Reference No. QCI/GC/1224/399

Request for Proposal
for
Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi

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Tender Notice

1. Quality Council of India invites proposals for **"Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi"**
2. The content of this RFP enlists the requirements of Quality Council of India. It includes the Bidding Terms & Conditions which details out all that may be needed by the potential bidders to understand the financial terms and bidding process and explain the contractual terms & Conditions that the Quality Council of India wishes to specify at this stage.
3. The prospective Bidders are invited to submit a "Technical Bid" and "Price Bid" for the package. Methodology for submission of Bid has been detailed hereunder in this document. The Bidder is expected to examine all instructions, forms, terms, conditions, specifications and other information in the bidding documents. Failure to furnish all information required as per the bidding documents or submission of a bid not substantially responsive to the bidding documents in every respect will be at the Bidder's risk and may result in rejection of its bid. The Bidder shall bear all costs associated with the preparation and submission of its Bid, and the QCI shall in no case be responsible or liable for those costs, regardless of the conduct or outcome of the Bidding process. After the submission of the proposal according to the instructions provided in the sections below, the bids will be evaluated through a two-bid system.
4. The Documents to be submitted:
   A. Bid acknowledgement form
   B. The "Technical Bid" shall contain the following:
      i. Signed and stamped Form-1, 2, 3, 4, 5 attached as Annexure-A
      ii. Details of Tender Fee submission
      iii. EMD (Bid security as per RFP) submission details
      iv. **Supporting documents** for the details required **as per pre-qualification criteria**
      v. HR declaration – No. of skilled manpower for interiors package and HVAC & Electrical Package
      vi. Organization chart of the proposed team to be deployed for the project
      vii. CVs of technical staff as detailed in clause IV sub-clause 1 (iii)
      viii. Approach & Methodology including a detailed timeline, execution plan, testing and Quality Assurance of works
      ix. Detailed activity-wise Level 1 and Level 2 schedule outlining the pre-construction, ongoing construction and post-construction phases of the project
      x. Completion certificate issued by client for evaluation of experience criteria detailed in clause IV sub-clause 3
      xi. Certificate copy of LEED / IGBC/ GRIHA executed projects
      xii. Copy of ESI/PF certificate
      xiii. Copy of Contractor's All-Risk policy / Workmen's Compensation policy certificate of recent completed project
      xiv. ISO related documents - 14001:2015, 18001:2007, and ISO 9001:2015
      xv. Details for of completed/ ongoing projects for **onsite inspections** as per Form 6 of Annexure-A.
      xvi. Item compliance sheet/ BOQ to be signed by authorised signatory **(unpriced bid) – *no price/rate shall be mentioned in the item compliance sheet/BOQ.* Non-compliance to this will be liable for rejection.**
      xvii. Any other details that the bidder may like to provide.

C. The "Price Bid" shall be submitted in a separate sealed envelope and shall contain the following:
   i. The Contractors should submit the proposal as per the Cover Letter for financial bid as per format given in Annexure – C in a spiral bound file.
   ii. Cover Letter for financial bid as per format in Annexure – C
   iii. Taxes would be additional and as per applicable statutory norms.

5. The Proposal may be submitted in two Parts, namely the "Technical Bid" Part and the "Price Bid". **'Technical Proposal'** for "**Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi**". Further, the Financial Proposal shall be placed in a sealed envelope clearly marked **'Financial Proposal'** for "**Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi**".

   Interested parties may submit the technical and financial Proposal in two separately sealed envelopes inside a larger sealed envelope super-scribing "**Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi**" to Deputy Director (Finance & Accounts), Quality Council of India, Institution of Engineers Building, 2nd Floor, 2, Bahadur Shah Zafar Marg New Delhi - 110002, India (By post or by hand) on or before January 10, 2025 by 3 PM.

Note –

1. The Technical Part shall not include any information related to the Price Bid. If any information related to the Bid price is found in the Technical Part of the Bid, the same shall be declared non-responsive.
2. The bidder shall furnish the letter of bid for financial part, mention the total price, applicable taxes and duties, any commission/ hidden charges, discount
3. Joint Ventures/Consortium participation are not allowed in this bid.

Tender Summary

S. No.	Item	Details
1	Project Scope	Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi
2	Pre-Bid meeting	January 2, 2025 *The link for the meeting will be uploaded on the QCI website.*
3	Bid duration	14 days
3	Time for Completion	120 days
4	Defects Liability Period	12 Calendar Months
5	Bid Selection	Two – Bid System
6	Earnest Money Deposit	₹ 60 lakhs
7	Last Date for Submission of Bid	January 10, 2025, by 3 PM
8	PBG	5% of the contract value
9	Presentation Round	To be notified via e-mail
10	Pre-bid Queries	To be submitted to procurement@qcin.org latest by one day post pre-bid meeting *(as per format given in Annexure-A)*
11	Tender fees (non-refundable)	Rs 29,500 (Rs 25000 + plus 18% GST.)
12	Bid validity	120 days

I. INTRODUCTION

QUALITY COUNCIL OF INDIA (QCI)

The Quality Council of India (QCI) is a pioneering experiment of the Government of India in setting up organizations in partnership with the Indian industry. The mandate of QCI is to lead nationwide quality movement in India by involving all stakeholders for emphasis on adherence to quality standards in all spheres of activities primarily for promoting and protecting interests of the nation and its citizens. To achieve this, QCI is playing a pivotal role in propagating, adoption and adherence to quality standards in all important spheres of activities including education, healthcare, environment protection, governance, social sectors, infrastructure sector and such other areas of organized activities that have significant bearing in improving the quality of life and well-being of the citizens of India.

To achieve this, QCI is playing a pivotal role in propagating, adoption and adherence to quality standards in all important spheres of activities including education, healthcare, environment protection, governance, social sectors, infrastructure sector and such other areas of organized activities that have significant bearing in improving the quality of life and well-being of the citizens of India.

It functions through its five constituent Boards and Project Implementation Divisions to establish National Accreditation Programme and Third-Party Assessment models with an aim to improve the quality ecosystem of the nation.

II. SCOPE OF WORK AND DELIVERABLES

The scope of work covered in this tender shall be as per the BOQ, specifications, drawings, instructions, orders issued to the Contractor from time to time during the execution of work. The total area where the work needs to be undertaken is 67,868 ft. approx.

Floor	Carpet Area
QCI Office	**(sq. ft.)**
Tower K – 1st floor	Approx. 17,991
Tower K - 2nd floor	Approx. 17,991
Tower J - 2nd floor	Approx. 21,592
Tower J - 3rd floor	Approx. 10,294

1. **The Contract Period**: The Contract period shall be reckoned from the day of issue of Work Order. The completion of the contract shall be date of issue of completion certificate. The commencement date for Defect Liability Period is the completion of Contract period.
2. **The Construction Period**: The Construction Period shall be **120 days** from the date of award of work. The completion date shall be the date of completion of the works at the end of the construction period including any extensions granted and taking care of snag list.
3. **Defects Liability Period**: The Defect Liability Period shall be **12 calendar months** starting from the date of issuance of the Completion Certificate. The Contractor shall promptly rectify/repair/replace all defects and deficiencies observed by the QCI Authorised Person during the Defects Liability Period within a period of 7 (seven) business days from the date of notice issued by QCI Authorised Person. The costs of rectify/repair/replace of all defects shall be borne solely by the Contractor. If the contractor fails to rectify/repair/replace the defect(s) deficiency(ies), within the specified time as above, the work should be redone or rectified through another agency, or departmentally by employing skilled labourers, at the contractor's cost. However, the penalty shall be imposed not to adhere the specified time for rectification/repair/replacement of the defect @ 1.5 times of the total cost incurred for the rectification/repair/replacement of the work/defect and the same shall be deducted from the final bill.

4. **Construction of temporary Site office and meeting room**: The contractor shall construct a temporary site office to accommodate Client (approx. 10 officials) and PMC officials (approx. 08 officials) and a conference room with a seating capacity for 20 people, ensuring it is in good condition and fully operational along with portable water and electricity. The construction and setup of these facilities must be completed within 3 to 4 days from the date of the award of work. The site office and meeting room shall include necessary furnishings and utilities (including drinking water, internet connectivity, toilet, printer) to facilitate efficient operations and meetings. The cost for the same shall be borne by contractor.

III. PRE-QUALIFICATION CRITERIA

S. No.	Basic Requirements	Specific Requirements	Documents Required
1	Legal Entity	The Bidder(s) interested in participating in the Selection Process must be a duly registered legal entity in India, under any one of the following categories: - • A Limited Liability Partnership ("LLP") registered under the LLP Act,2008; • an Indian Company ("Company") registered under the Companies Act, 1956/ 2013; • a "Partnership Firm" registered under the Indian Partnership Act, 1932; With minimum 7 years of existence at the time of submission of the bid.	Registration documents of the Bidder as a company/firm or any legal entity along with: i. Incorporation Certificate of the company ii. PAN Card of the registered legal entity iii. GST certificate of the registered legal entity iv. Certified copy of registered Partnership Deed; copy of Statement filed in the Register of Firms disclosing names, addresses and relevant details of ALL partners of the Partnership Firm v. MSME Certificate (if applicable) vi. Any other supporting document, as may be required
2	Average Annual Turnover	The bidding entity must have minimum average annual turnover of ₹ 120 crores or more in the last three financial years (i.e., 2021-22, 2022-23 and 2023-24).	i. Audited Financial Statements; or ii. Turnover certificate by CA (original) with FRN Number and UDIN Number
3	Solvency	The bidding entity must submit solvency certificate as on current Financial Year i.e. 2024-25	Copy of certificate certified by CA.

4	Technical Capability & Experience	The Bidder must have successfully executed / completed Similar Work in General Contracting model having size (60,000 sq. feet carpet area) or larger with at least one single order of Rs 18 crores or more; or 2 orders each of Rs 14 crores or more; or 3 orders each of Rs 10 crores or more, for similar project(s) to any Central / State Govt Organization / PSU / Statutory / Autonomous Organisation / Public Listed Company/ Private organisations of repute. In the last preceding five financial years (i.e. 2019-20, 2020-21, 2021-22, 2022-23 and 2023-24). The definition of "Similar Work" for the above stated work is as below: Similar work means Contracts having "Civil, Interior & Furnishing work such as Flooring, Wall & Ceiling finishes, Partitioning, Wood Work, False Ceiling, Plumbing, IT & AV, Electrical & other ancillary works inside the Office/Corporate building only".	(i) Work Order / Work Completion Certificates issued by Client. (ii) List of current ongoing projects in hand and their % of completion supported with work order (*as per format in Form 2 of Annexure-A*)
5	Blacklisting	The bidder shall not have been blacklisted by any central or state government agency, PSU etc. in the last 5 years preceding the proposal due date.	As per format in Form 4 of Annexure-A signed and stamped on company letterhead

IV. TECHNICAL EVALUATION

<table>
<tr><th>S. No.</th><th>Criteria</th><th>Maximum Marks</th></tr>
<tr><td>1</td><td>
Company Profile
i. Average Annual Turnover for last 3 FYs (2021-22, 2022-23, and 2023-24) – 10 marks
▪ At least ₹ 120 crores to ₹ 165 crores – 02 marks
▪ Above ₹ 165 crores to ₹ 210 crores – 04 marks
▪ Above ₹ 210 crores to ₹ 255crores – 06 marks
▪ Above ₹ 255 crores to ₹ 300 crores – 08 marks
▪ Above ₹ 300 crores – 10 marks
ii. Employees on roll – 10 marks (HR declaration to be submitted)
<table>
<tr><th>Interiors Package (skilled manpower) – 5 marks</th><th>HVAC & Electrical Package (skilled manpower) – 5 marks</th><th>Marks for each column</th></tr>
<tr><td>= 20</td><td>= 7</td><td>1</td></tr>
<tr><td>> 20 to 30</td><td>> 7 to 10</td><td>2</td></tr>
<tr><td>> 30 to 40</td><td>> 10 to 15</td><td>3</td></tr>
<tr><td>> 40 to 50</td><td>> 15 to 20</td><td>4</td></tr>
<tr><td>> 50</td><td>> 20</td><td>5</td></tr>
</table>
iii. Technical Staff – 20 Marks
<table>
<tr><th>S. No.</th><th>Minimum Qualification of Technical Representative</th><th>Designation of Technical Staff</th><th>Minimum experience</th><th>Minimum Number</th><th>Marks</th></tr>
<tr><td>1</td><td>Mandatory: B.E/B.Tech in Civil/Construction Management or equivalent.
Preferable: Post-graduate in Civil /Structural/Construction Management or equivalent.</td><td>Project Manager (Civil/ Interior)</td><td>20 years (and having experience of similar nature of work)</td><td>1 No.</td><td>3.5</td></tr>
<tr><td>2</td><td>Mandatory: B.E/B.Tech in Mechanical/Electrical Engineering or equivalent.
Preferable: Post-graduate in Mechanical/Electrical Engineering or equivalent.</td><td>Project Manager (MEP)</td><td>20 years (and having experience of similar nature of work)</td><td>1 No.</td><td>3.5</td></tr>
<tr><td>3</td><td>Graduate in Engineering with Diploma in Industrial Safety</td><td>Safety Officer</td><td>12 years (and having experience of similar nature of work)</td><td>1 No.</td><td>3.0</td></tr>
<tr><td>4</td><td>B.E/B.Tech in Civil Engineering or equivalent</td><td>Dy. Project Manager (Civil/Interior)</td><td>12 years (and having experience of similar nature of work)</td><td>1 No.</td><td>2.0</td></tr>
<tr><td>5</td><td>B.E/B.Tech in Electrical or equivalent</td><td>Dy. Project Manager (Electrical)</td><td>12 years (and having experience of similar nature of work)</td><td>1 Ns.</td><td>2.0</td></tr>
</table>
</td><td>40</td></tr>
</table>

		6	B.E/B.Tech in Mechanical Engineering or equivalent	Dy. Project Manager (Mechanical)	*12 years (and having experience of similar nature of work)*	1No.	2.0	
		7	B.E/B.Tech/Diploma in Civil/Electrical/Mechanical /Computer Science/ IT or equivalent	Project Engineer	*5 Years for B.E/B.Tech or 8 Years for Diploma*	4 Nos.	4	
					Total	**10 Nos.**	**20 marks**	
	Note: • The above list of resources is as per the minimum requirement. However, Client reserves the right to increase the resources at the time of execution of work as per the project requirements. • Bidder has to submit the organization chart for the above resources proposed to be deployed specifically for this project.							
2	• Presentation on the proposed approach and methodology for carrying out the project detailing timeline, execution plan and Quality assurance mechanism. • Detailed activity-wise Level 1 and Level 2 schedule outlining pre-construction, ongoing construction and post-construction phases of the project.							15
3	**Experience:** Projects executed/completed in past 5 years for any Central / State Govt Organization / PSU / Statutory / Autonomous Organisation / Public Listed Company/ Private organisations of repute, with the following range of carpet areas in sq. ft: 5 marks - >200,000 sq. ft project each subject to maximum of 05 (Five) projects 4 marks - between 200,000 sq. ft and 150,000 sq. ft project each 3 marks - between 150,000 sq. ft and 100,000 sq. ft project each 2 marks - 100,000 - 500,00 sq. ft project each 1 mark - < 5,00,00sq. ft project each **Note:** Bidders should submit completion certificate issued by client for evaluation of this criterion							25
4	The projects which have been executed as per green building projects: Certificate copy of LEED / IGBC/ GRIHA executed– 1 mark for each project subject to maximum of 4 projects.							4
5	i. Valid ISO 14001:2015 certification document – 2 marks ii. Valid ISO 18001:2007 certification document – 2 marks iii. Valid ISO 9001:2015 certification document – 2 marks							6
6	QCI will conduct an onsite inspection exercise for completed/ ongoing projects of similar scale (minimum carpet area of 60,000 sq. ft.) or larger to judge operational and executional competence (5 marks for each inspection subject to maximum of 2 projects)							10
							TOTAL	**100**

Note: Minimum marks for qualification are 70 out 100.

V. METHOD OF EVALUATION

- The bids of only those bidders who have fulfilled the minimum eligibility criteria will be evaluated.
- Evaluation of the bids will be done in two stages namely Technical Evaluation (comprising Pre-qualification Check and Technical Presentation) and financial evaluation based on Least Cost Selection (LCS) basis.
- The Financial Bid of only Technically Qualified Bidders will be opened.

VI. TERMS AND CONDITIONS

1. The construction period may be extended, subject to satisfactory performance of the contractor on the same terms & conditions and the requirements of QCI.

2. The QCI reserves to itself the authority to reject any or all the tenders received without assigning any reason. The acceptance of a tender shall be effective w.e.f. the date on which the letter of intent of acceptance of the tender is put in the communication by the QCI.

3. **Mobilization of Men, Materials and Machinery**: All expenses towards mobilization at site and de-mobilization including bringing in equipment, work force, materials, dismantling the equipment, clearing the site etc. shall be deemed to be included in price quoted and no separate payment on account of such expenses shall be entertained. It shall be responsibility of the contractor to obtain the approval for any revision and / or modification desired by him from QCI before implementation. Also, such revision and/or modifications if accepted /approved by the QCI shall be carried at no extra cost to QCI. All materials, once bought by the contractor within the project area, will not be allowed to be removed from the premises without the written permission of the QCI.

4. The rates quoted by the tenderer shall be firm and fixed for the entire period of completion and till handing over of the work. No revision to rates or any escalation shall be allowed on account of any increase in price of materials, labour, POL and overheads etc or any other statutory increase during the entire contract period.

5. No claim on account of any price variation/Escalation on whatsoever ground shall be entertained at any stage of works. All rate as per BOQ quoted by contractor shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation price variation clause shall be applicable on this contract.

6. **Technical Staff for Work**: The contractor shall employ at his own cost the adequate number of technical and other staff during the execution of this work depending upon the requirement of work. However, the minimum requirement has illustrated at Clause IV sub-clause 1(iii), i.e. Technical staff. The exact composition of the team shall consist of any or all the above-mentioned functionaries depending on the requirement of the project. The contractor shall not be entitled for any extra payment in this regard. However, if QCI feels additional requirement of the technical staff at project during execution, contractor shall deploy the same without any cost implication to QCI. The decision of QCI in this regard would be final and binding.

7. **Employment of Personnel**: The contractor shall employ only Indian Nationals as his representatives, servants and workmen after verifying their antecedents and loyalty. He shall ensure that no personal of doubtful antecedents and any other nationality in any way is associated with the works. Contractor will need to submit an undertaking to this effect before start of works. QCI shall have full power and without giving any reason to the contractor, to immediately remove any representative, agent, servant and workmen or employee on account of misconduct negligence or incompetence or whose continued employment may in their opinion be undesirable. The contractor shall not be allowed any compensation on this account.

8. For completing the work in time, the contractor might be required to work in two or more shifts (including night shifts). No claim whatsoever shall be entertained on this account, not with-standing the fact that the contractor may have to pay extra amounts for any reason, to the labourers and other staff engaged directly or indirectly on the work according to the provisions of the labour and other statutory bodies regulations and the agreement entered upon by the contractor with them.

9. **No Idle Charges towards Labour or P&M etc.**: No idle charges or compensation shall be paid for idling of the contractor's labour, staff or P&M etc. on any ground or due to any reason whatsoever. QCI will not entertain any claim in the respect.

10. **Authorization and Statutory Clearances**: The contractor shall be solely responsible for obtaining all necessary authorizations, permits, and statutory clearances required to execute the project in compliance with applicable laws, regulations, and guidelines. This includes, but is not limited to, environmental clearances, labour permits, safety certifications, and any other approvals mandated by local, state, or national authorities. The contractor shall ensure that all approvals are secured prior to commencing the relevant work and shall bear all associated costs. Any delays or disruptions caused by the failure to obtain such clearances shall be the contractor's responsibility, and no extensions of time or additional payments will be granted on this account.

11. **Work to be executed in accordance with Specifications, Drawings, Orders etc.:** The contractor shall execute the whole and every part of the work in the most substantial and workman like manner both as regard materials and otherwise in every respect in strict accordance with the specification. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions issued in respect to the work assigned by the QCI Authorised Person. The contractor shall comply with the provisions of the contract and execute the works with care and diligence and maintain the works and provide all labour and materials, tool and plants including for measurement and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these is specified or is reasonable inferred from the contract. The contractors shall take full responsibility for adequacy, suitability and safety of all the works.

12. **Site-Visit**: The bidder may visit the site with prior approval of QCI. The request to be submitted at procurement@qcin.org at least one day before the proposed site visit date along with the Authorization letter of the person visiting the site. The bidders will be allowed to visit the site from date of issue of this tender until day before the last date of submission.

    Address: 2nd & 3rd Floor of Tower J and 1st & 2nd Floor of Tower K World Trade Centre Nauroji Nagar New Delhi -110029

13. **Presentation**: As a part of Evaluation of proposals submitted by the applicants, QCI reserves the right to seek further information or a presentation from the Organizations for evaluation purposes. The presentation must include work methodology, stage wise approach, organizational chart, details of technical staff and Quality assurance approach. QCI may call for such information/presentation at a short notice.

14. **Schedule of Rates:** The quantities shown against the various items of work are only approximate quantities which may vary as per the actual requirement / measurement at site.

15. **Care of Works:** From the commencement to the completion of the works including handing over to the QCI, the contractor shall take full responsibility for the care thereof and all temporary works and in case any damage loss or injury shall happen to the works or to any part thereof or to any temporary works due to lack of precaution / negligence on part of contractor, the same shall be made good at his own cost.
    i. Care shall be taken by the contractor during execution of the work to avoid damage to the building and adjacent buildings.
    ii. They shall also be responsible for repairing all such damages and restoring the same to the original finish at their cost.

iii. They shall also remove all unwanted and waste materials arising out of the execution of work from the site from time to time.

16. **Materials and Samples**: The materials / products used on the work shall be of approved make/ brands out of list of approved makes given in the tender document. The contractor shall submit samples/ specimens of approved makes of materials / products to the QCI Authorised Person for prior approval. The contractor must submit a material inspection report to QCI Authorised person. In exceptional circumstances, or in case if any items whose make is not listed, QCI Authorised Person may allow alternate equivalent makes / brands of products / materials, the replaced/alternate materials used shall have same or richer specifications to the original materials and compatible to the work at his sole discretion. However, the contractor has to submit the request to QCI at least 7 days in advance for the same. The final choice of brand/ make shall remain with the QCI Authorised Person, whose decision in the matter shall be final and binding and nothing extra on this account shall be payable to the contractor.

17. **Warranty**:

i. The contractor has to provide OEM Warranty certificates in the name of QCI for all the items. In case of any specialized items become obsolete in the market, OEM support for such items (spare parts/ technical support) is to be provided for a minimum of 5 years after completion of Warranty period. Warranties shall be in the form of Certificates issued by the Manufacturer/OEM in the name of QCI clearly specifying the period of warranty, quantity & description of items. The items/equipment procured under this package shall not be before the date of work order.

ii. The agency has to produce Manufacturer Test Certificates (MTC), Warranty Certificates/Invoices for material/equipment supplied for certification and approval. The warranty of all the items should be transferred to QCI as a part of the handover of the site.

18. **Conditions for Subletting of work** :The contractor shall not sublet or assign the whole or part of the works except where otherwise provided, by the contract and even then only with the prior written consent of QCI and such consent if given shall not relieve the contractor from any liability or obligation under the contract and he shall be responsible for the acts, defaults or neglects of any subcontractor, his agent, servants or workman as if they were the acts, the defaults or neglects of the contractor, his agent servants or workman provided always that the provision of labour on piece work basis shall not be deemed to be a subletting under this clause. However, the following conditions must also be fulfilled in case of subletting:

i. Subcontracting may be allowed only for certain specialised works, subject to approval of competent authority. Bidders planning to subcontract shall specify, in the Letter of Bid, the activity(ies) or parts of the Works to be subcontracted along with complete details of the subcontractors and their qualification and experience. The subcontract bidders should have prior experience of executing similar works not less than 75% of the volume of work to be subcontracted in the last 3 financial years. It is the sole responsibility of the contractor to assess the performance and process of payment to the sub contractor and Employer bears no liability towards sub-contractor.

ii. The Contractor shall provide to the QCI Authorized Person a copy of the agreement to be entered into by Contractor with subcontractor. No subcontractor shall be permitted without a formal agreement between Contractor and subcontractor. This agreement shall clearly define the scope of work to be carried out by subcontractor and the terms of payment in clear & unambiguous manner.

19. **Compensation for Delay and Remedies**: If the contractor fails to maintain the required progress in terms of relevant clause of contract, to complete the work and clear the site on or before the Completion date or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to the Govt. on account of such breach, pay as agreed compensation the amount calculated at the rate stipulated below or such amount as the QCI Authorised Person (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every complete day /week (as applicable) that the progress work remains incomplete.

20. **Defects Liability Period:** The contractor shall be responsible for the rectification of defects in the works for a period **of 12 calendar months** from the date of taking over of the works by the Owner / Client. Any defects discovered and brought to the notice of the contractor shall be attended to and rectified, by the contractor at his own cost and expense.

For specialized works such as water proofing, anti-termite treatment etc, the defect liability period shall be for a minimum period of 10 years, in which:

i. The contractor shall be fully responsible for and shall guarantee proper performance of the entire waterproofing system for a period of 10 (Ten) years from the final completion of works. For this, a specific 10 years written guarantee *(to be furnished in a non-judicial stamp paper of value not less than Rs.100/-)* in the prescribed proforma ***(Annexure B)*** shall be submitted for the performance of the system before final payment and shall not in any way limit any other rights the Employer may have under the contract. All water-proofing work shall be carried out through specialized agency as per method of working approved by the QCI Authorized Person. However, the contractors shall be solely responsible for waterproofing treatment until the expiry of the above guarantee period.

ii. Defects of serious nature causing inconvenience such as leakage, reverse floor slopes affecting the drainage *(ponding of water), warping and opening of joints in doors and window shutters, etc, shall be undertaken by th*e contractor immediately on receipt of the complaint but not exceeding one-week time, failing which, the defects will be got removed at his risk and ***cost plus 50% + GST extra*** as supervision and establishment charges. This will be adjusted from amount retained by QCI.

iii. All other defects notified to the contractor during the DLP shall be rectified to the entire satisfaction of QCI Authorized Person or item replaced as soon as possible but not beyond one week failing which, QCI Authorized Person shall get it done at his **cost plus 50% + GST extra** as supervision and establishment charges. **The decision of QCI Authorized Person regarding a defect being of serious nature or otherwise shall be final and binding**. This will be adjusted from amount retained by QCI.

The scope of the defect liability will be as under (as applicable):

S. no.	SLA Parameters	Description	Response Time
1	Response Time for Reporting Defects	The contractor must acknowledge receipt of defect notifications.	Within 48 hours of the client's notification of a defect or issue
2	Resolution Time for Defects	The contractor is required to rectify any reported defects within the specified timeframe.	7 business days depending on the nature and severity of the defect. Minor issues may be resolved within 5 business days, while more significant defects may take up to 10 business days

3	Emergency Repairs/Temporary Solutions	For critical defects (e.g., electrical, HVAC failure, plumbing, fire safety), the contractor must provide temporary repairs to ensure safety and functionality until the permanent solution is applied	Within 24 hours of the issue being reported for emergency fixes. Permanent repair must be done within 7 to 10 days.
4	Rework and Quality Assurance	Any defect that occurs during the DLP period must be fixed to meet the original quality standards.	All rework should be completed to client satisfaction within the defect resolution timeline. The work must be inspected and approved by the client /PMC.
5	Cost of Repairs	The contractor is responsible for covering the costs of repairs related to defects in workmanship or materials.	No cost to the QCI for repairs, replacement, or rework due to contractor's fault or poor workmanship.
6	Performance Monitoring and Reporting	The contractor must monitor the performance of systems like HVAC, BMS, electrical, plumbing, etc., to ensure they continue to function properly during the DLP.	The contractor should provide a monthly performance report during the defect liability period. Any performance failures must be rectified within 5 working days of reporting.
7	Warranty for Installed Equipment	For all equipment (e.g., HVAC systems, fire alarms, white goods, IT/AV systems), the manufacturer's warranty and contractor's commitment during the DLP must be honored.	The contractor must ensure that all installed equipment is fully functional and any defects related to these systems must be corrected without cost to the QCI
8	Final Inspection at the End of DLP	The contractor and QCI will conduct a joint inspection at the end of the defect liability period to ensure that all defects have been addressed.	The inspection must occur within the last month of the DLP, with all outstanding issues resolved prior to this meeting.

Note: The above list is illustrative for works, however the same is not exhaustive and the decision of QCI Authorized Person would be final and binding in this regard.

21. Precautions to avoid any nuisance to the neighbourhood / surrounding. All the necessary precautions will need to be taken during the implementation of the project (either during day or night), to avoid any nuisance or any harm causing to the neighbourhood/surrounding areas of proposed construction site. No complaint should arise by the neighbourhood /occupiers of other office in the building, during the development work by contractor or any of the persons directly or indirectly related to the site work. In case of any such conditions the contractor shall be fully responsible for the consequences & settlement.

22. **Fair Wage Clause**: The contractor shall not pay less than fair wages/minimum wages to labourers engaged by him on the work as revised from time to time by the Government.

23. **Contractor Liable for Damage Done and For Imperfections:** If the Contractor or his work people or servants shall break, deface, injure or destroy any part of a building in which they may be working or any building, road, fence, enclosure, or cultivated ground, contiguous to the premises on which the work or any part of it is being executed, or if any damage shall happen to the work. If any imperfection becomes apparent while the work is in progress, , or the contractor shall within a period specified by QCI after a Certificate, final or otherwise of its completion (given by the QCI Authorised Person or Tendering Authority), shall cause the same to be made good by other workmen and deduct the expense (of which the certificate of the QCI Authorised Person or Tendering Authority shall be final) from any sums may be then, or at any time, thereafter that may become due to the Contractor, or form his performance security, or the proceeds of sale thereof, or of a sufficient portion thereof.

24. **Authenticity of Equipment**: The selected bidder shall certify that the supplied goods are brand new, genuine/ authentic, not refurbished, conform to the description and quality as specified in this bidding document and are free from defects in material, workmanship and service. If during the contract period, the said goods be discovered counterfeit/ unauthentic or not to conform to the description and quality aforesaid or have determined (and the decision of the QCI Authorised person in that behalf will be final and conclusive), notwithstanding the fact that the QCI may have inspected and/ or approved the said goods, the QCI will be entitled to reject the said goods or such portion thereof as may be discovered not to conform to the said description and quality. The selected bidder shall, if so called upon to do, replace the goods etc., or such portion thereof as is rejected by QCI Authorised person, otherwise the selected bidder shall pay such damage as may arise by the reason of the breach of the condition herein contained. Nothing herein contained shall prejudice any other right of the QCI Authorised person in that behalf under this contract or otherwise. Goods accepted by the QCI in terms of the contract shall in no way dilute QCI 's right to reject the same later or deduct equivalent value (market value) of product, if found deficient in terms of this clause of the contract.

25. **Withdrawal of Work from the Contractor**: If the Tendering Authority shall at any time and for any reasons, whatever, including inability to maintain pro rata progress, think any portion of the work should not be executed or should be withdrawn from the contractor, he may by notice in writing within 7 days to that effect, require the Contractor not to execute the portion of the work specified in the notice, or may withdraw from the Contractor the portion of work, so specified, and the Contractor shall not be entitled to any compensation, by reason of such portion of work having been withdrawn from him. The QCI Authorised Person or Tendering Authority may supplement the work by engaging another agency to execute such portion of the work at the risk and cost of the original contractor without prejudice to his rights. He shall also be competent to levy penalty for delay in progress. The recovery of excess cost shall be made good from the bills or any other claims and shall not be deferred.

26. **Protect Works**: The contractor shall arrange to protect, at his own cost, in an adequate manner all stone work and other works, requiring protection and to maintain such protection, as long as work is in progress. He shall remove and replace this protection as required by the QCI Authorised Person or Tendering Authority, from time to time, any damage to the work, so protected no matter how it may be caused. Shall be made good by the Contractor free of cost. All template, forms, moulds, centring, false ceiling works and models, which in the opinion of the QCI Authorised Person or Tendering Authority, are necessary for the proper and workman like execution of the work, shall be provided by the Contractor free of cost.

27. **Safety of Workers**: Ensuring safety of workers at time of construction shall be the responsibility of the bidder. QCI has no obligation or responsibility towards any individual in any such case or situations. The bidder must have and maintain valid and keep in force insurance policies accidents, public liability, professional indemnity, worker's compensation required by law. The bidder shall provide personal protective equipment like helmet, face shield, gloves, safety shoes, etc., of standard make acceptable, to all the employees at their cost.

28. **Force Majeure:** Any delay in or failure of the performance of either party hereto shall not constitute default hereunder to give rise to any claims for damages, if any to the Extent such delay or failure of performance is caused by occurrences such as acts of God or the public enemy, expropriation, compliance with any order or request of Government authorities, acts of war, rebellions, sabotage fire, floods, illegal strikes, pandemic, epidemic or riots (otherwise than among the contractors employees). Only extension of time shall be considered for Force Majeure conditions as accepted by QCI. No adjustment in contract price shall be allowed for reasons of force majeure.

    Force Majeure shall not include:

    i. any event which is caused by the negligence or intentional action of a Party or by or of such Party's agents or employees, nor
    ii. any event which a diligent Party could reasonably have been expected both to take into account at the time of the signing of the Contract and avoid or overcome with utmost persistent effort in the carrying out of its obligations hereunder.
    iii. Insufficiency of funds or manpower or inability to make any payment required for execution of services under this Contract.

29. The contract will be awarded to the Contractor whose proposal conforms to the terms of the RFP and is, in the opinion of QCI, the most advantageous and represents the best value of the assignment, price and other factors considered. QCI reserves the right to negotiate with the most competitive Contractor if required.

30. **Technical Data sheet**: Before initiation of inspection of material, the contractor should submit a Technical Data sheet for approval of QCI Authorised person.

31. **Amendments to RFP:** At any time prior to the last date for receipt of applications, QCI may for any reason, whether at its own initiative or in response to a clarification requested by a prospective applicant, modify the RFP document by an amendment by issuing Corrigendum. The same shall be published in QCI website. In order to provide prospective applicants reasonable time to take the proposed amendments into account while preparing their proposals, QCI may at its discretion extend the last date for the receipt of proposals and/or make other changes in the requirements set out in the RFP. Any such amendment shall be communicated to the contractors.

32. **Tender Fee:** Bidders shall submit, along with their bids, a non-refundable tender fee amounting to Rs 29,500 (Rs 25,000/- plus 18% GST) as per the details mentioned below:

    Deposit through RTGS/ NEFT as detail under: -

    For payment of Tender fee through Bank transfer:

Name of the Bank	Axis Bank LTD, 6/83, Padam Singh Road, Karol Bagh, New Delhi
Name of the Account	Quality Council of India
Saving Bank Account	223010100053020
IFSC Code	UTIB0000223

    The bidder should submit the transaction details in the technical bid.

33. **Earnest Money Deposit (EMD)/ Bid Security**: Bidders shall submit, along with their Bids, Bid Security (EMD) of INR 60 lakhs as per the details mentioned below:

i. By demand draft in favour of Quality Council of India, payable at New Delhi, or

ii. Deposit through RTGS/ NEFT as detail under: -

For payment of EMD through Bank transfer:

Name of the Bank	Axis Bank LTD, 6/83, Padam Singh Road, Karol Bagh, New Delhi
Name of the Account	Quality Council of India
Saving Bank Account	223010100053020
IFSC Code	UTIB0000223

Note:

i. NO CHEQUES WILL BE ACCEPTED. The applicant whose Tender Fee and EMD has been deposited by NEFT/RTGS, must enclose the transaction details/ evidence along with their technical bid, otherwise the bid will be rejected.

ii. Bid security in any other form will not be entertained.

iii. No interest will be payable to the Bidder on the amount of the EMD. Unsuccessful Bidder's EMD will be discharged/ returned as promptly as possible, but not later than 30 days of completion of the process

iv. In case bid is submitted without the bid security then QCI reserves the right to reject the bid without providing opportunity for any further correspondence to the bidder concerned. The EMD may be forfeited:

- If a bidder withdraws its bid during the period of bid validity.
- Bidder does not respond to requests for clarification of its Proposal.
- Bidder fails to provide required information during the evaluation process or is found to be nonresponsive.
- In case of a successful bidder, if the bidder fails to sign the contract in accordance with this RFP.

v. As it is a works contract, hence the benefits of MSEs are not applicable.

34. **EMD Refund:**

- For Unsuccessful Bidders: The EMD of all unsuccessful bidders would be refunded without interest by QCI on finalization of the bid in all respects by the successful bidders within 45 days after finalization of tender.
- For Successful Bidders: The EMD of successful bidders would be returned without interest upon submission of Performance Bank Guarantee by the successful bidders. The above-mentioned refund would be completed within 30 days of the issue of the work order to the successful bidder.
- In case a bid is submitted without the bid EMD then QCI reserves the right to reject the bid without providing opportunity for any further correspondence to the bidder concerned.

35. Mobilization Advance Bank Guarantee: The contractor will be entitled for Mobilization Advance of 5% of the Contract Value including GST within 7 days of acceptance of LOA and on submission of Bank Guarantee for an equivalent amount. The Bank Guarantee shall be released after successful handover of completed works.

36. **Performance Bank Guarantee**: The selected Bidder shall submit irrevocable Performance Bank Guarantee, within 15 days from the Notification of award, for a value equivalent to **5% of the contract value**. The Performance Bank Guarantee shall contain a claim period of three months from the last date of validity. The bank guarantee shall be valid for the period of 24 months from the date of issuance of work order plus three (03) months of claim period. The selected Bidder shall be responsible for extending the validity date and claim period of the Performance Bank Guarantee as and when it is due on account of non-completion of the delivery and Warranty period.

    The physical copy of Performance Guarantee should be submitted at QCI-HO within 15 days from the notification of award. In case the selected bidder fails to submit a Performance Guarantee within the time stipulated, QCI at its discretion may cancel the order placed on the selected bidder without giving any notice. QCI shall invoke the performance guarantee in case the selected bidder fails to discharge their contractual obligations during the period or QCI incurs any loss due to bidder's negligence in carrying out the project implementation as per the agreed terms & conditions.

37. **Ethics**: QCI expects all operators, shortlisted bidder(s) to show highest ethical standards during the course of the assignment especially during on-groundwork. If any complaints/information regarding any incident of malpractices (bribery, seeking monetary or non-monetary favor/gifts) is brought to the notice, the shortlisted bidder(s) shall take the necessary action (to the extent of expulsion/removal) as per its organization rules and laws applicable at that time. QCI is absolved of any liability/claim arising out of any such above situations.

38. **Amendment to work**: Any amendments to the scope of work under this RFP must be proposed in writing by either party, and shall be subject to mutual agreement, documented through a formal written amendment or change order signed by authorized representative of QCI. Amendments may result in adjustments to the project schedule, costs, and responsibilities, which shall be explicitly defined in the amendment document.

39. **Insurance**: The contractor shall obtain and maintain a comprehensive insurance policy at their own cost, covering all risks associated with the execution of the work, including but not limited to loss or damage to equipment, materials, and the worksite, as well as third-party liabilities, injuries to personnel, and damage to property arising from the performance of the contract. The insurance policy shall remain valid throughout the duration of the contract and shall be obtained from a reputable and authorized insurance provider. The contractor shall provide proof of such insurance to the client prior to commencing work and ensure that the policy includes the client as a beneficiary or co-insured, as applicable. Any lapse, cancellation, or modification of the policy without prior written consent of the client shall be deemed a breach of the contract.

    Goods supplied under the Contract shall be fully insured against loss by theft, destruction or damage incidental to manufacture or acquisition, transportation, storage, fire, flood, under exposure to weather and delivery at the designated project locations, in accordance with the applicable terms. The insurance charges will be borne by the supplier and QCI will not be required to pay such charges if incurred. The goods will be delivered and stored at the destination in perfect condition.

40. **Plant, Machinery & Job facility Area:** The contractor will have to make his own arrangement for storage of materials, plants, equipment's, machineries to be used in the execution of this work well in time after award of the contract, at his own cost. The land for facilitating the works shall be arranged by the contractor and maintained and re-instated after the implementation as per Environment mitigation norms. The contractor shall allow the QCI Authorized persons or any person authorized by the local authorities to access the site or any place where work in connection with the contract is being carried out or intended to be carried out or to any place where materials or plant are being manufactured / fabricated/ assembled for the works.

41. **Confidentiality**: The bidder(s) must not divulge any confidential information and ensure that reasonable steps are taken to provide for the safe custody of any and confidential information in its possession and to prevent unauthorized access thereto or use thereof. The shortlisted bidder(s) must not, without the prior written consent of QCI, disclose any confidential information of QCI or any government department or relating to any ministry or any other party. In giving written consent to the disclosure of confidential information, QCI may impose such conditions as it thinks fit, and the bidder must comply with these conditions. Confidentiality clause shall survive for a period of one year after the termination of contract or contract expiry period.

42. No part of this document including the Annexure can be reproduced in any form or by any means, disclosed or distributed to any person without prior written consent of QCI, except to the extent required for submitting the bid and no more. The information contained in this document is only disclosed for the purposes of enabling potential Contractors to submit a proposal to QCI. This document should not therefore be used for any other purpose. This document contains proprietary information furnished for evaluation purposes only; except with the written permission of the QCI, such information may not be published, disclosed, or used for any other purpose. The bidding firms acknowledge and agree that this document and all portions thereof, including, but not limited to, any copyright, trade secret and other intellectual property rights relating thereto, are and at all times shall remain the sole property of QCI. The title and full ownership rights in the information contained herein and all portions thereof are reserved to and at all times shall remain with QCI. Contractors must agree to take utmost care in protecting the proprietary and confidential nature of the information contained herein.

43. **Major Milestone Schedule:**
The Contractor has to complete the work in all aspects within 120 days from Award of Contract. Major Milestones are defined as under:

S. No.	% completion of work	Timeline (D= date of award of contract)
1	20%	D+ 25 days
2	40%	D+ 50 days
3	55%	D+ 75 days
4	75%	D+ 100 days
5	100% (Handing over of completed works)	D+ 120 days

44. **Payment Milestones**:

S. No.	Milestone	Payment Schedule
1.	Release of 5% amount for Mobilization Advance against submission of Mobilization Advance Bank Guarantee for equivalent amount and Within 7 days after acceptance of LOA	5%
2.	On completion of 15% of the total awarded work, and verified through Joint Measurement, 10% of the contract value shall be paid.	10%
3.	On completion of 40% of the total awarded work, and verified through Joint Measurement, 25% of the contract value shall be paid.	25%
4.	On completion of 55% of the total awarded work, and verified through Joint Measurement, 15% of the contract value shall be paid.	15%
5.	On completion of 75% of the total awarded work, and verified through Joint Measurement, 20% of the contract value shall be paid.	20%
6.	On completion of 95% of the total work awarded, verified through Joint Measurement, 20% of the contract value shall be paid.	20%
7.	On completion of 6 months after expiry of Defect Liability Period of 12 months from the date of handover of completed works	5%

i. **Payment** shall be made based on **Joint measurement certificate** against each RA bills submitted to be signed by contractor, PMC, and QCI authorised person. Measurements shall be conducted as per relevant IS codes and good engineering practices. The decision of **QCI Authorized Person would be final and binding in this regard.**

ii. Payment shall be made after submission of invoices within 30 days of receipt of invoice complete in all respect.

iii. Incorrect Invoices, Under/Over Payment: In case an invoice is found to have been rendered incorrectly after payment, any underpayment or overpayment will be recoverable by or from the contractor, as the case may be, and, without limiting recourse to other available means, may be offset against any amount subsequently due by QCI to the contractor under this contract.

45. **Penalty**: Penalty may be imposed on non-performance/ violation of any of the terms and conditions mentioned in this RFP. The quantum of such penalty shall be as decided by the committee of officials (constituted by QCI). The following shall be the treatment in case of damages and delays:

i. Any damage to the building or to any equipment which might result during the repair shall be repaired by the Contractor.

ii. If the job is not completed within the stipulated time penalty amount @ 1% (of the contract value) per week or part thereof, subject to cap of 10% of total contract value will be applicable on the contractor, provided such delay is not attributable to QCI.

The work must be completed as stipulated in the acceptance of the tender should be deemed to be the essence of the contract and delivery must be completed no later than the dates specified therein. Extension will not be given except in exceptional circumstances. However, if the work is completed after expiry of the contracted completion period without prior concurrence of QCI, such delivery will not deprive QCI of the right to recover liquidated damages.

46. QCI, by issuance of this RFP does not necessarily indicate or imply that the project will be commenced. The Contractor will absolve QCI of all responsibilities if the project does not start within a stipulated timeframe. QCI reserves the right to withdraw this assignment any time without prior consultation or intimation to the Contractors.

47. The interested Contractors shall furnish an affirmative statement as to the existence of, absence of, or potential for conflict of interest on the part of the Contractor or any prospective subcontractor due to prior, current, or proposed contracts, engagements, or affiliations with QCI. Additionally, such disclosure shall address any and all potential elements (time frame for service delivery, resource, financial or other) that would adversely impact the ability of the Contractor to complete the requirements as given in the RFP.

48. The Contractor shall not make any alteration / changes in the bid after the closing time and date. Unsolicited correspondence from the Contractor will not be entertained.

49. If at any stage of the tendering process or during the currency of the agreement any suppression / misrepresentation of such information is brought to the knowledge of QCI, QCI shall have right to reject the bid or terminate the agreement, as the case may be, without any compensation to the Contractor.

50. The Contractor shall be deemed to have complied with all clauses in this RFP. Evaluation shall be carried out on the available information in the bid.

51. The firms / agencies submitting their proposals would be responsible for all of its expenses, costs and risks incurred towards preparation and submission of their proposals, attending any pre-proposal meeting and visiting the site or any other location in connection therewith. QCI shall, in no case, be responsible or liable for any such costs whatsoever, regardless of the outcome of the process.

52. The proposals submitted by the firms/agencies shall remain valid for a period of 120 days after the closing date (deadline) for submission of proposals prescribed in this document.

53. During evaluation, QCI may, at its discretion, ask the respondents for clarifications on their proposals. The firms/agencies are required to respond within the time frame prescribed by QCI.

54. At any time prior to deadline for submission of proposals, QCI may for any reason, modify the RFP document. The prospective respondents having received the RFP document shall be notified of the amendments through email and such amendments shall be binding on them.

55. QCI may at its sole discretion and at any time during the evaluation of proposal, disqualify any respondent, if the firm:

    i. Submitted the proposal after the response deadline
    ii. Made misleading or false representations in the forms, statements and attachments submitted in proof of the eligibility requirements

iii. Exhibited a record of poor performance such as abandoning works, not properly completing the contractual obligations, inordinately delaying completion or financial failures, etc. in any project in the preceding three years
iv. Submitted a proposal that is not accompanied by required documentation or is non-responsive, failed to provide clarifications related thereto, when sought
v. Submitted more than one proposal
vi. Was declared ineligible by the Government of India/State/UT Government for corrupt and fraudulent practices.

56. **Obligation:** The contractor,
   i. must at all times comply with
      a. all Applicable Laws; and
      b. without limiting, all applicable anti-bribery, anti-corruption, anti-money laundering, trade sanctions and export control, modern slavery (including without limitation forced or compulsory labour, child labour, physical abuse, and withholding of identity papers), equal opportunity, anti-discrimination, health and safety, and environmental laws, rules, and regulations ("Compliance Laws");
   ii. shall ensure that any and all notices and instructions issued by QCI or state/Centre government in relation to any Applicable Laws are obeyed by its personnel and any visitors to the Site;
   iii. warrants that it and its officers and its current and historical Affiliates have never materially violated any Compliance Laws, nor been the subject of any government indictment, nor had any fines, penalties or settlement agreements with any government agency in the past five years that resulted in material financial costs, or negatively affected its ability to operate;
   iv. must at all times have due diligence procedures for its operations as well as for participants in its supply chains adequate to ensure that there is no modern slavery or human trafficking in it or its supply chains;
   v. must not engage any third party that at any time engages in modern slavery;
   vi. must not provide work environments that are unsafe or unhealthy for anyone;
   vii. must minimize adverse effects on the community, environment, and natural resources;
   viii. must notify QCI as soon as it becomes aware of any actual or suspected bribery, corruption, money laundering, slavery, human trafficking, discrimination, or breach of health and safety or environmental laws, in its own operations or supply chain;
   ix. must endeavour to maintain records tracing the supply chain of all goods and services provided under this Agreement and make immediately available to QCI upon its request all such records.
   x. Must intimate PMC/Client before proceeding for any drilling/breaking of existing structures and take prior approval before proceeding.
   xi. The contractor shall be responsible for liaison with concerned Government Authorities for obtaining statutory permits, clearances, taxes and other compliances like deposit of Labour Cess, etc. and submit copies of the same to Client/PMC without fail.
   xii. All the cost related to temporary arrangement of Electricity and Water required for construction till successful completion of the project (even in case of bill generated from meter reading) shall be borne by the GC Contractor only and ensuring proper health, safety and environmental compliances and deemed to included in the Contract value.
   xiii. The contractor shall ensure a healthy and cordial work environment and ensure proper coordination with the Client/PMC/subcontractor and other stakeholders with utmost integrity without indulging in arguments/ fights over sharing of project components amongst each other.

57. **Sustainability:** The contractor will,
    i. endeavour to embed appropriate sustainability practices in its business and supply chain policies and procedures;
    ii. promote age, racial, cultural, disability, gender and religious diversity and inclusivity of employees across its business and its supply chain, except where law prohibits;
    iii. adopt carbon reduction principles for its business and obtain similar commitments from its service contractors, subcontractors, agents and distributors;
    iv. adopt approaches to maximize positive social impacts of its practices such as buying locally, promoting skills development through apprenticeships, employee training and promotion and offering employment opportunities to the local community; and
    v. pay all employees, as a minimum, the national or local minimum wage as required by law or regulations.

58. **Audit and Access**: QCI (or their authorised representative) may conduct audits relevant to the performance of the contractors' obligations under this Agreement. Audits may be conducted of:
    i. the Contractor's operational practices and procedures as they relate to this Agreement, including security procedures;
    ii. the accuracy of the Contractor's invoices and reports in relation to the provision of the Services; the Contractor's compliance obligations under clause 56 (Compliance with Legislation);
    iii. the Contractor's compliance with its confidentiality, privacy and security obligations under this Agreement;
    iv. Work Product (including books and records) in the possession of the Contractor relevant to this Agreement; and
    v. Access any other matters determined by QCI to be relevant to the agreement. QCI (or their authorised representative) may, at reasonable times and on giving reasonable notice to the Contractor, and to the extent relevant to the performance of this Agreement:
        a. access the premises of the Contractor;
        b. require the provision by the Contractor, its personnel or subcontractors, of records and information in a data format and storage medium accessible by QCI;
        c. inspect and copy Work Product (including original documentation, books and records), however stored, in the custody or under the control of the Contractor, its personnel or subcontractors; and require any other reasonable assistance from the Contractor or its personnel in respect of an audit relevant to the performance of the Contractor's obligations under this Agreement.
        d. The Contractor must provide access to and reasonable assistance requested to use its computer hardware and software to the extent necessary for QCI to exercise its rights under this clause.

59. **Construction Resourcing**: The contractor shall provide suitable resourcing, by means of part-time or full-time staff, dedicated to sustainability implementation, tracking, document collation, and subcontractor/supplier coordination. The contractor's staff dedicated to sustainability shall: -
    i. Host meetings with the construction team, subcontractors, and suppliers to advise the sustainability requirements of the project
    ii. Notify the construction team, subcontractors, and suppliers of required documentation to validate sustainable delivery.
    iii. Develop documentation related to the contractor's sustainability materials, installation, and delivery.

iv. Vet subcontractors' and suppliers' documentation to ensure necessary sustainability details are included, prior to issuing to client, project manager, or relevant consultants.
v. Track documentation and manage timely retrieval
vi. Monitor energy/water/waste throughout construction
vii. Collate documentation for reporting to client (or submission if targeting a sustainability certification)
viii. Manage commissioning and handover to meet sustainability requirements of the project.

60. **Energy, Water and Waste Monitoring:** Energy shall be monitored on sites where the hoarded boundaries or controlled construction site is provided a segregated power supply to a temporary distribution board, or a larger site-power distribution network. Monitoring of energy consumption shall be recorded minimally monthly via a digital power meter within distribution boards. Large sites consisting of multiple plots shall record energy consumption minimally per plot, and sites of a single plot or space within a building shall record minimally a single energy consumption value.
Water shall be monitored on sites where the hoarded boundaries or controlled construction site is provided a segregated water supply to the site, or larger site-water distribution network. Monitoring of water consumption shall be recorded minimally monthly via water sub meters. Large sites consisting of multiple plots shall record water consumption minimally per plot, and sites of a single plot or space within a building shall record minimally a single water consumption value.
Waste shall be monitored on all sites, regardless of site. Segregated construction waste bins for smaller sites or skips for larger sites shall have content weighed before disposal or by waste disposal service provider. If waste is segregated into waste streams for recycling, weight of each waste stream shall be measure and recorded separately. Waste may be recorded per collection and detailed recording may be provided, however, monitoring of waste can be tallied recorded minimally weekly.
Waste material, scrap, off-cuts, or packaging shall not be removed from site by any contractor or supplier unless weighted and recorded. Energy, Water and Waste monitoring shall be recorded by the relative consuming or disposing contractor or supplier, with the main contractor or lead contractor responsible for information collation, including values being tallied and reported during regular construction meetings and recorded in construction meeting minutes.

61. **Reporting and Submission**: shall provide the following minimum documentation related to contracted scope of works:
i. Monthly report of project sustainability documentation statue and tracking
ii. Monthly risk tracking
iii. Testing and commissioning tracking
iv. Monitor energy/water/waste throughout construction
v. Minutes from regular construction stage sustainability meetings with subcontractors and suppliers.

62. **Sustainability Certification**: If a sustainability certification is being targeted for the project, refer to the relevant sections of the tender/contract documentation for information on the sustainability certification type, and the targeted award rating (e.g., LEED sustainability certification type, and Platinum target award rating), as well as supporting documentation such as scorecard or technical requirements from the consultant team.

The required documentation, testing, or other deliverables as asked in the tender for the project to achieve sustainability certification shall be delivered to meet the requirements to the sustainability certification body. Any deviation from contracted scope of work identified by the contractor to meet the sustainability certification requirements shall be informed to the relevant consultants, project manager, and client for approval. For any change implemented by the contractor, the contractor will be responsible to keep in adherence to requirements of sustainability certification, or if implementing alternative solutions to maintain the contract specified award rating.

Any alternative proposals to the contracted scope of work by the contractor shall not have negative impacts to the sustainability certification award rating and shall be submitted to the relevant consultants, project manager, and client for approval.

Based on contracted scope and sustainability certification, the related energy modelling, calculations or simulations to demonstrate compliance to the sustainability certification needing modification due to final materials installed or construction parameters shall be delivered by the contractor, unless otherwise specified as being delivered by another party, in which the contractor shall provide the necessary information for the party completing modelling, calculations or simulations to input material information or construction parameters.

63. **Construction Environmental Management:** During site mobilisation, the contractor is to provide a project specific Construction Environmental Management Plan, and implement construction environment management by:
    i. Assigning resources to oversee construction environment management
    ii. Implementing preventative measure and installations to avoid negative environmental impact (e.g., waste management plan and recycling solutions, acoustic barriers, stormwater management, pollution prevention thresholds/barriers, housekeeping facilities, etc.)
    iii. Briefing and training of staff, sub-contractors, and suppliers on the project specific plan and measures
    iv. Site supervision and driving of site implementation
    v. Actioning rectification of any lapses in environment management, and with improvement measures to prevent future lapses.

64. **Site Staff Training:** The contractor shall provide training as part of site induction or focused training on sustainability aspects of the project to all site staff, with recording and reporting on training attendees to project manager, client, and project team. Site staff training should cover aspects related to the project, including:
    i. Sustainability Minimum Requirements Specifications (these requirements)
    ii. Sustainable Construction Management Sustainability Features, relative to the project:
    iii. Environment & Wellbeing
    iv. Materials & Resources
    v. Energy Conservation
    vi. Site Location & Planning
    vii. Process & Management Construction Environmental Management Plan
    viii. Waste Management Plan (WMP)
    ix. Commissioning Plan
    x. Measurement and Recording (energy, water, and waste)
    xi. Documentation Preparation and submission

65. **Responsible Procurement:** The contractor shall conduct necessary vetting of vendors they procure from, and practice responsible procurement by procuring from contractors who limit their environmental impact, irradicating modern slavery, provide safe and pleasant work environments, and operating ethically. Responsible procurement can be achieved by prequalification of vendors, reviewing contractor information and policies (financial, quality, experience, expertise, HSE, sustainability, staffing, training, insurances, modern slavery, fair practice, D&I, data security, business continuity), inspecting contractor facilities, and following responsible procurement guidelines such as ISO 20400. Promoting responsible procurement to contractors encourages greater responsible practice throughout the entire supply chain, although tier-2, tier-3 and beyond is challenging to monitor. If a contractor or supplier is aware of a contractor they directly procure from or a contractor within their supply chain is reported to be operating in contradiction to responsible procurement (e.g., reports of modern slavery or bribery), the contractor or supplier is to inform QCI, and investigate and potentially cease procurement and ties with such contractors.

66. **Diverse suppliers** enrich the marketplace, inspire innovation, and enhance communities. QCI is supportive of having diverse suppliers directly engaged on our projects or having diverse suppliers in the supply chain. A Diverse Certified Business is recognised by an independent certification agency. Contractors and suppliers shall notify QCI if they are a Diverse Certified Business, or if there is a Diverse Certified Business within the supply chain, so QCI can obtain further information that may support Diverse Certified Business in future projects.

67. **Environment and Wellbeing**:

    i. **Duct and Filter Cleanliness:** Duct shall have opens and open ends sealed to prevent construction dust from entering ducts, settling, and potentially compromising indoor air quality when HVAC equipment is in operation.

    ii. Filters shall be covered with temporary filter media during initial commissioning of HVAC equipment, and only removed when site has is clean and ready for handover.

    iii. Ducts and filters that are found to be inadequately sealed over covered shall be cleaned for handover in the condition of a new installation.

    iv. **Ventilation, Filtration and Air Quality:** HVAC installations or modifications with impact to ventilation, filtration and air quality shall minimally comply to ASHAE requirement, local code requirements, or if technical specification requires more stringent requirements. Ventilation rates shall be sufficient based on occupancy and space (area or volume, depending on code) in design, with fan selections of flow and pressure drop to match actual site installation of ductwork, considering site adjustments in avoiding services clashes taken in pressure drop. Ventilation rates control shall fluctuate flow, if specified or required by code, based on percentage of occupancy, or to reduce to space ventilation rates when unoccupied, or to turn off. Ventilation rates shall be commission to meet specified flow rates. Filtration (filters or purifiers) shall be of required MERV, EN, HEPA or similar classification to match specification or code requirements, and while matching the filtration classification the selection shall consider filters of low pressure drop.

    v. **Occupant Comfort:** HVAC installations or modifications with impact to occupant comfort, shall require commissioning of systems with testing of temperature, humidity, draft air movement, mean radiant temperature, and air quality to validate that occupant comfort is suitable for the space in meeting specified or code requirements. Commissioning data shall be recorded and included as part of handover documentation.

vi. **Lighting Quality**: Lighting installation (new, existing replacement, reconfiguration or similar) exceeding a combined project area of 100sqm shall engage with lighting suppliers on final light fitting selections and complete lighting computer software simulations (Dailux or equivalent) to validate proposed artificial lighting layouts satisfy lux, uniformity, flicker, and glare requirements meeting or exceeding performance requirements of specifications and minimally of CIBSE Lighting Guide.

vii. **Acoustics**: Partitions, glazing, baffles, and other acoustic attenuation installations shall have both system acoustic performance and individual material acoustic performance meet or exceed specification requirements. Acoustic commissioning data of acoustic attenuation installations and of spaces shall be recorded and included as part of handover documentation.

viii. **Construction Noise:** Construction noise impacts site staff and surround areas of site in regards health, safety, security, and environment (HSSE), and is categorised as construction pollution. Installation of noise barriers, equipment noise reduction attenuation, both specified and to address site requirements, shall be provided throughout construction to contain noise with required or locally legislated limits.

68. **Materials and Resources:**

i. **Eco-labelled Products**: Eco-labels, EPC (Energy Performance Certificate), or EPD (Environmental Product Declarations) give reassurance that material used are certified as either lower environmental impact or have accountability and clarity of the environmental impact. Eco-labelling has become mature is most markets with every country now have eco-label alternatives for a large portion of products. Contractors are encouraged to propose eco-labelled products if available on the market, economical in competitive bidding, does not impact project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project.

ii. **Low Embodied Carbon Products:** All products require energy to produce the raw material and the end-product, thus have a carbon emission associated to it – known as embodied carbon. Beyond using eco-labelled products, further selecting low embodied carbon products can further reduce a project's environmental impact. Products that use more environmentally friendly to extract raw materials, timber from sustainable forestry, or recycled content can have a lower embodied carbon than those using virgin raw materials. Products will use renewable energy to reduce embodied carbon, and some will have associate carbon offsetting. Some projects will tally the embodied carbon of all products used in construction, as well as transport and construction emission, and determine an overall embodied carbon value of a project by performing an embodied carbon calculation. Contractors are encouraged to propose low embodied products if available on the market, economical in competitive bidding, does not impact Sustainability Minimum Requirements Specifications Materials & Resources project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project.

iii. **Circular Economy:** Circular economy supply of materials by prioritising reuse of existing materials, repurposing materials, or recycling further contributes to lowering embodied carbon. If works are specified to include aspects of circular economy (including simple material reuse), all care shall be taken to avoid damage, and to maximise the reuse of material. Incorporating circular economy solutions beyond specification is encouraged if commercially align with contract, in compliant to technical specifications, and otherwise not negatively impacting the project.

iv. **Transport & Local Sourced Products:** Transport of material from overseas can emit over 20-times more carbon emissions than transport from interstate, and airfreight can be over 40-times that of sea-freight. While select materials and quality equipment may be specified to be sourced from specific suppliers or countries, for products related to performance specification, locally available equivalents or products from reputable brands manufactured in local factories should be given greater consideration. Planning of delivery, transporting by bulk, and having long lead times transported to site by more sustainable means of sea and rail should be considered in logistics planning. Contractors are encouraged to resolve sustainable transport options and propose local sourced products if available on the market, economical in competitive bidding, does not impact project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project.

v. **Low VOC and Low Toxicity Products**: Products containing Volatile Organic Compound (VOC) and other toxins (BPA, PERC, Lead) can degas and contaminate air quality or water. Adhesives and paints are of particular concern with regards VOC, but furniture, equipment, and building materials may be above necessary VOC or toxicity. Products can be certified by independent certification agencies for being low VOC, zero-VOC, low-toxicity, or zero-toxicity products. Contractors are encouraged to propose low VOC, zero-VOC, low-toxicity, or zero-toxicity products if available on the market, economical in competitive bidding, does not impact project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project.

vi. **Sustainable Construction:** Structure and reinforced concrete works shall consider construction methods and solutions to reduce carbon emissions. Resolving a structure with a sustainable improved in CUI (concrete usage index), RCA (recycled concrete aggregate), steel-vs-composite optioning/optimising, and reinforced concrete alternatives (steel structure or cross-laminated timber) can have large impact on the embodied carbon and whole life carbon emissions of a property. Contractors are encouraged to propose sustainable construction methods and solutions if economical in competitive bidding, does not impact project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project.

vii. **Modular & Prefabrication:** Most installations can be constructed as modular and/or prefabrication. Modular and prefabrication can reduce the overall emissions in multiple ways, including materials usage efficiency, reduced offcuts, reduced waste, increased recycling, reduced worker travel, less disruption, resourceful delivery to site, improved coordination, and more. Modular and prefabrication can vary from full modular construction, extensive modular MEP, prefabricated panels, prefabricated interiors, prefabricated MEP risers, prefabricated MEP plant and controls. While specification may specifically require modular and prefabricated construction, proposals to increase the extent of modular and prefabrication can result in reduced embodied carbon during construction. Contractors are encouraged to propose modular and prefabrication solutions if available on the market, economical in competitive bidding, does not impact project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project.

viii. **Waste Management & Reduction:** A waste management plan (WMP) shall be established by the main contractor or lead contractor for all projects, detailing waste removal, waste stream segregation, recycling, efficient use of materials, packaging materials, and waste disposal monitoring. Main contractor or lead contractor, subcontractors, and suppliers shall adhere to the requirements of the WMP. Refer to relevant section of tender/contract documents regards waste management and WMP requirements.

ix. **Water Efficient Fittings:** Water efficient fittings shall be considered to reduce water usage during operation. For water fittings that are specified to be water efficient fittings, flow rates equal or lower shall be provided, while still suitable for use. Water fittings can be certified by independent certification agencies for being water efficient. Contractors are encouraged to propose water efficient products if available on the market, economical in competitive bidding, does not impact project programme timeline, is compliant to technical specifications and quality expectations, and does not otherwise have negative impact on the project. This encouragement to use water efficient fittings shall not be used to support unwanted alternate proposals of fittings that differ from specifications.

x. **Cooling Tower Water Efficiency:** Cooling Tower selections shall be made with consideration of water efficiency and increased cycles of concentration (COC) with solutions including drift eliminators, non-chemical water treatment, reduced blow down by water quality monitoring, planned maintenance in handover documentation, automated chilled tube cleaning, basin automated sweeper jets, and water level and usage monitoring. Cooling tower water usage estimate calculations shall be provided by cooling tower manufacturers and included in operation manuals and handover training/documentation for facilities managers to monitor against.

xi. **Refrigerants**: Refrigerants of zero ozone depleting potential (ODP) and low global warming potential (GWP) shall be given greater consideration for installation. Refrigerants within national refrigerant phase-out programmes to be phased-out within the next 5-years shall not be used. Refrigerant leak detection systems shall be installed within HVAC/chiller plant rooms. Contractors shall take all necessary measures to prevent refrigerant leaks in initial installation or from long-term deterioration.

69. **Energy Conservation**:

i. **HVAC Efficiency:** HVAC (heating, ventilation, and air conditioning) installations shall have efficiency values, technical data, and calculations provided by the contractor of HVAC installation works. The part load, full load, nominal load, or weighted efficiency values of HVAC equipment shall meet or exceed performance specified or required any applicable code or sustainability certification. For central HVAC plant installations, matching of part load values with load profiles, with comparison of more suitable configurations shall be provided/presented by the contractor to relevant consultants and the client for approval. Load profiles shall match final proposals of building envelope materials, internal equipment, and other space use parameters. Options of HVAC plant installations shall have part load values considering different options and efficiencies of chillers, boilers, cooling towers, pumps, and ancillaries (in lieu of isolated load matching with chiller or boiler). HVAC operational system efficiency shall be completed with minimally post-completion testing or by following specific operational system efficiency testing specified within contract (if any).

ii. **Fan Efficiency:** Fan efficiency shall be addressed for both mechanical ventilation and air handling equipment installations, via efficient motor selection, fan impeller/scroll efficiency, ducting and pressure drop, commissioning, and controls, meeting or exceeding technical specifications. Use of direct current electronic commutator motors shall be considered where suitable, or high-efficient MEPS (minimum energy performance

standard) motors of IE3 or IE4. Combined motor and fan efficiency must exceed local regulatory limits, and nominal flow and pressure on the fan-curve shall be within 10% of peak efficiency. Ducting shall be free of any excessive restriction, radius bends used thoroughly, and if site clash-avoidance is required then the duct adjustment shall be of equal or less pressure drop than design.

Duct network fittings of dampers, filters and grilles shall also be selected for low pressure drop. Controls shall reduce fan energy via VSD/VFD (variable speed drive / variable frequency drive) or other speed control, in either fixed speed operation or variable speed operation with sensors and logic to automate demand. Commissioning shall prioritise use of fan controls to reduce fan energy in lieu of dampers to meet air flow requirements. Duct pressure drop calculation based on installation, and fan selection data with fan, motor, and combined efficiencies at 100% and at duty flow rates shall be provided for each fan. Fan schedules shall present values of total power, efficiency expressed as power-over-flow, and tallied for each equipment type (e.g., AHUs, FCUs, MV 4kW) to show an overall fan efficiency value for each type.

iii. **Pump Efficiency:** Pump efficiency shall be addressed for domestic water, sanitary ejector, hot water systems, and piping distribution installations. Pump efficiency considerations to cover efficient motor selection, pump efficiency, pipework pressure drop, commissioning, and controls, meeting or exceeding technical specifications. Use of direct current electronic commutator motors shall be considered where suitable, or high-efficient MEPS (minimum energy performance standard) motors of IE3 or IE4. Combined motor and pump efficiency must exceed local regulatory limits, and nominal flow and pressure on the pump-curve shall be within 10% of peak efficiency. Pipework shall be free of any excessive restriction, smooth bends used thoroughly, and if site clash avoidance is required then the pipe adjustment shall be of equal or less pressure drop than design. Pipe network fittings of valves and strainers shall also be selected for low pressure drop. Controls shall reduce pump energy via VSD/VFD (variable speed drive / variable frequency drive) or other speed control, in either fixed speed operation or variable speed operation with sensors and logic to automate demand. Commissioning shall prioritise use of pump controls to reduce pump energy in lieu of valves to meet flow requirements. Full hydraulic calculations based on installation, and pump selection data with pump, motor, and combined efficiencies at 100% and at duty flow rates shall be provided for each pump. Pump schedules shall present values of total power, efficiency expressed as power-over-flow.

iv. **Minimum Energy Performance:** Use of direct current electronic commutator motors shall be considered where suitable, or high-efficient MEPS (minimum energy performance standard) motors of IE3 or IE4. Motors shall be tested according to IEC 60034-2 1:2014 (method 2-1-1B) or IEEE 112:2004 (method B). The awarded contractor may propose other efficient innovative smart motors, such as modern switched reluctance motor (SRN).

v. **Demand Control:** HVAC control with occupancy-sensor and IAQ-sensor installations shall support Demand Control to modulate operation to suit space occupants. Fresh air or ventilation air quantities may be controlled by CO2-sensors, CO sensors (for carparking and vehicle areas), and other IAQ monitoring systems to reduce air flow when air quality is within suitable range for occupancy, then increase as air quality approaches 100% flow setpoint. Fresh air or ventilation may be controlled by occupancy-sensors to reduce flow rates to space-only rates or off when space is unoccupied. Airside equipment and VAV-terminal-units may be controlled by occupancy sensors to increase temperature setpoint when space is unoccupied (or reduce setpoint when in winter heating mode).

vi. **Lighting Efficiency:** Lighting installations shall consider luminaires of higher lumens-per-watt, but within limitations of glare and other specification requirements. Lighting installation (new, existing replacement, reconfiguration or similar) exceeding a combined project area of 100sqm requires lighting power budget calculation, with zone-by-zone quantity tally of each fitting types, wattage, total watts and W/m2 values. Incorporation of calculations spreadsheet tables on lighting layout drawings (design drawings, shop drawings, and as-built drawings) if preferred. Designers shall resolve suitable lighting to meet project needs, with efficient lighting design solutions preferred when suitable, including adopting latest LED technology, placing luminaires above working surfaces, higher lux on working surfaces and lower in circulation areas, and use of pendant lights to reduce distance from luminaire to working surfaces.

Lighting control solutions shall further enhance lighting energy by turning off or dimming lights when space is unoccupied or bright artificial lighting is not required. Lighting control solutions shall incorporate automated controls, including occupancy sensor and daylight sensors, and manual controls, including local zone switches and dimming control panels.

70. **Site Location & Planning:**

i. **Building Envelope:** Façade, roofing, external wall, or other installations or major modification of building envelope works shall have envelope thermal transmittance values calculations completed based on the actual materials proposed to be installed. The envelope thermal transmittance values shall meet or exceed performance specified or required by any applicable code or sustainability certification. Material values of thermal transmittance (U-value), shading coefficient (SC), visible light transmission (VLT), external shading parameters, solar reflectance index (SRI), and other values of building envelope materials shall individually meet or exceed performance specified or required any applicable code or sustainability certification. Air tightness and leakage design parameters, performance testing, and commissioning shall meet or exceed performance specified or required by any applicable code or sustainability certification.

ii. **Urban Heat Island:** Construction schedule planning shall be mindful to limit contribution to urban heat island effect. Construction scheduling shall consider maintaining trees, green space and blue space as much as practical within the construction program. Leaving large slabs or cleared land without final surface treatment or finishes for long durations through the construction program shall be avoided as much as practical within the construction program. Applying good practice urban heat island effect mitigation measures will promote being a good neighbour to nearby properties, and benefit the local environment, but shall not have significant impact on the project delivery construction program.

71. **Process and Management:**

i. **Project Team Credentials:** Resourcing a project with knowledgeable team members that hold credentials to validate their sustainability knowledge or sustainable business practice can give greater assurance that a project is delivered in a more sustainable manner. Having an ISO 14001 certification is desired for all consultants and contractors, and certificates shall be submitted during onboarding. If ISO 14001 certification is not held, a copy of the company's environmental management system shall be submitted during onboarding. Resource the project necessary green associates and accredited professionals of applicable sustainability certifications (LEED, BREEAM, local green certification standards, or similar) shall be suitably meet the project needs to ensure the team has adequate knowledge to deliver sustainable initiatives.

ii. **Sustainable BIM Delivery:** Project delivery efficiencies that compliment sustainability can be realised through sustainable BIM delivery. Sustainable BIM delivery practices shall be considered, by establishing a BIM Execution Plan to decide on the level of detail (LOD) applicable at each stage of project delivery, clash detection resolution methodology, roles and responsibility, and quality control. For projects practicing BIM, consultants shall establish the project design in BIM beyond model to include material and equipment information, contractors shall progress BIM detailing until capturing all necessary as-built data, and suppliers shall support the BIM development with product data and BIM families.

iii. **Sustainable Handover:** Handover training and documentation shall include information on sustainable features delivered and sustainable operations to the satisfaction of consultants. Handover as-built drawings or BIM shall contain all details necessary for facilities management staff to operate and maintain the property, supported by operation and maintenance handover manuals. Operation and maintenance handover manuals shall extend beyond supplier/manufacturer documentation, to include contractor-produced sustainable operations details. Overall sustainable operations shall be captured in overall content of handover manuals, and within individual system operations sections, as necessary for the overall project and individual systems to optimise sustainability operation. Handover training shall be provided to facilities management staff that holistically covers sustainable features and operations, with step-by-step training slides included in handover manuals for re-training, and training of future facilities management staff new joiners.

iv. **Sustainable Operations:** Installations be installed to maximise sustainable operations, and systems shall be set-up commissioned to operate to maximise efficiency. The sequence of operation of systems shall be proposed and consultant approved during material submission. Operational upkeep and procedures of installations and systems shall be fully documented within handover as-built drawings or BIM, operation and maintenance handover manuals, and within handover training. For properties that include spaces to be leased, and details of sustainable operations and limits to tenants' energy are to be detailed within Green Leasing documentation, information on tenant sustainable operations shall additionally be separately provided.

v. **Commissioning**: Installations shall be commissioned to validate performance, and systems shall be set-up commissioned to operate to maximise efficiency. All installations and systems must achieve the minimum performance specified in specified design documentation. Commissioning procedures shall be proposed and consultant approved during material submission. Commissioning reports shall include steps of commissioning procedures, and holistically capture all commissioning data values, both measured and calculated. Commissioning shall be performed by suitably knowledgeable and experienced commissioning technicians.

When required, verification testing shall be provided, supported by contractors and suppliers, noting that verification testing may be required at a time after minimum occupancy is attained. If a sustainability specialist consultant is engaged for the project and a sustainability technical specification (or scorecard) is included within tender or contract award documentation, do refer to Commissioning Authority and verification testing information, if any, of the sustainability technical specifications.

72. **Forced Labour and Child Labour:** The contractor should strive to prevent the following behaviour anywhere in our business or supply chain:

i. Forced labour, whether in the form of trafficking of any kind, slavery, indentured labour, bonded labour or prison labour

ii. Confiscating, retaining or withholding worker identity documents or other valuable items, including work permits and travel documentation to bind workers to employment or restrict their freedom of movement
iii. Charging workers fees for recruitment, including costs associated with travel, processing official documents and work visas in both home and host countries
iv. Requiring workers to lodge deposits or security payments
v. Failure to comply with minimum working age laws and requirements, including the general use of child labour
vi. Imposing compulsory overtime hours for workers, except as permitted by applicable law.

73. **Unacceptable Working Conditions and Safety Risk**: The contractor should not permit these activities in our business or supply chain:
    i. Paying workers below just and favourable wage rates and subjecting them to inhumane conditions
    ii. Requiring workers to work more than the maximum hours of daily labour set by national or applicable local laws and forcing workers to work overtime for insufficient compensation
    iii. Unreasonably exposing workers to threats to their health, safety and security
    iv. Engaging in physical discipline or abuse, intimidation, sexual, gender-based or other harassment and verbal abuse.

74. **Discrimination and Prejudice:** The contractor should not permit the following:
    i. Discriminating against individuals or vulnerable segments of society (including minority groups), whether that discrimination is based on race, colour, gender, sexual orientation, religion, disability or otherwise.
    ii. Mistreating or limiting the rights of minority groups, including women.

75. **Freedom of Association:** The contractor should not prevent workers from freely joining or participating in a workers' association or union in accordance with national or local laws.

76. **Health, Safety, Security and Environment (HSSE) Commitments:**
    i. Contractor to submit a well documented HSSE Plan within 7 days from award of contract. The same has to be approved by all the project stakeholders.
    ii. Establishing a framework to review HSSE objectives and targets.
    iii. Preventing injury, ill health, and adverse environmental impacts by providing, to the extent reasonably practicable, safe, healthy, and sustainable working conditions.
    iv. Protecting and preserving the natural environment and promoting sustainable operating principles in the global communities in which we operate.
    v. Establishing a framework to review HSSE objectives and targets.
    vi. Preventing injury, ill health, and adverse environmental impacts by providing, to the extent reasonably practicable, safe, healthy, and sustainable working conditions.
    vii. Protecting and preserving the natural environment, minimizing pollution, enhancing environmental performance, and promoting sustainable operating principles in the global communities in which we operate.
    viii. Ensuring full compliance with all applicable legal, client, and other contractual requirements and integrating relevant industry and client HSE guidance into our operations.
    ix. Applying risk management principles to identify, and as appropriate, eliminate, control and/or reduce HSE hazards, risks and impacts relevant to our operations and the services we deliver.
    x. Developing and distributing structured HSE management systems that are suitable for our business.

xi. Providing HSE training, instruction, and information to our employees, as relevant to their roles and responsibilities.
xii. Encouraging our top management to engage and consult with our people on HSE matters.
xiii. Promoting a pro-active HSE culture where our people and contractor partners at all levels work collaboratively to improve HSE management.
xiv. Ensuring all employees, clients, and contractor partners are empowered to intervene should they see unsafe or environmentally unsound conditions.
xv. Fully supporting our employees in their efforts to continually improve health, safety, and environmental performance.
xvi. Regularly reviewing our HSE systems, in consultation with management and employees, with a view to continual improvement.
xvii. Celebrating the achievements of those who embody our HSE culture and philosophy; and
xviii. Sharing learnings and best practices to promote and support our HSE culture.

77. **Alcohol and Drug abuse policy:** No employees of contractor shall,
i. Report or try to report for work when unfit due to alcohol or drugs (whether illegal or not) or to substance abuse.
ii. Be in possession of alcohol or illegal drugs in the course of employment/duties or in office premises and if office outside premises, then while dealing with clients etc.
iii. Supply others with illegal drugs.
iv. Supply others with alcohol in the workplace or during employment/duties or in office premises and if office outside premises, then while dealing with clients etc.
v. Consume alcohol or illegal drugs or abuse any substance whilst at work.

78. **Legal and other requirements**: All Contractors shall comply to all provisions and section provided in the regulations mentioned below:
i. The Factories act 1948 (As applicable)
ii. The building and other construction workers rules 1998
iii. The Indian Electricity Rules 1956
iv. The Contract Labour (Regulation and Abolition) Rules 1971
v. The Petroleum Rules 2002
vi. The Gas Cylinder Rules 2016
vii. The environment protection act 1986
viii. The manufacture storage and handling of hazardous chemicals rules 1989
ix. The Noise pollution (Regulation & control) rules 2000
x. The construction and demolition waste management rules 2016
xi. The explosives rules 2008
xii. The Central Motor vehicles rules 1989
xiii. The Hazardous Wastes (Management, Handling and Transboundary Movement) Rules, 2009
xiv. The Bio-Medical Waste (Management and Handling) (Amendment) Rules, 2003

79. **General Requirements:**
i. Every construction site shall display the HSSE Policy of a suitable size at the entry of the site.
ii. A safety park consisting of HSE statistics board, mannequin with required and mandatory PPEs (Personal Protective Equipment's) (Personal Protective Equipment), and other essential element shall be arranged at all sites.

iii. Child labour is prohibited, all sites shall display a board mentioning this a prominent place visible to all in at least 3 languages English, Hindi, and the respective regional language. “Child labour is prohibited.”
iv. All Contractors shall deploy at least one safety officer (qualifications as per legal norms) and shall deploy safety steward or safety supervisor for every 50 workers engaged by them.
v. Contractors shall obtain Contractor All Risk Policy, Workmen Compensation Policy, Labour License & license under Building and other construction workers act as applicable.
vi. Site logistics plan shall be submitted by all Contractors’ one generic site logistics plan shall be displayed at the entry of the site for easy understanding of client and visitors.
vii. At least one security guard or required number of guards be deployed at the entry of the site to restrict unauthorized entrants.
viii. An emergency assembly area suitable enough to hold the peak labour strength be ear marked for emergency assembly and such assembly area be identified by a language or a poster understandable by all.
ix. Interior fit out sites shall follow the emergency assembly area made available by commonly by the estate manager or landlord.
x. All Contractors shall install electronic systems to track the work hours; without this, at least a register of entry/exit shall be maintained. With this Contractor shall submit the worked man hours every week
xi. All engineers and workers, daily, shall check personal protective gear for its integrity and immediately discard the damaged ones.
xii. Smoking is prohibited at the site.
xiii. Entering site under the influence of alcohol, psychotropic drugs is non-tolerable by QCI at any cost.
xiv. All contractors should ensure no worker can work alone in any area of the construction site.
xv. QCI, Contractor’s management staff and engineers at site shall strive hard to discourage horseplay and unsafe behaviours by workers.
xvi. All construction sites shall have designated scrap yard, with a segregation to separate recyclable and non-recyclable waste.
xvii. Site shall have a designated walkway, far away from construction hazards. All workers shall be encouraged to use walkways/gangways constructed for the said purpose.
xviii. To prevent unforeseen falls, all wall openings, edges, and open shafts must be protected with hard, sturdy metal components.
xix. Always use wheelbarrows, tough riders, pallet trolleys, duct lifter and suitable moving equipment to move materials, manual movement shall be avoided.
xx. Contractors shall ensure high risk activities like height works, hot works, excavation shall be performed with a barricading around and on lookers are not encouraged.
xxi. All Contractors shall deploy a suitable housekeeping crew to perform only housekeeping of construction site during active construction.
xxii. Contractors performing land developing / landscaping works shall remain cautious of hazards from pests and snakes, such workers shall wear shoes, safety goggles, cut resistant gloves and full arm clothes always.
xxiii. Contractor shall ensure to barricade and store the material as per logistic and waste management plan and display the relevant signage. Also, shall ensure to place the adequate amount of fire extinguisher and of required type.
xxiv. High risk activities like height work, excavation work, confined space, hot work, demolition work, penetration, lifting and night works shall always be performed under work permit.

xxv. Contractors shall ensure all measuring devices are well calibrated and certificates be made available for ready reference.
xxvi. Blades/open saw shall be prohibited, only retractable blades and cutters with enclosed blades shall be used.
xxvii. Sitting on the floor shall be avoided, suitable working tables be provided, suitable work benches be provided to work.
xxviii. All contractors shall agree to improve the working conditions by way of implementing better safer tools continuously, they also shall make earnest attempts to shed unsafe behaviours among workers.
xxix. All contractors shall strive hard to continually improve the health safety and environment aspects.
xxx. The contractor shall provide necessary fencing and lights to protect the public against accident or injury and shall be ready to defend any action that may be brought by any person for injury sustained owing to neglect of the above precautions.
xxxi. Land development works shall be carried out only on earth moving equipment, any manual cleaning, cutting be avoided.
xxxii. Protruding reinforcement rods from the civil works are immediately covered with re-bar caps to avoid accidental injuries.
xxxiii. All handheld tools like hammers, screwdriver, chisels, and all other tools shall be with a fault free grip and a rubber sheath be present to prevent slips while working.

80. **Security requirements:**

i. Contractors shall remain responsible for their men and material, and they shall deploy necessary security guards at the entry/exit point and restrict unauthorized entry.
ii. Security guards deployed by Contractors shall allow only workers with site identity card to enter construction site.
iii. QCI will deploy security and the guards in case Contractors failing to deploy security and the apportioned cost will be deducted from the upcoming bills submitted by Contractor.
iv. Check all workers who enter the site with site identity card, wearing a hard hat, illuminating vest and safety shoes. Those without safety gears be restricted from entering floor.
v. Co-ordinate with QCI in case of any emergency and by way of passing the information to project manager/Safety manager.
vi. Be first responder in case of any evacuation required inside the building.
vii. Keep a vigil on all material entry/exit and ensure delivered material are not taken back by the workers or any other unauthorized entrants.
viii. The security guards deployed shall be mandatorily trained as first aiders and firefighting techniques.
ix. It is the sole responsibility of every Contractor and QCI project manager to ensure every personnel before being engaged at site shall undergo site HSSE induction.
x. Dedicated safety induction space must be provided by the contractor for on-site induction.
xi. Every personnel seeking work at sites managed by QCI shall necessarily produce a proof of identity, age and address issued by Government of India (E.g. – Aadhaar, Driving License, Voter identity card or Ration card) In case of expats a passport.
xii. Every worker shall be subjected to medical examination by the qualified medical examiner as per the requirements of building and other construction workers act and rules made thereunder, such medical examination record be maintained at site for all workers.

xiii. Every worker irrespective of the type of the job they perform at site shall mandatorily undergo site HSSE induction as per QCI standard induction process. Attendee shall affix their signature for having attended HSSE induction.

xiv. Every construction worker only after successful completion of above steps shall enter QCI construction site only after receiving an identity card.

xv. All visitors intending to enter site shall undergo visitor induction and mark their entry in the visitor register.

xvi. All visitor entering site shall undergo visitor's induction and in case of such visitors are required to do a site visit for one time or for short span, such visitors shall always be accompanied by the host who is previously holding site identity card.

xvii. Arrangement of audio-visual system shall be done for induction of all new entrants at site. The induction material shall be based on the site requirement.

xviii. QCI project managers shall incorporate client specific requirements also on need basis and consider such requirements also during the induction.

81. **Incident reporting and investigation:**

i. 1 hour from the time of the occurrence of incident.

ii. Contractor shall ensure all incidents are reported to QCI in the prescribed format.

iii. Contractor shall at no time delay the injured from treatment, the personnel must be taken to site paramedic or to the nearest hospital without any delay.

iv. Contractor shall immediately start investigation of the incident immediately after the occurrence of the incident and shall submit the report to QCI within 5 working days.

v. Contractor shall ensure; statutory agencies are kept informed as per the requirements of the applicable law.

82. **Worker engagement & motivation:**

i. QCI encourages all workers including engineers to perform 10-minute body exercises before start of the work every day.

ii. All Contractors shall conduct safety motivation program at least once a month, all projects shall have an earmarked budget to conduct such event.

iii. QCI encourages rewarding workers who has practiced safe practices and recognize them by way of simple giveaways.

iv. All engineers shall develop the habit of appreciating the safe work practices adopted by workers, quick appreciation on the spot is advisable.

v. Workers including engineers at construction site shall develop the culture of intervening immediately in case of any imminent threat to life and limb of an individual, this irrespective of the Contractor packages.

83. **Communication and Consultation:**

i. Every works in-charge shall explain the safe work method statements during the toolbox talk.

ii. No work shall be started without trade wise toolbox talk.

iii. No worker shall be involuntarily subjected to perform a task that the person feels it is unsafe to perform, worker be given a right to reject to perform an unsafe task.

iv. Every project manager shall conduct at safety committee meeting once a week along with all Contractors to and assess safety performance on weekly basis.

v. Every project manager shall conduct at least one safety committee meeting once a month and include equal number of engineers and workers from each Contractors.

vi. Safe work method statements shall be made available to all workers at a communication board commonly accessible to all workers.

vii. Material safety data sheets be made available for all chemicals at common communication board accessible to all concerned.
viii. Contractors shall install adequate number of posters and signs to caution workers of imminent hazards.

84. **Emergency Preparedness response:**

i. Contractors shall identify and document all potential emergency which could occur at site and document the suitable procedure to mitigate all such emergencies.
ii. All Contractors shall install suitable number of fire extinguishers in their scope of work, QCI advises at least 1 for every 1000 square feet. Numbers and type of fire extinguisher shall match with IS: 2190.
iii. Suitable number of ABC stored pressure type of extinguishers and CO2 type of extinguishers shall be selected while installing extinguishers.
iv. Contractors shall install sand buckets containing fine sand shall be arranged wherever flammable liquids are stored e.g.: Diesel, thinner and paint materials.
v. Contractors shall install water buckets near the areas where wood, carton boxes or any other flammable materials or waste is stored.
vi. All the installed extinguishers be subjected to preventive maintenance as per IS: 2190 and shall be internally inspected at least once every month
vii. All extinguishers, sand buckets and water buckets installed at site shall be marked in the logistics plan.
viii. Interior fit out site should never disturb the existing base build fire detection and protection system.
ix. All thinner, paints and other chemicals combustible in nature shall be housed in fire cabinets.
x. Waste combustible in nature shall be removed from construction site at least once a day to avoid fire hazard.
xi. Contractors shall deploy trained and certified first aider at site.
xii. First aid medicines shall be maintained as per the recommendations of Building and other construction workers rules.
xiii. Contractors shall install adequate emergency lighting all along emergency egress route.
xiv. Security shall be provided with adequate search light & suitable number of beacons fitted megaphones to activate emergency alarm.
xv. Contractor shall earmark suitable emergency assembly area.
xvi. Contractor shall enter a tie-up with a locally available nearest hospital having ambulance facilities to get treatment in case of any emergencies.

85. **Chemical handling and storage**:

i. Chemicals of less hazardous in nature shall be used for construction purpose, before procuring any chemical, subcontractor shall ascertain if a better substitute is available without compromising the quality.
ii. Contractor shall never use Asbestos, lead and its compounds, Poly brominated biphenyls, poly brominated diphenyl ethers, hexavalent chromium in its construction process.
iii. All chemicals, paints and thinners shall be labelled in a language understandable by all.
iv. In compatible chemicals like an acid and base, oxygen and a fuel should never be stored inside a closed container.
v. All gas cylinders shall be stored inside a cool dry place with adequate ventilation under the shade.
vi. All workers handling the chemicals shall necessarily receive hazard awareness from the critical points mentioned in material safety data sheet.

vii. Material safety data sheet for all chemicals be made available and MSDS (Material Safety Data Sheet) shall be referred for use storage and disposal and all workers/users should be trained in line with MSDS.
viii. Chemicals requiring cross ventilation as per Material Safety data sheet or manufacturers be provided to avoid illness or injuries.
ix. Poisonous chemicals and explosives if used for any of the construction purposes, such chemicals shall always be kept under a locked store with authorized access.
x. No chemicals shall be allowed to be spilled on the ground causing soil pollution.
xi. All leftovers or chemicals waste shall be disposed of to the authorized agency as per the applicable HSSE regulations.

86. **Personal protective equipment:**

i. All Contractors shall understand that Personal protective gears at the last and least expected form of controls under hierarchy of controls. Such gears shall be use only after trying out all the opportunities to implement Elimination, Substitution, Engineering and Administrative controls.
ii. The mandatory PPE (Personal Protective Equipment) at all construction sites is safety helmet, high visibility vest, hand gloves and safety shoes.
iii. Contractor shall provide face shield with hard hat for welding and cutting activities.
iv. All personal protective gears shall at least comply to Indian standards and specifications prescribed in bureau of Indian standards, those with no IS specification shall comply to stringent most specification available.
v. Contractors shall ensure those personal protective gears which do not have any standard reference from Bureau of Indian standards. Such instances shall be brought to the notice of QCI /PMC Safety personnel and shall receive a written approval to use them.
vi. Contractors shall conduct training and awareness campaign to all workers as to how to maintain personal protective gears.
vii. Contractors shall provide suitable storage units for all workers to safeguard the personal protective gears.

87. **Work at confined space:**

i. Contractors shall ensure confined spaces entry and work shall always be performed under a work permit, with a supervision. Only trained personnel shall enter such works.
ii. Contractor shall ensure all confined spaces are provided with suitable access and made easy to return in case of exit requirement, a trained attendant shall always supervise and observe workers from out of the confined space.
iii. In absence of comfortable entry/exit, Contractors shall use a confined space entry kit with a tripod and automatic descending and ascending system in used.
iv. Contractors shall use local exhaust ventilation or general ventilation systems in confined areas, such as tanks and pressure vessels. This precaution should maintain toxic gases, fumes, or dusts below the maximum allowable concentrations.
v. Contractors shall make a provision shall be made for atmosphere monitoring at all confined spaces where there is a risk of oxygen deficiency or relevant specified risk.
vi. When gas welding is complete it is essential that the shut off valve on the cylinder is closed so there is no danger of the gas building up in a confined area such as an excavation, vessel, or tank.
vii. Gas cylinders, paints, hot works, and painting shall be strictly avoided inside confined spaces, such works if necessary to be conducted inside confined spaces, then a continuous oxygen indicator be installed.

viii. Contractor shall ensure no combustible, inflammable gases or materials or residues are completely removed before entering.

ix. Contractors shall provide adequate lighting arrangement (not less than 200 lux) before entering confined space.

x. According to the risk assessment of the site-specific confined space activity suitable recue arrangements to be ensured before works start.

88. **Work at height**

i. Work in any place from which a person could fall a distance liable to cause injury. This covers any work activity where a person can fall from a higher level to a lower level. This can include:
   a. Any work at height (> 4 ft/ 1.2 m) using work equipment e.g., mobile elevated work platforms, tower scaffold, ladder. Work on a roof, machine, plant, mezzanine, tree, telegraph pole.
   b. Working next to an excavation, cellar opening, lift shaft.
   c. Use of rope access, suspended platforms, cradles, bosun's chair.

ii. No person shall work at height without a fall protection and all such works be carried out under a supervision with a work permit in place.

iii. All height work accessories including scaffoldings, platform ladders, scissor lifts, boom lifts shall be inspected and be certified for use by way of affixing the green tag.

iv. All ceiling works in interior fit out jobs shall be conducted using aluminium dismantlable scaffolding as shown in the picture, such scaffolds shall have mid rail and top rail at the height of 1 meter and shall contain internal access and toe board to protect fall of tools.

v. Any intermediate height works like punning, rubbing, and painting shall be conducted using a platform ladder of suitable height.

vi. A-type ladders are prohibited at QCI construction sites.

vii. QCI advises mast climbing working platform, climbing formworks (Eg: Doka, RMD, Mivan) or H frame, cup lock or any other scaffoldings approved by site project management team be used whenever a standalone scaffold is required to erected and all workers on such scaffolds be wearing safety belts.

viii. Suspended scaffolding or gondolas could be used for specific works (Eg: fixing of sings on external glazing) all such suspended scaffoldings be inspected by competent chartered engineer after installation and before being used. Inspection certificate be maintained until completion of works.

ix. All scaffoldings be constructed mandatorily by experienced and trained personnel. • Scaffoldings construction be always on a firm ground with base plates of size at least 15 cm X 15 cm

x. Provide welded working platforms on scaffolds with clamping arrangement, Binding wire shall not be used to tie poles or platforms.

xi. Scaffolds shall have vertical anchorage supports every 20 feet (6.1 meters) or less for scaffolds less than three feet (0.91 meters) wide; every 26 feet (7.9 meters) or less for scaffolds more than three feet (0.91 meters) wide.

xii. Scheme drawing for scaffold - The Scaffolding design and erection drawings must be provided for all scaffolds.

xiii. Horizontally every scaffold shall have anchorage support at each end and at intervals not to exceed 30 feet (9.1 meters) from one end.

xiv. Those working on platform ladders and aluminium dismantlable scaffolds in fit out projects are exempted from wearing safety harness; however, any other works being conducted in open environment shall fasten themselves with a full body safety belt.

xv. All safety harness shall confirm to IS 3521 and shall be inspected on the daily basis.
xvi. Height works performed near unprotected edges of the building without railings/wall shall be protected with safety nets.
xvii. All short span work at height shall be performed using advanced construction equipment eg: Cherry pickers / Scissor lifts.
xviii. All such height work equipment be adequately tested and inspected by chartered engineer and shall have certificate made readily available.
xix. Operators for height work equipment shall have a training certificate produced by the equipment supplier or Contractor company.
xx. Operators of such height work equipment shall never drive them in case the driving surface is too undulant and if found unsafe for reasons like dampness, loose soil, or any other reason.
xxi. Lifeline structures planned to be installed for Pre-engineered building works be inspected by chartered engineer as per the law and certificate be obtained before use.
xxii. All wire ropes tied to lifelines shall be at least of 12mm or above and shall be tested and re-tested at least once in a month with a dummy standard load to ascertain its fitness.
xxiii. All roof works shall be performed after tying the lifeline and all workers to hook their safety belts with double lanyards to only the tested lifelines.
xxiv. Provision of peripheral catch nets in the buildings during construction works is mandatory for buildings. Once slab casting is completed at the ground level, a heavy duty catch net be permanently installed to avoid fall of men and material as per IS 11057
xxv. Heavy duty catches nets be so installed that no person will have a vertical fall for more than 6 meters and the catch net be protruding for at least 4.5 meters away from the edge of the building. Nevertheless, one catch net is mandatorily be installed at the level where slab casting or any other works happening at the last level or the lift.
xxvi. All the installed heavy-duty safety nets be tested as per the IS 11057 at least once in three months with the load of 140 kgs sandbag.

89. **Electrical Safety:**

i. Working live is forbidden.
ii. Contractor shall draw electricity only from approved source and only after obtaining prior approval from client and QCI, an approval from QCI project manager in a single line diagram for temporary/construction power supply is mandatory.
iii. Only authorized persons are allowed to work on electric supply line or apparatus. Person should possess a competency certificate “permit to work” as per Indian Electricity rules.
iv. Power supply shall be drawn only after protecting the supply with Residual Current Breaker with Over-Current of rating 30mA and 0.003 milli seconds.
v. All temporary or permanent electrical installations requiring clearance from inspectorate of electricity as per Indian Electricity Rules shall be obtained.
vi. All temporary electrical circuits be adequately protected by way of installing national or international quality approved rubber mats, the least to comply is IS Codes.
vii. Earth pit confirming IEC and Indian electricity rules be constructed first, before starting any other electrical works or in case if it is provided by client, earth pits be used to protect men and equipment.
viii. The earthing connection provided to the equipment and circuits shall be promptly connected and never be tampered with at any cost.
ix. All temporary electrical wire be installed above ground and at the height beyond where the highest construction equipment reaches or to the ceiling if inside building/floor, never shall the electrical cables be laid across construction works.

x. All electrical distribution boards should be equipped with an Earth Leakage circuit breaker of suitable capacity, a fire extinguisher, and an insulating mat (comply with IS 15652). All Earth leakage circuit breakers be tested at least once a month.
xi. In case electrical cable must be buried underground for any reason, only armoured electrical cables be buried on a layer of 20 mm (about 0.79 in) fine sand and at least one foot beneath ground level. A red coloured flag mounted on wooden batons be inserted at least 1 every 6 meters along the length as caution to mark buried electrical wire.
xii. Those distribution boxes installed in an open environment shall be waterproof complying to Ingress Protection rating of at least IP65 and those circuits installed inside the floor or in covered areas require Ingress Protection rating IP54.
xiii. Electrical wires, electrical accessories and fittings, Earth leakage, Residual current and miniature Circuit breakers shall at least comply to respective IS codes, IEC and Indian electricity rules
xiv. All distribution boxes are protected with provided with body earthing, adequately maintained, inspected, and tagged at least once a month during the construction phase.
xv. Only industrial plugs, sockets and fittings are allowed, domestic electrical fittings are forbidden.
xvi. Tasks related to line breaking or working on live equipment are always performed under a work permit.
xvii. All single phase portable electrical tools shall comply to at least IS Codes or any other suitable international codes and shall necessarily be protected with double insulation. Such portable tools are subjected to inspection at least once a month and be discarded if found unfit
xviii. Electrical apparatus producing sparks shall never be used where flammable liquids/vapours are believed to present E.g.: Paint storage rooms, diesel storage rooms.
xix. Electrical cables cannot be drawn on ground beyond 20 meters in length.
xx. A lock out tags out system be implemented at every site to de-energize apparatus before installing, commissioning, or performing any kind of maintenance to prevent individuals coming in contact with hazardous energy.
xxi. Wherever retrofit activity / dismantling of existing electric cables are required, Contractor should avail as built drawings and shall de-energize and verify zero power before starting dismantling activities.
xxii. Wherever cables are buried underground, and as built drawings are not made available, contractors are mandatorily required to mobilize cable tracers and dig or perform earth work in those areas where no cables are detected by the cable tracer.
xxiii. Individuals working on electrical equipment shall always wear cotton clothes, safety shoes, face shield / safety goggles and gloves with respective resistance rating as a minimum.

90. **Hot works:**

i. All hot works be always performed under work permit, with supervision.
ii. Cutting gases to be used are a combination of Oxygen and Acetylene or Bharat metal cutting gas (BMCG). Use of Liquid Petroleum Gas (LPG) is prohibited.
iii. Maintain suitable number of fire blankets, fire extinguishers of CO2 type when performing hot works. Remember, working on specialized materials require special extinguisher, consult QCI HSSE advisor for more information.
iv. Minimum personal protective gears to be worn during any hot works are full body leather apron, full arm leather hand gloves, nose mask, safety shoes and welding shield.

v. All hot works be carried inside a suitable barricade, restricting unauthorized entry. The fire watcher or helper standing around the welder also shall wear welding glasses along with other protective gears.
vi. All hot works wherever practicable shall be performed around the hard-sheeted barricade to avoid splinters or avoid exposures or shall be protected using fire blanket.
vii. Suitable ventilation to be provided for workers performing hot works.
viii. All electrical welding machines be fitted with voltage reduction device (VRD) and the earthing from the welding machine be promptly connected to the earth pit.
ix. Welding cables shall always be dry and free of dampness, grease, or oil to prevent breakdown of insulation or fire.
x. Welding cables are subjected to extreme work conditions and thus shall require routine testing and inspection, defective cables shall be immediately replaced.
xi. Never change electrodes by bare hands, wet gloves or when standing on wet floors. Do not throw the used electrodes on ground, they shall be always disposed into the sand bowl/bucket.
xii. Welding, cutting & brazing shall never be performed in the vicinity of combustible materials or combustible gaseous mixtures believed to be present.
xiii. A fire watch and a fire extinguisher should be maintained throughout the welding or cutting operation and continued for at least 30 minutes after job completion.
xiv. Suitable respirators be used wherever gases (the oxides of nitrogen, carbon monoxide, ozone) and metallic dusts and fumes may pose respiratory hazards and exceed beyond threshold limit values mentioned in the building and other construction workers rules.
xv. Should oxygen be deficient, self-contained breathing apparatus or hose masks with forced air ventilation be provided.
xvi. Use local exhaust ventilation or general ventilation systems in confined areas, such as tanks and pressure vessels. This precaution should maintain toxic gases, fumes, or dusts below the maximum allowable concentrations.
xvii. Local exhaust removal or general ventilation should be used when welding involves coatings or fluxes containing base metals that contain zinc, fluorine, beryllium, lead, or cadmium, and their compounds, so that the concentration of any toxic fume generated is below the TLV.
xviii. Local exhaust or general ventilation should be used to maintain the concentrations of oxides of nitrogen within safe limits.
xix. Inert gas-shielded arc welding requires that precautions be taken to provide proper respiratory protection, positive ventilation, local exhaust removal, or approved respiratory equipment, or a combination of them.

91. **Gas cylinder safety**:
i. Contractors shall ensure Industrial gas cylinders shall comply to IS: 3224 and valves for cylinders containing flammable gases shall comply to IS: 3224.
ii. Contractors shall ensure the cylinders shall be fitted with safety relief devices in their bodies and shall have such safety devices manufactured and maintained in accordance with IS: 5903.
iii. Contractors shall ensure the markings on every cylinder shall be clearly and permanently marked in accordance with following conditions by stamping, engraving or similar processes, namely:
iv. on the shoulder of the cylinder which shall be reinforced by forging or other means; or on such a part which is inseparably bound with the cylinder, and which is not or only negligibly effected by the stresses due to the gas pressure within it;

v. the name plate shall not be affixed to the cylinder by soldering if there is a risk of corrosion or embitterment.
vi. In conjunction with the original marking, space shall be provided for stamping the test date obtained at the periodic inspection.
vii. Markings shall be so carried out and the letters and numerals used shall be of such shape and size that the marking is clear and easily readable and does not give place for misreading.
viii. Contractors shall procure all cylinders coloured as per the identification specified in IS: 4379. Cylinders welded, brazed, or repaired shall never be accepted into construction sites.
ix. Contractors shall ensure gas cylinders shall never be rolled on ground or never be carried on shoulders; they shall be always moved in a trolley in locked position.
x. Contractors shall ensure they do not lift compressed gas cylinders with an electromagnet or slings. Where cylinders must be handled by a crane, carry them in a cradle or suitable platform.
xi. Contractors shall never tamper with safety valves/ end caps in cylinders. End caps shall be removed only while in use. They shall load cylinders to be transported, allowing less movement between cylinders. Secure them with chain to prevent violent contact.
xii. Cylinders shall always be stored inside a shade/shed in a dry, well-ventilated place prepared and reserved. Such storage places be made available with chain lock arrangement.
xiii. Contractors shall ensure oxygen cylinders stored indoors should be at least 6 metres away from other cylinders containing flammable gases or combustible materials.
xiv. Contractors shall ensure defective pressure gauges shall not be permitted on regulators, worn out gauges shall be repaired immediately.
xv. Contractors shall never allow oxygen and oil in the proximity; this might cause a combustible gaseous mixture and may cause explosion. Long hoses shall not be used, as they are difficult to purge. Leaking hoses must be repaired immediately without any delay.
xvi. Contractors shall protect hoses from sparks, slag, grease, oil, and hot objects. Check valves (flashback arrestors) should be installed at both the torch end and cylinder end of each hose to prevent back-flow of gases.
xvii. Contractors before changing torches, shut off the gas at the pressure reducing regulators and not by crimping the hose. Never put down a torch until the gases have been completely shut off.
xviii. Contractors shall never hang torches from a regulator or other equipment that allows them to come in contact with the sides of gas cylinders. When extinguishing the flame, close the acetylene and oxygen valves in the order recommended by the torch manufacturer.
xix. Contractors shall never keep gas cylinders inside a confined space. If a leak in the valve cannot be rectified by tightening the gland nut or the spindle, the cylinder shall be removed to an open space where it is least dangerous to life and property and the filler shall be informed.
xx. Contractors shall ensure adequate emergency handling equipment or kits and protective equipment like hand gloves, gas masks, breathing apparatus, goggles, gum boots shall be provided in the toxic, corrosive and flammable gas storage shed.
xxi. Contractors shall ensure when gas welding is complete it is essential that the shut off valve on the cylinder is to be closed so there is no danger of the gas building up in a confined area such as an excavation, vessel, or tank.
xxii. Contractors shall ensure conveyors, trolleys and cradles of adequate strength shall, as far as possible, be used when moving the cylinders and care shall be taken to avoid any damage to the cylinder valve.

xxiii. Contractors shall ensure cylinders shall be handled carefully and not be allowed to fall upon one another or otherwise subjected to any undue shock.

xxiv. Contractors shall ensure sliding, dropping, or playing with cylinders is prohibited. Cylinders used in shall always be in horizontal position and shall be so secured that they cannot roll.

xxv. Contractors shall never use open flames, lights, mobile phones, lighting of fires, welding and smoking shall be prohibited near any cylinder containing flammable gases except those whiles in use for welding, cutting, or heating.

92. **Illumination:**

i. Contractors shall arrange to provide illumination levels of not less than 200 lux at every working levels.

ii. Site entry/exit points shall be adequately lit with back up battery power to avoid emergencies due to power failure.

iii. Hand lamps / Task lights shall be arranged by respective Contractors at their individual working surfaces.

iv. All walkways, driveways and periphery of the construction sites shall be lit with at least 200 lux to provide good visibility.

v. All Contractors shall provide and maintain adequate emergency lighting in emergency egress routes in order to safety evacuate personnel from site.

93. **Construction Equipment and vehicles:**

i. Contractors shall ensure no equipment; vehicles or construction machineries are not older than 5 years.

ii. Contractors shall ensure all such equipment be subjected to inspection and certification by QCI engineers and safety personal and obtain certificate of use by tagging green.

iii. All motor vehicle falling under ambit of motor vehicles act shall comply to the requirements of central or state regulations as applicable.

iv. Driving 2&3 wheeled motor vehicles inside the site is prohibited.

v. All earth moving equipment including trucks, tractors, tough riders, and all moving machineries shall be fitted with reverse alarm before being engaged at construction site.

vi. All cranes mobile or standalone shall be inspected by chartered engineer as per the applicable laws and the safe working loads be conspicuously stamped.

vii. Contractors shall not use mobile cranes without out riggers, hydras are strictly prohibited from use.

viii. Never disable limit switches at any cost and do not work by passing them even after alarms.

ix. Fuel power vehicles fitted with spark arrestor shall only be permitted within the proximity of six meters around flammable liquid storage area.

x. All pressure vessels shall be inspected by chartered engineer as per the applicable laws.

xi. Hydraulic or pneumatic lines shall be left unattended, they shall always be secured while use and shall be disabled with zero pressure when works are completed. Contractor shall conduct the routine preventive maintenance for all construction equipment to prevent any injuries.

xii. All construction equipment operators shall be adequately by the original equipment manufacturers or their channel partners and shall hold a training certificate provided by them.

xiii. All construction equipment shall have rotated, reciprocating gears, belts, and conveyors to be covered or guarded to protect from accidental exposure of construction workers.

xiv. All electrically operated equipment be provided with earthing, body earthing and be tested before being put to us.

xv. All single-phase electrical equipment be protected with double insulation.

xvi. Contractor shall ensure all personnel operating equipment with abrasive wheels shall be always trained personnel; correct wheel should be used in accordance with the speed of grinding machine. Worn out wheel shall be removed from use promptly.
xvii. Contractors shall ensure all lifting operators shall have adequately trained operator, signal men with unique recognizable uniform.
xviii. Those signal men assisting erection works or signalling any crucial works shall wear sunglasses during the day and they shall never position themselves in the opposite direction of the sun rays to protect themselves from glared vision.
xix. Contractors shall ensure equipment having potential to malfunction in bad weather like high winds and rainfall shall be terminated.
xx. An inventory of all the equipment be maintained at site in a register after having certified for use.
xxi. Drivers & operators of the vehicles shall mandatorily apply hand brakes and provide wheel stopper (chocker) to prevent vehicle from moving accidentally.
xxii. Tyre cleaning facility shall be provided at the exit gates for all the vehicles coming to site.
xxiii. Wooden logs shall never be used for constructing scaffoldings and building form works. It must ensure at no point of time wood becomes part of working platform, access or climbing accessories.
xxiv. Wooden ladders, access platforms and any other load carry wooden logs are prohibited from use for construction purposes.
xxv. Contractor shall ensure metal form works planned for slab casting works shall be preapproved by designer to withstand the self-load and concrete load.
xxvi. Contractor shall ensure form work for beam casting shall also be approved by the designer in order to without the total load.
xxvii. Manual mixing and manual carrying of concrete mix shall be avoided and ready-mix concrete shall be used, and suitable concrete pumps (Stationary/mobile) pumping machines shall be used.
xxviii. Wherever construction vehicles and equipment must cross an overhead services line (Eg: Overhead electrical wire, pipeline etc) a clear indication of height limit will have to be placed to alert driver.
xxix. All overhead services lines (including electrical & piping) to be marked with hazard tape.

94. **Excavation and barricading:**

i. Contractors shall never excavate the land with 90o cut, all excavations be either an angle cut or bench cutting, soil conditions be assessed before start of excavation.
ii. All excavated pits be provided with hard barricaded entry/exit points with a suitable slope, all excavation deeper than 4feet and 20 feet in length be provided with two entry/exit points.
iii. The perimeter of excavations of each excavated area must be protected by way of hard barricade with caution tape around to prevent accidental falls.
iv. Provision to pump water from excavated pits to be made readily available in case of flooding.
v. Adequate lighting to be provided in the excavated area until it is back filled or constructed.
vi. Excavated soil should be stored away safely at a distance not less than the depth of the excavation.
vii. Adequate shoring shall be installed in excavations where workers are required work.

viii. Transit mixers shall never be driven in the vicinity of 3 meters inside the excavations, this limit is for the excavations up to the depth of 4.5 meters and beyond this excavation, as per the advice of geo technical engineer based on the soil stability.

ix. When a transit mixer is required to driven close by the excavated area, a driveway needs to be marked using differed coloured soil or white powder, wheel stoppers to be arranged at the place where vehicles need to be stopped.

x. Vehicles when driven around excavated areas a signal man (Flag man holding red and green flags) shall be must to direct the driver to drive safe.

xi. Rebars shall never be used for barricading, only pipes/ wooden batons be used to insert into the ground and horizontal pipes/caution tapes shall be used for barricading.

xii. All staircases' stalls be barricaded with double pole pipes to protect one from risk of falls.

95. **Lifting and rigging:**

i. Contractors shall cordon off the area where lift is planned and "No Entry" sign be placed to keep out unauthorized personnel and personnel involved in rigging and signaling be recognized by sticker on the helmet or with a unique uniform.

ii. Crane and Cherry picker operators be adequately trained by the original equipment manufacturer or through channel partners.

iii. Contractors shall ensure lifting tackle shall be identified with an identification number stamped on them and its "Safe Working Load" shall be painted conspicuously, and Contractors shall use vacuum or suction glass lifters while installing glasses.

iv. Contractors shall ensure all lifting tackles (Chain pulley blocks, slings, derricks, movable cranes, hoists) are inspected at least once in 12 months and as per the requirements of building and other construction workers rules, an inspection report by chartered engineer shall be maintained readily for inspection.

v. All lifting hooks shall be provided with safety latch and Contractors shall ensure wire ropes and slings shall be of the correct size, grade, and construction to withstand the maximum suspended load.

vi. The contractor shall ensure damaged or substandard lifting gear shall not be discarded and marked for non-use.

vii. Contractors shall ensure no erection and installation occurs during adverse environment conditions like high winds, heavy rain, or any other condition and shall ensure man baskets shall be load tested and approved by a chartered engineer and certificate of fitness be kept for inspection readily.

viii. Contractors shall arrange to bring all glasses in the actual wooden package and arrange to unpack them at site, contractors shall use forklifts to move glasses from truck to unpacking area and glass handling trolleys to move from place to place within site.

96. **Workers' welfare:**

i. Every construction site shall have an earmarked space for workers eating area, such area shall be always kept barricaded, clean, adequately lit, under shade and shall have drinking water, serving table, dining table and chairs and hand wash facility made available during the time window of breakfast or meal.

ii. Every construction site shall also have an earmarked space for workers resting such space shall have clean surface, shaded on top and shall have cover at all 3 sides, such space shall fit at least 30% of the peak labour count.

iii. Every construction site shall have site HSSE induction room in of size at least of 15ft X 30 ft size with 4 sides' covers, adequate lighting arrangement, writing board and projector.

Smaller site like interior fit out sites shall provide suitable space based on the site conditions.

iv. Adequate quantity of clean and safe drinking water shall be provided at prominent places and at workers rest area.

v. Contractors shall arrange toilet facilities for both women and men separately, toilet ratio shall be 1 for every 25 personnel. Toilets for men/women be made at a certain distance apart with adequate signage readable by all.

vi. Contractor shall build a separate crèche if 30 or more workers are engaged, such crèche shall be always led by a woman caretaker with adequate toys and childcare facilities.

97. **Environment and pollution control:**

i. Contractors shall determine the substance used during the construction process is the least hazardous substance.

ii. Contractors shall use natural resources like water, soil, and others to the minimal to protect depletion of resources.

iii. Contractors shall make sure dust menace is reduced by way or sprinkling water whenever it is required.

iv. Contractor shall provide adequate receptacles to collect waste and shall dispose the waste responsibly by way of recycling reduce and in authorized landfilling.

v. Contractor shall handle the hazardous waste is handled with due care and shall not be thrown out unscientifically, hazardous waste shall be disposed of to an authorized treatment agency.

vi. Contractors shall never store liquids in a way it will pollute the land, all liquids be stored with a secondary containment on an impervious layer.

vii. Gases cylinders with polluting gases shall be handled and stored by trained personnel.

viii. Contractors shall never generate noises mentioned in the noise pollution regulations, they shall employ healthy construction equipment and perform routine preventive maintenance

ix. Contractor shall provide mobile portable toilet for their workers without affecting the environment.

98. **Demolition and dismantling work:**

Dismantling: The term 'Dismantling' implies carefully separating the parts without damage and removing. This may consist of dismantling one or more parts of the building as specified or shown on the drawings.

Demolition: The term 'Demolition' implies breaking up. This shall consist of demolishing whole or part of work including all relevant items as specified or shown on the drawings.

i. Necessary approval, permits and regulatory clearances be obtained before starting the demolition activities including environment pollution control requirements.

ii. All as built drawings of the building and Mechanical, electrical, gas, plumbing and any other services drawings be kept readily available as ready reckoner.

iii. Structural engineers shall approve the demolition plan and obtain written clearance before starting the demolition works. The building or structure that is planned for demolition be adequately secured, barricaded, and be guarded by necessary security guards to ensure unauthorized access is strictly controlled.

iv. Safe access for equipment and men movement be established to make sure staff involved in demolition activity has easy access. Caution and warning sign boards be erected to ensure personnel are alerted about the imminent hazards all roads; open adjacent areas be protected.

v. Necessary emergency arrangements for fire, safety be implemented before initiating demolishing activity.
vi. All energy sources including electricity, pneumatic lines, underground water lines, fuel lines be isolated, and a lock out tag out be applied along with the name and contact details of the personnel at work be affixed.
vii. Contractors shall ensure, all over head and underground electrical lines are adequately isolated and a test certificate to this effect shall be maintained at site. Adequate illumination arrangements be provided by providing a separate temporary electrical line safety installed.
viii. Equipment requiring power to operate shall also have a separate dedicated temporary electrical circuit and equipment with hazardous material shall be decontaminated before starting dismantling activity.
ix. Construction debris arising out of demolition be handled as per the Hazardous waste management rules and Construction and demolition waste management rules.
x. Liquid and solid waste collected as waste from decontamination process be handled as per the applicable laws.
xi. Asbestos containing building materials be handled with due care, no asbestos be broken, processed at site. Handling asbestos be documented in the form of Safe work method statement or Job Safety Analysis and strictly be handled as per SWMS/JSA
xii. Demolition works requiring use of explosive be handled as per the developed SWMS (Safe Work Method Statements) or JSA (Job Safety Analysis) and as per regulatory requirements. Workers performing demolition and dismantling works be adequately trained and qualified to ensure they work safely.

99. **Pandemic/Endemic preparedness and response:**
i. Contractor shall incorporate potentially known pandemic situations in the HSSE plan and submit them for QCI's review before the start of the project.
ii. Contractor shall be prepared to plan to procure adequately approved / certified masks, hand sanitizers, respirators as enacted or notified by the government.
iii. Contractor shall conduct training, awareness and develop competence among workers to prevent the spread of infection and be skilled to prevent themselves from picking up infection from potential sources.
iv. Contractors shall make necessary provisions including procuring approved disinfectants, cleaning agents, fumigations and any other sanitization arising out of the ongoing pandemic situation and deploy those measures at site upon identification of pandemic situation.
v. Contractor shall make necessary arrangement to conduct health screening of their workers to ascertain they are in good health, and they are not prone to pick up or spread infection. This also includes planning to temperature screening using non-contact thermometer or any other device that may be required to detect the symptoms on the pandemic situation.
vi. Contractor shall arrange skilled staff including paramedic or a doctor if need arises and/or any other required resources to manage the pandemic situation.
vii. Contractor shall arrange hand wash basins, soap solutions, ablution facilities, eye wash stations, water fountain or any other hygiene facility required.
viii. Contractor shall train their staff and workers regarding social distancing scenarios, personal hygiene, maintaining hygiene during toolbox talks, working conditions at site, prevent workers from sharing food, tiffin boxes, water bottles.
ix. Contractors shall also implement necessary infection prevention programs at labour colonies.

x. Contractors shall conduct inspections and audits to ascertain infection prevention measures have been implemented at labour colonies and construction sites and submit the report to client and QCI.

100. **Penalty applicable for Safety lapses:** If the contractor does not adhere to the Client/ PMC safety regulations, penalty will be imposed as per the following table:

S. No.	Offence	Charge to Company for each H&S breach
1	Smoking in an unauthorized area or consumption of alcoholor use of illegal substances	Rs 2,500
2	Burning of waste or smoldering of combustible materials on site other than for heat treatment processes required for the execution of the Works	Rs 2,500
3	Failure to wear personal protective equipment (PPE) eg safety helmets, safety boots, goggles, respirator, ear plugs, safety belts, which shall include failure to anchor belt to a secure structure Where any site operation requires the use of PPE then all workmen must use the required PPE eg grinding, welding, burning, unloading hazardous materials etc.	i. Rs 2,500 per worker when lack of enforcement of the usage of PPE by the Contractor is observed Or ii. Rs 10,000 where issuance of the required PPE by theContractor is not carried out.
4	Failure to attend general safety induction course conductedby the Project Manager	i. Rs 2,500 per worker for not attending the course and ii. Workers to attend coursewithin 2 working days or be dismissed.
5	Failure by Engineers to attend a notified site safety meeting	Rs 2,500 per employee +Rs 10,000 per company
6	Failure to submit, within the specified time to the employer, safety supervisor reports which shall include other relevant statutory reports like the tool box briefing, records, weekly labour return, issuance of personal protective equipment records, safety data sheets of toxic and harmful material and other related certificates	Rs 2,500
7	Failure to submit a written report for an accident and / or other dangerous occurrence, to the employer within 24 hours of its occurrence	Rs 10,000
8	Damage to or misuse of the Employer's property	i. Rs 10,000 ii. In addition, the Contractor to rectify / replace the same at his risk and cost.
9	Failure to maintain work area, facility storage and preparation yard, officer premises and workers changingand rest area in a clean and orderly state and free from Health and Fire hazards	i. Rs 10,000 ii. 2. In addition the Contractor shall clean up the disorderly and untidy areas within 3 days at his risk and cost.
10	Obstruction of passageways, entrances, doorways, stairs,access to firefighting equipment etc. or the erection of unsafe accesses and crossings	Rs 10,000
11	Use of equipment that has not been examined by anapproved person as required under the relevant regulations	Rs 10,000
12	Using defective or uncertified slings for lifting operations	Rs 10,000

101. **Handing Over Schedule:** On completion of all items of work as per contract, the Contractor shall hand over the works to QCI. The handing over of the completed works in all respect to QCI (officially in writing) shall be the responsibility of the Contractor. The defect liability period will commence from the date of handing/taking over to the QCI. The process of handing over shall be as under:

i. One month in advance of the stipulated date of completion, joint inspection shall be carried out with Design Consultant, PMC and QCI Authorized Person and all the defects, deficiencies shall be noted and a time bound programme to be made for rectifying all the defects and deficiencies. After rectifying all defects, deficiencies at its own cost up to the satisfactions of Design Agency, PMC and QCI Authorized Person, the contractor shall handover the building premises to QCI.

ii. The Contractor shall remove at his own cost all surplus materials, debris, material waste, labour hutments before handing over to QCI. If it is felt that the Contractor is not responding to rectify the defects urgently and the QCI is suffering in using the assets created due to default of the contract, QCI shall be entitled to get the defects rectified at the risk and cost of the Contractor at any time after expiry of 24 hours' notice issued to the Contractor.

102. **Other Conditions:**

i. Other contractors working at site will also simultaneously execute the work. The contractor shall offer necessary cooperation to other contractors wherever required.

ii. Any malva / building rubbish generated is to be removed from the site within 24 hours.

iii. This malva / building rubbish has to be disposed-off to the dumping ground as approved by the Engineer in consultation with QCI Authorized Person. ***The rates quoted by the contractor are inclusive of all operations, labour, leads and lifts from site of work to the dumping ground.***

iv. Engineer/Supervisor shall carry mobile telephone (s) to enable the QCI Authorized person to have easy and quick communication. ***Nothing extra shall be paid to the contractor*** on this account and his ***quoted rates*** for various items under this contract will be ***inclusive of this obligation.***

v. The staff employed by the contractor should be well behaved and any complaint of misbehaviour shall be taken very seriously and such staff will have to be removed by the contractor immediately from the site.

vi. The dismantled materials shall be taken away and disposed off by the contractor at his cost. ***Nothing extra shall be paid to the contractor.***

vii. The contractor shall make all safety arrangements required for the labour engaged by him at his cost. All consequences due to negligence on behalf of security / safety or otherwise shall be on the contractor. The QCI shall not be responsible for any mishap, injury, accident or death of the contractor's staff. No claim in this regard shall be entertained / accepted by the QCI.

viii. The contractor shall be responsible for the watch and ward / guard of the buildings, till the building is physically handed over to the QCI. No extra payment shall be made on this account.

ix. The Contractor shall make all necessary arrangements for protecting from rains, fog or likewise extreme weather conditions, the work already executed and for carrying out the further work, during monsoon including providing and fixing temporary shelters, protections etc. ***Nothing extra shall be payable*** on this account. Also, no claims for hindrance shall be entertained on this account.

x. The contractor will take reasonable precautions to prevent his workmen and employees from removing and damaging any flora *(plant/vegetation)* from the premises of the building.

103. **Quality Assurance**

i. The proposed building is a prestigious project of QCI and quality of work is of paramount importance. Contractor shall have to engage well-experienced skilled labour and deploy modern T&P and other equipment to execute the work. Many items like exposed finish form work, specialized flooring work, Polysulphide/P.U. sealant and backer rod fixing in expansion joints, factory made door- window shutters, proper slope maintaining in toilet units, sanitary- water supply installation, textured finishing, grit plastering with aluminium channel insertions, water proofing treatment, Extruded Polystyrene insulation boards, facade works and chemical treatment in toilet drops will specially require engagement of skilled workers having experience particularly in execution of such items.

ii. The contractor shall ensure quality construction in a planned and time bound manner. Any sub-standard material/work beyond set out tolerance limit ***shall be summarily rejected*** by the QCI Authorized person & contractor shall be bound to replace/ remove such sub-standard/defective work immediately. If any material, even though approved by QCI Authorized person is found defective or not conforming to specifications shall be replaced/removed by the contractor ***at his own risk & cost.***

iii. The contractor shall submit, a detailed and complete method statement for the execution, testing and Quality Assurance of works. All the materials to be used in the work, to give the finished work complete in all respects, shall comply with the requirements of the specifications and shall pass all the tests required as per specifications as applicable or such specifications / standards as directed by the QCI Authorized person. However, keeping the Quality Assurance in mind, the Contractor shall submit, on request from the QCI Authorized person, his own Quality Assurance procedures for basic materials and such items, to be followed during the execution of the work, QCI Authorized person.

iv. All materials and fittings brought by the contractor to the site for use shall conform to the samples approved by the QCI Authorized Person which shall be preserved till the completion of the work. If a particular brand of material is specified in the item of work in Schedule of Quantity, the same shall be used after getting the same approved from QCI Authorized person. Wherever brand/quality of material is not specified in the item of work, the contractor shall submit the samples as per suggested list of brand names given in the tender document for approval of QCI Authorized person. For all other items, materials and fittings of ISI Marked shall be used with the approval of QCI Authorized person.

104. **Non-Tender items / Rates for extra items of works:** Any item of work carried out by the Contractor on the instructions of the QCI Authorized person which is not included in the accepted schedules of rates shall be executed at the rates OF L1 quotation taken from the rate analysis conducted by QCI.

105. **Disclaimer:** QCI shall not be responsible for any late receipt of applications for any reasons whatsoever. The applications received late will not be considered.
QCI reserves the right

i. To reject any/all applications without assigning any reasons thereof.

ii. To relax or waive any of the conditions stipulated in this document as deemed necessary in the best interest of the QCI without assigning any reasons thereof.

iii. To include any other item in the Scope of work at any time after consultation with applicants or otherwise
iv. To adopt method deemed fit to evaluate the proposals
vi. To select multiple Contractors for the project for allocation of work in different areas if it meets the essential criteria for qualification.

VII. SUBMISSION OF PROPOSALS

The intending contractor is expected to prepare proposals covering the following aspects:

1. **Bid acknowledgement form**
2. **Technical Proposal**
   i. Signed and stamped Form-1, 2, 3, 4, and 5 attached as Annexure-A
   ii. Tender Fee submission details as per RFP
   iii. EMD (Bid security as per RFP)
   iv. **Supporting documents** for the details required **as per pre-qualification criteria**
   v. HR declaration – No. of skilled manpower for interiors package and HVAC & Electrical Package
   vi. Organization chart
   vii. CVs of technical staff as detailed in clause IV sub-clause 1 (iii)
   viii. Approach & Methodology detailing timeline, execution plan, testing and Quality Assurance of works
   ix. Detailed activity-wise Level 1 and Level 2 schedule outlining the pre-construction, ongoing construction and post-construction phases of the project.
   x. Work Orders/ Letter of Award/ Completion Certificate issued by Client in support for experience criteria detailed in clause IV sub-clause 3
   xi. Certificate copy of LEED / IGBC/ GRIHA executed projects
   xii. Copy of ESI/PF certificate
   xiii. Copy of Contractor's All-Risk policy / Workmen's Compensation policy certificate of recent completed project
   xiv. Valid ISO related documents - 14001:2015, 18001:2007, and ISO 9001:2015
   xv. Details of **completed/ ongoing projects for onsite inspections as per Form 6 of Annexure-A.**
   xvi. Item compliance sheet/ BOQ to be signed by authorised signatory (unpriced bid) – no price/rate shall be mentioned in the item compliance sheet/BOQ. Non-compliance to this will be liable for rejection.
   xvii. Any other details that the bidder may like to provide.
3. **Financial Proposal**

   The Proposal should be signed by the authorized signatory and submitted in a sealed envelope, only as a hardcopy, separate from the Technical proposal. Softcopies are not permissible. The Proposal must adhere to the following guidelines:
   i. The Contractors should submit the proposal as per the format given in Annexure – C in a spiral bound file.
   ii. Cover Letter for financial bid as per format in Annexure – C.
   iii. Taxes would be additional and as per applicable statutory norms.

Note –

- The Technical Part shall not include any information related to the Price Bid. Information related to the Bid price is contained in the Technical Part the Bid shall be declared non-responsive.

- The bidder shall furnish the Cover letter for financial bid, mention the total price, applicable taxes and duties, any commission/ hidden charges, discount in a separate sealed envelope and not with the technical submittals.

4. Submission Details:

i. The Financial and Technical Proposals should be submitted separately in the given format and signed by the Authorized Signatory. Financial bid, if submitted along with the technical bid is liable to be rejected.

ii. All the pages of the proposal must be sequentially numbered and must contain the list of contents with page numbers. Any deficiency in the documentation may result in the rejection of the Bid.

iii. All pages of the application shall be signed and stamped by the authorised signatory.

iv. Please Note that Prices must not be indicated in the Technical Bid.

v. The Technical Proposal which includes the supporting documents pertaining to pre-qualification criteria and technical evaluation round shall be placed in a sealed envelope clearly marked

'Technical Proposal' for "**Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi**". Further, the Financial Proposal shall be placed in a sealed envelope clearly marked **'Financial Proposal'** for "**Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi**".

Interested parties may submit the technical and financial Proposal in two separately sealed envelopes inside a larger sealed envelope super-scribing "**Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi**" to Deputy Director (Finance & Accounts), Quality Council of India, Institution of Engineers Building, 2nd Floor, 2, Bahadur Shah Zafar Marg New Delhi - 110002, India (By post or by hand) on or before January 10, 2025 by 3 PM.

For any queries, you may contact the below:
Procurement Team, QCI Email id: procurement@qcin.org

ANNEXURE – A

Bid Acknowledgement Form

Bidding Organization Details

- **Company Name**: [Insert Company Name]
- **Contact Person**: [Insert Contact Person Name]
- **Address**: [Insert Company Address]
- **Phone Number**: [Insert Phone Number]
- **Email Address**: [Insert Email Address]

Tender/Bid Details

- **Tender Reference Number**: [Insert Tender Reference Number]
- **Tender Title**: [Insert Tender Title]
- **Bid Submission Date**: [Insert Bid Submission Date]

Bid Acknowledgment

We hereby acknowledge the receipt of your bid proposal for the above-mentioned tender/bid and confirm that the following documents have been submitted as part of the bid submission:

1. Technical Proposal
2. Financial Proposal

For Internal Use Only

- **Received by**:
- **Designation**:
- **Date**:

Signature of recipient:

Format for Pre-bid query form

S. No.	Clause no., Page no.	Original clause in RFP document	The point on which Clarification required	Reason for amendment (if any)

Bidders are required to submit their queries as per the above format on their letter head duly signed and also share the word file of the above to the procurement@qcin.org within 1 day from the date of conducting of pre-bid meeting.

Form 1: Covering letter with the Proposal in response to RFP Notice

(To be submitted on the Letterhead of the responding firm)

{Place}
{Date}

To,

Deputy Director (Accounts),
Quality Council of India,
Institution of Engineers Building,
2nd Floor, 2, Bahadur Shah Zafar Marg,
New Delhi-110002

Subject: Submission of proposal in response to the RFP for "Engagement of Contractor for General Contracting Works Package at QCI office, WTC, Nauroji Nagar, New Delhi".

Dear Sir,

1. Having examined the RFP document, we, the undersigned, herewith submit our proposal in response to your RFP dated <dd/mm/yy> for "<RFP Name>", in full conformity with the said RFP document.
2. We undertake, if our proposal is accepted, to adhere to assign a team dedicate to this project.
3. We have read the provisions of RFP and confirm that these are acceptable to us. We further declare that any additional conditions, variations, deviations, or alterations/modifications in the RFP, if any, found in our proposal shall be treated as non-responsive bid and will be liable for rejection.
4. We undertake, if our proposal is accepted, to adhere to the scope of engagement or such modified plan as may subsequently be mutually agreed between us and QCI or its appointed representatives.
5. We agree to unconditionally accept all the terms and conditions set out in the RFP document and also agree to abide by this bid response for a maximum period of TWO MONTHS from the date fixed for bid opening and it shall remain binding upon us with full force and virtue, until within this period a formal contract is prepared and executed, this bid response, together with your written acceptance thereof in your notification of award, shall constitute a binding contract between us and QCI.
6. We affirm that the information contained in this proposal or any part thereof, including its exhibits, Annexures, Enclosures, and other documents and instruments delivered or to be delivered to through this proposal is true, accurate, and complete.
7. This proposal includes all information necessary to ensure that the statements therein do not in whole or in part mislead the QCI as to any material fact. We agree that QCI is not bound to accept the lowest or any bid response you may receive. We also agree that you reserve the right in absolute sense to reject all or any of the products/ service specified in the bid response without assigning any reason whatsoever.
8. We confirm that we have not been blacklisted by any central or state government agency, PSU etc. in the last 5 years preceding the Proposal Due Date.
9. We hereby unconditionally and irrevocably agree and accept that, the decision made by the Quality Council of India in respect of any matter regarding or arising out the RFP shall be binding on us. We hereby expressly waive any and all claims in respect of this process.

It is hereby confirmed that I/We are entitled to act on behalf of our corporation/company/ firm/organization and empowered to sign this document as well as such other documents, which may be required in this connection.

Dated this Day of (Year)
(Signature) (In the capacity of)
Duly authorized to sign the Bid Response for and on behalf of:
(Name and Address of Company) Seal/Stamp of Contractor

Form 2: Relevant Project Experience

Completed Projects:

S. No.	Area/ Location	Client name	Name and Size of the project	Value	Area (in sq. ft.)	Completion date	Nature of works

Ongoing projects: Details about the projects currently in progress or recently awarded - location, Scope of services:

S. No.	Area/ Location	Client name	Name and Size of the project	Value	Area (in sq. ft.)	Completion date	Nature of works

Form 3: Details of the responding firm

Section No.	S. No.	Particular	Detail
I	**COMPANY PROFILE:**		
	1.	Name of the Organization * (As appearing on PAN Card)	
	2.	Registered Office Address *	
	3.	**SPOC for the bid submitted**:	
		Name:	
		Mobile no.:	
		Email Address:	
	4.	**Address for Billing Office***	
		Name of Contact Person *	
		Contact No. *	
		Mobile No.	
		E mail ID *	
	5.	**Name of Contact Person (Finance & Accounts) ***	
		Contact no.	
		Mobile no.	
		E mail ID *	

II	STATUTORY DETAILS:		
	1.	**GST Details: -**	
		Whether Registered Assessee (Yes or No)	
		If Yes: -	
		GSTIN Number # *	
		Type of Assessee	
	2.	**MSME**	
		Whether Registered under MSME (**Yes or No**) *	
		If Yes: -	
		MSME Registration No. and validity date # *	
	3.	Permanent Income Tax No. (PAN) #	
	4.	**NATURE OF ENTITY:** * **PROPRIETOR/PARTNERSHIP/ LPP/ PRIVATE LIMITED /PUBLIC LIMITED/GOVERNMENT**	
	5.	**WHETHER FUNCTIONING IN A SPECIAL ECONOMIC ZONE. (SEZ) (YES/ NO) ***	

III	BANK DETAILS: -		
		Name of Bank	
		Address of Bank	
		Bank Account No.	
		IFSC Code	
		SWIFT CODE (If party's billing address is outside India)	

IV	Details of responding Company		
1.	Current Year Turnover (Rs Crores) from application development and audit related operations in India;		
2.	Company Profile (Operations in India)		

2.1	Average turnover from Indian Operations	(Turnover in Rs Crores)	
2.2	Full-time professional staff engaged in related services	(Number of Staff)	
2.3	Extent of operations in India (national spread) i.e. number of offices in India (client specific / project specific offices should not be taken into account)	(Number of Offices in different cities/towns and their address)	
3.	Company Experience		
3.2	Experience of working on similar Specifications		(Number of Projects and their brief description)

Declaration by Director/ Proprietor/ Partner:

I/We declare that the information furnished above are correct to the best of my/our knowledge / belief. I/We undertake to inform you of any change in above particulars at the earliest.

Form 4: Format for Non-Blacklisting Undertaking

(To be submitted on the Letterhead of the responding firm)

To,
Deputy Director (Finance & Accounts),
Quality Council of India,
Institution of Engineers Building,
2nd Floor, 2, Bahadur Shah Zafar Marg,
New Delhi-110002

Subject: Non-Blacklisting declaration in connection with RFP Ref. No. _____ dated____ for _____

Dear Sir,

This is to notify you that our Firm/Company/Organisation _____ intends to submit proposal in response to invitation for Tender Ref. No. _____ for <>. In accordance with the above, we declare that:

a. We are not involved in any major litigation that may have an impact of affecting or compromising the delivery of services as required under this agreement
b. We are not blacklisted by any Central/ State Government/ agency of Central/ State Government of India or any other country in the world/ Public Sector Undertaking/ any Regulatory Authorities in India or any other country in the world for any kind of fraudulent activities in the last 5 years preceding the Proposal Due Date

Dated this Day of (Year)
(Signature) (In the capacity of)
Duly authorized to sign the Proposal Response for and on behalf of:
(Name and Address of Company) Seal/Stamp of Bidder

Form 5: Details for onsite inspection

S. No.	Client name	Address of the project site	Name and Size of the project	SPOC (Name and contact no.)

ANNEXURE-B: Format for Guarantee Bond related to Water-Proofing Works/Anti Termite Treatment

GUARANTEE BOND TO BE EXECUTED BY THE CONTRACTOR
FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT
OF
WATER-PROOFING WORKS/ANTI TERMITE TREATMENT

(To be executed on non-judicial stamp paper of the appropriate value in accordance with relevant stamp Act.)

The agreement made this..... day of ..... *(Five Hundred Rupees only)* ..... between .....S/o .....*(hereinafter called the GUARANTOR of the one part)* and the QCI *(hereinafter called the Employer of the other part)*

WHEREAS THIS agreement is supplementary to a contract *(hereinafter called the Contract)* dated ..... and made between the GUARANTOR OF THE ONE PART AND the QCI of the other part whereby the contractor inter alia undertook to render the building and structures in the said contract recited completely water and leak-proof.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the affect that the said work will remain water and leak proof, for ten years from the date of completion of work.

NOW THE GUARANTOR hereby guarantees that work executed by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date of completion of work.

The decision of the QCI Authorized Person with regard to nature and cause of defect shall be final and binding on Guarantor.

During this period of guarantee, the guarantor shall make good all defects and in case of any defect being found render the building ***water proof/anti termite*** to the satisfaction of the QCI Authorized Person calling upon him to rectify the defects failing which the work shall be got done by the Department by some other contractor at the Guarantor's cost and risk. The decision of the QCI Authorized Person as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the water proofing/anti termite treatment and fails to control all kinds of leakage and seepage or commits breach there under, then the guarantor will indemnify the principal and his successor against all loss, damage, cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and/or damage and / or cost incurred by the QCI, the decision of the QCI Authorized Person will be final and binding on both the parties.

IN WITNESS WHEREOF these presents have been executed by the obligator.....and ..... by ..... for and on behalf of the QCI on the day, month and year first above written.

SIGNED, sealed and delivered by OBLIGATOR in the presence of: -
1.....
2. .....

SIGNED FOR AND BEHALF OF QCI BY ..... in
the presence of: -
1.....
2.....

ANNEXURE-C

Format for Price Breakup

S. No	Item Description	Amount Quoted (in INR)
1	Civil and Interior works	
2	MEP Works	
3	Subtotal of 1+2	
4	Add GST @ ….. %	
5	Labour Cess @ …. %	
	Grand Total	

Amount in words:

Note:

1. The Total Price shown above shall match with the price quoted in the BOQ. Any other deviation in this regard shall not be entertained.
2. In case of discrepancies between figures and words, the amount indicated in words shall prevail.
3. This contract amount does not relieve the contractor from payment of any statutory fee, taxes, etc applicable as per Government Guidelines which are not indicated above.

Cover Letter for financial bid

(To be submitted in the Financial Cover only)
Request for Proposal No.: QCI
Date of this Bid submission:

To:
Quality Council of India (QCI),
2nd Floor, Institution of Engineers Building
2, Bahadur Shah Zafar Marg, New Delhi – 110002

We, the undersigned, hereby submit the second part of our Bid, the Price bid and Bill of Quantities. This accompanies the Letter of Technical Part.

In submitting our Bid, we make the following additional declarations:

(a) **Bid Validity Period**: Our Bid shall be valid for a period of 120 days from the date of the Bid submission as specified in RFP, and it shall remain binding upon us and may be accepted at any time before the expiration of that period;

(b) **Total Price**: The total price of our Bid is Rs…….. (in words) for the attached Annexure (i.e. BOQ), excluding GST any other taxes.

(c) Total GST…….. on the Above quoted Price and Other taxes, if applicable, to be declared.

(d) **Any other statutory charges /Commissions and fees which is required to be paid before the start of work shall be our sole responsibility.**

(e) All the rates quoted by us as per BOQ will be firm and fixed for entire contract period as well as extended period for completion of the works. In case of identical items appearing in the BOQ, we declare that the lowest quote will prevail and will supersede any higher rate quoted by us for the same item.

(f) We will make no claim on account of any price variation/Escalation on whatsoever ground.

Name of the Bidder

Authorized Signatory of the Bid on behalf of the Bidder: **

Date:
Place:

**: The person signing the Bid shall have the power of attorney given by the Bidder. The power of attorney shall be attached to the Price Bid.

ENCLOSURES

ANNEXURE D: Bill of Quantities (BOQ)

Annexure E: List of Approved Makes/Manufactures of Materials

ANNEXURE F: List of Drawings

ANNEXURE-G Technical Specifications

PROJECT :QCI, NEW DELHI			Date:-27-12-2024 R2	
			Total Carpet Area	**67868 sft**
Master Summary				
S No		**SUMMARY**	**Basic Cost**	**per sft cost**
PACKAGE 1: GC				
A		**Interior Works**		
1		Civil & Interior Works	-	-
2		Special Feature & Misc Items	-	-
3		Kitchen Equipments	-	-
		TOTAL of A (w/o Taxes)	**-**	**-**
B		**MEP'S Works**		
4		**Electrical**	**-**	**-**
	4.1	Electrical Works (Lowside)	-	-
	4.2	LT Panels	-	-
	4.3	UPS	-	-
	4.4	IT - Passive Cabling Work	-	-
	4.5	Security Works : FA, PA, CCTV, ACD, Rodent, WLD, Vesda	-	-
	4.6	Light Fixtures + Decorative Lights	-	-
	4.7	Lighting Automation (CM Cabin & Board room)	-	-
5		**HVAC**	**-**	**-**
	5.1	HVAC (Low Side)	-	-
	5.2	HVAC (Low+ high side for technical area)	-	-
	5.3	HVAC (Low + High Side for Café)	-	-
	5.4	Allied Electrical Work	-	-
	5.5	Air Purification + AQI Monitor	-	-

S No		SUMMARY	Basic Cost	per sft cost
6		**PFF**	**-**	**-**
	6.1	Plumbing Works	-	-
	6.2	Fire Protection work (Sprinkler System)	-	-
	6.3	Fire extinguishers	-	-
	6.4	Gas Based Supression System (For J Block)	-	-
	6.5	Panel Gas Suppression System	-	-
		TOTAL of B (w/o Taxes)	**-**	**-**
		Total (A+B) w/o taxes	**-**	**-**
		GST @18%		
		Labor Cess @1%		
		TOTAL including all taxes for all packages	**-**	**-**

Note: *The above calculations are based on assumptions basis and are subject to change as per the finaldesign &specifications.*

BOQ FOR CIVIL & INTERIOR WORKS

GENERAL NOTES FOR THE INTERIOR CONTRACTOR

* The following costing is based on item rate format wherein Quantities may vary as per actuals but rates remain firm.
* Items in the BOQ mentioned with base cost to be quoted basis the rate mentioned (The basic cost is excluding the taxes, transportation , wastage etc.). If base rate increases/ decreases, Adjustment would be done on prorata basis as per the rate quoted with maximum profit margin of ±15% on the item being procured as per the standard norms of CPWD.
* All Hardwood to be seasoned and painted with anti-termite and fire retardant paints.
* All partition to be erected from floor to the bottom of the ceiling as per the drawings/details issued by the architect, and filled with sound insulated material, as specified & as per the standard practices under the direction of the PMC/ architect.
* All openings for the cutouts for ducting/raceways/cables etc. in the partitions to be closed & made air tight with apropriate material.
* All Veneers to be seasoned and melamine polished to shade as / sample approved by Architect
* All materials to be as specified in the list of makes and duly Approved by the Architect/PMC/Client before execution. The Contractor to make a sample Board of approved sample and place it at site for display within a week of start of work at site .
* All Soft boards (Sitatex) make shall have beading as per approved EDGE finish all-around for edge protections.
* All fabric boards shall have PVC grippers with Al edge protection at critical junctions as per approved EDGE finish all-around for edge protections.
* Contractor shall provide all necessary protection of glass until handover.
* General housekeeping & site security during execution of work till handover od the site would be included in quoted rates.
* Hoisting of material would also be included in quoted rates.
* Making of Temporary site office along with light fixture, AC , 1no printer, 1no water dispenser (or as specified by the Project Manager) etc to be included in the quoted rates.
* Antitermite treatment for entire floor to be included in the quoted rates.
* "RO" Stand for Rate Only.

					J - BLOCK		K - BLOCK					
S No		**Description of items**		**Unit**	**2F**	**3F**	**1F**	**2F**	**Total Qty**	**Unit Rate**	**Total Amount**	**Images**
1		**Civil Work**										
	1.01	**4 1/2" thk Brick Masonary :** Providing I- class Burnt Brick masonry with conventional type brick in cement mortar 1:4 in half brick (115mm thick) including mild steel longitudinal reinforcement of 2 bars of 6mm dia or hoop iron strip 100mm x 1.6mm at every third course properly bent and bonded at ends, scaffolding, raking out joints and curing etc. also inculde RCC Lintel (1:1-1/2:3) of appropriate size (1 cement :1-1/2 coarse sand : 3 graded stone aggregate 25 mm nominal size) complete.		sqm	2.00	2.00	2.00	2.00	8.00		-	
	1.02	**AAC Block Masonary** : Providing and laying of Autoclaved Aerated Concrete (AAC) block masonry using blocks having dimensions of 650X240mm /600X200mm and thickness **(As mentioned below)** of density 600 Kg / m^3 with compressive strength not less than 3 N/mm^2 conforming to IS 2185 (part III)1985 from FFL till structural ceiling lvl or height as mentioned in drawing in cement sand mortar 1: 6 (Cement: sand), if required suitable plasticizer may also be added. The horizontal and vertical joint thickness should be approximately 10 mm. Masonry work strictly be carried out as per IS 6041 - 1985 (Reaffirmed 1990). The same shall be anchored properly with the structure. The cost to include providing & laying of 100mm thick RCC band @ every 1.00 Meter c/c as per details complete to true line & plane in all levels and locations & finished to receive plaster. The cost to include scaffolding, curing etc., complete as specified.									-	
	i)	100 mm thick		sqm	118.00	82.00	198.00	107.00	505.00		-	
	ii)	250 mm thick		sqm	4.00	3.00	4.00	4.00	15.00		-	
	1.03	**RCC Counter :** Providing and laying RCC (1:1-1/2:3) for Counter 50 mm to 75 mm thk. inclusive of all centering , shuttering , reinforcement (8mm to 10mm dia rod) and finishing work with complete required material to proper completion of work and to entire satisfaction of Architect.		sqm	***RO***	***RO***	***RO***	***RO***	***RO***		-	
	1.04	**Basin Counter:-**Providing & fixing Counter (650deepx300 facia drop) with appropriate MS framework for counter top finished with WPC Board 18mm thk, including making holes for wash basin with drain grating and dust bin along with SS trim including edge polishing around basin and edge moulding as per Drawing and approved sample of moulding. The MS frameowrk to be made in appropriate MS angles of 50mmx50mm and secured to the brickwork with fashners as per drawings and protected with anti corrosive paint as per standards. The Counter made should be finished in Granite with all the chamfering , edge polishing, drop groove etc. The quoted rate should be inclusive of all fabrication charges & Granite cost complete. Only counter top will be consider for measurements.		sqm	1.00	3.00	2.00	2.00	8.00		-	
	1.05	**Cement Plaster:** Providing and laying 12-15mm thick plaster in Cement mortar 1:5 (1cement : 5 sand) to all types of RCC work (small or big) brick/stone work surfaces including parapet, wall tops, jambs and cills etc.at all levels, in line, level and plumb as shown in detailed drawings, as directed including providing necessary bands, drip moulds, tapak, grooves & wire mesh at all the junctions of walls and ceiling, walls and frames for doors or windows, around skirting/dado or at other places as directed, including raking out the joints or roughening the RCC surfaces, necessary curing, scaffolding etc., complete as directed and specified.		sqm	30.00	20.00	30.00	30.00	110.00		-	
	1.06	**Water proofing treatment (Tapecreate) :** Providing and applying water proofing treatment on sunken / raised areas of toilets, etc. with three coats of tapecrete and sealing all junction, corners and joints of pipes after first coat with epoxy mortar as per approved specifications of the specialist agency including providing 10 years written guarantee against any defects and leakage. (Tapecrete is polymer modified cementious material being manufactured in collaboration with FRC Composite Ltd. Canada. It shall have low permeability with a high resistance to cracking. Quoted rate also including preparation of surface as required for treatment etc.including applying of protective plaster 1:4 (1 cement : 4 Sand) as per advised by Architect. The given quantity inclusive of floor & wall up to ht of 450 mm.		sqm	15.00	22.00	60.00	32.00	129.00		-	
	1.07	**Light Wt.Filling :** Providing and laying cinder filling of light weight of AAC blocks (Auto Areated Concrete), & placing the same in sunken area / raised floor surrounded by 115 mm thick brick wall as directed by the Architect (Depth as per site)		cum	1.50	1.50	6.50	3.50	13.00		-	
	1.08	**Lintel :** Providing and laying Lintel (6" x 8") (1:1-1/2:3) inclusive of all centering , shuttering , reinforcement and finishing work with complete required material to proper completion of work and to entire satisfaction of Architect. 4" thick		rmtr	35.00	25.00	60.00	32.00	152.00		-	
	1.09	**POP Punning (12mm-15mm):** Providing and applying average 12 - 15 mm thk plaster of Paris and wire mesh at joints of diff materials to the walls and columns in square plumb line and level including scraping and removing the existing neeru finish, hacking the surface of walls/ columns. After levelling, the surfaces to be finished to recieve paint etc.		sqm	325.00	310.00	280.00	230.00	1,145.00		-	
	1.10	**Providing and applying average 12 - 15 mm N1 Elite 90 plaster from Saint goabin as per site requirement. (All specifications will be same as above item but using of Elite 90 instead of POP)**		sqm	1,220.00	525.00	980.00	1,260.00	3,985.00		-	
	1.11	**POP Putty :** Providing and applying average 2-3 mm thk POP putty to the walls and columns as required complete.		sqm	751.00	298.00	728.00	827.00	2,604.00		-	
	1.12	**Making Core cuts of required size and shape in post RCC work** at designated locations if not mentioned in the drawings but required by Project Manager including cutting of reinforcement, finishing edges smooth with 1:3 (1 Cement : 3 Coarse Sand) cement mortar and plugging the open spaces around sleeves/puddle flanges with concrete 1:1.5 :3 (1 Cement : 1.5 Coarse Sand : 3 graded stone aggregate 20 mm nominal size) admixed with waterproofing compound of Grace / CICO or equivalent make etc. complete. for all leads lift and heights.Note:- The Core cutting would be done with machine and coordinated with the structural drawings provided by the base builder) The cost to include covering the joints with silicon sealant to check water seepage. The core cuts to be supported at the top and the soffit of the slab with 10mm thick MS plates (450mmx450mm) and secured with appropriate Hilti Bolts as specified by the structural engineer.										
	i)	Size of core cut up to 150 mm dia.		nos	4.00	2.00	4.00	4.00	14.00		-	
	ii)	Size of core cut above 150 mm x 150 mm & up to 300 mm x 300 mm or 300 mm dia.		nos	1.00	1.00	2.00	1.00	5.00		-	
		Sub Total									-	
2		**Screeding & Tile Work**										
	2.01	**Screed Work :** Providing & laying plain cement concrete 1:2:4 nominal mix (1 cement :2 coarse sand : 4 graded stone aggregate 25 mm nominal size) of approved quality with all lead & lift below/above the ground level as per drawing including the cost of cement, levelling of surface of concrete with al lead and lift, labour, material as per specifications and cleaning of RCC Surface, necessary curing complete. Screeding shall be provided with 12 x 12mm groove to form a grid of 3000 x 3000mm. Top may require to be finished with power trowel / manually to required finish as per site conditions as directed by Architect/ Project Manager. (Mechanical mixing only).This additional detail ensures the inclusion of the polythene layer to prevent seepage to be included in the quoted rates, as requested.	50-60mm thick	cum	115.68	53.40	94.08	94.08	357.24		-	
	2.02	**Floor Tiles :** Providing and laying ceramic / glazed Floor Tiles of minimum thickness 8 mm of approved make and colour, laid to pattern as per drawing, set in rich cement mortar 1:4, min 30-40 mm thick including cement slurry complete with oxalic acid wash. Joints to run continuous horizontally and vertically. Rate to include levelling of the existing floor if required.		sqm	1,813.00	827.00	939.00	1,511.00	5,090.00		-	
		Sub Total									-	
3		**Stone / Tile Work**										
		General & Mandatory:										

S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
		1. All natural stones to be of best quality & selected closest matching the approved samples, in color, pattern and shade. The Granites/Natural stones should be of uniform texture and shade, devoid of any blotches or spots. Italian marbles to be of uniform consistency and shade & free from cracks, webbings, patches etc.										
		2. All stones to receive superior quality mirror/ granite polish using Silicate polish materials from Ardex or equivalent . Filling material would be standard epoxy complete with appropriate polishing material . Cost of polish to be included in all flooring and cladding Items.										
		3. The contractor to ensure that the flooring is protected from any damage or scratch and for this if any POP protection as deemed necessary should be done by the contractor, and this activity should not be charged separately										
		4. Sealer polish to be considered above & below as per requirement only on italian marble.										
		5. Basic rates of items means cost without taxes, transport and wastage of material.										
	3.01	**Floor Tiles :** Providing and laying Vitrified Floor Tiles of minimum thickness 8 mm of approved make and colour, laid to pattern as per drawing, set in rich cement mortar 1:4, min 30-40 mm thick including cement slurry complete with oxalic acid wash. Joints to run continuous horizontally and vertically. Rate to include levelling of the existing floor if required. Tile joints to have 3 mm spaceers in between and to be finished with approved make tile epoxy grout in thickness as directed. (The quoted rate should includes protecting the tile from polythence & POP covering as required).										
	i)	Size :- 600x600 mm (Terrazo Flooring)		sqm	64.00	12.00	358.00	*RO*	434.00		-	
	ii)	Size :- 1200x165 mm (Wood look tiles)		sqm	15.00	*RO*	164.00	*RO*	179.00		-	
	iii)	Size :- 1200x600/600x600 mm		sqm	8.00	*RO*	95.00	45.00	148.00		-	
	3.02	**Wall tiles :** Providing and fixing Vitrified Wall tiles 8 mm thick of approved shade over a base of 20-25mm thick cement plaster 1:3 (1 cement : 3 coarse sand) including laying tiles to approved pattern with grooves setting the tiles in cement slurry joints filled and finished with neat white antifungal grout as per requirement. Tile joints to have 3 mm spaceers in between and to be finished with approved make tile epoxy grout in thickness as directed.										
	i)	Size :- 1200x600 mm : Up to 8'0" height		sqm	55.00	70.00	145.00	98.00	368.00		-	
	ii)	Size :- 1200x600 mm : Feature tile upto 8'0" height		sqm	*RO*	5.00	18.00	18.00	41.00		-	
	iii)	Designer Tile (300 x 300 mm)		sqm	*RO*	*RO*	20.00	*RO*	20.00		-	
	iv)	Subway tiles (250x 75 mm)		sqm	4.50	4.00	7.00	*RO*	15.50		-	
	vi)	Size :- 600x300 mm : Up to 8'0" height		sqm	*RO*	*RO*	78.00	*RO*	78.00		-	
	vii)	Size :- 2400x1200 mm : 6mm thick tile cladding with Adhesives		sqm	*RO*	12.00	*RO*	*RO*	12.00		-	
	3.03	**Granite on counters :**Providing and fixing 19mm thick pre-polished **Granite counters** ,or fascias laid in 19mm thick bed of cement mortar 1:4 and jointed with cement slurry with pigment to match the shade of granite including rubbing mirror polishing, bevelling of edges etc complete at all levels having 300 mm jhalar . (allowing for necessary cutouts for fixing of wash basin, pipes, waste coupling etc.if & where required)		sqm	2.00	4.00	4.00	2.00	12.00		-	
	3.04	same as above but with suitable adhesive on existing ply / board		sqm	5.50	6.00	8.00	10.00	29.50		-	
	3.05	**Stone Work (as mention below):** Providing and fixing 19-20mm thick pre-polished Granite ,laid/clad in cement mortar 1:4 and jointed with cement slurry with pigment to match the shade of granite stone including rubbing mirror polishing complete.										
	i)	75 mm high stone skirting with edge chamfering & polishing complete		rmtr	35.00	40.00	42.00	55.00	172.00		-	
	ii)	200mm wide stone cladding on **Cistern ledge** wall with half round on one edge with polish complete.		rmtr	*RO*	2.00	*RO*	*RO*	2.00		-	
	iii)	300 mm wide stone cladding with half round on two edge with polish complete.		rmtr	1.00	1.00	22.00	1.00	25.00		-	
	iv)	Using in the form of 4" wide strip pattern for ramp work		sqm	9.00	4.00	9.00	9.00	31.00		-	
	3.06	**Stone Flooring:-** Providing and Laying **19-20 mm thk. Italian marble stone** of approved colour shade & size in the flooring in slabs/ bands/ strips as per drawing/ **flooring** pattern, laid on min 20mm thick cement mortar (1 white cement : 3 coarse sand) and joined with white cement slurry mixed with matching colour pigment, to match the shade of Stone.All edges shall be free from chipping and shall be square.The flooring will be Diamond polished as per approval. Cost to include appropriate coating under the stone and at joints and top surface. (The quoted rate should includes protecting the tile from polythence & POP covering as required .										
	i)	Italian marble Stone (Grey)		sqm	110.00	*RO*	*RO*	*RO*	110.00		-	
	ii)	Italian marble Stone (Armani Beige)		sqm	*RO*	90.00	60.00	90.00	240.00		-	
	3.07	**Stone Skirting** 75 mm high with the same stone as per item no mentioned above complete with edge chamfering & polish										
	i)	Italian marble Stone		rmtr	18.00	*RO*	*RO*	*RO*	18.00		-	
	ii)	Italian marble Stone		rmtr	*RO*	37.00	19.00	36.00	92.00		-	
		Sub Total									-	
4		**<u>Antistatic Access floor/ Vinyl & LWF works</u>**										
	4.01	**Raised Antistatic Access Flooring (Height 450mm):** Panel:- The Access raised floor shall be medium grade FS 800H panel and also point load of 3.6 KN and UDL of 1350 KN/m2; panels manufactured from steel with lightweight cementitious core in the size 600 X 600 X 35 mm. The top panel shall be finished with high abrasion, anti-static High Pressure Laminate with PVC beading on all sides to provide protection of edges. The bottom of the panel shall be embossed in hemispherical shape to give strength and flexural rigidity. The entire panel shall be finished with electro deposition of cathodic epoxy paint on the exposed surface for lifetime protection and shall be Zinc Whisker free. PEDESTALS: Pedestals design shall confirm speedy assembly and removal for relocation and maintenance. Pedestal base to be permanently secured to portion on sub-floors, pedestal assembly shall provide easy adjustment of leveling and accurately aligned panel to ensure lateral resistance. It shall be designed to avoid any rattle or squeaks. It consists of 100x100x2mm thick galvanized base plate die pressed orbitally riveted to 25mm OD 2.20 mm thick G.I./epoxy coated pipe to engage, the pedestal head assembly consisting of 75mmx75mmx3.5mm embossed ribbed head with		sqm	28.00	7.00	11.00	16.00	62.00		-	
		four holes with steel pin for panel location for fasting and locating of tiles , mechanically locked to corresponding threaded stud 16mm dia OD and which is designed to engage the pedestal base assembly, the assembly shall provide a range of a height adjustment up to 50mm with the help of two check nuts . Pedestal shall be permanently fixed to sub floor by application of Araldite and 4 nos. wedge expansion type expansion hold fasteners with threaded dia of 6mm dia. STRINGERS: Stringers system is all steel construction hot dipped galvanized rectangular snap lock channel 570x25x32x0.80mm thick having notches for snap locking stringers to aluminium pedestals pre-punched counter sunk holes are provided at both ends for securing the stringers on to the pedestal head ensuring maximum lateral stability in all directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system shall provide a minimum clear uninterrupted height of 300 to 600mm between the bottom of the floor for electrical conduits and wiring etc.										
	4.02	**Vinyl Flooring:** Providing and laying 2 mm thick antistatic PVC vinyl flooring of approved quality and colour conforming to the IS: 3462/ 1986 on the finished flooring or any hard surface with necessary approved adhesive for laying antistatic PVC sheet/roll including cleaning the floor before and after laying of PVC flooring and providing thin copper strip of size about 20.00 x 0.20 mm along the periphery of room and below each joint of two sheets wherever directed with copper screws/ rivets @600 mm c/c .Two ends of copper strips (terminals) to be fixed to wall about 300 mm height for earthing of antistatic flooring all complete as per the direction of Engineer-in-charge		sqm	11.00	*RO*	26.00	7.00	44.00		-	

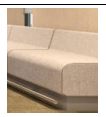
S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	4.03	**Floor Protection Sheet for Construction: (For the entire project closeout)** Supplying & Installation of a high-performance, three-layer composite sheet designed for floor protection during construction. Layer 1: Abrasion-resistant high-strength film for durability. Layer 2: High-density polyethylene foam for cushioning. Layer 3: Reinforced non-dusting and non-staining film for grip. Specifications: Thickness: 5mm Elongation: 207-370% Tear Strength: 3.0-3.8 kg/cm Puncture Resistance: 580 gsm, pass		sqm	42.00	42.00	45.00	45.00	174.00		-	
	4.04	**Engineered Wood Flooring:-** Providing and supplying Engineered Wood Flooring, with four side micro beveled. Planks which would be about 133.3 mm wide and in random length comprising of 5 ply including top veneer with a total thickness of about 9.52mm available in species of Walnut respectively.The top 2mm veneer shall be impregnated with stained acrylic resin to enhance the surface hardness multifold. The flammability ratings of plank as per ASTM E 648 - Critical Radiant Flux - 0.45 watts/sq. cm. or more - Class I.The planks shall have Urethane coating with Aluminium oxide crystals and additive like carbide, titanium, diamond cured in UV rays) for superior durability. The sub-floor shall be ensured to be smooth, flat , hard & free from moisture, grease, etc. on which the planks are to be laid. Self levelling compound shall be laid to ensure the same. The moisture level present in the subfloor should be less than 8% before installation of the floor.The Engineered hardwood should be a completely floating floor (using a water barrier of minimum of 250 microns and 2mm polyethylene foam). The tongue and groove joints shall be glued together using recommended adhesive.The installation shall be undertaken as per the manufacturer ' s installation instructions. Cost to include all items of all wooden edge trims, beading & skirting.		sqm	*RO*	94.00	13.00	*RO*	107.00		-	
	4.05	**Plateform :-** Supplying, fabricating, and installing a raised platform of 100-150mm height, constructed using a robust MS frame of 50x50mm sections placed at 600mm center-to-center spacing. The platform shall be clad with 18mm thick BWP plywood as per the design and instructions, ensuring a durable, stable, and sound structure suitable for use as an elevated stage. The platform shall be securely anchored to the floor using appropriate anchoring systems to enhance stability and load-bearing capacity. All materials and workmanship shall adhere to high-quality standards, with the structure designed to withstand load requirements and provide long-term functionality.		sqm	14.00	*RO*	14.00	*RO*	28.00		-	
		Sub Total									-	
5		**False Ceiling**										
		*General: Under this subhead,all the seen surfaces shall be measured and paid for.										
		*The quoted rate should be inclusive of all back ply required to support the all services cutout area as per drawings.										
	5.01	**Gypsum Board Suspended Ceiling:-** Providing and fixing in position multi level GYPSUM board false-ceiling suspended on G.I. frame work in design as shown in the drawing. The G.I. frame work consist of Perimeter channel of size 27mm x 0.5mm. Intermediate channel of size 45mm x 0.5mm thick. Ceiling section of 0.5mm thickness. 12.5mm thick tapered edge gypsum plaster board fixed to ceiling channel with 25mm dry wall screws at 230mm centers Jointed and finished with requisite filler, paper tape, finisher and primer suitable for Gypsum plaster boards. Rate to include making necessary cut-outs/openings for light fittings. All components to be of India Gypsum / Boral Gypsum. All flat & vertical surface to be measured under this item.		sqm	1,134.00	498.00	850.00	791.00	3,273.00		-	
	5.02	Same as above but using 12mm thick Calcium Silicate Board instead of Gypsum Board.		sqm	5.00	10.00	15.00	*RO*	30.00		-	
	5.03	**Gypsum Board Cove :** Providing and fixing upto 200 x 200 gypsum cove with or without provision for light as per drawing complete with necessary cut-outs for services out lets.		rmtr	85.00	24.00	16.00	22.00	147.00		-	
	5.04	**Extra & above cost for making cove in curved shape.**		rmtr	40.00	24.00	10.00	10.00	84.00		-	
	5.04	**Grid Ceiling :-**Providing & Fixing of Mineral Fibre Acoustical Suspended Ceiling System with TILES usiing SILHOUETTE EXPOSED GRID/ Ultralive. The tiles should have Humidity Resistance (RH) of 95%, NRC Upto 0.9/0.7, Light Reflectance >85%, Thermal Conductivity k = 0.052- 0.057 w/m K, Colour White, Fire Performance Class 0/ Class 1 (BS476 Part 6&7) in module size of 600 X 600 X 15 mm . The tile shall be laid on Silhouette profile grid system with 15mm white flanges incorporating a 6mm central reveal in white/black colour and with a web height of 45mm and a load carrying capacity of minimum 15.68 Kgs/M2. Silhouette, Main Runners & Cross Tees to have mitred ends & "birdsmouth" notches to provide mitred cruciform junctions. The T Sections have a Galvanizing of 120 grams per M2 & passed through 500 hrs of Salt test. The Tile & Grid system used together should carry a 10 year warrantee.										
		INSTALLATION: To comprise main runner spaced at 1200mm centres securely fixed to the structural soffit using specific manufactors suspension system (specifications below) at 1200mm maximum centre & not more than 150mm from spliced joints. The First/Last suspension system at the end of each main runner should not be greater than 600mm from the adjacent wall. 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm modules to be formed by fitting 600mm long cross tees centrally between the 1200 mm cross tees. The 1200mm cross tees to have central "birdsmouth" notches to facilitate fitting of 600mm cross tees. Perimeter trim to be shadow wall molding (dimensions: 19x7x7x14mm), secured to walls at 450 mm maximum centres. SUSPENSION SYSTEM accessories manufactured and consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanised steel of size 26 x 26 x 25 x 1.2mm with a Galvanised Thickness of 80gsm, A pre Straightened Hanger wire of dia – 2.68 mm of 1.83 m length., thickness of 80gsm and a tensile strength of 344-413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanised spring steel for 2.68 mm with a minimum pull strength of 110 kg. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner. (Note:- Quoted rate should includes Grid + tile)										
	i)	Size: 600 x 600 x 15 mm (NRC 0.9)		sqm	90.00	17.00	46.00	37.00	190.00		-	
	ii)	Size: 600 x 600 x 15 mm (NRC 0.7)		sqm	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	5.05	**Metal Ceiling-** Supply and Installation of Metal Grid ceiling system which includes T grid Wall angle of 24mmx24mmx0.40 shall be screw fixed to brick wall/partition with the help of approved screws at 600mm centers. Then suspending Main T grid of 15mmx32mmx0.33mm of length 3600mm is hung with adjustable level clips 85x31x0.6mm & 4mm diameter GI rod which are connected to Soffit Cleat 27x37x25x1.6mm and Approved 50mm dash Fasteners @1200mm centers or as approved from RCC Slab. The Cross T of 15mmx32mmx0.33mm of 1200mm length shall be interlocked between main T Grid at 600mm centers to form 1200 x 600mm modules. 600x600mm modules to be formed by click fitting Cross T of 15mmx32mmx0.33mm of 600mm length centrally between the 1200mm cross T's. Then Plain lay in ceiling Panels are Powder coated Aluminium 50 to 60 microns polyester paint thickness having Global white colour with size of 595mmx595mm (nominal) and having minimum 8mm drop and with thickness of 0.7mm. These tiles shall be placed into the above grid of size 600x600mm. Entire work should be carried out as per Manufacturer's guidelines and/or instruction of project in-charge. Approved Make: USG Knauf or Equivalent		sqm	10.00	2.00	10.00	10.00	32.00		-	
	5.06	**Laminated ceiling:** Providing & fixing laminated ceiling with concealed wooden /GI frame work with 12mm thick ply cladding & finished in texture laminate as approved. The quoted rate should be inclusive of all hardware & accessories.		sqm	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	5.07	**Pelmet :** P/F of pelmet made out of 19mm Comm Board in L/U- profile fixed to RCC slab with dash fasteners/ adequate rough wood framings..Cost to include prelamination of these pelmets in an appropriate white laminate as approved by the Architect and any support required to suspend it from the ceiling . This will also have long continuous cut-outs for Return Air o as per HVAC consultants Dwgs & other MEP services work.										
	i)	**Size:- 200 x 200 mm (U Shape)**		rmtr	28.00	8.00	8.00	10.00	54.00		-	
	ii)	**Size:- 300 x 500 mm (L Shape)**		rmtr	110.00	59.00	87.00	87.00	343.00		-	
	5.08	**Trap Door :** P/F Trap doors in ceiling made of 19 mm thick BWP commercial board with concealed wooden frame section as per detail drawing & finished in textured laminate complete with all necessary hardware required.		sqm	19.00	11.00	20.00	20.00	70.00		-	
	5.09	**Access Panel:-** Providing & Fixing of Knauf Access Panel with Moisture Resistant Gypsum Board & Powder coated Aluminium framing, Galvanised steel reinforcement on corners, push -latch closing mechanism with door retaining safety cable and hook, concealed locking arrangement, with air sealing strip on perimeter of access panel door. Fixing Details - Outer frame of access panel is screw fixed to the ceiling section with 25 mm dry wall screws at 230 mm centers. Screw fixing is done mechanically either with drilling machine with suitable attachment. Jointing compound to be applied to cover the drywall screws.										
	i)	size upto 300x300mm		nos	5.00	3.00	5.00	5.00	18.00		-	
	ii)	size upto 450x450mm		nos	10.00	6.00	10.00	10.00	36.00		-	
	iii)	size upto 600x600mm		nos	8.00	4.00	8.00	8.00	28.00		-	
	iv)	size upto 600x1200mm.		nos	5.00	3.00	5.00	5.00	18.00		-	

S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	5.10	Veneer Ceiling Works, the scope includes the supply, installation, and finishing of high-quality natural veneer sheets, with a base thickness of 4mm, applied over a stable HDHMR or plywood substrate to prevent warping and ensure durability & concealed GI and wooden framework structure as advised in the drawings. The veneer sheets should be carefully selected to maintain consistency in grain and color across the surfaces for a seamless aesthetic. Installation involves precise cutting and placement to avoid visible joints, and edges must be finished with matching veneer edge banding to provide a cohesive look. All veneer surfaces will undergo a thorough sanding process to achieve a smooth, blemish-free finish. Following sanding, a high-quality clear lacquer or polyurethane coating will be applied, with options for either matte or gloss finishes as per design specifications, to enhance the visual appeal while protecting against moisture, stains, and everyday wear. The installation should also consider appropriate expansion joints where necessary to accommodate environmental changes. Final inspection will ensure a polished, uniform appearance with no visible adhesive marks, bubbles, or imperfections, meeting the desired aesthetic and durability standards for high-end interiors. The quoted rates should also be inclusive of 12mm thick ply surface + Framing structure & all necessary hardwares.		sqm	*RO*	50.00	*RO*	*RO*	50.00		-	
		Sub Total									-	
6		**Partition wall**										
		General and mandatory										
		1. The frame work in partition (As specified) will be of 50mm x 38 mm Aluminium sections to have verticals as required (max 600 c/c) and as per Manul.'s specs. And horizontals at every 1200 mm c/c or as per the Pattern of grooves whichever is less . Cost of partitions to include insertion of necessary wooden members at skirting level or elsewhere as deemed fit by architect/PMC										
		2. The frame work in partition (As specified) will be of special section power pressed/ roll form G.I. sheet with zinc coating of 120 GSM as per Manuf.'s specs. Cost of partitions to include insertion of necessary wooden members at skirting level or elsewhere as deemed fit by him										
		3. All full ht. partitions ,unless otherwise specified will go up to RCC slab,complete with insulation , HDHMR Board etc. to be for first skin as applicable but till 100mm above false ceiling level. Above this shall go single skin of Gypsum. The second skin shall be over the first skin of HDHMR, in HDHMR/ Gypsum or as specified basis finish dwgs. Actual Area executed will be paid for.										
		4. All paneling framework, unless otherwise specified will go up to 150mm above bottom of false ceiling.										
		5. All exposed wooden surfaces in this Item or anywhere else in the BOQ to have melamine polish as per approved sample and as/green building specifications.										
		6. All wooden/HDHMR framework under this item or anywhere else in the BOQ to be treated with anti termite and fire retardant paint (viper or equiv.)										
		7. All the wooden framework under this Item or anywhere else in the BOQ will have well seasoned wooden members of species as defined in the individual item										
		8. All Glass to Glass, Glass joints shall be sealed with 6mmx6mm Alu I- Section/Box section as specified in the drawings with Glass works to be got done by an approved specialized Agency.										
		9. Any other Glass to Glass, Glass to wood and Glass to SS joints shall be sealed with Dow Corning Glass sealant with minimum contact surface to be not less than 6mm after cleaning and masking procedure with full tool & tackle .Silicon works to be got done by an approved specialized Agency										
		10. All panel like, gypsum board, HDHMR, Ply veneer etc to be fixed to the channels with dry wall screws, jointed and finished with requisite filler, paper tape, finisher and primer suitable for the surface.										
		11. The outer skin on either side shall have 10mm grooves with aluminum 'L' angle bends fixed to the thickness of board at the edges, neatly finished with paper tape and P.O.P punning.										
		12. All gypsum partitions to have 40mm wide 12mm thk HDHMR on corners on both sides(outward turning partition) to protect edges. Cost for the same shall be included in partition item.										
		13. Partitions to have extra skin of wire mesh only when specified by the architect/PMC for securing the finishes in given areas. The same will be paid separate extra only for the wire mesh										
		14. All Aluminum demountable partitions to be quoted with the inclusion of a 12x12mm joint groove made by a 12mm ply strip.									-	
		15. All Partition framework specified in Aluminium will be at a minimum of 600 x 600 but some additional members may be required at some locations.									-	
											-	
	6.01	**Aluminium Frame Work for Partition:-** Providing and fixing full height aluminium framework for **Partitions** of 50mm x 38 mm , 2 mm thk section at 600mm c/c including necessary cut-outs for electrical & networking in the partitions. Frame to be firmly fixed to ceiling and floor with necessary hardware and supports as required as per architect's directions.		sqm	30.00	15.00	28.00	25.00	98.00		-	
	6.02	**Aluminium Frame Work for Panelling:-**Providing and fixing full height aluminium framework for **Panelling** of 25mm x 50mm , 2 mm thk section at 600mm c/c including necessary cut-outs for electrical & networking in the partitions. Frame to be firmly fixed to ceiling and floor with necessary hardware and supports as required as per architect's directions.		sqm	10.00	12.00	8.00	8.00	38.00		-	
	6.03	**MS Frame Work for Partition:-** Providing, fabricating and fixing full height MS framework for **Partitions** of 50mm x 50 mm , 3.6 mm thk section at 600mm c/c including necessary cut-outs for electrical & networking in the partitions. Frame to be firmly fixed to ceiling and floor with necessary hardware and supports as required as per architect's directions.The quoted rate should be inclusive of red oxide paint complete.		sqm	40.00	10.00	20.00	20.00	90.00		-	
	6.04	**GI Frame Work for Partition:** Providing and fixing metal system up to ceiling height, which includes frame work made of special section power pressed/ roll form G.I. sheet with zinc coating of 120 GSM, consisting of U track 52mm wide having equal flanges of 30mm and 0.55mm thick (Base metal thickness) fastened to the floor slab and ceiling soffit using rawl plugs with screw/expansion fasteners at 600mm centers, with first & last fixing point at not greater than 50 mm from either end. C studs 50mm wide having one flange of 34mm, other flange 36mm, lip size 6 mm and 0.55mm thick installed perpendicularly within the flanges of floor and ceiling channels located directly opposite to each other at not more than 610mm centers. Maintain 5 to 10mm gap between C Stud and web of U Track.		sqm	770.00	267.00	385.00	255.00	1,677.00		-	
	6.05	**GI frame + one side gypsum :** Providing and fixing G.I frame section (50x38mm) in horizontal & vertical framework 600 mm c/c spacing as reqd for suitable rigidity & fixed from floor to ceiling with 12 mm thick gypsum cladding in one side complete. The quoted rate should be inclusive of taping & compounding.		sqm	225.00	135.00	172.00	172.00	704.00		-	
	6.06	**Fire Rated Gypsum Partition:-** Providing & fixing of full height 132mm thick Gypsteel ULTRA ® stud partition includes two layer of tapered edge 15mm thick Gyproc ® Fireline (conforming to IS 2095 Part 1 : 2011) is screw fixed with Gyproc ® Drywall Screws of 25mm & 50mm at minimum spacing of 300mm at Centre and 150mm at periphery of wall to either side of 70mm Gypsteel ULTRA ® C stud (0.5mm thick having one flange of 34mm and another flange of 36mm made of GI Steel) placed at 610mm Centre to Centre in 72mm Gypsteel ULTRA ® floor and ceiling channel (0.5mm thick have equal flanges of 32mm made of GI steel), which is anchored to the floor & true ceiling using HILTI HLC8x40/ HILTI X-GN20MX anchor fasteners at 600mm c/c in zigzag manner. Stud and floor channel are crimped together with crimping tool. 15mm thick Gyproc ® Fireline board strip of 72mm width is placed between ceiling channel and ceiling slab to improve fire performance of the system. A Gypsteel ULTRA ® noggin channel of 70mm width (0.5mm thick having two flanges of 40mm each) has to be provided at the horizontal joints of outer layer boards screw fixed to the studs using Gyproc ® metal to metal flat head screws. The boards are to be fixed vertically to the framework with joints staggered to avoid leakage through joints. 25x25x0.5mm Gyproc ® angle bead should be used at all L-Junctions of partition. Finally square and tapered edges of the boards are to be jointed and finished so as to have a flush look which includes filling and finishing with Gyproc ® Pro-Fill Jointing compound, Gyproc ® Joint Paper tape (as per recommended practices of Saint- Gobain Gyproc India). The junction of the partition with masonry & all penetration through the partition has to be treated with Hilti/Pyroplex fire and acoustic sealant. All other detailing and specifications to be followed as per approved shop drawing of Gyproc		sqm	10.00	8.00	10.00	10.00	38.00		-	
	6.07	**Laminated Partition wall with Aluminium Framework:-** Providing and fixing partition made in Aluminium framework 50 x 50 mm in horizontal & vertical framework 600 mm c/c spacing as reqd with 2x12 mm thick commercial ply cladding on either side of frame section & finished in 1 mm thick textured laminate with or without groove as per detail drawing .		sqm	27.00	14.00	16.00	15.00	72.00		-	
	6.08	Providing and placing 50 mm thick Rock wool insulation of 48 kg/ cum. density neatly packed in black fleece bag (Non Woven Tissue) of various sizes and shapes,bags shall be fully stiched all round with 25 mm double leaf fold, sealing the rockwool fibre fully. The bags to be stuffed in the cavities of Gyp. partitions from floor up to RCC slab above, cross stiched from one side with GI frame work of partition by 24 g GI wire to keep bags in possition. The quoted rate should be inclusive of RF tissue paper.		sqm	967.00	406.00	547.00	413.00	2,333.00		-	
		Skins over partitions and panelling									-	
		Note :									-	
		1) All grooves unless otherwise specified shall be 12mm wide with wooden finish/white color laminate at the back									-	
		2) The exposed edges of all Skin Types will be edge bound with suitable laminate/veneer/wood etc. as per Architects' directions									-	
		3) All Gypsum boards shall have Al. angle / MDF bead on the edges										
		4) All Glass to Glass, Glass to metal/ wood joints shall have Dow Corning silicon seal done by approved Applicator as per manufacturer's Specs										
		5) the cut outs made for erection of ducts / cts / cable tray to be sealed with approved sealant & finished properly & shall not be claimed extra									-	
		6) 50 mm shadow groove to be provided everywhere at the junction points of the false ceiling.									-	

S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	6.09	**1x12 mm thick Gypsum Plain Board cladding below False ceiling inclusive of taping & compounding: -** P/F Skin type **S3** of **Gypsum board skin with 50mm grooves** complete with angle beadings & paper tape as/manuf. Specs. . 12.5mm tapered edge gypsum plaster board fixed to the channels (behind single layer of gypsum board)with dry wall screws, jointed and finished with requisite filler, paper tape, finisher and and primer suitable for gypsum plaster boards. The outer skin shall have **50mm** grooves with aluminum 'L' angle bends fixed to the thickness of board at the edges, neatly finished. All components to be of India Gypsum/ Boral.		sqm	2,009.00	533.00	1,020.00	588.00	4,150.00		-	
	6.10	**1x12 mm thick Gypsum Plain board above False ceiling:-** P/f skin type **S3a of gypsum Board skin for above ceiling works**		sqm	792.00	260.00	340.00	280.00	1,672.00		-	
	6.11	**1x12 mm thick Gypsum Habito board Cladding :-** P/f skin type **S3b of gypsum Board skin on the existing frame work as per site requirement.**		sqm	60.00	10.00	30.00	35.00	135.00		-	
	6.12	**1x12 mm thick Gypsum Sound board Cladding :- P/f skin type S3c of gypsum Board skin on the existing frame work as per site requirement.**		sqm	50.00	20.00	40.00	40.00	150.00		-	
	6.13	**HDHMR Ply Cladding:- Providing & fixing of below mention material skinning with all required hardware complete.**							*RO*		-	
	ii)	**6mm HDHMR Ply**		sqm	50.00	25.00	50.00	50.00	175.00		-	
	i)	**12 mm HDHMR Ply**		sqm	279.00	275.00	180.00	152.00	886.00		-	
	ii)	**18 mm HDHMR Ply**		sqm	50.00	25.00	50.00	50.00	175.00		-	
	6.14	**Laminate Cladding :** Providing & pasting 1 mm textured thick laminate pasting on existing partition as per detail drawing/ advised		sqm	20.00	15.00	25.00	25.00	85.00		-	
	6.15	**12 mm thick Bison Board Cladding:-** Providing and fixing of 12mm thick Bison board cladding on existing frame / surface as advised. Bison Board shall be securely fixed onto the partition or panel using drywall screws spaced at intervals to ensure stability, as per best practices. This rate is inclusive of all Bison board material and installation using screws complete in all respect.		sqm	18.00	12.00	18.00	18.00	66.00		-	
	6.16	**18 mm thick BWP ply/ Boilo Board Cladding:-** Providing and fixing of 18mm thick BWP ply / Boilo board cladding on existing frame / surface as advised. BWP ply shall be securely fixed onto the partition or panel using drywall screws spaced at intervals to ensure stability, as per best practices. This rate is inclusive of all Bison board material and installation using screws complete in all respect.		sqm	10.00	5.00	10.00	10.00	35.00		-	
	6.17	**Cubicle Partitions :** Providing & fabrication of free-standing medium-height partition is a modular interior partition system designed to reach up to 2.1 meters in height with an overall thickness of 75mm. It features a durable MS framework (50x50x2mm) spaced at 600mm center-to-center for stability. The frame is securely anchored to the floor and fastened at the ceiling for enhanced support. Both sides of the partition are clad with a combination of 9mm-thick PET panels, laminated panels, and 6mm-thick lacquered glass panels as required for aesthetic and functional balance. Concealed metal parts are coated with two layers of red oxide paint for corrosion resistance, while exposed metal components are finished with flat enamel paint as per architectural specifications. This assembly ensures durability, modern design appeal, and compliance with safety standards.		sqm	209.00	13.00	89.00	65.00	376.00		-	
		Sub Total									-	
7		**Glazing and Glazed Openings**										
		Items will be inclusive of 12mm thick glass and all the necessary accessories along with the metal frame										
	7.01	**STRAIGHT GLAZED PARTITIONS : -** Supply & Installation of Full Height demountable Glazed Partitions using Anodised Aluminium Single Glazed Series Straight Partitions systems of Matt anodized finish of 40 x 18mm / 45x25 thk section and 'T' Section, corner Section & Tbetween glass to glass joint from FFL upto 2400 mm or equivalent & having 12mm thick toughned glass mounted in the middle of the frame or offset on either side of the frame.. The height of these Partitions would be 2400 mm from FFL. Section to be provided with all appropriate beading & glazing rubber. The Partition will have necessary cut-outs for Electrical / HVAC receptacles and shall have a cut for Room Wizard (Scheduler) installation & also including concealed wooden framework & 12 mm thick painted HDHMR strip required to fix the section as per detail drawing.	Grey Color	sqm	282.00	72.00	72.00	98.00	524.00		-	
		Sub Total									-	
8		**Panelling and Cladding**										
		Note :										
		1) All grooves unless otherwise specified shall be 12mm wide by using of aluminium U channel.										
		2) The exposed edges of all Skin Types will be edge bound with suitable laminate/veneer/wood etc. as per Architects' directions										
		3) All Gypsum boards shall have Al. angle / HDHMR bead on the edges										
		4) All Glass to Glass, Glass to metal/ wood joints shall have Dow Corning silicon seal done by approved Applicator as per manufacturer's Specs										
		5) the cut outs made for erection of ducts / cts / cable tray to be sealed with approved sealant & finished properly & shall not be claimed extra										
		6) 50 mm shadow groove to be provided everywhere at the junction points of the false ceiling.										
	8.01	Laminate Panelling:- Providing and fixing of 12mm thick HDHMR panels covered with laminate with a textured finish, in an approved color, shade, and design. The laminate includes edge bending all around to ensure a seamless finish per the drawing specifications. HDHMR panels shall be securely fixed onto the partition or panel using drywall screws spaced at intervals to ensure stability, as per best practices. This rate is inclusive of all HDHMR material, laminate application, aluminum U trims for grooves, edge bending, and installation using screws.		sqm	50.00	33.00	28.00	23.00	134.00		-	
	8.02	**Fabric Panelling:-**Providing and fixing of 12mm Sitatex Pin board covered with Fabric in an approved color, shade, and design. Sitatex Pin board shall be securely fixed onto the partition or panel using drywall screws spaced at intervals to ensure stability, as per best practices. This rate is inclusive of all Sitatex board material, Fabric application, PVC gripper for grooves, and installation using screws.		sqm	4.00	2.00	4.00	4.00	14.00		-	
	8.03	**4" thick projected boxing:** Providing & making 4" thick projected boxing made in 19 mm thick Commercial board complete with all hardware required at site.		sqm	13.00	59.00	35.00	9.00	116.00		-	
	8.04	Planilaque Glass Panelling:- Providing and fixing of 6 mm thick HDHMR panels covered with 6mm thick Planilaque Evolution Coloured Lacquer Glass fixed with manufacturer specified Saint Gobain make approved adhesive in an approved color, shade, and design. The Glass includes edge polishing all around to ensure a seamless finish per the drawing specifications. HDHMR panels shall be securely fixed onto the partition or panel using drywall screws spaced at intervals to ensure stability, as per best practices. This rate is inclusive of all HDHMR material, Lacquer glass application, aluminum U trims for grooves, edge bending, and installation using screws.										
	i)	Extra White		sqm	209.00	136.00	98.00	95.00	538.00		-	
	ii)	Grey/Brown/Metallic series		sqm	5.00	2.00	5.00	2.00	14.00		-	
	8.05	**Laminated band :** P/f textured laminate 12"-18" wide band made in 19 mm thick Commercial board and finished in texture laminate with 12mm thick ply back for groove as approved as per detail drawing		rmtr	25.00	9.00	6.00	6.00	46.00		-	
	8.06	**Mirror Cladding :** Providing & pasting 6 mm thk mirror on 12 mm thick BWP Ply including cutting , edge polish & pasting complete as & where required as per detail drawing .		sqm	1.00	2.00	3.00	1.00	7.00		-	
	8.07	**Aluminium Skirting (50 mm high) :-**Providing and fixing 1.5 to 2mm thick extruded anodized aluminum **skirting** as per IS standard pasted/fixed over 12 mm thick BWP ply as per Architects approval.	Grey Color	rmtr	810.00	395.00	610.00	525.00	2,340.00		-	
	8.08	**Sill Level Panneling :** P/F panelling for sill level (L shape) made in 18 mm thick HDHMR board finished in 1 mm thick laminate as per design / as per site requirement complete. Top of the ledge to be having 2mm thick edge binding tape as advised.		sqm	49.00	26.00	39.00	39.00	153.00		-	

S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	8.09	**Veneer Paneling Works, t**he scope includes the supply, installation, and finishing of high-quality natural veneer sheets, with a base thickness of 4mm, applied over a stable HDHMR or plywood substrate to prevent warping and ensure durability. The veneer sheets should be carefully selected to maintain consistency in grain and color across the surfaces for a seamless aesthetic. Installation involves precise cutting and placement to avoid visible joints, and edges must be finished with matching veneer edge banding to provide a cohesive look. All veneer surfaces will undergo a thorough sanding process to achieve a smooth, blemish-free finish. Following sanding, a high-quality clear lacquer or polyurethane coating will be applied, with options for either matte or gloss finishes as per design specifications, to enhance the visual appeal while protecting against moisture, stains, and everyday wear. The installation should also consider appropriate expansion joints where necessary to accommodate environmental changes. Final inspection will ensure a polished, uniform appearance with no visible adhesive marks, bubbles, or imperfections, meeting the desired aesthetic and durability standards for high-end interiors. The quoted rates should also be inclusive of 12mm thick ply surface & all necessary hardwares.		sqm	*RO*	86.00	34.00	14.00	134.00		-	
		Sub Total									-	
9		**Doors / Shutters**										
		General and mandatory :										
		1.All wooden members to be well seasoned and knot free										
		2.All exposed wooden surfaces to have PU polish compliant with standards and as per environmemt friendly ,green building norms.										
		3. The flush door shutter will be as per design and detail and inclusive of cost of hinges for mounting on Al frames or wooden frame as specified below.										
		4.All wooden sections to be treated with anti- termite & fire resistant treatment										
		5.All doors should have provision for fixing access control equipments etc. Cost of the same shall not be claimed extra.										
		6.For All doors Should have locks,handles,hinges,door stays, door stopper etc as per approval only										
		7.Any change in ht of doors due to site conditions will be paid accordingly as per sq.m rate quoted for doors.										
		8.All door should have half moon shape floor mounted door stopper										
		9 . All Aluminium Sections specified should be of thickness 2 mm - Miminum.										
		Shop Drawings required to be submited for Approval.										
	9.01	P/F Solid **Single Leaf Laminated Flush Door** (38 mm thick) on 4-5 side hinges (Compatible to imported aluminium frame) . The door is to be provided with surface mounted door closer ,door stoper, door handle , Locking mechamism , Cost of the Door to include necessary hardware but to exclude door frame. The Quoted rate should also be inclusive of drop seal. These will be in following Sizes:									
	i)	SIZE : 900 x 2400 mm		nos	2.00	1.00	3.00	2.00	8.00		-	
	ii)	SIZE : 1050 x 2400 mm		nos	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	iii)	SIZE : 1000 x 2400 mm Air Transfer Grill 75mm high in powder coating .		nos	*RO*	1.00	*RO*	*RO*	1.00		-	
	iv)	SIZE : 1200 x 2400 mm Air Transfer Grill 75mm high in powder coating .		nos	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	v)	SIZE : 900x2400/1050 x 2400 mm with Vision Panel made in 8 mm thick toughned g;ass (Size 1800x300mm)		nos	2.00	2.00	6.00	5.00	15.00		-	
	9.02	**Fire Doors :** Providing and fixing insulated fire rated GI Sheet doors conforming to FD 120-PI classification of IS 3614 :2021 with fire rating of 120 minutes integrity and 30 minutes insulation. The factory manufactured door frame and shutter assembly shall be made out of minimum 1.20 mm thick GI Sheet with minimum 120 GSM coating as per IS: 277. Door and frame should be finished with powder coating in standard RAL shade finish having DFT of minimum 30 microns. The door should carry a minimum 500 Hrs of salt spray test. All accressesories like hardware, vision panel, fire & smoke seal etc to be supplied by Fire door manufacturer only as per the guidelines laid down in IS 3614:2021.Every door must carry a label confirming to type of door & its fire rating. The door must carry a 5 years valid test evidence from CBRI-Roorkee / NTH-Kolkata/ NABL accrediated lab which operates in accordance with ISO/IEC 17025.									
		The Door frame shall be single / double rebate grooved profile of size minimum 100mm x 57mm / 154x77mm made out of 1.20mm (18gauge) minimum thick galvanized steel sheet. Frames shall be butt / mitered joint and field assembeled with bolting system. Frames to have inbuilt grooved to accomodate Intumuscent fire seal strip . Frames to have inbuilt grooved to accomodate Intumuscent fire seal strip of size 10x4mm. The frame should also be provided with EPDM seal to limit the spread of smoke vide clause no. 7.2.6 of IS code. All provisions should be mortised & provided with necessary inbuilt reinforcement to receieve appropriate hardware. Frames should be provided with back plate bracket for anchor fastner with 8-10 mm dia and minimum 80 mm long HDG fasteners, with Polyamide sleeves for installation of frame in finished plastered masonary wall opening. Note :- For grouting of Steel frames in masonary installations ;cement slurry of 1:3 ratio by civil contractor/fire rated PU foam or such fire rated material may be recommended except head member									
		Door leaf should be minimum 46mm /49mm thick fully flush double skin door. Door leaf must be manufactured from minimum 1.2mm(18gauge) thick galvanised steel sheet. The infill material shall be mineral wool of minimum density 100 kg/cum. All doors shall be factory prepped for receiving appropriate hardware and provided with necessary reinforcement for hinges, locks, and door closers. The edges should be interlocked with a bending radius of 1.4mm. For double leaf doors integrated astragals has to be provided on the meeting stile for both active and inactive leaf. The shutters shall be mounted to the frame with SS 304 grade ball bearing type hinges of size 100x 75x3 mm alongwith all suitable hardware . Vision lite size 200x300 mm or 150 x 400mm(max area 0.06sqm) wherever applicable should be provided with single layered clear fire rated glass panes as per guidelines laid down under IS 3614 : 2021 vide clause no. 7.2.7 table no. 2 with a clipon arrangement.The glass will be provided with fire rated ceramic tape of min. 2 mm thickness with min. 15mm width alround on either face. Every Glass pane must carry a permanent marking of its glass manufacturer .									
		Rate should include supply and installation of door frame + door leaf and hardware set complete with panic bar & drop seal & Astrgal seals as per requirements.									
	i)	Double Leaf Fire Door of Size : 2000 x 2400 with panic bar		nos	2.00	2.00	2.00	2.00	8.00		-	
	ii)	Single Leaf Fire Door of Size : 1200 x 2400 without panic bar		nos	3.00	1.00	3.00	3.00	10.00		-	
	9.03	**Door chaukhats:** Providing and fixing frames of doors, of any size and shape and fixed in position with necessary with 40 mm x 3 mm flat iron hold fast 400 mm long embedded in concrete blocks 200 mm x 100 mm x 150 mm cement concrete 1 : 2 : 4 or fixed with extra support of wooden batten in dry wall partition including applying wood preservative paint on the surface coming in contact with wall as approved. Item also includes mellamine polish t over a coat of wood primer / filler on wooden surfaces and anti-termite paint etc. complete and mellamine polish as approved by Architect.									
	i)	Size 6" x 2.5" (Miranti Wood)		rmtr	12.00	6.00	18.00	12.00	48.00		-	
	9.04	**Architrave :** P/F of moulding complete as per details drawing/ advised with polish /paint as approved complete.										
	i)	Size 1" x 0.5" (Miranti Wood)		rmtr	60.00	30.00	50.00	50.00	190.00		-	
	ii)	Size 3" x 3/4" (Miranti Wood)		rmtr	5.00	5.00	5.00	5.00	20.00		-	
	9.05	**Aluminum Stile door Shutter (Single Glazed):-** Supplying & fixing of Single glazed Shutter Door-Consisting of Single panel glazed door shutter in Anodized aluminium finish with 70x45 / 75 x40 mm system on all four sides using in vertical, and in top of the door and on the bottom of the door for 12mm thick tempered glass insert with alround beading, Door shutter to be formed of 12 mm Toughened glass (Compatible to imported aluminium frame) like Narrow stile mortize lock with 35mm backset, offset handle 300mm , 70mm EPC with one side key and one side thumb turn, Concealed door closer with hold open, floor mounted door stopper and side / astragal drop seal for sound barrier. The quoted rate should be inclusive of horizontal ntermediate section at center as shown in the view. The Quoted rate should also be inclusive of drop seal.									
	i)	SIZE : 800 x 2400mm (Single leaf)	Grey Color	nos.	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	ii)	SIZE : 1000/1050 x 2400mm (Single leaf)	Grey Color	nos.	19.00	10.00	10.00	11.00	50.00		-	
	iii)	SIZE : 1200 x 2400mm (Single leaf)	Grey Color	nos.	7.00	1.00	4.00	*RO*	12.00		-	
	iv)	SIZE : 1800 x 2400mm (Double leaf)	Grey Color	nos.	*RO*	1.00	*RO*	2.00	3.00		-	

S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	9.06	**ALUMINIUM DOOR FRAMES FOR GLASS DOOR AND SOLID DOOR :** Supply & Installation of Anodized Aluminium Door Frame made put of horizontal member on top 36x100 / 50X100 mm and both vertical member 36x100mm / 50x100 mm Along door jamb with schlegal door trim and Hinges for 45mm Door as per manufacturers specification. The door frame should be Compatible to hold the double glazed imported aluminium style door shutter.									-	
	i)	Size 800/900/1050x2400mm	Grey Color	nos.	23.00	15.00	19.00	18.00	75.00		-	
	ii)	Size 1200X2400mm	Grey Color	nos.	7.00	1.00	4.00	*RO*	12.00		-	
	iii)	Size 1800X2400mm	Grey Color	nos.	*RO*	1.00	*RO*	*RO*	1.00		-	
	9.07	Veneer Door 1000x2400mm : Specifcation same as item no 9.01 but using of venner instead of laminate & finish in PU polish.		nos.	*RO*	1.00	*RO*	*RO*	1.00		-	
		Sub Total									-	
10		**Storage**										
		General & Mandatory :										
		All Pre-laminated board specified in this Item or anywhere else in this BOQ shall be HDHMR Board										
		All storage shutters and external surfaces to be factory fabricated and all laminates to be machine pressed.										
		All internal surgfaces to be finished in balancing laminate of 0.5mm - 0.7mm thick										
		the storage units to have finger grooves with integrated Recessed grip profile from haffle as indicated in the Millwork drawings.										
		The shutter handles etc if any to be approved by the architect/PMC before installation.										
		All hinge, drawer channels etc to be soft closing from standard make list										
	10.01	**Full Height Storages (450 mm deep) :** Providing & fixing Full Height Laminated storage as per drawing . The overall Structure made in 18mm thick prelaminated board & back of storages with 6 mm thick ply . Storages finished in 1 mm thick textured laminate from everywhere except outer back side of storages and also including all SS snap hinges, handles, locks etc & all necessary hardware as required. Shutter size varies between 375-450mm wide & 450 mm deep as required with reverse bull nose edge on top & bottom of shutter (for files, folders coats etc) with select shelves duly adjustable as required on metal stud supports with sleeves set in at intervals of every 375 mm height. PVC lipping on all edges with matching shade, including laminated skirting in approved shade with all hardware, magnetic catchers, tower bolts, etc complete as per detailed drawings. (Front elevation area to be measured) All hinge, drawer channels etc to be soft closing from standard make list		sqm	68.00	23.00	15.00	7.00	113.00		-	
	10.02	**Same as item no-10.01 but for Janitor storage**		sqm	1.00	1.00	1.00	1.00	4.00		-	
	10.03	**Medium Height Storages :-** Providing & fixing Medium Height Laminated storage as per drawing . The overall Structure made in 18mm thick prelaminated board & back of storages with 6 mm thick ply. Storages finished in 1 mm thick textured laminate from everywhere and also including all SS snap hinges, handles, locks etc & all necessary hardware as required. Shutter size varies between 375-450mm wide & 400mm deep as required with reverse bull nose edge on top & bottom of shutter (for files, folders coats etc) with select shelves duly adjustable as required on metal stud supports with sleeves set in at intervals of every 375 mm height / or as advised. PVC lipping on all edges with matching shade, including laminated skirting in approved shade with all hardware, magnetic catchers, tower bolts, etc complete as per detailed drawings. All hinge, drawer channels etc to be soft closing from standard make list. The quoted rate should be inclusive of planter carcus with cut out at the storage top as shown in the drawings & having 3mm thick GI sheet cladding on the inner part of planter box..		sqm	6.00	8.00	8.00	33.00	55.00		-	
	10.04	**Over Head Storages (450 mm deep) :** Providing & fixing Over Head Laminated storage as per drawing . The overall Structure made in 18 mm thick prelaminated board . Storages finished in 1 mm thick textured laminate from everywhere except outer back side of storages and also including all SS snap hinges, handles, locks etc & all necessary hardware as required. Shutter size varies between 375-450mm wide as required with reverse bull nose edge on top & bottom of shutter (for files, folders coats etc) with select shelves duly adjustable as required on metal stud supports with sleeves set. PVC lipping on all edges of matching shade , including laminated skirting in approved shade with all hardware, magnetic catchers, tower bolts, etc complete as per detailed drawings. (Front elevation area to be measured) All hinge, drawer channels etc to be soft closing from standard make list		sqm	6.00	6.00	6.00	9.00	27.00		-	
	10.05	**Low Height Storages :** Providing & fixing Low Height Laminated storage as per drawing . The overall Structure made in 18 mm thick prelaminted board & back of storages with 6 mm thick ply. Storages finished in 1 mm thick laminate from everywhere except outer back side of storages and also including all SS snap hinges, handles, locks etc & all necessary hardware as required. Shutter size varies between 375-450mm wide & 450 mm deep as required with reverse bull nose edge on top & bottom of shutter (for files, folders coats etc) with select shelves duly adjustable as required on metal stud supports with sleeves set in at intervals of every 375 mm height. PVC lipping on all edges with matching shade, including laminated skirting in approved shade with all hardware, magnetic catchers, tower bolts, etc complete as per detailed drawings. (Front elevation area to be measured) All hinge, drawer channels etc to be soft closing from standard make list									-	
	i)	450 mm deep		sqm	3.00	2.00	3.00	3.00	11.00		-	
	ii)	600 mm deep (Facility Counter)		sqm	3.00	3.00	3.00	3.00	12.00		-	
	10.06	**Under Counter Storages 850 mm high and 600 mm deep:-** Providing & fixing Under counter storages for pantry & basin as per drawing . The overall Structure made in 19mm thick BWP ply. Storages finished in 1 mm thick laminate from everywhere except outer back side of storages and also including all SS snap hinges, handles, locks etc & all necessary hardware as required. PVC lipping on all edges with matching shade, including laminated skirting in approved shade with all hardware, magnetic catchers, tower bolts, etc complete as per detailed drawings. The quoted rate should be including the cost of granite. All hinge, drawer channels etc to be soft closing from standard make list		sqm	3.50	3.50	3.50	7.00	17.50		-	
	10.07	**Slotted Angle Rack:-** P/f slotted Angle Racks powder coated made in MS sections and framework as per approval for taking a load of 30kg/shelf.		sqm	*RO*	*RO*	22.00	*RO*	22.00		-	
	10.08	**P/F Self Help Counter Unit**, complete with Under counter & Overhead Storages along with front wall cladding as described in this Item. The entire construction will be in BWP with 1mm thick laminate on inner side & Venner 4mm thick mellamine plosh on all outer exposed surface all . The U/C Cabinetry will be a combination of Drawers and shutters. The gap between the Counter top and O/H Bins shall have Stone cladding over Comm ply . This will also have a metal PVD coated metal frame work with open shelving system as per view. . The Housing for Water dispenser shall be constructed in compact laminate with a cut out for taps and trays . Adequate provision of cove lights and electrical outlets shall be provided. The top shall have 18 mm thick Stone .		sqm	15.00	7.00	16.00	*RO*	38.00		-	
	10.09	**Electrical Panel cabinet :-** P/F both sides laminated shutters for Db's made of 19 thk comm. Board with hard wood fixing , Al. air transfer grille, SS hinges.This might be side hung and folding type.Wherever required bison board panelling needs to be provided behind the Db panel.		sqm	18.00	9.00	18.00	18.00	63.00		-	
	10.10	**Shaft Shutter:-**Providing and fixing shaft door shutters made of 32mm thick block board, finished with 1mm thick laminate of approved make, color, and design on both sides. The work shall include the supply and installation of a robust door frame made of seasoned hardwood, polished with approved shade and finish. The quoted rate shall be inclusive of all necessary hardware, including heavy-duty SS hinges, tower bolts, door handles, stoppers, and any additional fittings required for smooth functionality. The shutter shall be installed with precision to ensure alignment, durability, and seamless operation. All materials, workmanship, and finishes shall conform to relevant IS standards and as per the instructions of the architect/engineer in charge."		sqm	18.00	12.00	18.00	18.00	66.00		-	
		Sub Total									-	
11		**On Site Furniture (To be manufactured off site)**										
		General & Mandatory :										
	*	All Pre-laminated board specified in this Item or anywhere else in this BOQ shall be HDHMR Board										
	*	All internal surgfaces to be finished in balancing laminate of 0.5mm - 0.7mm thick										
	*	the storage units to have finger grooves as indicated in the Millwork drawings.										
	*	The shutter handles etc if any to be approved by the architect/PMC before installation.										
	*	All hinge, drawer channels etc to be soft closing from standard make list										

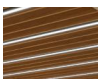
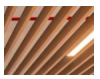
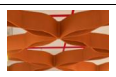
S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	11.01	The **reception table** shall be constructed with a combination of premium-grade plywood for the base structure and finished with a high-pressure laminate (HPL) or 12mm thick Corian clading for the curved external surfaces with complete thermofoaming . The front panel shall include a customized logo cut-out with backlit acrylic to enhance visibility. The base section will feature a wood veneer finish in natural tones & high quality PU polish, complementing the design. The tabletop shall be made of 18 mm thick Marble stone with a durable surface finish. All exposed edges must be edge-banded or polished for a seamless finish. Provision for cable management and storage, including drawers, shelves, and a lockable unit, should be included as per ergonomic standards. The table shall be supported by concealed hardware and finished to ensure structural stability and aesthetic appeal.										
	i)	Reception table Arc length 5800 mm		nos	1.00	RO	RO	RO	1.00		-	
	ii)	Reception table Arc length 5100 mm		nos	RO	1.00	RO	RO	1.00		-	
	iii)	Reception table Arc length 3500 mm		nos	RO	RO	1.00	1.00	2.00		-	
	11.02	**Running Working Counter** 600**mm wide:-** Providing & making counter with 25 thick post formed Laminated Top and side supports with concealed framework required to fix the same at site.		rmtr	2.00	RO	RO	RO	2.00		-	
	11.03	**Console Unit:-** Providing & fixing floating console unit made in 19 mm thick commercial board & finished in Laminate complete as per approved and as per detail drawing.The quoted rate should inclusive of all concealed framework & hardware to fix the same with dry partation.		sqm	14.00	3.00	3.00	7.00	27.00		-	
	11.04	**Console in Veneer finish:-** P/F Meeting Room **Consoles** made from 19 thk. Commercial board construction with veneer & PU polish finish on all exposed surfaces having 8 th. Solid Acrylic Surface (Samsung or equv) top. The construction will have combination of drawers on self clsoing drawer glides with softtouch closing and side hinged shutters of high quality Veneer Shutters on soft closing hinges . The entire Console will be supported on SS pipe & SS stud. Depth : 450 mm , height 900 mm and length will vary .		sqm	RO	12.00	RO	RO	12.00		-	
	11.05	**Running Shelf for quiet room :-** Providing and fixing of Running shelves 500mm deep & 50mm Fascia and constructed out of 19 mm thick commercial borad. The entire assembly to be finished in laminate as per approved with all concealed framework required to fix the same on the 100mm thick dry wall partition.		rmtr	RO	RO	RO	RO	RO		-	
	11.06	**Floating Shelves:-** P/F floating shelves 8"-12" deep & 2" thick made in 19 mm thick commercial borad & finished in laminate as per approved with all concealed framework required to fix the same in wall.		rmtr	5.00	3.00	5.00	5.00	18.00		-	
	11.07	**Cafe Running Counter** :Supplying & making Café high counter 600 mm deep 50 mm thickk & 1050 mm ht made in 19 mm thick commercial board & finished in laminate as approved with SS leg having metal base plate & foot rest (304 grade) as per detail drawing / advised.		rmtr	5.00	RO	RO	2.50	7.50		-	
	11.08	**Running Sofa seats (Wedges):-** Supplying & making upholstered sofa seats made in combination of concealed wooden / MS framework of size 50x50mm & 12 mm thick ply cladding as required with cushion & foam of 40 kg density & finshed in fabric The sofa seats having sturdy S.S legs system as per detail drawing. The whole exposed wooden surface finished in mellamine polish as advised/ approved.		rmtr	5.00	9.00	RO	RO	14.00		-	
	11.09	**Collab high counter :-** Supplying & making high hot desk table made in double layer facia of 25 mm thick top finished in laminate as approved as per detail having appropriate supports SS understructure + foot rest nad modesty panel as per detail drawing / advised.The entire assembly to be anchored to the floor as per the drawings.									-	
	i)	L1800 x D800 x H 1050 mm		nos	RO	RO	1.00	RO	1.00		-	
	ii)	L3000 x D700 x H 1050 mm		nos	1.00	RO	RO	RO	1.00		-	
	11.10	**Board room Table of size L18500 x D700 xH750 mm -** The table is to be supplied in completely knock down conditions for assembly at site. The construction of the main table shall be free standing structure constructed with the help of concealed wooden framework , 19 mm thick commercial board cladding & 4mm thick veneer & finished in PU polish as approved & as required. The table should have waterfall edge .The table connections have to be made in such a way that no gaps should be seen in between the tables. The main table shall be supported on gable ends and a modesty panel.. Quoted rates shall include all necessary materials, accessories and labour and also allow provisions for electrical / telephone / computer wiring conduits and switch boxes, etc. All exposed surface will be finished in in Veneer & internal surface in laminate as approved. (Materials for wiring conduits and switch boxes shall be separately paid for.)		nos	RO	1.00	RO	RO	1.00		-	
	11.11	**Readymade Bed in Wellness room Room with 6" mattress (Size 6'x3') & 450x450mm side Stool :- Providing and fixing of readymade Wellness room bed of size 6'0" x 3'0" with 6" mettress & Side stool of size 450x450mm as approved by Architect/PMC. Note :- Please refer view before quoting rates.**		nos	RO	RO	1.00	1.00	2.00		-	
	11.12	**Planter Ledge :-** Providing & making planter boxes ledge with outer surface finished of 19 mm thick commercial board & finished in laminate as approved & in side in 2 mm thick G.I sheet & structure made in 38x38 M.S tabular section with board/ply cladded as detail dwg. with coping laminated finish all completed. **Size : 500 mm wide & 600 mm high**		rmtr	53.00	36.00	80.00	80.00	249.00		-	
	11.13	**Laminated Bench of size L1500x D450 xH450mm for toilets**		nos	2.00	1.00	2.00	2.00	7.00		-	
	11.14	**Bain Marie Counter:** P/F shell for Bain Marie comprising of corian top over a BWP ply top with 19x6mm SS inserts to be used as sliding rail, side part of the shell to be finished in the laminate with wooden battens 25mm x 8mm spaced at 8mm. The front will be in open shelves made out of designer tile (Base rate of tile Rs 132/ - per sft) with internal divsions and lining to be done in 12 thick compact laminate to keep plates and cutlery with SS skirting. The rear side of the counter will have a combination of open shelves and louvered shutters as indicated in the drawings and to be finished in approved laminate with SS skirting. Size 7100 (L)x 900mm (d)x 850mm (h). cost to include corian cladding of 8mm thk in upto 950/sqft. All construction in BWP ply. This will have a provision to install Induction Plates for Food Warming ,and a sneeze guard which is part of Kitchen Equipment supply.		nos	RO	RO	1.00	RO	1.00		-	
	11.15	**Trianglar Shape (7800mm long & 500mmwide:** Supplying & making high desk table made in double layer facia of 25 mm thick top finished in laminate as approved as per detail having appropriate supports SS understructure + foot rest nad modesty panel as per detail drawing / advised.The entire assembly to be anchored to the floor as per the drawings.		nos	RO	1.00	RO	RO	1.00		-	
		Sub Total									-	
12		**Painting & Polishing Work**										
		All paints to be of low VOC content (250g/l)as per green building standards GC-03.										
	12.01	Providing and applying 2 or more coats of **Plastic Emulsion paint** on walls or ceiling wherever advised . The surface shall be thoroughly cleaned and prepared by raking sand papering and applying putty to achieve smooth and truly levelled surface. Required number of coats and type of primer as prescribed by manufacture shall be applied before the application of finishing coat as recommended by manufactures' specifications										
	i)	In white/ Off White colour (On Ceiling)		sqm	2,250.00	1,210.00	1,385.00	1,020.00	5,865.00		-	
	ii)	In white/ Off White colour (On walls)		sqm	1,511.00	531.00	1,092.00	945.00	4,079.00		-	

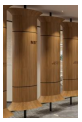
S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	iii)	In Accent/ Feature colours (On walls & Ceiling Selected area)		sqm	450.00	180.00	360.00	350.00	1,340.00		-	
	iv)	Flat Spray paint on Metal/wood / Concrete surface as advised		sqm	225.00	135.00	220.00	250.00	830.00		-	
	v)	Paint on exposed Ceiling		sqm	751.00	297.00	728.00	827.00	2,603.00		-	
	vi)	Enamal Paint		sqm	10.00	10.00	10.00	10.00	40.00		-	
	vii)	Concrete Paint		sqm	*RO*	45.00	*RO*	*RO*	45.00		-	
	12.02	**Light Textured Paint :** providing and applying high perforance low voc acrlic sheen plastic light texture emulsion paint with super biofine undercoat and mirac sealer, to gypsum wall, pop puning,base coat as per manufacture recommendation and finishing with 2/3 coats of plastic / acrylic emulsion paint of approved color and make surface coating to be achived as per manufactures recommendations for coverage of paint. (Base Rate Rs. 70/- per sft)		sqm	12.00	15.00	8.00	8.00	43.00		-	
	12.03	**Duco paint :** P/A od duco paint as approved by the Architect. The quoted rate should be inclusive of base preparation of metal surface & all the required process to apply the Duco paint.		sqm	5.00	8.00	5.00	5.00	23.00		-	
		Sub Total									-	
13		**Blinds**										
	13.01	**Roller Blinds with 5% openness factor:-** Supply & Installation of manually operated roller Blinds.**HARDWARE; TOP TUBE :** Made of extruded aluminium with 38 mm Dia. and wall thickness of 1.2 mm with spline adoptable to accommodate clutch of UNISOLIL/ACMEDA make.**CLUTCH MECHANISM :** Moulded plastic having self lubrication with Glass fibre reinforcement, having a minimum lifting capacity of 8 lbs **weight capality** - 8 lbs **Head adoptability** - 38 mm **OPERATING CHAIN :** PLASTIC / STEEL ball chain adoptable to the clutch pitch for smooth operation of blinds.**LOCKING MEMBER :** Plastic/ steel stop locks for limit setting adoptable to the steel chain.Bonding (Fabric > Tube) : 30/36 mm wide double sided adhesive tape of 3M for strong holding capacity.**SPRING BOOSTERS:** provided as per the requirement Bottom Bar : aluminium extruded circular section with powder coated finish, having a Min. weight to be 365 gms / Rmt for a perfect fall of fabric to avoid warpage / floating. Ends are covered with end caps to give a perfect finish.**FABRIC: -** Screen fabric Roller Blinds WINFAB MAKE **Composition** : 30% polyester and 70% PVC.**Openness factor** - 5%, **Weight** 380 gms / sq mtr +/- 5%, thickness 0.53 mm +/-5%, **Fire classification** : NFPA NO.701-2004 TM#1,california administrative code Title 19 BS 5867 part 2 Type B. Width(mm) :183/250/300 Mesh/ IN : 52 * 48 **Breaking strength:** WARP> = 1300 WEFT> = 1200 Tear strength: WARP> =20 WEFT> = 20. color fastness : ISO 105 B02 grade 8. **Anti ultravoilet :** 95%		sqm	296.00	105.00	234.00	234.00	869.00		-	
	13.02	**Blackout Roller Blind:-** Supply & Installation of manually operated Blackout roller Blinds.**HARDWARE; TOP TUBE :** Made of extruded aluminium with 38 mm Dia. and wall thickness of 1.2 mm with spline adoptable to accommodate clutch of UNISOLIL/ACMEDA make.**CLUTCH MECHANISM :** Moulded plastic having self lubrication with Glass fibre reinforcement, having a minimum lifting capacity of 8 lbs weight capality - 8 lbs Head adoptability - 38 mm **OPERATING CHAIN :** PLASTIC / STEEL ball chain adoptable to the clutch pitch for smooth operation of blinds.**LOCKING MEMBER :** Plastic/ steel stop locks for limit setting adoptable to the steel chain.Bonding (Fabric > Tube) : 30/36 mm wide double sided adhesive tape of 3M for strong holding capacity.**SPRING BOOSTERS:** provided as per the requirement Bottom Bar : aluminium extruded circular section with powder coated finish, having a Min. weight to be 365 gms / Rmt for a perfect fall of fabric to avoid warpage / floating. Ends are covered with end caps to give a perfect finish.**FABRIC: -** Blackout Roller Blinds WINFAB MAKE **Composition** PVC / FIBERGLASS**Weight** 470 gms / sq mtr, thickness 0.34 mm, **Openness factor Aprox.** 0%, **Fire classification** CCC-C-521E & NFPA NO.701. **CARE INSTRUCTION** : Cleanable with mild detergent.		sqm	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	13.03	**Wooden Venetian Blinds:** Providing & fixing of manual cord (polyester) operated 50mm wooden venetian blinds for indoor use of winfab makes, with steel zinc plated u section head rail in enamel paint / powder coated finish, bottom rail in the same wood species as wooden slatz, the wood should be staines with natural finish & covered with protective pu coating & end caps to be supplied with the same, size of slats as per architect's approval (50mm widths x 2.5-3m thick) Make : Hunter Dagulus		sqm	*RO*	56.00	*RO*	*RO*	56.00		-	
	13.04	Supply & Installation of Soness Somfy motor		no	*RO*	8.00	*RO*	*RO*	8.00		-	
	13.05	Remote having 4 channel		no	*RO*	2.00	*RO*	*RO*	2.00		-	
		Sub Total									-	
14		**Toilet Cubical**										
	A.	**Scope of Work** Supply and installation of **(SS)** series cubicles of width and depth as per specifications/ site drawings. Cubicle height to be 2003 mm.		nos	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	B.	**ITEM DESCRIPTION** Made from solid grade compact high pressure laminate as per IS:2046 manufactured under high specific pressure > 5 MPa and temperature >120oC with bunch of kraft papers impregnated with thermosetting phenolic resin and decorative papers made of Alpha cellulose fiber impregnated with thermosetting melamine resin which provide superior scratch, abrasion, heat, chemical, impact, graffiti & moisture resistance along with anti-bacterial properties. Panels have a black core that when machined, presents a distinctive black edge. Front panel, door & divider panel to be fix vertically by using extruded grade aluminum alloy epoxy powder coated profiles. Panel thickness 12 mm. Design no. as specified by Arch. / Engr. in suede finish. Size of panels to be as per drawing.										
	C.	**HARDWARE & ACCESSORIES (SS Series)** • Semi-spherical (Top) head frame structure for surface protection. Size to be 50x32x1.6T. Corner joinery section, Size to be 40x16.5x1.8T.U-Channel Wall joinery section, Size to be 22x16x1.6T.Door stopper section, Size to be 21x12.5x1.6T. •SS 304 grade Adjustable Pedestal Footing of base minimum diameter 70 mm, giving a clearance height of 150mm. • Self closing Hinges (Gravity mechanism) made from SS 304 grade. Color to be as per specifications. • Round Coat hook with base diameter 53 mm made from SS 304 grade . Color to be as per specifications. • Round Door knob diameter 48 mm with thumb-recess made from SS 304 grade . Color to be as per specifications. • Rotating Thumb-turn locking system with privacy indicator locking system made from SS 304 grade. Color to be as per specifications. • Anti-noise rubber padding. • Stainless steel grade 304 screws. • Anti-rotation Nylon polyamide grade-6 expandable wall plugs. • The Work shall complete as per drawing , under supervision of engineer in charge and company experts										
	D.	**Cubicles: Std Sizes** (W x D x H)- 900 mm x 1550 mm x 2003 mm, (Height is including 150 mm gap from bottom) **Door Size- 600 mm**										
		Sub Total									-	
15		**Compactor**										
	15.01	Provide and put in place **Compactors** 1200 W 1800 H and 400 deep with a stack of 6 of shelves with Double faced movable block size 1200 X 800 X 1800 and Single faced fixed block size 1200 X 400 X 1800 Rails Pairs length of which will vary between 6000m to 10000m approx , though majority are 7.5 m in length. Suggested Brand Godrej / Kompress										
	i)	Single Face		nos	*RO*	*RO*	1.00	*RO*	1.00		-	
	ii)	Double Face		nos	*RO*	*RO*	5.00	*RO*	5.00		-	
	15.02	Provide and put in place **Compactors** 2300 W 1800 H and 400 deep with a stack of 6 of shelves with Double faced movable block size 2300 X 800 X 1800 and Single faced fixed block size 2300 X 400 X 1800 Rails Pairs length of which will vary between 6000m to 10000m approx , though majority are 7.5 m in length. Suggested Brand Godrej / Kompress							*RO*		-	
	i)	Single Face		nos	*RO*	*RO*	1.00	*RO*	1.00		-	
	ii)	Double Face		nos	*RO*	*RO*	5.00	*RO*	5.00		-	
		Sub Total									-	
16		**Sliding Folding Partation**										

S No		Description of items		Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	16.01	Providing and fixing Sliding and folding Acoustic partition up to false ceiling level (MANUAL) consisting of series of individual flat elements of 80-100 mm thick travelling along the ceiling track assembled to form a solid wall. The sound insulation of the operable partition should be 50db. Elements must be constructed of a torsion-free steel horizontal tube frame and torsion-stiff vertical aluminium profiles, bolted together to make the element strong and sturdy. The frame must be clad either side with 12-16mm HDHMR panels hung in acoustic free suspension from the panel frame. The elements must be inter-connected by means of a positive locking tongue & Groove or concave/convex aluminium profile with an integrated magnetic strip and sealing lip. Each element must have a spindle mechanism which should be connected to the spring loaded top and bottom retractable seal. The spindle mechanism should be operated manually by a bayonet connected crank handle that acts as a lock in function during cranking process. The horizontal top and bottom seals must be extended manually by crank handle and should ensure a contact pressure of 800N when the seals are completely extended. No fixed sweep seals allowed in top and bottom of the element that would rub against the track or floor while moving the element. The telescopic element or the end closure element must open and close 120mm horizontally. The movement of the telescopic panel and the operation of the horizontal top and bottom seal and must be operated by a single mechanism. Each element must be suspended from the track capable of withstanding the load of the element. The elements shall run with the help of steel clad, multi directional rollers on a 80-100mm thick aliminum extruded track capable of taking a weight of 500 kgs/ element. Panel should be stacked in center/2pin stacking position. After installation of tracks, a sound barrier should be erected between the RCC and the false ceiling. Quote without the Sound Barrier as this Item is paid for seperately in the relevant Item. The openable door will be the part of sliding folding partition		sqm	*RO*	*RO*	23.00	*RO*	23.00		-	
	16.02	Providing and fixing Sound Barrier Partition above Operable Sliding/Folding Partition to the required profile and shape 2 layers of 12.5mm thickGypsum board on GI framework comprising 40x40x18G galvanized tubular frame 610x610mm centre to centre fixed on Roof Structure with 40x40x5 MS cleat, 100mm long 1200 c/c and ceiling framework with welded connections. The Gypsum board to be backed with 50mm thick resin bonded fiberglass cut to size and inserted in GI framework and held in place with 28G x 12mm GI wire netting. The first layer of Gypsum board to have joints over frame and second layer of Gypsum board tohave joint staggered with respect to the first layer, all joints between board in both layers to be taped with paper tape and filled with sealing compound. Gypsum board layer to be sealed at junction with Roof sheeting / structure and false ceiling below with the non-hardening mastic compound, so as to provide smooth surface.Entire work to be done as per drawing, specifications and as per directions of Engineer-in-charge.		sqm	*RO*	*RO*	10.00	*RO*	10.00		-	
	16.03	P/F Skin type **S9 - P**roviding and fixing of 9 mm thick 100% polyester fiber (P.E.T.) panel (0.5 NRC value) of approved color & design as shown in the drawing or view. The quoted rate should inclusive of pasting with double side tissue paper, hot melt adhesive, glass glue etc. according to different wall surface as available at site.		sqm	*RO*	*RO*	46.00	*RO*	46.00		-	
		Sub Total									-	
17		**Dismantling Work**										
	17.01	**Dismantling of existing block work/brick work (115/230mm thick)** in cement mortar, with or without plaster/dado finishes complete in all respect including stacking of serviceable materials and disposal of unserviceable materials from the site.		sqm	50.00	40.00	45.00	45.00	180.00		-	
	17.02	**Dismantling of RCC work** in Slabs lintels using specilaized electrical cutters etc. including cutting of reinforcement steel including stocking the debris in allocated location, shifting of debris out side the primises as directed.		cum	1.50	1.00	1.50	1.50	5.50		-	
	17.03	**Dismantling of Flooring. (Stone / Tile) in all respect including stacking of serviceable materials and disposal of unserviceable materials from the site.**		sqm	40.00	30.00	40.00	40.00	150.00		-	
	17.04	**Dismantling of Ceiling/Dry Partition and cladding in all respect including stacking of serviceable materials and disposal of unserviceable materials from the site.**		sqm	20.00	10.00	20.00	20.00	70.00		-	
	17.05	**Dismantling of Dry Partition and cladding , wood shutters , any joinary work in all respect including stacking of serviceable materials and disposal of unserviceable materials from the site.**		sqm	15.00	8.00	15.00	15.00	53.00		-	
		Sub Total									-	
Net total Without GST											-	

Sl.no	**Summary**	
1	Civil Work	-
2	Screeding & Tile Work	-
3	Stone / Tile Work	-
4	Antistatic Access floor/ Vinyl & LWF works	-
5	False Ceiling	-
6	Partition wall	-
7	Glazing and Glazed Openings	-
8	Panelling and Cladding	-
9	Doors / Shutters	-
10	Storage	-
11	On Site Furniture (To be manufactured off site)	-
12	Painting & Polishing Work	-
13	Blinds	-
14	Toilet Cubical	-
15	Compactor	-
16	Sliding Folding Partation	-
17	Dismantling Work	-
	Grand Total	-

BOQ for Special Feature & Misc Items

S No		Description of items		Unit	J - BLOCK 2F	J - BLOCK 3F	K - BLOCK 1F	K - BLOCK 2F	Total Qty	Unit Rate	Total Amount	Images
1		**Designer Ceiling**										
	1.01	**Baffle Ceiling :-** Supplying & Installation of vertical linear ceiling made out of Aluminium in 0.8mm thickness. The baffle units shall be in size of 200(H) x 50mm(W) x 2400(L). The ceiling baffle units shall be installed at the distance of 200mm from c.c. All Baffle to be provided with end cap and special splice to be provided to join two baffles together. The baffle units should be attached by C-channel carriers of size 25 x 40 x25mmx 1.2mm thick at 1200mm c.c. and suspended with M6 threaded rod hangers spaced 1200mm c.c. Quality and finishes of baffles should be followed the TIAM quality standard and powder coated finish with minimum 60 microns paint thickness. Finish-Woodgrain. This texture of ceiling should be approved in the guidance of engineering-in- charge.		rmtr	*RO*	*RO*	160.00	360.00	520.00		-	
		Installation of U-Grid:The U profile to be suspended at every 1200mm on-centre using 6mm threaded rod from the structural soffit using U-profile hanger. U-profile splice to be used to join more than one U profiles of length 3.75M. 1st U-Grid Channel must be no more than 400mm from the perimeter. Installation of Baffles: Locate the slot for Baffle Hangers in slot of Baffle section at 1200mm centres. Hangers are inserted into the slot, then rotated 90° and fixed into position by tightening the grub screw. Baffle to be lifted into position and hangers engage over lip of U-Grid Channel. Each Hanger to be secured into position by inserting the Locking Clip. Baffles blades to be connected at ends with Baffle Joiner, which are inserted into the top and bottom slots of the Baffle closed profile for alignment only. The bottom Joiner to be located first and fastened on one side only. The top Joiner to be fitted then and secured with grub screws on one side. Then the two Baffle sections shall be joined and the top Joiner is screw fastened on the 2nd Baffle profile. End Caps to be located by pushing the End Cap tongues into Baffle slots. Installation shall be according to the instructions provided by manufacturer. The rates should be inclusive of the neccessary concealed wooden frame works for the fixing arrangment and 12 mm thick back ply for backing surface complete as advised. Please refer View. **Mode of Measurements :** *Only Ceiling area (LXB) will be considered for measurements.*									-	
	1.02	**Acoustic Baffle Ceiling:** **A)Construction:** i) The baffles are constructed from 9mm thick acoustic woven panels, designed to enhance sound absorption and reduce noise levels. ii) The panels are available in multicolor shades, which will be chosen and approved according to the project specifications. iii) The overall thickness of the baffles will be 36mm & 250mm height, including the 9mm thick woven panel cladding. **B) Finish:** The woven panels provide a visually appealing finish while contributing to the acoustic properties of the ceiling. Hanging Arrangement: The quoted rate includes all necessary hardware and accessories required for hanging and securing the baffles. This encompasses suspension systems, brackets, and any additional fixing materials needed to install the baffles according to the site requirements and architectural guidelines. Installation: The installation process should follow the specified design and layout to ensure the baffles are securely fixed and evenly spaced for optimal acoustic performance. All installation work should adhere to the highest standards of craftsmanship, ensuring that the final product not only meets acoustic requirements but also adds to the aesthetic appeal of the space.									-	
	i)	**In Flexi Room** **Size : 250mm high & 20mm thick**		rmtr	*RO*	*RO*	307.00	*RO*	307.00		-	
	1.03	**ACOUSTICAL GLASS FIBER FALSE CEILING - SOUNDSCAPES BLADES SYSTEM:** Providing and Fixing SoundScpaes Acoustical blades which are 30-40 mm thick, flat glass fibre panels with Humidity Resistance RH 90%, with factory fitted embedded metal insert with ¼" – 20 threading for fixing cable adjuster for hanging application. Acoustical blades shall have sizes of 200x1200mm, 200x1600mm, 200x1800mm, or customized as advised with both side laminated scrim finished with uniform water based paint on all surface (including edges). Acoustical performance of 0.65 NRC as per ASTM C-423 (Average value of Absorption Co-efficient readings taken at 250 Hz, 500 Hz, 1000 Hz and 2000 Hz) in standard White color with Light reflectance 87% or in the color specified by the Architect (Shell / Tangerine/ Cranberry / Moss / Kiwi / Reef / Lagoon), Fire Performance Class B2 – s1, d0 as per EN 13501-1 .The blade shall be made of Glass fibre panel with density of 110-120 Kg/ m3. SUSPENSION: The panel shall be hung using hanging kit comprising of griper structure anchor & cap of dia 20mm, spring loaded bottom end cable adjuster of dia. 9mm and 2.4m long aircraft cable of 1/16" dia. Components 1) Griper structure anchor 2) Gripper anchor cap 3) Cable adjuster 4) Aircraft Cable Cable adjuster Spring loaded bottom end cable adjuster of dia. 9mm and 45mm long Aircraft cable Material Galvanized Steel Aircraft cable dimension 1/16 " Ø x 2.4m Tolerance ± 1mm. INSTALLATION:Hanger Wire Attachment to Structure: Attach the gripper structure anchor to the structure with an appropriate fastener (1/4"-20 Threading) that will carry the full weight of the blades. Insert the end of the cable into the gripper anchor cap. Screw the gripper anchor cap completely into the gripper structure anchor. Insert Suspension Cables: The panel is to be suspended using the aircraft cables which are suspended from the soffit using the gripper structure anchors and its other end passing through the bottom end cable adjuster. The height & level of the panels can be adjusted using the bottom end cable adjusters.Suspension of Blade: Locate the two factory fitted female inserts on the blades. Suspend the Blades by screwing the bottom end of the cable adjuster into the female inserts. Installation should be carried out as per Manufacturer recommended procedure.		rmtr	1,265.00	490.00	615.00	1,178.00	3,548.00		-	
	Alt 1	Size same as mentioned above but made in combination of 9 mm thic PET panels		rmtr	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	Alt 2	Supplying & Installation of Polylam Modular Baffle Ceiling system: POLYLAM® is vertical & horizontal baffle system, exhibiting space-delineating characteristics. The system comprises baffles 30mm wide & 200 Deep thickness of minimum 0.5mm GMS, installed at 300mm C/C . Baffle to be perforated having acoustic fleece pasted from inside. The C shaped shaped carrier rails run perpendicular to the main baffles profiles / hanging with clutchwires & dash fashner. Individual baffle lengths between 300 and 2400 mm can be selected. Baffle are supplied with the end cap matching the similar finish of baffle. Tolerances according to TAIM, DIN EN 13964 and quality controlled to ISO 9001:2015 approved by SIS. Substructure for POLYLAM® Vertical baffle system consisting of C shape carrier of minimum 1.2mm thick installed perpendicularly to baffles, same was hanged to wall with the help of wall anchor fasteners. Baffles to be connected perpendicular to C shaped carriers with the help of baffle hanger brackets. The primary profiles must be connected to one another with longitudinal splice connectors. C shaped baffle carriers to be installed at maximum distance of 1200mm. in a length of 2400 mm baffles. Baffle width: 30mm Baffle height: 200 mm Individual baffle lengths: Min.300/Max.2400mm Material: Minimum 0.5 mm GMS. Surface: Selected Digitally printed Woodgrain/ white finish having minimum 80 micron paint thickness.Manufacturer shall have the fully automatic powder coating system with power and free conveyorize 3mtr/minute capacity. Powder coating plant shall be equipped with latest modern technology with fully automatic inline Pre-treatment using nano technology, Inline automatic water Drying system after pre-treatment.		rmtr	*RO*	*RO*	*RO*	*RO*	*RO*		-	
	1.04	**Open cell metal Ceiling :**Providing and fixing of 100mm open cell ceiling with cell size of 100x100mm made out Aluminium . The assembled cell ceiling panels shall be in size of 600x600/ 600x1200 made out of blades in 9mm (W) x 40mm (H). The assembled cell ceiling panels are then clipped into U-94 carriers in Aluminium, pre-coated in black enamelled finished at 1200mm c.c. Wire clips shall hold the cell ceiling panels into the U-94 carriers. Once the U-94 carriers are installed then primary angles made out of GMS, type U1040 are cross connected to the U-94 carriers at 1200mm c.c. for lateral bracing The whole ceiling shall be suspended by M6 threaded rods installed 1200mm c.c.All panel modules must be hingeable through wire clips.		sqm	88.00	59.00	rate only	rate only	147.00		-	
	1.05	**Stretch Ceiling :-**Providing and fixing demountable ceiling made of Polyester knitted fabric coated with polyurethane 309 T Translucent white, Weight: From 200g to 250g / m2. Fire Rating:B s1 d0 (Ex M1) / Flame retardant. Fabric has translucid fabric for backlighting purpose with CE (Complies with European Union norms), stretch on self supporting frame Profile. The rates should be inclusive of the neccessary frame works for the fixing arrangment of stretched fabric panels and the complete LED light fixture as required. The quoted rate should be inclusive of all LED strip with required wattage as per site requirement. The quoted rate should also be inclusive of base prepartion with concealed wooden frame work & 12mm thick ply backing & white laminate finish with all hardware complete.		sqm	7.00	46.00	rate only	rate only	53.00		-	
	1.06	**Double Layer Ceiling Tiles:** Supply, and installation of Double Layer Adhesive Stapling Ceiling Tiles (300x600mm), featuring an innovative dual-layer construction for superior sound absorption and seamless aesthetic appeal. The tiles shall be eco-friendly, lightweight, and dimensionally stable in high-humidity environments, offering low embodied energy and modern designs. Installation includes fixing the tiles onto a gypsum board mounted on a metal frame using adhesive and staples, ensuring a flat, high-quality finish with excellent acoustic properties. Multiple orientations and patterns can be created as per the approved design, promoting flexibility and creativity in execution. The system must comply with international acoustic and environmental standards, with materials and workmanship of the highest quality."		sqm	79.00	20.00	15.00	18.00	132.00		-	
	1.07	**Decorative flower feature :** Design, supply, and installation of a ceiling-hung decorative flower feature with an overall size of 1800x1800mm and a depth of 200mm, fabricated from 12mm thick PET acoustic panels in the specified color and pattern. The panels shall be precision-cut using CNC or laser technology to achieve the desired floral shape, ensuring smooth edges and high accuracy. The feature shall have a layered or sculptural design to achieve the specified depth, providing a visually striking three-dimensional appearance. The assembly shall include a lightweight yet robust suspension system comprising powder-coated metal frames or wires, securely anchored to the ceiling structure. All materials must comply with acoustic and fire-retardant standards, offering durability and aesthetic appeal. Installation shall be carried out on-site with proper alignment, ensuring stability and a seamless finish."		nos	rate only	rate only	60.00	rate only	60.00		-	
											-	
2		**Special Feature & Misc Items**									-	
	2.01	**Fluted Paneling Works**, the specification includes the supply, installation, and finishing of high-quality fluted MDF or hardwood panels, with a base rate of Rs 310 per sq. ft. The fluted panels feature precisely cut, uniform grooves typically 10–20mm in width and 5–10mm in depth, creating a textured linear design that adds depth and dimension to the wall or column surface. Panels are mounted securely on a prepared substrate using a combination of high-strength construction adhesive and concealed fasteners, ensuring both aesthetic appeal and structural stability. For edge treatment, matching veneer or solid wood trim strips are installed to conceal exposed edges and create a seamless appearance. To enhance durability, all panels undergo surface preparation, including light sanding to smooth any roughness in the grooves. After installation, a protective clear finish—either matte, satin, or gloss—is applied as specified, enhancing the natural wood texture while protecting against wear, moisture, and stains. Special attention is given to alignment and consistency in groove spacing for a flawless, continuous effect across panel joints..		sqm	3.00	19.00	3.00	3.00	28.00		-	
	2.02	**PET Panel :** Providing and fixing of as per below mentioned thickness 100% polyester fiber (P.E.T.) panel (0.5 NRC value) of approved color & design as shown in the drawing or view. The quoted rate should inclusive of pasting with double side tissue paper, hot melt adhesive, glass glue etc. according to different wall surface as available at site.									-	
	i)	**12mm thick**		sqm	250.00	120.00	142.00	150.00	662.00		-	
	ii)	**9mm thick**		sqm	20.00	10.00	20.00	20.00	70.00		-	
	iii)	**Extra & above costing for router cutting as advised by the Architect.**		sqm	200.00	100.00	130.00	130.00	560.00		-	
	2.03	**Duster tray niche :-**P/F duster try niche 6" wide & 4" deep as per design to keep markers and duster for the Glass Writing Board, with fixing arrangement to fix on to the partition with groove. and finished with laminate cladding as advised.		rmtr	16.00	8.00	8.00	9.00	41.00		-	

S No		Description of items	Base Rates	Unit	2F	3F	1F	2F	Total Qty	Unit Rate	Total Amount	Images
	2.04	**Duster Tray -** P/F Aluminum Tray bent as per design to keep markers and duster for the Glass Writing Board, with fixing arrangement to fix on to the partition groove. Size 450-600 mm long		nos	2.00	2.00	2.00	2.00	8.00		-	
	2.05	**Entrance Floor Mats--** Providing and installing trapper floor matting (Heavy duty) as per manufacturer specification Source :- Euronics / 3M		sqm	12.00	9.00	12.00	12.00	45.00		-	
	2.06	**Aluminium L Corner trim :-**P/F aluminium L shape corner trim of size 25x25 mm designed for use at all corner junction to providing a neat edge and a safe transition.	Grey Color	rmtr	210.00	82.00	96.00	96.00	484.00		-	
	2.07	**Z profile 30-40mm wide :** The Z profile in aluminum finish is designed to provide a sleek and durable solution for concealing junctions in flooring applications, effectively hiding transitions between various materials such as tiles, hardwood, vinyl, or carpet. Constructed from high-quality aluminum, this profile offers excellent resistance to wear and corrosion, ensuring a long-lasting finish. The unique Z-shaped design facilitates easy installation and secure adhesion, creating a neat edge that enhances the overall aesthetic while preventing dirt accumulation and moisture ingress. Available in various widths and a polished or anodized aluminum finish, the Z profile can seamlessly blend with different flooring materials.	Grey Color	rmtr	32.00	26.00	32.00	40.00	130.00		-	
	2.08	**Magazine Rack:-** Supplying & making magazine rack made in perforated powdercoated MS sheet & operatable from both side & 8 mm thick acrylic sheet with 3M printed vinyl film.		nos	1.00	1.00	1.00	1.00	4.00		-	
	2.09	**Providing and fixing in position steps in server room / Hub room** made of hard wood frame work of 75x75 section laid to receive 19mm thick commercial ply with laminate to be screwed to the hard wood frame work complete as directed. The rate to be inclusive of ANTI STATIC laminate. Surface area to be consider for measurement.		sqm	1.00	1.00	1.00	1.50	4.50		-	
	2.10	**Acrylic Cladding:-** P/F 12mm thk. **Acrylic finish counter / cladding(Corian)** with edge molding profile as/design to be fixed og n ply boxing with appropriate adhesive as per manufacturer specs. The cost should include finishing of any cut outs for wash basins, faucets etc.		sqm	2.00	3.00	2.00	2.00	9.00		-	
	2.11	**Booth Seating Type-01** inclusive of Set of 2 Sofa + 1 table as shown in the drawing									-	
		Partation made in MS tubular frame having 12mm thick Ply on both side & PET Panel cladding (Router cut) as shown in the view									-	
		Ceiling area with concealed MS frame & finished in 12 mm thick ply base & PET Panel cladding (Router cut) as shown in the view									-	
		Table :- made in SS base plate with stand & 25 mm thick laminated top as approved									-	
		Sofa seats :- Supplying & making upholstered sofa seats made in concealed wooden framework & ply cladding as required with cushion & foam of 40 kg density & finshed in fabric (). The sofa seats having 3" dia soild CP teak wood legs system as per detail drawing. The whole exposed wooden surface finished in mellamine polish as advised/ approved.									-	
	i)	**Booth Seating Type-01 (1350mm long)**		set	rate only	2.00	rate only	rate only	2.00		-	
	ii)	**Booth Seating Type-02 (1800mm long)**		set	rate only	rate only	1.00	rate only	1.00		-	
	iii)	**Booth Seating Type-03 (2100mm long)**		set	rate only	rate only	1.00	rate only	1.00		-	
	iv)	**Booth Seating Type-04 (750 mm long)**		set	rate only	rate only	rate only	3.00	3.00		-	
	v)	**Booth Seating Type-05 (1500mm long)**		set	rate only	rate only	rate only	2.00	2.00		-	
	2.12	**S.S -304 bollard** 1050mm high 250mm dia with an S.S body and S.S base (300 mm dia) anchored the floor with screws as / manufacturer's standard offering		nos	2.00	1.00	2.00	2.00	7.00		-	
	2.13	P/F **Vinyl washable wall papers** pasted with appr. Adhesive solution without any bubbles or unevenness over wall/partitions as /design. The quoted rate should be inclusive of base preparation with primer/ as advised by the wall paper vendor		sqm	20.00	104.00	63.00	58.00	245.00		-	
	2.14	**Video Wall Carcus :** Provision and fabrication of a freestanding Video wall carcass projecting 6"-8" thick, constructed with concealed MS (50x50mm) framework at 600mm c/c spacing and 18mm thick HDHMR board as depicted in the detailed drawing. The rear side of the wall is to be finished with laminate, while the front side with 6mm thick lacquered glass. The cost of lacquered glass is to be considered under a separate BOQ item. The quoted rate should include all necessary hardware, elements, and openings essential for the video walls. Contractors are advised to refer to the drawing for precise execution in line with project requirements."		sqm	9.00	rate only	rate only	rate only	9.00		-	
	2.15	**MS Structural Steel Work Fabrication:** This tender encompasses the supply, fabrication, surface preparation, and erection of mild steel (MS) structural steelwork, including all necessary components per approved design drawings and technical specifications. The work includes fabrication of MS columns, beams, base plates, cleats, gussets, bracings, and connections with accurate dimensioning and alignment per design. Base plates and cleats must be cut and drilled precisely, providing for anchor bolts as specified, with proper welding or bolting as applicable. Full-penetration and fillet welds, where required, should adhere to the latest welding standards and undergo quality inspections for strength and uniformity. All steel members must be surface prepared with sandblasting or shot blasting to remove rust, oil, and scale, then primed with an anti-corrosive coating followed by two coats of epoxy paint, or an equivalent specified finish. Fabricated components must be assembled using approved MS bolts, nuts, washers, and anchor bolts, with all fasteners conforming to international standards. During erection, careful handling and transportation are required to prevent deformation. On-site assembly includes accurate positioning, leveling, and securing of base plates, alignment of cleats, and bolted or welded connections as per the drawing, with final inspection ensuring compliance with structural and safety standards.		kg	1,000.00	180.00	900.00	3,100.00	5,180.00		-	
	2.16	BioZone Scientific AirCare Systems comprising of dual UV wavelength Photoplasma technology for effective Air & Surface disinfection, purification & odor control by destroying bacteria, viruses and other microbial contaminants also the VOCs. The complete system should be within compact and high quality aluminium housing with inbuilt safety measure to ensure UV lamp should turn off if the enclosure is opened. Model AC10, AC20 or AC30 would be installed permanently on wall or under ceiling, the plug & play system is provided with around 3 meters length trailing cable and 13A British Standard 3 Pin (Flat pin) Plug (1 Universal socket with 16A switch to be provided for the same)		no	rate only	1.00	rate only	rate only	1.00		-	
	2.17	**Revolving feature column:** Supplying & Installation of feature column & structure should consist of a robust core made of HDHMR or plywood, Ril wood (6/8/12mm thick) shaped into a cylindrical form. The column is designed to revolve, suspended from the ceiling and supported at the floor using precision-engineered bearings for smooth rotation. The veneer finish should be of high quality, applied seamlessly using contact adhesive or press bonding techniques. Flexible or steam-bent veneer sheets are necessary to conform to the curved surfaces without visible joints. The veneer surface (Paper veneer to be used here) must be stained or pre-finished with a protective lacquer to enhance durability and visual appeal. The bearing system at both the ceiling and floor ends should be carefully installed, ensuring alignment and minimal friction for rotation. Additional provisions, such as concealed fasteners and edge treatment, will ensure both functionality and aesthetic integrity. PU polish to be used as approved.		no	28.00	rate only	rate only	rate only	28.00		-	
	2.18	Supply, fabrication, and installation of a custom-designed wall-mounted or freestanding display unit made of premium-grade plywood with a natural veneer finish as per approved design. The unit shall feature multiple shelves with concealed LED strip lighting for enhanced display, beveled or polished edges, and provisions for securely housing trophies, certificates, and decorative items. The veneer finish shall include proper sanding, staining (if required), and PU coating for durability and a premium appearance. The back panel shall include a matching veneer finish to ensure a seamless look. All materials and hardware used, including hinges and fittings (Softclose), shall be of ISI-marked or equivalent high quality for durability. Measurements and installation shall be carried out on-site to ensure a precise fit and finish."		sqm	rate only	10.00	rate only	rate only	10.00		-	
	2.19	Supplying & Installation of PARACOUSTIC MASS LOADED VINYL/ SOUND DEADENING MEMBRANE of 3 mm thickness having 1800-2000 Kg/M3 Density, and upto 34db STC. It comes in Rolls of length - 5/10 M & width - 1 M in Black color. Material to be fixed with Glue/Nail/Screw & Staple. Make - PARACOUSTIC		sqm	45.00	65.00	30.00	30.00	170.00		-	
	2.20	Accoustic 3 D panels : Supplying & Insttaltion of 3D designer type accoustic panels on the existing surface as advised.		sqm	40.00	10.00	20.00	32.00	102.00		-	
	2.21	Supplying & Installation of Board room Chair as approved by the Client & Architect		nos	*RO*	25	*RO*	*RO*	25.00		-	Haworth, Steelcase
	2.22	Supplying & Installation of Chairman Cabin Main Chair as approved by the Client & Architect		nos	*RO*	1	*RO*	*RO*	1.00		-	Human Scale Freedom with headrest
	2.23	Supplying & Installation of Chairman Cabin Visitors Chair as approved by the Client & Architect		nos	*RO*	4	*RO*	*RO*	4.00		-	Human Scale Freedom without headrest
											-	
		Sub Total									-	

Bain Marie BOQ

tem No.	Description of Item	Specifications & Details	Unit	Quantity	Rate (₹)	Amount (₹)
1	**Design, Fabrication & Supply of Bain Marie Unit**	Overall Size: **1800 mm (L) x 600 mm (W) x 850 mm (H)**	Nos	2		-
		Top & Body: SS-304, 1.2 mm thick				
		Skirt edge with rounded corners				
2	**Stainless Steel (SS-304) Food Pans**	Size: **GN 1/1 – 530 mm x 325 mm x 150 mm**	Nos	12		-
		Material: SS-304, 0.8 mm thick				
		Smooth edge finish				
3	**Heating System – Thermostatically Controlled**	Heating Element: **2.5 kW (Single-phase, 230V)**	Nos	2		-
		Controlled by adjustable thermostat (0°C to 90°C)				
4	**Water Tank with Inlet & Outlet System**	Integrated SS-304 water tank	Set	2		-
		Capacity: **12-15 Litres**				
		SS-304 Ball Valve for Outlet				
5	**Thermal Insulation for Heat Retention**	Material: **Mineral Wool**	Sqft	As Required	Included	Included
		Thickness: **25 mm**				
		Ensures minimum heat loss				
6	**Control Panel & Electrical Wiring**	Control Panel with:	Nos	2		-
		- ON/OFF Switch				
		- Heating Indicator Light				
		- Thermostat Knob				
		- Heavy-duty Wiring				
7	**Underneath Storage Cabinet**	Material: SS-304	Nos	2		-
		Size: **1500 mm (L) x 500 mm (W) x 400 mm (H)**				
		SS Hinged Doors				
8	**Castor Wheels (Heavy-Duty)**	4 Nos (2 with brakes)	Set	2		-
		Material: Polyurethane Coated Wheels				
		Diameter: **75 mm**				
9	**Polishing & Finishing**	Stainless Steel Buff Polishing – Satin Finish	LS	2		-
		Smooth weld joints & rounded edges				
10	**Testing, Delivery & Installation**	On-site delivery, commissioning, and operational testing to ensure proper functionality	LS	2		-
	Total					-

PROJECT - QCI, NAUROJI NAGAR, DELHI		
PACKAGE - INTERNAL ELECTRIFICATION WORKS		
SUMMARY OF COST		
S.NO.	**DESCRIPTION**	**AMOUNT**
1	CHAPTER 1: LT CABLES & TERMINATIONS	-
2	CHAPTER 2: CABLES MANAGEMENT	-
3	CHAPTER 3: DISTRIBUTION BOARD	-
4	CHAPTER 4: WIRING	-
5	CHAPTER 5: EARTHING SYSTEM	-
6	CHAPTER 6: MISCELLANEOUS WORKS & CONDUTING FOR ELV SYSTEM	-
7	CHAPTER 7 : FIXING OF LIGHTING FIXTURES & FANS	-
	TOTAL AMOUNT IN RUPEES	**-**
	EXCLUSIONS:	
A	Civil works including foundations, core cuts, excavation and any cutouts in any structural component	
B	Lifts works.	
C	Any kind of Automation Works	
D	Solar PV System	
E	Liaisoning Charges	
	RATES	
1)	The quoted rates are exclusive of all taxes and duties.	
2)	The rates shall be prepared in conjuction and with reference to the contents of Specification &	
3)	The rates quoted shall also include for providing any temporary work or preparatory work required	
4)	The unit prices stated hereunder shall be deemed to include, but not be limited to the following :	
a.	Site management and supervision, labour and all costs in connection therewith, including the cost of	
b.	The supply, fabrication and supervision during installation of all goods and all costs in connection	
c.	Delivery as appropriate.	
d.	Paint, tools, equipment and all cost in connection therewith site facilities and all other costs from	
e.	Waste of Material	
f.	Mobilization costs, overhead costs and profit.	
g.	Major civil works shall not form any part of this contract including foundations.	
5)	The rates for each item of work included in the schedule of quantities shall unless expressed stated	
	NOTES	
1)	All the items of work under this contract shall be executed strictly in accordance with the description	
2)	This bill is to be read in conjunction with all other project documents and deviations if any shall be	
3)	All the items of work given in this schedule of quantities shall be executed strictly in accordance with	
4)	The contractor shall visit the site and shall satisfy himself as to conditions under which the work is to	
5)	No Alteration whatsoever is to be made to the text or quantities of this schedule of quantities unless	
6)	Any error in totalling in the amount column and in carrying forward totals shall be corrected.	
7)	Any error in description or in quantity or omission of items from the contract schedule shall not	

PROJECT - QCI, NAUROJI NAGAR, DELHI

PACKAGE - INTERNAL ELECTRIFICATION WORKS

DETAILED ESTIMATES

S.NO.	DESCRIPTION	UNIT	QUANTITY	UNIT RATE	AMOUNT
1	**CHAPTER 1: LT CABLES & TERMINATIONS**				
1.1	Supplying, unloading, storing, installation, testing and commissioning of following sizes of **1.1 kV grade XLPE** insulated Heavy duty, **Aluminium** conductor **armoured** cables suitable for working voltage upto and including 1100 Volts, laid and tied on existing overhead cable trays including providing MS supports and clamps for fixing to supports in an approved manner, **providing fire retardant sealant** for crossing through shafts, openings etc where required complete as required and as per specifications. **Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site.**				
1.1.1	3.5C X 300 Sqmm aluminium conductor flat armoured.	Meter	RO		-
1.1.2	3.5C X 240 Sqmm aluminium conductor flat armoured.	Meter	RO		-
1.1.3	3.5C X 185 Sqmm aluminium conductor flat armoured.	Meter	RO		-
1.1.4	3.5C X 150 Sqmm aluminium conductor flat armoured.	Meter	250		-
1.1.5	3.5C X 120 Sqmm aluminium conductor flat armoured.	Meter	200		-
1.1.6	3.5C X 95 Sqmm aluminium conductor flat armoured.	Meter	RO		-
1.1.7	3.5C X 70 Sqmm aluminium conductor flat armoured.	Meter	100		-
1.1.8	3.5C X 50 Sqmm aluminium conductor flat armoured.	Meter	200		-
1.1.9	4C X 35 Sqmm aluminium conductor flat armoured.	Meter	90		-
1.1.10	4C X 25 Sqmm aluminium conductor flat armoured.	Meter	55		-
1.1.11	4C X 16 Sqmm aluminium conductor wire armoured.	Meter	RO		-
1.2	Supplying and making end termination with **Double compression brass gland** and lugs for following size of XPLE insulated and PVC sheathed /XLPE **aluminum conductor cable** of 1.1 KV grade of the following sizes as required. The cost shall include the cost of crimping and all tools and accessories required to complete the job in full respect. Note : Al lugs shall be used for Al cable and PG Threaded Nylon Flexible cable glands to be used for earthing/flexible cables for termination in earth box.				-
1.2.1	3.5C X 300 Sqmm aluminium conductor flat armoured.	Each	RO		-
1.2.2	3.5C X 240 Sqmm aluminium conductor flat armoured.	Each	RO		-
1.2.3	3.5C X 185 Sqmm aluminium conductor flat armoured.	Each	RO		-
1.2.4	3.5C X 150 Sqmm aluminium conductor flat armoured.	Each	8		-
1.2.5	3.5C X 120 Sqmm aluminium conductor flat armoured.	Each	8		-
1.2.6	3.5C X 95 Sqmm aluminium conductor flat armoured.	Each	RO		-
1.2.7	3.5C X 70 Sqmm aluminium conductor flat armoured.	Each	2		-
1.2.8	3.5C X 50 Sqmm aluminium conductor flat armoured.	Each	4		-
1.3	Supplying and making end termination with **Single compression** brass gland and lugs for following size of XLPE insulated and PVC sheathed **aluminum conductor cable** of 1.1 KV grade of the following sizes as required. The cost shall include the cost of crimping and all tools and accessories required to complete the job in full respect. Note : Al lugs shall be used for Al cable and PG Threaded Nylon Flexible cable glands to be used for earthing/flexible cables for termination in earth box.				-
1.3.1	4C X 35 Sqmm aluminium conductor flat armoured.	Each	2		-
1.3.2	4C X 25 Sqmm aluminium conductor flat armoured.	Each	2		-
1.3.3	4C X 16 Sqmm aluminium conductor wire armoured.	Each	RO		-
1.4	Supplying, unloading, storing, laying, testing and commissioning of following sizes of **1.1 kV grade XLPE insulated** Heavy duty, **Copper** conductor **armoured** cables suitable for working voltage upto and including 1100 Volts, laid and tied on existing overhead cable trays including providing MS supports and clamps for fixing to supports in an approved manner, **providing fire retardant sealant** for crossing through shafts, openings etc where required complete as required and as per specifications. **Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site.**				-
1.4.1	4C X 25 Sqmm copper conductor wire armoured	Meter	RO		-
1.4.2	4C X 16 Sqmm copper conductor wire armoured	Meter	1265		-
1.4.3	4C X 10 Sqmm copper conductor wire armoured	Meter	1550		-
1.4.4	4C X 6 Sqmm copper conductor wire armoured	Meter	900		-
1.4.5	4C X 4 Sqmm copper conductor wire armoured	Meter	RO		-
1.4.6	3C X 16 Sqmm copper conductor wire armoured	Meter	RO		-
1.4.7	3C X 10 Sqmm copper conductor wire armoured	Meter	RO		-
1.4.8	3C X 6 Sqmm copper conductor wire armoured	Meter	575		-
1.4.9	3C X 4 Sqmm copper conductor wire armoured	Meter	RO		-
1.4.10	3C X 2.5 Sqmm copper conductor wire armoured	Meter	RO		-
1.4.11	2C X 6 Sqmm copper conductor wire armoured	Meter	RO		-
1.5	Supplying and making end termination with **Single compression** brass gland and lugs for following size of **XLPE insulated** and PVC sheathed **copper armoured conductor cable** of 1.1 KV grade of the following sizes as required. The cost shall include the cost of crimping and all tools and accessories required to complete the job in full respect. Note : cu lugs shall be used for copper cable and PG Threaded Nylon Flexible cable glands to be used for earthing/flexible cables for termination in earth box.				-

1.5.1	4C X 25 Sqmm copper conductor wire armoured	Each	**RO**		-
1.5.2	4C X 16 Sqmm copper conductor wire armoured	Each	54		-
1.5.3	4C X 10 Sqmm copper conductor wire armoured	Each	72		-
1.5.4	4C X 6 Sqmm copper conductor wire armoured	Each	38		-
1.5.5	4C X 4 Sqmm copper conductor wire armoured	Each	**RO**		-
1.5.6	3C X 16 Sqmm copper conductor wire armoured	Each	**RO**		-
1.5.7	3C X 10 Sqmm copper conductor wire armoured	Each	**RO**		-
1.5.8	3C X 6 Sqmm copper conductor wire armoured	Each	28		-
1.5.9	3C X 4 Sqmm copper conductor wire armoured	Each	**RO**		-
1.5.10	3C X 2.5 Sqmm copper conductor wire armoured	Each	**RO**		-
1.5.11	2C X 6 Sqmm copper conductor wire armoured	Each	**RO**		-
1.6	Supplying, unloading, storing, laying, testing and commissioning of following sizes of **1.1 kV grade XLPE insulated** Heavy duty, **Copper** conductor **unarmoured** cables suitable for working voltage upto and including 1100 Volts, laid and tied on existing overhead cable trays including providing MS supports and clamps for fixing to supports in an approved manner**, providing fire retardant sealant** for crossing through shafts, openings etc where required complete as required and as per specifications. **Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site.**				-
1.6.1	1C X 120 sqmm copper conductor unarmoured	Meter	**RO**		-
1.6.2	1C X 95 sqmm copper conductor unarmoured	Meter	990		-
1.6.3	1C X 70 sqmm copper conductor unarmoured	Meter	**RO**		-
1.6.4	1C X 50 sqmm copper conductor unarmoured	Meter	**RO**		-
1.6.5	1C X 35 sqmm copper conductor unarmoured	Meter	**RO**		-
1.6.6	1C X 25 sqmm copper conductor unarmoured	Meter	**RO**		-
1.6.7	1C X 16 sqmm copper conductor unarmoured	Meter	**RO**		-
1.6.8	1C X 10 sqmm copper conductor unarmoured	Meter	264		-
1.6.9	3C X 6 sqmm copper conductor unarmoured	Meter	671		-
1.7	Supplying and making end termination with **Single compression** brass gland and lugs for following size of XPLE insulated and PVC sheathed /XLPE **copper unarmoured conductor cable** of 1.1 KV grade of the following sizes as required. The cost shall include the cost of crimping and all tools and accessories required to complete the job in full respect. Note : Cu lugs shall be used for copper cable and PG Threaded Nylon Flexible cable glands to be used for earthing/flexible cables for termination in earth box.				-
1.7.1	1C X 120 sqmm copper conductor unarmoured	Each	**RO**		-
1.7.2	1C X 95 sqmm copper conductor unarmoured	Each	120		-
1.7.3	1C X 70 sqmm copper conductor unarmoured	Each	**RO**		-
1.7.4	1C X 50 sqmm copper conductor unarmoured	Each	**RO**		-
1.7.5	1C X 35 sqmm copper conductor unarmoured	Each	**RO**		-
1.7.6	1C X 25 sqmm copper conductor unarmoured	Each	**RO**		-
1.7.7	1C X 16 sqmm copper conductor unarmoured	Each	**RO**		-
1.7.8	1C X 10 sqmm copper conductor unarmoured	Each	264		-
1.7.9	3C X 6 sqmm copper conductor unarmoured	Each	44		-
1.8	Supply, installation, testing & commisioning of **IS marked (BIS) Fire Survival** armoured cable as per IS **17505, fire Test as per BS 6387CWZ, BS 8491 and BS 8434**, copper conductor /mica taped- Flame Barrier/ Cross Linked Insulation/ Halogen Free Inner Sheath/ SWA/ Halogen Free Outer Sheath **(1000V)**, NABL inhouse lab for testing Fire survival cable **(Tagging to be provided with aluminium strips on both the ends as approved).**				-
1.8.1	3.5C X 240 Sqmm aluminium conductor flat armoured.	Meter	**RO**		-
1.8.2	3.5C X 120 Sqmm aluminium conductor flat armoured.	Meter	**RO**		-
1.8.3	3.5C X 70 Sqmm aluminium conductor flat armoured.	Meter	**RO**		-
1.8.4	4C X 25 Sqmm aluminium conductor flat armoured.	Meter	**RO**		-
1.9	Supply, installation, testing & commisioning of cable termination of above cables with **aluminium lugs** & **flameproof brass compression glands** on both the ends with inhibting compound etc. complete as required.				-
1.9.1	3.5C X 240 Sqmm aluminium conductor flat armoured.	Each	**RO**		-
1.9.2	3.5C X 120 Sqmm aluminium conductor flat armoured.	Each	**RO**		-
1.9.3	3.5C X 70 Sqmm aluminium conductor flat armoured.	Each	**RO**		-
1.9.4	4C X 25 Sqmm aluminium conductor flat armoured.	Each	**RO**		-
1.1	Supply, installation, testing & commisioning of **IS marked (BIS) Fire Survival** armoured cable as per IS **17505, fire Test as per BS 6387CWZ, BS 8491 and BS 8434**, copper conductor /mica taped- Flame Barrier/ Cross Linked Insulation/ Halogen Free Inner Sheath/ SWA/ Halogen Free Outer Sheath **(1000V)**, NABL inhouse lab for testing Fire survival cable **(Tagging to be provided with aluminium strips on both the ends as approved).**				-
1.10.1	4C X 16 Sqmm copper conductor wire armoured	Meter	**RO**		-
1.10.2	4C X 10 Sqmm copper conductor wire armoured	Meter	**RO**		-
1.10.3	4C X 6 Sqmm copper conductor wire armoured	Meter	650		-
1.10.4	4C X 4 Sqmm copper conductor wire armoured	Meter	**RO**		-
1.10.5	3C X 10 Sqmm copper conductor wire armoured	Meter	**RO**		-
1.10.6	3C X 6 Sqmm copper conductor wire armoured	Meter	**RO**		-

1.11	Supply, installation, testing & commisioning of cable termination of above cables with **copper lugs & flameproof brass compression glands** on both the ends with inhibting compound etc. complete as required.				-
1.11.1	4C X 16 Sqmm copper conductor wire armoured	Each	**RO**		-
1.11.2	4C X 10 Sqmm copper conductor wire armoured	Each	**RO**		-
1.11.3	4C X 6 Sqmm copper conductor wire armoured	Each	16		-
1.11.4	4C X 4 Sqmm copper conductor wire armoured	Each	**RO**		-
1.11.6	3C X 10 Sqmm copper conductor wire armoured	Each	**RO**		-
1.11.7	3C X 6 Sqmm copper conductor wire armoured	Each	**RO**		-
	SUBTOTAL CARRIED OVER TO SUMMARY				-
2	**CHAPTER 2: CABLES MANAGEMENT**				
2.1	Supply and installation of following sizes of **Pre-Galvanized perforated type Iron cable tray** with perforation not more than 17.5%, and necessary bends, tees, reducer couplers, dashfastners, **HDG** nuts bolts including cutting,bending, drilling, bolting required suspension arrangement fabricated from steel etc.complete as per specifications and as approved by Engineer - in - charge. For the suspension of cable tray, only GI round rods with **ceiling/wall** anchoring facility should be used including providing required MS supports fabricated from steel flats, angles, bars, channels as required for fixing/hanging cable trays duly painted with one coat of primer and 2 coats of synthetic enamel paint of approved colour etc. complete as required.				
2.1.1	50 mm width x 25 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.1.2	50 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.1.3	100 mm width x 50 mm depth x 1.6 mm thickness	Meter	150		-
2.1.4	150 mm width x 50 mm depth x 1.6 mm thickness	Meter	400		-
2.1.5	300 mm width x 50 mm depth x 1.6 mm thickness	Meter	650		-
2.1.6	450 mm width x 50 mm depth x 2 mm thickness	Meter	350		-
2.1.7	600 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.1.8	750 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.1.9	900 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.2	Supply and installation of following sizes suitable **"Covers"** for following size **Pre-Galvanized perforated type Iron cable tray** in convenient sections for straight runs, tee, elbows reducers etc. including providing suitable clamps, **HDG** bolts & nuts, etc, joined with connectors for cable trays suspended from the ceiling mounted on floor, surface mounted upto satisfaction of engineer-incharge complete as required, for following size of cable trays The coller height of cover should be minimum 15mm				-
2.2.1	50 mm width x 25 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.2.2	50 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.2.3	100 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.2.4	150 mm width x 50 mm depth x 1.6 mm thickness	Meter	150		-
2.2.5	300 mm width x 50 mm depth x 1.6 mm thickness	Meter	250		-
2.2.6	450 mm width x 50 mm depth x 2 mm thickness	Meter	50		-
2.2.7	600 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.2.8	750 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.2.9	900 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.3	Supply and installation of following sizes of **powder coated perforated type Iron cable tray** with perforation not more than 17.5%, and necessary bends, tees, reducer couplers, dashfastners, **HDG** nuts bolts including cutting,bending, drilling, bolting required suspension arrangement fabricated from steel etc.complete as per specifications and as approved by Engineer - in - charge. For the suspension of cable tray, only GI round rods with **ceiling/wall** anchoring facility should be used including providing required MS supports fabricated from steel flats, angles, bars, channels as required for fixing/hanging cable trays duly painted with one coat of primer and 2 coats of synthetic enamel paint of approved colour etc. complete as required.				-
2.3.1	50 mm width x 25 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.3.2	50 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.3.3	100 mm width x 50 mm depth x 1.6 mm thickness	Meter	50		-
2.3.4	150 mm width x 50 mm depth x 1.6 mm thickness	Meter	100		-
2.3.5	300 mm width x 50 mm depth x 1.6 mm thickness	Meter	100		-
2.3.6	450 mm width x 50 mm depth x 2 mm thickness	Meter	**RO**		-
2.3.7	600 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.3.8	750 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.3.9	900 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.4	Supply and installation of following sizes suitable **"Covers"** for following size **powder coated perforated type Iron cable tray** in convenient sections for straight runs, tee, elbows reducers etc. including providing suitable clamps, **HDG** bolts & nuts, etc, joined with connectors for cable trays suspended from the ceiling mounted on floor, surface mounted upto satisfaction of engineer-incharge complete as required, for following size of cable trays The coller height of cover should be minimum 15mm				-
2.4.1	50 mm width x 25 mm depth x 1.6 mm thickness	Meter	**RO**		-

2.4.2	50 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.4.3	100 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.4.4	150 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.4.5	300 mm width x 50 mm depth x 1.6 mm thickness	Meter	**RO**		-
2.4.6	450 mm width x 50 mm depth x 2 mm thickness	Meter	**RO**		-
2.4.7	600 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.4.8	750 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.4.9	900 mm width x 75 mm depth x 2 mm thickness	Meter	**RO**		-
2.5	Supply and installation of following sizes of **Pre-Galvanized perforated type Iron cable tray** with perforation not more than 17.5%, and necessary bends, tees, reducer couplers, dashfastners, **HDG** nuts bolts including cutting,bending, drilling, bolting required mounting arrangement fabricated from steel etc.complete as per specifications and as approved by Engineer - in - charge. For the mounting of cable tray below **false floor**, MS stucture should be used including steel flats, angles, bars, channels as required for fixing cable trays duly painted with one coat of primer and 2 coats of synthetic enamel paint of approved colour etc. complete as required.				-
2.5.1	300 mm width X 75 mm depth X 2 mm thickness	Meter	**RO**		-
2.5.2	450 mm width X 75 mm depth X 2 mm thickness	Meter	20		-
2.5.3	600 mm width X 75 mm depth X 2 mm thickness	Meter	20		-
2.5.4	750 mm width X 75 mm depth X 2 mm thickness	Meter	**RO**		-
2.5.5	900 mm width x 75 mm depth x 2 mm thickness	Meter	50		-
2.6	Supply and fixing of following sizes of **2mm thick Pre-Galvanized raceway,** , with openable cover with all accessories as required, identification for power and elv to be provided, **laid in floor** including marking the routing, getting it approved,cutting the floor,filling and plastering after laying the raceway,grouting the raceway to the floor,sealing of raceway cover,joints and junction boxes complete as required. including junction boxes for smooth pulling of structured and power cabling (**Note:costing for junction boxes to be considered in this item by tenderer**). It will be the responsibility of the contractor to coordinate with structured cabling contractor for laying of cable. Notes: # Variation in height may be considered for quoting as floor thickness may vary. # Junction boxes to be provided at every bend, cable riser and 6 meters of straight run # Painting of all junction boxes to be considered in cost : blue for data raceways and orange for electrical raceways				-
2.6.1	50 mm x 40 mm (2 mm thick cover)	Meter	150		-
2.6.2	100 mm x 40 mm (2 mm thick cover)	Meter	1100		-
2.6.3	150 mm x 40 mm (2 mm thick cover)	Meter	230		-
2.6.4	200 mm x 40mm (3 mm thick cover)	Meter	150		-
2.6.5	250 mm x 40 mm (3 mm thick cover)	Meter	**RO**		-
2.6.6	300 mm x 40 mm (3 mm thick cover)	Meter	300		-
2.7	Supply and fixing of following sizes of **2mm thick Pre-Galvanized raceway,** , with openable cover with all accessories as required, identification for power and elv to be provided, **laid in floor** including marking the routing, getting it approved,cutting the floor,filling and plastering after laying the raceway,grouting the raceway to the floor,sealing of raceway cover,joints and junction boxes complete as required. including junction boxes for smooth pulling of structured and power cabling (**Note:costing for junction boxes to be considered in this item by tenderer**). It will be the responsibility of the contractor to coordinate with structured cabling contractor for laying of cable. Notes: # Variation in height may be considered for quoting as floor thickness may vary. # Junction boxes to be provided at every bend, cable riser and 6 meters of straight run # Painting of all junction boxes to be considered in cost : blue for data raceways and orange for electrical raceways				-
2.7.1	50 mm x 25 mm (2 mm thick cover)	Meter	**RO**		-
2.7.2	100 mm x 25 mm (2 mm thick cover)	Meter	50		-
2.7.3	150 mm x 25 mm (2 mm thick cover)	Meter	50		-
2.7.4	200 mm x 25 mm (3 mm thick cover)	Meter	50		-
2.7.5	250 mm x 25 mm (3 mm thick cover)	Meter	**RO**		-
2.7.6	300 mm x 25 mm (3 mm thick cover)	Meter	50		-

2.8	Supply and fixing of following sizes of **2mm thick powder coated MS raceway,** with openable cover with all accessories as required, identification for power and elv to be provided, **laid in floor** including marking the routing, getting it approved,cutting the floor,filling and plastering after laying the raceway,grouting the raceway to the floor,sealing of raceway cover,joints and junction boxes complete as required. including junction boxes for smooth pulling of structured and power cabling (**Note:costing for junction boxes to be considered in this item by tenderer**). It will be the responsibility of the contractor to coordinate with structured cabling contractor for laying of cable. Notes: # Variation in height may be considered for quoting as floor thickness may vary. # Junction boxes to be provided at every bend, cable riser and 6 meters of straight run # Painting of all junction boxes to be considered in cost : blue for data raceways and orange for electrical raceways				-
2.8.1	50 mm x 40 mm (2 mm thick cover)	Meter	**RO**		-
2.8.2	100 mm x 40 mm (2 mm thick cover)	Meter	**RO**		-
2.8.3	150 mm x 40 mm (2 mm thick cover)	Meter	**RO**		-
2.8.4	200 mm x 40mm (3 mm thick cover)	Meter	**RO**		-
2.8.5	250 mm x 40 mm (3 mm thick cover)	Meter	**RO**		-
2.8.6	300 mm x 40 mm (3 mm thick cover)	Meter	**RO**		-
2.9	Supply and fixing of following sizes of **2mm thick powder coated MS raceway,** with openable cover with all accessories as required, identification for power and elv to be provided, **suspended from ceiling i**ncluding providing suspension arrangement with all accessories in an approved manner complete as required**.**,joints and junction boxes complete as required. including junction boxes for smooth pulling of structured and power cabling (**Note:costing for junction boxes to be considered in this item by tenderer**). It will be the responsibility of the contractor to coordinate with structured cabling contractor for laying of cable. Note: Variation in height may be considered for quoting as floor thickness may vary. Notes: # Junction boxes to be provided at every bend, cable riser and 10 meters of straight run				-
2.9.1	50 mm x 50 mm (2 mm thick cover)	Meter	50		-
2.9.2	100 mm x 50 mm (2 mm thick cover)	Meter	50		-
2.9.3	150 mm x 50 mm (2 mm thick cover)	Meter	150		-
2.9.4	200 mm x 50 mm (2 mm thick cover)	Meter	100		-
2.9.5	250 mm x 50 mm (2 mm thick cover)	Meter	**RO**		-
2.9.6	300 mm x 50 mm (2 mm thick cover)	Meter	750		-
2.10	Supply and fixing of following sizes of **powder coated MS raceway,** with openable cover and all accessories as required for **fixing on wall/ column** complete as required including providing junction boxes,bends and tees as required. Notes: # Junction boxes to be provided at every bend, cable riser and 10 meters of straight run				-
2.10.1	50 mm x 40 mm (2 mm thick cover)	Meter	35		-
2.10.2	100 mm x 40 mm (2 mm thick cover)	Meter	50		-
2.10.3	150 mm x 40 mm (2 mm thick cover)	Meter	50		-
2.10.4	200 mm x 40 mm (2 mm thick cover)	Meter	20		-
2.10.5	250 mm x 40 mm (2 mm thick cover)	Meter	**RO**		-
2.10.6	300 mm x 40 mm (2 mm thick cover)	Meter	80		-
2.11	Supply and fixing of following sizes of **2mm thick powder coated MS raceway,** with openable cover with all accessories as required, identification for power supply to **network racks**, **suspended from ceiling i**ncluding providing suspension arrangement with all accessories in an approved manner complete as required**.**,joints and junction boxes complete as required. including junction boxes for smooth pulling of structured and power cabling (**Note:costing for junction boxes to be considered in this item by tenderer**). It will be the responsibility of the contractor to coordinate with structured cabling contractor for laying of cable. Note: Variation in height may be considered for quoting as floor thickness may vary.				-
2.11.1	200 mm x 75 mm (2 mm thick cover)	Meter	50		-
2.11.2	250 mm x 75 mm (2 mm thick cover)	Meter	**RO**		-
2.11.3	300 mm x 75 mm (2 mm thick cover)	Meter	40		-
2.11.3	450 mm x 75 mm (2 mm thick cover)	Meter	**RO**		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**
3	**CHAPTER 3: DISTRIBUTION BOARD**				

3.1	Supply, Installation, Testing and Commissioning of following three phase and neutral (TPN), MS powder coated with thickness minimum 18 gauge, horizontal , double door (IP 43), recessed/surface mounting type, MCB distribution boards as per specifications. The distribution boards shall have protection against mechanical impact index of minimum IK08. Supplier should provide the testing certificate for Ingress protection and mechanical impact tested at third party location. outer door shall be hinged type, inner door shall be fixed up with screws with cut-outs for MCB operation, copper busbar of at least 1.5 times the rating of incomer MCB, along with din bars, neutral bars, earth bars, lockable door arrangement including all internal connections as required. The board shall have adequate space for termination of incoming and outgoing cables, and also a separate space with proper partition of same material and thickness as specified for distribution board, removable un drilled top & bottom gland plates, should be suitable for recessed mounted or wall/ column mounting type B.				
	Note: 1. Separate neutral bars to be provided for each phase. 2. Dedicated earth busbar isolated from body inside UPS DBs to be provided.				
3.1.1	**14Way TPN DB** (Light/Power)- with 36 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32 Amp, 10kA ,FP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 36 Nosx 6/10/16 SP, C type, 10kA, MCB	Each	**RO**		-
3.1.2	**12Way TPN DB** (Light/Power)- with 30 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32/25 Amp, 10kA ,FP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 30 Nosx 6/10/16 SP, C type, 10kA, MCB	Each	23		-
3.1.3	**8Way TPN DB** (Light/Power)- with 18 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32/25 Amp, 10kA ,FP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 18 Nosx 6/10/16 SP, C type, 10kA, MCB	Each	14		-
3.1.4	**6Way TPN DB** (Light/Power)- with 12 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32/25 Amp, 10kA ,FP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 12 Nosx 6/10/16 SP, C type, 10kA, MCB	Each	2		-
3.1.5	**16Way SPN DB** (Light/Power) - with 12 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 2 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration: Incomer : 63/40/32 Amp, 10kA ,DP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 1 x (63/40/25 Amp, 30mA, DP RCCB) Outgoings : 12 Nosx 6/10/16 Amp SP, C type, 10kA, MCB	Each	**RO**		-
3.1.6	**12Way SPN DB** (Light/Power) - with 8 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 2 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration: Incomer : 63/40/32 Amp, 10kA ,DP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 1 x (63/40/25 Amp, 30mA, DP RCCB) Outgoings : 8 Nosx 6/10/16 Amp SP, C type, 10kA, MCB	Each	1		-
3.1.7	**8Way SPN DB** (Light/Power) - with 4 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 2 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration: Incomer : 40/32 Amp, 10kA ,DP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 1 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 4 Nosx 6/10 Amp SP, C type, 10kA, MCB	Each	**RO**		-

3.1.8	**14Way TPN DB** (UPS/INVERTER)- with 36 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32 Amp, 10kA ,FP, C type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 36 Nosx 6/10/16 SP, D type, 10kA, MCB	Each	**RO**		-
3.1.9	**12Way TPN DB** (UPS/INVERTER)- with 30 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32/25 Amp, 10kA ,FP, D type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40 Amp, 30mA, DP RCCB) Outgoings : 30 Nosx 6/10/16 SP, D type, 10kA, MCB	Each	14		-
3.1.10	**8Way TPN DB** (UPS/INVERTER)- with 18 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32/25 Amp, 10kA ,FP, D type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40 Amp, 30mA, DP RCCB) Outgoings : 18 Nosx 6/10/16 SP, D type, 10kA, MCB	Each	10		-
3.1.11	**6Way TPN DB** (UPS/INVERTER)- with 12 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/40/32/25 Amp, 10kA ,FP, D type MCB Busbar : 100 A Cu busbar. Per phase incomer : 3 x (40 Amp, 30mA, DP RCCB) Outgoings : 12 Nosx 6/10/16 SP, D type, 10kA, MCB	Each	7		-
3.1.12	**16Way SPN DB** (UPS/INVERTER) - with 12 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 2 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration: Incomer : 63/40/32 Amp, 10kA ,DP, D type MCB Busbar : 100 A Cu busbar. Per phase incomer : 1 x (63/40/25 Amp, 30mA, DP RCCB) Outgoings : 12 Nosx 6/10/16 Amp SP, D type, 10kA, MCB	Each	3		-
3.1.13	**12Way SPN DB** (UPS/INVERTER) - with 8 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 2 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration: Incomer : 63/40/32 Amp, 10kA ,DP, D type MCB Busbar : 100 A Cu busbar. Per phase incomer : 1 x (63/40/25 Amp, 30mA, DP RCCB) Outgoings : 8 Nosx 6/10/16 Amp SP, D type, 10kA, MCB	Each	5		-
3.1.14	**8Way SPN DB** (UPS/INVERTER) - with 4 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 2 modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration: Incomer : 40/32 Amp, 10kA ,DP, D type MCB Busbar : 100 A Cu busbar. Per phase incomer : 1 x (40/25 Amp, 30mA, DP RCCB) Outgoings : 4 Nosx 6/10 Amp SP, D type, 10kA, MCB	Each	2		-
3.1.15	**12 Way VTPN DB** with 36 modules suitable for both SP and TP MCBs in outgoing , modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 100/125/63 Amp, 16kA ,TPN MCCB Busbar : 150 A Cu busbar. Outgoings : 36 x (25/32/40/63 Amp, 10kA, C type, SP/TP MCBs)	Each	**RO**		-
3.1.16	**8 Way VTPN DB** with 24 modules suitable for both SP, DP and TP MCBs in outgoing , modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 100/125/63 Amp, 16kA ,TPN MCCB Busbar : 150 A Cu busbar. Outgoings : 24 x (25/32/40/63 Amp, 10kA, C type, SP/TP MCBs)	Each	1		-

3.1.17	**8 Way VTPN DB** with 24 modules suitable for both SP and TP MCBs in outgoing , modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 63/100 Amp, 10kA ,FP MCB Busbar : 150 A Cu busbar. Outgoings : 24 x (25/32/40/63 Amp, 10kA, D type, SP/TP MCBs)	Each	**RO**		-
3.1.18	**6 Way VTPN DB** with 18 modules suitable for both SP and TP MCBs in outgoing , modules for placing incoming switchgear, complete with earth bar, neutral bars, din rails, connections, ferruling, dressing and with following configuration : Incomer : 100/125 Amp, 16kA ,TPN MCCB Busbar : 150 A Cu busbar. Outgoings : 18 x (25/32/40 Amp, 10kA, C type, SP/TP MCBs)	Each	**RO**		-
3.1.19	**8 Way TPN DB -Timer Based DB** - with 12 modules for SP MCBs in outgoing ,2 modules per phase for RCCB, 6 modules for placing incoming switchgear, complete with earth bar, separate neutral bars provided for each phase R,Y,B, din rails, connections, ferruling, dressing and with following configuration : **Incomer :** 40 Amp, 10kA ,FP, C type MCB **1 Set**. Astronomical Time switch programmeable type (0-24) hour with NO and NC contact setting and Automatic selector switch. **3 Nos.** 40 A SP motor duty contactor with NO-NC contact and 230 V A.C coil. **Busbar :** 100 A Cu busbar. Per phase incomer : 3 x (25 Amp, 30mA, DP RCCB) **Outgoings :** 18 Nosx 10/16 SP, C type, 10kA, MCB	Each	**RO**		-
	SUBTOTAL CARRIED OVER TO SUMMARY				-
4	**CHAPTER 4: WIRING**				
	General Notes:				
a.	The rates for point wiring for all the items shall include the following :				
i	-For Lighting: -Switch controlled lights : The Point Wiring rates shall include the wiring of light from the switch or sensor including required GI modular boxes for switches. . For switch controlled lights, the submain wiring from DB till switchboard has been considered elsewhere in the tender. -DB controlled lights : The Point Wiring rates shall include the wiring of light of any length from the distribution board to the light point via sensor if provided. - The rates includes conduit from distribution board to light point. - The cost of switch with modular polycarbonate cover plate for switch controlled lights is also included in the cost -For socket outlets: -The Point Wiring rates shall include the wiring for outlet of any length from the distribution board to the point including required GI modular boxes. - The rates includes conduit from distribution board to socket outlet point. - The cost of switch & socket with modular polycarbonate cover plate is also included in the cost. - All sockets to be checked with a Check Plug socket tester for live-neutral reverse, no earth,neutral fault, live earth reverse, neutral earth reverse.				
ii	Painting of junction boxes upto satisfaction of engineer incharge. The boxes shall be of same make as switches and sockets.				
iii	Embedding conduits and allied fittings in walls/floors/slabs etc. during construction and/or in chases including cutting chases and making good as necessary in the case of concealed conduit work.				
iv	After slab conduit opening GI fish wiring required.				
v	All accessories necessary to complete the wiring as specified.				
vi	Internal wiring between accessories.				
vii	The rate include supply and laying of wiring, conduit including all accessories i.e. clamps, nuts, bolts, bends, socket, junction Box, pull boxes,connector circuit ferrueling etc. fan hook, rod thickness and size should be as per IS.				
viii	Wherever flexible conduit are required GI flexible conduit of suitable size shall be used with checknut.				
ix	Minimum dia of conduit shall be **25mm** unless otherwise specified. Conduiting may be concealed or surface mounted (Exposed) as the case may be. (if required 20mm conduit can only be used for single circuit of 1.5sq.mm)				
x	All sockets shall be provided with equivalent rating switches.				
b.	DBs to be provided and located in designated areas as shown in electrical drawings				
c.	All circuit & point wiring shall be colour coded & shall have ferruling on either end for circuit identification.				

d.	If **PVC conduits** is being used, it shall be of **FRLS type.** The **exposed running** conduit shall have minimum wall thickness of **2mm (Rigid heavy duty HMS type)** and **concealed runnig conduit** shall have minimum wall thickness of **1.6mm (Rigid Medium duty MMS type)** unless otherwise specified. OEM specified adhesive to be used for joining/ fixing of FRLS PVC conduits. The solvent must be used in between fixing of PVC conduit and accessories such as bend/ sockets etc.				
e.	If **metallic (MS or GI) conduits** are being used, it shall have **1.6mm wall thickness** upto **32mm dia** and conduits **above 32mm dia** shall have **wall thickness of 2mm** unless otherwise specified. OEM specified methods to be used for joining/ fixing of conduits.				
f.	**Flexible conduits**, where ever required, shall be of **Corrugated pattern finished coloured PVC Coated (min 120gsm) Pre-Galvanized Steel (min Z120GSM)** as per IS:3480 & BS:731-1 latest as on date and complete with couplers.				
g.	The outer surface of conduit including all bends, unions, tees, junction boxes etc. forming part of the conduit system shall be adequately protected mechanical impact during execution. Contractor shall be responsible for executing and handing over of undamaged conduiting system.				
h.	Where the conduits are to be laid along the trusses, steel joints 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.				
i.	The recessed Switches & Socket outlet **GI boxes** shall be of mimium **1.2mm thick** for brick wall & partitions and **2.0mm thick** for Mivan shuttering. The **GI boxes** shall be of the same make / manufacturer as of the switches & sockets. Local make boxes are not to be used.				
j.	Wiring terminations shall be made using proper sized copper thimbles/ lugs.				
k.	The rates shall include material & labour for any length of circuit (P+N+E) and point wiring (P+N+E), rigid and flexible conduiting, bends, junction boxes, pull boxes, screws, washers, check nuts, couplers, saddles, hangers supports, GI pull wire, civil work comprising chipping, cutting chases, fixing conduits & making good or surface clamping of conduit work as the case may be, modular switches, socket outlets, Electronic fan regulators surface or recessed outlet boxes as the case may be, ceiling rose, rigid and flexible conduit (PVC / GI / M.S.) as may be required, connectors and terminal blocks of proper rating etc. & sleeves etc. including lugs/ thimbles for terminations. Fan points wiring shall include switch as well as electronic speed regulator, and fan hook box with fan hook.				
l.	The internal layout may vary from tender drawing. If it is the case, no variation shall be payable for wire and conduit length increased in GFC drawing.				
m.	All the switch boxes, outlet and junction boxes shall be covered with Charcoal grey / Black Polycarbonate modular cover plate. (variation in color of modular plate and switch sockets shall be considered while quoting)				
4.1	Conduiting, wiring including termination for primary light point switch controlled with **2 x 1.5 sq. mm PVC** insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100 V grade** wire in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above wiring in conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, providing & fixing a **6 amp. switch** with approved modular polycarbonate cover plate in **1.2mm thick GI box** and including the cost of running **1.5 sq. mm PVC** insulated FRLS-H single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100 V grade** earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags.				
4.1.1	First point controlled by one no. 6 amp one way switch.	Each	500		-
4.1.2	First point controlled by two nos. 6 amp two way switch.	Each	10		-
4.2	Same as item 4.1 above but **Loop Point** i.e. wiring including termination of point looped from first point with **2 x 1.5 sq. mm** PVC insulated FRLS-H single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100 V grade** wire (controlling switch in item 1.1) in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring and including the cost of running **1.5 sq. mm** PVC insulated FRLS-H single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V grade** earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags.	Each	550		-

4.3	Conduiting, wiring including termination for the following light points controlled by MCB in DB / sensor with **2 x 2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100 V grade** wire in surface / recessed 1.6mm thick **MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for the cost of wiring and including the cost of running **2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor 1100V grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. (Cost of MCB/sensor has been taken elsewhere in the tender)				-
4.3.1	First point controlled by MCB in DB	Each	170		-
	Same as item No. 4.3 above but LOOP POINT i.e. wiring including termination of point looped from first point with **2 x 2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, Class-2 stranded/ multistranded copper conductor **1100 V** grade wire in surface / recessed **1.6mm thick MS conduits i**n Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for the cost of wiring and including the cost of running **2.5 sq. mm** PVC insulated FRLS-H single core (RoHS compliance) confirming to IS:694, Class-2 multistranded copper conductor 1100V grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags.	Each	1000		-
4.4	Conduiting, wiring including termination for 240 volt **6 amp single phase and neutral** socket outlet with switch (wiring from distribution board to first 6A socket) with **2 x 2.5 sq. mm** PVC insulated FRLS-H single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/multistranded copper conductor **1100V grade** wires in recessed in Wall/Slab **1.6mm thick MS conduits** and earthing. The rates includes supply and laying of above conduit and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and providing and fixing of a **6 amp socket outlet controlled with 1x6A switch**, both with moulded cover plate in recessed **1.2mm thick GI box** for socket & switch and including earthing of the earth pin with **2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V grade** earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. **(First Point)**	Each	69		-
4.5	Conduiting, wiring including termination for 240 volt **6 amp single phase and neutral** socket outlet with switch (looped to first point considered above in item no.-4.4) with **2 x 2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/multistranded copper conductor **1100 V grade** wires in recessed in Wall/Slab **1.6mm thick MS conduits** and earthing. The rates includes supply and laying of above conduit and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and providing and fixing of a **6 amp socket outlet controlled with 1x6A switch**, both with moulded cover plate in recessed **1.2mm thick GI box** for socket & switch and including earthing of the earth pin with **2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V grade** earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. **(Loop Point)**	Each	161		-
4.6	Conduiting, wiring including termination for 240 volt **6/16 amp single phase and neutral** power socket outlet **with switch** (wiring from distribution board to first 6/16A socket) with **2 x 4.0 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **6/16 amp socket outlet** controlled with **16 amp** 240 volt single pole mounted switch as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **4.0 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. **(First Point).**	Each	140		-

4.7	Conduiting, wiring including termination for 240 volt **6/16 amp single phase and neutral** power socket outlet **with switch** (looped to first point considered above in item no.-4.6) with **2 x 4.0 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **6/16 amp socket outlet** controlled with **16 amp** 240 volt single pole mounted switch as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **4.0 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. **(Loop Point).**	Each	140		-
4.8	Conduiting, wiring including termination for 240 volt **16 amp single phase and neutral** power socket outlet **with switch** (wiring from distribution board to first 16A socket) with **2 x 4.0 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **16 amp socket outlet** controlled with **16 amp** 240 volt single pole mounted switch as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **4.0 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. **(First Point).**	Each	175		-
4.9	Conduiting, wiring including termination for 240 volt **16 amp single phase and neutral** power socket outlet **with switch** (looped to first point considered above in item no.-4.8) with **2 x 4.0 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **16 amp socket outlet** controlled with **16 amp** 240 volt single pole mounted switch as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **4.0 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. **(Loop Point).**	Each	25		-
4.10	Conduiting, wiring including termination for 240 volt **25 amp 3 pin single phase and neutral power socket outlet** with **2 x 6.0 sq. mm** PVC insulated **FRLS** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **25 amp socket outlet** controlled with **25 amp switch** as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **6.0 sq.mm** PVC insulated **FRLS** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V grade earth wire** for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags	Each	**RO**		-
4.11	Conduiting, wiring including termination for 240 volt **25 amp 3 pin single phase and neutral power socket outlet** with **2 x 6.0 sq. mm** PVC insulated **FRLS** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **25 amp socket outlet** controlled with **25 amp SP MCB** as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **6.0 sq.mm** PVC insulated **FRLS** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V grade earth wire** for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags	Each	**RO**		-

4.12	Conduiting, wiring including termination for 240 volt **25 amp 3 pin** single phase and neutral power socket outlets with **2 x 6.0 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100** Volt grade wires in surface / recessed **2mm thick FRLS heavy duty PVC conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **25 amp socket** outlet controlled with **25 amp SP MCB** in **weather- proof** (**IP-65 rated**) enclosure as required with moulded cover plate in a recessed 1.2mm thick GI box including earthing of the earth pin with **6.0 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags **(for AC outdoors).**	Each	2		-
4.13	Conduiting, wiring including termination for 240 volt **6/16 amp single phase and neutral** power socket outlets with **2 x 2.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/ multi-stranded copper conductor **1100 Volt** grade wires in surface / recessed **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **6/16 amp socket outlet** controlled with **16 amp** 240 volt single pole mounted switch as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **2.5 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags **(2 to 4 outlet shall be connected to each circuit) (For AC Indoor Units/VAV boxes)**	Each	105		-
4.14	Conduiting, wiring including termination for **USB/Type-C power socket** with usb wall charger (Rated Current : **5Amp** Rated voltage: 110V~250V, DC power output: 5V minimum 1500mah, 1A, 2.1A, 2 port USB smart charger) point with **3 x 1.5 sq. mm FRLS-H, Class-2** single core (RoHS compliance) confirming to IS:694, PVC insulated copper conductor **1100 V** wires in recessed in Wall/Slab **1.6mm thick MS conduits** and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **USB/Type-C socket outlet** as required with moulded cover plate in a recessed **1.2mm thick GI box** including earthing of the earth pin with **1.5 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, Class-2 multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags **(Looped from nearby circuit)**	Each	5		-
4.15	Conduiting, wiring including termination for the **Call bell buzzer controlled with bell push** with **2 x 1.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/multistranded copper conductor **1100 V grade** wire in **1.6mm thick MS conduits** in Wall/Slab and earthing. The rates includes supply and laying of above conduit including cost of providing saddles, hangers, support etc for surface conduiting and/or cost of cutting and filling chases for recessed conduiting, the cost of wiring, and including providing and fixing of **call bell buzzer with 2 module bell push** with modular cover plate in **1.2mm thick** recessed GI box and including the cost of running **1.5 sq. mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, **Class-2** multistranded copper conductor **1100V grade earth wire** for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags. (Looped to lighting circuit as shown in drawing)	Each	4		-
4.16	Supplying and fixing of 1 or 2 Module (75 mmX75 mm), 1.2mm thick GI box with earth pin recessed in wall etc as required.	Each	100		-
4.17	Supply and ,installation of floor mounted ega box for housing minimum **2 nos. 6A sockets with switch, 3 nos. data/voice** points complete as required. Note : The ega boxes should be high strength. The cost of switch, socket and data/voice points has been considered elsewhere in BOQ.	Each	5		-
4.18	Supply and ,installation of floor mounted ega box for housing minimum **1 nos. 6A sockets with switch, 2 nos. data/voice** points complete as required. Note : The ega boxes should be high strength. The cost of switch, socket and data/voice points has been considered elsewhere in BOQ.	Each	10		-
4.20	Wiring for **circuit/submain** wiring alongwith earth wire with the following sizes of PVC insulated FRLS single core (RoHS compliance) confirming to IS:694, **Class-2** stranded/multistranded copper conductor **1100 V grade,** single core cable in existing surface/recessed conduit complete as required and as per specifications.				-

4.20.1	2 x 1.5 sq.mm. + 1 x 1.5 sq.mm. earth wire.	Meter	500		-
4.20.2	2 x 2.5 sq.mm. + 1 x 2.5 sq.mm. earth wire.	Meter	6,000		-
4.20.3	2 x 4.0 sq.mm. + 1 x 4.0 sq.mm. earth wire.	Meter	300		-
4.20.4	2 x 6.0 sq.mm. + 1 x 6.0 sq.mm. earth wire.	Meter	530		-
4.20.5	4 x 4 sq.mm. + 2 x 4 sq.mm. earth wire	Meter	**RO**		-
4.20.6	4 x 6 sq.mm. + 2 x 6 sq.mm. earth wire	Meter	280		-
4.20.7	4 x 10 sq.mm. + 2 x 10 sq.mm. earth wire	Meter	**RO**		-
4.20.8	4 x 16 sq.mm. + 2 x 16 sq.mm. earth wire	Meter	**RO**		-
4.21	Supplying and fixing in position the following size **MS conduits** including all accessories, running exposed concealed in ceiling/wall/floor as required including **16 gauge M.S. junction or pull boxes** with 3mm thick cover plate complete with 1.6 mm dia G.I. pull wires in the length of conduit complete as required and as per specifications or upto the satisfaction of engineer-in-charge.				-
4.21.1	20 mm	Meter	400		-
4.21.2	25 mm	Meter	4,500		-
4.21.3	32 mm	Meter	350		-
4.21.4	40 mm	Meter	**RO**		-
4.21.5	50 mm	Meter	**RO**		-
4.21.6	25 mm dia flexible conduit (Corrugated pattern finished coloured PVC Coated (min 120gsm) Pre-Galvanized Steel (min Z120GSM))	Meter	1,000		-
4.22	Supplying and fixing in position the following sizes **ISI Mark Rigid Heavy duty HMS PVC conduit** as per IS:9537 Part-3 latest as on date concealed in slab/wall/floor including cutting the wall or running on surface with saddles including all accessories complete with 1.6 mm dia G.I. pull wires in the length of conduit complete as required and as per specifications or upto the satisfaction of engineer-in-charge.				-
4.22.1	20 mm	Meter	**RO**		-
4.22.2	25 mm	Meter	**RO**		-
4.22.3	32 mm	Meter	**RO**		-
4.22.4	40 mm	Meter	**RO**		-
4.22.5	50 mm	Meter	**RO**		-
4.23	Supply, installation, testing, commisioning of **modular TV antenna Co-Axial socket outlet (RG-6)** complete as required with all acessories and upto the satisfaction of engineer-in-charge.	Each	10		-
4.24	Supplying, drawing, connecting, testing and commissioning of **TV Coaxial cable RG 6** in existing conduit complete as required and upto the satisfaction of engineer-in-charge.	Meter	700		-
4.25	Supplying, drawing, connecting, testing and commissioning of **TV Coaxial cable RG 11** in existing conduit/raceway complete as required and upto the satisfaction of engineer-in-charge.	Meter	500		-
4.26	Supply, Installation, Testing & Commissioning of **Antenna Splitter** complete as required and upto the satisfaction of engineer-in-charge.	Each	4		-
4.27	Wiring including termination for the following configuration of **outlets for workstations with 3 core x 2.5 sq.mm Copper conductor cable**, **PVC** insulated PVC sheathed colour coded wires of **1.1KV grade** in **existing conduit/raceway** including supplying and fixing following numbers socket and switch housed in GI box with approved White polycarbonate modular cover plate as required. Notes: # Colour coding shall be strictly followed for wiring. **For Raw in one circuit maximum eight workstations shall be looped and for UPS in one circuit maximum six workstations shall be looped**. All the circuit must be dressed with circuit identification tags # The rates in each item below includes specified copper cable from distribution board to the first point.				-
4.27.1	1 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (Raw power at workstations) (RAW word to be engraved on sockets)	Set	70		-
4.27.2	2 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (Raw power at workstations) (RAW word to be engraved on sockets) (Internal looping between socket of same table shall be included in the cost)	Set	**RO**		-
4.27.3	1 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (UPS power at workstations) (UPS word to be engraved on sockets)	Set	**RO**		-
4.27.4	2 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (UPS power at workstations) (UPS word to be engraved on sockets) (Internal looping between socket of same table shall be included in the cost)	Set	350		-
4.27.5	**1 No. 6/16A, round pin outlets** controlled by **1 No. 16A** switch. (Raw power at workstations) (RAW word to be engraved on sockets)	Set	6		-

4.28	Wiring including termination for the following configuration of **outlets for workstations with 3 core x 2.5 sq.mm Copper conductor cable**, **PVC** insulated PVC sheathed colour coded wires of **1.1KV grade** in **existing conduit/raceway** including supplying and fixing following numbers socket and switch housed in GI box with approved White polycarbonate modular cover plate as required. Notes: # Colour coding shall be strictly followed for wiring. **For Raw in one circuit maximum eight workstations shall be looped and for UPS in one circuit maximum six workstations shall be looped**. All the circuit must be dressed with circuit identification tags # The rates in each item below includes specified copper cable from first point to the Loop point.				-
4.28.1	1 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (Raw power at workstations) (RAW word to be engraved on sockets)	Set	1,100		-
4.28.2	2 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (Raw power at workstations) (RAW word to be engraved on sockets) (Internal looping between socket of same table shall be included in the cost)	Set	**RO**		-
4.28.3	1 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (UPS power at workstations) (UPS word to be engraved on sockets)	Set	**RO**		-
4.28.4	2 No. **6A**, **round pin outlets** controlled by **1 No. 6A switch**. (UPS power at workstations) (UPS word to be engraved on sockets)	Set	1,375		-
4.28.5	**1 No**. **6/16A**, **round pin outlets** controlled by **1 No. 16A** switch. (Raw power at workstations) (RAW word to be engraved on sockets)	Set	6		-
4.29	Wiring including termination for **USB/Type-C power socket** with usb wall charger (Rated Current : **5Amp** Rated voltage: 110V~250V, DC power output: 5V minimum 1500mah, 1A, 2.1A, 2 port USB smart charger) point with **3 x 1.5 sq. mm FRLS-H, Class-2** single core (RoHS compliance) confirming to IS:694, PVC insulated copper conductor **1100 V** wires in existing conduit or raceway and earthing. The rates includes supply and laying of wiring, and including providing and fixing of **USB/Type-C socket outlet** as required with moulded cover plate in a existing furniture or fliptop box or ega box including earthing of the earth pin with **1.5 sq.mm** PVC insulated **FRLS-H** single core (RoHS compliance) confirming to IS:694, Class-2 multistranded copper conductor **1100V** grade earth wire for loop earthing etc. complete as per specifications and as required. All the circuit must be dressed with circuit identification tags **(Looped from same circuit at workstation)**	Set	200		-
4.30	Supplying and fixing of **25 amp 3-pin 1-phase industrial socket outlet**, Self locking type including supplying FR Thermoplastic boxes of suitable size **DP C Curve MCB** with flap and a plug top, complete as required and as per specifications.	Each	1		-
4.31	Supplying and fixing of **32 amp 3-pin 1-phase industrial socket** outlet including supplying Halogen-free FR PVC moulded boxes of suitable size, weather proof **(IP 67)**, resistant to temperatures of -25°C to +40°C, 32 amp DP, **100mA RCBO 10 KA Breaking capacity and a plug top, complete as required and as per specifications.**	Each	2		-
4.32	Supplying and fixing of **63 amp 5-pin 3-phase industrial socket** outlet including supplying Halogen-free FR PVC moulded boxes of suitable size, weather proof **(IP 67)**, resistant to temperatures of -25°C to +40°C, **63 amp FP, 100mA RCBO 10 KA** Breaking capacity and a **plug top**, complete as required and as per specifications.	Each	2		-
4.33	Supplying and fixing of **32 amp industrial socket outlet**, Self locking type including supplying FR Thermoplastic boxes of suitable size **32 amp DP D Curve MCB** with flap and a plug top, complete as required and as per specifications.(Server/Network/ Hub Room)	Each	50		-
4.44	Supply, installation, testing & commissioning of high performance, non regulating type **Occupancy detector** for lighting control with photo cell holding light off in bright ambient conditions when area becomes occupied having 180 degree angle of viewing, Up to **800 sq.ft** major motion coverage and **400 sq.ft** minor motion coverage and off delay range of **1 to 60** minutes complete as required.	Each	15		-
					-
	SUBTOTAL CARRIED OVER TO SUMMARY				-
5	**CHAPTER 5: EARTHING SYSTEM**				
A.	**Earthing System**				

5.1	Supply, installation, connections,testing & commissioning of 17.2 mm dia low carbon, high tesile mild steel rod of 3 meter length having copper bonding of 250 micron, along with 25 kg of maintenance free ground enhancing compound **(0.2 ohm resistivity)** to achieve an earth resistance of less than 1 ohms with fused rod to tape clamp for interconnection of strip from earth pit to equipment. Provide masonry chamber with concrete base, CI man-hole cover (cover to be heavy duty) with frame (300mm x 300mm) and make earth pit sign/ identifcation no in each earth station **(Maintenance Free Earthing)**	Each	8		-
5.2	Supply & Laying of following Tinned copper earth wire/earth strip, GI earth wire/strip fixed on wall/side of trench/slab /column /beam/ shaft, connection to panel/DBs/SFU's etc. with 5mm thick GI Spacers & 2mm thick GI Saddle including connection/termination with suitable GI/Cu. thimble & nut bolts etc as required to do the job in all respect in accordance with laid specification, drawing or upto the satisfaction of engineer in charge.				-
5.2.1	25x6 mm G.I. Strip	Meter	3,500		-
5.2.2	25x6 mm Cu. Strip (PVC insulated heat shrinkable sleeves)	Meter	**RO**		-
5.2.3	50x6 mm G.I. Strip	Meter	50		-
5.2.4	8 swg GI wire	Meter	50		-
5.2.5	8 swg Cu. wire	Meter	**RO**		-
4.3	Supply, installation, testing and commissioning of sheet metal enclosed 275 x 150 x 125 (D) mm insulated earth distribution board with 1 nos. 25 x 6 mm tinned copper earth bars on SMC insulator suitable for 8/10 nos connections complete with all fixing accessories with a glass cover etc as required to do the job in all respect in accordance with laid specification, drawing or upto the satisfaction of engineer in charge.	Each	4		-
4.4	Supply, installation, testing and commissioning of sheet metal enclosed 300 x 200 x 150 (D) mm insulated earth distribution board with 1 nos. 50 x 6 mm tinned copper earth bars on SMC insulator suitable for 8/10 nos connections complete with all fixing accessories with a glass cover etc as required to do the job in all respect in accordance with laid specification, drawing or upto the satisfaction of engineer in charge.	Each	3		-
4.5	Supplying, unloading, storing , laying, testing and commissioning of following sizes **XLPE** insulated (Heavy duty) **Copper** conductor cables suitable for working voltage upto and including 1100 Volts , laid and tied on existing overhead cable trays; or laid and tied over MS supports in masonry trenches including providing MS supports and clamps for fixing to supports in an approved manner complete as required and as per specifications. **Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site**				-
4.5.1	1C X 185 sqmm copper conductor wire armoured	Meter	600		-
4.5.2	1C X 150 sqmm copper conductor wire armoured	Meter	**RO**		-
4.5.3	1C X 95 sqmm copper conductor wire armoured	Meter	**RO**		-
4.5.4	1C X 70 sqmm copper conductor wire armoured	Meter	600		-
4.5.5	1C X 50 sqmm copper conductor wire armoured	Meter	**RO**		-
4.5.6	1C X 35 sqmm copper conductor wire armoured	Meter	400		-
4.5.7	1C X 10 sqmm copper conductor wire armoured	Meter	**RO**		-
4.5.8	2C X 6 sqmm copper conductor armoured	Meter	1,128		-
4.6	Supplying, unloading, storing , laying, testing and commissioning of following sizes **PVC** insulated (Heavy duty) **Copper** conductor cables suitable for working voltage upto and including 1100 Volts , laid and tied on existing overhead cable trays; or laid and tied over MS supports in masonry trenches including providing MS supports and clamps for fixing to supports in an approved manner complete as required and as per specifications. **Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site**				-
4.6.1	1C X 95 sqmm copper conductor unarmoured	Meter	100		-
4.6.2	1C X 70 sqmm copper conductor unarmoured	Meter	**RO**		-
4.6.3	1C X 50 sqmm copper conductor unarmoured	Meter	100		-
4.6.4	1C X 35 sqmm copper conductor unarmoured	Meter	**RO**		-
4.6.5	1C X 25 sqmm copper conductor unarmoured	Meter	**RO**		-
4.6.6	1C X 16 sqmm copper conductor unarmoured	Meter	**RO**		-
4.6.7	1C X 10 sqmm copper conductor unarmoured	Meter	500		-
4.6.8	1C X 6 sqmm flexible wire including termination	Meter	1,000		-
4.7	Termination of the following sizes of PVC / XLPE insulated **Copper** conductor cable including providing terminal lugs,**single/double compression** glands crimping the joints,providing insulation, effecting terminal connections to the equipment complete as required.				-
4.7.1	1C X 185 sqmm copper conductor wire armoured	Each	8		-
4.7.2	1C X 150 sqmm copper conductor wire armoured	Each	**RO**		-
4.7.3	1C X 95 sqmm copper conductor wire armoured	Each	16		-
4.7.4	1C X 70 sqmm copper conductor wire armoured	Each	**RO**		-
4.7.5	1C X 50 sqmm copper conductor wire armoured	Each	**RO**		-

4.7.6	1C X 35 sqmm copper conductor wire armoured	Each	8		-
4.7.7	1C X 10 sqmm copper conductor wire armoured	Each	**RO**		-
4.7.8	1C X 95 sqmm copper conductor unarmoured	Each	16		-
4.7.9	1C X 70 sqmm copper conductor unarmoured	Each	16		-
4.7.10	1C X 50 sqmm copper conductor unarmoured	Each	16		-
4.7.11	1C X 35 sqmm copper conductor unarmoured	Each	**RO**		-
4.7.12	1C X 25 sqmm copper conductor unarmoured	Each	**RO**		-
4.7.13	1C X 16 sqmm copper conductor unarmoured	Each	**RO**		-
4.7.14	1C X 10 sqmm copper conductor unarmoured	Each	44		-
4.7.15	2C X 6 sqmm copper conductor armoured	Each	246		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**
6	**CHAPTER 6: MISCELLANEOUS WORKS & CONDUTING FOR ELV SYSTEM**				
6.1	Providing & fixing in position 1000 mm wide , Electrical Insulating Rubber Mats as per IS 15652:2006, 2 mm thick, suitable up to 1.1 KV , fire retardant, no effect of acids, alkalis and transformer oils, moisture proof, high tensile strength and texture finish / cloth impression (Anti slip , marking on top)	Meter	20		-
6.2	Supply & fixing shock treatment chart duly mounted on a wooden frame with 5 mm thick glass as required (approx front area 1.20 Sq Meter)	Each	2		-
6.3	Providing and fixing L.V. danger notice plate of 200 mm X 150 mm, made of mild steel, at least 2 mm thick, and vitreous enameled white on both sides, and with inscription in single red colour on front side as required.	Each	5		-
6.4	Supply of Tool box & First Aid Box with all necessary tools for maintenance of electrical installation & First aid.	Each	2		-
6.5	Providing temporary construction lighting and power including Project Managers office area by using required nos. of fixtures (minimum 250 Lux), required flexible double insulated copper wiring, distribution board, minimum 3 nos. flood light , earthing, main panel with incoming MCCB and required MCCB in the outgoing for distributing the power throught the duration of the project. It will be the responsibility of Electrical Contractor to distribute power to all the contractors working at site. The rates shall be all inclusive. The material bought by the contractor shall be the property of the contractor and after the work is completed it can be taken back by him. (All item mentioned above, shall be new and of good quality by considering site safety parameter.Old and repaired item shall never be allowed to used at site.)	LS	1		-
6.6	Supplying and fixing in position the following size **MS conduits** including all accessories, running exposed concealed in ceiling/wall/floor as required including **16 gauge M.S. junction or pull boxes** with 3mm thick cover plate complete with 1.6 mm dia G.I. pull wires in the length of conduit complete as required and as per specifications or upto the satisfaction of engineer-in-charge.				-
6.6.1	20 mm	Meter	**RO**		-
6.6.2	25 mm	Meter	3,000		-
6.6.3	32 mm	Meter	500		-
6.6.4	40 mm	Meter	**RO**		-
6.6.5	50 mm	Meter	**RO**		-
6.6.6	25 mm dia flexible conduit (Corrugated pattern finished coloured PVC Coated (min 120gsm) Pre-Galvanized Steel (min Z120GSM))	Meter	1,000		-
6.7	Supplying and fixing in position the following sizes **ISI Mark Rigid Heavy duty HMS PVC conduit** as per IS:9537 Part-3 latest as on date concealed in slab/wall/floor including cutting the wall or running on surface with saddles including all accessories complete with 1.6 mm dia G.I. pull wires in the length of conduit complete as required and as per specifications or upto the satisfaction of engineer-in-charge.				-
6.7.1	20 mm	Meter	**RO**		-
6.7.2	25 mm	Meter	**RO**		-
6.7.3	32 mm	Meter	**RO**		-
6.7.4	40 mm	Meter	**RO**		-
6.7.5	50 mm	Meter	**RO**		-
6.9	Supply, installation & testing of **UL listed 2 hours** fire rated **sealant for** packing the cutouts, cable/earthing entries, and other cutouts.	Sq. Mtr.	100		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**
7	**CHAPTER 7 : FIXING OF LIGHTING FIXTURES & FANS**				
	Notes:				
a	The fixtures shall be suitable for single phase, 50 cycles, 230 Volts, A.C. supply system.				
b	All fixtures shall be factory wired with copper conductor wires.				
c	All fixtures shall be supplied with Drivers, lamps/bulbs, as specified.				
d	The rate shall be quoted for the Catalogue no. specified for the fixture however if contractor wants to supply equivalent then sample shall have to be got approved from Architect before procurement.				
e	All the samples shall be submitted within two weeks of the issue of work order, for approval from the Architect.				

f	Any loss & damage during transportation shall be in scope of Electrical Contractor till final testing & commissioning.				
g	The Lighting Fixture supplier will be responsible for ensuring that lighting fixture is fixed properly by the Contractor as per their requirement.				
h	The rates for fixing of lighting fixtures shall include all fixing accessories that are required to make the installation complete in all respects including the following :-				
i	Providing connecting wires and channel support wherever required.				
ii	Internal wiring between accessories.				
iii	Self interlocking connector blocks for connecting the wires from fixtures to the points.				
iv	Earthing of fixtures with PVC insulated copper conductor FR wire.				
v	Approved colour powder coated down rods, clamps and other components and fixing accessories wherever required.				
vi	Testing of fixtures before Installation.				
vii	Identification tags with a distance not more 3 meters to be used for circuit identification				
7.1	Receiving, fixing in position, effecting proper connections, testing and commissioning of following type of **Indoor** LED fixtures Note: Contractor shall study RCPs and quote accordingly				
7.1.1	Linear Fixture (1200mm)	Each	86		-
7.1.2	Linear Fixture (1800mm)	Each	31		-
7.1.3	Linear Fixture	Meter	885		-
7.1.4	Recessed Downlighter (6W to 20W)	Each	1,374		-
7.1.5	Surface Downlighter (10W to 30W)	Each	344		-
7.1.6	COB (10W to 30W)	Each	380		-
7.1.7	5mtr IP20 flexible LED strip light	Each	787		-
7.1.8	Sqare Fixtures (2'x2')	Each	52		-
7.1.9	Pendant Lights	Each	130		-
7.1.10	Cove Light / LED Strip	Meter	100		-
7.1.11	Suspended Decorative light	Each	120		-
7.1.12	Pendant Decorative Light	Each	20		-
7.1.13	Elliptical Decorative light	Each	2		-
7.1.14	Magnetic Track	Each	40		-
7.1.15	Suspension Wire	Each	40		-
7.1.16	Magnetic Foldable light	Each	80		-
7.1.17	Fabric light	Each	**RO**		-
7.1.18	Table lamp	Each	2		-
7.1.19	CM Cabin Light	Each	1		-
7.1.20	Wall Light	Each	2		-
7.1.21	Stretch Fabric LED Light Profile	Sq. Meter	55		-
					-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**

PROJECT - QCI, NAUROJI NAGAR, DELHI					
PACKAGE - LT PANELS					
DETAILED ESTIMATE					
S.NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
1	**CHAPTER 1: LT PANELS**				
	Design, manufacture, testing at works, supply, installation, testing & commissioning of following floor / wall mounted clad switchboard, factory built, modular, sectionalised, dead front, fully compartmentalized with hinged lockable detachable front & back openable, **Form IIIB type** extensible **Partial Type Tested Assembly, IEC-60439 compliant** LT cubicle panel of suitable size, suitable for operation on **433 volts, 50 Hz AC** 3 phase 4 wire supply system fabricated from powder coated CRCA sheet steel, with all load bearing members of minimum 2mm thickness , all non-load bearing members of minimum 1.6mm thickness and minimum 3mm thick gland plates. The panels shall be fabricated in easily transportable sections, length, height, depth etc. to match with site condition, having vibration free structure with stiffeners provided as required.				
	Note - The following minimal characterstics shall be considered for each panel :				
a.	Operating Voltage - 433 Volts				
b.	Frequency - 50 Hz (+/- 3%)				
c.	IP 43 for Indoor Panels & IP 55 for Outdoor Panels				
d.	Pollution Degree - 3				
e.	Ambient Temperature - 45 Degree Celsius				
f.	Annual Average Relative Humidity - 50%				
g.	An approval shall be taken for each panel before manufacturing.				
h.	The Switchboards shall have provision to accommodate all cables from the bottom /top as required.				
i.	All live accessible parts shall be shrouded with 1mm thick polycarbonate/3 mm thick FRP sheet and all equipment shall be finger touch proof. The busbar insulation shall be with heat shrinkable sleeves according to the colour code. SMC shrouds and busbar supports shall be used. All MCCB door handle shall be interlocked and lockable in OFF position.				
j.	Galvanised hardware with zinc passivation shall be used in fabrication of Switchboards.				
k.	The bottom base ISMC channel of suitable section but not less than 75mm x 50mm x 5mm shall be used.				
l.	Each panel shall have a suitable aluminium earth bus but not less than 25mm x 6mm throughout the length of switchboards at the rear with 2 nos. earth studs on either sides of panel board for connecting earthing strips. (Except Main Isolation panel where earth bus shall be 50mmx10mm)				
m.	The busbar insulation shall be with heat shrinkable sleeves according to the colour code. SMC shrouds and busbar supports shall be used.				
n.	PVC insulated FRLS copper conductor to be used for connections and interconnection with solid conductor wires and control wiring with 1.5 sqmm. & 2.5sqmm for voltage & current respectively.				
o.	Suitable Aluminium earth bus to be provided throughout the length of Switchboards.				
p.	All indication lamps / illuminated push buttons shall be LED type.				
q.	All incomers shall be provided with R,Y,B indication lamps. 2A/6A SP MCBs shall be used as backup protections.				
r.	All MCCBs incomers shall be provided at least with R, Y, B, ON, OFF & Trip indication lamps unless otherwise specified and All MCCBs outgoungs shall be provided at least with ON, OFF & Trip indication lamps unless otherwise specified.				
s.	All MCCBs shall be with thermal magnetic releases up to 160A rating and with microprocessor based releases above 160 A rating, line load reversibility, Ics = 100% Icu, & extended rotary handle unless otherwise specified				
t.	All micrprocessor based MCCBs shall have inbuilt earth fault protection and all incomer thermal magnetic based MCCBs shall be provided earth fault protection through E/F module having separate indication of overcurrent & earth fault on panel door.				
u.	All MCCB shall have rotary handle with pad locking arrangement. The MCCBs shall be lockable in OFF position.				
v.	Door interlocking for all feeders shall be provided.				
w.	All TP MCCB'S shall have solid neutral link,disconnect type.				
x.	The MCCBs shall have single frame size upto maximum rating available with OEM to reduce the requirement of spares management.				
y.	All breaking Capacity for MCCB to be Ics=100%Icu and Uimp of 8KV.				

z.	All control & power wiring from all components such as switchgears, meters, relays etc. shall be broughtout upto the terminal blocks inside cable alley.				
aa.	All outgoing terminals shall be provided in cable alley on proper insulated supports (SMC).				
ab.	Any panel which has almirah type doors at back side shall be provided with lockable arrangement.				
ac.	Space heater shall be provided with thermostat with 6A MCB as backup protection inside all cable alleys controlled with feeder 20 A DP MCB 10 KA.				
ad.	Provision of one 6/16 amp socket & compartment lighting for each vertical section of each Panel.				
ae.	All MCB to be C Curve for raw power and D curve for UPS power.				
af.	Removable lifting hook shall be provided in all transportation section.				
ag.	Multifunction meters installed shall be BMS Compatible, capable of delivering Bacnet, Modbus or Lonworks protocol etc.				
ah.	Bus bar shall be high conductivity (99%), ETP - Electrical grade copper or 50-55% Aluminium as specified in BOQ.				
ai.	Bus bar shall be designed on 45 deg. Ambient temperature and limit of temperature rise shall be 35 deg. Over and above Ambient temperature.				
aj.	Bus bars shall be with heat shrinkable PVC sleeves.				
ak.	MCB's shall be of minimum 10kA fault with stand capacity.				
al.	Illuminated push button on Starter Panels of Pumps.				
am.	Interlocking / Auto start command terminals for starter Panels.				
an.	Concerning vendor needs to furnish the busbar calculations (for both phase and earth bus) at the time of GA approval and busbar size has to be as per the approved GA drawing.				
ao.	Provision for accommodating incoming and outgoing cables adequately shall be as per single line diagram for each panel.				
ap.	The starter shall comprise of all necessary power and control equipments including Auto / Manual selector switch, illuminated Start/stop push butons, LED indications, Star contactor , delta contactor , timer relay contactor, electronic timer, potential free NO/NC contacts and necessary control wirings properly connected in fully usable state.				
aq.	Interlocking / Auto start command terminals for starter Panels.				
ar.	Minimum utilization catagory for all contactors shall be AC3 and contactor shall be capable to withstand the steady state (full load) and starting inrush current.				
as.	The starter shall have necessary protection device whose settings and ratings shall be as per the type-2 co-ordination chart.				
at.	The starter shall have inbuilt protection against overcurrent, short circuit and single phasing.				
au.	All these starters shall be equipped with discharge resistors suitable for making the starter run under the closed transition state.				
av.	All below mentioned starters shall be BMS compatible and additional contacts and wiring required for BMS integration shall be provided.				
aw.	The starter component selection shall stricly be as per respective OEMs Type-II selection criteria.				
ax.	Panel builder shall consider necessary provision for implementation of Tubular Gas Suppression System by third party at site with minimal hassles and alterations.				
ax.	All floor mounted panels shall be minimum 1800mm hin height. Dummy or spare compartments to be provided if required.				
ay.	Maximum of 4xFP MCBs or 8xDP MCBs shall be accomodated in one compartment not more than these.				
az.	All MCB compartments shall be provided with viewing window.				
1.1	**LNP Panel-1 ("]" Block)**	Set	1		-
	Incomer : 1 x Type-1+2 surge arrester with suitable protection. 1 x 200 A, FP, 36kA, MCCB with with microprocessor based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x200/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 250 A, 36 kA for 1 sec of required length and cross sectional area.				

	Direct Outgoings : 1 x 100A TPN, 16kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	2 x 63A TPN, 16kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x63/5A 5VA Class 1.0 CTs)				
	4 x 25A TPN, 16kA MCCB with thermal magnetic based release.				
	Sub - Incomer-1 : 1 x 100 A,TPN 16 kA, MCCB with thermal magnetic based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs).				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 150 A, 10 kA for 1 sec of required length and cross sectional area.				
	Sub-Outgoings : 9 x 63 A, FP, 10kA, MCB "C Curve". 8 x 40 A, FP, 10kA, MCB "C Curve". 2 x 40 A, DP, 10kA, MCB "C Curve".				
1.2	**LNP Panel-2 ("K" Block)**	Set	1		-
	Incomer : 1 x Type-1+2 surge arrester with suitable protection. 1 x 100 A, FP, 16kA, MCCB with thermal magbetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 150 A, 10 kA for 1 sec of required length and cross sectional area.				
	Outgoings : 3 x 63 A, FP, 10kA, MCB "C Curve". 6 x 40 A, FP, 10kA, MCB "C Curve". 2 x 40 A, DP, 10kA, MCB "C Curve". 2 x 25 A, DP, 10kA, MCB "C Curve".				
1.3	**LNP Panel-1 ("K" Block)**	Set	1		-
	Incomer : 1 x Type-1+2 surge arrester with suitable protection. 1 x 200 A, FP, 36kA, MCCB with with microprocessor based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x200/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 250 A, 36 kA for 1 sec of required length and cross sectional area.				
	Direct Outgoings : 1 x 100A TPN, 36kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	3 x 63A TPN, 36kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x63/5A 5VA Class 1.0 CTs)				
	Sub - Incomer-1 : 1 x 100 A,TPN 36 kA, MCCB with thermal magnetic based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs).				

	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 150 A, 10 kA for 1 sec of required length and cross sectional area.				
	Sub-Outgoings : 9 x 63 A, FP, 10kA, MCB "C Curve". 8 x 40 A, FP, 10kA, MCB "C Curve". 2 x 40 A, DP, 10kA, MCB "C Curve".				
1.4	**UPS Output Panel-1 ("J" Block)**	Set	1		-
	Incomer : 1 x Type-3 surge protection device with suitable protection 1 x 250 A, TP+2N, 36kA, MCCB with microprocessor based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x250/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - TP+2N P + E) Busbar made up of electrolytic grade high conductivity tinned copper in rectangular cross section and suitable for 415V, TP+2N, 50 Hz, 300 A, 10 kA for 1 sec of required length and cross sectional area.				
	6 x 63 A, FP, 10kA, MCB "D Curve". 7 x 40 A, FP, 10kA, MCB "D Curve". 1 x 40 A, DP, 10kA, MCB "D Curve".				
1.5	**UPS Output Panel-1 ("K" Block)**	Set	1		-
	Incomer : 1 x Type-3 surge protection device with suitable protection 1 x 250 A, TP+2N, 36kA, MCCB with microprocessor based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x250/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - TP+2N P + E) Busbar made up of electrolytic grade high conductivity tinned copper in rectangular cross section and suitable for 415V, TP+2N, 50 Hz, 300 A, 10 kA for 1 sec of required length and cross sectional area.				
	Direct Outgoings : 1 x 100A TPN, 25kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	Direct Outgoings : 1 x 63A TPN, 25kA MCCB with thermal magnetic based release.				
	Sub - Incomer-1 : 1 x 100 A,TPN 25 kA, MCCB with thermal magnetic based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs).				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 150 A, 10 kA for 1 sec of required length and cross sectional area.				
	Direct Outgoings : 5 x 63 A, FP, 10kA, MCB "D Curve". 4 x 40 A, FP, 10kA, MCB "D Curve".				
1.6	**UPS Output Panel-2 ("J" Block) Typical To UPS Output Panel-2 ("K" Block)**	Set	2		-
	Incomer : 1 x Type-3 surge protection device with suitable protection 1 x 250 A, TP+2N, 36kA, MCCB with microprocessor based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x250/5A 5VA Class 1.0 CTs)				
	Busbar-1 (1 Set - TP + 2N + E) Busbar made up of electrolytic grade high conductivity tinned copper in rectangular cross section and suitable for 415V, TP+2N, 50 Hz, 300 A, 16 kA for 1 sec of required length and cross sectional area.				

	Outgoings : 4 x 40 A, FP, 10kA, MCB "D Curve". 4 x 40 A, DP, 10kA, MCB "D Curve". 12 x 32 A, DP, 10kA, MCB "D Curve".				
1.7	**UPS Output Panel-3 ("J" Block) Typical To UPS Output Panel-3 ("K" Block)**	Set	2		-
	Incomer : 1 x Type-3 surge protection device with suitable protection 1 x 63A, FP 16 kA, MCCB with thermal magnetic based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x60/5A 5VA Class 1.0 CTs)				
	Main Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity tinned copper in rectangular cross section and suitable for 415V, FP, 50 Hz, 100 A, 10 kA for 1 sec of required length and cross sectional area.				
	Outgoings : 6 x 40 A, FP, 10kA, MCB "D Curve". 3 x 40 A, DP, 10kA, MCB "D Curve".				
1.8	**UPS Output Panel-4 ("K" Block)**	Set	1		-
	Incomer : 1 x Type-3 surge protection device with suitable protection 1 x 100A, FP 16 kA, MCCB with thermal magnetic based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	Main Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity tinned copper in rectangular cross section and suitable for 415V, FP, 50 Hz, 100 A, 10 kA for 1 sec of required length and cross sectional area.				
	Outgoings : 7 x 63 A, FP, 10kA, MCB "D Curve". 4 x 40 A, FP, 10kA, MCB "D Curve".				
1.9	**Utility Panel ("K" Block)**	Set	1		-
	Incomer : 1 x 200 A, FP, 36kA, MCCB with with microprocessor based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x200/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 300 A, 10 kA for 1 sec of required length and cross sectional area.				
	Outgoings : 1 x 100A TPN, 16kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	3 x 63A TPN, 16kA MCCB with thermal magnetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x60/5A 5VA Class 1.0 CTs)				
	5 x 25A TPN, 16kA MCCB with thermal magnetic based release.				
1.10	**HVAC Panel ("J" Block) (Outdoor Type-IP55) Typical for HVAC Panel ("K" Block) (Outdoor Type-IP55)**	Set	2		-
	Incomer : 1 x Type-1+2 surge arrester with suitable protection. 1 x 100 A, FP, 25kA, MCCB with thermal magbetic based release. 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 3x100/5A 5VA Class 1.0 CTs)				
	Busbar (1 Set - 4P + E) Busbar made up of electrolytic grade high conductivity aluminium in rectangular cross section and suitable for 415V, FP, 50 Hz, 150A, 25 kA for 1 sec of required length and cross sectional area.				
	Outgoings : 2 x 63 amps FP 10kA MCB with RCCB 300mA 6 x 40 amps FP 10kA MCB with RCCB 300mA				

1.11	**UPS Input Isolator-1 Typical To UPS Input Isolator-2 ("J" Block), UPS Input Isolator-1 ("K" Block), UPS Input Isolator-2 ("K" Block)**	Set	4		-
	1 x Type-1+2 surge protection device with suitable protection 1 x 200 A, FP, 36kA, MCCB with with microprocessor based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 250/5A 5VA Class 1.0 CTs)				
1.12	**UPS Input Isolator-3 ("J Block) & Typical To UPS Input Isolator-3 ("K Block)**	Set	2		-
	1 x 63 A, FP, 16kA, MCCB with thermal magnetic based release 1 x (Digital flush type class -1.0 accuracy multifunction meter with RS-485 communication port for measurement of at least KWH, KVARH, KVAR, PF, V, A, HZ with 60/5A 5VA Class 1.0 CTs)				
1.13	Supplying and fixing of following MCCB/MCB isolator with suitable M.S. enclosure on surface suitable of following rating and breaking capacity panel board including drilling holes with required arrangement for incoming and outgoing cable, making connections, testing and commissioning etc. complete as required to do the job in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.				
1.13.1	200 A TPN MCCB with 36 KA service breaking capacity, heavy duty solid neutral link (IP 43)	Set	1		-
1.13.2	100 A TPN MCCB with 25 KA service breaking capacity, heavy duty solid neutral link (IP 43)	Set	**RO**		-
1.13.3	63 A TPN MCCB with 25 KA service breaking capacity, heavy duty solid neutral link (IP 43)	Set	**RO**		-
1.13.4	40 A FP MCB with RCCB 100mA, 10 KA service breaking capacity (IP 55)	Set	**RO**		-
1.13.5	25 A FP MCB with RCCB 100mA, 10 KA service breaking capacity (IP 55)	Set	**RO**		-
1.13.13	16 A TP MPCB of 50 KA breaking capacity for 7.5 KW motor along with the following for each outgoing motor starter feeder: DOL Starter with 25 A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 11-16A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-30A with 5VA burden, Class-III CT's of rating 30/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	**RO**		-
1.13.14	1 Nos. of 16A TP MPCB of 50 KA breaking capacity for 7.5 KW along with the following for each outgoing motor starter feeder: DOL Starter with 25A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 11-16A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-30A with 5VA burden, Class-III CT's of rating 30/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	2		-
1.13.15	1 Nos. of 13A TP MPCB of 50 KA breaking capacity for 5.5 KW along with the following for each outgoing motor starter feeder: DOL Starter with 25A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 9-13A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-30A with 5VA burden, Class-III CT's of rating 30/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	2		-

1.13.16	1 Nos. of 13A TP MPCB of 50 KA breaking capacity for 4.5 KW along with the following for each outgoing motor starter feeder: DOL Starter with 25A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 9-13A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-30A with 5VA burden, Class-III CT's of rating 30/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	3		-
1.13.17	1 Nos. of 8A TP MPCB of 50 KA breaking capacity for 3 KW along with the following for each outgoing motor starter feeder: DOL Starter with 25A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 4-6.3A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-30A with 5VA burden, Class-III CT's of rating 30/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	1		-
1.13.18	5A TP MPCB of 50 KA breaking capacity for 2.20KW motor along with the following for each outgoing motor starter feeder: DOL Starter with 18 A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 4-6.3A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-16A with 5VA burden, Class-III CT's of rating 16/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	**RO**		-
1.13.19	5 A TP MPCB of 50 KA breaking capacity for 1.1 KW motor along with the following for each outgoing motor starter feeder: DOL Starter with 12 A contactor with 2 NO and 2 NC auxillary contacts. Over load relay of rating 2.5-4A with in built Single Phasing Preventer. Digital Ammeter with inbuilt selector switch of range 0-30A with 5VA burden, Class-III CT's of rating 30/5A or direct reading meter as per available range with respective OEM One set of AMBER indication with 2A SP MCB as back up, Start, Stop Push button illuminated type with remote control start, stop arrangement, Auto/ manual/ off selector switch.	Set	**RO**		-
1.14	Supplying and fixing of following MCCB in existing rising main tap offs of following rating and breaking capacity panel board including drilling holes with required arrangement for incoming and outgoing cable, making connections, testing and commissioning etc. complete as required to do the job in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.				
1.14.1	200 A TPN MCCB with 36 KA service breaking capacity, heavy duty solid neutral link	Set	7		-
1.14.2	250 A TPN MCCB with 36 KA service breaking capacity, heavy duty solid neutral link	Set	**RO**		-
1.15	Dismantling safely, shifting, storing following electrical components / systems at designated place within premises without damaging in stipulated time frame. The cost shall also include supply of required tools, materials, manpower etc to complete the job in all respect and upto the satisfaction of incharge. Note : Cost of transportation, loading unloading, delivering all dismantled items or components to the End Users warehouses within 10KM shall be included in the cost.				-
1.15.1	125 A MCCB	Set	7		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**

PROJECT - QCI, NAUROJI NAGAR, DELHI					
PACKAGE - UPS SYSTEM					
DETAILED ESTIMATE					
S.NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
1	**CHAPTER-1 : UPS SYSTEM**				
1.1	Design, manufacturing, testing at works, supplying, installation, testing and commissioning of **1x100 kVA Modular Type i**ntegrated with K-13, Copper wound Isolation Transformer at output side in separate cabinet adjacent to UPS. each individual 100KVA modular rating should have **25KVA x 4 hot Swappable power module and** the **cabinet capacity shall be minimum of 125KVA to support any future expansion** ,UPS VFI (voltage frequency independent) online double conversion with DSP controlled, indoor type, compact UPS system of mentioned rating with IGBT based PWM technology to achieve THD < 3% @ 100% linear load and input power factor of greater than 0.95 at 50% loading, **output PF unity (kVA=kW) at 40 degree centigrade without any derating**, suitable for three phase AC input voltage 320 V to 478 V, 50 Hz +3% / - 3 % and three phase AC output voltage 400 ± 1% volts & frequency 50 ± 0.5 Hz with all components as mentioned in BOQ, specifications and schedule, complete as required and as per technical specification**.** Each unit shall be comprising of the following: UPS shall be capable to connect Parallel with other **(For workstations & field devices)**	Set	2		
a	Failure of any sub power module in individual UPS Frame shall not lead to entire Frame Capacity Down but only the failed sub power module capacity shall go down. i.e. In case of Failure of any one Sub Power module, rest of the available power module in the frame shall continue to operate in normal double conversion mode of operation with reduced capacity. This shall also be applicable to all UPS's operating in parallel configuration also				
b	Fully DSP controlled power factor corrected rectifier and IGBT inverter capable of providing high quality AC power for sensitive electronic equipment loads.				
c	100% rated Inbuilt Maintenance Bypass. In addition Input, output and bypass isolators shall be provided within the same UPS chasis/ frame. Printed Circuit Boards in the UPS frame shall be 100% conformally coated. Washable dust filters shall be available on front door of UPS to improve reliability from dust.				
d	Web-enabled Monitoring and Management through SNMP protocols for multi-OS environments. Card should be certified for cybersecurity standard UL/IEC/ Indian equivalent. Certificate to be provided by vendor.				
e	Type test report from NABL accredited lab for same model or higher rating shall be furnished as per IEC 62040-3				
1.1.1	Supplying, unloading, installation, testing and commissioning of High performance NMC+LMO Type lithium Ion battery, UL9540A Certified for cell level, module level & rack level fire safety suitable size having **15 minutes back up** time using minimum 32kWh battery capacity to deliver each 100KVA UPS at full load (0.9PF to be considered). Lithium ion battery to have must inbuilt Battery Management system. Inbuilt Battery Management system should be of same make as LiB Modules, Battery MCCB shall be part of LiB Cabinet. AC-AC Efficiency in normal operation from 25% load to 75 % Load shall be > 95%. Note : Concerning vendor needs to furnish the battery sizing calculations at the time of GA approval and battery size has to be as per the approved GA drawing.	Set	2		
1.1.2	Supply, unloading, installation, testing & commissioning of LIB cabinet to house above mentioned batteries for each 100 KVA UPS system along with Integrated Battery Management System (BMS) allows for full monitoring and control, optimizing the usage and performance of the battery. Suitable size uninyvin interconnecting cable [for UPS to Battery], MCCB etc. complete as required & as per specifications.	Set	2		

1.2	Design, manufacturing, testing at works, supplying, installation, testing and commissioning of **1x100 kVA Modular Type** integrated with K-13, Copper wound Isolation Transformer at output side in separate cabinet adjacent to UPS. each individual 100KVA modular rating should have **25KVA x 4 hot Swappable power module and** the **cabinet capacity shall be minimum of 125KVA to support any future expansion** , VFI (voltage frequency independent) online double conversion with DSP controlled, indoor type, compact UPS system of mentioned rating with IGBT based PWM technology to achieve THD < 3% @ 100% linear load and input power factor of greater than 0.95 at 50% loading, **output PF unity (kVA=kW) at 40 degree centigrade without any derating**, suitable for three phase AC input voltage 320 V to 478 V, 50 Hz +3% / - 3 % and three phase AC output voltage 400 ± 1% volts & frequency 50 ± 0.5 Hz with all components as mentioned in BOQ, specifications and schedule, complete as required and as per technical specification**.** Each unit shall be comprising of the following: UPS shall be capable to connect Parallel with other **(For Server, Networking, security & AV System)**	Set	2		
a	Design, manufacturing, testing at works, supplying, installation, testing and commissioning of **1x100 kVA Modular Type** integrated with K-13, Copper wound Isolation Transformer at output side in separate cabinet adjacent to UPS. each individual 100KVA modular rating should have **25KVA x 4 hot Swappable power module and** the **cabinet capacity shall be minimum of 125KVA to support any future expansion** , VFI (voltage frequency independent) online double conversion with DSP controlled, indoor type, compact UPS system of mentioned rating with IGBT based PWM technology to achieve THD < 3% @ 100% linear load and input power factor of greater than 0.95 at 50% loading, **output PF unity (kVA=kW) at 40 degree centigrade without any derating**, suitable for three phase AC input voltage 320 V to 478 V, 50 Hz +3% / - 3 % and three phase AC output voltage 400 ± 1% volts & frequency 50 ± 0.5 Hz with all components as mentioned in BOQ, specifications and schedule, complete as required and as per technical specification**.** Each unit shall be comprising of the following: UPS shall be capable to connect Parallel with other **(For Server, Networking, security & AV System)**				
b	Fully DSP controlled power factor corrected rectifier and IGBT inverter capable of providing high quality AC power for sensitive electronic equipment loads.				
c	100% rated Inbuilt Maintenance Bypass. **In addition Input, output and bypass isolators shall be provided within the same UPS chasis/ frame.** Printed Circuit Boards in the UPS frame shall be 100% conformally coated. Washable dust filters shall be available on front door of UPS to improve reliability from dust.				
d	Web-enabled Monitoring and Management through SNMP protocols for multi-OS environments. Card should be certified for cybersecurity standard UL/IEC/ Indian equivalent. Certificate to be provided by vendor.				
e	Type test report from NABL accredited lab for same model or higher rating shall be furnished as per IEC 62040-3				
1.2.1	Supplying, unloading, installation, testing and commissioning of High performance NMC+LMO Type lithium Ion battery , UL9540A Certified for cell level, module level & rack level fire safety suitable size having **30 minutes back up** time using minimum 100kWh battery capacity to deliver each 100KVA UPS at full load (0.9PF to be considered). Lithium ion battery to have must inbuilt Battery Management system. Inbuilt Battery Management system should be of same make as LiB Modules, Battery MCCB shall be part of LiB Cabinet. AC-AC Efficiency in normal operation from 25% load to 75 % Load shall be > 95%. Note : Concerning vendor needs to furnish the battery sizing calculations at the time of GA approval and battery size has to be as per the approved GA drawing.	Set	2		
1.2.2	Supply, unloading, installation, testing & commissioning of LIB cabinet to house above mentioned batteries for each 100 KVA UPS system along with Integrated Battery Management System (BMS) allows for full monitoring and control, optimizing the usage and performance of the battery. Suitable size uninyvin interconnecting cable [for UPS to Battery], MCCB etc. complete as required & as per specifications.	Set	2		

1.3	Design, manufacturing, testing at works, supplying, installation, testing and commissioning of **1x10 kVA**, Parallel Redundant UPS system operating in load sharing mode . Each UPS should be of VFI (voltage frequency independent) online double conversion based with DSP controlled mechanism, at output side of UPS cabinet (no external transformer), indoor type, compact UPS system of mentioned rating with IGBT based rectifier and IGBT based PWM technology to achieve THDi ≤ 5% @100% linear load and input power factor of greater than 0.99 at 50% ~100% loading,suitable for three phase AC input voltage 320 V to 476 V, 50 Hz +3% / - 3 % and three phase AC output voltage 400 ± 1% volts & frequency 50 ± 0.5 Hz with all components as mentioned in BOQ, specifications and schedule, complete as required and as per technical specification. Each unit shall be comprising of the following:	Set	2		
a	Fully DSP controlled power factor corrected IGBT rectifier and IGBT inverter capable of providing high quality AC power for sensitive electronic equipment loads. **AC-AC Efficiency in normal operation shall be >= 90% including transformr losses @ 100% loading.**				
b	100% rated Inbuilt isolator at the invertor output + 1 Nos. 100% rated Inbuilt input cum static switches at the input.				
c	100% rated Inbuilt Maintenance Bypass. **In addition Input, output and bypass isolators shall be provided within the same UPS chasis/ frame.**				
d	Web-enabled Monitoring and Management through SNMP protocols for multi-OS environments. Card should be certified for cybersecurity standard UL/IEC/ Indian equivalent. Certificate to be provided by vendor.				
1.3.1	Supplying, unloading, installation, testing and commissioning of necessary SMF VRLA batteries of suitable size having **90 minutes** back up time to each inidvidual 1**0 KVA UPS** for full load (Load PF for battery sizing to be 0.9PF). Note : Concerning vendor needs to furnish the battery sizing calculations at the time of GA approval and battery size has to be as per the approved GA drawing.	Set	2		
1.3.2	Supply, unloading, installation, testing, commissioning of open racks to house above mentioned batteries for **10 KVA UPS system** along with suitable size interconnecting uninyvin cable for UPS to Battery and battery to battery), MCCB etc. complete as required & as per specifications.	Set	2		
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**

PROJECT - QCI, NAUROJI NAGAR, DELHI					
PACKAGE -PASSIVE NETWORKING SYSTEM					
DETAILED ESTIMATE					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
1	**CHAPTER 1 : PASSIVE NETWORKING SYSTEM**				
A.	**CAT-6A COMPONENTS**				
1.1	Supply & Installation of **CAT 6A 10G speed UTP jack information outlets** complying fully or exceeding with category 6A connecting hardware specifications for all pair combinations up to 500 MHz. Outlets shall use lead frame technology, . **(Yellow in Colour for Data, Red in colour for redundant complete as required and as per technical specifications. (For Data Outlets)**	Each	1,905		-
1.2	Supply & Installation of **Cat 6A UTP 26 AWG** multi core **Patch Cord - 1 mtr** terminated with RJ-45 modular plugs on both ends and having phosphor bronze contact blade. Maximum insulation resistance shall be 35m ohms. The patch cords shall be conforming to ANSI/ TIA/ EIA-568-C.2 standards and certified by ETL.	Each	800		-
1.3	Supply & Installation of **Cat 6A UTP 26 AWG** multi core **Patch Cord - 2 mtr** terminated with RJ-45 modular plugs on both ends and having phosphor bronze contact blade. Maximum insulation resistance shall be 35m ohms. The patch cords shall be conforming to ANSI/ TIA/ EIA-568-C.2 standards and certified by ETL. complete as required and as per technical specifications.	Each	2,800		-
1.4	Supply, Installation, Testing & Commissioning of **LSZH Cat 6A-10G speed 500 MHz**unshielded twisted pair computer cable with 23 AWG solid copper conductors in existing concealed / surface conduits / Raceways **(Yellow in Colour for Data, Red in colour for Redundant)** complete as required and as per technical specifications.	Metre	85,685		-
1.5	Supply & Installation of **Cat 6A Modular Jack Panels** for accommodating **24 port** termination and shall facilitate cross-connection and inter-connection using modular patch cords and shall conform to EIA standard, **19-inch** relay rack mounting requirements. Patch Panel shall come with preloaded information outlets .Panel shall have label holders and designation labels as part of the standard device. Shall also come with rear cable management metallic tray with velcro ties complete as required and as per technical specifications.	Each	106		-
1.6	Supply & Installation of **1U PVC cable manager** complete as required and as per technical specifications.	Each	159		-
B.	**CAT-6 COMPONENTS**				-
1.7	Supply & Installation of **CAT 6 1G speed** UTP jack information outlets complying fully or exceeding with category 6 connecting hardware specifications for all pair combinations up to 250 MHz. Outlets shall use lead frame technology,. **(Blue in Colour for Voice)** complete as required and as per technical specifications. **(For Voice Outlets)**	Each	1,111		-
1.8	Supply & Installation of **Cat 6 UTP 23 AWG** multi core Patch Cord - **1 mtr** terminated with RJ-45 modular plugs on both ends and having phosphor bronze contact blade. Maximum insulation resistance shall be 35m ohms. The patch cords shall be conforming to ANSI/ TIA/ EIA-568-C.2 standards and certified by ETL.	Each	500		-
1.9	Supply & Installation of **Cat 6 UTP 23 AWG** multi core Patch Cord - **2 mtr** terminated with RJ-45 modular plugs on both ends and having phosphor bronze contact blade. Maximum insulation resistance shall be 35m ohms. The patch cords shall be conforming to ANSI/ TIA/ EIA-568-C.2 standards and certified by ETL. complete as required and as per technical specifications.	Each	1,500		-
1.10	Supply, Installation, Testing & Commissioning of **LSZH Cat 6-1G speed** unshielded twisted pair computer cable with 23 AWG solid copper conductors in existing concealed / surface conduits / Raceways **(Yellow in Colour for Data Blue in Colour for Voice)** complete as required and as per technical specifications. **(For Voice Outlets)**	Meter	54,995		-

1.11	Supply & Installation of **Cat 6 Modular Jack Panels** for accommodating **24 port** termination and shall facilitate cross-connection and inter-connection using modular patch cords and shall conform to EIA standard, **19-inch** relay rack mounting requirements. Patch Panel shall come with preloaded information outlets .Panel shall have label holders and designation labels as part of the standard device. Shall also come with rear cable management metallic tray with velcro ties complete as required and as per technical specifications.	Each	62		-
1.12	Supply & Installation of **1U PVC cable manager** complete as required and as per technical specifications.	Each	74		-
C.	**MISCELLANEOUS COMPONENTS**				-
1.13	Supply,Installation, testing and commissioning of following **Networking Enclosure Closed rack** with Front Glass door, rear steel door, castors, fans with fan tray, power distribution units and complete with all accessories as required along with Horizontal Cable manager and vertical Cable manager complete as required.				-
1.13.1	6U Wall mounted (Closed Rack)	Each	1		-
1.13.2	9U Wall mounted (Closed Rack)	Each	4		-
1.13.3	12U Wall mounted (Closed Rack)	Each	1		-
1.13.4	15U Wall mounted (Closed Rack)	Each	2		-
1.13.5	24U Floor mounted (Closed Rack)	Each	1		-
1.13.6	42U Floor mounted 1000mm (W) X 1000mm (D) (Closed Rack)	Each	1		-
1.13.7	42U Floor mounted 1000mm (W) X 800mm (D) (Closed Rack)	Each	16		-
1.13.8	42U Floor mounted 1000mm (W) X 600mm (D) (Open Rack)	Each	4		-
1.13.9	45U Floor mounted (Closed Rack)	Each	1		-
1.14	Supply, Installation, Testing and Commissioning of **armoured Single mode OS2 fiber optic cable** of following sizes for connectivity where ever required in prelaid conduits / shafts/cable trays/raceways, whichever maybe available etc. complete as required and as per technical specifications.				-
1.14.1	12 Core	Metre	500		-
1.14.3	6 Core	Metre	3,000		-
1.15	Supply & Installation of **Quad Face Plates** along with clearly printed labels and holders complete as required specifications.	Each	100		-
1.17	Supply & Installation of **Dual Face Plates** along with clearly printed labels and holders complete as required and as per technical specifications.	Each	716		-
1.18	Supply & Installation of **Single Face Plates** along with clearly printed labels and holders complete as required and as per technical specifications.	Each	1,150		-
1.19	Supplying and fixing in position **GI box for data/voice outlet** suitable for fixing of RJ 45 jack complete as required. **(For Data/voice outlets)**	Each	400		-
1.20	Supplying and fixing in position **PVC back box for data/voice** outlet complete as required. **(For Data/voice outlets)**	Each	20		-
1.21	Supply, Installation, Testing & Commissioning of **24 Port Fiber LIU Loaded with LC LC Coupler,** as per given Specification etc. all complete.	Each	4		-
1.22	Supply, Installation, Testing & Commissioning of **12 Port Fiber LIU Loaded with LC LC Coupler,** as per given Specification etc. all complete.	Each	26		-
1.23	Supply, Installation, Testing & Commissioning of **LC-LC SM Fiber Patch Cords (3 Mtr)** as per given Specification etc. all complete.	Each	100		-
1.24	Supply,fixing and testing of MDF Box 1000 Pair with Krone Module	Each	2		-
1.25	Supply,fixing and testing of MDF Box 500 Pair with Krone Module	Each	2		-
1.26	Supply,fixing and testing of MDF Box 250 Pair with Krone Module	Each	4		-
1.27	Supply,fixing and testing of MDF Box 100 Pair with Krone Module	Each	2		-
1.28	Supply,fixing and testing of MDF Box 50 Pair with Krone Module	Each	4		-
1.29	Supply installation,testing and commissioning of 0.5mm size solid annealed copper, jelly filled telephone cables, polythene insulated, petroleum jelly filled with poly-al laminate moisture barrier,polythene sheathed, unarmoured polythene jacketed telephone cables as per DOT specifications of following sizes				-
1.29.1	2 Pair	Metre	800		-
1.29.2	10 Pair	Metre	200		-
1.29.3	20 Pair	Metre	100		-
1.29.4	50 Pair	Metre	500		-
1.29.5	100 Pair	Metre	850		-

	SUBTOTAL CARRIED OVER TO SUMMARY				-
	Notes:				
a	All products for structured cabling solution shall be provided from the single manufacturer				
b	System Integrator shall be provide the certification for total structured cabling from the manufacturer for Life time warranty.				
c	System integrator shall provide all the necessary documentation comprising patching details, labeling and network schematic. Required				
d	System integrator shall also provide the floor layout with final node distribution clearly marked on the layout.				

PROJECT - QCI, NAUROJI NAGAR, DELHI		
PACKAGE - SECURITY WORKS		
SUMMARY OF COST		
S. No.	**DESCRIPTION**	**AMOUNT**
1)	CHAPTER 1: FIRE ALARM & DETECTION SYSTEM	0
2)	CHAPTER 2: PUBLIC ADDRESS SYSTEM	0
3)	CHAPTER 3 : ACCESS CONTROL SYSTEM	0
4)	CHAPTER 4 : RODENT REPELLENT SYSTEM	0
5)	CHAPTER 5 : WATER LEAK DETECTION SYSTEM	0
6)	CHAPTER-6 : VESDA SYSTEM	0
7)	CHAPTER 7 : IP BASED CCTV SYSTEM	-
	TOTAL AMOUNT IN RUPEES	**0**
	RATES	
1)	The quoted rates are exclusive of all taxes and duties.	
2)	The rates shall be prepared in conjuction and with reference to the contents of Specification & Drawings.	
3)	The rates quoted shall also include for providing any temporary work or preparatory work required to execute the particular items of work.	
4)	The unit prices stated hereunder shall be deemed to include, but not be limited to the following :	

a.	Site management and supervision, labour and all costs in connection therewith, including the cost of overtime as necessary.
b.	The supply, fabrication and supervision during installation of all goods and all costs in connection therewith.
c.	Delivery as appropriate.
d.	Paint, tools, equipment and all cost in connection therewith site facilities and all other costs from items that are necessary to execute the Work.
e.	Waste of Material
f.	Mobilization costs, overhead costs and profit.
g.	Major civil works shall not form any part of this contract including foundations.
5)	The rates for each item of work included in the schedule of quantities shall unless expressed stated otherwise, include cost of all equipment, ancilliary equipment, fixing material, accessories, tools, plants, transport, labour and incidentals required for the completion of the work as called for in the item and as per Specification and drawings.
	NOTES

1)	All the items of work under this contract shall be executed strictly in accordance with the description of the item in the schedule of quantities relevant drawings and specifications read in conjunction with appropriate Indian Standard Specifications, Special conditions of contract.	
2)	This bill is to be read in conjunction with all other project documents and deviations if any shall be brought into the notice of the consultant in prior.	
3)	All the items of work given in this schedule of quantities shall be executed strictly in accordance with Indian Electricity Rules and requirements of the local Electric Supply Authority, local Chief Electrical Inspectorate and Indian standards & National Building code read in conjunction with the relevant drawings, specifications and the appropriate Indian Standards.	
4)	The contractor shall visit the site and shall satisfy himself as to conditions under which the work is to be performed. No extra claim as a consequence of ignorance or on grounds of insufficient description will be allowed at a later date.	
5)	No Alteration whatsoever is to be made to the text or quantities of this schedule of quantities unless alteraion is authorised in writing by client. Any such alterations, notes or additions shall, unless authorised in writing be disregarded when tender documents are considered.	
6)	Any error in totalling in the amount column and in carrying forward totals shall be corrected.	
7)	Any error in description or in quantity or omission of items from the contract schedule shall not vitiate this contract but shall be corrected and deemed to be a variation required by the owner.	

PROJECT - QCI, NAUROJI NAGAR, DELHI					
PACKAGE - FIRE ALARM & DETECTION SYSTEM					
DETAILED ESTIMATES					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
1	**CHAPTER 1: FIRE ALARM & DETECTION SYSTEM**				
1.1	SITC of **networkable addressable type fire alarm control panel** with min 8" TFT colour touch-screen user interface that is ergonomically engineered specifically for fire alarm control, connecting 125 addressable detector/devices any combination on digital protocol for less false alarm due to electrical interference. The panel shall be capable of flexible single or dual hardware loop configurations to optimise loop power and address capacity with Emergency Mode. The loop power shall be a maximum of 1000mA, to support up to 250 addresses, with up to 2000m of loop cable. Panel loop can be split into two separate loops and have the power intelligently distributed so that each loop can support the power it requires.The panel shall have reflective monitoring & self test facility to test sounder/strobes in working condition.The Panel networking should be Peer to Peer only upto 99 panels to handle 99,000 points . Shall have its own Battery charger. Shall have provision for interfacing with the Public Address System. The Panel Shall have 16 Zones with Individual LED Indicators, expandable up to 80/240 LED Indicators. The Panel shall have 10,000 event log with dynamic filters for effective event diagnostics to quickly resolve site investigations. And GSM dialer Panel should be IP30 raiting Approved by (EN54/VDS/ LPCB/UL)				
1.1.1	**8 Loop Panel**	Each	**RO**		-
1.1.1	**6 Loop Panel**	Each	**RO**		-
1.1.1	**4 Loop Panel**	Each	2		-
1.1.2	**Network Card OFC Type**	Each	2		-
1.2	SITC of addressable type min 8.4' inch TFT Touch screen **Repeater panel**, with all required accessories which shall display date, time & description of alarm/trouble events that are displayed in the FACP with an inbuilt buzzer to indicate fault/fire alarm. The FACP panel shall support repeaters incorporating a full colour Graphical user Inter-face. The repeater shall be managed by user level password or a RFID card with unique identification of the user. The repeater shall provide a touch screen interface that provides features such as Maps, Zone identification, on screen help menus, allow for silencing and resetting of the alarm, testing, viewing of event logs confirming to standards and duly approved by EN54/VDS/ LPCB/UL	Each	**RO**		-
1.3	SITC of intelligent addressable type **optical smoke + heat detector(multi)** incorporate an LED, clearly visible from the outside, to provide in-dication of alarm or fault actuation.B24 with mounting base complete as required. Smoke detectors shall be capable of detecting visible combustion gases emanating from fires.Detectors shall employ the forward light-scatter principle, using optical components operating at a wavelength of 4.35 nm. Approved by EN54/VDS/ LPCB/UL. **(True Ceiling)**	Each	185		-
1.4	SITC of intelligent addressable type optical smoke + heat detector(multi) incorporate an LED, clearly visible from the outside, to provide in-dication of alarm or fault actuation.B24 with mounting base complete as required. Smoke detectors shall be capable of detecting visible combustion gases emanating from fires.Detectors shall employ the forward light-scatter principle, using optical components operating at a wavelength of 4.35 nm. Approved by EN54/VDS/ LPCB/UL. **(False Ceiling)**	Each	259		-
1.5	SITC of intelligent addressable type **heat detector** incorporate an LED, clearly visible from the outside, to provide in-dication of alarm or fault actuation.B24 with mounting base complete as required. Detector shall be capable of detecting rapid rise in temperature and fixed absolute tem-peratures. Detectors shall employ two heat sensing elements with different thermal characteristics to provide a rate of rise dependent response.It should also be able work at 55°CELSIUS & 78 °CELSIUS both temperatures , Detector shall include RFI screening and feed-through connecting components to mini-mise the effect of radiated and conducted electrical interferences Approved by EN54/VDS/ LPCB/UL	Each	11		-
1.6	Supply, installing, testing and commissioning of addressable type **Fault Isolators** for isolating shorted, de wired and loose circuits between two successive fault isolators with automatic resetting arrangement. Approved by EN54/VDS/ LPCB/UL	Each	33		-
1.7	Supply, Installation, Testing and commissioning of **Response Indicator** with colour LED.	Each	185		-
1.8	SITC of addressable **manual call point** to monitor and signal to the control and indicating equipment the status of a switch operated by a resettable/deforamable assembly be capable of operating by means of thumb pressure and not require a hammer. Incorporate a mechanism to interrupt the normal addressable loop scan to provide an alarm re-sponse within less than 3 seconds. Capable of being tested using a special 'key' without the need for depressing the unit. Provide an integral red LED to indicate activation. Call point to include the use of a yellow led to signal fault condition also to have integral isolator. Approved by EN54/VDS/ LPCB/UL	Each	16		-
1.9	SITC of addressable **loop powered sounder** incorporate an integral line isolator. Be capable of producing a sound output of 103dB at 1m. Souner cum strobe shall have 2 volume, 2 flash rates & 16 selectable tones which can be configured using panel configuration software. Be equipped with LED beacon that has two flash rates 1 Hz. & 0.5 Hz. Sounder with strobe shall have the feature of Reflective sound monitoring (RSM) & Reflective light monitoring (RLM) which enables a full self-test of devices with an activation time of a fraction of a second per device.Approved by EN54/VDS/ LPCB/UL	Each	16		-
1.10	Supply, installing, testing and commissioning of addressable and automatic commandable control modules for: for Sounders / Strobes / Sounder cum Strobes/ PA system/ The control module shall provide supervised NAC output rated at 24v DC, 2A. Approved by EN54/VDS/ LPCB/UL	Each	20		-
1.11	SITC of **Relay/Control ouput module** used for controlling third party devices by means of Dry contact (AHU, Access Control, integration, or tripping any third paarty equipment using dry contact) or 24Vdc to drive sounder or Sounder cum strobes having contact raring of 2A at 24Vdc and Approved by EN54/VDS/ LPCB/UL	Each	25		-

1.12	Supply, Installation, Testing and Commissioning of **Addressable 2 Wire monitor module,** capable of monitoring NO contacts, Option to choose operation mode as supervision of 20Sec or activation immediatee to connect NO/NC contacts such as pressure switch, flow switches, fire pump contacts etc.Addressing shall be with user friendly rotary decimal switches complete as required in accordance with laid specification or upto the satisfaction of engineer in charge. Approved by EN54/VDS/ LPCB/UL	Each	7		-
1.13	Supplying, laying, testing and commissioning of 2x1.5 sq.mm 1.1KV grade aluminium/copper conductor armored **FIRE SURVIVAL cable with LSZH insulation** as per BS 7846:2009 & IEC-60502:2004 Part-1 (Armored), Retain circuit integrity as per BS 6387 C.W.Z (armored), BS-8491:2008, BS 8434-2: 2009 (armored), (Resistance to fire at 950º C for 3 hours), as per specifications in cable trays, clamped including anchor fasteners to wall with suitable clamps, saddles fixing bolts, complete in all respect and as per specifications.	Metre	11,152		-
1.14	Supplying & Fixing in position **GI Box** for installation of detectors on true Ceiling, MCP, RM, MM, CM etc. Complete as required to do the job in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.	Each	280		-
1.15	Supply, Installation , Testing & commissioning of The system monitoring program shall be the **colour graphic display software** to be installed in a personal computer. By connecting to FACP network via system interface unit, the program shall provide the system with an ability to monitor the FACPs on network, display events currently occurring, and control systems.	Each	**RO**		-
1.16	Supply, Installation, testing & commissioning of the Central Control Stations consisting of Pentium i7 machine, 8 GB Ram with the capacity of 1TB HDD, along with display monitor flexibility of HDMI cable connectivity and with suitable Graphic card for the system. (Ref Make - Dell & HP) (CORE I7TH 4TH GEN CPU GIGABYTE MOTHER BOARD WITH SERIAL AND PARALLEL PORT, 500GB SSD, 16GB KINGSTON RAM,2GB GRAPHIC CARD N VEDIA, ATX CABINET, 21" COLOUR MONITOR LED DISPLAY, KEY BOARD, MOUSE AND A4 LASER PRINTER.)	Each	**RO**		-
1.17	Supply, installing, testing and commissioning of **BMS Integration Module** i.e. Bacnetover TCPIP module. (BacNet/Modbus)	Each	**RO**		-
1.18	Supply, Installation, testing & commissioning FIRE EXIT Signage with LED and battery back up and charger with hanging arrangement complete as required (90 minutes backup)	Each	25		-
1.19	Supply, Installation, Testing and Commissioning of **armoured singlemode OS2 fiber optic cable** of following sizes for connectivity where ever required in prelaid conduits / shafts/cable trays/raceways, whichever maybe available etc. complete as required and as per technical specifications.				-
1.19.1	12 Core	Metre	**RO**		-
1.19.2	8 Core	Metre	**RO**		-
1.19.3	6 Core	Metre	500		-
1.21	Supply, Installation, Testing and Commissioning of 24 Port 1U x 19" LIU Loaded with Singlemode OS2 LC Adapters & LSZH Pigtails along with Splice Trays, Min. 4 No of Circular Cable Entry with Rubber Groummet/Glands to close any open entry, Cable Holders for Cable Entry Inside Panel, Heat Shrink Tubes for Splices, Tube for open fibers, Ties, Panel shall be Powder Coated with Min. 1.2mm Metal Sheath, 30 Years Channel Warranty. Factory Loaded LC Type LSZH Pigtails should meet IEC 61034-1 ,IEC-60332-1, IEC-60754-1, Insertion loss <= 0.35 dB, Return Loss >= 50, Attenuation: 1310/1550 : 0.3/0.2 dB/KM, Repeatability: <= 0.2DB 1000 Times Mating Cycles, RoHS Complied, Meets ANSI/TIA 568.3-D.The optical fiber Pigtails shall be factory loaded inside each individual Port of the panel. Pigtails shall be LSZH with Single mode 9/125 µm fiber				-
1.21.1	6 Port -LIU Single Mode Fiber	Each	**RO**		-
1.21.2	24 Port -LIU Single Mode Fiber	Each	2		-
1.21.3	48 Port -LIU Single Mode Fiber	Each	**RO**		-
1.22	Supply, Installation, Testing and Commissioning of Fiber Patch Cord, LC Duplex - LC Duplex, 9/125µm OS2 Singlemode Duplex Zip Cord (<= 2.0mm), IL <= 0.35dB, RL>= 50dB, LSZH Jacket IEC 60332-1, Operating Temperature -40°C to +85°C, Meets ANSI/TIA 568.3-D, Length 3Meter.Cable : LC/LC or LC/SC or SC/SC, 9/125µm OS2 Singlemode Duplex Zip Cord (<= 2.0mm)				-
1.22.1	Fiber Patch Cord Single Mode- 3Meter	Each	2		-
1.23	Supply ,installation, Testing and Commissioning of Critical Alarm systems Panel with Touch Screen Dispaly. The panel shall have 16 digital and 4 Analog Inputs and potential free Alarm,fault outputs. Alarm Notification by SMS and Email. Event Log and Battery backup.Everyday Scheduling for the Status of the Panel. Following system digital inputs shall be provided. WLD, Fire alarm system , Critical room Cooling temp., UPS, GSS etc. Cost to include necessary communication, power wiring/cable mounting accessories, hardwares and all required components to integrate the system complete as required.	Each	2		-
	SUBTOTAL CARRIED OVER TO SUMMARY				-

PACKAGE - PUBLIC ADDRESS SYSTEM					
DETAILED ESTIMATES					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**
2	**CHAPTER 2: PUBLIC ADDRESS SYSTEM**				

2.1	Supply, Installation, Testing and Commissioning of **8 zone Digital Voice Evacuation Master controller**. and it should be capable for the EVAC, Paging, PA and BGM functions. The Controller shall have SD card option to store the EVAC and Alert Voice Message. The Controller shall have Speaker line supervision record out and amplifier auto changeover. The Controller shall have following features: Separate Zone volume control at the front side of panel, Status indications on the Panel for EVAC,Fault ,AC,DC ,Fault, ALERT & Fireman mic, Zone capacity up to 120 Zones, 8 programmable Control Input and output, Fireman Microphone with High Priority, THD<1%, Frequency response 80Hz - 20kHz, Up to 1000 Record files, 100V Class-AB Speaker Output.				
2.1.1	**8 zone Digital Voice Evacuation Master controller**	Each	2		-
2.2	Supply, Installation, Testing and Commissioning **Networkable touch screen paging station** for selection of zones, supervision of system status, setting of scheduled broadcasts with the following functions: . Built-in monitoring loudspeaker . Detachable goose-neck microphone . LCD touchscreen display . Audio input complete in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.				-
2.2.1	**8 zone paging microphone (call station)**	Each	2		-
2.3	Supply, installation, testing and commissioning of table top **micro phone (Mic)**	Each	2		-
2.4	Supply, Installation, Testing and Commissioning of **500W RMS Dual Channel Class-D Digital Power Amplifier** with Switch power technology for power electricity saving. Amplifier shall have Following Features: 500W RMS per Channel, Amplifier Output 100V, Short Circuit, Power, Tempreature, Overload Protection, Auto Cooling Fans. THD <0.1%, Frequency Response 20Hz - 20kHz, AC & DC Fuse, SNR >80dB.	Each	2		-
2.5	Supply, Installation, Testing and Commissioning of **6W/10W volume controller** complete in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.	Each	15		-
2.6	Supply, Installation, Testing and Commissioning of **6W Recessed Ceiling speakers** with following features:- Speaker Drive 4", Complete metal grille and line matching transformer 100/70V line. Variable wattage tapings of 6 / 3 / 1.5 at 100v, Effective frequency range 90-18kHz (BS6840), SPL@1m/1W=90dB, Peak SPL 98dB complete with necessary mounting hardware & accessories.	Each	190		-
2.7	Supply, Installation, Testing and Commissioning of **6W wall mount speakers** with following features:- component 7.5", Complete metal grille and line matching transformer 100/70V line. Variable wattage tapings of 5/10W, Effective frequency range 150-15kHz (BS6840), SPL@1m/1W=90dB, Peak SPL 98dB complete with necessary mounting hardware & accessories.	Each	**RO**		-
2.8	Supplying, installation, testing & commissioning of **metal box** for ceiling speakers duly painted with paint of approved colour etc. complete as required.	Each	150		-
2.9	Supply, Installation, Testing and Commissioning of 19-inch Equipment Rack with standardized frame or enclosure for mounting multiple PA controllers, CD player, FM sources, Amplifiers etc modules. Size 18U,				-
2.9.1	**12U Equipment Rack (Closed Rack)**	Each	1		-
2.10	Supplying, laying, testing and commissioning of 2x1.5 sq.mm 1.1KV grade aluminium/copper conductor armored **FIRE SURVIVAL cable with LSZH insulation** as per BS 7846:2009 & IEC-60502:2004 Part-1 (Armored), Retain circuit integrity as per BS 6387 C.W.Z (armored), BS-8491:2008, BS 8434-2: 2009 (armored), (Resistance to fire at 950^{o} C for 3 hours), as per specifications in cable trays, clamped including anchor fasteners to wall with suitable clamps, saddles fixing bolts, complete in all respect and as per specifications.	Metre	2,838		-
2.11	Supply, Installation, Testing & Commissioning of **LSZH Cat 6A-10G speed** unshielded twisted pair computer cable with 23 AWG solid copper conductors in existing concealed / surface conduits / Raceways **(Grey Colour)** complete as required and as per technical specifications.	Metre	150		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**
	PACKAGE - ACCESS CONTROL SYSTEM				
	DETAILED ESTIMATES				
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**
3	**CHAPTER 3 : ACCESS CONTROL SYSTEM**				
3.1	Supply, installation, testing and commissioning of **Four Reader Control panel (controlling 4 EM locks)** housed in MS Powder Coated Cabinet, complete with Onboard IP / LAN port, and Builtin Web Server for Remote Log in to every controller. It shall also include the required RJ-45 socket outlets with GI back box, frame & cover plate, etc. and required patch cord. The the ACP PAnel shall be complete with power supply unit for Controllers & Magnetic Locks with Battery charger, battery & Backup for 30 minutes of operation in case of Power Failure (in case UPS supply not provided)	Each	14		-
3.2	Supply, installation, testing and commissioning of **Two Reader Control panel (controlling 2 EML locks)** housed in MS Powder Coated Cabinet, complete with Onboard IP / LAN port, and Builtin Web Server for Remote Log in to every controller. It shall also include the required RJ-45 socket outlets with GI back box, frame & cover plate, etc. and required patch cord. The the ACP PAnel shall be complete with power supply unit for Controllers & Magnetic Locks with Battery charger, battery & Backup for 30 minutes of operation in case of Power Failure (in case UPS supply not provided)	Each	2		-
3.3	Supply, installation, testing and commissioning of **Smart Access cards** MIFARE® Classic - 1K - ISO Card (PVC) - 7UID	Each	2,000		-

3.4	Supply, installation, testing & commissioning of Proximity Card reader 13.56MHz, IS0/IEC 14443Afrequency, Wiegand with Touchscreen 26~128 Bits, read range upto 5cm, Tri color LED, RS232 serial ASCII,19200, N, 8, 1 Aux interface, UL294 Polycarbonate, IP65, Mifare Classic 1K/4K, Ultralight, Desfire, Mifare Plus, Smart Card Support tags ,Operating Temperature -10 to 55°C complete in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.	Each	60		-
3.5	Supply , installation, testing and commissioning Face Recognition at a Distance up to 3 M, Up to 20,000 (1 Face / 1 User), Up to 5,00,000 (1 Finger / 1 User), both Mifare & Proximity card, 10000000 Transaction capacity, TCPIP + RS-485 + Wiegand	Each	**RO**		-
3.6	Supply , installation, testing and commissioning of Smart Card Reader with Keypad CE, with all mounting accessories, complete as per all requirements of technical specifications.	Each	**RO**		-
3.7	Supply, installation, testing & commissioning of **single Electromagnetic lock, 600 lbs** along with magnetic contact with door ajar alarm buzzer connectivity, along with L Z U Bracket with all accessories complete as required.	Each	14		-
3.8	Supply, installation, testing & commissioning of **single Electromagnetic lock,1200 lbs** along with magnetic contact with door ajar alarm buzzer connectivity, along with L Z U Bracket with all accessories complete as required.	Each	7		-
3.9	Supply, installation, testing & commissioning of d**ual Electromagnetic lock ,600 lbs** with Magnetic contact with door ajar alarm buzzer connectivity, along with L Z U Bracket with all accessories complete as required.	Each	25		-
3.10	Supply, installation, testing & commissioning of **dual Electromagnetic lock , 1200 lbs** with Magnetic contact with door ajar alarm buzzer connectivity, along with L Z U Bracket with all accessories complete as required.	Each	**RO**		-
3.11	Supply, installation, testing & commissioning of 12V/5V Door Ajar Buzzer with timer circuit suitable to be connected to mentioned EM locks complete as required.	Each	46		-
3.12	Supply, installation, testing & commissioning of Panic Bar with magnetic contact, Hooter , EM Lock (1200 lbs) Emergency Exit push button complete as required (Panic bar to be provided by the developer)	Each	**RO**		-
3.13	Supply , installation, testing and commissioning of **Push Button** for Exit with complete accessories to mount	Each	35		-
3.14	Supply , installation, testing and commissioning of **Panic Switch** with all mounting accessories & hardware complete as required	Each	4		-
3.15	Supply, installation, testing and commissioning of **emergency door open break glass switch** for individual access control door. This shall be located in a powder coated lockable enclosure ,with required all accessories for mounting	Each	46		-
3.16	Workstaion shall have minimum below specification: Processor : Intel@quad core Xeon® Server class Machine, 2.4GHz CPU, RAM 16 GB- System Server, Hard disk : 250 GB SATA or SCSI 7200RPM min or soild state drive 60GB Free space Serial communication ports : As per requirements, Secondary Storage : Tape or DVD burner, Printer Port : 1 (2 if badging), Monitor display : 21 inches 1600x900 Resolution Colors-true color, keyboard connection port, Pointing device : Mouse (USB Mouse preffered), Keyboard, mousepad, Power supply- Hot swap redundant with UPS, Data Base Engine : SQL 2016 Standard (64 bit only) Multiple User license (1 admin + minimum 3 user licenses) Capability to map multiple Firm within the Enterprise, and Various departments within a Firm. Should have capablity for generating extensive customised reports. it shall be provided with integration software for fire alarm system, CCTV System, BMS etc.	Each	1		-
3.17	Supplying, drawing, connecting, testing & commissioning of **8 core x 0.5 sq. mm. stranded copper conductor**, pvc insulated PVC sheathed, shielded FRLS wire in existing conduit complete in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.	Metre	5,000		-
3.18	Supplying, drawing, connecting, testing & commissioning of **4 core x 1.5 sq. mm. stranded copper conductor**, pvc insulated FRLS wire for Access Door in existing conduit/raceway complete in all respect in accordance with laid specification or upto the satisfaction of engineer in charge.	Metre	2,200		-
3.19	Supply, Installation, Testing & Commissioning of **LSZH Cat 6A-10G speed** unshielded twisted pair computer cable with 23 AWG solid copper conductors in existing concealed / surface conduits / Raceways **(Grey Colour)** complete as required and as per technical specifications.	Metre	200		-
3.20	Supply, Installation, Testing, Commissioning of Intelligent **Access Management Software** Should be Web Based Enterprise level Application for Time Attendance-Access Control, GUI, Antipass back, Reports in Inbox, with Unlimited Users, Door Scheduling, Unlimited logins, Event Notification, POP ups, Mustur Points, Area Control, Time base access and alerts. The software should have reader based licences for easy future expansion. Shall have distributed Architecture, shall have both Access & Time Attendance system in single interface and the one database only, shall be open for any kind of customisation & integration if required. shall have built-in Card Key Management Module for secure authentication between Card & Readers. Lincense to be considered for at-least 60 doors	Lot	1		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**

PACKAGE - RODENT REPELLENT SYSTEM

DETAILED ESTIMATES

S. NO.	DESCRIPTION	UNIT	QUANTITY	RATE	AMOUNT
4	**CHAPTER 4 : RODENT REPELLENT SYSTEM**				
4.1	Supply , installation, testing and commissioning **Master Console** capable of connecting to **10 Satellites** complete with backet and all accessories as per specifications.	Each	4		-
4.2	Supply , installation, testing and commissioning **Satellite Units** complete as per the specification	Each	18		-
4.3	Supplying, drawing, connecting, testing & commissioning **2 x 1.5 sq. mm** unshielded twin copper loop cable	Metre	150		-
4.4	Supplying, drawing, connecting, testing & commissioning of **Rodent Cable** from Each Satellite to Console, two core multistranded flexible cable with suitable SWG standards.	Metre	200		-
	SUBTOTAL CARRIED OVER TO SUMMARY				-

PACKAGE - WATER LEAK DETECTION SYSTEM					
DETAILED ESTIMATES					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**
5	**CHAPTER 5 : WATER LEAK DETECTION SYSTEM**				
5.1	Supply , installation, testing and commissioning **Water leak detection control panel of 2 zone** type consisting with features like, Auxiliary alarm contacts,Monitored alarm outputs,Open circuit line monitoring, Bright LED's for indication. The panel shall work on 230v AC. Sensing technology shall be AC. The panel shall have accept / reset / Iosolate/Mute buttons and it shall be wall mounted type. The panel shall have MODBUS connectivity to intergate with BMS.	Each	4		-
5.2	Supplying, drawing, connecting, testing & commissioning **Water leak sensing cable twisted**, mechanically strong, resistant to corrosion and abrasion. The cable shall be constructed with two sensing wires,an alarm signaling wire and an continuity wire and all shall be in a fluoropolymer carrier (OR equi. material).The cable shall have end circuit to detect open circuit fault.The cable shall be rugged in construction, no metal exposes, enables it to be reusable even in corrosive environment.	Metre	100		-
5.3	**Electronic Hooter out side the room**	Each	4		-
5.4	Supply and surface laying of **2c x 1.5 sq mm FRLS PVC insulated copper conductor cable** in 20 mm dia M.S. conduit	Metre	150		-
	SUBTOTAL CARRIED OVER TO SUMMARY				-

PACKAGE - VESDA SYSTEM					
DETAILED ESTIMATES					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**
6	**CHAPTER-6 : VESDA SYSTEM**				
6.1	UL,VDS & FM approved High Defination LED based Aspirating Smoke Detector with **Two channel dual Pipe Inlet dual Sensor** on board Programmer suitable for 600 mtr pipe.length with area coverage of minimum 4000 square meter (Each Channel minimum coverage of 2000 square meter). Each channel should capable of adjusting the sensitivity of LED detectors with individual address. The Unit should have external filter box. The detector shall have IP 54 protection catagory. The Pre Alarm sensitivity will be 0.002% / Meter. The Unit should have 3 in-built relay and provision of installing additional relay cards.	Each	1		-
6.2	Supply, Installation, Testing & Commissioning of **UL/VDS Approved Power Supply.** The Power supply shall be supplied with all necessary enclosures and shall be Monitored by the Fire Alarm Control Panel. Complete with 240 volts AC PSU, automatic battery charger, 24 volts SMF batteries sufficient for 24 hours normal working and for 30 minutes on full alarm conditions.	Each	1		-
6.3	Supply, Installation, Testing & Commissioning of Sampling Pipes for Primary & Secondary Sampling, smooth Inner Bore 21mm ID and 25 mm outer dia, Sch.40, PVC Pipes with Fittings, Hi-quality Supports, accessories and Sealing compound; Red colour sampling point lables.	Metre	30		-
6.4	Supply of Aspirating Tube, capilary Tube, Nozzles , accessories etc.	Each	8		-
	SUBTOTAL CARRIED OVER TO SUMMARY				-

PACKAGE - IP BASED CCTV SYSTEM					
DETAILED ESTIMATES					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**RATE**	**AMOUNT**
7	**CHAPTER 7 : IP BASED CCTV SYSTEM**				
7.1	Supply, installation, testing and commissioning of 2/4/5 MP CMOS Vandal-proof, Network **Dome Camera** HD, 1/3" Progressive scan CMOS, 0.01Lux@F1.2, AGC ON. 0 Lux with IR on, IR cut filter with auto switch, IR range up to 30 mtrs, H.265 / MJPEG, Dual stream, motion detection, Bit rate 32 Kbps-16Mbps, 3D DNR, DWDR, 12 VDC ± 10%, PoE (802.3af) with **fixed lens** 2.8mm/3.6mm/6mm/ 12 mm, size of lens shall be as per site requirement & mockup. ONVIF Profile S supported, connectors complete as required in dome shape fixed type for mounting recessed in false ceiling or Surface Mounted on True Ceiling complete as required.				
7.1.1	**2MP Fixed Lens Dome camera**	Each	27		-

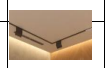
7.2	Supply, installation, testing and commissioning of 2/4/5 MP CMOS, Vandal-proof, Network Bullet Camera (outdoor type), HD, 1/3" Progressive scan CMOS, 0.01@F1.2 or better , AGC ON. 0 Lux with IR on, IR cut filter with auto switch,, H.265 / MPEG4 , Dual stream, Bit rate 32 Kbps-16Mbps, Standard IP66, PoE (802.3af), with fixed lens 8mm/10mm/12mm, size of lens shall be as per site requirement & mockup, IR range 30-40 mtr, motion detection, with ONVIF Profile S supported, connectors complete as required IR Bullet fixed type for mounting on wall/Pole/surface mounted with back box and adapter plate complete as per tender specifications required (Outdoor)				-
7.2.1	**2MP Fixed Lens Bullet camera**	Each	**RO**		-
7.3	Supply, Installation, Testing & Commissioning of IP Network 12MP Fisheye Camera, 30ips @ 12MP, Sony IMX 412 1/2.3" CMOS Image Sensor, 1.55um ,lens: Glass Aspherical, focal length:1.6mm, feild of view: 180° panoramic view with wall mount and 360° bird's eye view with ceiling mount, Min. Illumination required Color:Color 0.7 lux, B/W 0.13 lux; 0 lux with IR, 120dB True WDR, Outdoor rating: IP66/IP67 & NEMA 4X, ONVIF Profile S & Profile G compliant,IP67, IK10, PoE, UL 60950-1; CAN/CSA-C22.2 No. 60950-1; EN 60950-1,FCC,CE compliant complete as required in accordance with laid specification or upto the satisfaction of engineer in charge.	Each	**RO**		-
7.4	Supply , Installation , Testing and commissioning of 8/16/32/64 Channel NVR (Network Vedio Recorder), for recording upto 8/16/32/64 CH @ 1080P with 08 nos. SATA HDDs minimum 24TB storage or more (recording requirement all cameras recording at 2MP, 25fps for **30 days in motion)**,H.265/H.264/MJPEG/MPEG4 codec decoding, Front Control Pannel with LEDs Indication, iPhone; iPad; Android based Mobile clients, Video Export feature on USB, Search Mode: Time/Date; Alarm; Motion Detection (MD); Exact Search (accurate to a second); Smart Search, Dual HDMI Output, eSATA Device,Operating Temperature –10°C to 55°CCertification : CE, FCC & UL.				-
7.4.1	**32 Channel NVR**	Each	2		-
7.4.2	**64 Channel NVR**	Each	**RO**		-
7.5	Supply, Installation, testing and commissioning of **8TB** hard disk for above NVR		6		-
7.6	Supply, Installation, Testing & Commissioning **Video Analytics Software...** - 1 - Entering in unauthorized zone , 2 - Object removed from location, 3 - Crowd detection & estimation, 4- Loitering & tempering detection, 5- Wrong direction & wrong turn, 6-Unattended object detection. It shall be complete as per specification/drawings and as directed by Engineer In Charge.	Each	**RO**		-
7.7	Supply, Installation, Testing & Commissioning of Network Video Management & Monitoring Software (NVMMS) system with distributed architecture to collect, manage and present video from all the cameras and supports 4K resolution, H.265, H.264 codec, multi-imager/lens cameras and 360° fisheye cameras. NVMMS shall support variuos types of Recording & Storage Servers such as Windows or Linux based with embadded storage or network storage option from single or multiple locations, licenced for 500 cameras & 5 concurrent users clients expandale to unlimited based on add on license. The NVMMS should support network joystick controller, GPU rendering support for H.264 and H.265 decoding , video on demand, Screen Layout up to 8x8 grid and custom layout, Adaptive video throttling, operatore role management, server based Video Motion Detection (VMD), edge storage backfill support, Thumbnail based search, timeline search, Preview search, synchronous playback, monitor wall support, surrounding camera mode, password expiry, non-recoverable password and integration with Access Control complete as required in accordance with laid specification or upto the satisfaction of engineer in charge.	Lot	**RO**		-
7.8	Supply, installation, testing & commissioning of Client Workstation PC:♦ Intel i3(or higher) Processor 2.2 GHz or more 1333 MHz FSB, 4MB L2 cache ♦ Preloaded with Genuine Microsoft ® Windows ® 7 ♦ Intel Q43 chipset or Equivalent / Higher ♦ 4 GB DDR2 SD RAM @ 667 MHz ♦ 19" TFT LCD Non-Wide colour monitor having 0.264mm pixel pitch 1280×1024 @ 60Hz native resolution with Digital Input & Aspect ratio: 4:3 ♦ 500 GB SATA-II Hard disk ♦ Integrated Graphics Media Accelerator ♦ PCI (full-height); 1 PCI-Express X1 ♦ Ecology, Energy, Ergonomics, Emissions ♦ 50 Hz, 230V A/C with Indian Standard Plug Tops	Each	1		-
7.9	Supply, Installation, testing & Commissoning of 43" HI DEF. LED monitor screen along with all the necessary fixing supports, required patch cables for connecting with workstation, etc. with complete accessories. (commercial - 24x 7 type LED display monitor)	Each	2		-
7.10	Supply, Installation, Testing and Commissioning of 10/100/1000Mbps PoE & 2 ports for optional SFP/ SX & SFP+/SR Modules supporting 1G & 10G respectively, layer 2 managed switch with Stacking cable (Non blocking switch fabric, IPv6 ready), supports IGMPv2/3 & Multicasting switch as per below configuration:				-
7.10.2	24 Port POE Layer2 Switch	Each	**RO**		-
7.10.3	16 Port POE Layer2 Switch	Each	3		-
7.10.4	8 Port POE Layer2 Switch	Each	1		-
7.11	Supply, Installation, Testing and Commissioning **Layer 3 managed Switch** with minimum of 8Port Fiber Ports, supporting Multimode SFP/ SX 1G & SFP+/SR 10Gmodules & 8 Ports Giga Copper Ports. Should have Non blocking switch fabric, IPv6 Ready, option for RPS. The core switches, should be implemented in Active - Active, redundant topology for High Availability.	Each	1		-
7.12	Supply,Installation, testing and commissioning of following **Networking enclosure** with castors, fans with fan tray, power distribution units and complete with all accessories as required along with Horizontal Cable manager and vertical Cable manager complete as required.				-
7.12.1	6U Wall mounted	Each	**RO**		-
7.12.2	9U Wall mounted	Each	3		-
7.12.3	12U Wall mounted	Each	**RO**		-
7.12.4	15U Wall mounted	Each	1		-

7.12.5	24U Floor mounted	Each	1		-
7.13	Supply, Installation, Testing & Commissioning of **LSZH Cat 6-1G speed** unshielded twisted pair computer cable with 23 AWG solid copper conductors in existing concealed / surface conduits / Raceways **(White in Colour)** complete as required and as per technical specifications.	Metre	1500		-
7.14	Supply & Installation of **Cat 6 UTP 23 AWG** multi core Patch Cord - **1 mtr** terminated with shielded RJ-45 modular plugs on both ends and having phosphor bronze contact blade. Maximum insulation resistance shall be 35m ohms. The patch cords shall be conforming to ANSI/ TIA/ EIA-568-C.2 standards and UL certified and certified by ETL.	Each	27		-
7.15	Supply & Installation of **Cat 6 UTP 23 AWG** multi core Patch Cord - **2 mtr** terminated with shielded RJ-45 modular plugs on both ends and having phosphor bronze contact blade. Maximum insulation resistance shall be 35m ohms. The patch cords shall be conforming to ANSI/ TIA/ EIA-568-C.2 standards and UL certified and certified by ETL.	Each	27		-
7.16	Supply & Installation of **CAT 6 1G speed** UTP jack information outlets complying fully or exceeding with category 6 connecting hardware specifications for all pair combinations up to 250 MHz. Outlets shall use lead frame technology, non PCB pyramid type. **(White in Colour)** complete as required and as per technical specifications.	Each	27		-
7.17	Supply & Installation of **Cat 6 Modular Jack Panels** for accommodating **24 port** termination and shall facilitate cross-connection and inter-connection using modular patch cords and shall conform to EIA standard, **19-inch** relay rack mounting requirements. Patch Panel shall come with preloaded information outlets of non PCB and pyramid type using lead frame technology.Panel shall have label holders and designation labels as part of the standard device. Shall also come with rear cable management metallic tray with velcro ties complete as required and as per technical specifications.	Each	2		-
7.18	Supply & Installation of **1U PVC cable manager** complete as required and as per technical specifications.	Each	4		-
7.19	Supply, Installation, Testing and Commissioning of **armoured single mode OS2 fiber optic cable** of following sizes for connectivity where ever required in prelaid conduits / shafts/cable trays/raceways, whichever maybe available etc. complete as required and as per technical specifications.				-
7.19.1	12 Core	Metre	**RO**		-
7.19.2	8 Core	Metre	**RO**		-
7.19.3	6 Core	Metre	1000		-
7.18	Supply, Installation, Testing and Commissioning of 24 Port 1U x 19" LIU Loaded with Singlemode OS2 LC Adapters & LSZH Pigtails along with Splice Trays, Min. 4 No of Circular Cable Entry with Rubber Groummet/Glands to close any open entry, Cable Holders for Cable Entry Inside Panel, Heat Shrink Tubes for Splices, Tube for open fibers, Ties, Panel shall be Powder Coated with Min. 1.2mm Metal Sheath, 30 Years Channel Warranty. Factory Loaded LC Type LSZH Pigtails should meet IEC 61034-1 ,IEC-60332-1, IEC-60754-1, Insertion loss <= 0.35 dB, Return Loss >= 50, Attenuation: 1310/1550 : 0.3/0.2 dB/KM, Repeatability: <= 0.2DB 1000 Times Mating Cycles, RoHS Complied, Meets ANSI/TIA 568.3-D.The optical fiber Pigtails shall be factory loaded inside each individual Port of the panel. Pigtails shall be LSZH with Single mode 9/125µm fiber				-
7.18.1	6 Port -LIU Single Mode Fiber	Each	**RO**		-
7.18.2	24 Port -LIU Single Mode Fiber	Each	4		-
7.18.3	48 Port -LIU Single Mode Fiber	Each	**RO**		-
7.19	Supply, Installation, Testing and Commissioning of Fiber Patch Cord, LC Duplex - LC Duplex, 9/125µm OS2 Singlemode Duplex Zip Cord (<= 2.0mm), IL <= 0.35dB, RL>= 50dB, LSZH Jacket IEC 60332-1, Operating Temperature -40°C to +85°C, Meets ANSI/TIA 568.3-D, Length 3Meter.Cable : LC/LC or LC/SC or SC/SC, 9/125µm OS2 Singlemode Duplex Zip Cord (<= 2.0mm)				-
7.19.1	Fiber Patch Cord Single Mode- 3Meter	Each	8		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**

Notes:

* The quoted rates should be exclusive of GST & it would be extra as applicable.
* The quoted rates should be inclusive of custom duty as applicable.
* The quoted rates should be F.O.R at site including all freight,packaging, installation etc.
* It will be the vendors responsibility to hand-over the Light to clients/owner free of defects.
* Any material found to be defective and covered under warranty shall be replaced free of cost.
* Vendor shall rectify all snags before handing over of the completed project.
* Storing, safe guarding of the supplied material shall be the scope of the vendor till handing over.
* Availability of material & timelines be confirmed along with submission of bids.
* Before placing the final order, Quantities to be strictly rechecked with the latest approved layout from client/architect.
* "RO" Stands for rate only
* All vendors are expected to ensure the thorough coverage of all materials with polythene wrapping until the handover stage. Additionally, vendors are responsible for the proper disposal of all packing materials from the site as instructed, without incurring any additional costs to the client. Compliance with these requirements is mandatory for all vendors involved in the project.
* In the event that adjustments to the wattage of the light fixtures are necessary to achieve the desired lux levels specified by the client, the light supply vendor shall be required to facilitate the increase without requesting any additional charges. It shall be the sole responsibility of the contractor to ensure that all necessary modifications are implemented to meet the client's requirements.

S.No	Items	Drg Code		Unit	2F	3F	1F	2F	Qty	Unit rate	amount	SIZE	Refer Images
I	**SUPPLY & FIXING OF LIGHTING FIXTURES**												
1	SUPPLY & Fixing in position testing and commissioning of the following Lighting fixtures including lamps at site. . Use all Philips Trulite/Osram lumilux plus Eco lamps in Fluorescent lamp fittings. Use Osram CFL lamp - Dulux L Lumilux in all CFL lamp fixtures (Samples of all light fixtures to be submitted to the client for approval prior to procurement of fixtures)												
1	1x15W downlighter	L1		nos	430	210	265	240	1145		-		
2	Surface mounted 1x18W (150x100mm)	L2		nos	102	42	75	125	344		-		
3	Linear 1200mm long hanging light	L4		nos	262	80	190	312	844		-		
4	Linear 1500mm long hanging light & 50 mm thick	L8		nos	28	2	11	10	51		-		
5	Linear 1800mm long hanging light & 50 mm thick	L89		nos	8	3	2	2	15		-		
6	Ring Light 900mm dia	L7		nos	3	2	2	0	7		-		
7	Ring Light 1200mm dia			nos	1	0	1	0	2		-		
8	600x600mm light	L10		nos	14	3	24	10	51		-		
9	Spot Light 1x9W	L11 / L5		nos	72	20	25	18	135		-		
10	Strip Light 10W per 5mtr	L6		rmtr	100	30	40	20	190		-		
11	100x100 mm light for open cell Ceiling			nos	25	18	0	0	43		-		
12	Curve / Straight Profile light at edge			rmtr	250	170	120	40	580		-		
	Pendents												
13	Type 1 :Set of three	L3.1		set of three	0	0	0	1	1		-		
14	Type 2	L3.2		nos	0	0	7	2	9		-	300 MM DIA	
15	Type 3	L3.3		nos	7	4	4	2	17		-	400 MM DIA	
16	Type 4	L3.4		nos	5	2	5	4	16		-	450 MM DIA	
17	Type 5	L3.5		nos	0	0	60	0	60		-	150 MM DIA	
18	Type 6	L3.6		nos	5	4	4	0	13		-		

19	TabLe Lamp			nos	0	2	0	0	2		-		
20	CM cabin Light			nos	0	1	0	0	1		-	2100X750	
21	Wall light			nos	0	2	0	0	2		-		
22	TabLe Lamp			nos	0	1	0	0	1		-		
23	Track Length (Magnetic)			rmtr	0	23	0	0	23		-		
24	Track Light	L12		nos	0	25	0	0	25		-		
25	Freight + Loading & Unloading												
	TOTAL CARRIED OVER TO SUMMARY										-		

PROJECT - QCI, NAUROJI NAGAR, DELHI					
PACKAGE - LIGHTING AUTOMATION SYSTEM (CM CABIN & BOARD ROOM)					
DETAILED ESTIMATE					
S. NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
1	**CHAPTER 1 : LIGHTING AUTOMATION SYSTEM**				
1.1	Supply of recessed type dali dimmable LED downlight with maximum system wattage 12W and minimum system lumen 1200lm available with coloured trim of various shade i.e rose gold/black/gold. CCT=4000K (SDCM<3), CRI>90. Housing made of pressure die cast Aluminium. Specialy design optics made of aluminum reflector with beam angle 40/60 deg. The luminaire shall have a rated system lifetime of 50,000 burning hours at L70. The luminaire shall meet IP20 rating with THD<10% @full load and PF > 0.9. Operating voltage 220-240V , 50/60 Hz .Fixture & Driver should be BIS compliant.Including 3 core 1.5 sq.mm FRLS PVC insulated and PVC sheathed copper conductor cable and earthing etc.	Nos	35		-
1.2	Supply of Suspended /Surface Mounted Magnetic Track :- Supply of Suspended /Surface Mounted Magnetic Track Dimensions (mm): 25 (W) x 56 (H) x (L) Available -1000MM All dimensions are in tolerance of ± 5mm & Lifetime: 80,000hrs Mounting Type: Suspended ,designed for Indoor Application with IP20 Protection. Magnetic suspension kit for track- 2meter to be provided along with track. The Track should compatable be Dali-2 Diming. The cost of track should include all joint like Mid joint, End Joint & corner joint & Dali -2 Driver of 48 volt. Contractor to provide shop drawings and sample for approvals.	Meters	36		-
1.3	Supply of Suspension Wire of 2 mtr suitable for magnetic track with all hardware and mounting accessories, complete as requires.	Nos	36		-
1.4	Supply of Magnetic Foldable dali dimmable LED Light of System Wattage 12W in White / Black Color Housing. The lights can be easily attach of de-attach from the track channel. CCT-3000/4000K/57000K CRI 90 Tolrence +-2%, 12W Beam Angle 36° width - 22mm Length -220mm height -110mm Tolerence of ± 5mm, & Should be compatible with Track Dali-2 Dimming. Reference image is only for the design intent. Contractor to provide shop drawings and sample for approvals.	Nos	72		-
1.5	Supply of 5mtr IP20 flexible LED strip light made of Polymide double sided PCB, Strip should have minimum efficacy at System level >=70lumens/watt with nominal system lumens 700lm/mtr, Life of LED strip : 35000 burning Hrs. @ (ta 45 C) @L70 Lumen maintenance , CCT of 3000K, CRI Ra >=80, an operating Voltage Range of 100 - 300 VAC, and surge protection of 3KV. Complete with Necessary driver and other installation accessories like aluminium channel etc	Nos	15		-
1.6	Supply of CE Certified DALI2 certified sensor with ability to detect occupancy and must be programmable for constant light control for energy efficiency using Imagine's daylight harvesting functionality. Should be able to detect area of 8m*6.2m at a max mounting height of 4mtrs. 10 mA DALI current consumption and must consume power via the DALI Application controller only. No separate BUS or PSU must be required. Must compy with DALI2 standard IEC62386, Parts 101, 103, 303 and 304.	Nos	5		-
1.7	Supply of Pendant Ring luminaire with HE-High Efficiency dali dimmable LED (Light Emitting Diode) system power: 60W (30% Up, 70% Dn) lumino, Up/Down Light output, luminous flux of luminaire 5000 lm, colour temperature of 4000 K, warm white, SDCM<3, THD<10%, P.F>0.9, CRI>90, 230V constant current driver, 70% of luminous flux after 50,000 operating hours, direct - indirect light emission, curved luminaire profile in aluminium, powder coated Black, opal diffuser for uniform illumination, Electronic control gear, IP20 Ø = 900 mm, B = 50-53 mm, H = 50 mm, PL max = 1200 mm	Nos	1		-
1.8	Supply of Stretch Fabric dali dimmable LED Light Profile light with all fitting & mounting accessories complete as required. Contractor to provide shop drawings and sample for approvals.	Sqm.	53		-
1.9	Supply of designe dali dimmable Light with all fitting & mounting accessories complete as required. Contractor to provide shop drawings and sample for approvals. (For CM Cabin)	nos	1		-
1.10	Supply of CE Certified DALI2 certified Application Controller , with a built-in DALI PSU & a built-in Real time clock, capable of handling 2 DALI Subnet. Suitable for each DALI line of up to 64 devices in each universe with 1nos of 10 / 100 Ethernet gateway to connect to LMS network. The Imagine controller must be capable to provide DALI-OUT current : 480mA Must comply with DALI STANDARD (IEC 62386) Parts : o 101 (System Components) o Part 103 (Control Devices) o Part 301 (Push Buttons) o Part 303 (Occupancy Sensor) o Part 332 (Feedback, LED only)	Nos	3		-

1.11	Supply of BACnet Gateway provides a simple interface to a router system and allows lighting system data to appear in a BACnet Building energy Management System. • Operates as BACnet server • workgroup discovery tool • router selector • Automatic point identification • BACnet/IP compatible • Automatic BACnet instance labelling • COV (change of value) BACnet feature Browser programming interface	Nos	1		-
1.12	Remote Control for Lighting automation	Nos	3		-
1.13	Supply of compatible touch panel for Lighting management system with advanced lighting control features incorporates touchsensitive technology to provide an intuitive and familiar user experience. Integrated Bluetooth® connectivity expands the control possibilities to smartphones and tablets via the SceneSet® app for iOS and Android. The panel range allows for easy-to-use control of lighting control systems and DALI Type 8 colour devices. They provide out-of-thebox ability to modify, store and recall intensity, colour temperature or colour scenes (CT and x-y)	Nos	3		-
1.14	Supply, installation, testing & commissioning of high performance, non regulating type **Occupancy detector** for lighting control with photo cell holding light off in bright ambient conditions when area becomes occupied having 180 degree angle of viewing, Up to **800 sq.ft** major motion coverage and **400 sq.ft** minor motion coverage and off delay range of **1 to 60** minutes complete as required.	Nos	1		-
1.15	Wiring for circuit/ submain wiring alongwith earth wire with the following sizes of FRLS 1.1KV grade PVC insulated copper conductor, single core cable in existing surface/ recessed **steel conduit** as required.				-
1.15.1	2 x 1.5 sq.mm. + 1 x 1.5 sq.mm. earth wire.	Meter	50		-
1.15.2	2 x 1.5 sq.mm.	Meter	500		-
1.16	Supply, Installation, Testing & Commissioning of following Annealed Tinned Copper Shielded unarmoured ATC cable suitable for automation applicationl & Communication complete as required.				-
1.16.1	2 x 1.0 sq.mm	Meter	300		-
1.16.2	2 x 1.5 sq.mm	Meter	50		-
1.16.3	4 x 1.5 sq.mm	Meter	**RO**		-
1.17	Supply, Installation, Testing & Commissioning of **LSZH Cat 6-1G speed** unshielded twisted pair computer cable with 23 AWG solid copper conductors in existing concealed / surface conduits / Raceways **(Black in Colour)** complete as required and as per technical specifications.	Meter	200		-
1.18	Supplying and fixing of following sizes of **steel conduit** along with accessories in surface/recess including painting in case of surface conduit, or cutting the wall and making good the same in case of recessed conduit as required.				-
1.18.1	20 mm	Meter	**RO**		-
1.18.2	25 mm	Meter	500		-
1.18.3	32 mm	Meter	**RO**		-
1.18.4	40 mm	Meter	**RO**		-
1.18.5	50 mm	Meter	**RO**		-
1.18.6	25 mm dia flexible conduit (Corrugated pattern finished coloured PVC Coated (min 120gsm) Pre-Galvanized Steel (min Z120GSM))	Meter	30		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**-**

PROJECT - QUALITY COUNCIL OF INDIA (QCI)		
PACKAGE - MECHANICAL WORKS		
SUMMARY OF COST		
SI.NO.	**DESCRIPTION**	**AMOUNT**
1)	CHAPTER 1: AIR DISTRIBUTION SYTSTEM & CHILLED WATER PIPING	-
2)	CHAPTER 2: VRV CONDENSING UNIT (TECHNICAL AREAS)	-
3)	CHAPTER 3: VRV CONDENSING UNIT (CAFETERIA & KITCHEN)	-
4)	CHAPTER 4: ELECTRICAL WORK	-
5)	CHAPTER 5: AIR PURIFICATION & AQI MONITORING SYSTEM	-
	TOTAL	**-**
	TOTAL AMOUNT IN RUPEES (NDSR+DSR)	
	EXCLUSIONS:	
1)	Civil works shall not form any part of this bill including foundations, core cuts and any other kind of cutouts in any structural component etc.	
2)	Any kind of false ceiling works, boxing work, wooden framework/carpentry work.	
3)	False ceiling insulation work (If Any).	
4)	Statutory deposits or fee for any approval or liasoning.	
	RATES:	
1)	The taxes are excluded from this bill of quantity.	
2)	The rates shall be prepared in conjuction and with reference to the contents of Specification & Drawings.	
3)	The rates quoted shall also include for providing any temporary work or preparatory work required to execute the particular items of work.	
4)	The unit prices stated hereunder shall be deemed to include, but not be limited to the following :	

a.	Site management and supervision, labour and all costs in connection therewith, including the cost of overtime as necessary.
b.	The supply, fabrication and supervision during installation of all goods and all costs in connection therewith.
c.	Delivery as appropriate.
d.	Paint, tools, equipment and all cost in connection therewith site facilities and all other costs from items that are necessary to execute the Work.
e.	Waste of Material
f.	Mobilization costs, overhead costs and profit.
h.	Stand/Foundation for ODU.
i.	3 Pin socket switch for Cassette, ductable unit near to the each Indoor unit or fan.
j.	Isolator Switch (Weather Proof) near to the each Outdoor Units.
k.	Provision of necessary drain points and its end connection
l.	Copper wiring /earthing from Isolator switch to M/C (Outdoors)
5)	The rates for each item of work included in the schedule of quantities shall unless expressed stated otherwise, include cost of all equipment, ancilliary equipment, fixing material, accessories, tools, plants, transport, labour and incidentals required for the completion of the work as called for in the item and as per Specification and drawings.
	NOTES:
1)	This bill is to be read in conjunction with all other project documents and deviations if any shall be brought into the notice of the consultant in prior.

2)	The Quantities in this schedule are provisional. The Contractor will be paid for the actual quantity of work executed at site at the rates quoted in the tender and finally accepted in writing by the client. The Owner reserves the right to increase or decrease any of the quantities or to totally omit any item or work and any claims by the Contractor in these accounts will not be entertained.
3)	The contractor shall visit the site and shall satisfy himself as to conditions under which the wrok is to be performed. No extra claim as a consequence of ignorance or on grounds of insufficient description will be allowed at a later date.
4)	No Alteration whatsoever is to be made to the text or quantities of this schedule of quantities unless alteraion is authorised in writing by client. Any such alterations, notes or additions shall, unless authorised in writing be disregarded when tender documents are considered.
5)	Any error in totalling in the amount column and in carrying forward totals shall be corrected.
6)	Any error in description or in quantity or omission of items from the contract schedule shall not vitiate this contract but shall be corrected and deemed to be a variation required by the owner.

PROJECT - QUALITY COUNCIL OF INDIA (QCI)					
PACKAGE - MECHANICAL WORKS					
DETAILED ESIMATES					
SI.NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
1	**CHAPTER 1: AIR DISTRIBUTION SYTSTEM & CHILLED WATER PIPING**				
1.1	**SINGLE WALLED OVAL DUCTS**				
	Fabrication, supply, installation, testing & commissioning of powder coated G.I. Oval Factory fabricated & painted/ powder coating Ducting as per SMACNA standards of following duct gauges complete with splitter dampers, turning vanes, wire rope supports etc.as per drawings and specifications. Cost including all low side accessories for oval duct as per drawings and specifications. The scope includes Supply & fixing of Thermal insulation for duct using 13 mm thick class " O " (FM approved & in accordance to UL 94(HB, VO, 1996) Aluminium foil faced Closed cell nitrile rubber based elastomeric insulation with the density of 40 - 55 kg/m³. It should not absorbs more than 0.2% water by volume, should not support microbial growth, should not emit objectionable odors and thermal conductivity K value should not exceed 0.033W/m.k @ 0deg C as per DIN EN 12667 and water vapor permeance of 0.10. Joints should be sealed with 50 mm wide 3 mm thick self adhesive insulation tape (Black Cotton Tape not acceptable). Adhesive shall be used additionally with VOC level not exceeding 50 grms / Litre. Note : 1. Insulation should be applied from inside of the duct. 2. All duct work shall confirm to the requirements of IS:277. 3. The ducting shall be provided with suitable thickness enamel painting applied through painting Gun. it shall be ensured that the GI colour of duct shall not be visible after painting. The colour of painting shall be finalized and approved by architect. Cost of ducting includes painting of approved colour and no extra cost shall be paid. 4. The hanging arrangement shall include cost of supports conying SMACNA standards including gripple wire or threaded rod complete as required (the contractor should do sampling for supporting arrangement at site and seek approval from PMC/client/architect/consultant before execution) Note:				
1.1.1	24 G (0.63 mm)	Sq.mtr.	1700		-
1.1.2	22 G (0.80 mm)	Sq.mtr.	500		-
1.1.3	20 G (1.0 mm)	Sq.mtr.	30		-
1.1.4	18 G (1.0 mm)	Sq.mtr.	30		-
1.2	**SUPPLY AIR GRILLE (FOR OVAL DUCT)**				
	Supply, installation, testing,balancing and fixing of Powder coated aluminium extruded grill with 5mm blade thickness in front, Grille height 16 mm and blade pitch 12.5 mm including aluminium construction collar damper for supply air as per specification & the sizes will be as per schedules and drawing.Refer technical specification for detail description. (The colour approval shall be taken from client/architect before ordering of material.)				
1.2.1	Curved Linear Grille (Flush Type)	Sq.mtr.	20		-
1.3	**VOLUME CONTROL DAMPER (FOR OVAL DUCT)**				
	Supply, installation, testing & commissioning of Volume Control dampers made of Galvanised steel constructed Frame of 16G & Blade of 18G, aerofoil design blades, blade spindle connected with self lubricated bronze bush, damper is operated by means of lever & fault linkage connected to the spindle. These dampers shall be provided with oval/ round duct piece connection on both sides of dampers to facillitate easy connections with ducting. VCD to be installed on duct along with necessary support & accessories.	Sq.mtr.	11		-
1.4	**MOTORISED FIRE & SMOKE DAMPER (FOR OVAL DUCT)**				

	Supply, installing, testing and commissioning of Motorised fire and smoke dampers and with all required electrical and low side accessories. Motorised dampers shall be thermally treated for 2 hrs stable operation in case of fire. Fire damper shall be UL certified as per UL-555 and UL-555S suitable for smoke as well as fire with class 1 leakage rating. Actuator shall be with auxillary switch & suitable for power supply of 220V, necessary power cable between actuator control panel & Actuator shall be considered (Final actuator torque to be as per selection). The scope shall include fire damper control panel. The necessary step down transformer with rectifier (AC to DC 12 or 24V), shall be part of control panel suiting to the voltage requirement of damper actuator. The necessary wiring between the control panel and the damper actuators shall be included in the scope of work. The quoted price shall be inclusive of all the necessary components and accessories. The damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed or open (as per requirement) in the event of fire signal complete as required and as per specifications. Note: BMS compatible Control panel shall be provided by OEM.				
1.4.1	Damper	Sq.mtr.	**RO**		-
1.4.2	Actuator with controller	Each	**RO**		-
1.5	Supply, Installation , Testing & Commissioning of BMS compatible VAV boxes for **Oval duct** of following capacities as per Specifications , schedules provided and includes all following:- # VAVs shall be pressure independent type & low velocity type. # VAV shall be slow reacting type capable of delivering variable air volume type by the action of opposed blade volume control damper # VAV boxes shall be supplied with end flanges for attachment to flanged duct ends and shall be complete with all internal Acoustic treatment. # The casing shall be single skin type of Galvanized sheet steel construction with a completely sealed , easily removable. # VAV shall be electronically controlled networkable controller type complete with low leakage damper, actuator , Microprocessor unit , wall/ ceiling mounted temperature sensor with ON/OFF Switch , control transformer , unit hander brackets etc				
	# VAV Boxes shall also be able to reset any air flow between zero and the maximum air quantity that the boxes can handle without changing orifices or other parts, but the boxes shall be factory set at 10% of the maximum flow as minimum flow. # The noise level from the VAV boxes shall not exceed 35 dB (A) at 1 meter distance. # It shall include Touch screen type digital thermostat for each VAV. # The the entire control mechanism shall be fully compatible with BMS System through BACNET/MSTP/MODBUS protocol. Data like temperatures, set points, damper position shall be monitored through BMS system. # The VAV shall be suitable to operate on 220 V, single phase electrical supply. # The quoted price shall be inclusive of associated cabling required for the functioning of the VAV system. # The capacities of the units with the above specification are as follows as per technical specifications with all the necessary mounting accessories as required for complete installation.				
1.5.1	100 CFM - 600 CFM	Each	10		-
1.5.2	600 CFM - 1000 CFM	Each	7		-
1.5.3	1000 CFM -1500 CFM	Each	2		-
1.5.4	1500 CFM -2000 CFM	Each	**RO**		-
1.5.5	2000 CFM -3000 CFM	Each	**RO**		-
1.5.6	3000 CFM -4000 CFM	Each	**RO**		-
1.5.7	4000 CFM -5000 CFM	Each	2		-
1.6	**ROUND DIFFUSER**				

	Supply, Installation, Testing,commissioning and balancing of powder coated round supply air diffusers with removable key operated butterfly volume control dampers as per the approved shop drawings and specifications.The diffusers shall be anti-smudge flush type as approved by the interior designer. Diffuser shall be complete with GI cone with circular connection at the rear. The colour approval shall be taken from client/architect before ordering of material.				
1.6.1	537 mm dia round diffuser with GI cone	Each	15		-
1.6.2	287 mm dia round diffuser with GI cone	Each	295		-
1.6.3	214 mm dia round diffuser with GI cone	Each	10		-
1.7	**SLOT DIFFUSER**				
	Supply , installation , testing and commissioning of Powder coated Aluminium extruded trimless ceiling linera slot diffuser with/without hit and miss type aluminium volume control dampers.The colour approval shall be taken from client/architect before ordering of material.				
1.7.1	2 Slot Diffuser with aluminium VCD	Metre	75		-
1.7.2	2 Slot Diffuser without VCD	Metre	75		-
1.8	**JET DIFFUSER**				
	Supply, Installation, Testing,commissioning and Balancing of powder coated supply air jet diffusers with removable key operated butterfly volume control dampers as per the approved shop drawings and specifications.The diffusers shall be anti-smudge flush type as approved by the interior designer. Diffuser shall be complete with GI cone with circular connection at the rear. The colour approval shall be taken from client/architect before ordering of material.				
1.8.1	300 mm dia jet nozzle with GI cone	Each	**RO**		-
1.9	**SPIGOT DAMPER**				
	Supply, Installation,Testing ,commissioning and Balancing of single piece GI round spigot made out of spinning process with 50mm height and having grooves on both sides and circular flanges. Spigots shall be installed on main ducts to facilitate connection of flexible ducts.				
1.9.1	100 mm Dia	Each	**RO**		-
1.10	**GSS DUCT (FACTORY FABRICATED)**				
	Supply, installation, balancing and commissioning of factory fabricated GSS sheet metal rectangular ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, wire rope supports etc. as per approved drawings and specifications of following sheet thickness complete as required. All duct work shall confirm to the requirements of IS:277. Note: The hanging arrangement shall include cost of supports conying SMACNA standards including gripple wire or threaded rod complete as required (the contractor should do sampling for supporting arrangement at site and seek approval from PMC/client/architect/consultant before execution)				
1.10.1	24 G (0.63 mm)	Sq.mtr.	950		-
1.10.2	22 G (0.80 mm)	Sq.mtr.	760		-
1.10.3	20 G (1.0 mm)	Sq.mtr.	730		-
1.10.4	18 G (1.0 mm)	Sq.mtr.	15		-
1.11	**GSS DUCT (SITE FABRICATED)**				
	Supply, installation, balancing and commissioning of fabricated at site GSS sheet metal rectangular ducting complete with neoprene rubber gaskets, elbows, splitter dampers, vanes, wire rope supports etc. as per approved drawings and specifications of following sheet thickness complete as required. All duct work shall confirm to the requirements of IS:277. Note: The hanging arrangement shall include cost of supports conying SMACNA standards including gripple wire or threaded rod complete as required (the contractor should do sampling for supporting arrangement at site and seek approval from PMC/client/architect/consultant before execution)				
1.11.1	24 G (0.63 mm)	Sq.mtr.	50		-
1.11.2	22 G (0.80 mm)	Sq.mtr.	40		-
1.11.3	20 G (1.0 mm)	Sq.mtr.	10		-
1.11.4	18 G (1.0 mm)	Sq.mtr.	5		-
1.12	**SUPPLY AIR GRILLE**				
	Supply, installation, testing,balancing and fixing of Powder coated aluminium extruded grill with aluminium construction collar damper for supply air as per specification & the sizes will be as per schedules and drawing.Refer technical specification for detail description.The colour approval shall be taken from client/architect before ordering of material				

1.12.1	Rectangular grilles	Sq.mtr.	20		-
1.13	**RETURN AIR GRILLE**				-
	Supply, installation, testing,balancing and fixing of Powder coated aluminium extruded grill with aluminium construction collar damper for supply air as per specification & the sizes will be as per schedules and drawing.Refer technical specification for detail description.The colour approval shall be taken from client/architect before ordering of material				-
1.13.1	Rectangular grilles	Sq.mtr.	15		-
1.14	**FLEXIBLE DUCT**				-
	Supply, Installation,Testing ,commissioning and Balancing of thermally insulated flexible ducting comprising of inner as well as outer skin constructed out of aluminum & fiber glass insulation 25mm thick of minimum 24 kg/cu.m density insulation sandwiched in between duly supported at regular interval as per site requirement etc. complete as required as per specifications . Duct should confirm to fire rating standards BS-476 part 5, 6 & 7. Flexible Ducts of following sizes as per approved shop drawings, specifications :				-
1.14.1	150 mm Dia	Metre	20		-
1.14.2	100 mm Dia	Metre	5		-
1.15	**DOUBLE LAYER CANVAS CONNECTION**				-
1.15.1	Supply,Installation,testing and commissioning of double Layer silicon based canvas connection fire retardant material for the end connection suitable for operation till 200 Deg.C with both side 45 mm steel flanges to reduce the vibration. It shall be fire rated for atleast 2 hrs. as per the drawings/ specifications. The silicon shall have backing of glass fibre.	Sq.mtr.	8		-
1.16	**DUCT INSULATION**				-
	Supplying and fixing of following thickness duly laminated aluminum foil of mat finish closed cell Nitrile rubber (Class "O") insulation on rectangular duct after applying suitable adhesive for Nitrile rubber. The joints shall be sealed with 50 mm wide and 3 mm thick self adhesive nitrile rubber tape insulation complete as per specifications and as required.				-
1.16.1	19 mm on Supply/Return duct	Sq.mtr.	2304		-
1.16.2	25 mm on Supply/Return duct	Sq.mtr.	5		-
1.17	**DUCT ACOUSTIC LINING**				-
	Supply & fixing of Acoustic insulation for air ducts & plenum using following thickness class "1" rating Open cell nitrile rubber elastomeric insulation with density of 140 - 180 kg / m^3 and specification. It should not absorb more than 0.2% water by volume, should not support microbial growth, should not emit objectionable odors. The conductivity K value should not exceed 0.04W/m.k @ 20 degC as per DIN EN 12667 and water vapor permeance of 0.10. Adhesive shall be used additionally with VOC level not exceeding 50 grms/ Litre.				-
1.17.1	10 mm thick	Sq.mtr.	10		-
1.17.2	15 mm thick	Sq.mtr.	260		-
1.17.3	25 mm thick	Sq.mtr.	**RO**		-
1.18	Supply & fixing of Acoustic insulation for air ducts and plenum with 25 mm thick resin bonded glass wool having density of 32 kg/m^3, with 25mm X25 mm GI section of 1.25 thick, at 600 mm centre to centre covered with Reinforced Plastic tissue paper and 0.5 mm thick perforated aluminum sheet fixed to inside surface of duct with cadnium nuts, bolts, sticks pins, CPRX compound etc. complete as required and as per specifications.	Sq.mtr.	**RO**		-
1.19	**VAV BOXES**				-
	Supply, Installation , Testing & Commissioning of BMS compatible VAV boxes for **Rectangular duct** of following capacities as per Specifications , schedules provided and includes all following:- # VAVs shall be pressure independent type & low velocity type. # VAV shall be slow reacting type capable of delivering variable air volume type by the action of opposed blade volume control damper # VAV boxes shall be supplied with end flanges for attachment to flanged duct ends and shall be complete with all internal Acoustic treatment. # The casing shall be single skin type of Galvanized sheet steel construction with a completely sealed , easily removable. # VAV shall be electronically controlled networkable controller type complete with low leakage damper, actuator , Microprocessor unit , wall/ ceiling mounted temperature sensor with ON/OFF Switch , control transformer , unit hander brackets etc				-

	# VAV Boxes shall also be able to reset any air flow between zero and the maximum air quantity that the boxes can handle without changing orifices or other parts, but the boxes shall be factory set at 10% of the maximum flow as minimum flow. # The noise level from the VAV boxes shall not exceed 35 dB (A) at 1 meter distance. # It shall include Touch screen type digital thermostat for each VAV. # The the entire control mechanism shall be fully compatible with BMS System through BACNET/MSTP/MODBUS protocol. Data like temperatures, set points, damper position shall be monitored through BMS system. # The VAV shall be suitable to operate on 220 V, single phase electrical supply. # The quoted price shall be inclusive of associated cabling required for the functioning of the VAV system. # The capacities of the units with the above specification are as follows as per technical specifications with all the necessary mounting accessories as required for complete installation.				-
1.19.1	100 CFM - 600 CFM	Each	30		-
1.19.2	600 CFM - 1000 CFM	Each	5		-
1.19.3	1000 CFM -1500 CFM	Each	5		-
1.19.4	1500 CFM -2000 CFM	Each	2		-
1.19.5	2000 CFM -3000 CFM	Each	2		-
1.19.6	3000 CFM -4000 CFM	Each	1		-
1.19.7	4000 CFM -5000 CFM	Each	**RO**		-
1.20	**VAV INTEGRATION WITH VFD**				-
1.20.1	Supply, laying, integrating and Testing of all necessary copper control wiring cabling etc. as required for proper functioning & integration of VAVs with VFD. All cabling to be laid in MS conduits. Quoted price shall be inclusive of all necessary arrangement to make system complete & functional.	Each	66		-
1.21	**DOUBLE LAYER CANVAS CONNECTION (FOR RECTANGULAR DUCT)**				-
1.21.1	Supply,Installation,testing and commissioning of double Layer silicon based canvas connection fire retardant material for the end connection suitable for operation till 200 Deg.C with both side 45 mm steel flanges to reduce the vibration. It shall be fire rated for atleast 2 hrs. as per the drawings/ specifications. The silicon shall have backing of glass fibre.	Sq.mtr.	8		-
1.22	**VOLUME CONTROL DAMPER**				-
1.22.1	Supply, installation, testing & commissioning of Volume Control dampers made of Galvanised steel constructed Frame of 16G & Blade of 18G, aerofoil design blades, blade spindle connected with self lubricated bronze bush, damper is operated by means of lever & fault linkage connected to the spindle. VCD to be installed on duct along with necessary support & accessories. VCD to be installed on duct along with necessary support & accessories.	Sq.mtr.	10		-
1.23	**FIRE DAMPER**				-
	Supply, installing, testing and commissioning of Motorised fire and smoke dampers and with all required electrical and low side accessories. Motorised dampers shall be thermally treated for 2 hrs stable operation in case of fire. Fire damper shall be UL certified as per UL-555 and UL-555S suitable for smoke as well as fire with class 1 leakage rating. Actuator shall be with auxillary switch & suitable for power supply of 220V, necessary power cable between actuator control panel & Actuator shall be considered (Final actuator torque to be as per selection). The scope shall include fire damper control panel. The necessary step down transformer with rectifier (AC to DC 12 or 24V), shall be part of control panel suiting to the voltage requirement of damper actuator. The necessary wiring between the control panel and the damper actuators shall be included in the scope of work. The quoted price shall be inclusive of all the necessary components and accessories. The damper shall be motorized and spring return so as to close the damper in the event of power failure automatically and open the same in case of power being restored. The spring return action shall be inbuilt mechanism and not externally mounted. The damper shall also be closed or open (as per requirement) in the event of fire signal complete as required and as per specifications. Note: BMS compatible Control panel shall be provided by OEM.				-
1.23.1	Damper	Sq.mtr.	22		-

1.23.2	Actuator with controller	Each	35		-
1.24	**BACK DRAFT DAMPER**				-
1.24.1	Supplying, installing, testing & commissioning of GI Back Draft damper with minimum 1.4 mm flange and 1.2 mm blade thickness within ducts to be provided with suitable links, levers and quadrants for manual control of volume of air flow and for proper balancing of the air distribution system as per drawings and technical specifications.	Sq.mtr.	**RO**		-
1.25	**AXIAL FANS**				-
	Supply , installation , testing and commissioning of ceiling mounted Axial flow fans with adjustable pitch blade complete with tube casing (2mm thick up to 600 mm dia fan, 2.5 mm thick from 700 to 1250 mm dia & 3 mm thick above 1300 mm dia or as per manufacturer standard) , cast aluminium impeller , bird screen , gravity louvers , necessary nut bolts, fire retardant 150 mm deep (Inlet and Outlet as required) canvas connection for proper installation, directly coupled with TEFC Sq.cage IP-55, Class-F and IE-3 efficiency induction motor mounted on vibration isolators suitable for 415V±10% , 50 Hz. 3 phase electric supply complete as per the technical specifications. The fans shall be AMCA certified for air and sound performance in accordnace to AMCA 210 and AMCA 300. The complete fan shall be tested and approved by UL / EN in accordance with "Power Ventilators for Smoke Control Systems" for 250 °C for 2 hours. Fan outlet velocity shall be limited to maximum of 16 m/sec. The fan shall be complete in all respect and should match the specification ,Drawings and Schedule.The unit shall be capable to communicate with BMS system. 1. Noise level should be selected for 3 meter distance from fan at room condition. 2. For Emergency case - 75dB(A)@3m 3. All fan should be factory tested 4.For dia upto 1120mm fan RPM should be 1450 and above 1120 dia 950 RPM # Below specified fan static is tentative and requirement may vary +/- 5 millimeters as per actual site requirement. Contractor should consider the same in their costing and nothing extra shall be paid for such variation.				-
1.25.1	20000 CFM,Total Static pressure of 30 mm (Fresh air fan in case of fire)	Each	2		-
1.25.2	15000 CFM,Total Static pressure of 30 mm (Fresh air fan in case of fire)	Each	2		-
1.25.3	12000 CFM,Total Static pressure of 30 mm (Fresh air fan in case of fire)	Each	2		-
1.25.4	8000 CFM,Total Static pressure of 30 mm (Fresh air fan in case of fire)	Each	1		-
1.25.5	7500 CFM,Total Static pressure of 30 mm (Fresh air fan in case of fire)	Each	1		-
1.26	**INLINE FANS**				-
	Supply , installation , testing and commissoning , of duct mounted inline fans complete with direct driven centrifugal fan , TEFC squirrel cage induction motor , with efficiency class IE-3 whichever is higher , direct drive arrangement , heavy gauge sheet metal casing , rubber isolator mounts and other accessories.The fan shall be complete in all respect and should match the specification ,Drawings and Schedule. The scope includes 3 meters long wire with 3 pin top for connection with socket. Maximum acceptable noise limits shall be 60 dB @ 3 meters distance and wherever sound attenuation is required, contractor shall provide the same without any additional cost. Inline fans shall be of following capacities.				-
1.26.1	100 CFM,Total static pressure of 10 mm WG (For CM cabin's toilet)	Each	1		-
1.27	Supply, installation and commissioning of following factory fabricated Z type acoustic return air baffle with required acoustic lining from inside, insulation and hardwares as required to damp sound upto 90% as per approved drawings complete as required and upto satisfaction of engineer in charge (prior sampling to be done before procurement).	Sq.mtr.	25		-
1.28	**ACOUSTIC INSULATION FOR ROOM**				-
1.28.1	Supplying and fixing of acoustic lining on wall and ceiling of AHU rooms with 50 mm thick, density 64 kg/cu.m resin bonded rock wool insulation with less than 10% split particles and shall be fixed in 610 mm x 610 mm frame work made of 25x50x50x50x25 mm made out of 0.6mm thick GI sheet U shaped channel and covered with reinforced fiber glass tissue and finished with 0.80 mm perforated aluminium sheet etc.complete as required and as per specifications with all the necessary mounting accessories as required for complete installation.	Sq.mtr.	100		-
1.29	**FRESH/EXHAUST AIR LOUVER**				-
1.29.1	Supply, Installation, testing and commissioning of extruded aluminum powder coated louver with GI wire mesh to be installed outside for discharge of fresh/exhaust air from Fresh/exhaust fans as per the specifications and shop drawings. Sample of louvers to be got approved from consultants and Clients prior to procurement.	Sq.mtr.	**RO**		-
1.30	**EXPANSION KIT FOR AHU**				-
1.30.1	Supply, installation, tesing and commissioning of expansion and control kit for the operation of AHU's	Each	2		-

1.31	Fabrication, supply, installation, testing & commissioning of G.I Rectangular Box type site fabricated Plenum box with flexible duct upto diffuser as per SMACNA standards with fixing of Thermal insulation for plenum box using 19 mm thick class "O" aluminium foil faced Closed cell nitrile rubber based Microban Antimicrobial insulation with the density of 40 - 55 kg/m³. Cost shall include flexible duct & all low side accessories i.e rod, anchor, fastener, slotted channel, MS angles etc. as per drawings and specifications.				-
1.31.1	1400 x 200 x 250H - For Slot Diffuser	Each	4		-
1.31.2	1000 x 200 x 250H - For Slot Diffuser	Each	4		-
1.31.3	500 X 500 X 250H - For Diffuser	Each	2		-
	Notes:				-
	# The final color of the ducts/grilles/diffusers/ Louvers will be approved by the Engineer/client/architect for which no extra payment shall be given.				-
	# The material of allen key knob for operating the collar dampers/ Volume control dampers of grilles/ diffusers shall be made of die cast aluminium.				-
1.32	**CHILLED WATER PIPE**				-
	Supplying, laying/ fixing, testing and commissioning of following nominal sizes of chilled water inside the building (with necessary clamps, vibration isolators and fittings but excluding valves, strainers, gauges etc.) duly insulated with following closed cell elastromeric nitrile rubber with 7 mil GC cloth over the nitrile rubber insulation. Insualtion shall have minimum 45 Kg / m3 density,thermal conductivity 0.037W/MK or better at 20 C mean temperature Class "O" Insulation applied by suitable adhesive over the pipes. complete including repairing of damage to building etc. as per specifications and as required complete in all aspect.				-
	Note:- The pipes of sizes 150 mm and below shall be M.S 'C' class as per IS:1239 and pipes size above 150 mm shall be welded black steel pipe heavy class as per IS: 3589, from minimum 6.35 mm thick M.S. Sheet for pipes upto 350 mm dia and from minimum 7mm thick MS sheet for Pipes of 400 mm Dia and above.				-
1.32.1	65 mm dia	Metre	**RO**		-
1.32.2	50 mm dia	Metre	**RO**		-
1.32.3	40 mm dia	Metre	**RO**		-
1.32.4	32 mm dia	Metre	**RO**		-
1.32.5	25 mm dia	Metre	**RO**		-
1.32.6	20 mm dia	Metre	**RO**		-
1.33	Supplying, fixing, testing & commissioning of **Butterfly Valve** for chilled water circulation, with C.I body SS disc nitrile sheet & O- ring & PN-16 pressure rating as specified. All valve shall be insulated with the same material as of pipe insulation material.				-
1.33.1	65 mm dia	Each	**RO**		-
1.33.2	50 mm dia	Each	**RO**		-
1.33.3	40 mm dia	Each	**RO**		-
1.33.4	32 mm dia	Each	**RO**		-
1.33.5	25 mm dia	Each	**RO**		-
1.33.6	20 mm dia	Each	**RO**		-
1.34	Supplying, fixing, testing & commissioning of **Y Strainer** of Ductile CI Body flanged ends with stainless steel strainer for chilled water circulation as specified				-
1.34.1	65 mm dia	Each	**RO**		-
1.34.2	50 mm dia	Each	**RO**		-
1.34.3	40 mm dia	Each	**RO**		-
1.34.4	32 mm dia	Each	**RO**		-
1.34.5	25 mm dia	Each	**RO**		-
1.34.6	20 mm dia	Each	**RO**		-
1.35	Supplying , fixing, testing & commissioning of expansion below of PN-16 pressure rating for chilled water across pump and chiller, AHU for resisting the unit vibration to the main pipe Line.				-
1.35.1	65 mm dia	Each	**RO**		-
1.35.2	50 mm dia	Each	**RO**		-
1.35.3	40 mm dia	Each	**RO**		-
1.35.4	32 mm dia	Each	**RO**		-
1.35.5	25 mm dia	Each	**RO**		-
1.35.6	20 mm dia	Each	**RO**		-

1.36	Supply , Installation, testing and commissioning of following sizes electronic, self balancing, Pressure independent type dynamic balancing valve with integrated 2 way Balancing and modulating Control valves in a single unit of valve. The actuator shall be capable of accepting upto 10V DC and upto 20mA electric signal and shall provide similar transduved feedback output to control system. Maximum close off pressure shall not be less than 6 bar for upto 50 mm valves and 7 bar for 65mm and above. Valves should have pressure rating of 25 bar minimum. Pressure Drop across the valve must not exceed 20 kpa up to DN 32 and 30 Kpa in bigger Sizes (for AHUs). DN 15 to DN 32 Brass Body Ext. Threaded DN 40 & DN 50 Cast Iron Body Ext. Threaded and DN 65 to DN 100 Cast Iron body, Flanged Ends Connection. Duly mounted with Modulating actuator IP42/54 accordingly type suitable for 24V AC. The Valve should be selected to enable lowest possible pressure drop to have benefits of lower recurring Pumping Energy. All Valve shall be capable to communicate with BMS System.				-
1.36.1	DN 65 mm dia	Each	**RO**		-
1.36.2	DN 50 mm dia	Each	**RO**		-
1.36.3	DN 40 mm dia	Each	**RO**		-
1.36.4	DN 32 mm dia	Each	**RO**		-
1.36.5	DN 25 mm dia	Each	**RO**		-
1.36.6	DN 20 mm dia	Each	**RO**		-
1.37	**PRESSURE GAUGE**				-
	Supplying, installing, testing and commissioning of pressure gauges, it shall be dial type (100mm) of range 75 mm. Dial to be in white colour and numbers in black and / or red colour. Gauges selected must provide mid-scale readings under normal operating pressures. Gauges shall be liquid filled to dampen pulsation, with bright finished stainless steel ss-304 case, brass movement, bronze bourdon tube, and shall be furnished witha pulsation dampening orifice. Gauges shall have a SS syphon of 19 mm dia and 400mm length both side threaded with SS nut. A ball valve shall be provided at one end for protection of gauge.	Each	7		-
1.38	**TEMPERATURE GAUGE**				-
	Supplying, installing, testing and commissioning of Immersion Temperature sensors with a separable stainless steel/brass well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.Operating range shall be -20 to 70 deg C; pressure rating shall be min. PN 16, IP 54 protection,1000 ohms platinum at 0 deg. C, . To meet UL 1995 plenum requirements if necessary. Accuracy to ±0.73F° at 70°F (±0.41C° at 21°C), DIN Class B.	Each	7		-
1.39	**DRAIN VALVE**				-
	Supply, Installation, Testing , & Commissioning of Ball Valve of 25 mm diameter (Drain) in dirt legs complete with nipples etc. as required as per specifications.	Each	2		-
1.40	Providing, fixing, testing and commissioning of Purge valve with 15mm ball valve for automatic air vent. The complete purge valve body shall be SS 304.	Each	**RO**		-
1.41	Supply, Installing, testing and commissioning of UVGI (ultra voilet germicidal irradiation) system to provide minimum 100 micro watt per centimeter square intensity through out the coil surface for air de contamination and microbial removal from cooling coil and drain pan. The UVGI system shall be installed between fan and coil. The air pressure drop of UVGI system shall be Neglegible (Not more than 1 mm).				-
	The UVGI system shall be provided with IP-54 unit mounted touch screen control panel including all internal wiring and protection. Only single power cabling and earthing shall be provided at control panel from outside.				-
	The scope shall include suitable interlock to switch off the UV lamps whenever some one open the door of AHU. It shall also have suitable interlock to switch on and off the UV lamps as per AHU operation.				-
1.41.1	For AHU 14000 CFM	Each	4		-
1.41.2	For AHU 17000 CFM	Each	2		-
1.41.3	For AHU 18000 CFM	Each	1		-
1.41.4	For AHU 5000 CFM	Each	2		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**0**
2	**CHAPTER 2: VRV CONDENSING UNIT (TECHNICAL AREAS)**				
2.1	**VARIABLE REFRIGERANT FLOW/VOLUME SYSTEM**				

	Supply, Installation, testing and commisioning of variable refrigerant flow/Volume modular type air conditioning system with all Inverter Scroll Compressor suitable to operate on 415 ± 10% V and 50 Hz complete with outdoor units ,controllers, accessories including fully charged with refrigerant R410A to outdoor unit and all running refrigerant pipe as per detail given in specifications & Drawings for the following configurations. It shall include anti vibration isolator pad for outdoors unit. The unit shall be complete in all respect and should match the specification , Drawings and Schedule.The quoted price shall be inclusive of refnut required to connect the outdoor unit.The COP of unit shall not be less than 3.6 @100% loading condition during peak summer of Delhi. The unit shall operate at outside temperature of 45 C. Necessary deartion of outdoor unit shall be selected while selection. All interconnecting piping, joints and U bends within the condensing unit shall be painted with two coats of clear transparent polymer coating for protection against corrosion from ambient air pollution.				
	Outdoor Units				
2.1.1	18 HP	Each	**RO**		-
2.1.2	14 HP	Each	2		-
2.1.3	8 HP	Each	6		-
2.1.4	4 HP	Each	4		-
2.2	**INDOOR UNIT**				-
	Supply, installation, testing and commissioning of following minimum capacity VRV/VRF High wall type Indoor unit equipped with washable synthetic media pre-filter, fan section with low noise fan/dynamically balanced blower, multispeed motor, coil section with DX copper coil, electronic expansion valve, outer cabinet, cord less / wired remote control/thermostat, drain pan, necessary accessories etc., suitable for operation on 230 V ± 10%, 50 Hz, single phase AC supply, complete as required. The unit shall have automatic force shut down provision in case of fire on receiving signal from BMS System. The cooling capacity of indoor unit will be at air inlet conditions of 27 Degree C DB and 19 Degree C WB temperature.				-
	Note: - The contractor should be provided the cordless or wired remote as per site requirement				-
2.2.1	Hi Wall : 3 TR	Each	4		-
2.2.2	Hi Wall : 2 TR	Each	22		-
2.3	**MEDIUM STATIC DUCTABLE UNIT**				-
	Supply, Installation, testing and commisioning of the ceiling mounted ductable indoor unit complete with coil, filters, blower section with motors & drive, refrigerant piping, thermostatic expansion valve distributer, drain pump, starter and other necessary controls. Unit shall be complete in all respect and suitable for 230 ±5% volts included with wired thermostat for ductable unit having a dispay showing temperature of the space. The Quoted price shall include hanging arrangemnt of the unit with necessary supporting rod, nut & bolts,fastners and accessories for complete installation of Indoor unit. User shall be able to adjust the temperature as per their comfort level requirement. All items should be encased in enamel painted anti corrosive, sheet metal cabinet. The units shall be of capacities not less than specified as below:				-
2.2.1	Ductable Unit : 4.55 TR(5.0 HP) (Single phase machine)	Each	**RO**		-
2.2.2	Ductable Unit : 3.98 TR(5.0 HP) (Single phase machine)	Each	**RO**		-
2.2.3	Ductable Unit : 3.18 TR(4.0 HP) (Single phase machine)	Each	**RO**		-
2.2.4	Ductable Unit : 2.55 TR(3.0 HP) (Single phase machine)	Each	**RO**		-
2.2.5	Ductable Unit : 2.01 TR(2.5 HP) (Single phase machine)	Each	2		-
2.2.6	Ductable Unit : 1.28 TR(1.6 HP) (Single phase machine)	Each	**RO**		-
2.3	**SEQUENTIAL CONTROLLER**				-
2.3.1	Supply, Installation ,Testing & Commissioning of digital sequential controller for cyclic ON/OFF operation of ac units with LED indication and timer modes. Quoted price shall be inclusive of necessary conduting, copper control cabling from the sensors to the respective on board microprocessor complete in all respects.	Each	9		-
2.4	**REFRIGERANT PIPING**				-
	Supplying, installing, testing and commissioning ,interconnecting refrigerant copper pipe work with (19mm/13 mm thick) closed cell elastomeric nitrile rubber tubular insulation (Class-"O") between each set of indoor & outdoor units as per specifications, all piping inside the building shall be properly supported with MS hanger. refrigerant pipe insulation shall be cover with UL certified UV protective coating with 7 mill fiber glass cloth with two Coat system. Protective Coating shall be UL classified and should conform to UL for surface burning characteristics.The Protective Coating should conform to ASTM D 5590 standard for fungal resistance.				-
2.4.1	6.4 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	**RO**		-
2.4.2	9.5 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	715		-
2.4.3	12.7 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	95		-
2.4.4	15.86 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	525		-
2.4.5	19 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	280		-

2.4.6	22.2 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	**RO**		-
2.4.7	28.58 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	105		-
2.4.8	34.9 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	Metre	75		-
2.4.9	41.27 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	Metre	**RO**		-
2.5	**DRAIN PUMP**				-
	Supply, Installation, Testing & Commissioning of On Line Type Condensate drain pump for Hi-wall units complete with water level sensor and accessories as required. Quoted price shall be inclusive of controller, NRVs & water sensors and associated wiring etc. to make installation complete. Drain Pump shall be suitable for operation on 220+6 % volts 50 Hz, 1phase AC power supply.Drain pumps shall automatically ON/Off based on water level.				-
2.5.1	Drain pump for wall mounted units	No.	26		-
2.6	**REFNUT/Y-JOINT**				-
2.6.1	Supply,Instllation,testing and comissioning of Y-joints and headers etc.	Each	26		-
2.7	**CONDENSATE DRAIN PIPING**				-
	Supply, installation, testing and commissioning of Rigid heavy class (6Kg) uPVC pipe with minimum 6 mm nitrile rubber insulation ,complete with fittings, supports,U trap arrangement,clean plug and accessories for units as per specifications and technical specification.				-
2.7.1	40 mm dia	Metre	85		-
2.7.2	32 mm dia	Metre	35		-
2.7.3	25 mm dia	Metre	110		-
2.8	**DX TYPE UNIT**				-
	Supplying, Installing, testing and commissioning of air-cooled split unit, 3 star inverter type along with indoor/ outdoor units, controls, copper piping, uPVC condensate drain piping, including fully charged with refrigerant R32/R410a to outdoor unit and all running refrigerant pipe as per detail given in drawing,suitable to operate on 230 Volts 50 Hz AC supply etc. Quoted price shall include cost of wireless remote controller, wiring, control cable ,MS stand for placing outdoor unit with rubber pad isolator & earthing. Unit shall be provided with auto timer setting, complete as per technical specifications and tender drawings.The length of refrigerant pipe and drain pipe shall be considered from respective head.				-
2.8.1	2.0 TR Wall Mounted Unit	Each	**RO**		-
2.8.2	1.5 TR Wall Mounted Unit	Each	**RO**		-
2.9	**MS FRAME FOR OUTDOOR UNIT**				-
	Supply and Erection of MS base frame duly applied with of red-oxide primer & followed by black enamel paint for mounting of outdoor units.				-
2.9.1	Supply, fabrication and installation of support including cutting,bending, drilling, bolting etc. The STAND shall be fabricated using **MS/rectangular tube/chanel/angle** duly painted with two coat of red-oxide and 2 coat of approved shade colour (minimum thickness 5mm) including providing & fixing of mounting accessories like base plate / anchor fastener / clamps / nuts / bolts etc. The stand when installed at location shall be provided with anti-corrosive treatment through enamel paint or galvanizing spray complete as required.	Each	600		-
2.10	**CENTRALIZED REMOTE CONTROLLER (TOUCH SCREEN TYPE)**				-
2.10.1	Supply, installation, testing & commissioning of the Graphic central remote Controller. It must act as an advanced air conditioning management system to facilitate complete control of VRF air conditioning equipment, It should be user friendly through its touch screen, icon display and color LCD display. Integratable upto 64 remote controller groups (including AHUs & TFAs) and BMS compatible with ethernet/ Wi-Fi communication protocol for remote monitoring. In addition to basic controls such as settings for on/stop, the operation mode & temperature,the air quantity and auto louver can be set. If a problem occurs, an alarm code immediately shows the details of the problem. An external input terminal is provided as standard. External signals enable the following function: central operation/stop,demand control, emergency stop, central operation output & central alarm output. The controller shall perform but not limited to following functions:	Set	2		-
	Controls:				
	On/Off control				
	Temperature setting				
	Operation mode				
	Fan speed/direction				
	Filter alarm reset				
	User control restriction				
	Operation mode Lock & set temp. limit				
	Emergency stop				
	Monitoring:				
	On/Off				
	Set temperature				

	Room temperature				
	Operation mode				
	Fan speed/direction				
	Filter alarm				
	User control restriction				
	Operation mode lock & set temp limit				
	Power distribution				
	Error information related to EEVs/Temp. Sensors/ODUs				
	SUBTOTAL CARRIED OVER TO SUMMARY				**0**
3	**CHAPTER 3: VRV CONDENSING UNIT (CAFETERIA & KITCHEN)**				
3.1	**VARIABLE REFRIGERANT FLOW/VOLUME SYSTEM**				
	Supply, Installation, testing and commisioning of variable refrigerant flow/Volume modular type air conditioning system with all Inverter Scroll Compressor suitable to operate on 415 ± 10% V and 50 Hz complete with outdoor units ,controllers, accessories including fully charged with refrigerant R410A to outdoor unit and all running refrigerant pipe as per detail given in specifications & Drawings for the following configurations. It shall include anti vibration isolator pad for outdoors unit. The unit shall be complete in all respect and should match the specification , Drawings and Schedule.The quoted price shall be inclusive of refnut required to connect the outdoor unit.The COP of unit shall not be less than 3.6 @100% loading condition during peak summer of Delhi. The unit shall operate at outside temperature of 45 C. Necessary deartion of outdoor unit shall be selected while selection. All interconnecting piping, joints and U bends within the condensing unit shall be painted with two coats of clear transparent polymer coating for protection against corrosion from ambient air pollution.				
	Outdoor Units				
3.1.1	18 HP	Each	2		-
3.1.2	6.0 HP	Each	1		-
3.2	**AIR HANDLING UNIT (SINGLE FLUID)**				-
	Supply, Installation, Testing and commissioning of factory built ceiling suspended with chilled copper coil type double skin type horizontal/vertical air handling units made of 50mm thick panels consisting of pre plasticized G.I. casing of thickness 0.8mm outside layer and 0.8 mm inside layer with polyurethane foam (PUF) insulation factory injected between them by injection moulding machine, complete with blower section with blower suitable for static pressure as required, minimum 2 bend GSS/PVC eliminators, cooling coil section with aluminium finned copper tubes (tubes thickness not less than 0.5mm) cooling coil of 6 row deep, filter section with 50mm thick metal viscous/ washable synthetic type air prefilters, belt drive package with TEFC drive motor of efficiency class IE3 suitable for 415 ± 10% volts, 50Hz, 3 Phase AC supply suitably designed for varialbe frequency drive applications, drain connections, stainless steel (18G) drain pan with PUF insulationnecessary vibration isolation arrangement etc. complete as per specification and of following. (cost of local pucsh ON/OFF push button & required isolators included))				-
3.2.1	5000 CFM, Total Static pressure of 50 mm	Each	**RO**		-
3.3	**AIR HANDLING UNIT (DUAL FLUID)**				-
	Supply, Installation, Testing and commissioning of factory AHU, comprise of corrossion resistant evaporator fan section with DIDW fan with compensate blade Fixed scroll compressors, safety controls for DX/VRV mode, Straight/Slant flat type Evaporator DX/VRV and CHW Cooling Coil with hydrophilic blue fin coating, ceiling suspended with chilled copper coil type double skin type horizontal/vertical air handling units made of 50mm thick panels consisting of pre plasticized G.I. casing of thickness 0.8mm outside layer and 0.8 mm inside layer with polyurethane foam (PUF) insulation factory injected between them by injection moulding machine, complete with blower section with blower suitable for static pressure as required, minimum 2 bend GSS/PVC eliminators, cooling coil section with aluminium finned copper tubes (tubes thickness not less than 0.5mm) cooling coil of 6 row deep, filter section with 50mm thick metal viscous/ washable synthetic type air prefilters, belt drive package with TEFC drive motor of efficiency class IE3 suitable for 415 ± 10% volts, 50Hz, 3 Phase AC supply suitably designed for varialbe frequency drive applications, drain connections, stainless steel (18G) drain pan with PUF insulationnecessary vibration isolation arrangement etc. complete as per specification and of following.				-
3.3.1	5000 CFM, Total Static pressure of 50 mm	Each	2		-
3.4	**TREATED FRESH AIR UNIT**				-

	Supply , Installation , testing and commissioning of factory built ceiling suspended double skinned direct expansion horizontal type with thermal break profile fabricated out of extruded aluminium section with 0.8mm pre-plasticized GI sheet outside & 0.8mm 180 GSM galvanised sheet inside, blower section with AMCA certified DIDW Backward Curve blower (Suitable static pressure as required , minimum 2 bend GSS/ PVC eliminators) and blower motor TEFC type with IE-3 class rating suitable for operation on 415 volts ± 10% , 50 Hz ± 5% AC supply , 8 row deep cooling coil or selected for off coil temperature of 11.5 °C made of aluminium finned copper tube(Tube thickness not less than 0.45 mm) with coil section , pre-filter section with non wovensynthetic media down to 10 micron particle size with an efficiency of 90% , fine filter section down to 5 micron particle size with an efficiency of 99%, Electrostatic filter down to 2.5 micron particle size with an efficiency of 99.999%, polished stainless steel drain pan made out of 20 G sheet duly insulated with 13 mm nitrile rubber insulation and shall be connected to nearest floor drain as shown in the layout.The TFA shall be complete in all respect as per the specification.				-
	TFA Unit panels shall be insulated with 46±2 mm thick & 40 Kg/m³ density PU foam. The motor & blower assembly shall be mounted on aluminium extruded section only. The complete TFA shall confirm to standard specification. The face velocity across cooling coil shall be limited to 450 FPM maximum.The unit shall be connected to VRV condensing unit to acheive the desired temperature. The capacity of Air-handlers shall be as follows:				-
3.4.1	CS TFA : 600 CFM/ 4 TR, 60-65 mm total static pressure	Each	1		-
3.5	**EXPANSION KIT FOR TFA**				-
3.5.1	Supply, installation, tesing and commissioning of expansion and control kit for the operation of TFA.	Each	1		-
3.6	**REFRIGERANT PIPING**				-
	Supplying, installing, testing and commissioning ,interconnecting refrigerant copper pipe work with (19mm/13 mm thick) closed cell elastomeric nitrile rubber tubular insulation (Class-"O") between each set of indoor & outdoor units as per specifications, all piping inside the building shall be properly supported with MS hanger. refrigerant pipe insulation shall be cover with UL certified UV protective coating with 7 mill fiber glass cloth with two Coat system. Protective Coating shall be UL classified and should conform to UL for surface burning characteristics.The Protective Coating should conform to ASTM D 5590 standard for fungal resistance.				-
3.6.1	6.4 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	**RO**		-
3.6.2	9.5 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	50		-
3.6.3	12.7 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	120		-
3.6.4	15.86 mm dia (OD) (Soft drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	50		-
3.6.5	19 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	**RO**		-
3.6.6	22.2 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	**RO**		-
3.6.7	28.58 mm dia (OD) (Hard drawn) with tube thickness 1.2 mm with 19 mm thick insulation	Metre	100		-
3.6.8	34.9 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	Metre	**RO**		-
3.6.9	41.27 mm dia (OD) (Hard drawn) with tube thickness 1.62 mm with 19 mm thick insulation	Metre	**RO**		-
3.7	**INLINE FANS**				-
	Supply , installation , testing and commissoning , of duct mounted inline fans complete with direct driven centrifugal fan , TEFC squirrel cage induction motor , with efficiency class IE-3 whichever is higher , direct drive arrangement , heavy gauge sheet metal casing , rubber isolator mounts and other accessories.The fan shall be complete in all respect and should match the specification ,Drawings and Schedule. Inline fans shall be of following capacities.				-
3.7.1	800 CFM,Total static pressure of 10 mm WG (For kitchen exhaust)	Each	1		-
3.8	**CENTRALIZED REMOTE CONTROLLER (TOUCH SCREEN TYPE)**				-
3.8.1	Supply, installation, testing & commissioning of the Graphic central remote Controller. It must act as an advanced air conditioning management system to facilitate complete control of VRF air conditioning equipment, It should be user friendly through its touch screen, icon display and color LCD display. Integratable upto 64 remote controller groups (including AHUs & TFAs) and BMS compatible with ethernet/ Wi-Fi communication protocol for remote monitoring. In addition to basic controls such as settings for on/stop, the operation mode & temperature,the air quantity and auto louver can be set. If a problem occurs, an alarm code immediately shows the details of the problem. An external input terminal is provided as standard. External signals enable the following function: central operation/stop,demand control, emergency stop, central operation output & central alarm output. The controller shall perform but not limited to following functions:	Set	1		-
	Controls:				
	On/Off control				
	Temperature setting				
	Operation mode				
	Fan speed/direction				

	Filter alarm reset				
	User control restriction				
	Operation mode Lock & set temp. limit				
	Emergency stop				
	Monitoring:				
	On/Off				
	Set temperature				
	Room temperature				
	Operation mode				
	Fan speed/direction				
	Filter alarm				
	User control restriction				
	Operation mode lock & set temp limit				
	Power distribution				
	Error information related to EEVs/Temp. Sensors/ODUs				
	SUBTOTAL CARRIED OVER TO SUMMARY				**0**
4	**CHAPTER 4: ELECTRICAL WORK**				
4.1	Supplying, unloading, storing, laying, testing and commissioning of following sizes of **1.1 kV grade XLPE insulated** Heavy duty, **Copper** conductor **armoured** cables suitable for working voltage upto and including 1100 Volts, laid and tied on existing overhead cable trays including providing MS supports and clamps for fixing to supports in an approved manner, **providing fire retardant sealant** for crossing through shafts, openings etc where required complete as required and as per specifications. **Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site.**				
4.1.1	4C X 16 Sqmm copper conductor wire armoured	Metre	**RO**		-
4.1.2	4C X 10 Sqmm copper conductor wire armoured	Metre	90		-
4.1.3	4C X 6 Sqmm copper conductor wire armoured	Metre	100		-
4.1.4	3C X 16 Sqmm copper conductor wire armoured	Metre	**RO**		-
4.1.5	3C X 10 Sqmm copper conductor wire armoured	Metre	**RO**		-
4.1.6	3C X 6 Sqmm copper conductor wire armoured	Metre	**RO**		-
4.2	Supplying and making end termination with **Single compression** brass gland and lugs for following size of **XLPE insulated** and PVC sheathed **copper armoured conductor cable** of 1.1 KV grade of the following sizes as required. The cost shall include the cost of crimping and all tools and accessories required to complete the job in full respect. Note : cu lugs shall be used for copper cable and PG Threaded Nylon Flexible cable glands to be used for earthing/flexible cables for termination in earth box.				-
4.2.1	4C X 16 Sqmm copper conductor wire armoured	Each	**RO**		-
4.2.2	4C X 10 Sqmm copper conductor wire armoured	Each	20		-
4.2.3	4C X 6 Sqmm copper conductor wire armoured	Each	18		-
4.2.4	3C X 16 Sqmm copper conductor wire armoured	Each	**RO**		-
4.2.5	3C X 10 Sqmm copper conductor wire armoured	Each	**RO**		-
4.2.6	3C X 6 Sqmm copper conductor wire armoured	Each	**RO**		-
4.5	Supplying, installation, testing & commissioning of following size control cum transmission cables: complete as required and as per specifications. Circuit identification tag should be attached with the concerned cable alongwith the test report of following sizes of cable to be submitted by the contractor at the time of delivery of material at site.				-
4.5.1	2C X 1.5 sqmm copper conductor cable	Metre	3500		-
4.5.2	4C X 2.5 sqmm copper conductor cable	Metre	500		-
4.5.3	Supplying, laying **8Cx1.5 sq.mm control cum transmission cable** in 2mm thick heavy duty PVC Conduit between thermostat and Fan coil unit including terminations at both ends indoor and outdoor units complete as required. **(For Thermostat)**	Metre	100		-
4.6	Supply and installation of following sizes of **Pre-Galvanized perforated type Iron cable tray** with perforation not more than 17.5%, and necessary bends, tees, reducer couplers, dashfastners, GI nuts bolts including cutting,bending, drilling, bolting required suspension arrangement fabricated from steel etc.complete as per specifications and as approved by Engineer - in - charge. For the suspension of cable tray, only GI round rods with **ceiling** anchoring facility should be used including providing required MS supports fabricated from steel flats, angles, bars, channels as required for fixing/hanging cable trays duly painted with one coat of primer and 2 coats of synthetic enamel paint of approved colour etc. complete as required.				-
4.6.1	100 mm width X 75 mm depth X 1.6 mm thickness	Metre	**RO**		-

4.6.2	150 mm width X 75 mm depth X 1.6 mm thickness	Metre	30		-
4.6.3	300 mm width X 75mm depth X 1.6 mm thickness	Metre	200		-
4.6.4	450 mm width X 75 mm depth X 2 mm thickness	Metre	300		-
4.7	Supply and installation of following sizes suitable **"Covers"** for following size **Pre-Galvanized perforated type Iron cable tray** in convenient sections for straight runs, tee, elbows reducers etc. including providing suitable clamps, G.I. bolts & nuts, etc, joined with connectors for cable trays suspended from the ceiling mounted on floor, surface mounted upto satisfaction of engineer-incharge complete as required. The coller height of cover should be minimum 15mm				-
4.7.1	100 mm width X 75 mm depth X 1.6 mm thickness	Metre	**RO**		-
4.7.2	150 mm width X 75 mm depth X 1.6 mm thickness	Metre	10		-
4.7.3	300 mm width X 75mm depth X 1.6 mm thickness	Metre	10		-
4.7.4	450 mm width X 75 mm depth X 2 mm thickness	Metre	50		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**0**
5	**CHAPTER 5: AIR PURIFICATION & AQI MONITORING SYSTEM**				
5.1	**IAQ Module for FAD** Filter to be designed to effectively remove the urban based gaseous contaminants and pollutants such as VOCs along with particulate dust. The filters shall contain very high activity carbon and higher density of micro-carbon granules bonded together to offer highest effective media area resulting in a high pontaneity of adsorption. The filtration should be of Deep panel filter construction having minimum 8 Pleats per foot filter media designed for commercial and industrial HVAC standard installations. The filter should deliver the desired air quality when used in systems with challenging odor and VOC conditions and offer particulate efficiency of MERV 8 as per ASHRAE 52.2 Filter should be manufactured in India and comply to all the technical requirement. The frames to be constructed with Galvanized Steel with frame header and frame assembly to be sturdy to resist the damage during shipping and handling. The media to be supported with Metal Backing mesh.It shall be suitable with the standard panel filter mounting arrangement or with UHF Frame. The filter frames and media to be sealed with Polyurethane frame sealant which has high bonding strength. The frames to have no gaps or projections during the installation in the Fresh air and have front loading & unloading for ease of maintenance.				
5.1.1	2400 CFM	Each	**RO**		-
5.2	**Central monitoring Platform for IAQ System** Customised web software platform shall be provided to monitor and access are moitoring devices. It shall also have feature to download reports, view real-time, daily average data in single or multiple screens. Platform shall have option to create Kiosk view for real-time air quality display on single / multiple Smart TVs. It shall have cloud storage of upto 1 year. Email Alerts/ Notification, Data access to Mobile App Android / iOS, Report download. Threshold creation of air quality as per ISHRAE / WELL / ASHRAE / Custom. (BMS Compatible) to be installed in existing system	Set	2		-
5.3	Supply, Installation, testing & commissioning of the Central Control Stations consisting of Pentium i7 machine, 8 GB Ram with the capacity of 1TB HDD, along with display monitor flexibility of HDMI cable connectivity and with suitable Graphic card for the system. (Ref Make - Dell & HP) (CORE I7TH 4TH GEN CPU GIGABYTE MOTHER BOARD WITH SERIAL AND PARALLEL PORT, 500GB SSD, 16GB KINGSTON RAM,2GB GRAPHIC CARD N VEDIA, ATX CABINET, 21" COLOUR MONITOR LED DISPLAY, KEY BOARD, MOUSE.	Each	**RO**		-
5.4	Supply, Installation, Testing & commissioning of WELL complied RESET IAQ Monitor to measure PM2.5, PM10, CO2, TVOCs, Temperature, Humidity on a real time basis. The IAQ Monitor should be capable of getting connected with Wi-Fi / GSM for data transmission and shall be BMS compatible. The IAQ Monitor should be capable of sending the indoor air quality information on display screen/Mobile/Workstationas per Client's requirement. It should indicate the quality of air through changing the colors as per the NAAQS standards. It shall have an in-built battery with backup of 3 to 4 hours. It shall have grade B sensor as per RESET certification. It shall be CE certified. It shall be accredited to be used in green building projects. Each device shall be suitable to capture data of minimum 500 m2. IAQ monitoring system shall have in-house web dashboard with following features- Kiosk view for real-time air quality display on single / multiple Smart TVs.				-
5.4.1	Smart IAQ monitoring system	Nos	4		-
5.5	**FILTERS FOR AHU**				-

5.5.1	**Stage 1 - MERV8 filter** Supply, installation, testing & commissioning of AHU MERV8 filtration to improve the indoor air quality. Corrossion resistant frame, Pleated Synthetic media sandwich in HDPE and metallic mesh, for lower carbon footprint; Initial Pressure Drop (IPD) </=50 Pa (+/- 5Pa), final Pressure drop (FPD) should not be less than 250 Pa, Ease of maintenance. In accordance to ASHRAE 52.2 or EN 779:2012 & BIS: IS17570 or ISO 16890:2016. (1 Nos. filter for each 2000 CFM)				-
5.5.1.1	AHU 14000 CFM (4 Nos.)	Each	28		-
5.5.1.2	AHU 17000 CFM (2 Nos.)	Each	18		-
5.5.1.3	AHU 18000 CFM (1 Nos.)	Each	9		-
5.5.1.4	AHU 5000 CFM (2 Nos.) (For cafeteria)	Each	6		-
5.5.2	**Stage 2 - MERV14 filter** Supply, installation, testing & commissioning of AHU MERV14 filtration to improve the indoor air quality. Media shall be made of micro glass fibers with a water repellent binder and shall be a dual density construction with coarser fibers on the air entering side and finer fibers on the air leaving side. The molded end panels are to be made of high impact polystyrene plastic and center support members shall be made of high impact plastic. No metal components are to be used. For lower carbon footprint; Initial Pressure Drop (IPD </= 75 Pa (+/- 10%) and final pressure drop shall not be less than 450Pa. Multiple mini-pleat media packs, assembled into a series of V-banks, permit substantially more media to be contained in the filter — up to 60% more than standard rigid cartridge filters. Maximum effective media area provides greater airflow capacity, low resistance, high dust holding capacity, and unusually long service life. In accordance to ASHRAE 52.2 or EN 779:2012 & BIS: IS17570 or ISO 16890:2016.				-
5.5.2.1	AHU 14000 CFM (4 Nos.)	Each	28		-
5.5.2.2	AHU 17000 CFM (2 Nos.)	Each	18		-
5.5.2.3	AHU 18000 CFM (1 Nos.)	Each	9		-
5.5.2.4	AHU 5000 CFM (2 Nos.) (For cafeteria)	Each	6		-
5.5.3	Supply and installation of universal holding frames shall be designed for easy to use and fit for single filter or multiple filter banks. The design shall be front-loading design with 100% sealing integrity.				-
5.5.3.1	AHU 14000 CFM	Each	28		-
5.5.3.2	AHU 17000 CFM	Each	18		-
5.5.3.3	AHU 18000 CFM	Each	9		-
5.5.3.4	AHU 5000 CFM	Each	6		-
	SUBTOTAL CARRIED OVER TO SUMMARY				**0**

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI		
PACKAGE - INTERNAL PLUMBING WORKS		
SUMMARY OF COST		
S.No.	**DESCRIPTION**	**AMOUNT IN RUPEES**
1)	CHAPTER-1 : SANITARY FIXTURES & CP FITTINGS	0
2)	CHAPTER-2 : INTERNAL DRAINAGE	0
3)	CHAPTER-3 : INTERNAL WATER SUPPLY	0
4)	CHAPTER -4: HOT WATER STORAGE SYSTEM	0
5)	CHAPTER 5: DRINKING WATER SYSTEM	0
6)	CHAPTER-6 : GREASE SEPARATOR AND WASTE LIFTING UNIT	0
7)	CHAPTER-7: DISMANTELING AND RECIEVING	0
	TOTAL AMOUNT IN RUPEES	**0**
	EXCLUSIONS	
1)	Civil works shall not form any part of this bill including foundations, core cuts and any other kind of cutouts in any structural component etc.	
2)	Statutory deposits or fee for any approval or liasoning.	
	RATES	
1)	The quoted rates are exclusive of all taxes and duties.	
2)	The rates shall be prepared in conjuction and with reference to the contents of S.C.C., Specification &	
3)	The rates quoted shall also include for providing any temporary work or preparatory work required to execute the particular items of work.	
4)	The unit prices stated hereunder shall be deemed to include, but not be limited to the following :	
a.	Site management and supervision, labour and all costs in connection therewith, including the cost of overtime	
b.	The supply, fabrication and supervision during installation of all goods and all costs in connection therewith.	
c.	Delivery as appropriate.	
d.	Paint, tools, equipment and all cost in connection therewith site facilities and all other costs from items that are necessary to execute the Work.	
e.	Waste of Material.	
f.	Mobilization costs, overhead costs and profit.	
g.	Major civil works shall not form any part of this contract including foundations.	
5)	The rates for each item of work included in the schedule of quantities shall unless expressed stated otherwise, include cost of all equipment, ancilliary equipment, fixing material, accessories, tools, plants, transport, labour and incidentals required for the completion of the work as called for in the item and as per Specification and drawings.	
	NOTES	
1)	All the items of work under this contract shall be executed strictly in accordance with the description of the item in the schedule of quantities relevant drawings and specifications read in conjunction with appropriate Indian Standard Specifications, Special conditions of contract.	
2)	This bill is to be read in conjunction with all other project documents and deviations if any shall be brought into the notice of the consultant in prior.	
3)	All the items of work given in this schedule of quantities shall be executed strictly in accordance with National Building codes 2016 and requirements of the Indian standards read in conjunction with the relevant drawings, specifications and the appropriate Indian Standards.	
4)	The contractor shall visit the site and shall satisfy himself as to conditions under which the work is to be performed. No extra claim as a consequence of ignorance or on grounds of insufficient description will be allowed at a later date.	

5)	No Alteration whatsoever is to be made to the text or quantities of this schedule of quantities unless alteraion is authorised in writing by client. Any such alterations, notes or additions shall, unless authorised in writing be disregarded when tender documents are considered.
6)	Any error in totalling in the amount column and in carrying forward totals shall be corrected.
7)	Any error in description or in quantity or omission of items from the contract schedule shall not vitiate this contract but shall be corrected and deemed to be a variation required by the owner.

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI									
PACKAGE - INTERNAL PLUMBING WORKS									
DETAILED ESTIMATE									
S.NO.	DESCRIPTION	UNIT	BLOCK - J		BLOCK - K		Total Qty	UNIT RATE	AMOUNT
			2ND FLOOR	3RD FLOOR	1ST FLOOR	2ND FLOOR			
1	**CHAPTER-1 : SANITARY FIXTURES & CP FITTINGS**								
	Contractors will include providing and fixing of all other accessories like extension piece, fixing devices, CP Screws, including consumables etc. in the respective rates in his tender to make item fully operational. No extra payment on this account will be admissible under any circumstances. Approved Makes of all sanitary installation shall be as per the architectural selection.								
A.	**SANITARY FIXTURES**								
1.1	Supply, installation, testing and commisioning of fixing vitreous china extended **Floor Mounted/wall hung EWC (Low Flow)** with 6-3 lit. capacity concealed dual flushing cistern with fixing brackets and overflow pipe of approved design with hanging arrangement, should be bolt fixing set with 150 mm length, exposed/concealed cistern inner fittings including dual flushing System, Plastic seat and cover, CP Brass hinges, rubber buffers concealed pipe work with "P" Trap with accessories including cutting and making good the walls wherever required.	Each	RO	1	RO	RO	1		-
1.2	Supply, installation, testing and commisioning of vitreous china **Oval/Rectangular (Above Counter) wash basin** (as per architectural selection) for above counter mounting, specially fabricated brackets painted white, 32mm C.P.brass bottle trap, waste connector and pipe to wall with C.P. wall flange and rubber adopter for waste connection complete, including cutting and making good the walls wherever required.	Each	RO	1	RO	RO	1		-
1.3	Supply, installation, testing and commisioning of white vitreous china battery based infrared **sensor operated urinal** of approx. size 610 x 390 x 370 mm having pre & post flushing with water (250 ml & 500 ml consumption), having water inlet from back side, including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-charge.	Each	RO	RO	RO	RO	RO		-
1.4	Supply, installation, testing and commisioning of AISI 304 (18/8) **Kitchensink** as per IS : 13983 with C.I. brackets, duly painted 40mm C.P. waste, C.P. brass chain and rubber plug, 40mm C.P. cast brass bottle trap with pipe to wall and C.P. wall flange,rubber adopter for waste connection complete,including cutting and making good the walls where required.								
1.4.1	Single bowl Sink without Drain board	Each	RO	RO	3	2	5		-
1.4.2	Double bowl Sink without Drain board	Each	RO	RO	1	RO	1		-
B.	**FAUCETS, VALVES, MIXERS & SHOWERS**								
1.5	Supply, installation, testing and commisioning of **C.P. brass single lever basin mixer** with / without pop up waste complete as required as per the requirement of the Engineer-in-charge.	Each	RO	1	RO	RO	1		-
1.6	Supply, installation, testing and commisioning of C.P. brass **sink mixer** with swinging casted spout (table mounted) and copper / Braided pipe / Hose 450 mm long connection complete including cutting and making good the walls wherever required.	Each	RO	RO	4	2	6		-
1.7	Supply, installation, testing and commisioning of fixing 15mm C.P brass **Angle Valve** with C.P. copper connecting pipe 300 mm long & nuts, washer and C.P. brass flange complete, including cutting & making good the wall wherever required.	Each	RO	3	8	4	15		-
1.8	Supply, installation, testing and commisioning of **Health faucet** including ABS Flexible Tube with wall hook.	Each	RO	1	RO	RO	1		-
1.9	Supply, installation, testing and commisioning of **Shower system** consisting of the following:-								
1.9.1	Supply, installation, testing and commisioning of C.P concealed fourway diverter.	each	RO	1	RO	RO	1		-
1.9.2	Supply, installation, testing and commisioning of 15mm C.P overhead shower with shower arm.	each	RO	1	RO	RO	1		-
1.9.3	Supply, installation, testing and commisioning of one bath spout complete including cutting and making good the walls wherever required.	each	RO	1	RO	RO	1		-
C.	**C.P. ALLIED FITTINGS**								
1.10	Supply, installation, testing and commisioning of fixing C.P. Brass **paper holder**, with roller complete, including cutting and making good the walls wherever required .	Each	RO	1	RO	RO	1		-
1.11	Supply, installation, testing and commisioning of fixing C.P.cast brass twin **coat hooks** fixed to wooden cleats with C.P.brass screws.	Each	RO	1	RO	RO	1		-
1.12	Supply, installation, testing and commisioning of fixing C.P. brass **towel Rail (900mm wide)** fixed to Wooden / PVC cleats with C.P. brass screws	each	RO	1	RO	RO	1		-
1.13	Supply, installation, testing and commisioning of 20mm diameter **CP Brass flexible connection pipe of 300/450mm length** with brackets fixed to wooden cleats with C.P. brass screws.	Each	RO	3	8	4	15		-
D.	**OPTIONAL ITEMS**								
1.14	Supply, installation, testing and commisioning of **liquid soap dispenser** with push lever assembly complete with soap refill.	Each	14	8	13	13	48		-
1.15	Supply, installation, testing and commisioning of fixing **tissue paper dispenser** complete including cutting and making good the walls screws.	Each	4	3	4	4	15		-
1.16	Supply, installation, testing and commisioning of **hand drier** in rugged multiple stoved, multiple grounded steel enclosure with 1 bracket for firm wall fixture, 1 meter sheathed 3 core flexible cable with 3 pin 15A plug top along with lock and key and of shade approved by engineer incharge. The hand drier shall have the following features: No. touch operation. Solid state time delay to allow user to keep hands in comfortable position. Suitable for operation on 230 V 50 Hz 15 A outlet AC supply.	Each	4	3	4	4	15		-
E.	**HANDICAPPED TOILET ACCESORIES**								
1.17	Supply, installation, testing and commisioning of **support arms** of 35 mm dia Stainless steel body to be mounted on the track (vertically and laterally) for handicap toilet complete as required.								
1.17.1	Grab bar 600mm	Each	1	1	1	1	4		-
1.17.2	Grab bar 900mm	Each	1	1	1	1	4		-
1.17.3	Lift Up arm support 600mm	Each	1	1	1	1	4		-

1.17.4	Long Grab bar 1500mm	Each	1	1	1	1	4		-
1.17.5	HV Grab bar 600x300mm	Each	1	1	1	1	4		-
1.18	Supply, installation, testing and commisioning of **raised toilet seat cover** for handicap toilet.	Each	1	1	1	1	4		-
1.19	Supply, installation, testing and commisioning of **Wall mount Panic Alarm system** for Physically handicap Toilets, including Pull Cord Calling Point and Wall Mounted Receiver with blinking Lights with Siren.	Each	1	1	1	1	4		-
	SUBTOTAL CARRIED OVER TO SUMMARY								**-**
2	**CHAPTER-2 : INTERNAL DRAINAGE**								
	PIPES AND FITTINGS								
2.1	Supplying, fixing, testing and commissioning of **Centrifugally Cast (Spun) Iron Hubless Pipes & Fittings** as per ISO-6594 / IS-15905:2011 with Stainless Steel coupling with Electrometric Gasket (EPDM) as per ISO-6594 / DIN-19543 / ASTM / IS-15905 Standards alongwith suitable and necessary fittings, joints, clamps, supports & connections for fixing etc complete as required and in accordance with the Engineer-in-charge. Work under this section shall consists of furnishing all labour, materials, equipments & appliances necessary & required to completely install all soil, waste and Vent pipes with respective fittings fixed truly vertical, horizontal or in slope as required by the drawings or as directed by Engineer-in-charge. The material shall be painted with atleast 2 coats of primer followed by 2 coats of sythetic enamel paint. All corecuts, cutouts and sleeves shall be sealed with approved fire proof sealent at either end to the satisfaction of the Engineer-in-charge.								
2.1.1	50mm O.D.	Meter	10	15	25	15	65		-
2.1.2	100mm O.D.	Meter	25	25	25	25	100		-
2.2	Supplying, fixing, testing and commissioning in position CI **full bore multi-trap** (ISO-6594 / IS-15905:2011) of 100mm mm diameter for underslab location including providing necessary galvanized steel support and as per Specification and duly epoxy coated. alongwith suitable joints, clamps & connections for fixing etc complete with minimum 70 mm water seal, cutting chase / hole in floors / slabs and bringing the same in proper condition and shape after placing the trap in right position complete by supporting by GI clamps / hangers as required.	Each	1	2	4	2	9		-
2.3	Supplying, fixing, testing and commissioning of **CI Hubless Reducing bend of 100 x 50 mm** in cement concrete 1:2:4 at all levels for floor drains (exlcuding cost of grating) for connection to floor traps in sunken portions, complete as per drawings and as per approval of the engineer-in-charge.(CI Pipe for connecting elbow with floor trap shall be measured seperately)	Each	**RO**	2	2	2	6		-
2.4	Providing and fixing **CI Hubless multi inlet hopper** with 4 inlet fittings to receive waste pipes from fixtures waste. for underslab location including providing necessary galvanized steel support and as per Specification and duly epoxy coated. alongwith suitable joints, clamps & connections for fixing etc complete including cutting chase / hole in floors / slabs and bringing the same in proper condition and shape after placing the trap in right position complete by supporting by GI clamps / hangers as required.	Each	1	2	4	2	9		-
2.5	Supplying, fixing, testing and commissioning in position **G.I. pipe and fittings** of heavy class (Type -C) conforming to IS:1239 (for waste pipe from individual fixtures to floor trap / floor drain & vent pipe) including fixing at wall / ceiling level supported by galvanized clamps and hangers providing two coats of synthetic enamel paint of approved shade as per pipe colour code over atleast 2 coats of primer.								
2.5.1	40mm diameter	Meter	20	15	40	40	115		-
2.5.2	50mm diameter	Meter	10	10	20	20	60		-
2.6	Supplying, fixing, testing and commissioning of Heavy class **SS grating with Cockroach proof SS strainer** of approved design including setting in floor with cement motor to match with floor finish as per architect requirement suitable for FD and FT. a) Size 100mm x 100mm	each	1	4	6	4	15		-
2.7	Supplying, fixing, testing and commissioning of **cast brass Floor Clean Out plug** with suitable insert keys for opening, male threaded joint with G.I. socket drip seal to soil pipe / waste pipe of C.I. pipe as required complete as per drawing, approved sample and direction by Engineer-in-charge.								
2.7.1	100 mm dia	Each	**RO**	**RO**	2	**RO**	2		-
2.8	Supplying, fixing, testing and commissioning of SCH 40/80 **PVC pipe** confirming to **ASTM D -1785** and fittings as per **ASTM D-2466/2467** whichever would be applicable as per pipes grade, cut to required lengths including all necessary fittings such as bends, tees, unions, reducers, flanges & plugs, expansion bellows etc. Threading, jointing, and making proper connections. Cutting hole in wall / floor / slab and making good the same. Cost shall be inclusive of supports for fixing of pipes complete as per specifications. Pipes and fittings upto 50mm dia shall be of Sch40 and higher dia pipes i.e. from 65mm dia to 200mm dia shall be of Sch 80.								
2.8.1	50 mm dia (For Macerating Unit)	metre	10	10	10	50	80		-
2.9	**Cutting chases in brick masonry walls** for following diameter sand cast iron/ centrifugally cast (spun) iron pipes and making good the same with cement concrete 1:3:6 (1 cement : 3 coarse sand :6 graded stone aggregate 12.5 mm nominal size), including necessary plaster and pointing in cement mortar 1:4 (1 cement : 4 coarse sand) :								
2.9.1	100 mm dia	metre	15	15	15	15	60		-
	SUBTOTAL CARRIED OVER TO SUMMARY								**-**
3	**CHAPTER-3 : INTERNAL WATER SUPPLY**								
	PIPES AND FITTINGS								

3.1	Supplying, fixing, testing and commissioning of **CPVC (Chlorinated Poly Vinyl Chloride) water supply pipes** conforming to IS 15778 with pipe as per CTS SDR 11 (operating pressure - 7 Bar @ 82 Deg C and 28 Bar @ 23 Deg C)for pipes from 1/2 Inch to 2 Inch. Schedule 80 Pipe to be used from 2-1/2 Inch to 6 Inch. Pipes shall be joined using solvent welded CPVC fittings i.e. Tees, Elbows, Couplers, Unions, Reducers, brushings etc. including transition fittings (connection between CPVC & metal pipe/GI) i.e. Brass Adaptors (both Male & Female threaded) conforming to ASTM D-2846. ASTM F441 with only CPVC solvent cement conforming to ASTM F-493. All termination points for installation of faucets shall have brass termination fittings. Installation shall be to as per Technical Manual of manufacturer of pipes & fittings. Cost shall be inclusive of (a)Making maximum of 7.5 x 7.5 cm chasing in wall and floors for the pipe, making good the same by using 1:1 cement mortar over the wire mesh and providing protection to embedded pipes and fittings (in wall chase) by wrapping two layers of 400 micron polythene sheet including proper overlaps on joints complete as required or (b) Fixing/supporting the pipes (& fittings) at wall/ceiling level supported by galvanized clamps, hangers etc, as per specification.								
3.1.1	20mm nominal bore (SDR-11)	Meter	15	30	50	40	135		-
3.1.1	25mm nominal bore (SDR-11)	Meter	10	15	20	20	65		-
	VALVES AND ALLIED								
3.2	Supplying, fixing, testing and commisioning of female screwed end Full bore lever operated **Forged brass ball valve(PN 16)** having forged brass stem, carbon steel nut, carbon steel washer, carbon steel lever, forged brass body and gland nut, PTFE gland packing and body seat ring, forged brass bonnet and ball with (threaded joints) complete as required with nuts, bolts, gaskets, washers, plastic sleeve over handle etc.. The body of the valve to be tested to a pressure of 24 Kg / sqcm and seat pressure to be 17.6 kg/sqcm for metal seated valves.								
3.2.1	20mm Diameter	Each	1	2	3	2	8		-
3.2.2	25mm Diameter	Each	1	2	3	2	8		-
3.3	Supplying, Installation, Testing and Commissioning of diameter **electronic water meter with direct reading dial in KL** with all internal parts in gunmetal or brass, flanged distance piece for easy removal in future, strainer, 100mm dia Bourden type gylicerine filled pressure gauge and isolation cock complete in all respects.								
3.3.1	20 mm dia	each	2	2	2	2	8		-
3.3.1	25 mm dia	each	1	1	1	1	4		-
	SUBTOTAL CARRIED OVER TO SUMMARY								**-**
4	**CHAPTER -4: HOT WATER STORAGE SYSTEM**								
4.1	**Geyser:** Supply, installation, testing and commisioning of storage type **electrical water heaters** with copper container, insulation, and stove enameled M.S. jacket, thermostatically controlled immersion heater, with pilot lamp, 15/20mm dia inlet with non return valve and 5/20mm dia outlet including making connections complete in all respects. (Wall mounted with suitable M.S. bolts and nuts).								
4.1.1	Capacity 6 litres (Instant type)	each	1	1	**RO**	2	4		-
4.1.2	Capacity 25 litres (Storage type)	each	**RO**	1	**RO**	**RO**	1		-
4.1.3	Capacity 50 litres (Storage type)	each	**RO**	**RO**	1	**RO**	1		-
	SUBTOTAL CARRIED OVER TO SUMMARY								**-**
5	**CHAPTER 5: DRINKING WATER SYSTEM**								
5.1	**Localized RO Unit:** Supply, Installation, Testing & Commisioning of Reverse Osmosis unit (wall mounted/undercounter) of **25 LPH** capacity to treat the raw water having TDS 1500 ppm and reducing TDS to 100ppm and hardness less than 50 ppm or as per WHO standards. The operating voltage to 230 volt AC +/- 10%. Potable water system components shall comply with Safe Drinking Water Act Amendments, the 1988 Lead Contamination Control Act and shall be to ANSI/NSF 61 Section 9. Contractor shall require to submit test report post installation of RO plant and cost shall be inclusive of 15 days training to engineer incharge. The item is inclusive of al fixing arrangements as required in accordance with the engineer in charge. The item shall be inclusive of 60 litre diaphragm tank and a pressure booster pump adequate for 5 outlet @ 1.5 bar pressure.	each	1	1	**RO**	2	4		-
5.2	**Localized RO Unit:** Supply, Installation, Testing & Commisioning of Reverse Osmosis unit (wall mounted/undercounter) of **50 LPH** capacity to treat the raw water having TDS 1500 ppm and reducing TDS to 100ppm and hardness less than 50 ppm or as per WHO standards. The operating voltage to 230 volt AC +/- 10%. Potable water system components shall comply with Safe Drinking Water Act Amendments, the 1988 Lead Contamination Control Act and shall be to ANSI/NSF 61 Section 9. Contractor shall require to submit test report post installation of RO plant and cost shall be inclusive of 15 days training to engineer incharge. The item is inclusive of al fixing arrangements as required in accordance with the engineer in charge. The item shall be inclusive of 60 litre diaphragm tank and a pressure booster pump adequate for 5 outlet @ 1.5 bar pressure.	each	**RO**	**RO**	1	**RO**	1		-
5.3	Supply, installation , testing & commissioning of **bottled water dispenser,** which will provide chilled water at 15°C cooled from 40°C inlet water at 45°C ambient. The unit shall be with manual actuation. The unit shall be with anti-microbial compound that reduces the growth of micro-organisms and mildew to protect the surfaces from discoloration, odors and degradation. Basin shall be designed to eliminate splashing and standing water. Water saver bubblerwhich reduces waste water by 50% and shall have flexible guard and operate between 20 and 100 PSI. Evaporator shall be high tank type and shall be encapsulated in insulation. R-134a refrigerant to be used. An adjustable thermostat having an off position shall control refrigeration system. Potable water system components shall comply with Safe Drinking Water Act Amendments, the 1988 Lead Contamination Control Act and shall be to ANSI/NSF 61 Section 9. chiller should be single phase 220 V, 50 Hz, with cooling coil, heavy gauge galvanized steel complete as required including foundation, complete as required.	each	2	1	2	2	7		-
	SUBTOTAL CARRIED OVER TO SUMMARY								**-**
6	**CHAPTER-6 : GREASE SEPARATOR AND WASTE LIFTING UNIT**								

6.1	Supplying, installation, testing and commisioning of Floor standing grease separator unit manufactured according to DIN EN 1825 and DIN 4040, with manually controlled disposal and cleaning operation in SS Built. Grease capacity: 23 liter Inlet / Outlet: DN 110 (DA 110 mm)	each	**RO**	**RO**	**RO**	2	2		-
6.2	Supplying, installation, testing and commisioning of under sink grease trap with cutting, mixing shredder mix with autodisposal and 9 kg grease capacity, Overall capacity 35 ltr, with 2 mm thickness SS304 for undersink operations. Grease capacity: 9 kg. Overall capacity: 35 ltr Dim: 450x500x300mm Inlet / Outlet: DN 60 (DA 60 mm)	each	**RO**	**RO**	1	**RO**	1		-
6.3	Supply, installation, testing and commisioning of **macerating unit** with provision of 2 no. inlet connection and 1 no. pressurized outlet of capacity 5-8m3/hr and 6 mtr. Head with horizontal travel of upto 100m, 400W motor,IP44 rated, 220-240V, 50Hz, sound level not more than 50db, complete in all respect in accordance with th engineer in charge and as per the OEM's recommendation. Article No. Minilift	each	**RO**	**RO**	**RO**	1	1		-
	SUBTOTAL CARRIED OVER TO SUMMARY								**-**
7	**CHAPTER-7: DISMANTELING AND RECIEVING**								
7.1	Dismantling safely, removal, shifting, storing following size existing pipes, water points supply points, drainage pipes and their associated accessories within premises without damaging in stipulated time frame. The cost shall also include supply of required tools, materials, manpower etc to complete the job in all respect and upto the satisfaction of incharge. Note : Cost of transportation, loading unloading, delivering all dismantled items or components to the End Users warehouses within 10KM shall be included in the cost.								
7.1.1	20mm dia to 50mm dia pipes	metre	10	10	10	10	40		-
7.1.2	65mm dia to 100mm dia pipes	metre	15	15	15	15	60		-
7.1.3	150mm dia pipes	metre	20	20	20	20	80		-
7.2	Reciving from store or site following size pipes, water points supply points, drainage pipes and their associated accessories within premises without damaging in stipulated time frame. The cost shall also include supply of required tools, materials, manpower etc to complete the job in all respect and upto the satisfaction of incharge. Note : Cost of transportation, loading unloading, items or components to the End Users warehouses within 10KM shall be included in the cost.								
7.2.1	20mm dia to 50mm dia pipes	metre	10	10	10	10	40		-
7.2.2	65mm dia to 100mm dia pipes	metre	15	15	15	15	60		-
7.2.3	150mm dia pipes	metre	20	20	20	20	80		-
	SUB-TOTAL CARRIED TO SUMMARY								**-**

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI									
PACKAGE - FIRE PROTECTION WORKS									
SCHEDULE OF QUANTITIES									
S. NO.	DESCRIPTION	UNIT	BLOCK - J		BLOCK - K		Total Qty	UNIT RATE	AMOUNT
			2ND FLOOR	3RD FLOOR	1ST FLOOR	2ND FLOOR			
1	**CHAPTER-1 : SPRINKLER SYSTEM**								
1.1	Providing, fixing, testing & commissioning of **brass quartzoid sprinklers** (UL Listed and FM approved) of 15 mm dia size, suitable for sustaining the pressure on the seat & water hammer effect.The sprinkler nozzle to be adequate for a working pressure of 12bar and tested to a pressure of not less than 35 bar with minimum working pressure of 0.5 bar. The type & temperature rating shall be as follows :								
1.1.1	Recessed type Pendant/Upright Sprinkler - Standard Coverage, Quick Response, K-Factor 5.6 US (80metric), Temperature rating 68deg.	Each	146	86	107	96	435		0
1.1.2	Concealed type Pendant/Upright Sprinkler - Standard Coverage, Quick Response, K-Factor 5.6 US (80metric), Temperature rating 68deg. (For Chairman office and Board room)	Each	25	RO	RO	RO	25		0
1.2	Providing, fixing, testing & commissioning of stainless steel rossette plate for pendant type sprinklers.	Each	171	86	107	96	460		0
1.3	Providing and fixing of corrugated stainless steel (AISI 304) **unbraided flexible sprinkler pipe** drops of 25 mm dia of following length and maximum working pressure of 175 psi with all accessories and clamps as required. The flexible pipe drop shall be UL approved. The pipe drop shall be of 1.2mtr. length.	Each	128.25	64.5	80.25	72	345		0
1.4	Supply, installation, testing and commissioning of electrically operated water **flow switches (Vane type)** including all accessories, complete required.	Each	2	1	2	2	7		0
	SUBTOTAL CARRIED OVER TO SUMMARY								**0**
2	**CHAPTER-2 : PIPING, VALVES AND ALLIED ACCESSORIES**								
2.1	Supplying, laying, jointing, testing and commissioning of following sizes of pipes conforming to IS-1239 with all accessories like fittings (for pipes upto 50mm dia threaded forged steel fittings and for pipes above 80 mm dia MS fitting with welded joint shall be used) including tees, elbows, reducers, union, flanges, rubber gaskets, GI nuts bolts, washer etc. and all associated fittings as required. The item is inclusive of supporting/fixing the pipe on floor/wall/ceiling with clamps, hangers (using anchor fastners) as per specification, drawings and as per the approval from the engineer in charge. The pipes to be provided with two or more coats of synthetic enamel paint of approved shade over two coats of primer. Prior to application of primer the surface should be cleaned for any dirt, rusts, rough substance etc.. Painting of flow directions and legends as per the approval of the Engineer in charge.								
	All hangers, clamps, brackets etc. shall be of galvanized iron unless specified otherwise and the supply of the same shall also be included in rates under this head. Welding of any kind on the galvanized support / hanger shall not be permitted. Wherever clubbed pipe work is running, a combined support will be permitted as per the specifications and as per the detailed drawings shared with the contractor. The pipe supports worked with Mild steel material shall be coated with atleast 2 coats of primer followed by 2 coats of the same enamel paint as the pipe.								
	MS `C' Heavy class pipe (For Internal Hydrant and Sprinkler Piping)								
2.1.1	25 mm diameter (Thickness 4mm)	Meter	280.5	174.9	214.5	206.8	876.7		0
2.1.2	32 mm diameter (Thickness 4mm)	Meter	36.3	16.5	25.3	17.6	95.7		0
2.1.3	40 mm diameter (Thickness 4mm)	Meter	42.9	33.55	47.3	45.1	168.85		0
2.1.4	50 mm diameter (Thickness 4.5mm)	Meter	35.2	23.65	22.55	29.15	110.55		0
2.1.5	65 mm diameter (Thickness 4.5mm)	Meter	44	30.8	35.2	49.5	159.5		0
2.1.6	80 mm diameter (Thickness 4.8mm)	Meter	24.2	6.6	18.15	17.6	66.55		0
2.1.7	100 mm diameter (Thickness 5.4mm)	Meter	55	27.5	27.5	24.2	134.2		0
2.1.8	150 mm diameter (Thickness 5.4mm)	Meter	9.35	13.2	RO	RO	22.55		0
2.2	Supplying, fixing, testing and commisioning of **butterfly valve (PN 16)** conforming to IS: 13095 with Grey cast iron Body, Carbon steel flow control lever, Stainless steel (AISI 304), EPDM HT Lining, Stainless steel (AISI 304) Disc, Bronze Stem bush, Nitrile rubber 'O' Ring and Neoprene body lining. The valves above 150mm nominal bore to be Gear operated and below and equal to 150mm nominal bore to be Flow control lever operated. The valve shall be compatible to be installed between flanges as per BS 10 relevant tables. The cost of the valves to be inclusive of flanges on either ends with rubber gaskets, nuts, washers etc. complete as required as per the satisfaction of the engineer in charge. The body of the valve to be tested to a pressure of 24 Kg / sqcm and seat pressure to be 17.6 kg/sqcm. All valves shall be provided with Pad lock arrangement with lock and key. 4 set of keys to be provided.								
2.2.1	100 mm nominal bore (Lever operated)	Each	1	RO	2	2	5		0
2.2.2	150 mm nominal bore (Lever operated)	Each	1	1	RO	RO	2		0
	SUBTOTAL CARRIED OVER TO SUMMARY								**0**
3	**CHAPTER 3: DISMANTLING AND PAINTING ON EXISTING SPRINKLER PIPES**								
3.1	Dismantling safely, removal, shifting, storing following size existing fire pipe and their associated accessories within premises without damaging in stipulated time frame. The cost shall also include supply of required tools, materials, manpower etc to complete the job in all respect and up-to the satisfaction of incharge. Note : Cost of transportation, loading unloading, delivering all dismantled items or components to the End Users warehouses within 10KM shall be included in the cost.								
3.1.1	25mm dia to 50mm dia pipes	metre	10	10	10	10	40		0
3.1.2	65mm dia to 100mm dia pipes	metre	10	10	10	10	40		0
3.1.3	150mm dia pipes	metre	10	10	10	10	40		0
3.2	Receiving from store or site following size fire pipes associated accessories within premises without damaging in stipulated time frame. The cost shall also include supply of required tools, materials, manpower etc to complete the job in all respect and upto the satisfaction of incharge. Note : Cost of transportation, loading unloading, items or components to the End Users warehouses within 10KM shall be included in the cost.								
3.2.1	25mm dia to 50mm dia pipes	metre	10	10	10	10	40		0
3.2.2	65mm dia to 100mm dia pipes	metre	10	10	10	10	40		0
3.2.3	150mm dia pipes	metre	10	10	10	10	40		0
3.3	Painting on existing sprinkler pipes, including cleaning, surface preparation, and applying paint (minimum 2 coat of red oxide & 2 coat of synthetic enamel paint), ensuring proper adhesion and durability. All work shall comply with relevant safety standards and specifications.	Lot	1	1	1	1	4		0
	SUBTOTAL CARRIED OVER TO SUMMARY								**0**

	NET TOTAl								**0**

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI									
PACKAGE - FIRE EXTINGUISHERS									
SUMMARY OF COST									
S.NO.	DESCRIPTION	UNIT	BLOCK - J		BLOCK - K		Total Qty	UNIT RATE	AMOUNT
			2ND FLOOR	3RD FLOOR	1ST FLOOR	2ND FLOOR			
1	**CHAPTER-1 : FIRE EXTINGUISHERS**								
1.1	Supply, installation, testing and commissioning of ISI marked **handheld dry chemical powder type ABC-90%** (Mono ammonium phosphate and ammonium sulphate) fire extinguisher with minimum sheet thickness of 1.6mm, epoxy powder coating on the inner side and epoxy polyster powder coating on the outside, tested via helium leak detection test conforming to IS: 15683:2018 with gun metal cap and nozzle complete in all respects including initial fill. The item is inclusive of wall suspension brackets or floor mounted stand as required with built in MS powder coated ring type suitable to mount 6kg extinguisher.								
1.1.1	6Kg	each	17	7	12	10	46		0
1.2	Supply, installation, testing and commissioning of ISI marked **handheld CO2 based fire extinguisher** (PESO certified), epoxy powder coating on the inner side and epoxy polyster powder coating on the outside, tested via helium leak detection test conforming to IS: 15683:2018 with gun metal cap and nozzle complete in all respects including initial fill. The item is inclusive of wall suspension brackets or floor mounted stand as required with built in MS powder coated ring type suitable to mount 4.5 kg extinguisher.								
1.2.1	4.5Kg	each	17	7	12	10	46		0
1.3	Supply, installation, testing and commissioning of **5 kg capacity Ceiling Mount Clean Agent (FK 5-1-12) Fluoroketon (UL Listed)** based fire extinguisher, Test pressure 30 bar, Anti-corrosive Treatment, Shell Diameter 230 mm, Overall Height 325mm, Bulb Temperature 68°C, Charged Weight 9.5kgs, Charged Pressure 15 bar.	each	2	RO	5	7	14		0
	SUBTOTAL CARRIED OVER TO SUMMARY								**0**

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI					
PACKAGE - FIRE EXTINGUISHERS					
SUMMARY OF COST					
S.NO.	**DESCRIPTION**	**UNIT**	**QUANTITY**	**UNIT RATE**	**AMOUNT**
2	**CHAPTER-1 : GAS BASED SUPRESSION SYSYTEM**				
1.1	Supply, Installation, Testing and Commissioning of Total Room Flooding System, FK 5-1-12 Gas shall be UL Listed / FM Approved. The system shall have a Working Pressure of 25/42/50 Bar. Complete Flooding System shall be UL Approved. Storage Cylinder shall have PESO (Ex-CCOE) Approval., The system also to be fitted with low pressure supervisory switch for monitoring cylinder pressure gauge with safety burst disc safety cap, elbow and other accessories, mounting bracket, container straps, NRV , Pressure operated control head which shall allow for pressure actuation of gas mounted, manually operated actuator to actuate the gas flooding process with the help of a lever, flexible rubber hose with wire braided enforcement to route the gas from the storage cylinder to the discharge piping, to be connected to the discharge outlet of gas cylinder valve & to be terminated at the system piping or discharge manifold, Flexible actuation hose complete as required. Designated to provide proper flow rate & distribution gas to flood the hazard area as per latest NFPA 2001. OEM to provide 10 years support for gas on letterhead.				
1.1.1	Seamless Master Cylinder PESO (Ex-CCOE) approved 80 Ltr Capacity, suitable to hold gas at 50 BAR , complete with valve & Integrated Electric Release (Solenoid), Contact pressure Gauge, Syphon Tube and Safety Cap. (Main) -1no..	Nos	1		-
1.1.2	FK 5-1-12 (Fluoroketon) - Factory Filled	KG	60		-
1.1.3	Accessories for Master Cylinder : Manual Release Device 1 No's, Discharge Hose - DN 50 1 No's, Cylinder Strap 2 No's, Caution Advisory Signage's 2 No's	Set	1		-
1.1.4	Nozzles--180 degree - 1"	Nos	6		-
1.1.5	Pipe ASTM A 106 Gr B Sch 40,along with threaded fittings of 3000# conforming to ANSI B 16.11 with MS fabricated (50 mm x 50 mm x 6mm) rigid supports at every 1 mtr and every bend, T, and at nozzles with U bolts clamps etc. cost shall include 3 coats of PO red paint and 2 coats of Zinc primer. supports shall be painted black.	Lot	1		-
1.1.6	Fire Detection (Conventional) System: UL Listed Multisensor Smoke Detector + Base, Response Indicator, Microprocessor Based Gas Release Control Panel, UL Listed Hooter cum Strobe, UL Listed Abort Switch (Dual Action), UL Listed Release Switch (Dual Action), UL Listed Manual Call Point (Dual Action), Response Indicator & Fitre survival 250C for 3 hours Armoured Loop Cable Copper (2C x 1.5 Sq.mm 1100 V grade)	Lot	1		-
1.1.7	Installation, Testing & Commissioning of System	Set	1		-
1.2	LED type display sign board flashing with inbuilt Sounder "**EVACUATE GAS RELEASED**" & "**DO NOT ENTER**" (warning plate)	Set	1		-
1.4	UL approved **Flow calculation with piping isometric**, Gas quantity, layout drawings with Cylinder CCOE certificate for Storage cylinders,OEM fill certificate, Certificate for filling in India and all related documentation complete	Job	1		-
1.5	**Room Integrity Test** for server Room. Fire Vendor Shall inspect & ensure that rooms are propoerly sealed & ready for room integrity test. In case of failure of test; Re-test to be conducted by fire vendor at no additional cost. Test as per **NFPA 2001** including all consumables. Only power to equipment for testing shall be supplied at site.	Job	1		-
1.6	**Fire Sealan**t Suitable for Base Materials of Concrete, Masonry, Gypsum, Metal, Steel, Glass. Application Temperature Range 5 - 40 °C of 150 mm Thick Wall / partition	Sq.mtr.	0.5		-
	SUB-TOTAL CARRIED TO SUMMARY				**-**

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI					
FIRE PROTECTION WORKS					
DETAILED ESTIMATE					
S. NO.	DESCRIPTION	UNIT	QUANTITY	UNIT RATE	AMOUNT NDSR
	CHAPTER 1: PANEL GAS SUPPRESSION SYSTEM				
	Panel Suppression is to be considered in the following panels with the tentative sizes mentioned as below: **J-Block:** UPS Output Panel -1 (1.1Mx0.4Mx2.2M) UPS Output Panel -2 (1.1Mx0.4Mx2.2M) LNP Pane-1 (2.7 Mx0.4Mx2.2M) **K-Block:** UPS Output Panel -1 (1.1Mx0.4Mx2.2M) UPS Output Panel -2 (1.1Mx0.4Mx2.2M) LNP Panel-1 (2.4 Mx0.4Mx2.2M) Utility Panel (2.4Mx0.4Mx2.2M)				
1.1	Supply, Installation, Testing and Commissioning of **FK 5-1-12 Fluoroketone based Direct Low Pressure (DLP) Pre-Engineered Panel Gas Suppression System**, **PESO Approved Seamless Aluminium Cylinder,** Gas shall be Zero ODP and GWP less than 1., Agent shall be UL Listed & FM Approved, the system shall be designed accordance to NFPA 2001 (Latest Edition), The Clean Agent is stored in MS cylinders as compressed liquid, super-pressurized with Dry Nitrogen to 13.5 bar to 16 bar. Cylinder shall be equipped with DLP Valve and Pressure Gauge need to be integrated on DLP Valve itself to monitor the Cylinder Pressure. UL Listed Detection Tube shall be manufactured from specially processed polymer material to achieve the desired heat detection and delivery characteristics., and shall cover and routed to each compartment of panel, End Line Adapter to be placed at the termination point of detection tube for charging the Nitrogen., Pressure Switch should be integrated with Master Control Unit for Audio Visual Alarm in the even of Fire & System Discharge. Master Control Unit should have provision to Interface system with main control fire alarm system and BMS.				
1.1.1	**2Kg Direct Low Pressure (DLP) Clean Agent Pre-Engineered Fire Suppression System**, Filled with FK 5-1-12 Fluoroketone Gas (UL & FM Approved), DLP Valve made of Brass/SS Agent Stored in **PESO Approved Seamless Aluminium Cylinder**, Clean Agent having Zero Ozone Depletion Potential & GWP Less than or Equal to 1, EPA & SNAP Approved, Equipped with a Pressure Gauge to Monitor the System Pressure, with a Ball Valve Interfacing the Tubing and the cylinder.	Nos	7		0
1.1.2	UL Listed Automatic Heat Detection and Suppression Tube, Made of Special Modified Polyamide Material, Inner diameter **4mm**, Outer Diameter **6 MM**, Operating Pressure **15-18 Bar**, Maximum Pressure **30 Bar** at maximum Temperature of +65 Degree C, Pressurized with dry Nitrogen as per **UL 521** STANDARD FOR HEAT DETECTORS FOR FIRE PROTECTIVE SIGNALING SYSTEMS, Service Life 8-9 Years, Max Bend in Installation 140mm.	R.M.	250		0
1.1.3	Pressure Switch to Monitor Pressure Drop in the Tube along with **Check Valve**	Nos	7		0
1.1.4	End of Line Plug & T Connector with Push-in Tube Fitting Mechanism	Nos	7		0
1.1.5	Master Control Unit with Battery Backup	Nos	7		0
1.1.6	Installation & Commissioning Charges includes complete setup of the system, Installation of Cylinders on specially designed brackets, Laying of sensor tubes using tube attachments and Cable ties, fixing end of line plugs and end of line adapters, pressurizing tube @ 15 Bars using Nitrogen pressurizing agent.	Nos	7		0
	SUBTOTAL CARRIED OVER TO SUMMARY				**0**

Annexure - E

List of approved makes : Civil & Interior Works		
S.No	**Details of Materials**	**Manufacturers Name**
1	Reinforcement and structural steel	Kamdhenu / TISCON-42 / SAIL /Rathi
2	Cement	ACC /Ultratech /Ambuja/JK Cement
3	Anti-termite treatment	Thiodan / Dursban/ Creative Pest Control/Orient Pest Control
4	Polysulphide Sealant	Dulux Aquatech/PIDISEAL by M/s Pidilite Industries Ltd., Bombay.
5	Waterproofing Compounds (acrylic based polmer)	Pidilite / Tape Crete / FOSROC / Marmo
6	Epoxy Paints & Primers	Berger/Dulux/ Nerolac /Asian
7	White Cement	J.K. White / BIRLA White Cement
8	M.S.Pipe (Railings)	Jindal / Apollo/Tata
9	Admixtures and Epoxy Flooring	'Ardex/Laticrate/Weber /MC/ Marmo
10	Ceramic Tiles	Kajaria/ Somany/Sidron/Restile / Orient Bell/ Restile
11	Vitrified Tiles	Kajaria/ Somany/Sidron/Restile / Orient Bell/ Restile
12	Hand Crafted Ceramic tiles	World of Mosaic / Kenzai / Mosaic People
13	Designer Tiles	Sidron / Soil / Beyoind Cermaic
14	Tile Adhesive & Tile Grout	Pidilite / MYK/Marmo
15	Distempers, Synthetic Enamel, Plastic Emulsion Polyurethane, Automotive Paints,	Berger/Dulux/ Nerolac
16	Fire Resistant Paint	'VIPER' by Navair Pvt. Ltd. / Denber Paint
17	Flush Doors	Archid/ Merino / Greenply
18	Fire Doors	Navair /Shakti Hormann
19	Mineral Wool	Rocklloyd 300 – Lloyd Insulations, Lapinus Rockwool/Shreeram
20	Particle Board	Green Panel/ Action /Strawcture/ Century Prowud
21	Aluminum Sections (Glazing & Stile doors)	Unidor/Alkom/ Kubik / Red plus
22	Laminates	Merino / Greenlam /Skydecore /Archid
23	POP	Birla White / Sakarni /Superfine
24	Expansion Bolts for fixing	"Dash Fasteners" of appropriate size – Hilti/Fisher
25	Block board/ ply	Duro/ Archid /Merino / Green/Strawcture
26	HDHMR Board / MDF	Action Tesa / Greenply / Archid / Strawcture
27	Boilo	Action Tesa / Greenply / Archid / Century Prowud

S.No	Details of Materials	Manufacturers Name
28	Door Closers, Floor Springs	Dorma/Geze/Hafele
29	Hardware/Locks (Doors)	Dorma/Geze/Hafele
30	Hardware/Locks (Storages & Fur)	Hafele / Hettich
31	Tempered Glass	Saint Gobain / Modi Guard/ Asahi Glass
32	Veneer	Duro/Greenply / Archid
33	Lacquered glass	Saint Gobain / Modi Guard/ Asahi Glass
34	Float Glass	Saint Gobain / Modi Guard/ Asahi Glass
35	Mirror	Saint Gobain / Modi Guard/ Asahi Glass
36	Heat Reflecting Glass	Saint-Gobain/ Asahi All glass (Asia) P. Ltd./ Modi
37	GI Pipe / MS Pipe	TATA / Jindal/ BEC
38	Pre-Laminated Board	Merino/ Action / Century / Strawcture
39	EPDM Gaskets	Victor/ RK Gaskets / SAI
40	Gypsum Board	USG Boral/ Gyproc Saint Gobain
41	Silicon Sealant	Dow Corninger/ 3M
42	PVC Rainwater Pipe	Polypack / Astral /Supreme
43	Agglomerated Marble	Asian / Classic / Johnson
44	False Ceiling with T-section Framework	Armstrong/ AMF/USG/Decosonic
45	Roller / Vertical Blinds	Hunter Douglas / Walltract / Graber
46	Wooden Flooring	Perscape/ Green Panel/Koncept Design/Action
47	Raised Access Floor	Camfloor / Unitile / Uniflor
48	Aluminium Skirting	Bottomline/Alkom/Unidor / Kubik/ Bottom Line
49	Vinyl Floor	LG/Tarkett/Armstrong
50	SPC Flooring (Stone Plastic Composite)	Welspun / VOX/ Vibrant
51	Vinyl Film	3M / Avery
52	Security Film	3M / Avery
53	Graphic Film	3M / Avery
54	Acrylic Solid Surfaces	LG Hi Macs / Merino Hynex / Dupont
55	Adhesive	Fevicol/ Anchor / Jivanjor
56	Polish Stainer	ICI Dulux/Berger/ Nerolac

S.No	Details of Materials	Manufacturers Name
57	Rock Wool	Lloyod / Shriprakash / Shriram
58	Fabric	Warvick / Sarom/ Response
59	Artificial Stone / Engineered stone	Gravva /Marble City/Gem Stone
60	Marble & Granite Stone	Bestone /Marble City/Delhi Rocks
61	Cement Primer	JK max/ Berger/ICI Dulux/ Nerolac
62	Flush Doors	Duro/ Archid /Merino
63	Dry Distemper	JK max/ Berger/ICI Dulux/ Nerolac
64	Texture Paint	Berger/ JK max/Nerolac/ICI Dulux
65	M.S Angle	Apollo/ Rathi / TATA
66	Welding Electrodes	Advani / victor/Modi Hitech
67	Sealing Component	Dow Corning / GE Bayer Silicone Ltd., Pidilite / 3M
68	Wall Paper	Winfab/Marshal/ Muraspec / Vibrant
69	Open Cell	Harsongreen / Durlum/Hunter Daglus / Knauf
70	Husk Ceiling	Tranquil/ Knauf/Thermofriz /Paracoustic
71	Paints (On pipe)	Asian Paints / Nerolac / Berger
72	Metal Ceiling	Harsongreen/ Uniflo/Knauf
73	Toilet Cubicle	Green / Merino/Century
74	Sliding Folding Partition	Geze /Dorma/Hafele
75	AAC Block	JK Cement / Buildtech Building Element/HIL
76	Engineered wooden Floor	Perscape /Squarefoot/Pergo/Koncept Design
77	Wooden Grid Ceiling	Knauf / Tranquil/Ecotone/Anutone
78	Designer Metal Baffle Ceiling	Harsongreen / Durlum/Hunter Daglus / Knauf
79	Axiom	Knauf/Anutone
80	Soundscape	Tranquil/ Knauf/ Ecotone/ Echopone
81	Partition Aluminum Frame	Jindal/Bhoruka/Apollo/Indo Allusys
82	Acoustic Panel	Artoise/HIFONE/ dBaccoustic/Thermofriz
83	Wooven Panel / PET Panels	Tranquil/Ecotone/Sonidoa/ Paracoustic
84	LVT Floor	Vibrant/Merino/ Welspun
85	Self Levelling	Ardex/Laticrate/Fosroc

S.No	Details of Materials	Manufacturers Name
86	Fluted Panelling	AGT//Vetra / Ecotone/Brillante
87	Floor Mat	Euronics/3M/Ultimates
88	Fire Rated Glazed Partition	Saint Gobain/Equivalent
89	Net Boxes	A&H Meyer
90	Double Layer Ceiling	Nitobbo / Eq
91	Fire Curtain	Coopers fire Limited U.K/ Stoibich/ Koneba Colt
92	Light Fixtures	Jaquar / Wipro /Divinty/ Hybec
93	Decorative Light Fixtures	Jaquar /Sketch Light /Light Craft/ Hybec

Note : * The Contractor shall provide the materials as per the MAKE or BRAND indicated above. When two or more alternative brands have been mentioned, the brand to be finally used shall be as decided by the Consultant/Client

PROJECT - QCI, NAUROJI NAGAR, DELHI				
PACKAGE - MECHANICAL WORKS				
LIST OF PROPOSED MAKES - HVAC				
S.No.	**DESCRIPTION**	**PROPOSED MAKE**		
1	VRV	Mitsubishi Electric	Daikin	
2	AHU/CSAHU/TFA/HRW	VTS	Zeco	Edgetech
3	G.I. Sheets	Sail	Tata	Jindal
4	Factory fabricated Duct	Zeco	GPS Spiro	Ductofab
5	Anchor Fastner	Hilti	Fisher	
6	Duct Support	Gripple	Easyflex	GPL
7	Grills/Diffusers/Registers	Caryaire	Cynor	Systemair
8	Volume Control Dampers	Caryaire	Cynor	Systemair
9	Volume Control Damper Actuators	Johnson	Honeywell	Belimo
10	Fire Dampers	Caryaire	JCI	Systemair
11	Fire Damper Actuators	Johnson	Belimo	Honeywell
12	Thermal Insulation for duct	Armacell	K-flex	Superlon
13	Thermal Insulation for Pipe	Armacell	K-flex	Superlon
14	Duct Acoustic Insulation	Armasound	K-Flex	Superlon
15	AHU & AC Plant Acoustic Insulation	UPTwiga	Aerolam	
16	Underdeck Insulation	Armacell	K-flex	Superlon
17	Cabinet fan	Nicotra	Maico	Greenheck
18	Tube axial fan	Nicotra	Maico	Greenheck
19	Propeller Fan	Nicotra	Maico	Greenheck
20	Inline Fan	Caryaire	Maico	Greenheck
21	Copper Pipe	Mandev	Rajco	Maxflow

1	VRV	Mitsubishi Electric	Daikin	
22	Condensate Drain Pipe	Supreme	Finolex	AKG
23	Flexible Duct	Rolastar	Thermaflex	GP Spira
24	Flexible connection	Easyflex	BDK	Resistoflex
25	Air Curtain	VTS	Mitzvah	
26	Thermostat	Honeywell	Omicron	Anergy
27	Temperature & RH Sensor	Honeywell	Omicron	Anergy
28	MS Pipe	Tata	JSW	Sail
29	Butterfly Valve & Motorised BF	Advance	Danfos	Castle
30	Ball Valve	L &T/Audco	Zoloto	Castle
31	Balancing Valve	Advance	Danfos	Castle
32	Y-Strainer	Sant	Rapidcool	Castle
33	Non Return Valve	Advance	Danfos	Castle
34	Pressure Gauge	Taylor	H Guru	Waree
35	Temperature Gauge	Taylor	H Guru	Waree
36	Acoustic Insulation	Armasound	K-Flex	Superlon
37	Drain Valve/Purge Valve/Air Vent	L &T	Zoloto	Castle
38	PICV Valves	Danfos	Belimo	Siemens
39	Welding Rod	Advani	Maruti Weld	L & T
40	Aluminium Tape	Johnson	Birla 3M	Wonder Polymer
41	Cables	Havells	Polycab	KEI
42	Cable Tray	Ralbo	Indiatech	Slotco
43	Electrical Panel	Indiatech	EVA	Precision
44	MCCB	Schneider	ABB	LK (Formerly L&T)

1	VRV	Mitsubishi Electric	Daikin	
45	MCB	Schneider	ABB	LK (Formerly L&T)
46	CTS.	Schneider	ABB	LK (Formerly L&T)
47	Meter	Schneider	ABB	LK (Formerly L&T)
48	Starters	Schneider	ABB	LK (Formerly L&T)
49	Indication Lamp	Schneider	ABB	LK (Formerly L&T)
50	Selectro switch	Schneider	ABB	LK (Formerly L&T)
51	contactors	Schneider	ABB	LK (Formerly L&T)
52	MPCB	Schneider	ABB	LK (Formerly L&T)
53	Filters	American Air Filters	Hindair	Air Exchange Solutions
54	IAQ Module	American Air Filters	Hindair	Air Exchange Solutions
55	IAQ Monitoring System	Airveda	Kaiterra	Air Exchange Solutions
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes.			

PROJECT - QCI, NAUROJI NAGAR, DELHI				
PACKAGE - ELECTRICAL WORKS				
LIST OF APPROVED MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**Electrical Works**			
1)	LT Cables and control cables (Normal)	Havells	Polycab	Finolex
2)	LT Cables and control cables (Fire Survival)	Rallison	Polycab	Bonton
3)	Single / double compression glands	Comet	Stepwell	Dowell
4)	Crimping Lugs	Comet	Stepwell	Dowell
5)	Flexbile cables / wires	Havells	Polycab	Finolex
6)	Metallic Conduits & Accessories	BEC	Precision	RMCON
7)	Flexible Conduit	BEC	RMCON	
8)	Distribution Boards	Schneider (Acti-9) / Legrand (Ekinox3) / Hager(Novello+)		
9)	MCB, RCCB, RCBO, ELCB	Schneider (Acti-9) / Legrand (Ekinox3) / Hager(Novello+)		
10)	Cable trays, Raceways and accessori	Indiatech	Steelways	Ralbo
11)	Earthing System	Obo bettermann	Cape Electric	Dehn
12)	Anchor fastener	Hilti	Fisher	
13)	Industrial Socket	Schneider-56 Series	Cape Electric	BCH Electric
14)	Switch and Sockets Outlets	Legrand (Myrius)	Schneider (unica pure)	Hager (Insysta)
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes.			

PROJECT - QCI, NAUROJI NAGAR, DELHI				
PACKAGE - LT PANELS				
LIST OF PROPOSED MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
	LT PANELS (PTTA)			
1	LT Panels	Indiatech / EVA Engineering / Precision / Krypton		
2	LT Switchgears	Schneider (NSX)	ABB (Tmax)	Lauritz Knudsen (D Sine)
3	Surge Arrestor	Obo bettermann	Schneider	ABB-Furse
4	Meters	Conzerv	Elmeasure	ABB
5	Current Transformer	Kalpa	AE	Pragati
6	R,Y,B indication lamp	Schneider	ABB	Lauritz Knudsen
7	Terminal Blocks	Elmex	Connectwell	
8	Selector Switch	Schneider	ABB	Lauritz Knudsen
9	Push button	Schneider	ABB	Lauritz Knudsen
10	Timers	Schneider	ABB	Lauritz Knudsen
11	Rotary Switch	Schneider	ABB	Lauritz Knudsen
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes or any other preferred makes.			

PROJECT - QCI, NAUROJI NAGAR, DELHI				
LIST OF PROPOSED MAKES				
PACKAGE - UPS SYSTEM				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**UPS WORKS**			
1	UPS	Numeric (Legrand)	Schneider	Eaton
2	Isolation Transformer	Datsons		
3	Uninyvin Cables	Polycab	Miracle	Flexon
4	lithium Ion Batteries	Samsung	Panasonic	
5	SMF VRLA **b**atteries	Exide	Quanta	EnerRocket
6	Switchgear (MCCB/MCB)	Schneider	ABB	Lauritz Knudsen
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to			

PROJECT - QCI, NAUROJI NAGAR, DELHI				
LIST OF APPROVED MAKES				
PACKAGE - LIGHTING & LIGHTING AUTOMATION SYSTEM				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
1)	Lighting Automation System	Helvar	Crestron	Zumtobel
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes.			

PROJECT - QCI, NAUROJI NAGAR, DELHI				
LIST OF APPROVED MAKES				
PACKAGE - PASSIVE NETWORKING SYSTEM				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**Paasive Components**			
1)	Cat-6A & Cat-6 Cable and components	Siemon	Panduit-Pannet	Belden
2)	Face Plates	Siemon	Panduit-Pannet	Belden
3)	Jack panels	Siemon	Panduit-Pannet	Belden
4)	Network Racks	Rittal	Panduit-Pannet	APC (ABW)
5)	Fibre Cable & Components	Simon	Panduit-Pannet	Belden
6)	MDF & SDF	Krone		
7)	Analogue Telephone Cable	Delton	Bonton	Polycab
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes.			

PROJECT - QCI, NAUROJI NAGAR, DELHI				
LIST OF APPROVED MAKES				
PACKAGE - SECURITY WORKS				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**CCTV System**			
1)	CCTV cameras (True IP)	Honeywell	Uniview	Samsung (Hanwa)
2)	Workstation/Server hardware	Dell	Lenovo	HP
3)	NVR	Honeywell	Uniview	Samsung (Hanwa)
4)	Monitor Screen	Samsung	LG	Sony
5)	Hard Disk	Seagate	WD	Toshiba
6)	Network cable & Component/ Racks/ F	Simon	Panduit-Pannet	Belden
7)	Network Switch	Alcatel / Cisco / Aruba-HP/ Ruckus		
8)	VMS / Analytic Software	Mile Stone	Avigilon	IDIS
B.	**Fire Alarm & Digital Voice Evacuation System**			
1)	Fire alarm system and devices	Tyco	Bosch	Notifier
2)	Public Address System	ATIS	Bosch	Heinrich
3)	Cables / Wires	Polycab	Rallison	Bonton
4)	Fire Survival Cable	Polycab	Rallison	Bonton
5)	Exit Signage	Prolite	Glow Lite	Heinrich
C.	**Access Control System**			
1)	Access Control Readers & Controllers	Tyco	HID	Rosslare
2)	Elecromagnetic locks	Bell	Ebelco	Rosslare
3)	Buzzer	ISI		
4)	Emergency Exit	Securico	Rosslare	Prolite
5)	Access Control Software	Tyco	Rosslare	Security Shells

A.	**CCTV System**			
D.	Water Leak Detection System	Sontay	Csystem	
E.	Rodent Repellant System	Maser	Csystem	
F.	Vesda System	Wagner	Protec	Xtralis
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes.			

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI				
PACKAGE - PLUMBING WORKS				
LIST OF MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**SANITARY FIXTURES AND ALLIED ACCESSORIES**			
1	Vitreous China Sanitaryware	Jaquar	Kohler	Vitra
2	Health Faucet	Jaquar	Kohler	Vitra
3	Flexible pipe	Jaquar	Kohler	Vitra
4	Auto Urinal Flush System	Jaquar	Kohler	Euronics
5	Shower items	Jaquar	Kohler	Euronics
6	Kitchen Sink	Nirali	Jayana	
7	Hand Drier	Euronics	UTEC System	Kopal
B.	**INTERNAL DRAINAGE**			
1	CI Hubless Pipes and Fittings	NECO	Saint Gobain	
2	Coackroach Proof Grating, SS Grating and Clean out plug	Chilly	Viking	Neer
3	C.I Pipe joint sealant	ACQUA Bond	Drip Seal	
4	GI Pipes	APL Apollo	Jindal hissar	Tata Steel
5	GI Pipe Fittings	Jaison	Kirti	Unik
6	G.I Pipe joint sealant	Henkel - LOCTITE 55	Drip Seal	
7	Shower Channel	Aco	Viega	Kessel/MEA
C.	**WASTE LIFTING & GREASE SEPRATOR**			
1	Macerating unit	Grundfos	SanitFLO	Kessel
2	Grease Seperator	Nugreen	Kessel	Aco

A.	**SANITARY FIXTURES AND ALLIED ACCESSORIES**			
D.	**INTERNAL WATER SUPPLY**			
1	CPVC Pipes & Fittings	Astral	ck birla	Prince
2	Ball/Butterfly valve	Zoloto	Honeywell	Sant
E.	**HOT WATER SYSTEM**			
1	Geyser	AO Smith	Racold	Jaquar
F.	**DRINKING WATER SYSTEM**			
1	Wall mounted RO unit	AO Smith	Aquaguard	Kent
2	Bottle Filling unit	Oasis	Voltas	Bluestar
G.	**ACCESSORIES**			
1	Welding rod	ADOR	Esab	Cosmos
2	Expansion Bolt	Fisher	Hilti	Powers
3	GI Hangers	Fisher	Hilti	Powers
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes or any other preferred makes.			

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI				
PACKAGE - FIRE PROTECTION WORKS (SPRINKLER SYSTEM)				
LIST OF MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**Fire Protection System**			
1	MS Pipes	TATA Steel	Jindal Hissar	Surya
2	MS Fitting	DRP	Zoloto-M	Unik
3	Sprinklers and Nozzle	Tyco	Viking	HD
4	Sprinkler Flexible Pipe	Tyco	Viking	HD
B.	**ACCESSORIES**			
1	Welding rod	ADOR	Esab	Cosmos
2	Expansion Bolt	Fisher	Hilti	Powers
3	GI Hangers	Fisher	Hilti	Powers
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes or any other preferred makes.			

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI				
PACKAGE - FIRE PROTECTION WORKS				
LIST OF MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**Fire Extinguishers**			
1	Fire Extinguishers	Ceasefire	Minimax	Fire Mech
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes or any other preferred makes.			

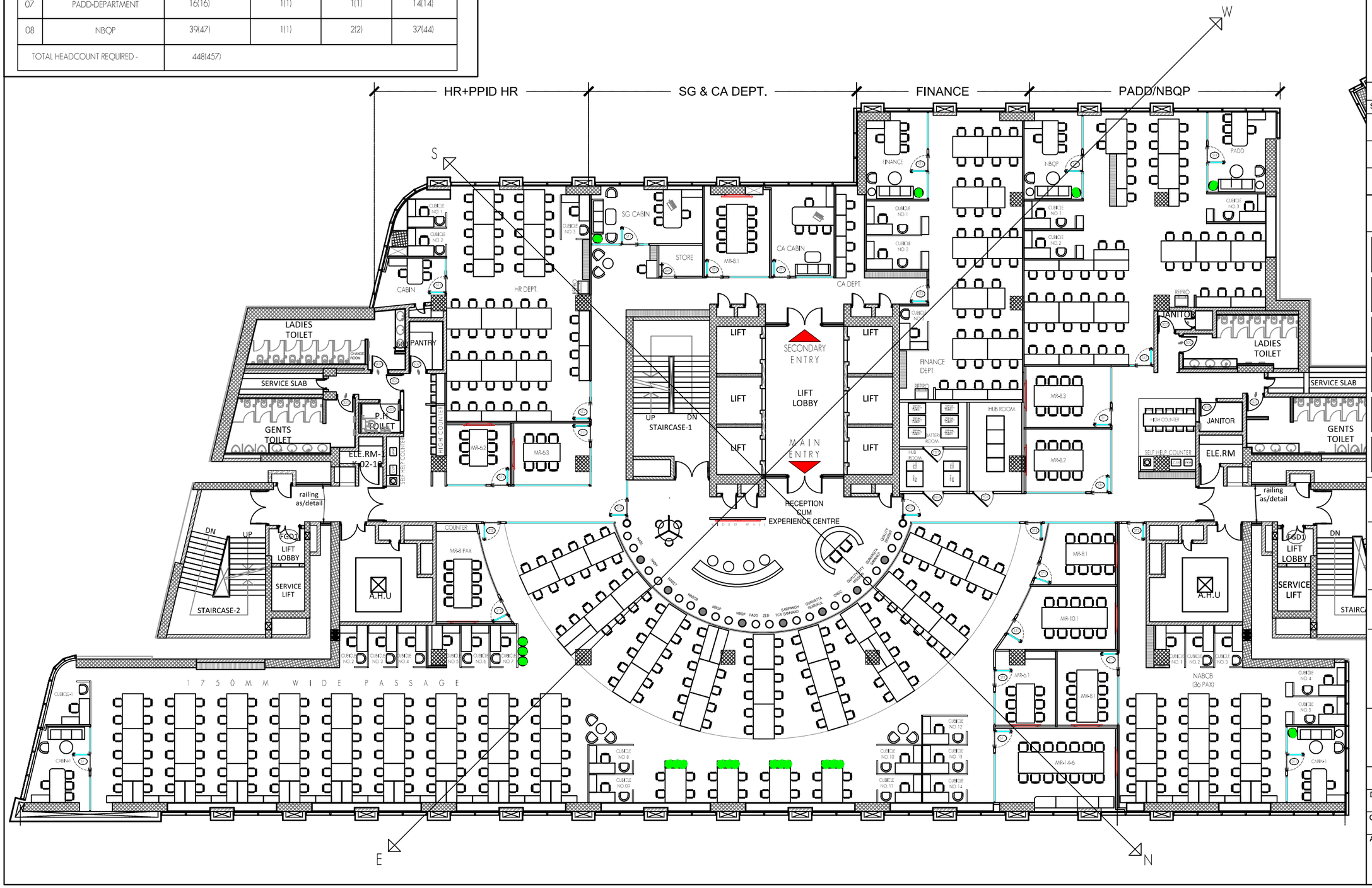
PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI				
PACKAGE - FIRE PROTECTION WORKS				
LIST OF MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**Gas Based Suppression system**			
1	Gas Based Suppression system	Minimax	FireMech	Wabley
2	Control Panel	Ravel		
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes or any other preferred makes.			

PROJECT - OFFICE FOR QCI AT NAUROJI NAGAR, DELHI				
LIST OF MAKES				
S. No.	**ITEM DESCRIPTION**	**PROPOSED MAKE**		
A.	**Panel Suppression**			
1	LT Panel Suppression system	Minimax	FireMech	Ceasfire/wabley
2	Control Panel	Ravel		
	Notes:			
a.	For any other item sample to be approved by Engineer incharge/client/consultant.			
b.	The list of approved materials is only for the guideline. However the Client reserves the right to choose any of the indicated makes or any other preferred makes.			

Annexure-F

OCCUPANCY ---REQ(ACH.)

SR. NO.	DEPARTMENT DESCRIPTION	TOTAL HEADCOUNT	CABINS	CUBICLES	WORK STATIONS
01	SG-DEPARTMENT (W/S 1.2MX0.6M)	2(2)	1(1)	0	1(1)
02	CA-DEPARTMENT (W/S 1.2MX0.6M)	4(5)	1(1)	0	3(4)
03	NABL-DEPARTMENT	250(242)	1(1)	16(14)	233(227)
04	FINANCE-DEPARTMENT	45(45)	1(1)	3(3)	41(41)
05	ADMIN+PPID HR	57(58)	1(1)	3(3)	53(54)
06	NABCB	35(42)	1(1)	5(5)	29(36)
07	PADD-DEPARTMENT	16(16)	1(1)	1(1)	14(14)
08	NBQP	39(47)	1(1)	2(2)	37(44)
TOTAL HEADCOUNT REQUIRED -		448(457)			



NOTES

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REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
3	R-3		

- ○ FOR REFERENCE CUSTOMER_____
- ○ FOR APPROVAL CUSTOMER_____
- ○ ADVANCE COPY CUSTOMER_____
- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

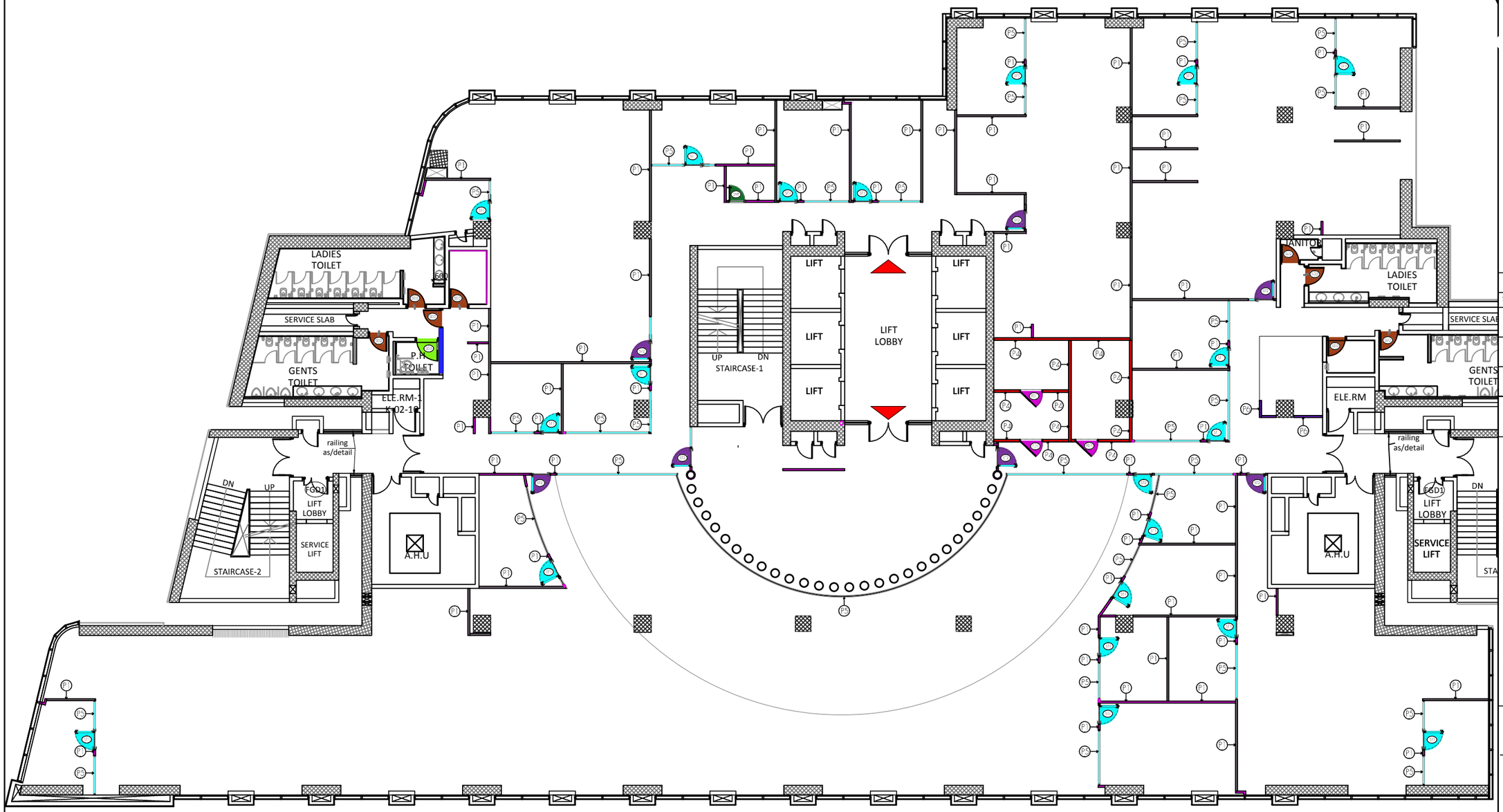
PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : 2ND FLOOR LAYOUT (J BLOCK)

DRAWING NUMBER : QCI/DEL-WTC/L-02/LP-01

DRAWN BY :	SCALE :	REV NO.: V3
CHECKED BY :	DATE : 21.10.24	NORTH:
APPROVED BY :		



NOTES

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- ● FOR TENDER — CUSTOMER_____
- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : DOOR AND PARTITION SETTING OUT

DRAWING NUMBER : QCI/DEL-WTC/J-02/LP-02

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 04-12-24	NORTH:
APPROVED BY :		

LEGEND FOR PARTITIONS

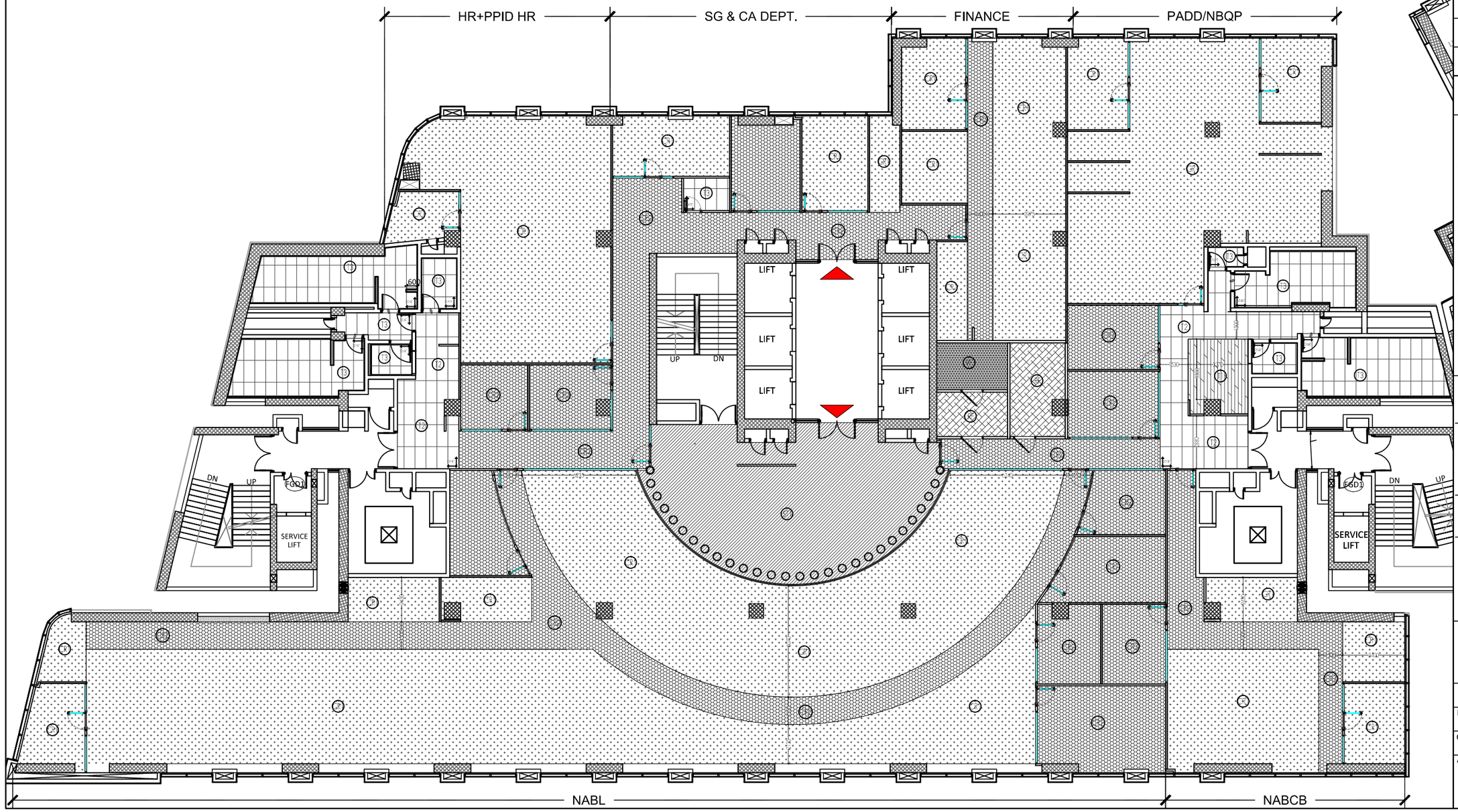
S.NO	SYMBOL	DESCRIPTION
P1		100MM THK. FULL HEIGHT GYPSUM PARTITION AS/APPR.
P2		200MM THK. AAC BLOCK
P3		SLIDING FOLDING PARTITION AS/SHOP DRAWING
P4		132MM THK. FULL HEIGHT FIRE RATED PARTITION AS/APPR.
P5		12MM THK. SINGLE GLASS PARTITION 2400 MM HIGH
P6		100 MM THK. FULL HEIGHT GYPSUM HABITO PARTITION

LEGEND FOR DOOR OPENINGS

S.NO	SYMBOL	CODE	SIZE (MM)	QTY	DESCRIPTION
1.	ST1		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME)
2.	ST2		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME) WITH ACD
3.	DVP		900X2400	-	VISION PANEL DOOR (900 MM CLEAR OPENING)
4.	SD1		900X2400	-	900 MM WIDE SINGLE LEAF SOLID DOOR
5.	SD2		1000X2400	-	1000 MM WIDE SINGLE LEAF SOLID DOOR
6.	SD3		1200X2400	-	1200 MM WIDE SINGLE LEAF SOLID DOOR
7.	FD1		1200X2400	-	1200 MM WIDE FIRE RATED DOOR

SCHEDULE FOR FLOORING

S.NO		SYMBOL	DESCRIPTION	QTY. (SQ.FT.)
1.	CR1		LIGHT GREY CARPET	-
2.	CR2		DARK GREY CARPET	-
3.	ST1		GREY MARBLE	-
4.	T1		1200 X 600 WOOD LOOK TILE	-
5.	T2		1200X600 MM TERRAZO TILE	-
6.	T3		1200X600 MM WASHROOM TILE	-
7.	RF		RAISED FLOOR	-
7.	VF		VINYL FLOORING	-



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REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
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- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME : QCI

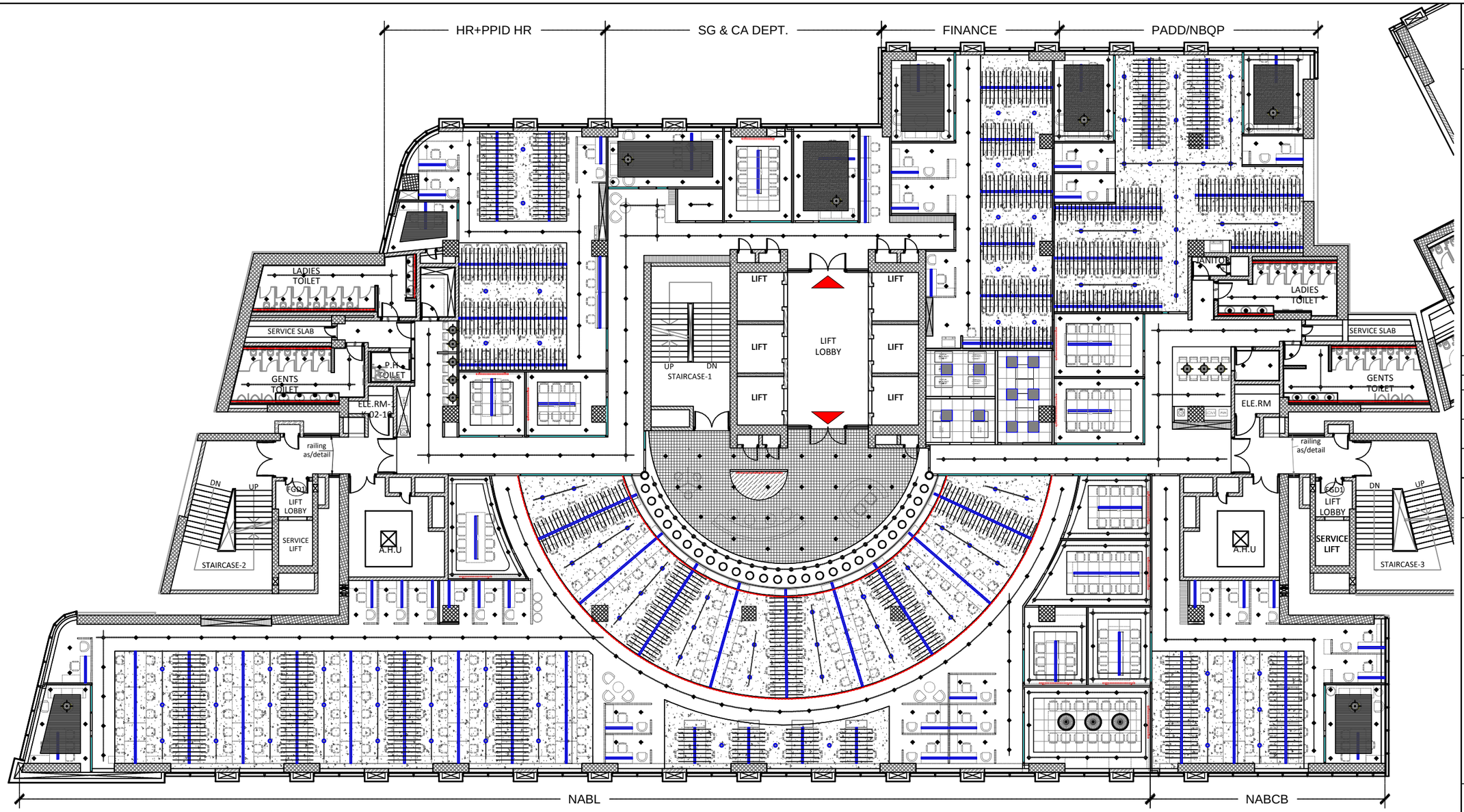
INTERIOR ARCHITECTS :

DRAWING TITLE :

PROPOSED FLOORING LAYOUT PLAN

DRAWING NUMBER : QCI/DEL-WTC/J-02/LP-03

DRAWN BY :	SCALE : NTS	REV NO.:
CHECKED BY :	DATE : 10-12-24	NORTH:
APPROVED BY :		



LIGHTING LEGEND

S.NO	SYMBOL	DESCRIPTION
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT- P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT

CEILING LEGEND

S.NO	SYMBOL	DESCRIPTION
1.		GYPSUM CEILING
2.		600X600 GRID CEILING
3.		M.R. GRADE GYPSUM CEILING @ WASHROOM
4.		EXPOSED CEILING
5.		WALLPAPER FINISH
6		ACOUSTICS BAFFLES @ WORKHALL
7.		OPEN CELL CELING
8.		NITOBO CEILING
9.		STRETCH CEILING

NOTES

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- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME : OCI

INTERIOR ARCHITECTS :

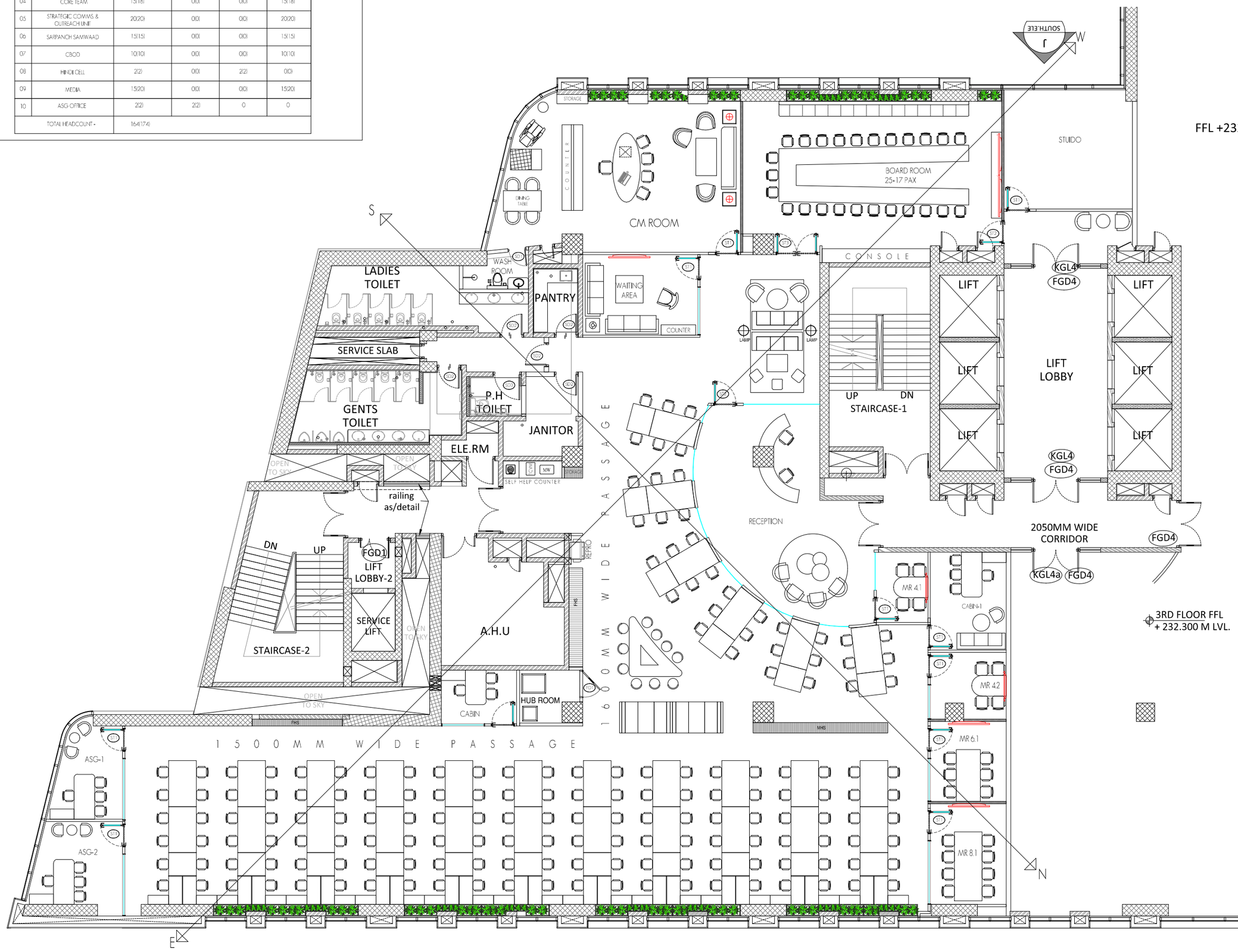
DRAWING TITLE : 2ND FLOOR-J BLOCK REFLECTED CEILING PLAN

DRAWING NUMBER : -

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 19-11-24	NORTH:
APPROVED BY :		

OCCUPANCY -----REQ(ACH)

SR NO.	DEPARTMENT DESCRIPTION	TOTAL HEADCOUNT	CABINS	CUBICLES	WORK STATIONS
01	CHAIRPERSON	1(1)	1(1)	0(0)	0(0)
02	POLICY UNIT	49(50)	0(0)	0(0)	49(50)
03	IT CELL	35(36)	1(1)	0(0)	34(35)
04	CORE TEAM	15(18)	0(0)	0(0)	15(18)
05	STRATEGIC COMMS. & OUTREACH UNIT	20(20)	0(0)	0(0)	20(20)
06	SARPANCH SAMWAAD	15(15)	0(0)	0(0)	15(15)
07	CBOD	10(10)	0(0)	0(0)	10(10)
08	HINDI CELL	2(2)	0(0)	2(2)	0(0)
09	MEDIA	15(20)	0(0)	0(0)	15(20)
10	ASG OFFICE	2(2)	2(2)	0	0
	TOTAL HEADCOUNT -	164(174)			



NOTES

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REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
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CONTRACTORS

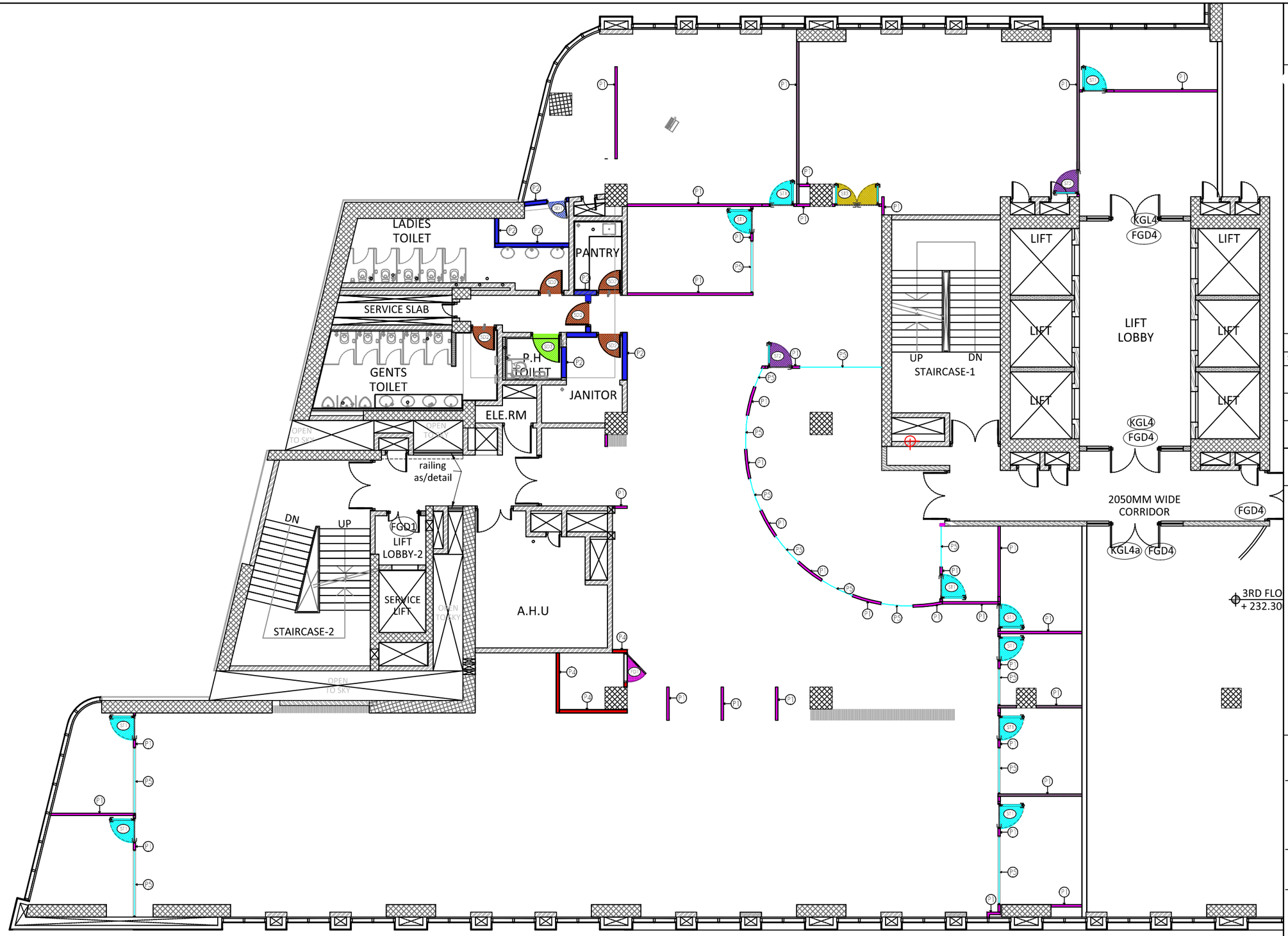
PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : 3RD FLOOR (J BLOCK)

DRAWING NUMBER : -

DRAWN BY :	SCALE :	REV NO.: V3
CHECKED BY :	DATE : 21.10.24	NORTH:
APPROVED BY :		



NOTES

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1	R-1		
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- ● FOR TENDER — CUSTOMER_____
- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : DOOR AND PARTITION SETTING OUT

DRAWING NUMBER : QCI/DEL-WTC/J-03/LP-02

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 04-12-24	NORTH:
APPROVED BY :		

LEGEND FOR PARTITIONS

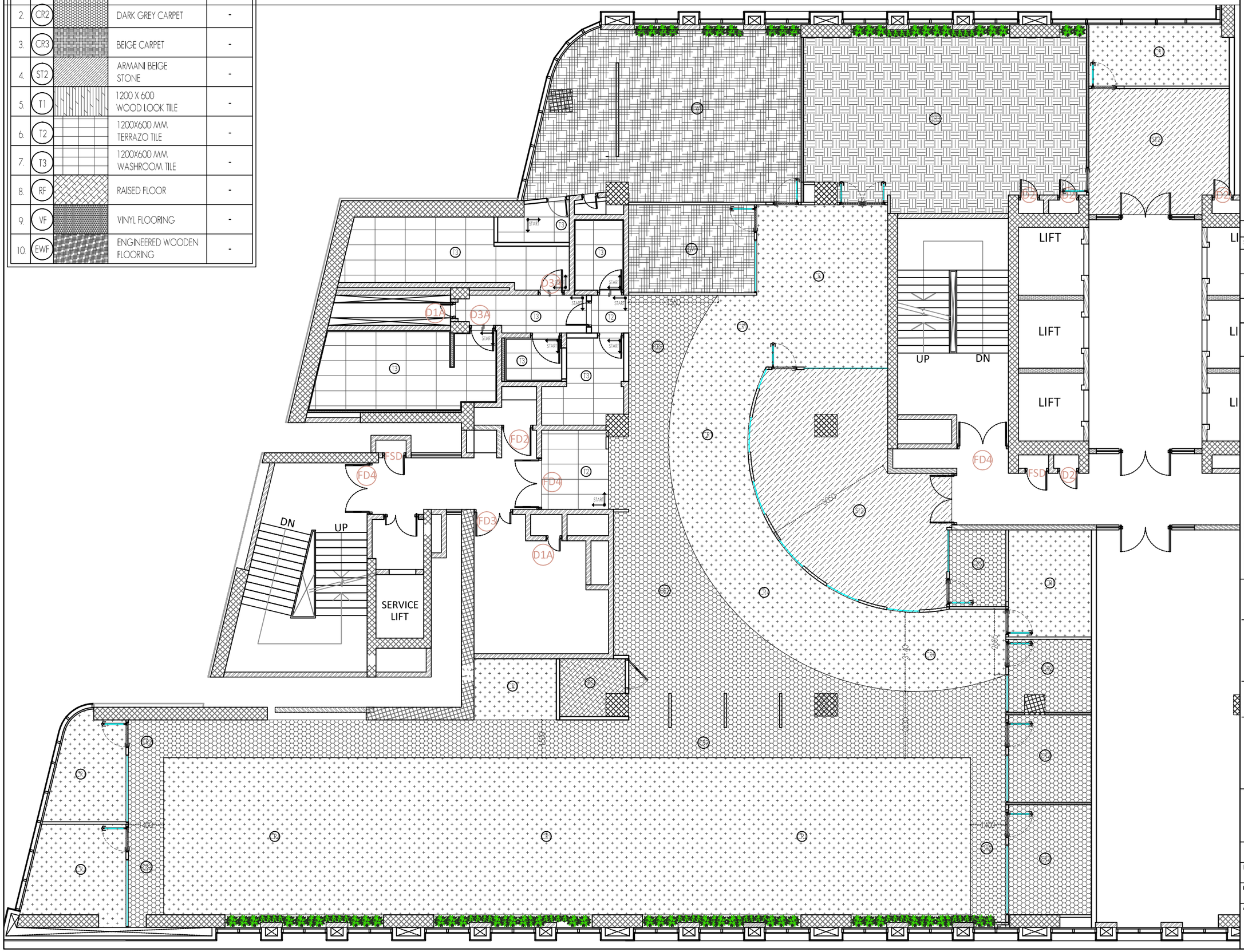
S.NO	SYMBOL	DESCRIPTION
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P3		SLIDING FOLDING PARTITION AS/SHOP DRAWING
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P5		12MM THK. SINGLE GLASS PARTITION 2400 MM HIGH
P6		100 MM THK. FULL HEIGHT GYPSUM HABITO PARTITION

LEGEND FOR DOOR OPENINGS

SNO	SYMBOL	CODE	SIZE (MM)	QTY	DESCRIPTION
1.	ST1		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME)
2.	ST2		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME) WITH ACD
3.	DVP		900X2400	-	VISION PANEL DOOR (900 MM CLEAR OPENING)
4.	SD1		900X2400	-	900 MM WIDE SINGLE LEAF SOLID DOOR
5.	SD2		1000X2400	-	1000 MM WIDE SINGLE LEAF SOLID DOOR
6.	SD3		1200X2400	-	1200 MM WIDE SINGLE LEAF SOLID DOOR
7.	FD1		1200X2400	-	1200 MM WIDE FIRE RATED DOOR

SCHEDULE FOR FLOORING

S.NO		SYMBOL	DESCRIPTION	QTY. (SQ.FT.)
1.	CR1		LIGHT GREY CARPET	-
2.	CR2		DARK GREY CARPET	-
3.	CR3		BEIGE CARPET	-
4.	ST2		ARMANI BEIGE STONE	-
5.	T1		1200 X 600 WOOD LOOK TILE	-
6.	T2		1200X600 MM TERRAZO TILE	-
7.	T3		1200X600 MM WASHROOM TILE	-
8.	RF		RAISED FLOOR	-
9.	VF		VINYL FLOORING	-
10.	EWF		ENGINEERED WOODEN FLOORING	-



NOTES

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* ANY ISSUE OF STRENGTH,DURABILITY,QUALITY ETC. BROUGHT UNDER THE NOTICE OF ARCHITECT

REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
3	R-3		

- ○ FOR REFERENCE — CUSTOMER_____
- ○ FOR APPROVAL — CUSTOMER_____
- ○ ADVANCE COPY — CUSTOMER_____
- ● FOR TENDER — CUSTOMER_____
- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

PROJECT NAME :

QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :

PROPOSED FLOORING LAYOUT PLAN

DRAWING NUMBER :

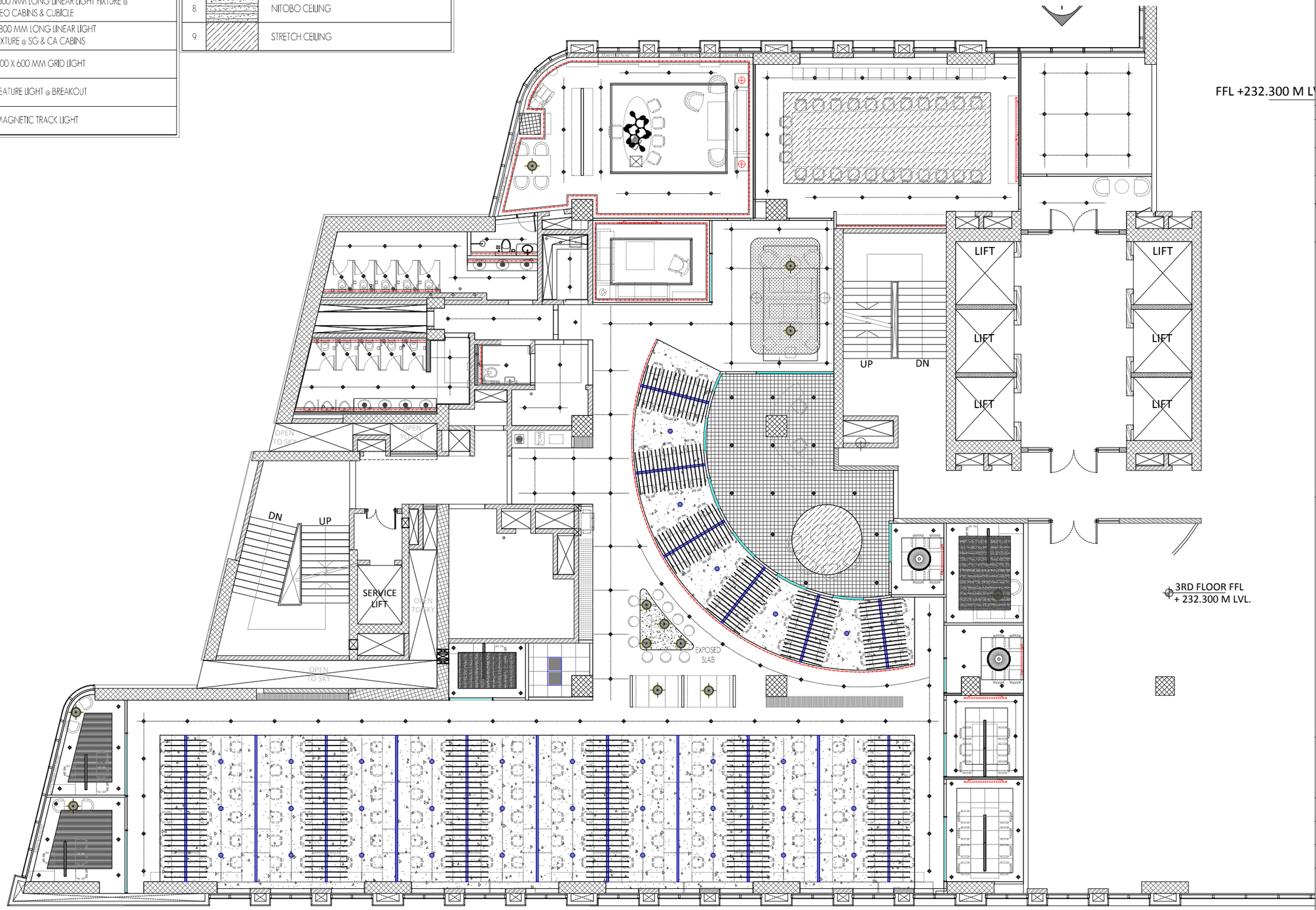
DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 10-12-24	NORTH:
APPROVED BY :		

LIGHTING LEGEND

S.NO	SYMBOL	DESCRIPTION
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT- P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
L12		MAGNETIC TRACK LIGHT

CEILING LEGEND

S.NO	SYMBOL	DESCRIPTION
1.		GYPSUM CEILING
2.		600X600 GRID CEILING
3.		M.R. GRADE GYPSUM CEILING @ WASHROOM
4.		EXPOSED CEILING
5.		WALLPAPER FINISH
6		ACOUSTICS BAFFLES @ WORKHALL
7.		OPEN CELL CEILING
8.		NITOBO CEILING
9.		STRETCH CEILING



NOTES

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S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
3	R-3		

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- ○ FOR APPROVAL CUSTOMER_____
- ○ ADVANCE COPY CUSTOMER_____
- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME :

QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :

3RD FLOOR-J BLOCK REFLECTED CEILING PLAN

DRAWING NUMBER : -		
DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 19-11-24	NORTH:
APPROVED BY :		

OCCUPANCY ---REQ(ACH.)

SR. NO.	DEPARTMENT DESCRIPTION	TOTAL HEADCOUNT	CABINS	CUBICLES	WORK STATIONS
01	NABH	125(143)	1(1)	4(5)	120(137)
02	NABET & TCB	120(122)	1(1)	6(6)	114(116)
TOTAL HEADCOUNT -		245(265)			



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- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

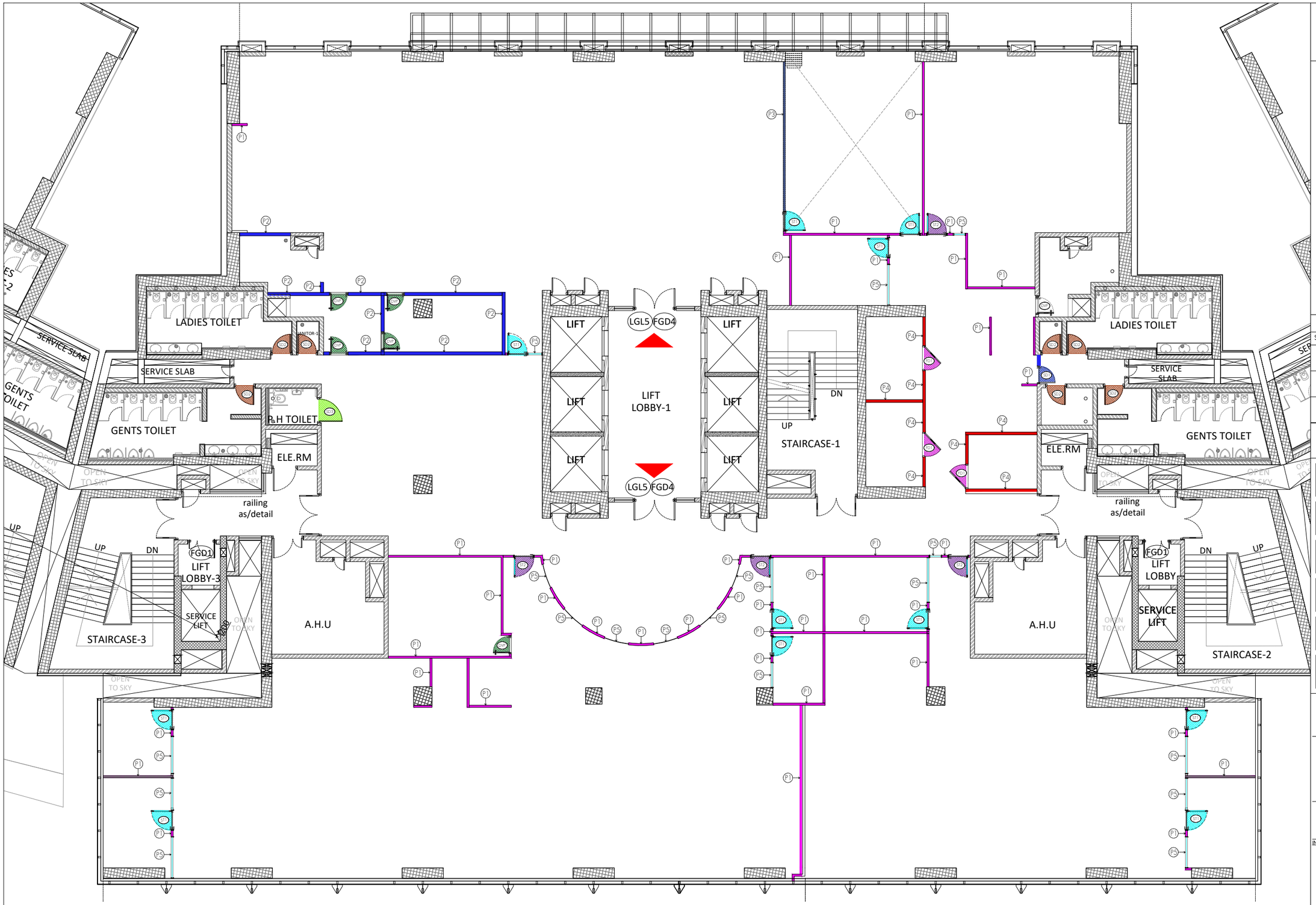
PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : 1ST FLOOR LAYOUT (K BLOCK)

DRAWING NUMBER : -

DRAWN BY :	SCALE :	REV NO.: V3
CHECKED BY :	DATE : 21.1024	NORTH:
APPROVED BY :		



LEGEND FOR PARTITIONS

S.NO	SYMBOL	DESCRIPTION
P1		100MM THK. FULL HEIGHT GYPSUM PARTITION AS/APPR.
P2		150MM THK. AAC. BLOCK
P3		SLIDING FOLDING PARTITION AS/SHOP DRAWING
P4		132MM THK. FULL HEIGHT FIRE RATED PARTITION AS/APPR.
P5		12MM THK. SINGLE GLASS PARTITION 2400 MM HIGH
P6		100 MM THK. FULL HEIGHT GYPSUM HABITO PARTITION

LEGEND FOR DOOR OPENINGS

S.NO	SYMBOL	CODE	SIZE (MM)	QTY	DESCRIPTION
1.	ST1		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME)
2.	ST2		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME) WITH ACD
3.	DVP		900X2400	-	VISION PANEL DOOR (900 MM CLEAR OPENING)
4.	SD1		900X2400	-	900 MM WIDE SINGLE LEAF SOLID DOOR
5.	SD2		1000X2400	-	1000 MM WIDE SINGLE LEAF SOLID DOOR
6.	SD3		1200X2400	-	1200 MM WIDE SINGLE LEAF SOLID DOOR
7.	FD1		1200X2400	-	1200 MM WIDE FIRE RATED DOOR

NOTES

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REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
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2	R-2		
3	R-3		

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- ○ ADVANCE COPY CUSTOMER_____
- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :

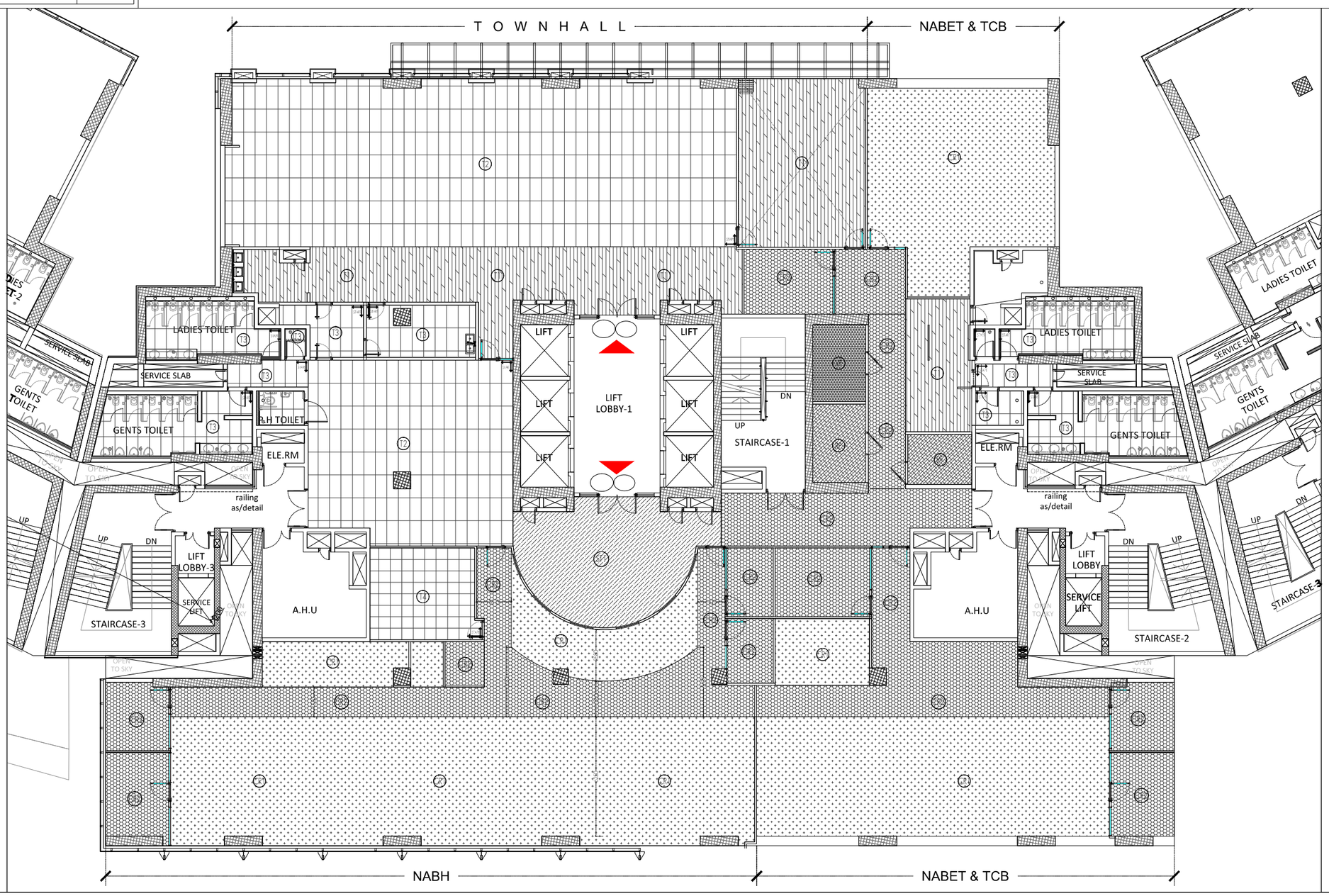
DOOR AND PARTITION SETTING OUT

DRAWING NUMBER : QCI/DEL-WTC/K-01/LP-02

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 04-12-24	NORTH:
APPROVED BY :		

SCHEDULE FOR FLOORING

S.NO		SYMBOL	DESCRIPTION	QTY. (SQ.FT.)
1.	CR1		LIGHT GREY CARPET	-
2.	CR2		DARK GREY CARPET	-
3.	ST1		GREY MARBLE	-
4.	T1		1200 X 600 WOOD LOOK TILE	-
5.	T2		1200X600 MM TERRAZO TILE	-
6.	T3		1200X600 MM WASHROOM TILE	-
7.	T4		600X600 MM STORE ROOM TILE	
8.	RF		RAISED FLOOR	-
9.	VF		VINYL FLOORING	-



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- ● FOR TENDER — CUSTOMER_____
- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

PROJECT NAME : QCI

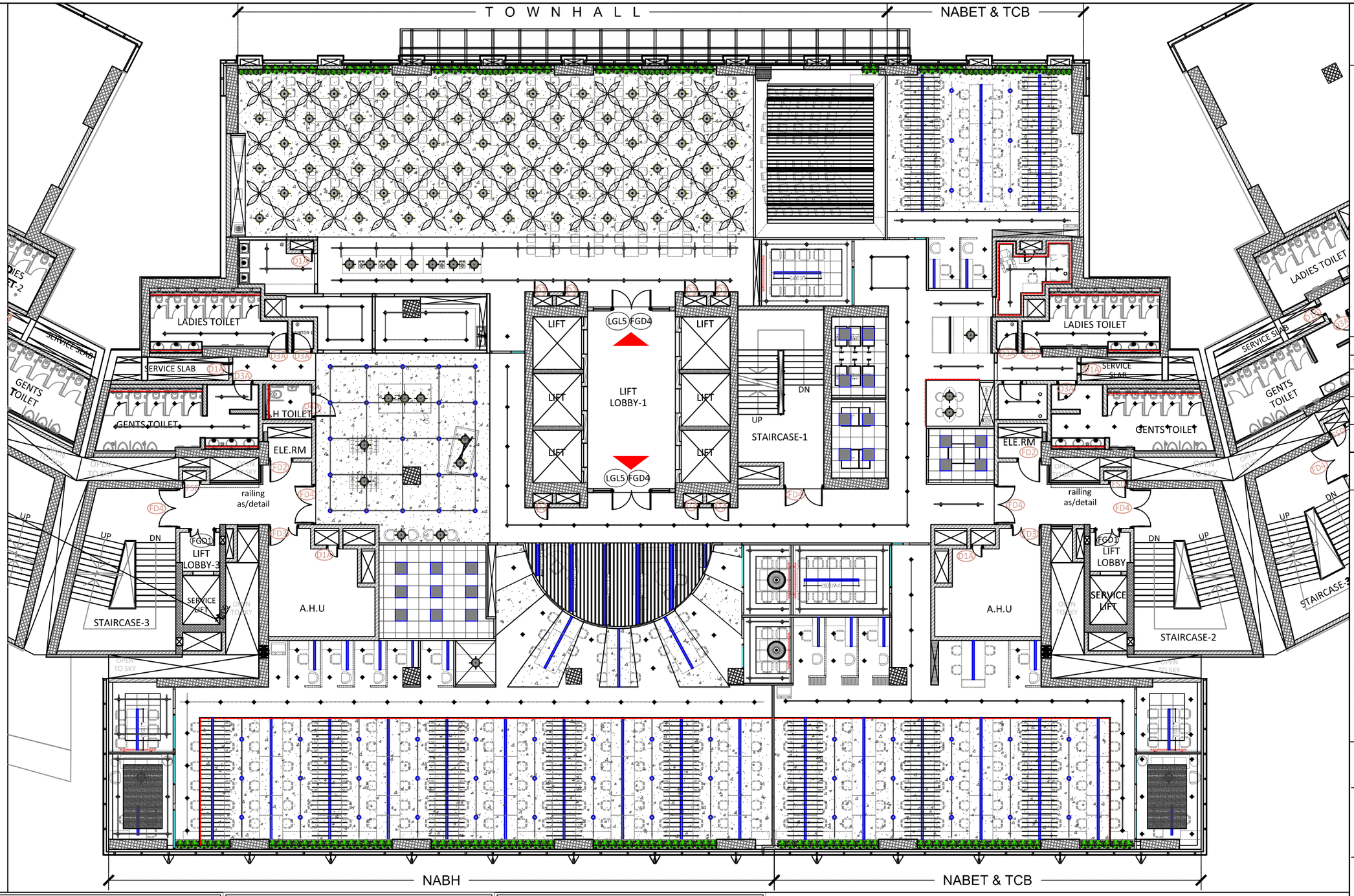
INTERIOR ARCHITECTS :

DRAWING TITLE :

PROPOSED FLOORING LAYOUT PLAN

DRAWING NUMBER : QCI/DEL-WTC/K-01/LP-03

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 10-12-24	NORTH:
APPROVED BY :		



NOTES

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- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME :
QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :
1ST FLOOR-K BLOCK
REFLECTED CEILING PLAN

DRAWING NUMBER : -

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 19-11-24	NORTH:
APPROVED BY :		

CEILING LEGEND

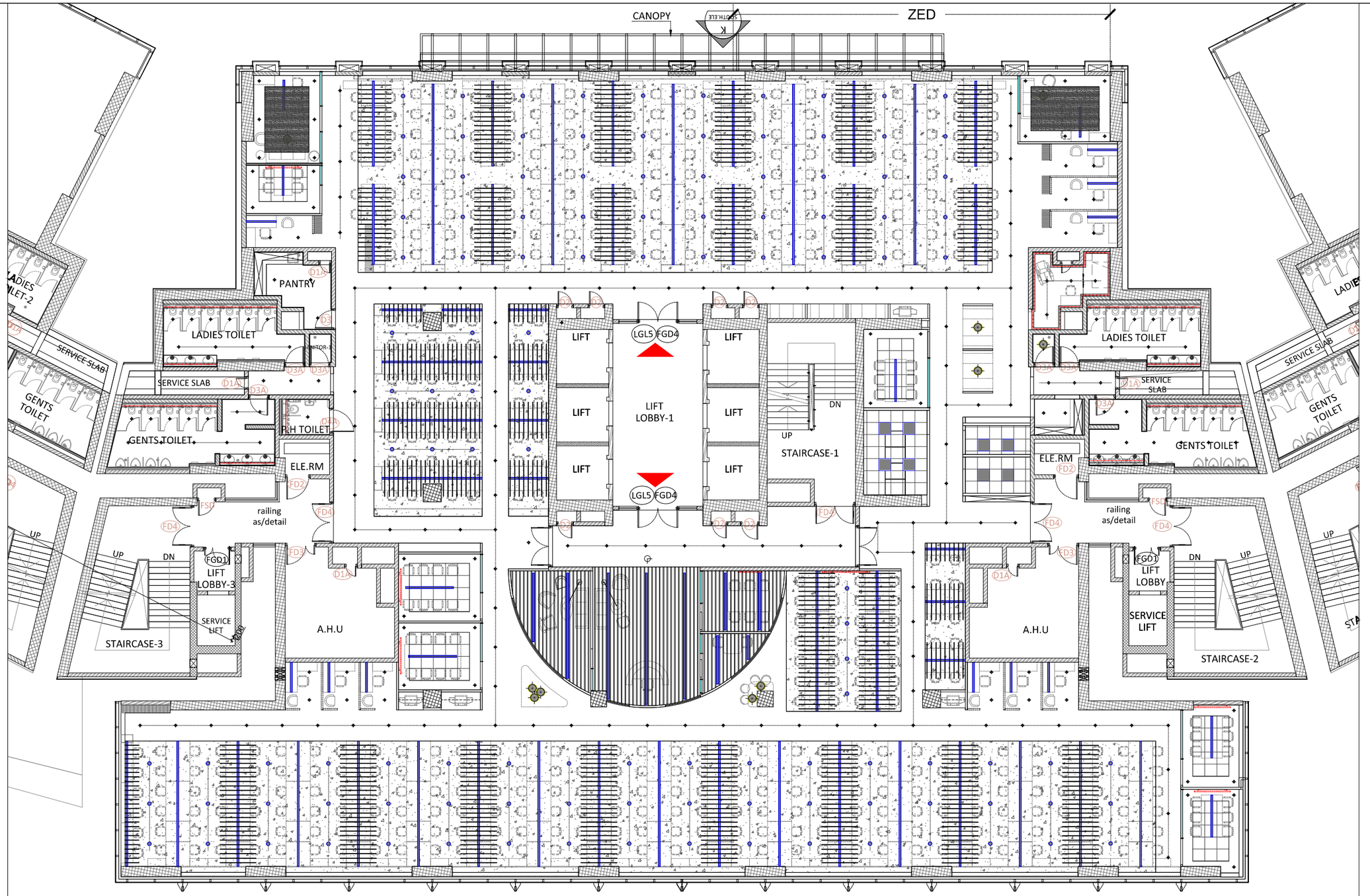
S.NO	SYMBOL	DESCRIPTION
1.		GYPSUM CEILING
2.		600X600 GRID CEILING
3.		M.R. GRADE GYPSUM CEILING @ WASHROOM
4.		EXPOSED CEILING
5.		WALLPAPER FINISH
6		ACOUSTICS BAFFLES @ WORKHALL
7.		OPEN CELL CELING
8.		NITOBO CEILING

LIGHTING LEGEND

S.NO	SYMBOL	DESCRIPTION
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT- P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT

LIGHTING LEGEND

S.NO	SYMBOL	DESCRIPTION
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
L12		GLOBE LIGHT @ CAFETERIA



CEILING LEGEND

S.NO	SYMBOL	DESCRIPTION
1.		GYPSUM CEILING
2.		600X600 GRID CEILING
3.		M.R GRADE GYPSUM CEILING @ WASHROOM
4.		EXPOSED CEILING
5.		WALLPAPER FINISH
6		ACOUSTICS BAFFLES @ WORKHALL
7.		OPEN CELL CEILING
8.		NITOBO CEILING

LIGHTING LEGEND

S.NO	SYMBOL	DESCRIPTION
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT- P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT

LIGHTING LEGEND

S.NO	SYMBOL	DESCRIPTION
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
L12		GLOBE LIGHT @ CAFETERIA

NOTES

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S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
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- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSI CUSTOMER_____

CONTRACTORS

PROJECT NAME :

QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :

2ND FLOOR-K BLOCK
REFLECTED CEILING PLAN

DRAWING NUMBER : -

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 21-11-24	NORTH:
APPROVED BY :		



LEGEND FOR PARTITIONS

S.NO	SYMBOL	DESCRIPTION
P1		100MM THK. FULL HEIGHT GYPSUM PARTITION AS/APPR.
P2		150MM THK. AAC. BLOCK
P3		SLIDING FOLDING PARTITION AS/SHOP DRAWING
P4		132MM THK. FULL HEIGHT FIRE RATED PARTITION AS/APPR.
P5		12MM THK. SINGLE GLASS PARTITION 2400 MM HIGH
P6		100 MM THK. FULL HEIGHT GYPSUM HABITO PARTITION

LEGEND FOR DOOR OPENINGS

S.NO	SYMBOL	CODE	SIZE (MM)	QTY	DESCRIPTION
1.	ST1		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME)
2.	ST2		1000X2400	-	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME) WITH ACD
3.	DVP		900X2400	-	VISION PANEL DOOR (900 MM CLEAR OPENING)
4.	SD1		900X2400	-	900 MM WIDE SINGLE LEAF SOLID DOOR
5.	SD2		1000X2400	-	1000 MM WIDE SINGLE LEAF SOLID DOOR
6.	SD3		1200X2400	-	1200 MM WIDE SINGLE LEAF SOLID DOOR
7.	FD1		1200X2400	-	1200 MM WIDE FIRE RATED DOOR

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- ○ ADVANCE COPY CUSTOMER_____
- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME :

QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :

DOOR AND PARTITION SETTING OUT

DRAWING NUMBER : QCI/DEL-WTC/K-02/LP-02

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 04-12-24	NORTH:
APPROVED BY :		

SCHEDULE FOR FLOORING

S.NO		SYMBOL	DESCRIPTION	QTY. (SQ.FT.)
1.	CR1		LIGHT GREY CARPET	-
2.	CR2		DARK GREY CARPET	-
3.	ST1		GREY MARBLE	-
4.	T1		1200 X 600 WOOD LOOK TILE	-
5.	T2		1200X600 MM TERRAZO TILE	-
6.	T3		1200X600 MM WASHROOM TILE	-



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- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

PROJECT NAME : QCI

INTERIOR ARCHITECTS :

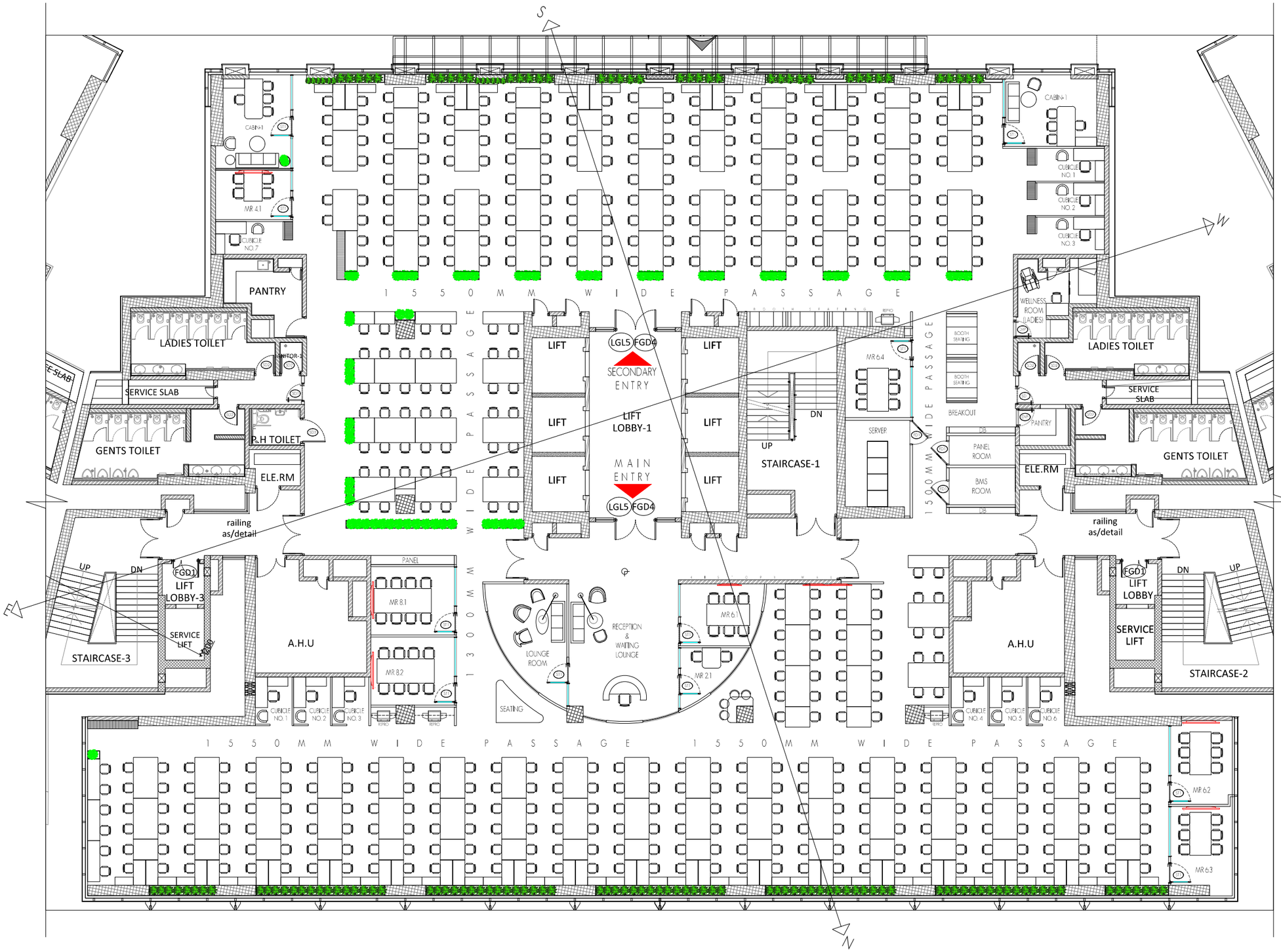
DRAWING TITLE : PROPOSED FLOORING LAYOUT PLAN

DRAWING NUMBER : QCI/DEL-WTC/K-02/LP-03

DRAWN BY :	SCALE : NTS	REV NO.: R0
CHECKED BY :	DATE : 10-12-24	NORTH:
APPROVED BY :		

OCCUPANCY -----REQ(ACH.)

SR. NO.	DEPARTMENT DESCRIPTION	TOTAL HEADCOUNT	CABINS	CUBICLES	WORK STATIONS
01	PPID-DEPARTMENT	450(413)	1(1)	7(7)	442(405)
02	ZED	75(75)	1(1)	3(3)	72(72)
	TOTAL HEADCOUNT	525(488)			



NOTES

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- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

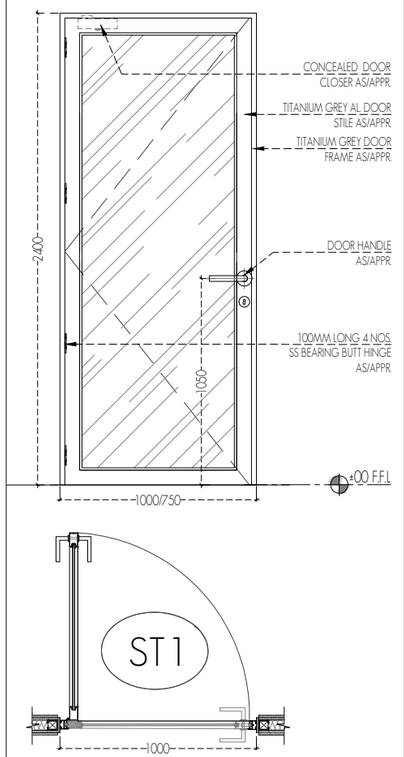
PROJECT NAME : OCI

INTERIOR ARCHITECTS :

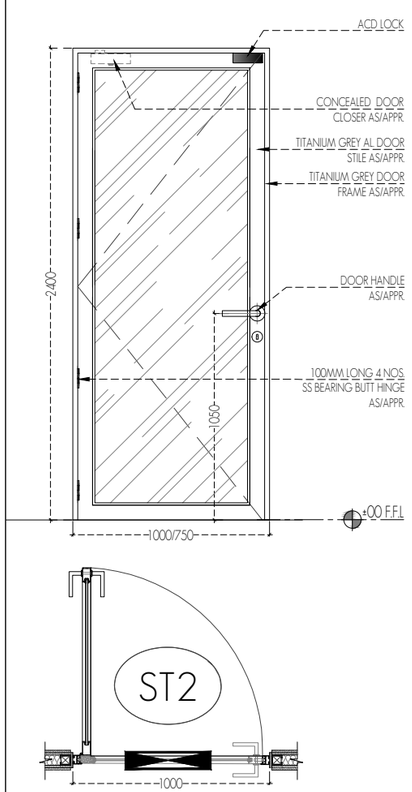
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DRAWING NUMBER :

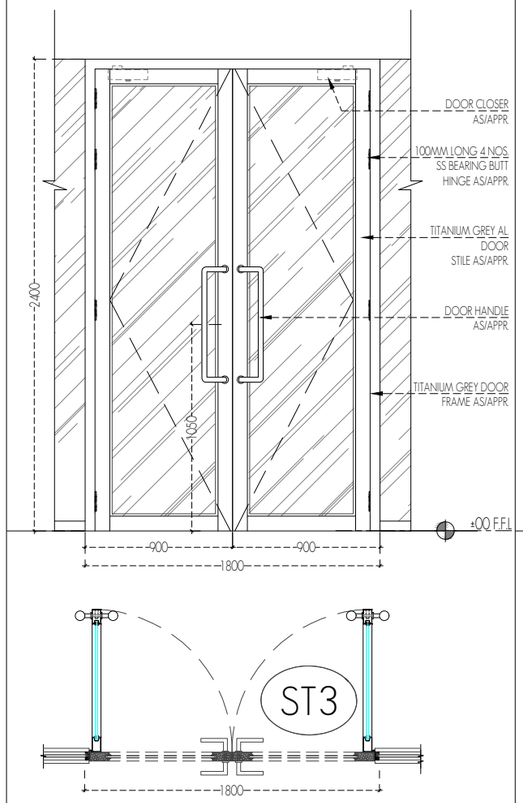
DRAWN BY :	SCALE :	REV NO.: V3
CHECKED BY :	DATE : 21-10-24	NORTH:
APPROVED BY :		



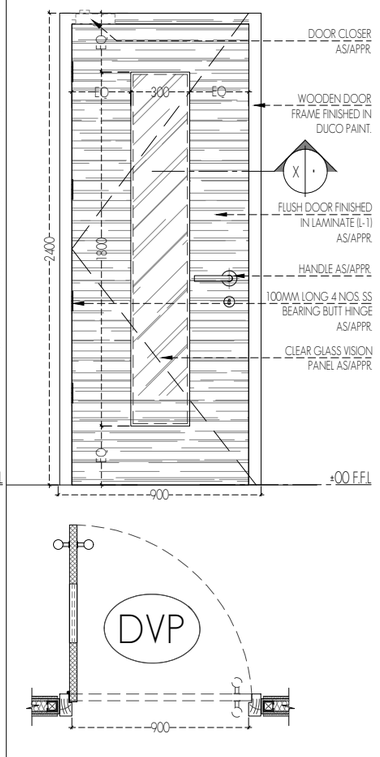
1. STILE DOOR (ST1)



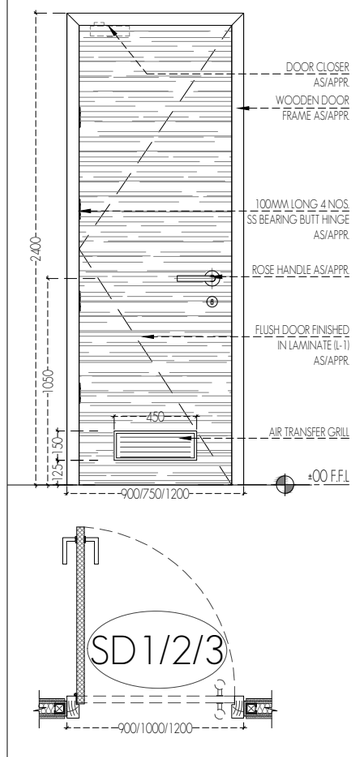
2. STILE DOOR WITH ACD (ST2)



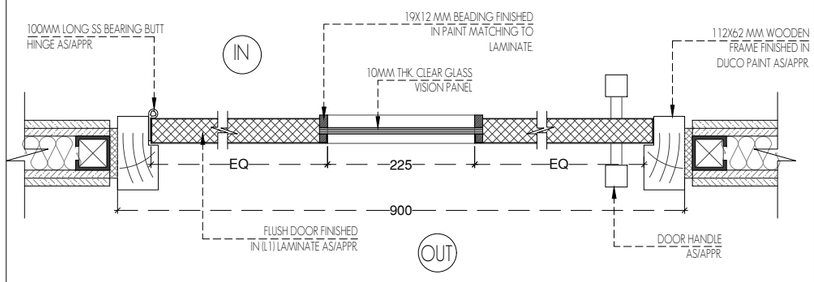
3. DOUBLE LEAF STILE DOOR (ST3)



4. VISION PANEL DOOR (DVP)



5. SOLID DOOR (SD1/SD2/SD3)



6. SECTION X

NOTE :FIRE RATED DOOR WILL BE AS /APPROVED SHOP DRAWING

LEGEND FOR DOOR OPENINGS

S.NO	SYMBOL	SIZE (MM)	DESCRIPTION
1.	ST1	1000X2400	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME)
2.	ST2	750X2400	1000 MM WIDE STILE DOOR (INCLUDING DOOR FRAME) WITH ACD
3.	ST3	1800X2400	1800 MM WIDE DOUBLE LEAF STILE DOOR (INCLUDING DOOR FRAME)
4.	DVP	900X2400	VISION PANEL DOOR (900 MM CLEAR OPENING)
5.	SD1	900X2400	900 MM WIDE SINGLE LEAF SOLID DOOR
6.	SD2	1000X2400	1000 MM WIDE SINGLE LEAF SOLID DOOR
7.	SD3	1200X2400	1200 MM WIDE SINGLE LEAF SOLID DOOR

NOTES

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REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
3	R-3		

- ○ FOR REFERENCE CUSTOMER_____
- ○ FOR APPROVAL CUSTOMER_____
- ○ ADVANCE COPY CUSTOMER_____
- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

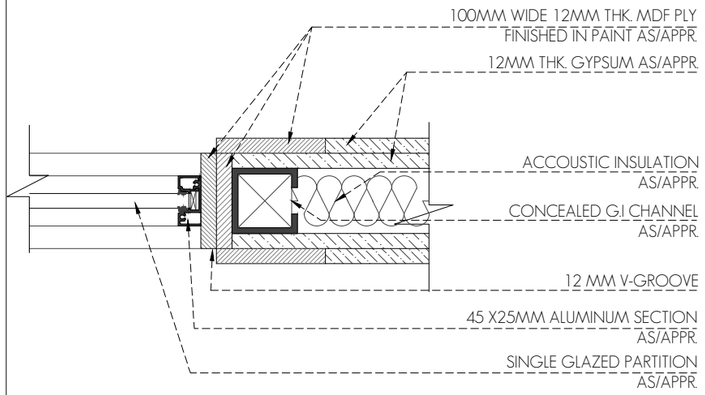
PROJECT NAME : QCI

INTERIOR ARCHITECTS :

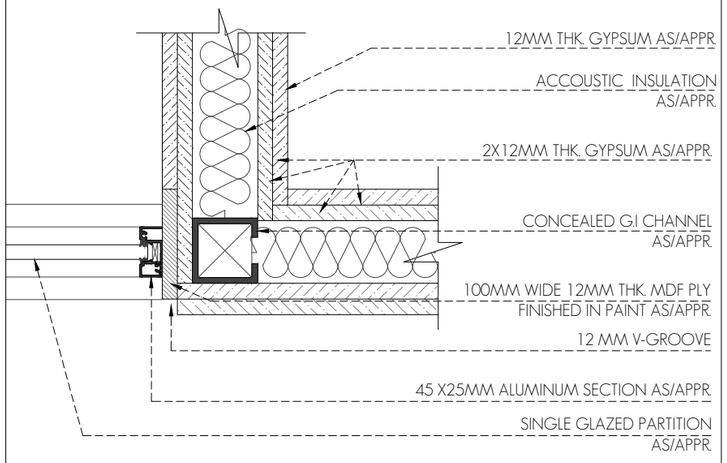
DRAWING TITLE : TYPICAL DOOR DETAIL

DRAWING NUMBER : QCI/DEL-WTC/J-02/TYP-03

DRAWN BY :	SCALE : NTS	REV NO.:
CHECKED BY :	DATE : 09-12-24	NORTH:
APPROVED BY :		



1. DETAIL AT 'A' (PARTITION TO GLASS PARTITION JUNCTION)



2. DETAIL AT 'B' (CORNER PARTITION JUNCTION)

4. DETAIL AT 'C' (T-PARTITION JUNCTION)

5. DETAIL AT 'D' (MULLION JUNCTION DETAIL)

6. DETAIL AT 'E' (DOOR FRAME JUNCTION)

7. DETAIL AT 'F' (DOOR FRAME JUNCTION)

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- ● FOR TENDER — CUSTOMER_____
- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

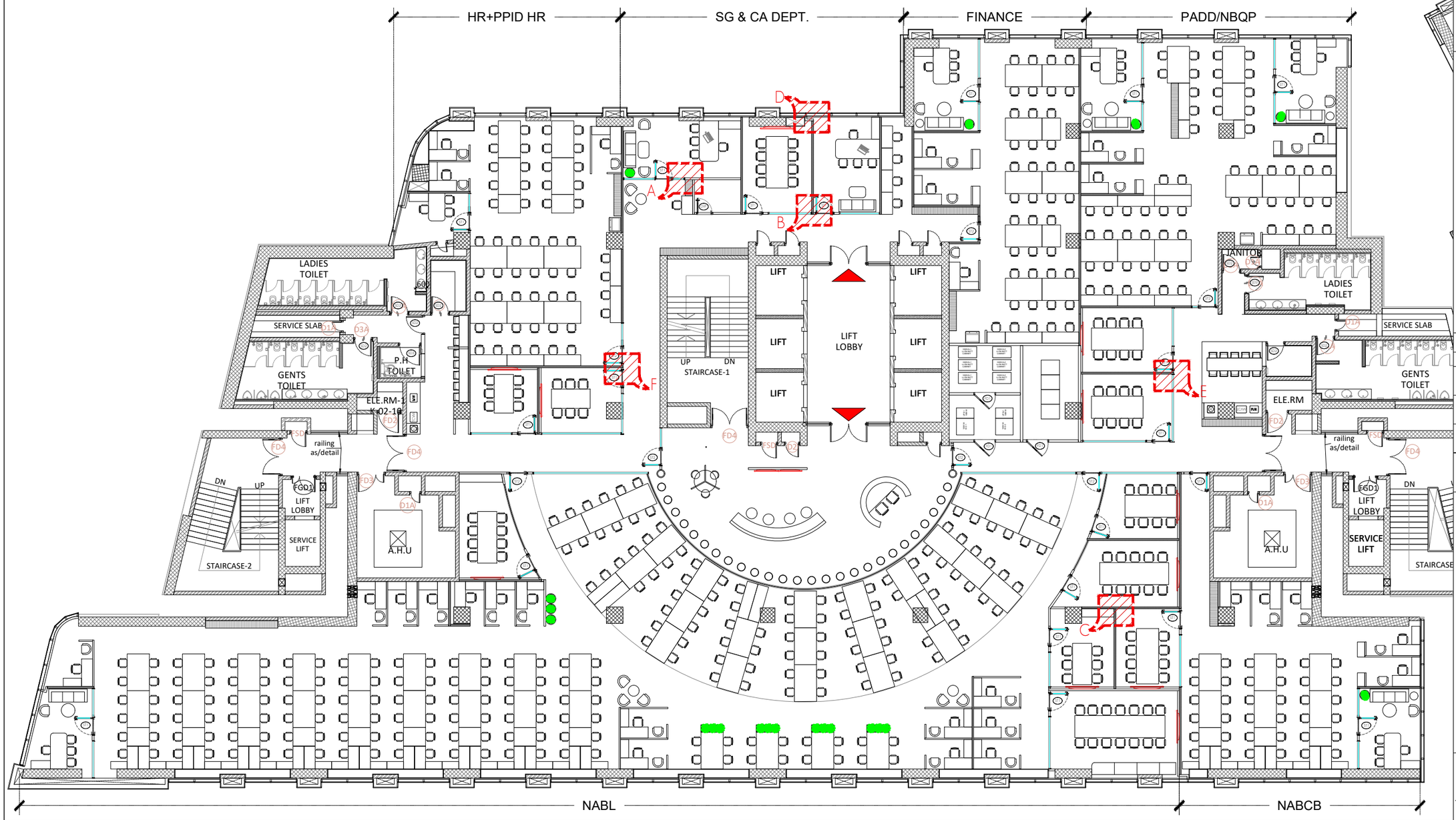
PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : PARTITION JUNCTION DETAIL (SHEET-A)

DRAWING NUMBER : QCI/ DEL-WTC/J-02/TYP-02

DRAWN BY :	SCALE : N.T.S	REV NO.:
CHECKED BY :	DATE : 09-12-24	NORTH:
APPROVED BY :		



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- ○ FOR CONSTRUCTION CUSTOMER_____
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CONTRACTORS

PROJECT NAME : QCI

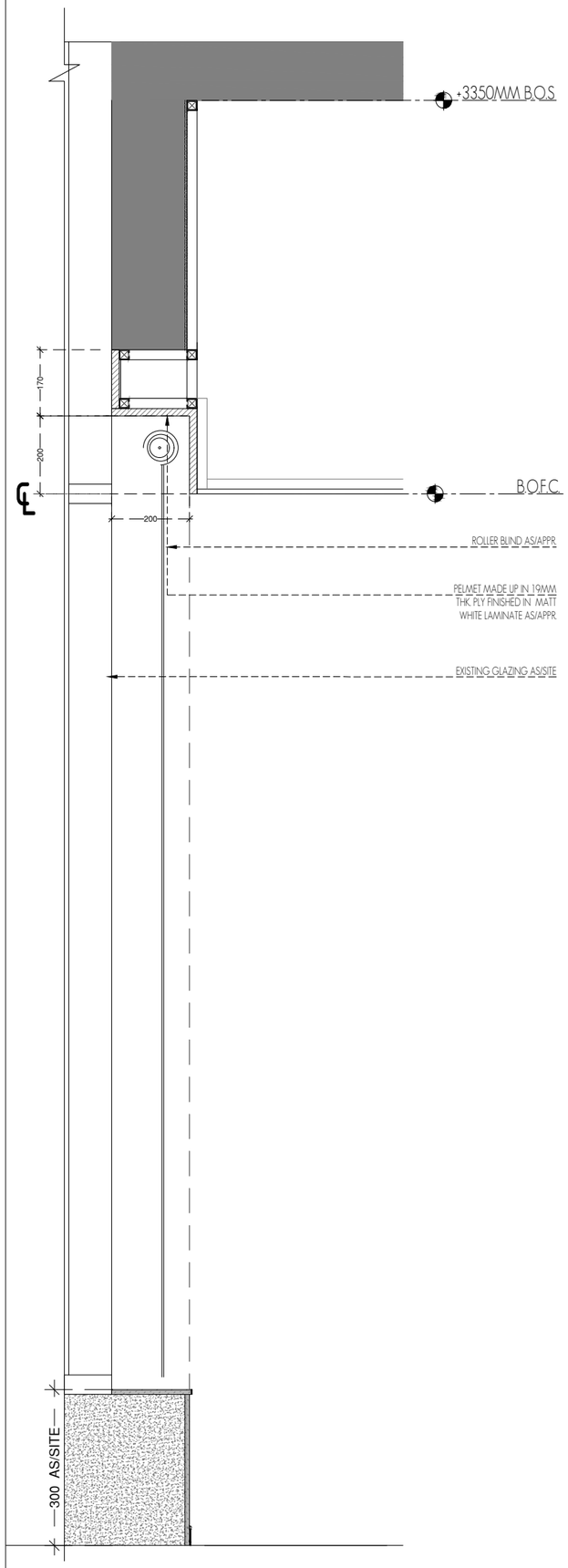
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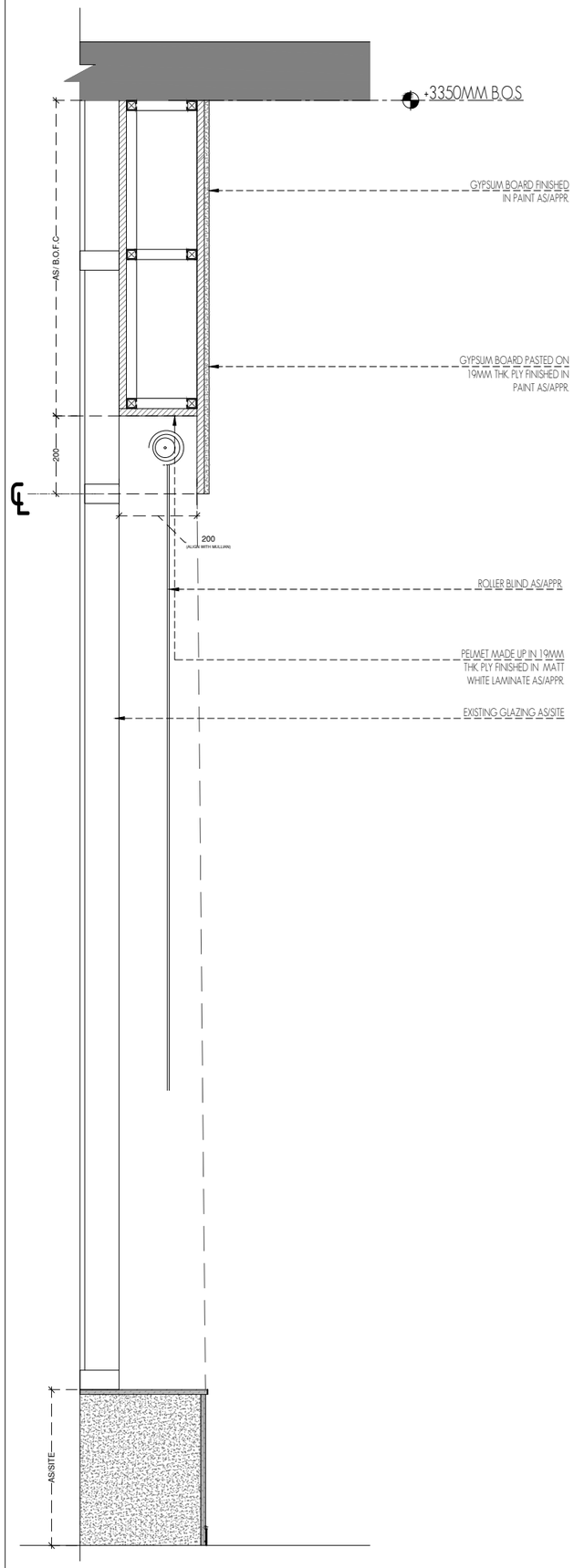
PARTITION JUNCTION DETAIL (SHEET-B)

DRAWING NUMBER : QCI/ DEL-WTC/J-02/TYP-02

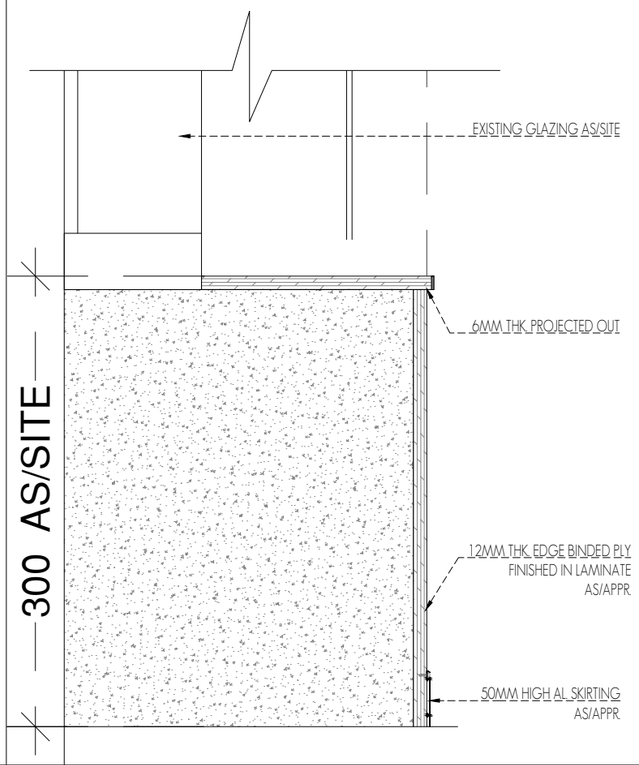
DRAWN BY :	SCALE : NTS	REV NO.:
CHECKED BY :	DATE : 09-12-24	NORTH:
APPROVED BY :		



1. WINDOW LINTEL AND CILL DETAIL WITH DRESSED CEILING



2. WINDOW LINTEL AND CILL DETAIL WITH EXPOSED CEILING



3. SILL DETAIL

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- ○ FOR CONSTRUCTION — CUSTOMER_____
- ○ FOR BUILDER SUBMISSION — CUSTOMER_____

CONTRACTORS

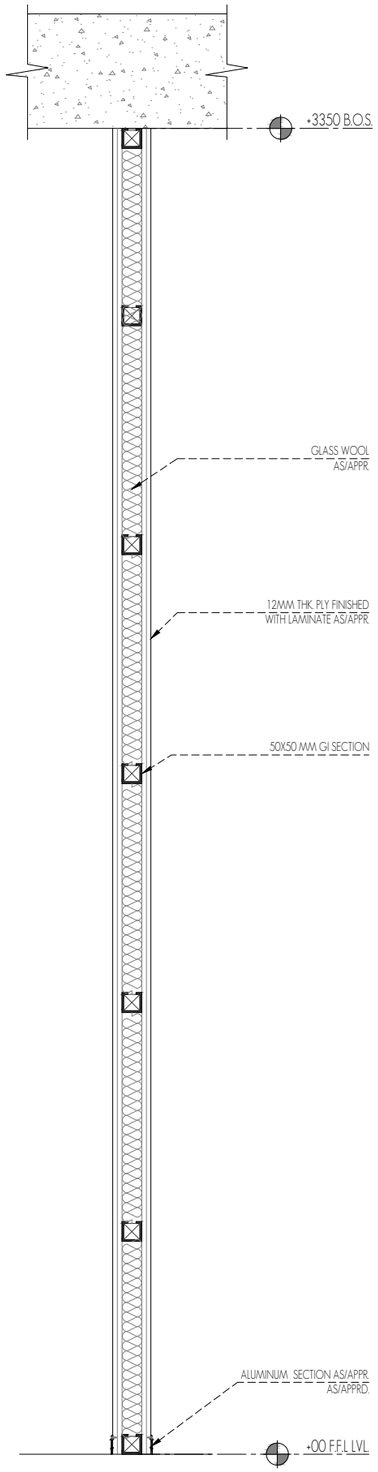
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INTERIOR ARCHITECTS :

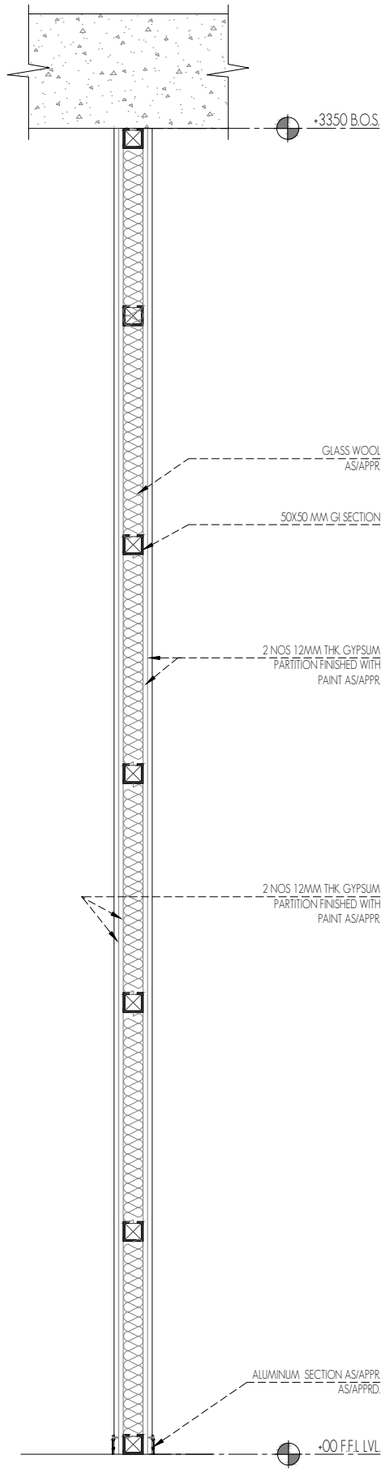
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DRAWING NUMBER : QCI/DEL-WTC/-/TYP-04

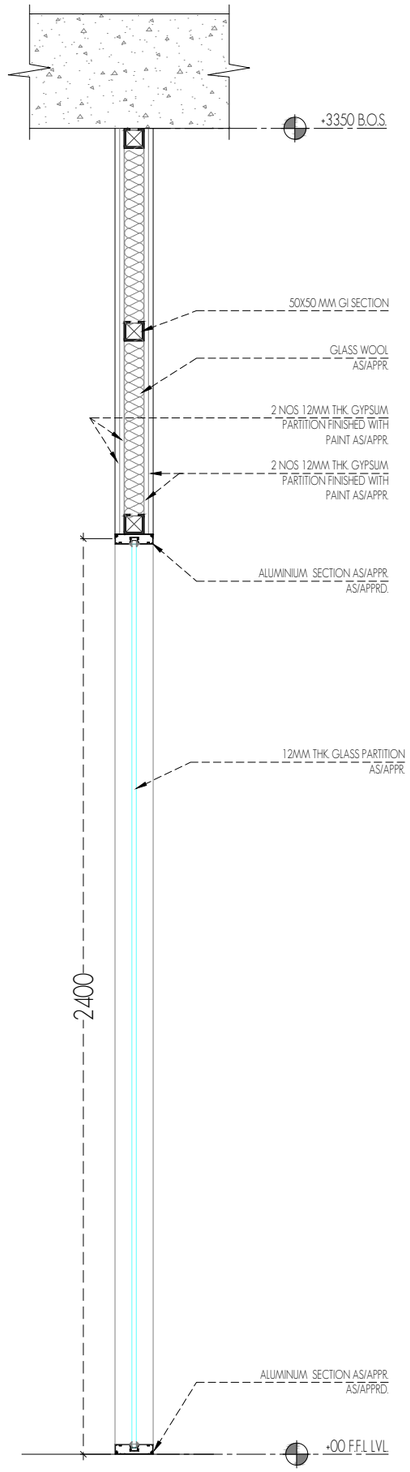
DRAWN BY :	SCALE : NTS	REV NO.: NTS
CHECKED BY :	DATE : 12-12-24	NORTH:
APPROVED BY :		



TYPICAL 100MM LAMINATED PARTITION DETAIL



TYPICAL 100 MM GYPSUM PARTITION DETAIL



TYPICAL GLASS PARTITION DETAIL

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3	R-3		

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- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

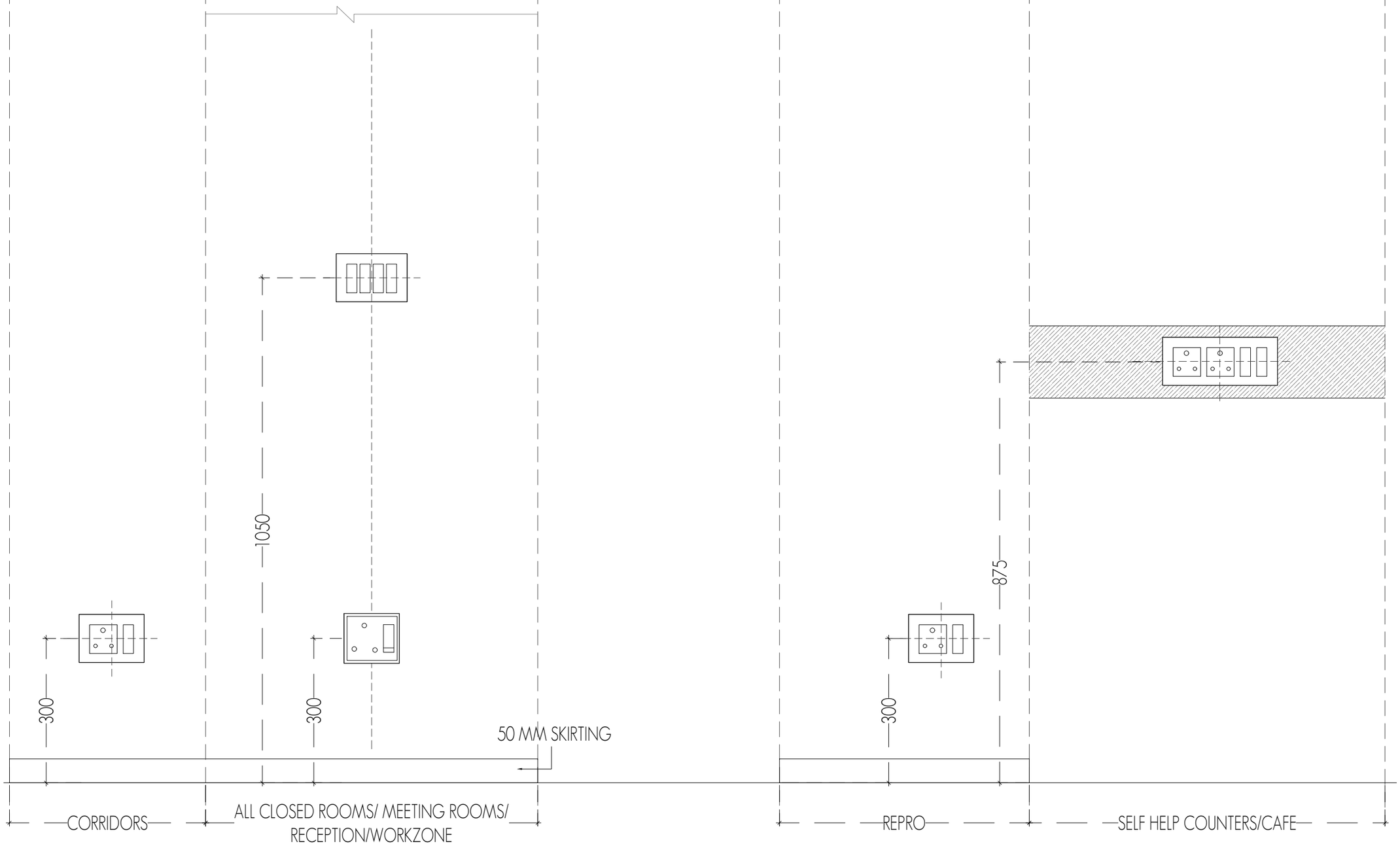
PROJECT NAME : QCI

INTERIOR ARCHITECTS :

DRAWING TITLE : TYPICAL PARTITION DETAIL

DRAWING NUMBER : QCI/DEL-WTC/J-02/TYP-02

DRAWN BY :	SCALE : NTS	REV NO.:
CHECKED BY :	DATE : 09.12.2024	NORTH:
APPROVED BY :		



TYPICAL SWITCH BOARD HEIGHT DETAIL

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CONTRACTORS

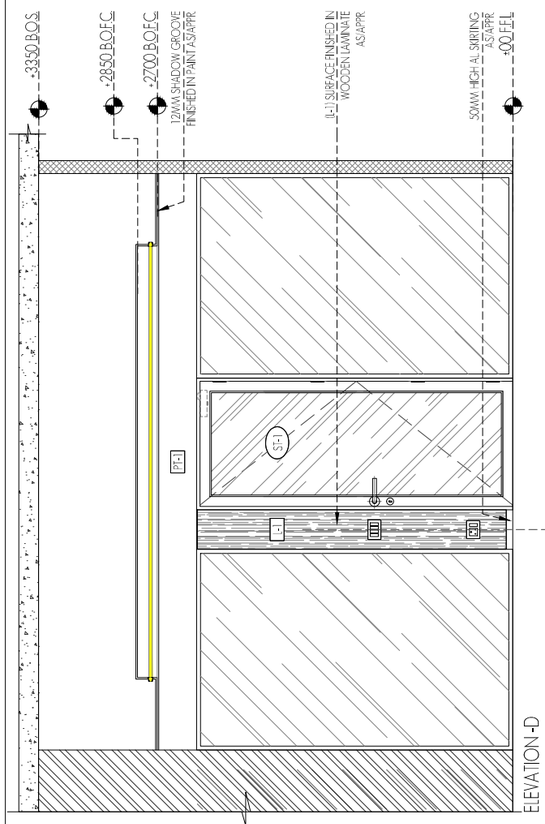
PROJECT NAME : QCI

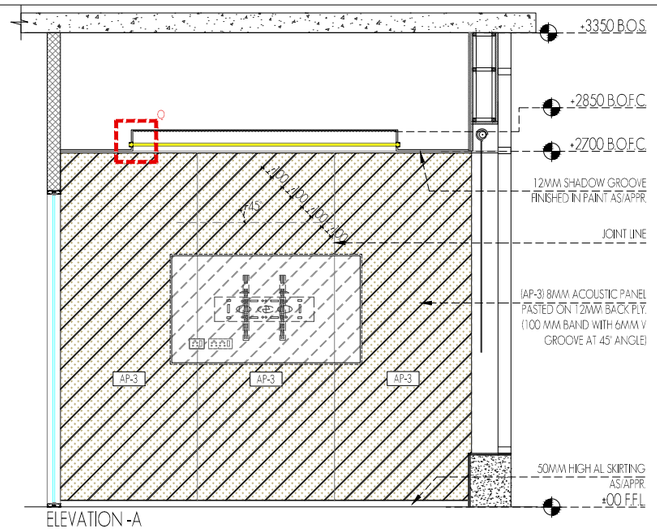
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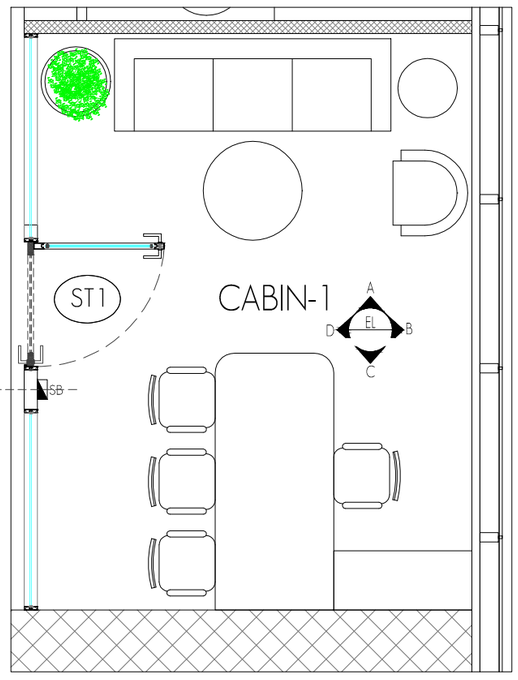
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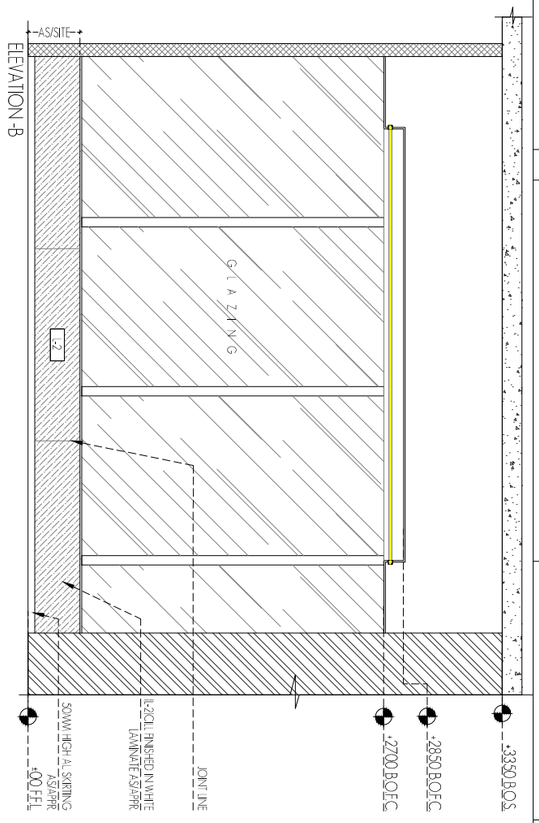
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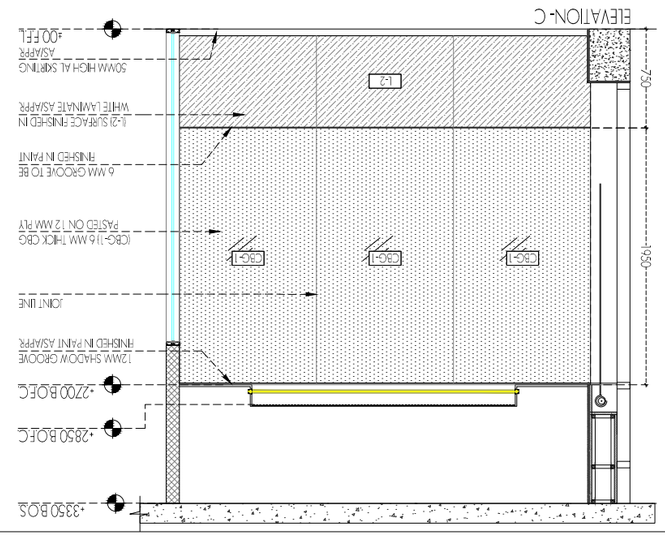
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CHECKED BY :	DATE : 09-12-24	NORTH:
APPROVED BY :		

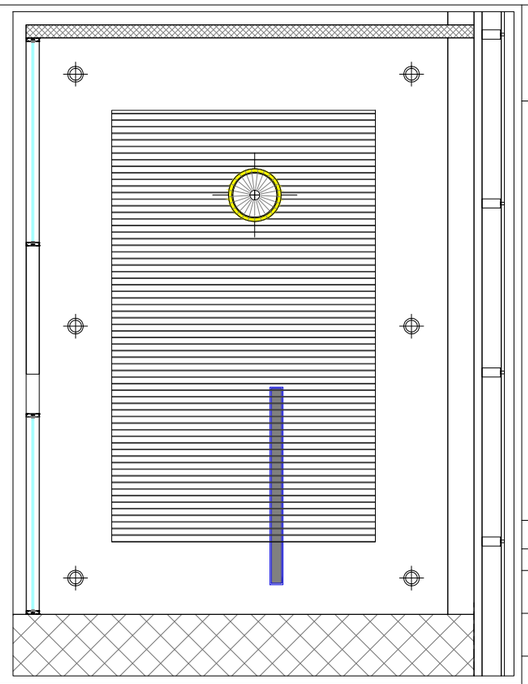








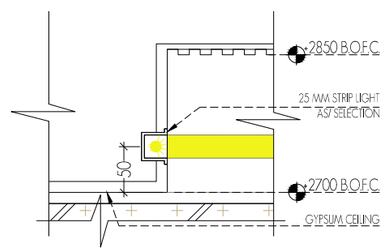




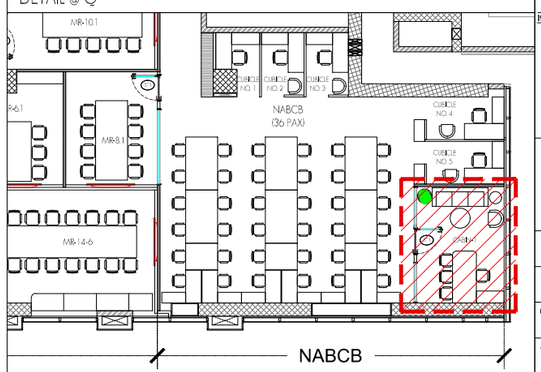
REFLECTED CEILING PLAN

LEGEND FOR FINISHES

S.NO	CODE	SYMBOL	DESCRIPTION
1.	CBG-1		C.B.G-WHITE
2.	PT-1		WHITE PAINT
3.	AP-3		BEIGE ACOUSTIC PANEL
4.	L-1		WOODEN LAMINATE
5.	L-2		WHITE LAMINATE
6.	SB		SWITCH BOARD



DETAIL @ Q



KEY PLAN

NOTES

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- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME :

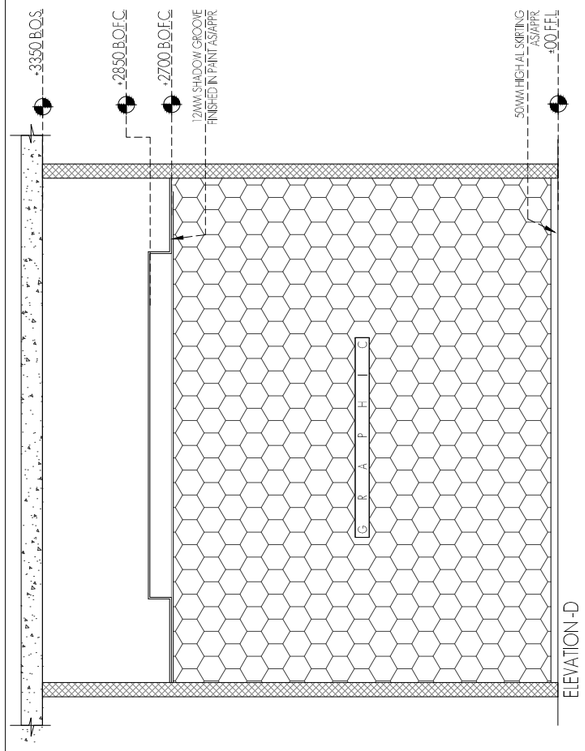
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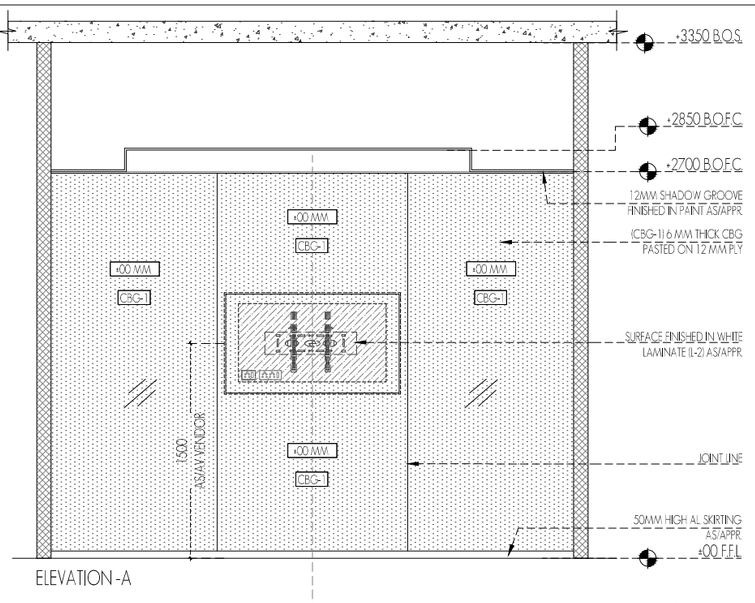
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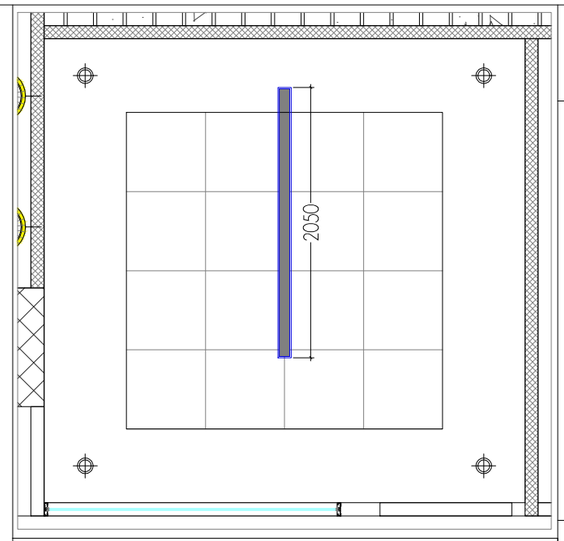
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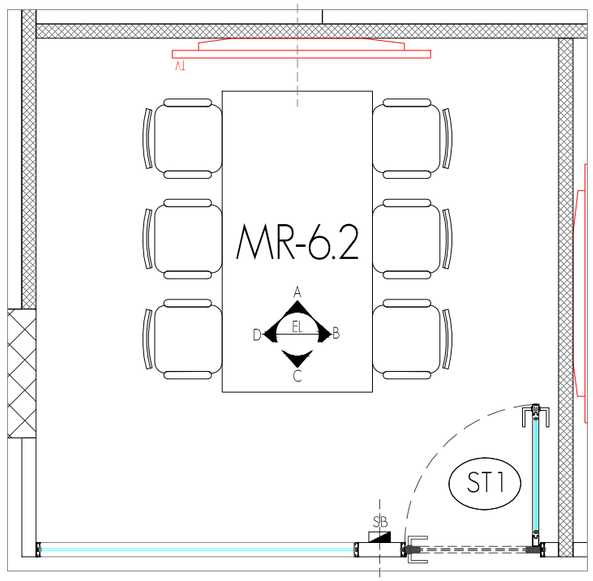
CABIN-1 (NABCB)

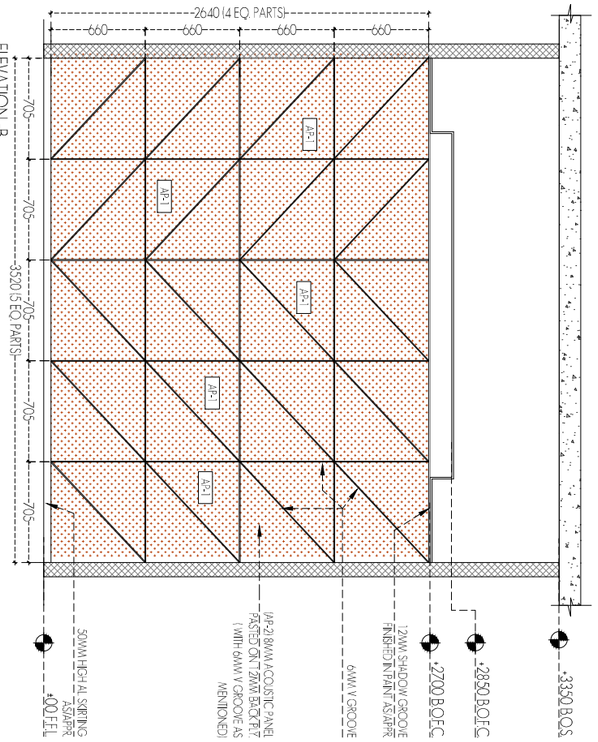
DRAWING NUMBER : QCI/DEL-WTC/J-02/AWE-08		
DRAWN BY :	SCALE :	REV NO.:
CHECKED BY :	DATE : 09.12.24	NORTH:
APPROVED BY :		

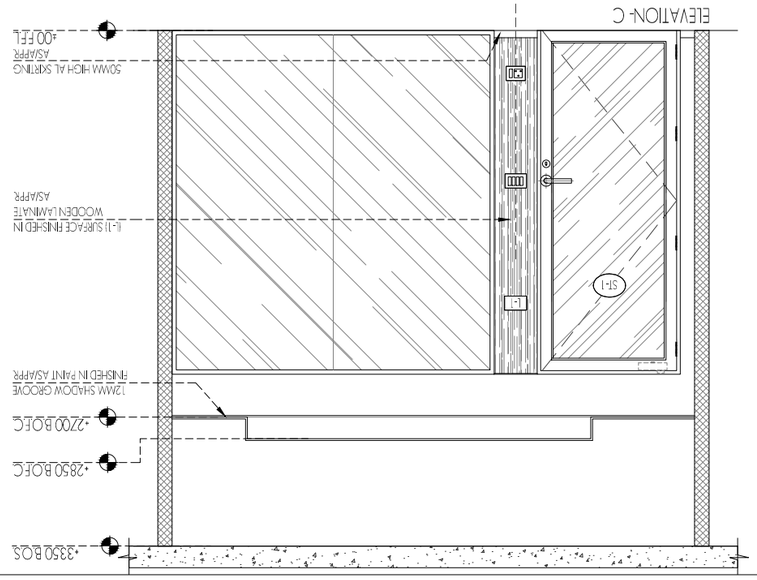






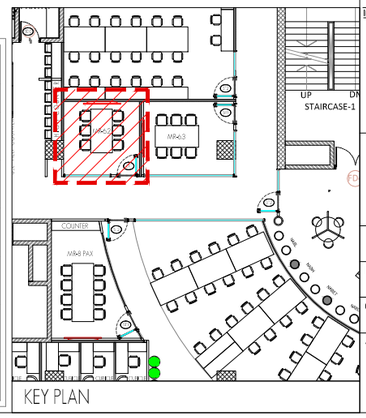






LEGEND FOR FINISHES

S.NO	CODE	SYMBOL	DESCRIPTION
1.	CBG-1		C.B.G-WHITE
2.	PT-1		WHITE PAINT
3.	AP-1		ORANGE ACOUSTIC PANEL
4.	L-1		WOODEN LAMINATE
5.	GR		GRAPHIC
6.	SB		SWITCH BOARD



NOTES

* ALL DIMENSIONS ARE IN MILIMETERS AND AND LEVELS IN METRE UNLESS OTHERWISE MENTIONED.
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* ALL DISCREPANCIES TO BE BROUGHT TO THE NOTICE OF THE ARCHITECT BEFORE EXECUTION AND HIS DECISION TO BE FINAL.
* THIS DRAWING TO BE READ IN CONJUNCTION WITH DETAILS, LARGE SCALE DRAWINGS, STRUCTURAL, SERVICES AND OTHER RELEVANT DRAWINGS.
* ALL SERVICES DRAWINGS TO BE COORDINATED WITH SERVICE CONSULTANTS
* ALL THE SAMPLES SHOULD BE APPROVED BY CONSULTING ARCHITECT BEFORE EXECUTION
* ANY ISSUE OF STRENGTH,DURABILITY,QUALITY ETC. BROUGHT UNDER THE NOTICE OF ARCHITECT

REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
3	R-3		

- ○ FOR REFERENCE CUSTOMER_____
- ○ FOR APPROVAL CUSTOMER_____
- ○ ADVANCE COPY CUSTOMER_____
- ● FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

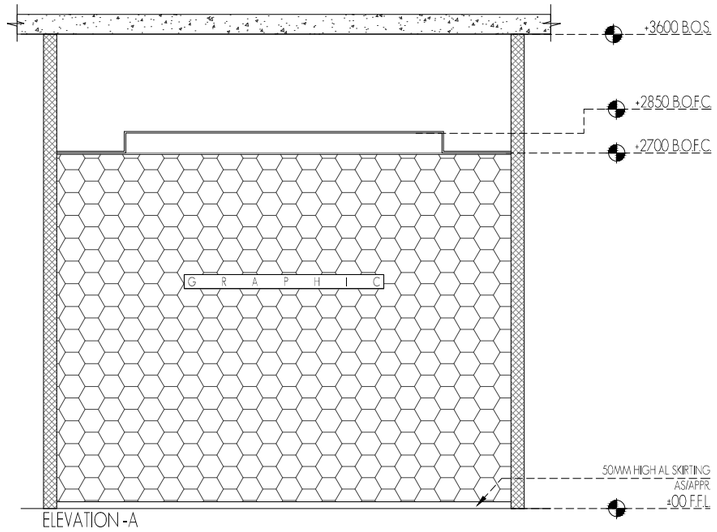
PROJECT NAME :
QCI

INTERIOR ARCHITECTS :

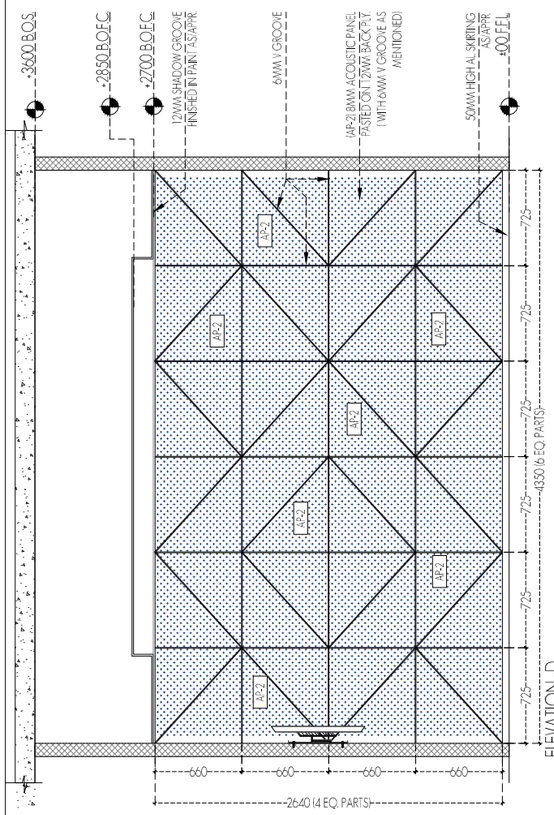
DRAWING TITLE :
MR 6.2

DRAWING NUMBER : QCI/DEL-WTC/J-02/AWE-1.5

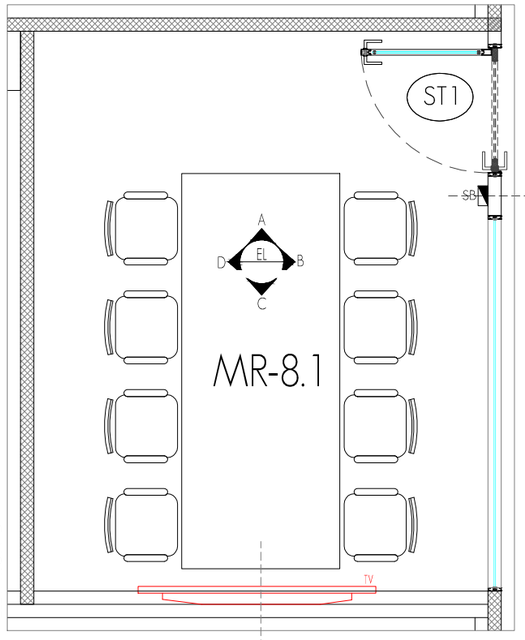
DRAWN BY :	SCALE :	REV NO.:
CHECKED BY :	DATE : 09.12.24	NORTH:
APPROVED BY :		

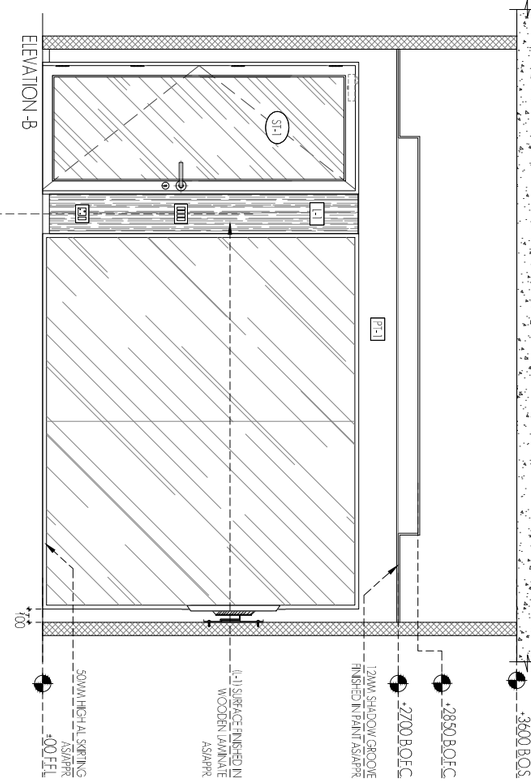


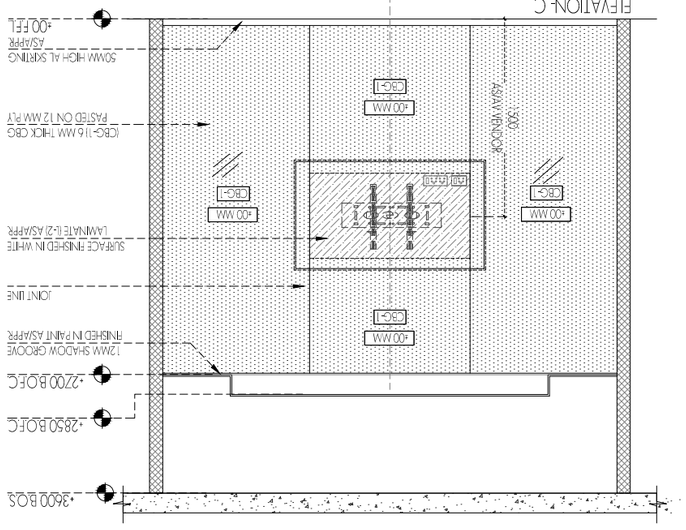
ELEVATION - A

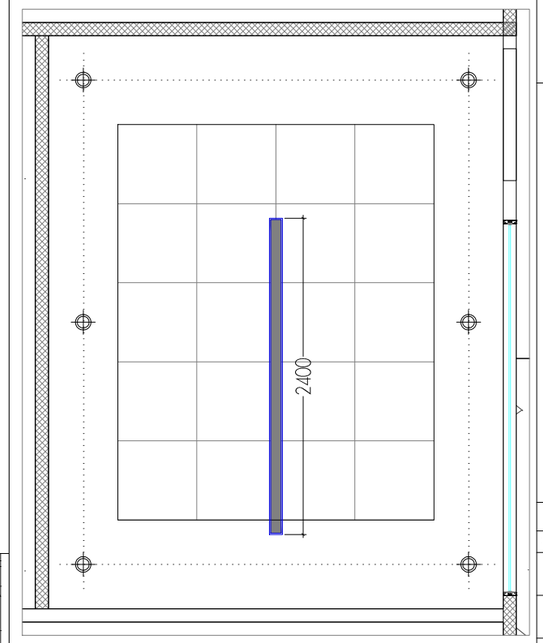


ELEVATION - D



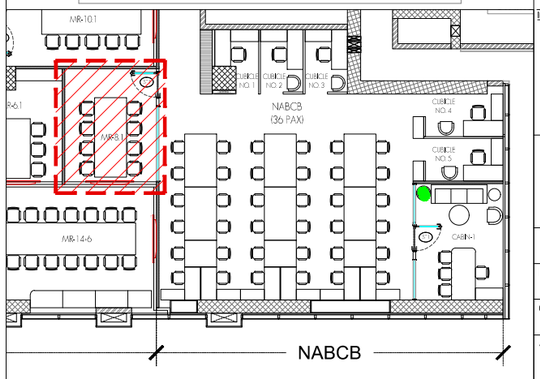






REFLECTED CEILING PLAN

LEGEND FOR FINISHES			
S.NO	CODE	SYMBOL	DESCRIPTION
1.	CBG-1		C.B.G-WHITE
2.	PT-1		WHITE PAINT
3.	AP-2		DARK BLUE ACOUSTIC PANEL
4.	L-1		WOODEN LAMINATE
5.	GR		GRAPHIC
6.	SB		SWITCH BOARD



KEY PLAN

NOTES

* ALL DIMENSIONS ARE IN MILIMETERS AND AND LEVELS IN METRE UNLESS OTHERWISE MENTIONED.
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* ALL SERVICES DRAWINGS TO BE COORDINATED WITH SERVICE CONSULTANTS
* ALL THE SAMPLES SHOULD BE APPROVED BY CONSULTING ARCHITECT BEFORE EXECUTION
* ANY ISSUE OF STRENGTH,DURABILITY,QUALITY ETC. BROUGHT UNDER THE NOTICE OF ARCHITECT

REVISION HISTORY

S.NO.	REV.NO.	DATE	REVISION NOTE
1	R-1		
2	R-2		
3	R-3		

- ○ FOR REFERENCE CUSTOMER_____
- ○ FOR APPROVAL CUSTOMER_____
- ○ ADVANCE COPY CUSTOMER_____
- ○ FOR TENDER CUSTOMER_____
- ○ FOR CONSTRUCTION CUSTOMER_____
- ○ FOR BUILDER SUBMISSION CUSTOMER_____

CONTRACTORS

PROJECT NAME :

QCI

INTERIOR ARCHITECTS :

DRAWING TITLE :

MR 8.1 (NABCB)

DRAWING NUMBER : QCI/DEL-WTC/J-02/AWE-09

DRAWN BY :	SCALE :	REV NO.:
CHECKED BY :	DATE : 09.12.24	NORTH:
APPROVED BY :		

ELECTRICAL LEGEND:		
S.NO	SYMBOL	DESCRIPTION
		6AMP ONE WAY SWITCH (NORMAL)
		6AMP ONE WAY SWITCH(EMERGENCY)
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT– P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
	E	INDICATED CIRCUIT ON EMERGENCY SUPPLY
		ONE WAY NORMAL LOOPING.
		ONE WAY EMERGENCY LOOPING.
		DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP

NOMENCLATURE OF DISTRIBUTION BOARDS

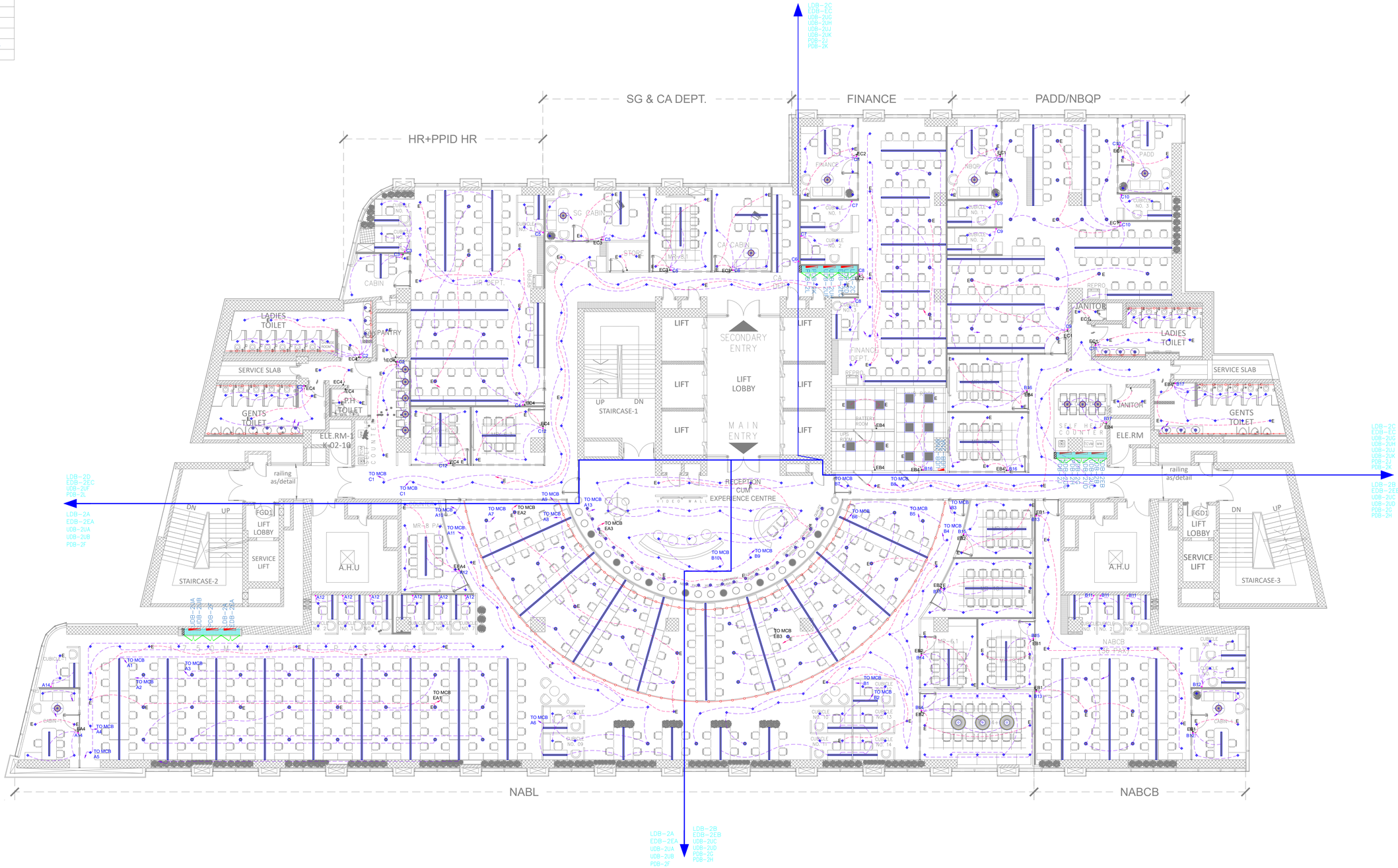
L DB 2 K

K REPRESENT DB NUMBER
2 REPRESENT SECOND FLOOR DB.
DISTRIBUTION BOARD
L REPRESENT LIGHT DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

E DB 2 EA

EA REPRESENT DB NUMBER
2 REPRESENT SECOND FLOOR DB.
DISTRIBUTION BOARD
E REPRESENT EMERGENCY DB.



1 SECOND FLOOR PLAN
Scale: 1:25

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING.
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

STRUCTURE: 19.11.2024

STRUCTURE:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE:1:125

ISSUED DATE:26.12.2024

DRAWN BY:

CHECKED BY.

APRVD BY:

DRAWING TITLE:

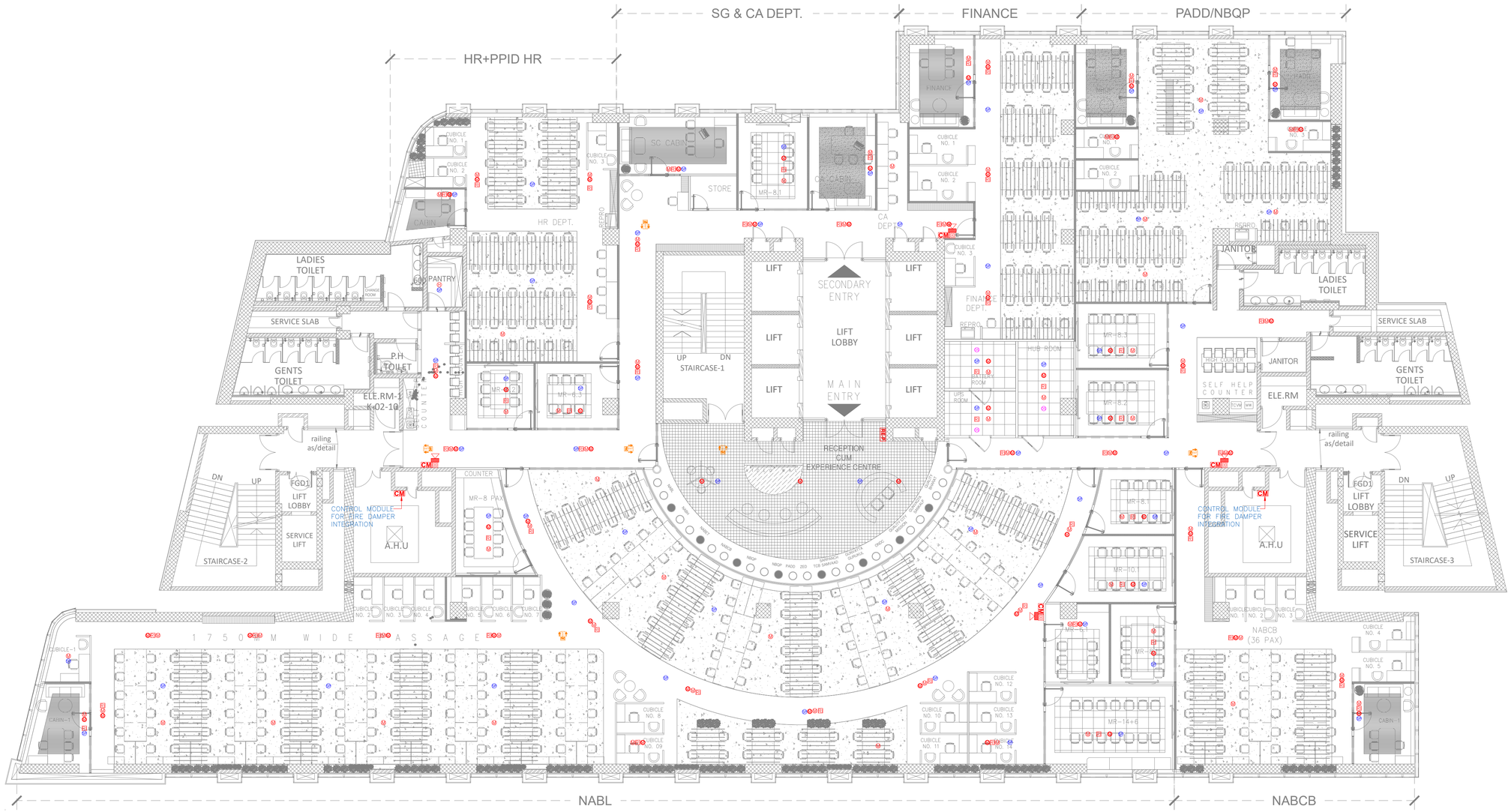
SECOND FLOOR PLAN - LIGHTING

PE-J-TD-E-200.A

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	MULTI CRITERIA DETECTOR (TRUE CEILING)
	MULTI CRITERIA DETECTOR (FALSE CEILING)
	HEAT DETECTOR
	RESPONSE INDICATOR
	SPEAKER
	MANUAL CALL POINT
	HOOTER CUM STROBE
CM	CONTROL MODULE
REP	REPEATER PANEL
	OCCUPANCY SENSOR

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP



1 SECOND FLOOR PLAN
Scale: 1:25

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE 26.12.2024

DRAWN BY:

CHECKED BY.

APRVD BY:

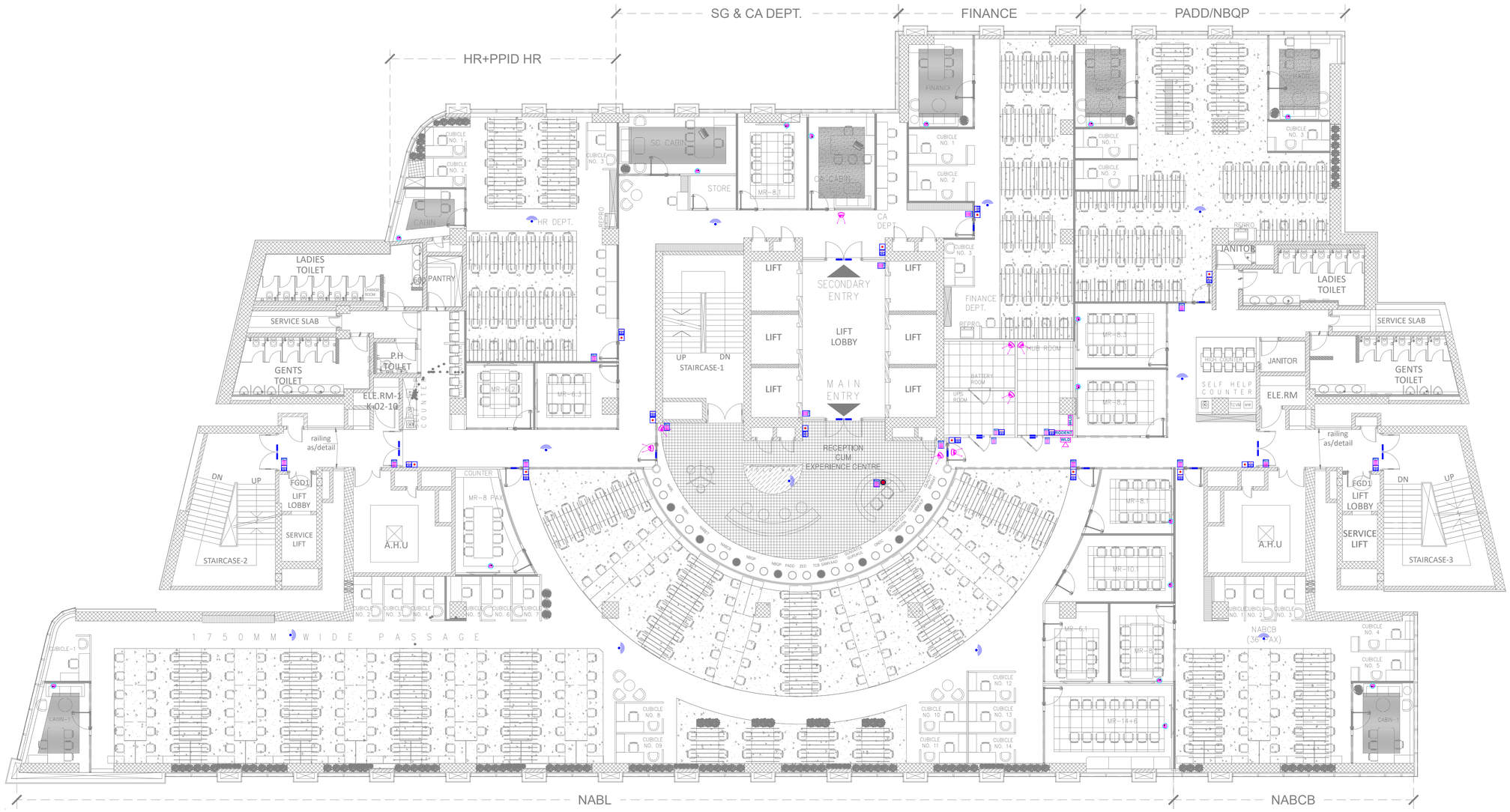
DRAWING TITLE:

SECOND FLOOR PLAN - FIRE & PA SYSTEM

PE-J-TD-E-200.B

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	PROXIMITY READER WITHOUT KEYPAD
	ELECTROMAGNETIC LOCK SINGLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK SINGLE DOOR 1200 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 1200 LBS.
	EMERGENCY BREAK GLASS (EXIT)
	EXIT PUSH BUTTON
	PANIC SWITCH
	IP BASED FIXED DOME CAMERA (INDOOR)
	SOUND BAR WITH VC CAMERA
	WI-FI ROUTER
WLD	WATER LEAKAGE DETECTION PANEL
WLD	HOOTER FOR WLD
RODENT	RODENT REPELLENT PANEL



1 SECOND FLOOR PLAN
Scale: 1:25

NOTES:

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5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY

APRVD BY:

DRAWING TITLE:

SECOND FLOOR PLAN - SECURITY SYSTEM

PE-J-TD-E-200.C

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO(RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
P	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
UW	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
PROJ	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
D1	1 NO. DATA POINT (IN CEILING)
VC	1 NO. DATA OUTLET (VIDEO CONFRENCE)
T	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE
HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE
	GEYSER SWITCHING
	DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION	LOCATION
A	TYPE–A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE–B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE–C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE–C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE–C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE–A, TYPE– C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE–D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE–E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE–E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE–G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE–H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

NOMENCLATURE OF DISTRIBUTION BOARDS

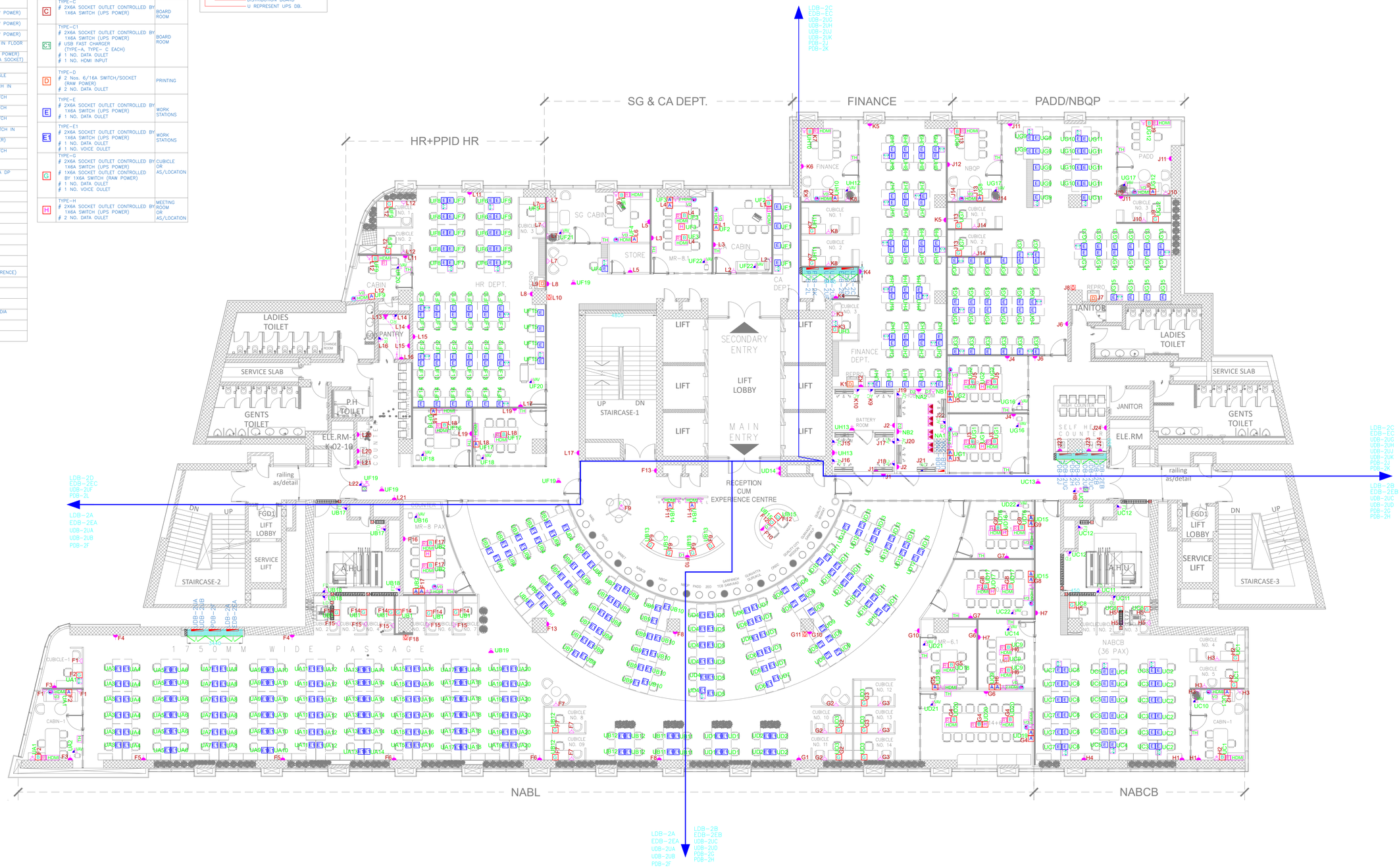
DB 1 2 A

- A REPRESENT DB NUMBER
- 2 REPRESENT SECOND FLOOR DB.
- DISTRIBUTION BOARD
- P REPRESENT RAW POWER DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

UDB 2 U

- UA REPRESENT DB NUMBER
- 2 REPRESENT SECOND FLOOR DB.
- DISTRIBUTION BOARD
- U REPRESENT UPS DB.



1 SECOND FLOOR PLAN
Scale: 1:25

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE:1:125

ISSUED DATE26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

SECOND FLOOR PLAN - POWER

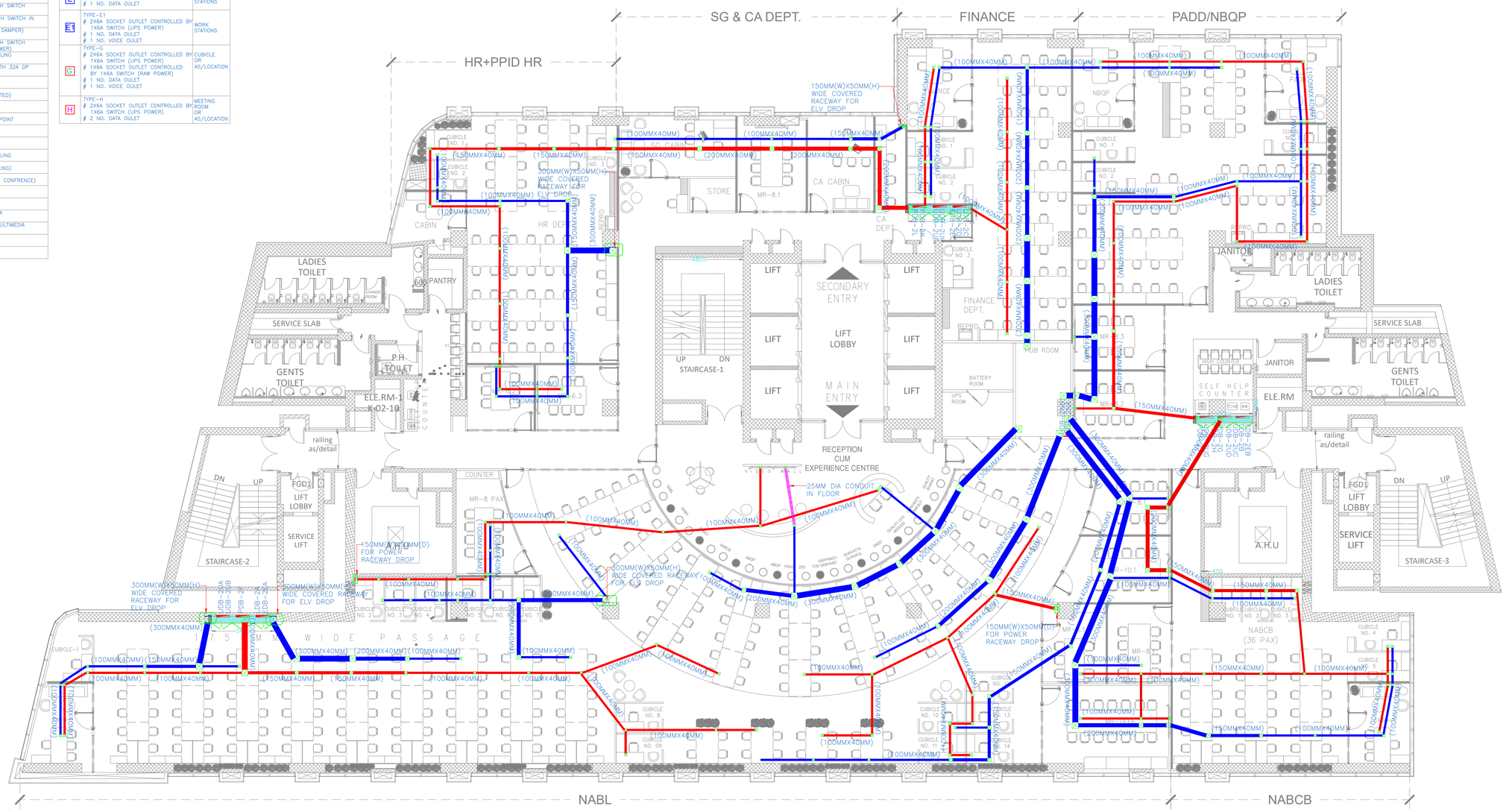
PE-J-TD-E-200.D

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
16	16A SOCKET FOR INLINE FAN AND GEYSER
6	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
6L	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
6	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
6	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO(RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
P	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
UW	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
	1 NO. DATA POINT (IN CEILING)
VO	1 NO. DATA OUTLET (VIDEO CONFRENCE)
	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE.
HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE.
	GEYSER SWITCHING
	DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:		
SYMBOL	DESCRIPTION	LOCATION
A	TYPE–A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE–B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE–C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE–C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE–C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE–A, TYPE– C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE–D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE–E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE–E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE–G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE–H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL EQUIPMENT
	POWER RACEWAY IN FLOOR
	ELV RACEWAY IN FLOOR
	25MM DIA CONDUIT IN FLOOR
	JUNCTION BOX (150MMX150MM)
	JUNCTION BOX (200MMX200MM)
	JUNCTION BOX (250MMX250MM)
	JUNCTION BOX (300MMX300MM)
	JUNCTION BOX (350MMX350MM)



1 SECOND FLOOR PLAN
Scale: 125

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE:1:125

ISSUED DATE:26.12.2024

DRAWN BY:

CHECKED BY.

APRVD BY:

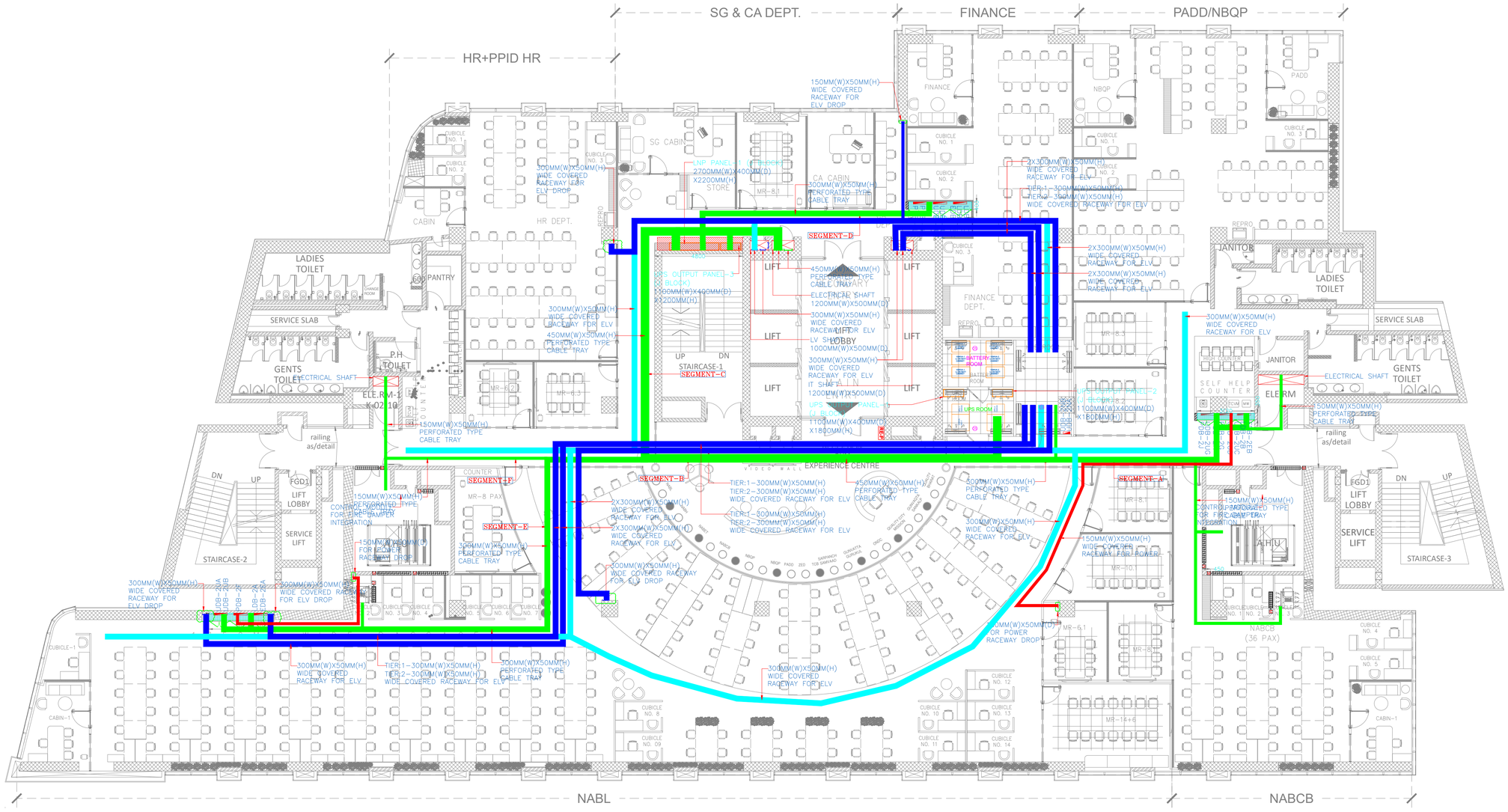
DRAWING TITLE:

SECOND FLOOR PLAN - FLOOR RACEWAY

PE-J-TD-E-200.D

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL PERFORATED CABLE TRAY
	POWER RACEWAY IN CEILING
	ELV RACEWAY IN CEILING
	ELV RACEWAY IN CEILING



1 SECOND FLOOR PLAN
Scale: 125

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

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ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE:1:125

ISSUED DATE26.12.2024

DRAWN BY:

CHECKED BY

APRVD BY:

DRAWING TITLE:

SECOND FLOOR PLAN - CEILING ROUTING

PE-J-TD-E-200.E

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS.

ELECTRICAL LEGEND:		
S.NO	SYMBOL	DESCRIPTION
		6AMP ONE WAY SWITCH (NORMAL)
		6AMP ONE WAY SWITCH(EMERGENCY)
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT– P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
L12		MAGNETIC TRACK LIGHT
	E	INDICATED CIRCUIT ON EMERGENCY SUPPLY.
		ONE WAY NORMAL LOOPING.
		ONE WAY EMERGENCY LOOPING.
		DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP

NOMENCLATURE OF DISTRIBUTION BOARDS

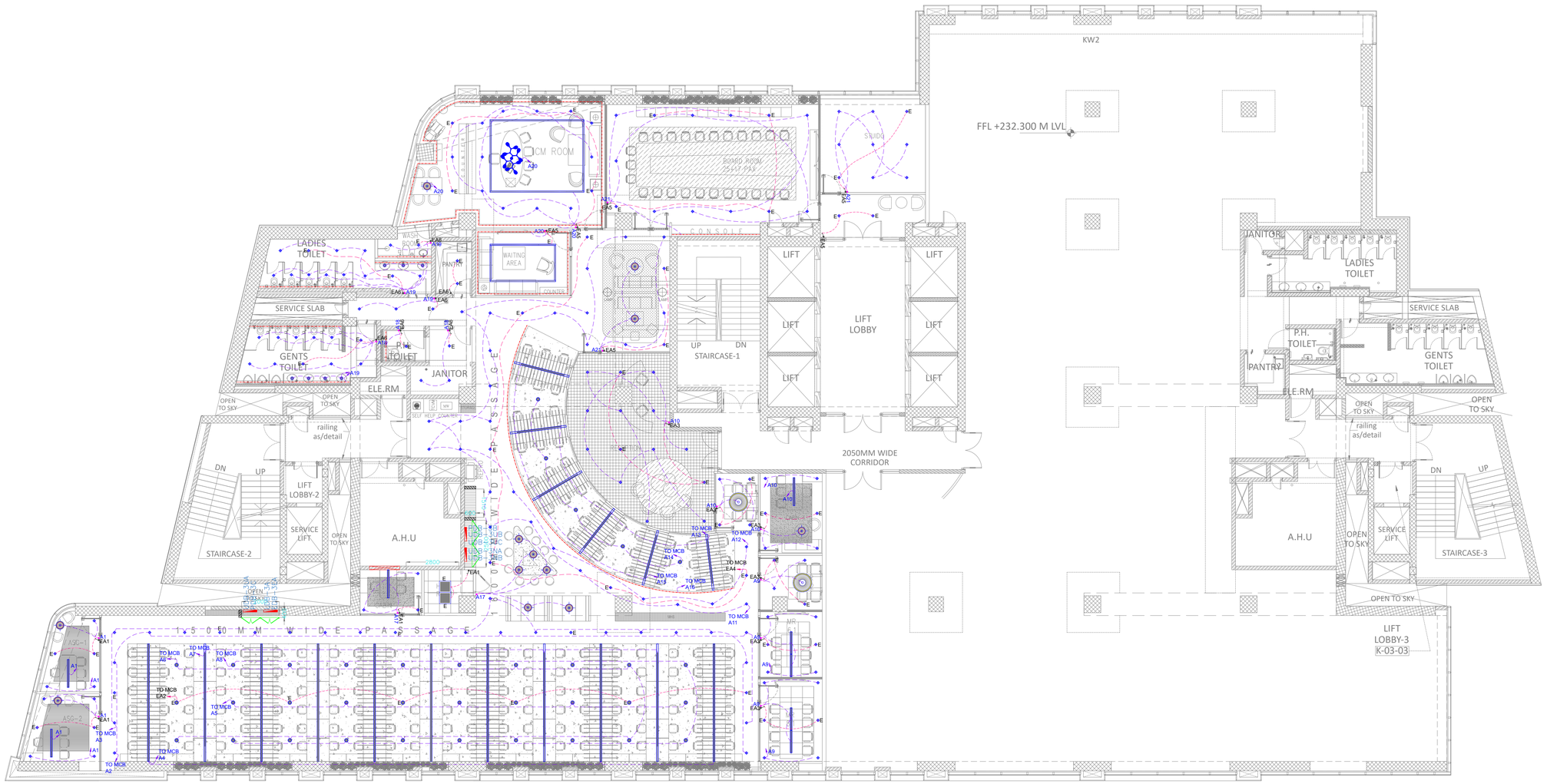
(L)(DB)(3)(D)

- D REPRESENT DB NUMBER
- 3 REPRESENT THIRD FLOOR DB.
- DISTRIBUTION BOARD
- L REPRESENT LIGHT DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

(E)(DB)(3)(EA)

- EA REPRESENT DB NUMBER
- 3 REPRESENT THIRD FLOOR DB.
- DISTRIBUTION BOARD
- E REPRESENT EMERGENCY DB.



1 THIRD FLOOR PLAN
Scale: 125

NOTES:

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PROJECT:

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KEY PLAN:

BASE PLAN REFERENCE:

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FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY

APRVD BY:

DRAWING TITLE:

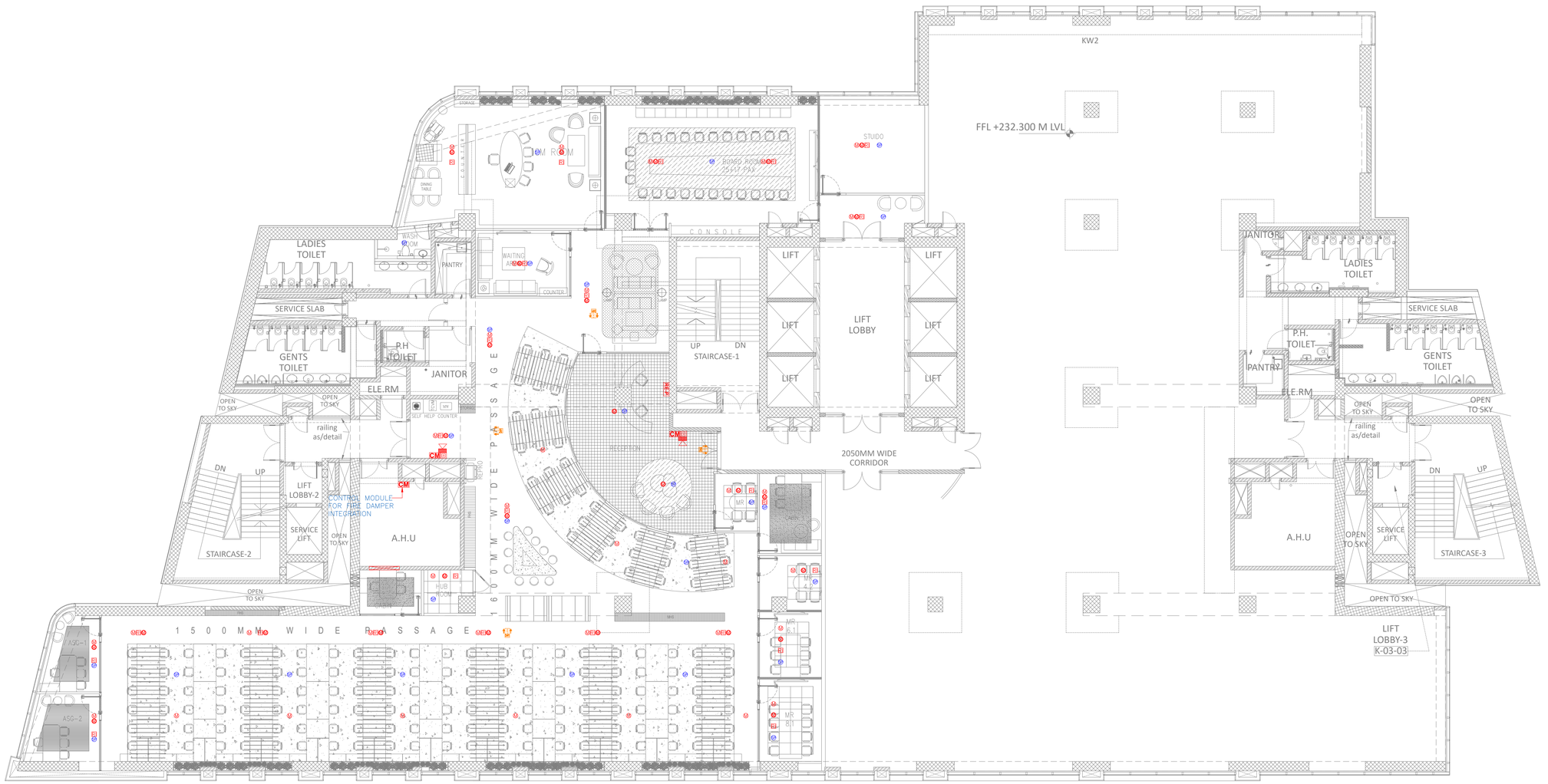
THIRD FLOOR PLAN - LIGHTING

PE-J-TD-E-201.A

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS.

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	MULTI CRITERIA DETECTOR (TRUE CEILING)
	MULTI CRITERIA DETECTOR (FALSE CEILING)
	HEAT DETECTOR
EI	RESPONSE INDICATOR
	SPEAKER
	MANUAL CALL POINT
	HOOTER CUM STROBE
CM	CONTROL MODULE
REP	REPEATER PANEL
	OCCUPANCY SENSOR

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP



1 THIRD FLOOR PLAN
Scale: 1:25

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

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ARCHITECT:

STRUCTURE:

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ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

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APRVD BY:

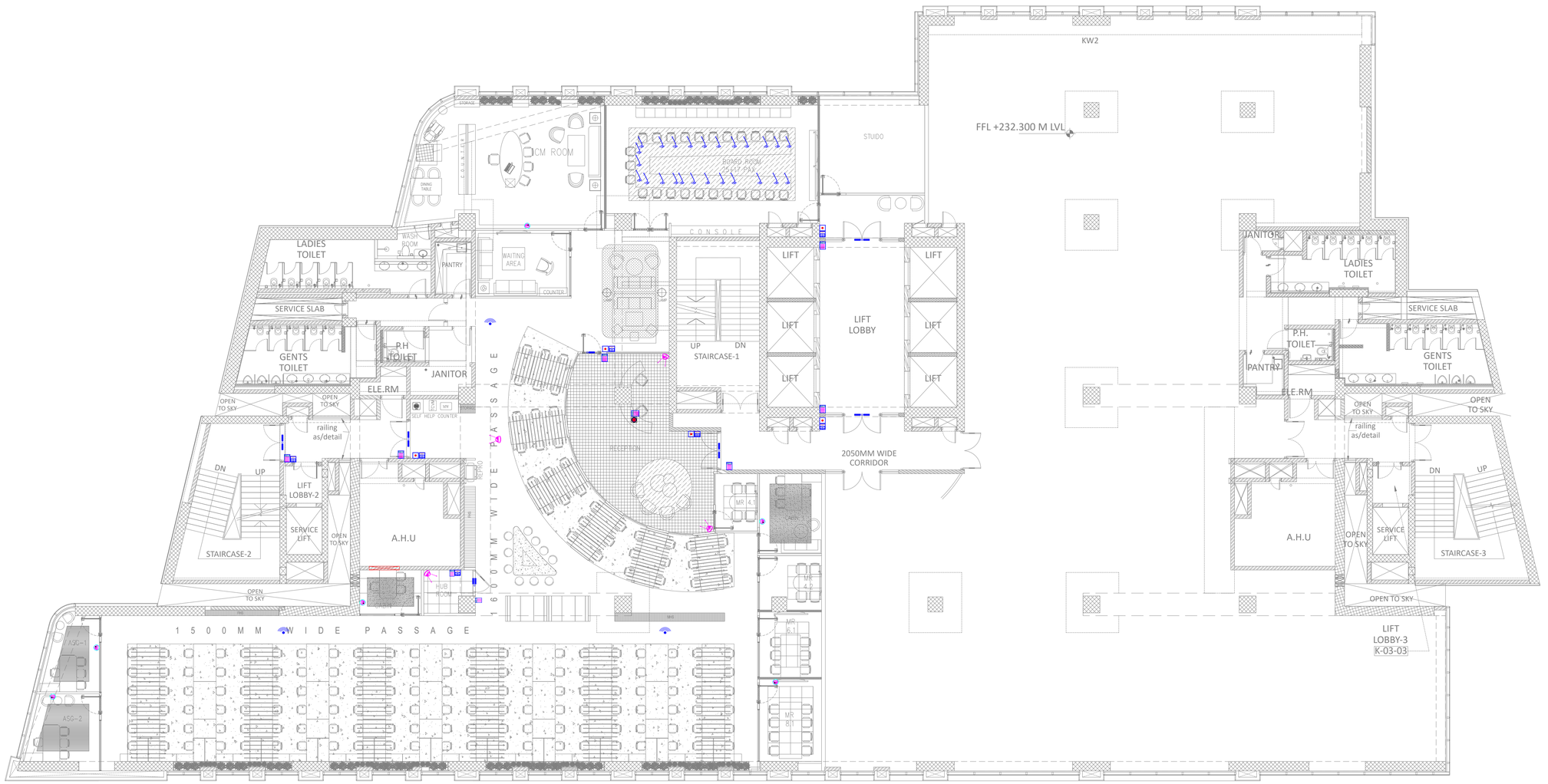
DRAWING TITLE:

THIRD FLOOR PLAN - FIRE ALARM SYSTEM

PE-J-TD-E-201.B

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS.

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	BIOMETRIC CARD
	PROXIMITY READER WITHOUT KEYPAD
	ELECTROMAGNETIC LOCK SINGLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK SINGLE DOOR 1200 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 1200 LBS.
	EMERGENCY BREAK GLASS (EXIT)
	EXIT PUSH BUTTON
	PANIC SWITCH
	IP BASED FIXED DOME CAMERA (INDOOR)
	SOUND BAR WITH VC CAMERA
	WI-FI ROUTER
	MICROPHONE SYSTEM



1 THIRD FLOOR PLAN
Scale: 125

NOTES:

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PROJECT:

QCI

KEY PLAN:

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STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY

APRVD BY:

DRAWING TITLE:

THIRD FLOOR PLAN - SECURITY SYSTEM

PE-J-TD-E-201.C

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS.

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO(RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
P	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
VAV	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
	2 NO. DATA OUTLET IN CEILING
	1 NO. DATA POINT (IN CEILING)
VC	1 NO. DATA OUTLET (VIDEO CONFRENCE)
	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE
HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE
	GEYSER SWITCHING
	DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:		
SYMBOL	DESCRIPTION	LOCATION
A	TYPE–A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE–B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE–C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE–C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE–C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE–A, TYPE– C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE–D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE–E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE–E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE–G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE–H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

NOMENCLATURE OF DISTRIBUTION BOARDS

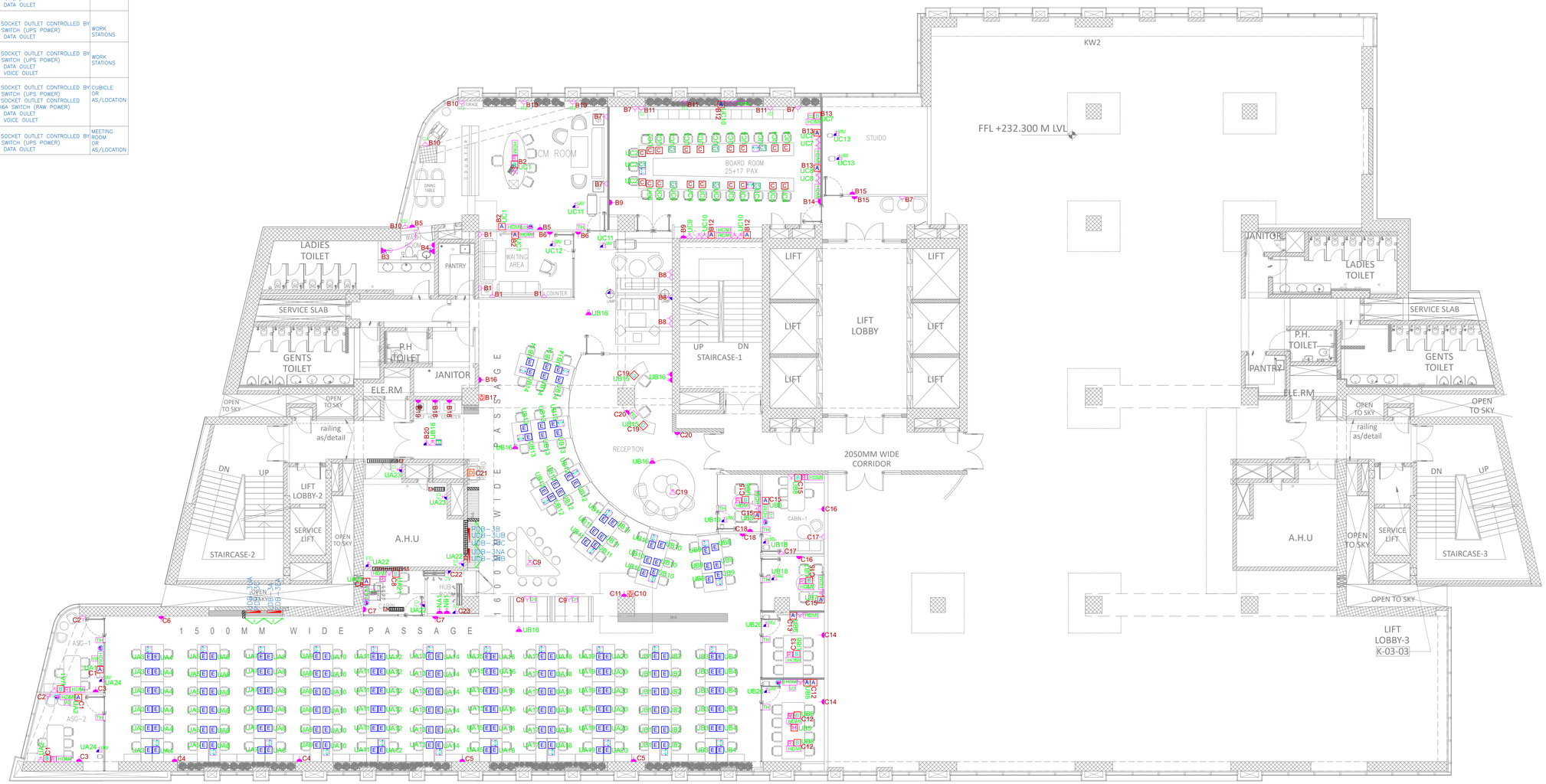
DB1 | DB | 1 | A

- A REPRESENT DB NUMBER
- 3 REPRESENT THIRD FLOOR DB.
- DISTRIBUTION BOARD
- P REPRESENT RAW POWER DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

UPS1 | UPS | 1 | UA

- UA REPRESENT DB NUMBER
- 3 REPRESENT THIRD FLOOR DB.
- DISTRIBUTION BOARD
- U REPRESENT UPS DB.



1 THIRD FLOOR PLAN
Scale: 1:25

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

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REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE:1:125

ISSUED DATE:26.12.2024

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APRVD BY:

DRAWING TITLE:

THIRD FLOOR PLAN - POWER

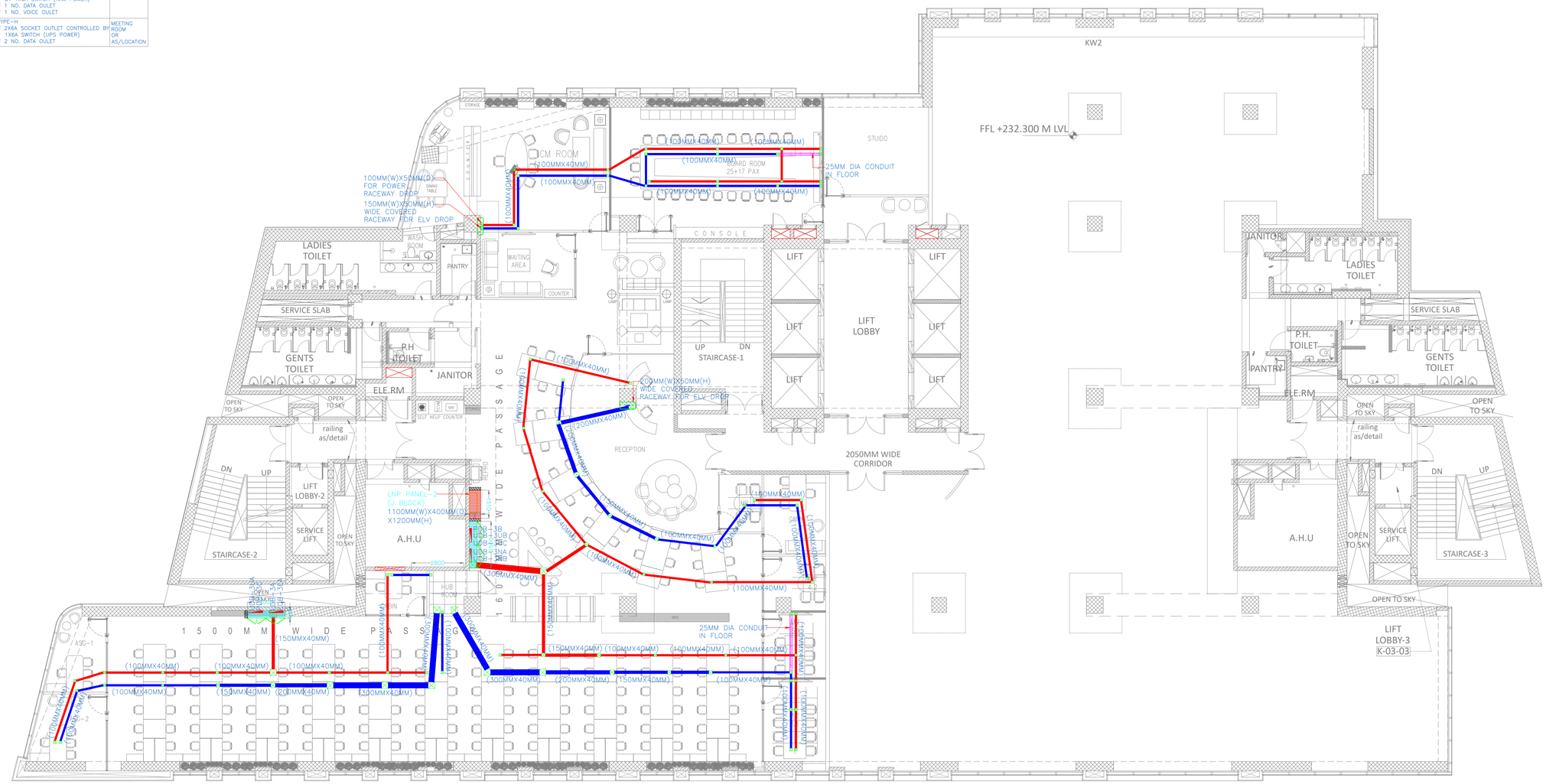
PE-J-TD-E-201.D

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ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO(RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
P	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
UW	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
PJ	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
RD	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
D1	1 NO. DATA POINT (IN CEILING)
VC	1 NO. DATA OUTLET (VIDEO CONFRENCE)
TP	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE
2 HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE
	GEYSER SWITCHING
	DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:		
SYMBOL	DESCRIPTION	LOCATION
A	TYPE–A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE–B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE–C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE–C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE–C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE–A, TYPE– C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE–D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE–E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE–E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE–G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE–H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL EQUIPMENT
	POWER RACEWAY IN FLOOR
	ELV RACEWAY IN FLOOR
	25MM DIA CONDUIT IN FLOOR
	JUNCTION BOX (150MMX150MM)
	JUNCTION BOX (200MMX200MM)
	JUNCTION BOX (250MMX250MM)
	JUNCTION BOX (300MMX300MM)
	JUNCTION BOX (350MMX350MM)



1 THIRD FLOOR PLAN
Scale: 125

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NOTES:

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SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY

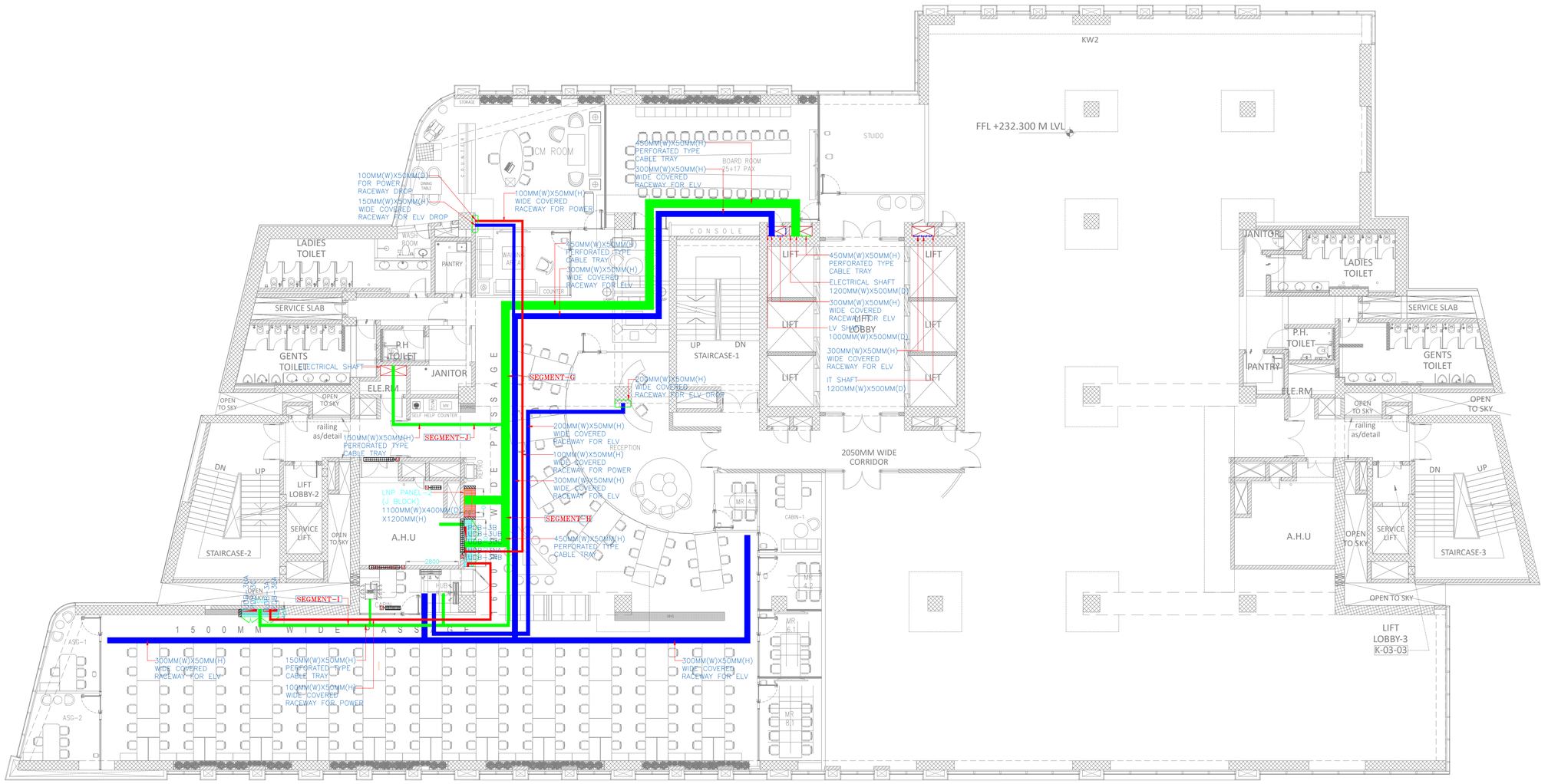
APRVD BY:

DRAWING TITLE:

THIRD FLOOR PLAN - FLOOR RACEWAY

PE-J-TD-E-201.E

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL PERFORATED CABLE TRAY
	POWER RACEWAY IN CEILING
	ELV RACEWAY IN CEILING



1 THIRD FLOOR PLAN
Scale: 1:125

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

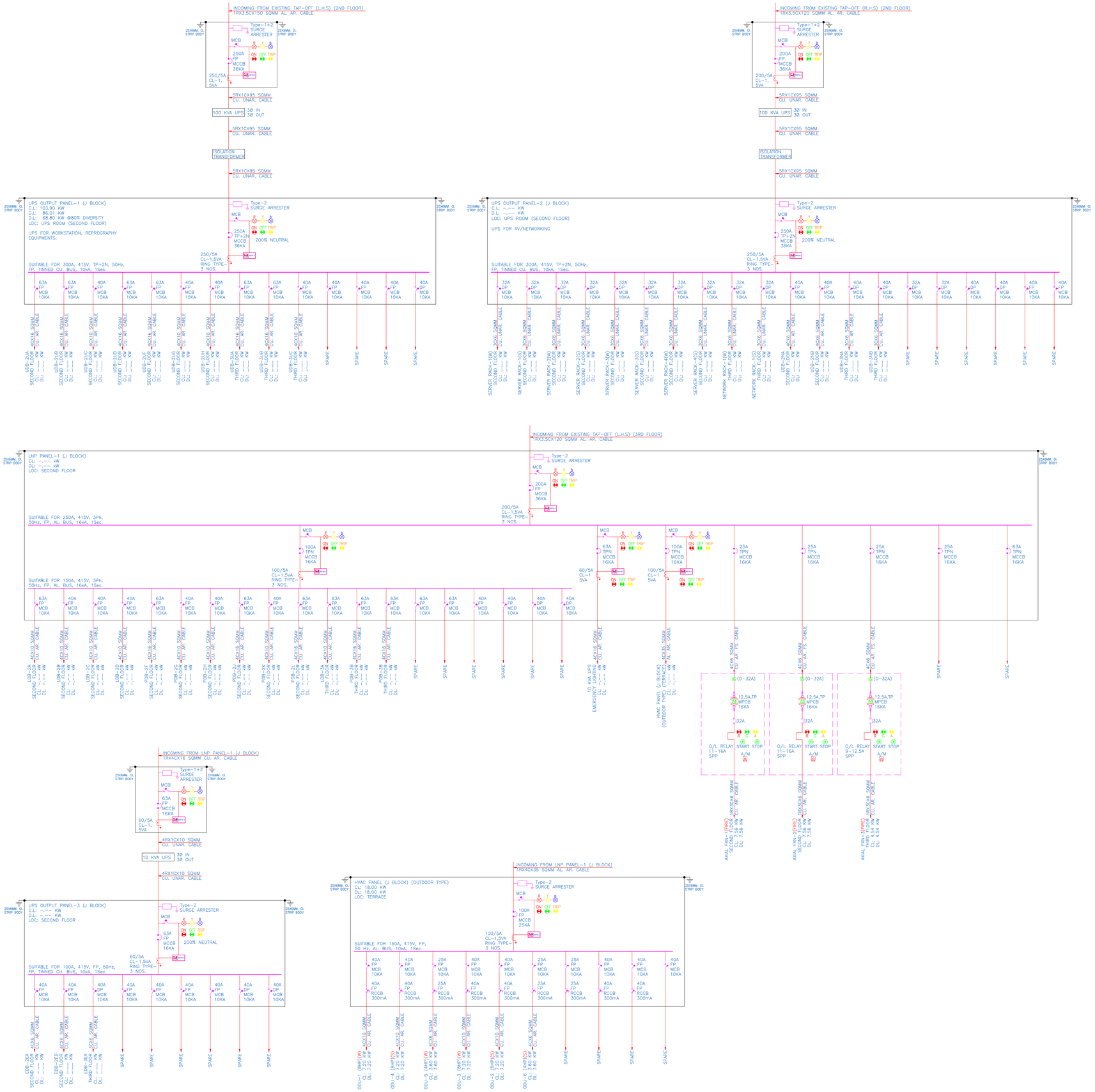
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APRVD BY:

DRAWING TITLE:

THIRD FLOOR PLAN - CEILING ROUTING

PE-J-TD-E-201.F



1 SINGLE LINE DIAGRAM
Scale: N.T.S

NOTE:–

1. LOAD SHALL BE BALANCED EQUALLY ON EACH PHASE.
2. EVERY PHASE SHALL BE PROTECTED THROUGH 30MA ELCB.
3. ONLY FRLS CABLE SHALL BE USED.
4. NO PVC PIPES TO BE USED FOR ELECTRICAL & FDA WIRING, ONLY MS PIPES TO BE USED EVEN IN DETECTION SYSTEM.
5. ALL DRAWINGS SHOULD COMPLY WITH CEA AND CEIG NORMS.
6. RUBBER MAT SHOULD BE PROVIDE AS PER IS.
7. SUITABLE RATING HARMONICS SUPPRESSION FILTERS TO BE PROVIDED WITH IN UPS.
8. HEAT SENSING TUBULAR BASED AUTOMATIC FIRE SUPPRESSION SYSTEM FOR SHALL BE PROVIDED FOR ALL MAIN ELECTRICAL PANELS BEING INSTALLED BY THE CLIENT.

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION
	MOULDED CASE CIRCUIT BREAKER (MCCB)
	MINIATURE CIRCUIT BREAKER (MCB)
	RESIDUAL CURRENT BREAKER WITH OVERLOAD
	CHANGE OVER SWITCH (COS)
	EARTH
	CONTACTOR
	CURRENT TRANSFORMER
	MULTI FUNCTION METER WITH THD, KVARH, KW KWH, KVAR, PF, V, A, Hz
	MULTI FUNCTION METER WITH KWH, PF, V, A, HZ
	SURGE ARRESTER
ON	ON (INDICATION LAMP)
OFF	OFF (INDICATION LAMP)
TRIP	TRIP (INDICATION LAMP)
	R-PHASE
	Y-PHASE
	B-PHASE
	AUTO/MANUAL SELECTOR SWITCH
TIMER	ON DELAY TIMER
	MOTOR PROTECTION CIRCUIT BREAKER (MPCB)
A	AMMETER
V	VOLTMETER
A	DC AMMETER
V	DC VOLTMETER

NOTES :–

1. THE PANELS SHALL BE FORM IIIB TYPE EXTENSIBLE ASSEMBLY, FABRICATED FROM POWDER COATED CRCA SHEET STEEL, WITH ALL LOAD BEARING MEMBERS OF MINIMUM 2MM THICKNESS , ALL NON-LOAD BEARING MEMBERS OF MINIMUM 1.6MM THICKNESS AND MINIMUM 3MM THICK GLAND PLATES.
2. THE INGRESS PROTECTION RATING SHALL BE IP-43 FOR INDOOR PANELS & IP-55 FOR OUTDOOR PANELS.
3. THE MAXIMUM AND MINIMUM OPERATING HEIGHT OF MCCBs SHALL NOT BE MORE THAN 1800MM & LESS THAN 400MM RESPECTIVELY
4. ALL METERS SHALL BE BMS COMPATIBLE WITH INBUILT SELECTOR SWITCH & RS-485 PORT FOR COMMUNICATION.
5. ALL LIVE ACCESSIBLE PARTS SHALL BE SHROUDED WITH 1MM THICK POLYCARBONATE OR 3 MM THICK FRP SHEET AND ALL EQUIPMENT SHALL BE FINGER TOUCH PROOF, THE BUSBAR INSULATION SHALL BE WITH HEAT SHRINKABLE SLEEVES ACCORDING TO THE COLOUR CODE. SMC SHROUDS AND BUSBAR SUPPORTS SHALL BE USED. ALL MCCB DOOR HANDLE SHALL BE INTERLOCKED AND LOCKABLE IN OFF POSITION.
6. EACH PANEL SHALL HAVE A SUITABLE EARTH BUS BUT NOT LESS THAN 25MM X 6MM THROUGHOUT THE LENGTH OF SWITCHBOARDS.
7. ALL MICRPROCESSOR BASED MCCBS SHALL HAVE INBUILT EARTH FAULT PROTECTION AND ALL THERMAL MAGNETIC BASED MCCBS SHALL BE HAVE EARTH FAULT PROTECTION THROUGH EARTH FAULT MODULE HAVING SEPARATE INDICATION OF OVERCURRENT & EARTH FAULT ON PANEL DOOR.
8. AT MAIN PANEL ALL THE OUTGOING MCCBs SHALL BE MICROPROCESSOR BASED UNLESS OTHERWISE SPECIFIED.
9. ALL THE MCCBs WITH RATING 250A AND ABOVE SHALL BE MICROPROCESSOR BASED AND BELOW 250A SHALL BE THERMAL MAGNETIC BASED (EXCEPT AT MAIN LT PANEL WHERE ALL OUTGOINGS SHALL BE MP BASED).
10. BUS BAR SHALL BE HIGH CONDUCTIVITY (99%), ETP – ELECTRICAL GRADE COPPER OR 50–55% ALUMINIUM UNLESS OTHERWISE SPECIFIED.
11. BUS BAR SHALL BE DESIGNED ON 45 DEG. AMBIENT TEMPERATURE AND LIMIT OF TEMPERATURE RISE SHALL BE 35 DEG. OVER AND ABOVE AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.
12. ADEQUATE HEAT DISSIPATION MEASURES SHALL BE CONSIDERED FOR ALL THE BUS BAR CHAMBERS.
13. ALL CONTROL & POWER WIRING FROM ALL COMPONENTS SUCH AS SWITCHGEARS, METERS, RELAYS ETC. SHALL BE BROUGHTOUT UPTO THE TERMINAL BLOCKS INSIDE CABLE ALLEY.
14. SPACE HEATER SHALL BE PROVIDED WITH THERMOSTAT WITH MCB AS BACKUP PROTECTION AND 6/16A UTILITY OUTLET WITH LED LAMP INSIDE ALL CABLE ALLEYS.
15. ALL INDICATION SHALL BE LED TYPE.
16. METAL ENGRAVED CAUTION BOARDS SHALL BE RIVETTED ON COVERS FOR BUS BAR CHAMBER.
17. ALL THE MCCBs SHALL BE PROVIDED WITH R/Y/B/ON/OFF/TRIP INDICATION LAMPS.
18. SEPARATE MCB PROTECTION SHALL BE PROVIDED FOR PHASE INDICATION LAMPS & MULTIFUNCTION METERS FOR RESPECTIVE FEEDER.
19. DUAL EARTHING SHALL BE PROVIDED TO ALL THE ELECTRICAL EQUIPMENTS. BODY EARTHING SHALL BE PROVIDED FROM EXISTING SYSTEM. EARTHING SHALL BE CARRIED OUT AS PER IS:3043 AND CEIG REGULATIONS.
20. DEDICATED EARTHING SHALL BE PROVIDED FOR SENSITIVE ELECTRICAL EQUIPMENTS.

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE:19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

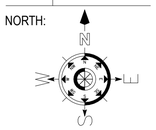
ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:



FORMAT: A1 SIZE

SCALE: N.T.S

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY

APRVD BY:

DRAWING TITLE:

SINGLE LINE DIAGRAM - ELECTRICAL

PE-J-TD-E-300

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:

S.NO	SYMBOL	DESCRIPTION
		6AMP ONE WAY SWITCH (NORMAL)
		6AMP ONE WAY SWITCH(EMERGENCY)
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT– P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
L12		GLOBE LIGHT @ CAFETERIA
	E	INDICATED CIRCUIT ON EMERGENCY SUPPLY.
		ONE WAY NORMAL LOOPING.
		ONE WAY EMERGENCY LOOPING.
		DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP

NOMENCLATURE OF DISTRIBUTION BOARDS

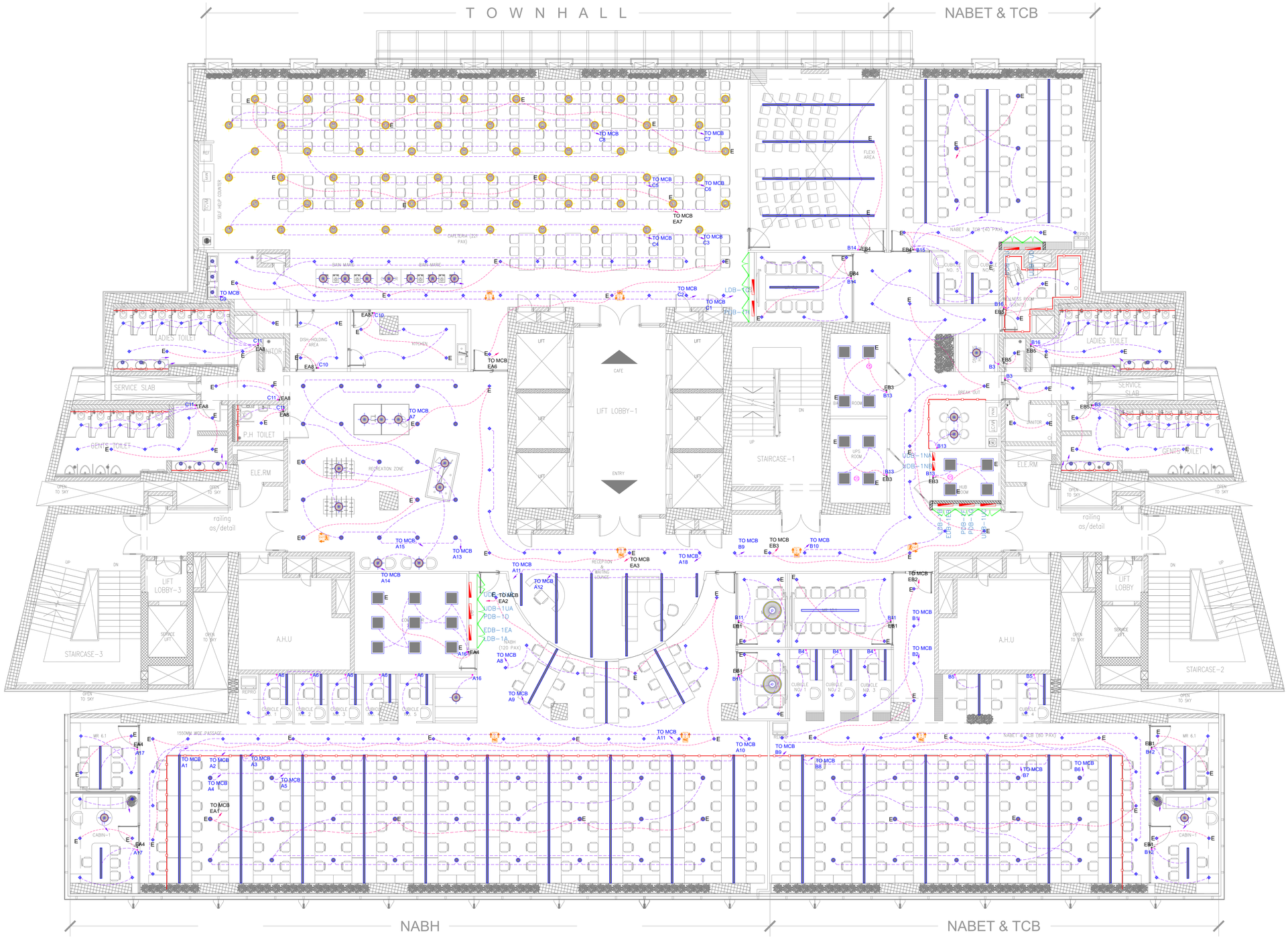
[A] [DB] [1] [L]

- A REPRESENT DB NUMBER
- 1 REPRESENT FIRST FLOOR DB.
- DISTRIBUTION BOARD
- L REPRESENT LIGHT DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

[E] [DB] [1] [EA]

- EA REPRESENT DB NUMBER
- 1 REPRESENT FIRST FLOOR DB
- DISTRIBUTION BOARD
- E REPRESENT EMERGENCY DB.



1 FIRST FLOOR PLAN
Scale: 1:100

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY: S.SINGH

CHECKED BY:

APRVD BY:

DRAWING TITLE:

FIRST FLOOR PLAN - LIGHTING

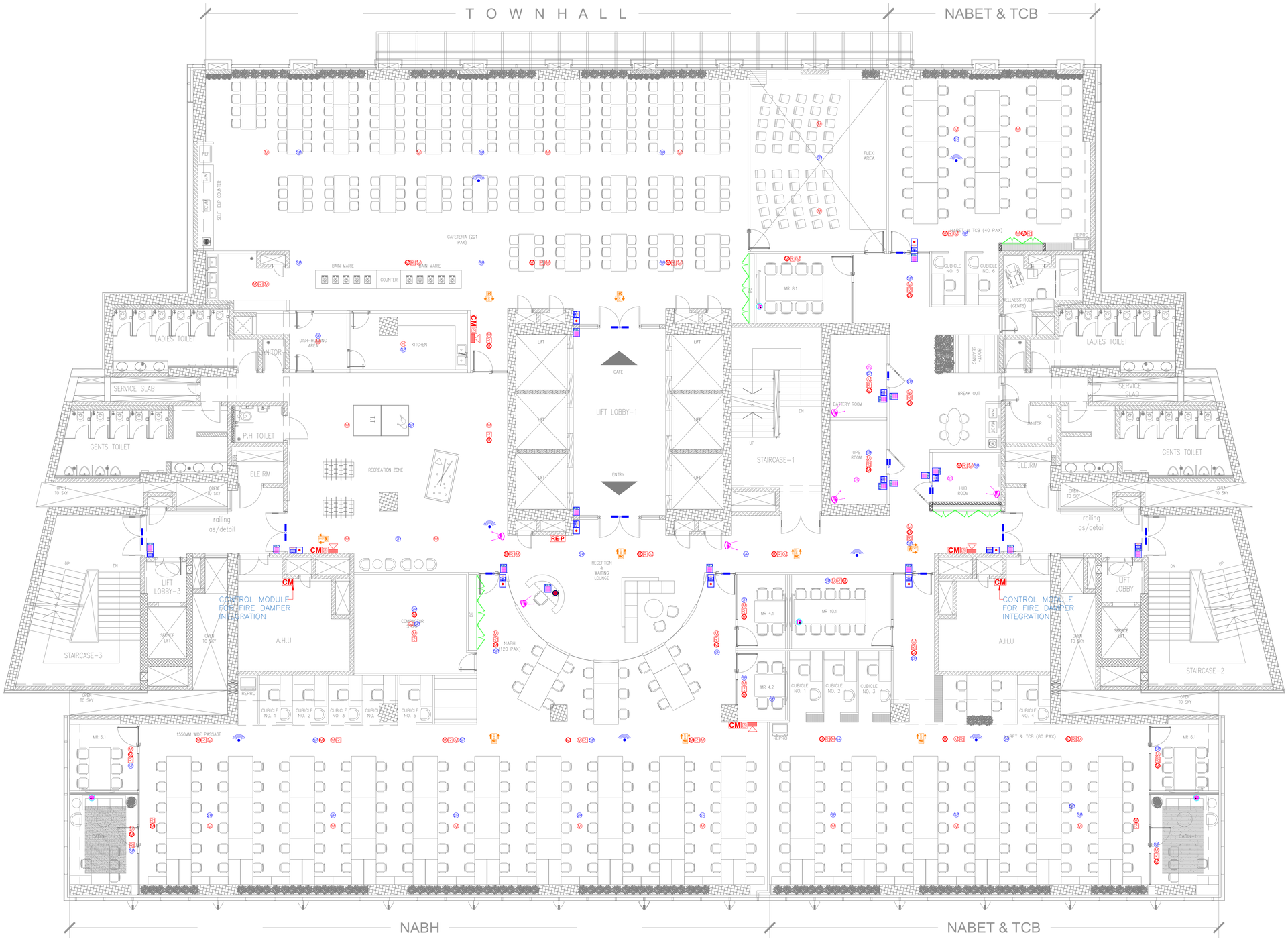
PE-K-TD-E-200.A

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	MULTI CRITERIA DETECTOR (TRUE CEILING)
	MULTI CRITERIA DETECTOR (FALSE CEILING)
	HEAT DETECTOR
	RESPONSE INDICATOR
	SPEAKER
	MANUAL CALL POINT
	HOOTER CUM STROBE
CM	CONTROL MODULE
REP	REPEATER PANEL
	OCCUPANCY SENSOR

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	PROXIMITY READER WITHOUT KEYPAD
	ELECTROMAGNETIC LOCK SINGLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK SINGLE DOOR 1200 LBS.
	EMERGENCY BREAK GLASS (EXIT)
	EXIT PUSH BUTTON
	PANIC SWITCH
	IP BASED FIXED DOME CAMERA (INDOOR)
	SOUND BAR WITH VC CAMERA
	WI-FI ROUTER

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP



1 FIRST FLOOR PLAN
Scale: 1:100

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

FIRST FLOOR PLAN - SECURITY SYSTEM

PE-K-TD-E-200.B

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
EX	6A SOCKET OUTLET (EXHAUST FAN)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO(RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
VAV	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
PJ1	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
R	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
D	1 NO. DATA POINT (IN CEILING)
VO	1 NO. DATA OUTLET (VIDEO CONFRENCE)
T	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE.
HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE.
	GEYSER SWITCHING

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION	LOCATION
A	TYPE-A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE-B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE-C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE-C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE-C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE-A, TYPE- C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE-D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE-E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE-E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE-G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE-H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

NOMENCLATURE OF DISTRIBUTION BOARDS

F 1 C 1 F

- F REPRESENT DB NUMBER
- 1 REPRESENT FIRST FLOOR DB
- DISTRIBUTION BOARD
- P REPRESENT RAW POWER DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

U1 UDB1 C 1 U(A)

- UA REPRESENT DB NUMBER
- 1 REPRESENT FIRST FLOOR DB
- DISTRIBUTION BOARD
- U REPRESENT UPS DB.



1 FIRST FLOOR PLAN
Scale: 1:100

NOTES:

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

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MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

FIRST FLOOR PLAN - POWER

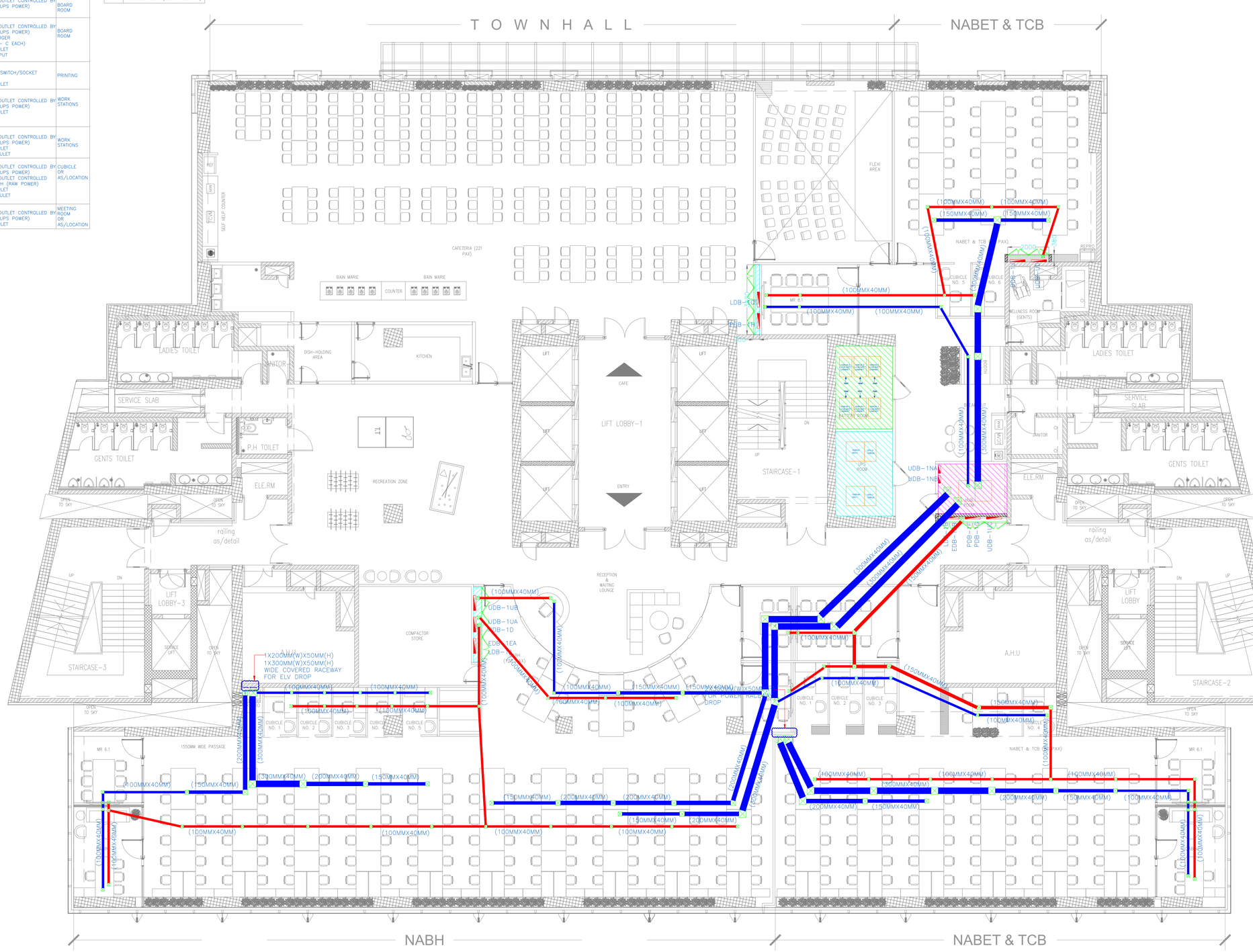
PE-K-TD-E-200.C

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
EX	6A SOCKET OUTLET (EXHAUST FAN)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO(RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
U	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
U	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
U	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
UAV	16A SOCKET OUTLET IN CEILING (AV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
PJ	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
D	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
D	1 NO. DATA POINT (IN CEILING)
V	1 NO. DATA OUTLET (VIDEO CONFRENCE)
T	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE.
HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE.

ELECTRICAL LEGEND:		
SYMBOL	DESCRIPTION	LOCATION
A	TYPE–A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE–B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE–C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE–C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE–C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE–A, TYPE– C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE–D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE–E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE–E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE–G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE–H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL EQUIPMENT
	POWER RACEWAY IN FLOOR
	ELV RACEWAY IN FLOOR
	JUNCTION BOX (150MMX150MM)
	JUNCTION BOX (200MMX200MM)
	JUNCTION BOX (250MMX250MM)
	JUNCTION BOX (300MMX300MM)
	JUNCTION BOX (350MMX350MM)



NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

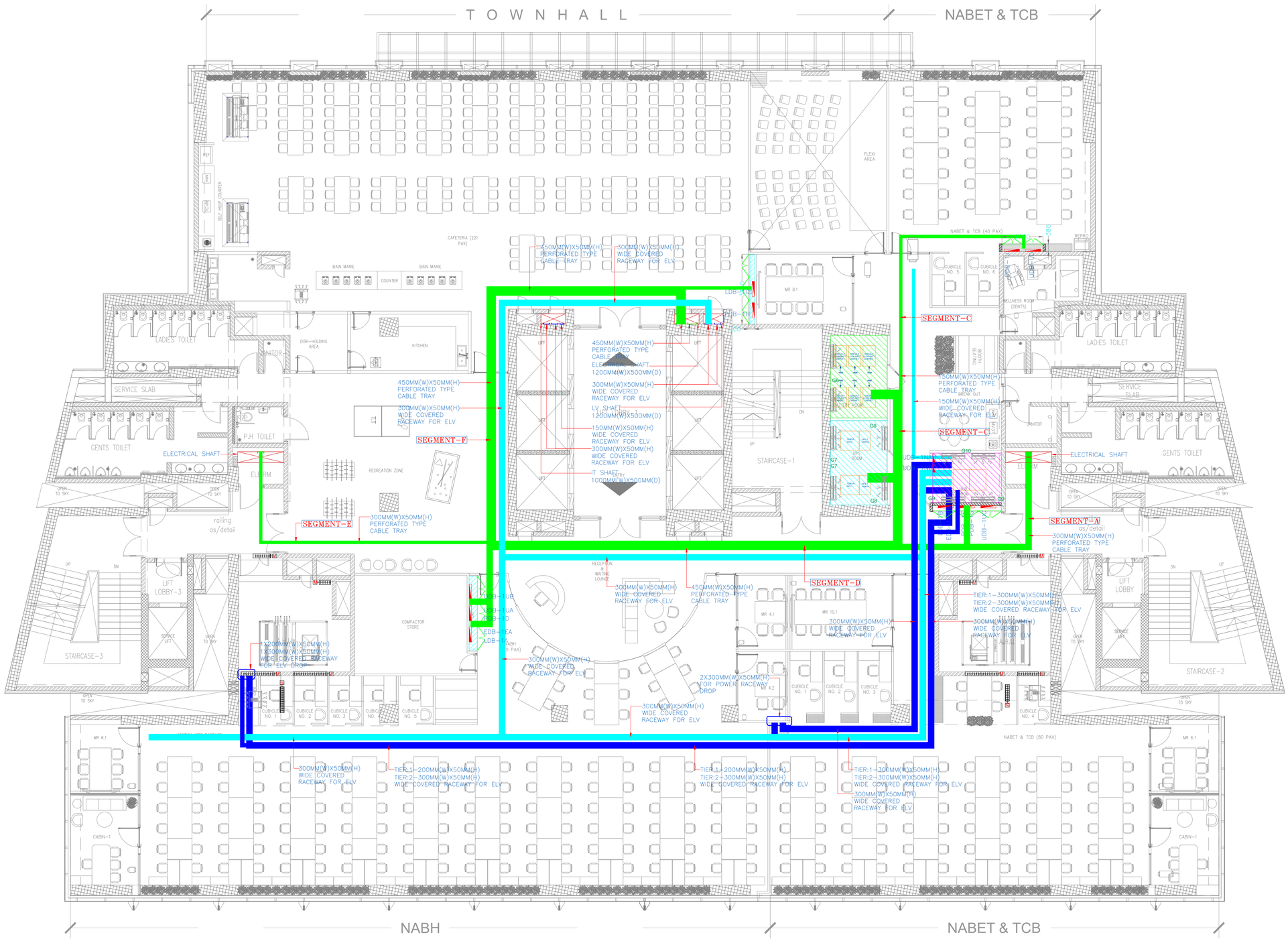
FIRST FLOOR PLAN - FLOOR RACEWAY

PE-K-TD-E-200.D

1 FIRST FLOOR PLAN
Scale: 1:100

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL PERFORATED CABLE TRAY
	POWER RACEWAY IN CEILING
	ELV RACEWAY IN CEILING
	ELV RACEWAY IN CEILING



1 FIRST FLOOR PLAN
Scale: 1:100

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING.
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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

FIRST FLOOR PLAN - CEILING ROUTING

PE-K-TD-E-200.E

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:		
S.NO	SYMBOL	DESCRIPTION
		6AMP ONE WAY SWITCH (NORMAL)
		6AMP ONE WAY SWITCH(EMERGENCY)
L1		12W LED RECESSED LIGHT
L2		SUSPENDED BULK HEAD LIGHT
L3		DECORATIVE LIGHT– P1
L4		SUSPENDED LINEAR FIXTURE @ WORKHALL & MEETING ROOM (SIZES AS/LAYOUT)
L5		5 W LED SPOT LIGHT
L6		LED COVE LIGHT
L7		900 MM DIA RING LIGHT
L8		1500 MM LONG LINEAR LIGHT FIXTURE @ CEO CABINS & CUBICLE
L9		1800 MM LONG LINEAR LIGHT FIXTURE @ SG & CA CABINS
L10		600 X 600 MM GRID LIGHT
L11		FEATURE LIGHT @ BREAKOUT
L12		GLOBE LIGHT @ CAFETERIA
	E	INDICATED CIRCUIT ON EMERGENCY SUPPLY
		ONE WAY NORMAL LOOPING.
		ONE WAY EMERGENCY LOOPING.
		DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP

NOMENCLATURE OF DISTRIBUTION BOARDS

L | DB | 2 | A

- A REPRESENT DB NUMBER
- 2 REPRESENT SECOND FLOOR DB.
- DISTRIBUTION BOARD
- L REPRESENT LIGHT DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

E | DB | 2 | EA

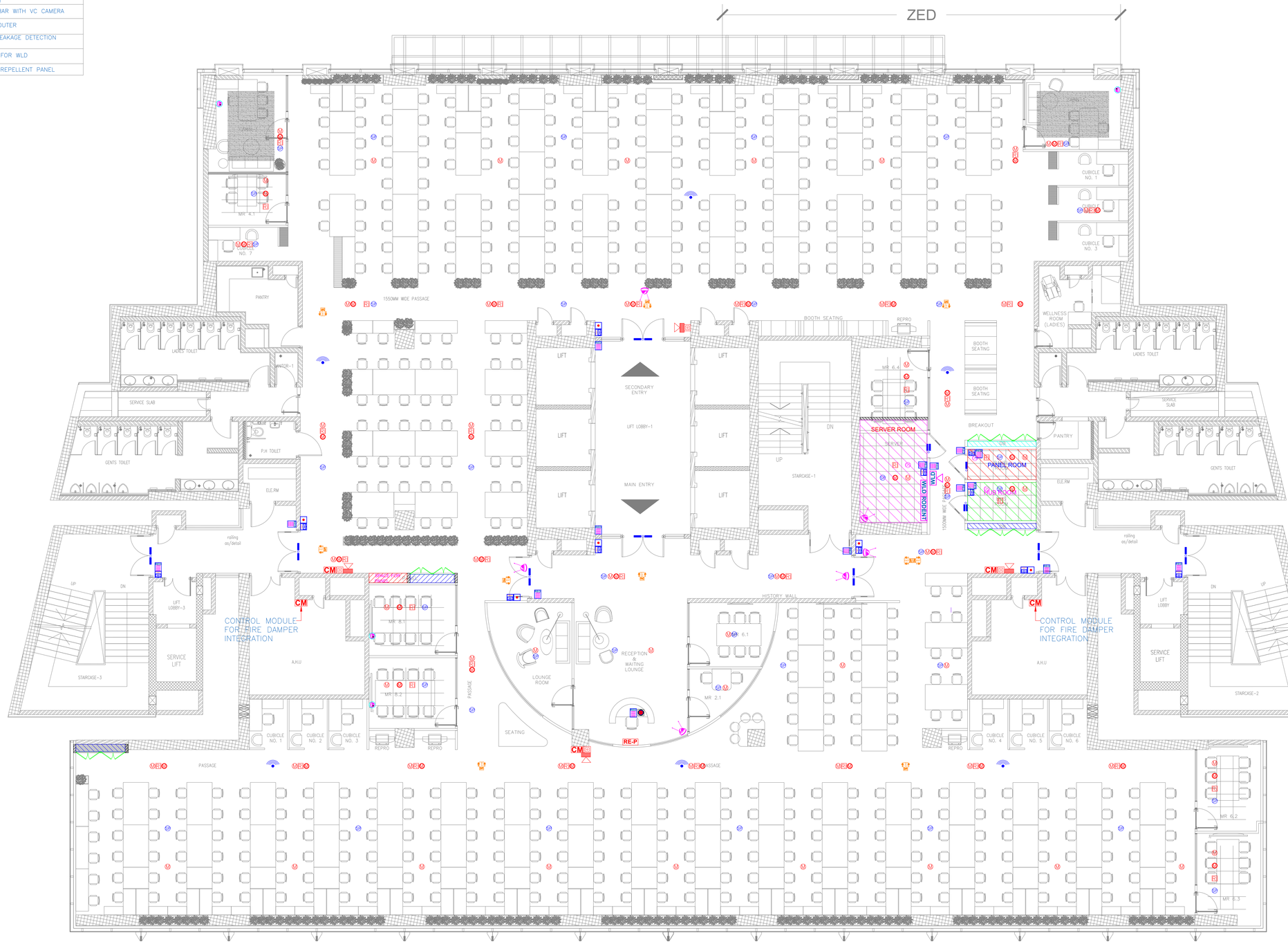
- EA REPRESENT DB NUMBER
- 2 REPRESENT SECOND FLOOR DB.
- DISTRIBUTION BOARD
- E REPRESENT EMERGENCY DB.


ZED
CABIN-1
MR 4.1
CUBICLE NO. 1
PANTRY
LADIES TOILET
GENTS TOILET
P.H TOILET
SERVICE SLAB
ELE.RM
SECONDARY ENTRY
LIFT LOBBY-1
LIFT
MAIN ENTRY
UP
DN
STAIRCASE-1
SERVER
MR 6.4
BREAK OUT
PANTRY
BMS ROOM
1500MM RCC RAMP
LIFT LOBBY
SERVICE LIFT
STAIRCASE-2
LIFT LOBBY-3
STAIRCASE-3
A.H.U
rolling as/detail
BOOTH SEATING
REPRO
HISTORY WALL
RECEPTION & WAITING LOUNGE
LOUNGE
MR 2.1
DRAWING
CUBICLE NO. 2
CUBICLE NO. 3
CUBICLE NO. 4
WELLNESS ROOM (LADIES)
MR 6.2
MR 6.3
TO MCB B8
TO MCB B7
TO MCB B6
TO MCB B5
TO MCB B4
TO MCB B3
TO MCB B2
TO MCB B9
TO MCB B1
TO MCB D8
TO MCB D7
TO MCB D6
TO MCB D5
TO MCB D4
TO MCB D3
TO MCB D2
TO MCB D1
TO MCB EA4
TO MCB A12
TO MCB A11
TO MCB EA3
TO MCB A10
TO MCB A9
TO MCB A8
TO MCB A7
TO MCB C8
TO MCB C7
TO MCB C6
TO MCB C5
TO MCB EC1
TO MCB C3
TO MCB C2
TO MCB C1
TO MCB C4
TO MCB EC2
TO MCB A1
TO MCB EA1
TO MCB A2
TO MCB A3
TO MCB A4
TO MCB A5
TO MCB A6
TO MCB EA2
UDB-2UF
UDB-2UG
PDB-2
EDB-2UF
EDB-2UG
EDB-2UH
EDB-2UI
EDB-2UJ
EDB-2UK
EDB-2UL
EDB-2UM
EDB-2UN
EDB-2UO
EDB-2UP
EDB-2UQ
EDB-2UR
EDB-2US
EDB-2UT
EDB-2UU
EDB-2UV
EDB-2UW
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EDB-2VA
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EDB-2XD
EDB-2XE
EDB-2XF
EDB-2XG
EDB-2XH
EDB-2XI
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EDB-2XX
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EDB-3UL
EDB-3UM
EDB-3UN
EDB-3UO
EDB-3UP
EDB-3UQ
EDB-3UR
EDB-3US
EDB-3UT
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EDB-3UZ
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EDB-3XO
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ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	MULTI CRITERIA DETECTOR (TRUE CEILING)
	MULTI CRITERIA DETECTOR (FALSE CEILING)
	HEAT DETECTOR
	RESPONSE INDICATOR
	SPEAKER
	MANUAL CALL POINT
	HOOTER CUM STROBE
CM	CONTROL MODULE
RE-P	REPEATER PANEL
	OCCUPANCY SENSOR

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	PROXIMITY READER WITHOUT KEYPAD
	ELECTROMAGNETIC LOCK SINGLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 600 LBS.
	ELECTROMAGNETIC LOCK SINGLE DOOR 1200 LBS.
	ELECTROMAGNETIC LOCK DOUBLE DOOR 1200 LBS.
EXIT	EMERGENCY BREAK GLASS (EXIT)
	EXIT PUSH BUTTON
	PANIC SWITCH
	IP BASED FIXED DOME CAMERA (INDOOR)
	SOUND BAR WITH VC CAMERA
	WI-FI ROUTER
WLD	WATER LEAKAGE DETECTION PANEL
WLD	HOOTER FOR WLD
RODENT	RODENT REPELLENT PANEL

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	LED BASED EXIT SIGNAGE BOARDS ALONG WITH MOUNTING BRACKET,MAINTAINED BATTERY BACKUP



1 SECOND FLOOR PLAN
Scale: 1:100

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING.
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

SECOND FLOOR PLAN - SECURITY SYSTEM

PE-K-TD-E-201.B

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO (RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
F	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
P	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
VAV	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
I	USB FOR AV SYSTEM
	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
R	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
	1 NO. DATA POINT (IN CEILING)
VO	1 NO. DATA OUTLET (VIDEO CONFRENCE)
	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE.
2 HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE.
	GEYSER SWITCHING
	DISTRIBUTION BOARD (DB)

NOMENCLATURE OF DISTRIBUTION BOARDS

F | DB | 2 | P

- F REPRESENT DB NUMBER
- 2 REPRESENT SECOND FLOOR DB.
- DISTRIBUTION BOARD
- P REPRESENT RAW POWER DB.

NOMENCLATURE OF DISTRIBUTION BOARDS

U | DB | 2 | UA

- UA REPRESENT DB NUMBER
- 2 REPRESENT SECOND FLOOR DB.
- DISTRIBUTION BOARD
- U REPRESENT UPS DB.

ELECTRICAL LEGEND:		
SYMBOL	DESCRIPTION	LOCATION
A	TYPE–A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE–B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE–C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE–C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE–C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE–A, TYPE– C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE–D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE–E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE–E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE–G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE–H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION



1 SECOND FLOOR PLAN
Scale: 1:100

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING.
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

SECOND FLOOR PLAN - POWER

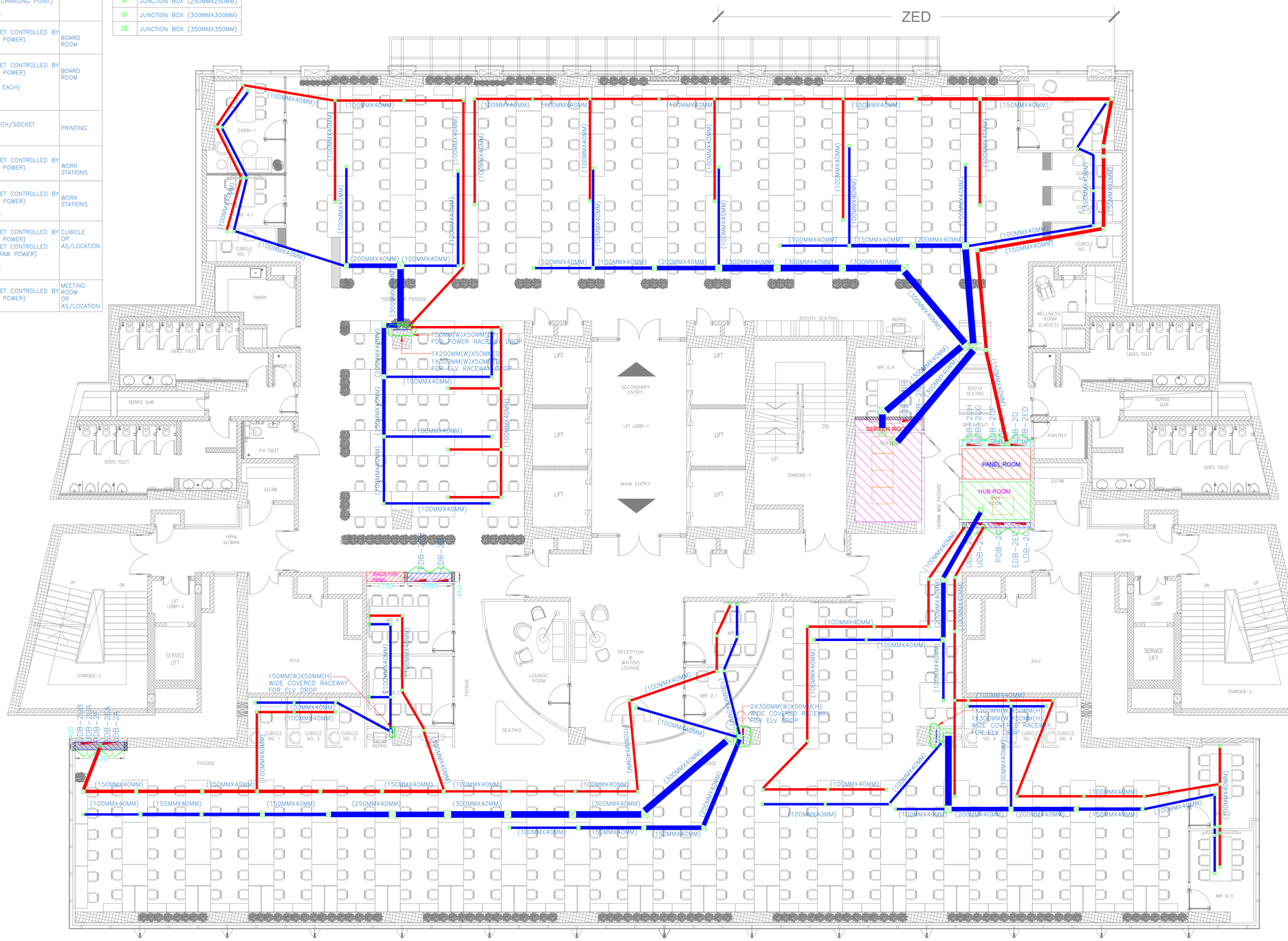
PE-K-TD-E-201.C

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

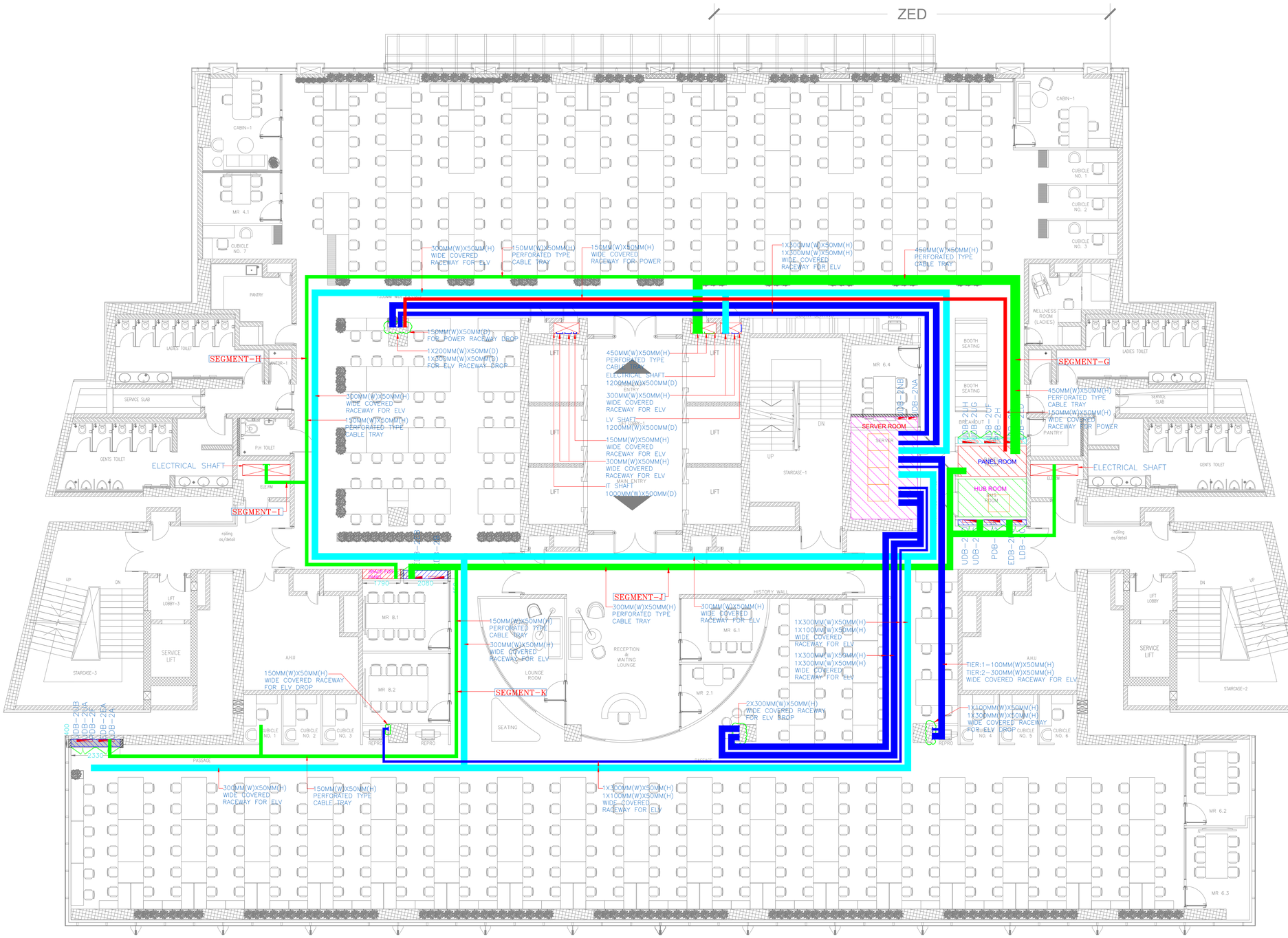
ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	16A SOCKET FOR INLINE FAN AND GEYSER
	6A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6A SOCKET OUTLET WITH SWITCH FOR LAMP (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH (RAW POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (RAW POWER)
RO	6/16A SOCKET OUTLET WITH SWITCH FOR RO (RAW POWER)
FR	6/16A SOCKET OUTLET WITH SWITCH FOR FRIDGE (RAW POWER)
AC	6/16A SOCKET OUTLET WITH SWITCH WALL MOUNTED FOR INDOOR UNIT (AC)
	16A SOCKET FOR GEYSER
	25A 1ø INDUSTRIAL SOCKET (RAW POWER)
	25A 3ø INDUSTRIAL SOCKET (RAW POWER)
	32A 1ø INDUSTRIAL SOCKET (RAW POWER)
F	6A SOCKET OUTLET WITH SWITCH IN FLOOR (UPS POWER)
	6A SWITCH SOCKET OUTLET (UPS POWER) (1 NO. 6A SWITCH AND 1 NO. 6A SOCKET)
	6A SOCKET OUTLET WITH SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SINGLE SWITCH (UPS POWER)
	2X6A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
P	6/16A SOCKET OUTLET WITH SWITCH (PROJECTOR)(UPS POWER)
	6A SOCKET OUTLET WITHOUT SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH (UPS POWER)
	6/16A SOCKET OUTLET WITH SWITCH IN CEILING (UPS POWER)
FD	16A SOCKET OUTLET (FIRE DAMPER) (UPS POWER)
NR	6/16A SOCKET OUTLET WITH SWITCH (NETWORK RACK) (UPS POWER)
VAV	16A SOCKET OUTLET IN CEILING (VAV BOXES) (UPS)
	32A INDUSTRIAL SOCKET WITH 32A DP MCB (UPS)
	USB FOR AV SYSTEM
	PROJECTOR (CEILING MOUNTED)
TH	THERMOSTAT FOR A.C
R	1 NO. REDUNDANCY DATA POINT
D1	1 NO. DATA OUTLET
D2	2 NO. DATA OUTLET
D2	2 NO. DATA OUTLET IN CEILING
	1 NO. DATA POINT (IN CEILING)
VO	1 NO. DATA OUTLET (VIDEO CONFRENCE)
TP	1 NO. TELEPHONE POINT
DTH	DTH OUTLET
HDMI	HIGH DEFINITION MULTIMEDIA INTERFACE.
2 HDMI	2 NO. HIGH DEFINITION MULTIMEDIA INTERFACE.
	GEYSER SWITCHING
	DISTRIBUTION BOARD (DB)

ELECTRICAL LEGEND:		
SYMBOL	DESCRIPTION	LOCATION
A	TYPE-A # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT # 1 NO. DATA OULET	CABIN'S OR MEETING ROOM
B	TYPE-B # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # USB PORT/TYPE-C(CHARGING POINT) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CABIN'S OR MEETING ROOM
C	TYPE-C # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER)	BOARD ROOM
C1	TYPE-C1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # USB FAST CHARGER (TYPE-A, TYPE- C EACH) # 1 NO. DATA OULET # 1 NO. HDMI INPUT	BOARD ROOM
D	TYPE-D # 2 Nos. 6/16A SWITCH/SOCKET (RAW POWER) # 2 NO. DATA OULET	PRINTING
E	TYPE-E # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET	WORK STATIONS
E1	TYPE-E1 # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	WORK STATIONS
G	TYPE-G # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 1X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (RAW POWER) # 1 NO. DATA OULET # 1 NO. VOICE OULET	CUBICLE OR AS/LOCATION
H	TYPE-H # 2X6A SOCKET OUTLET CONTROLLED BY 1X6A SWITCH (UPS POWER) # 2 NO. DATA OULET	MEETING ROOM OR AS/LOCATION

ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL EQUIPMENT
	POWER RACEWAY IN FLOOR
	ELV RACEWAY IN FLOOR
	JUNCTION BOX (150MMX150MM)
	JUNCTION BOX (200MMX200MM)
	JUNCTION BOX (250MMX250MM)
	JUNCTION BOX (300MMX300MM)
	JUNCTION BOX (350MMX350MM)


ZED
CABIN-1
CABIN-2
CUBICLE NO. 7
PANTRY
LADIES TOILET
GENTS TOILET
P.H TOILET
SERVICE SLAB
ELERM
LIFT LOBBY-3
STAIRCASE-3
SERVICE LIFT
SECONDARY ENTRY
LIFT LOBBY-1
MAIN ENTRY
LIFT
STAIRCASE-1
BOOTH SEATING
REPRO
MR 6.4
SERVER ROOM
PANEL ROOM
HUB ROOM
BREAKOUT-1
BREAKOUT-2
WELLNESS ROOM (LADIES)
LIFT LOBBY
STAIRCASE-2
A.H.U
MR 6.1
MR 6.2
MR 6.3
MR 2.1
LOUNGE ROOM
RECEPTION & WAITING LOUNGE
SEATING
HISTORY WALL
PASSAGE
CUBICLE NO. 1
CUBICLE NO. 2
CUBICLE NO. 3
CUBICLE NO. 4
CUBICLE NO. 5
CUBICLE NO. 6
150MM WIDE PASSAGE
(100MMX40MM)
(150MMX40MM)
(200MMX40MM)
(250MMX40MM)
(300MMX40MM)
150MM(W)X50MM(H) WIDE COVERED RACEWAY FOR ELV DROP
1X200MM(W)X50MM(H) 1X150MM(W)X50MM(H) WIDE COVERED RACEWAY FOR ELV DROP
2X300MM(W)X50MM(H) WIDE COVERED RACEWAY FOR ELV DROP
1X300MM(W)X50MM(H) 1X150MM(W)X50MM(H) WIDE COVERED RACEWAY FOR ELV DROP
EDB-2A
EDB-2B
EDB-2C
EDB-2D
EDB-2E
LDB-2A
LDB-2B
PDB-2A
PDB-2B
PDB-2C
PDB-2D
PDB-2E
UDB-2A
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UDB-2V
UDB-2W
UDB-2X
UDB-2Y
UDB-2Z
UDB-2ZA
UDB-2ZB
UDB-2ZC
UDB-2ZD
UDB-2ZE
UDB-2ZF
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ELECTRICAL LEGEND:	
SYMBOL	DESCRIPTION
	DISTRIBUTION BOARD (DB)
	ELECTRICAL PERFORATED CABLE TRAY
	POWER RACEWAY IN CEILING
	ELV RACEWAY IN CEILING



1 SECOND FLOOR PLAN
Scale: 1:100

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
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5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

SECOND FLOOR PLAN - CEILING ROUTING

PE-K-TD-E-201.E

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

1 SINGLE LINE DIAGRAM
Scale: N.T.S

NOTE:-
1. LOAD SHALL BE BALANCED EQUALLY ON EACH PHASE.
2. EVERY PHASE SHALL BE PROTECTED THROUGH 30MA ELCB.
3. ONLY FRLS CABLE SHALL BE USED.
4. NO PVC PIPES TO BE USED FOR ELECTRICAL & FDA WIRING, ONLY MS PIPES TO BE USED EVEN IN DETECTION SYSTEM.
5. ALL DRAWINGS SHOULD COMPLY WITH CEA AND CEIG NORMS.
6. RUBBER MAT SHOULD BE PROVIDE AS PER IS.
7. SUITABLE RATING HARMONICS SUPPRESSION FILTERS TO BE PROVIDED WITH IN UPS.
8. HEAT SENSING TUBULAR BASED AUTOMATIC FIRE SUPPRESSION SYSTEM FOR SHALL BE PROVIDED FOR ALL MAIN ELECTRICAL PANELS BEING INSTALLED BY THE CLIENT.

NOTES :-
1. THE PANELS SHALL BE FORM IIIB TYPE EXTENSIBLE ASSEMBLY, FABRICATED FROM POWDER COATED CRCA SHEET STEEL, WITH ALL LOAD BEARING MEMBERS OF MINIMUM 2MM THICKNESS , ALL NON-LOAD BEARING MEMBERS OF MINIMUM 1.6MM THICKNESS AND MINIMUM 3MM THICK GLAND PLATES.
2. THE INGRESS PROTECTION RATING SHALL BE IP-43 FOR INDOOR PANELS & IP-55 FOR OUTDOOR PANELS.
3. THE MAXIMUM AND MINIMUM OPERATING HEIGHT OF MCCBs SHALL NOT BE MORE THAN 1800MM & LESS THAN 400MM RESPECTIVELY
4. ALL METERS SHALL BE 8MS COMPATIBLE WITH INBUILT SELECTOR SWITCH & RS-485 PORT FOR COMMUNICATION.
5. ALL LIVE ACCESSIBLE PARTS SHALL BE SHROUDED WITH 1MM THICK POLYCARBONATE OR 3 MM THICK FRP SHEET AND ALL EQUIPMENT SHALL BE FINGER TOUCH PROOF. THE BUSBAR INSULATION SHALL BE WITH HEAT SHRINKABLE SLEEVES ACCORDING TO THE COLOUR CODE. SMC SHROUDS AND BUSBAR SUPPORTS SHALL BE USED. ALL MCCB DOOR HANDLE SHALL BE INTERLOCKED AND LOCKABLE IN OFF POSITION.
6. EACH PANEL SHALL HAVE A SUITABLE EARTH BUS BUT NOT LESS THAN 25MM X 6MM THROUGHOUT THE LENGTH OF SWITCHBOARDS.
7. ALL MICRPROCESSOR BASED MCCBS SHALL HAVE INBUILT EARTH FAULT PROTECTION AND ALL THERMAL MAGNETIC BASED MCCBS SHALL BE HAVE EARTH FAULT PROTECTION THROUGH EARTH FAULT MODULE HAVING SEPARATE INDICATION OF OVERCURRENT & EARTH FAULT ON PANEL DOOR.
8. AT MAIN PANEL ALL THE OUTGOING MCCBs SHALL BE MICROPROCESSOR BASED UNLESS OTHERWISE SPECIFIED.
9. ALL THE MCCBs WITH RATING 250A AND ABOVE SHALL BE MICROPROCESSOR BASED AND BELOW 250A SHALL BE THERMAL MAGNETIC BASED (EXCEPT AT MAIN LT PANEL WHERE ALL OUTGOINGS SHALL BE MP BASED).
10. BUS BAR SHALL BE HIGH CONDUCTIVITY (99%), ETP – ELECTRICAL GRADE COPPER OR 50–55% ALUMINIUM UNLESS OTHERWISE SPECIFIED.
11. BUS BAR SHALL BE DESIGNED ON 45 DEG. AMBIENT TEMPERATURE AND LIMIT OF TEMPERATURE RISE SHALL BE 35 DEG. OVER AND ABOVE AMBIENT TEMPERATURE UNLESS OTHERWISE SPECIFIED.
12. ADEQUATE HEAT DISSIPATION MEASURES SHALL BE CONSIDERED FOR ALL THE BUS BAR CHAMBERS.
13. ALL CONTROL & POWER WIRING FROM ALL COMPONENTS SUCH AS SWITCHGEARS, METERS, RELAYS ETC. SHALL BE BROUGHTOUT UPTO THE TERMINAL BLOCKS INSIDE CABLE ALLEY.
14. SPACE HEATER SHALL BE PROVIDED WITH THERMOSTAT WITH MCB AS BACKUP PROTECTION AND 6/16A UTILITY OUTLET WITH LED LAMP INSIDE ALL CABLE ALLEYS.
15. ALL INDICATION SHALL BE LED TYPE.
16. METAL ENGRAVED CAUTION BOARDS SHALL BE RIVETTED ON COVERS FOR BUS BAR CHAMBER.
17. ALL THE MCCBs SHALL BE PROVIDED WITH R/Y/B/ON/OFF/TRIP INDICATION LAMPS.
18. SEPARATE MCB PROTECTION SHALL BE PROVIDED FOR PHASE INDICATION LAMPS & MULTIFUNCTION METERS FOR RESPECTIVE FEEDER.
19. DUAL EARTHING SHALL BE PROVIDED TO ALL THE ELECTRICAL EQUIPMENTS. BODY EARTHING SHALL BE PROVIDED FROM EXISTING SYSTEM. EARTHING SHALL BE CARRIED OUT AS PER IS:3043 AND CEIG REGULATIONS.
20. DEDICATED EARTHING SHALL BE PROVIDED FOR SENSITIVE ELECTRICAL EQUIPMENTS.

ELECTRICAL LEGEND:

SYMBOL	DESCRIPTION
	MOULDED CASE CIRCUIT BREAKER (MCCB)
	MINIATURE CIRCUIT BREAKER (MCB)
	RESIDUAL CURRENT BREAKER WITH OVERLOAD
	CHANGE OVER SWITCH (COS)
	EARTH
	CONTACTOR
	CURRENT TRANSFORMER
	MULTI FUNCTION METER WITH THD, KVARH, KW KWH, KVAR, PF, V, A, Hz
	MULTI FUNCTION METER WITH KWH, PF, V, A, HZ
	SURGE ARRESTER
	ON (INDICATION LAMP)
	OFF (INDICATION LAMP)
	TRIP (INDICATION LAMP)
	R-PHASE
	Y-PHASE
	B-PHASE
	AUTO/MANUAL SELECTOR SWITCH
	ON DELAY TIMER
	MOTOR PROTECTION CIRCUIT BREAKER (MPCB)
	AMMETER
	VOLTMETER
	DC AMMETER
	DC VOLTMETER

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PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE:19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: N.T.S

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:
SINGLE LINE DIAGRAM - ELECTRICAL

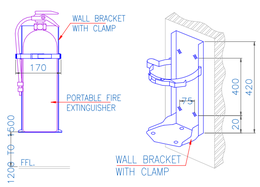
PE-K-TD-E-300

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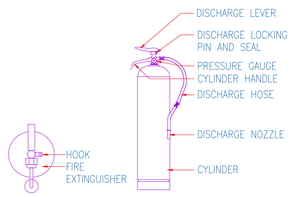
FIRE PROTECTION LEGEND	
	PENDENT SPRINKLER(68 DEG. C)
	SPRINKLER BRANCH PIPE
	SPRINKLER MAIN PIPE
	4.5 kg CO2 TYPE EXTINGUISHER
	6 kg ABC DRY POWDER TYPE EXT.
	5 KG CEILING MOUNTED MODULAR TYPE

NO. OF SPRINKLER	DIA METER IN MM
1–2	25
3	32
4–6	40
7–10	50
11–18	65
19–30	80
31–60	100
61>	150

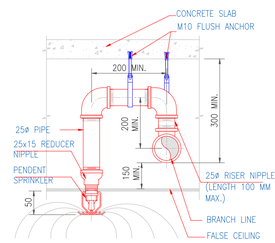
TYPE OF FIRE EXTINGUISHERS	EXTINGUISHERS CAPACITIES
POWDER	6 KG
CARBON DIOXIDE (CO2)	4.5KG



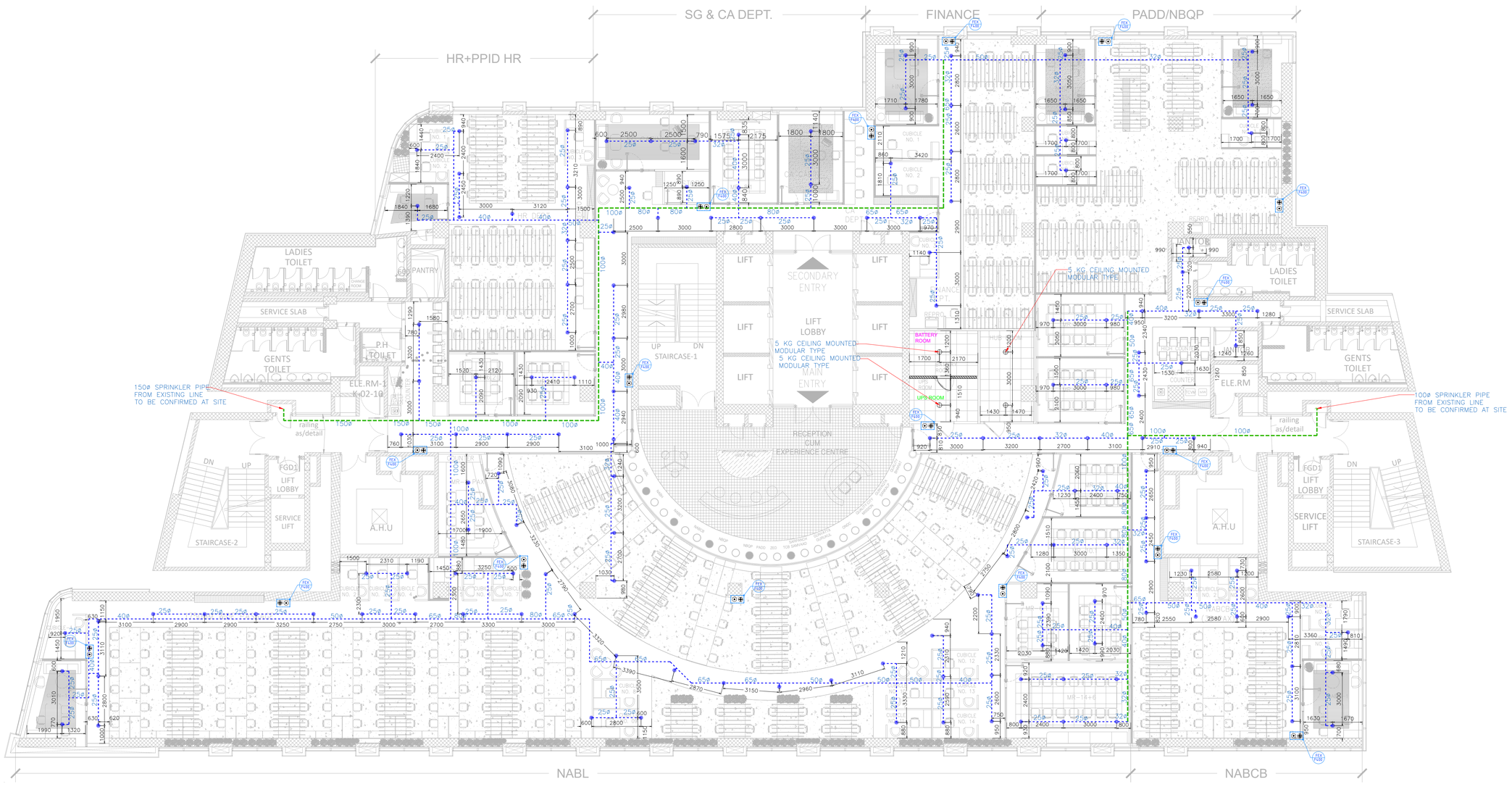
1 WALL SUPPORT DETAIL
Scale: NTS



2 FIRE EXTINGUISHER HANGING DETAIL
SCALE: NTS



3 PENDENT SPRINKLER INSTALLATION DETAIL
Scale: NTS



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KEY PLAN:

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ARCHITECTURE:19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description
R0	TD

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

J BLOCK
SECOND FLOOR
PLAN - FIRE PROTECTION

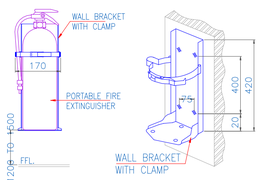
PE-J-TD-F-200

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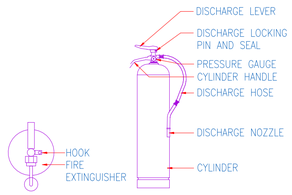
FIRE PROTECTION LEGEND	
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	5 KG CEILING MOUNTED MODULAR TYPE

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31–60	100
61>	150

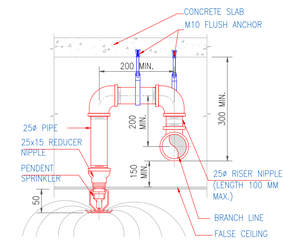
TYPE OF FIRE EXTINGUISHERS	EXTINGUISHERS CAPACITIES
POWDER	6 KG
CARBON DIOXIDE (CO2)	4.5KG



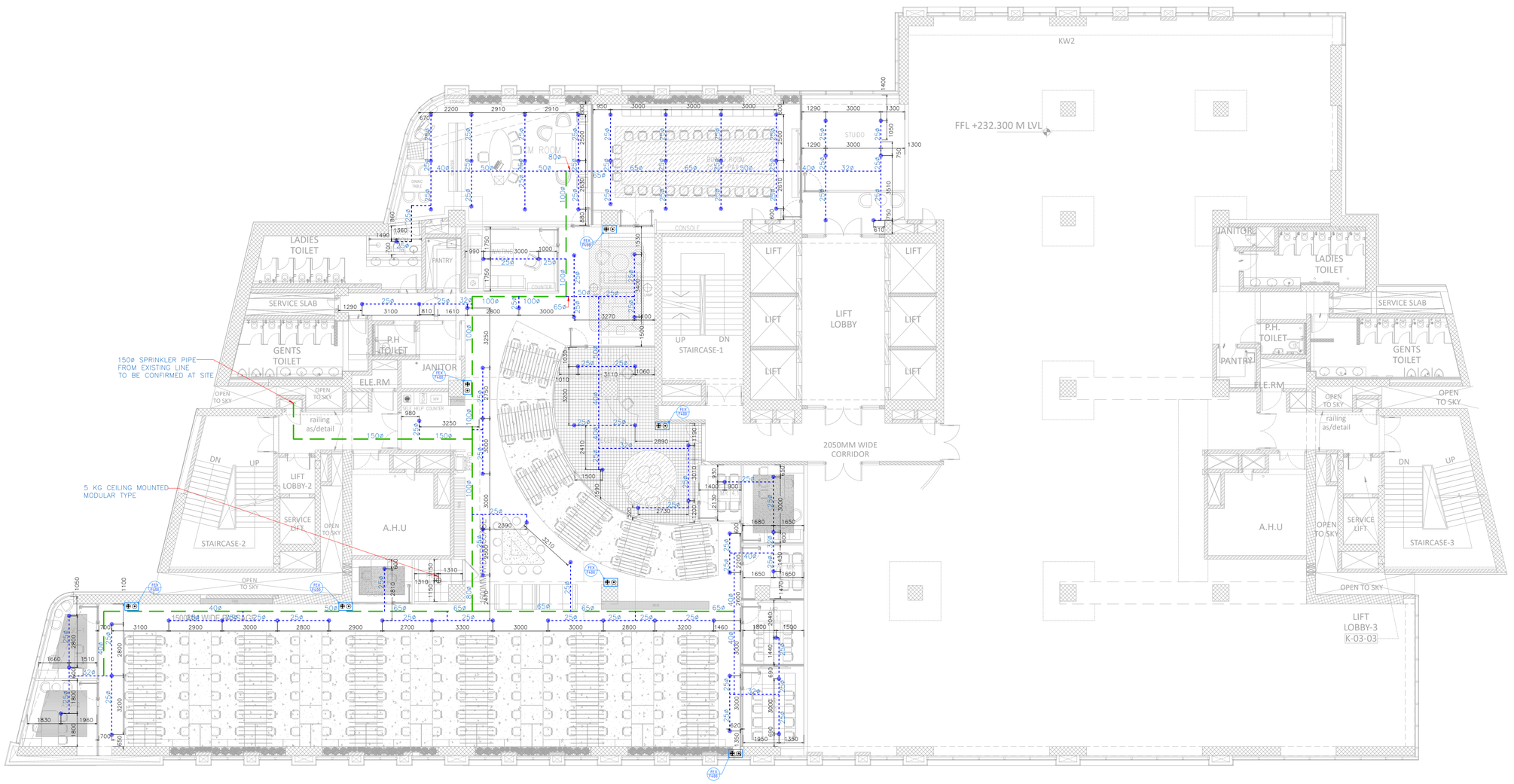
1 WALL SUPPORT DETAIL
Scale: NTS



2 FIRE EXTINGUISHER HANGING DETAIL
SCALE: NTS



3 PENDENT SPRINKLER INSTALLATION DETAIL
Scale: NTS



NOTES:

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QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE:19.11.2024

STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY

APRVD BY:

DRAWING TITLE:

J BLOCK
THIRD FLOOR
PLAN -FIRE PROTECTION

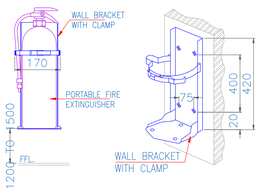
PE-J-TD-F-200

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

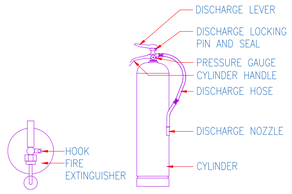
FIRE PROTECTION LEGEND	
	PENDENT SPRINKLER(68 DEG. C)
	SPRINKLER BRANCH PIPE
	SPRINKLER MAIN PIPE
	4.5 kg CO2 TYPE EXTINGUISHER
	6 kg ABC DRY POWDER TYPE EXT.
	5 KG CEILING MOUNTED MODULAR TYPE

NO. OF SPRINKLER	DIA METER IN MM
1–2	25
3	32
4–6	40
7–10	50
11–18	65
19–30	80
31–60	100
61>	150

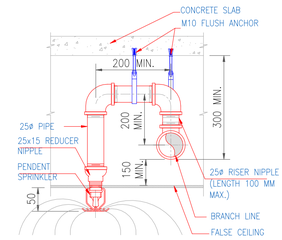
TYPE OF FIRE EXTINGUISHERS	EXTINGUISHERS CAPACITIES
POWDER	6 KG
CARBON DIOXIDE (CO2)	4.5KG



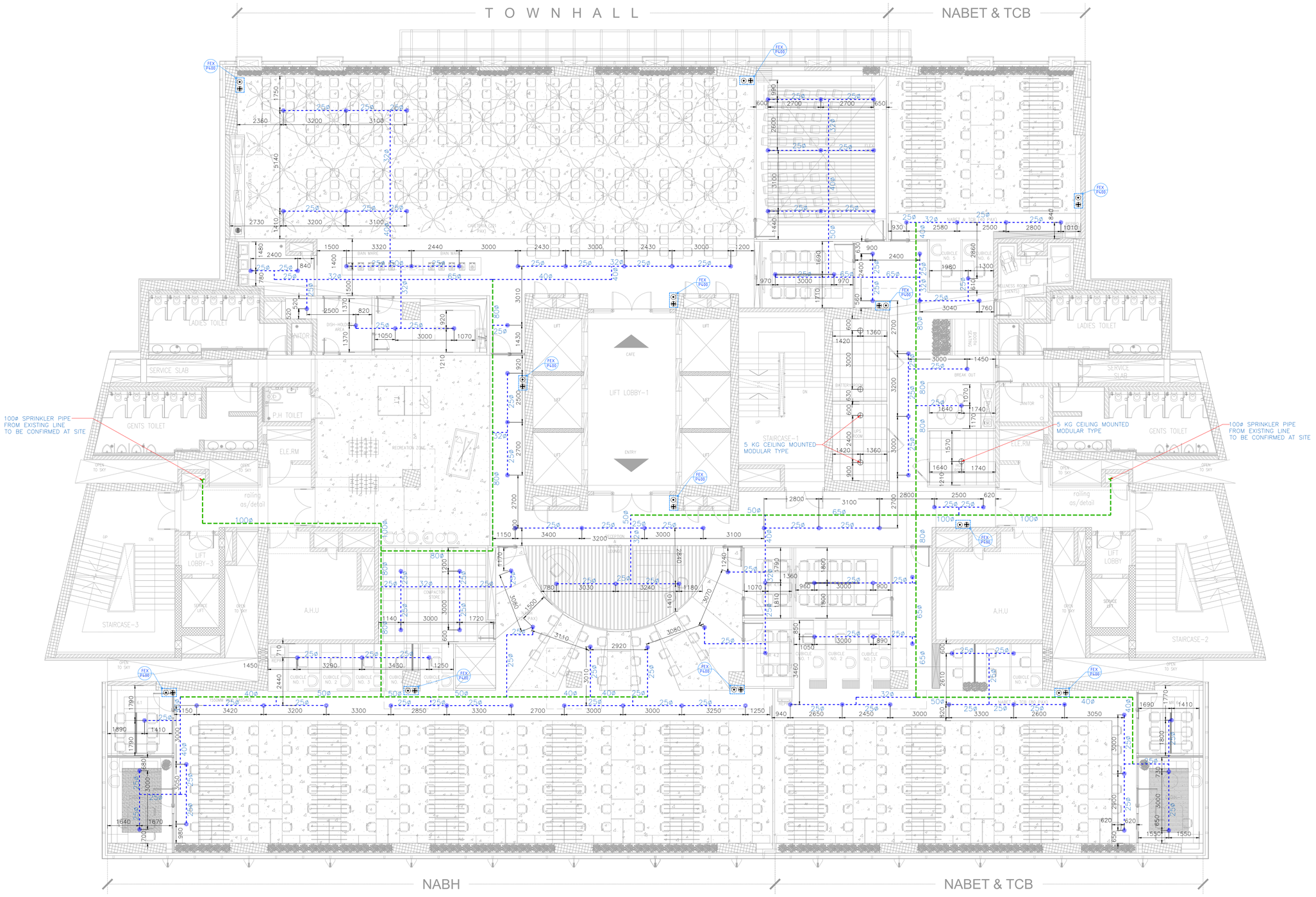
1 WALL SUPPORT DETAIL
Scale: NTS



2 FIRE EXTINGUISHER HANGING DETAIL
SCALE: NTS



3 PENDENT SPRINKLER INSTALLATION DETAIL
Scale: NTS



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Rev. No.	Description
R0	TD

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

K BLOCK
FIRST FLOOR PLAN-
FIRE PROTECTION

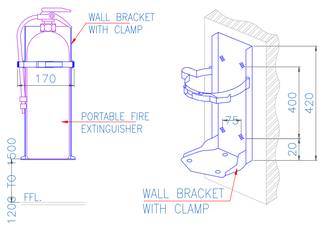
PE-K-TD-F-200

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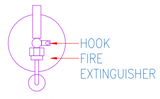
FIRE PROTECTION LEGEND	
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	SPRINKLER BRANCH PIPE
	SPRINKLER MAIN PIPE
	4.5 kg CO2 TYPE EXTINGUISHER
	6 kg ABC DRY POWDER TYPE EXT.
	5 KG CEILING MOUNTED MODULAR TYPE

NO. OF SPRINKLER	DIA METER IN MM
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3	32
4–6	40
7–10	50
11–18	65
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31–60	100
61>	150

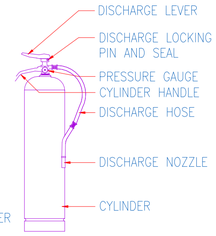
TYPE OF FIRE EXTINGUISHERS	EXTINGUISHERS CAPACITIES
POWDER	6 KG
CARBON DIOXIDE (CO2)	4.5KG



1 WALL SUPPORT DETAIL
Scale: NTS

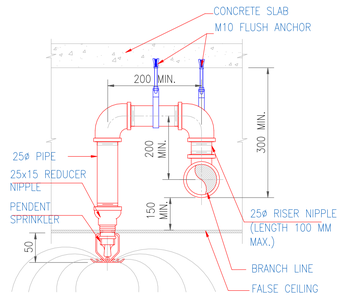


PLAN

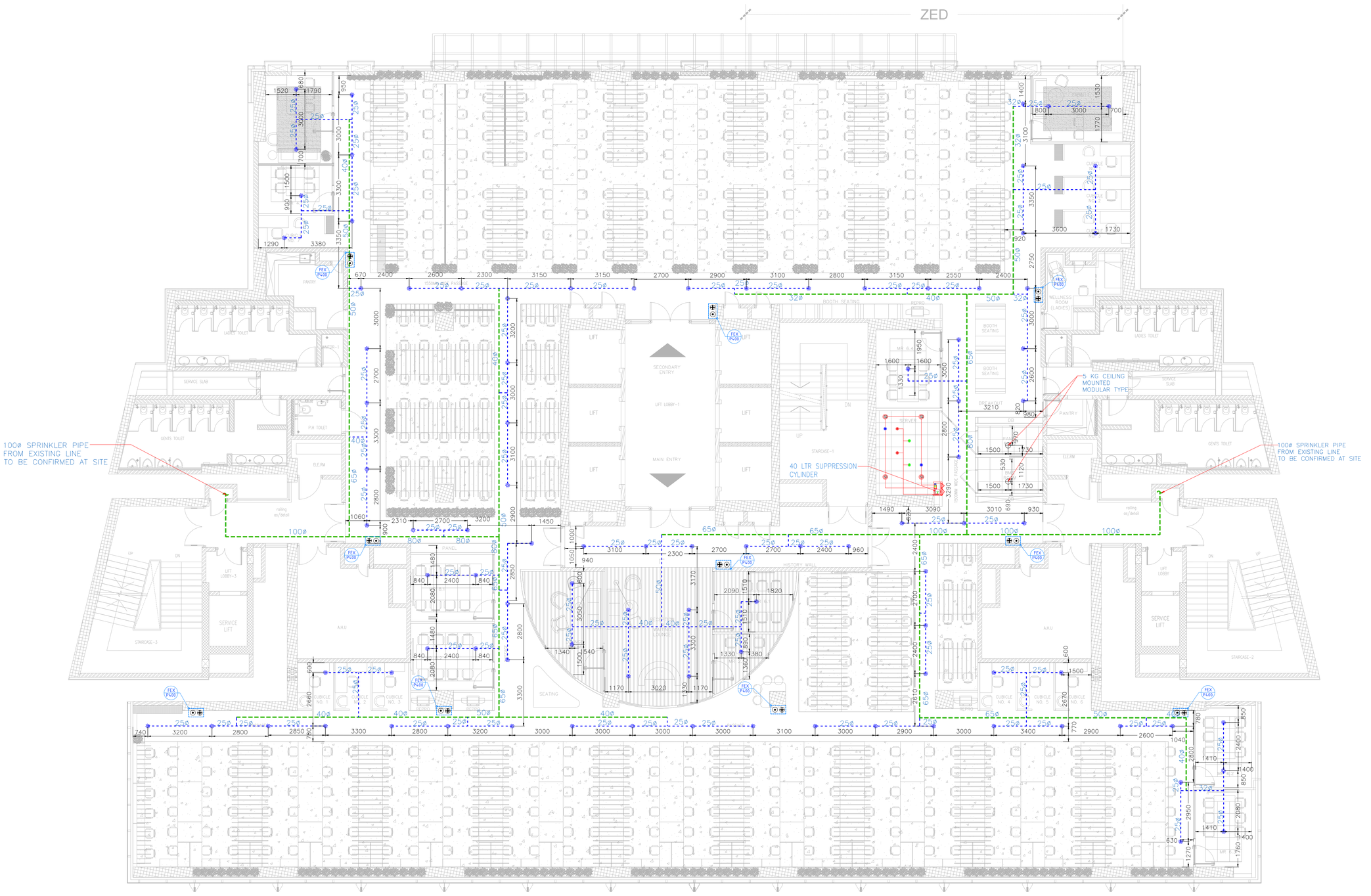


FIRE EXTINGUISHER

2 FIRE EXTINGUISHER HANGING DETAIL
SCALE: NTS



3 PENDENT SPRINKLER INSTALLATION DETAIL
Scale: NTS



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QCI

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STRUCTURE:

MEP CONSULTANT:

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TENDER DRAWING

REVISION:

Rev. No.	Description
R0	TD

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

K BLOCK SECOND FLOOR PLAN- FIRE PROTECTION

PE-K-TD-F-201

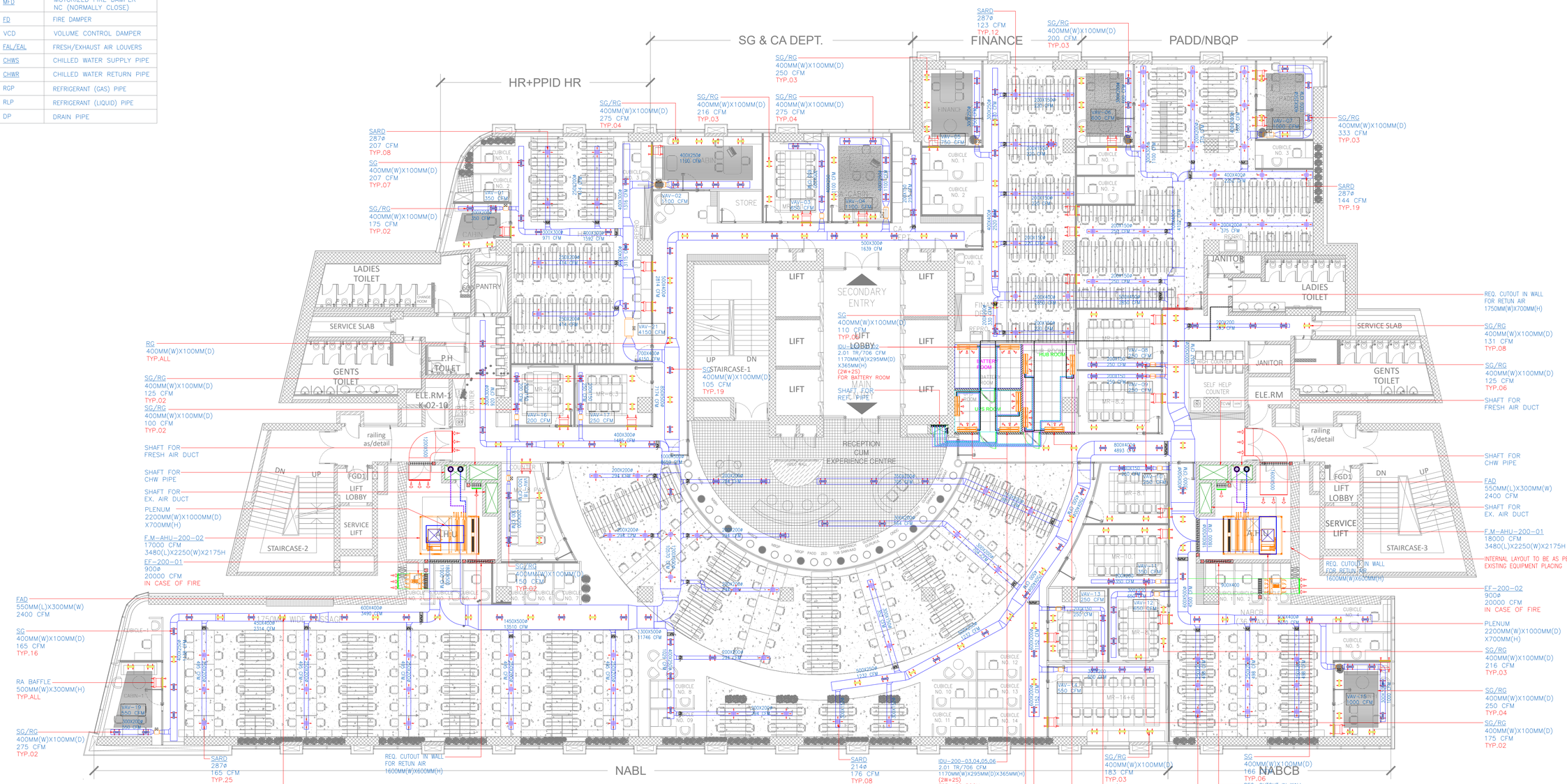
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MECHANICAL LEGEND	
SYMBOL	DESCRIPTION
SAD	SUPPLY AIR DUCT
SC	SUPPLY AIR COLLAR
RAD	RETURN AIR DUCT
FAD	FRESH AIR DUCT
EAD	EXHAUST AIR DUCT
SG	SUPPLY AIR GRILLE
RG	RETURN AIR GRILLE
SARD	SUPPLY AIR ROUND DIFFUSER
FM-AHU	FLOOR MOUNTED AHU
IDU	HI-WALL UNIT
EF/FF	EXHAUST/FRESH AIR AXIAL FAN
EF/FF	EXHAUST/FRESH AIR CIRCULAR INLINE FAN
VAV	VARIABLE AIR VOLUME
RAB	RETURN AIR Z-TYPE BAFFLE
MFD	MOTORIZED FIRE DAMPER NC (NORMALLY CLOSE)
FD	FIRE DAMPER
VCD	VOLUME CONTROL DAMPER
FAL/EAL	FRESH/EXHAUST AIR LOUVERS
CHWS	CHILLED WATER SUPPLY PIPE
CHWR	CHILLED WATER RETURN PIPE
RGP	REFRIGERANT (GAS) PIPE
RLP	REFRIGERANT (LIQUID) PIPE
DP	DRAIN PIPE

DESCRIPTION OF VAV BOXES			
VAV BOX CFM	L	H	W
100-600	300	250	200
600-1000	600	250	250
1000-1500	650	250	300
1500-2000	700	300	300
2000-3000	800	445	500
3000-4000	1000	500	500
4000-5000	1000	500	500
5000-5500	1000	500	500
6000-7000	1000	500	500

NOTES:

1. VAV BOXES TO BE INSTALLED IN EVERY SUPPLY AIR BRANCH
2. DEDICATED AC SYSTEM IS PROPOSED FOR SERVER ROOM & UPS ROOM TO MAINTAIN REQUIRED AMBIENT 24x7. CONFIRM IF ANY OTHER.
3. ALL RETURN AIR BAFFLE TO BE INSTALLED ABOVE FALSE CEILING.



1 SECOND FLOOR PLAN
Scale: 1:125

NOTES:

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QCI

KEY PLAN:

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STRUCTURE: 19.11.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

J BLOCK SECOND FLOOR PLAN - MECHANICAL

PE-J-TD-M-200

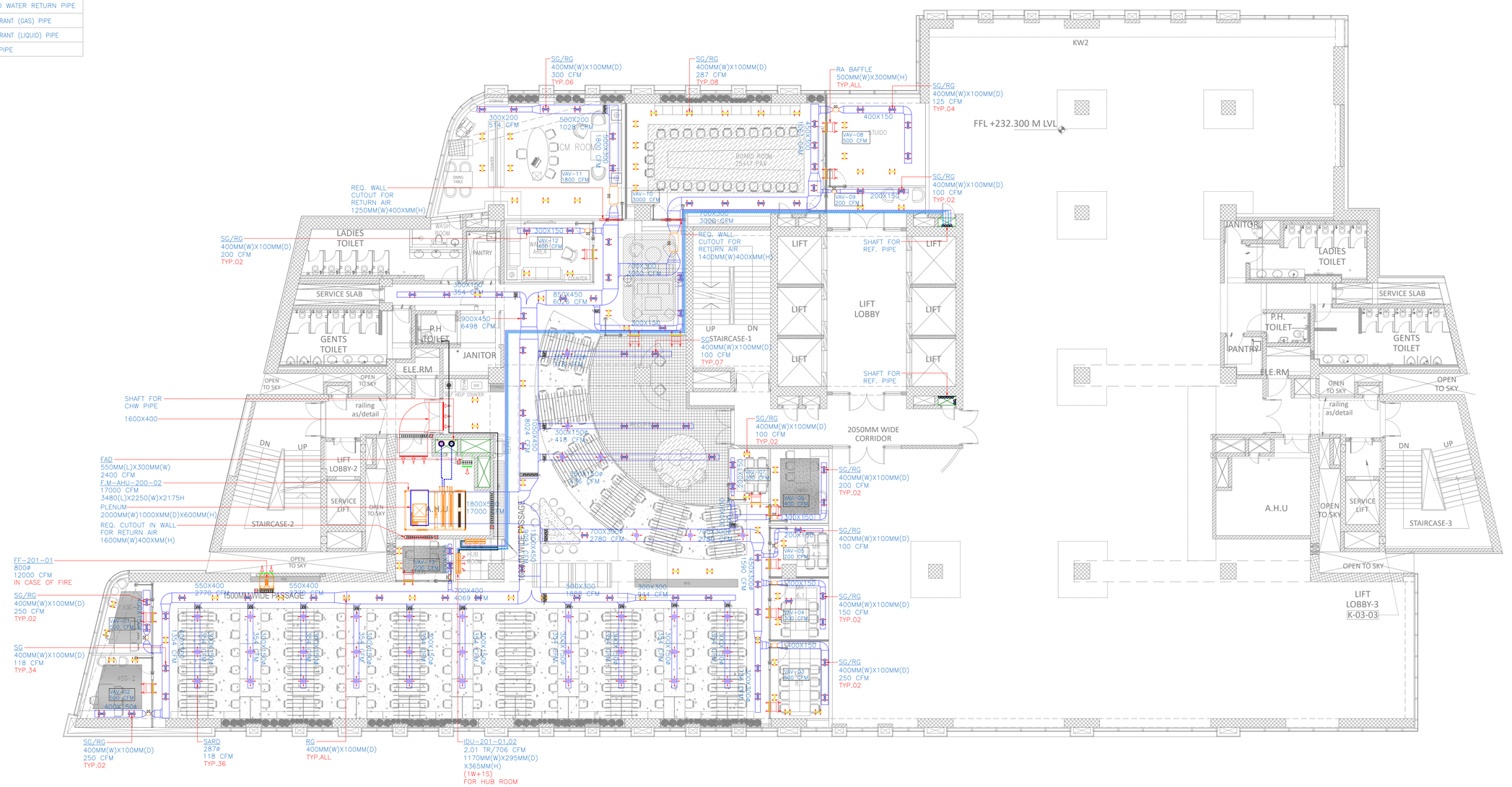
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MECHANICAL LEGEND	
SYMBOL	DESCRIPTION
SAD	SUPPLY AIR DUCT
SC	SUPPLY AIR COLLAR
RAD	RETURN AIR DUCT
FAD	FRESH AIR DUCT
SG	SUPPLY AIR GRILLE
RG	RETURN AIR GRILLE
FM-AHU	FLOOR MOUNTED AHU
IDU	HI-WALL UNIT
EF/FF	EXHAUST/FRESH AIR AXIAL FAN
EF/FF	EXHAUST/FRESH AIR CIRCULAR INLINE FAN
VAV	VARIABLE AIR VOLUME
RAB	RETURN AIR Z-TYPE BAFFLE
MFD	MOTORIZED FIRE DAMPER NC (NORMALLY CLOSE)
MFD	MOTORIZED FIRE DAMPER NO (NORMALLY OPEN)
FD	FIRE DAMPER
VCD	VOLUME CONTROL DAMPER
FAL/EAL	FRESH/EXHAUST AIR LOUVERS
CHWS	CHILLED WATER SUPPLY PIPE
CHWR	CHILLED WATER RETURN PIPE
RGP	REFRIGERANT (GAS) PIPE
RLP	REFRIGERANT (LIQUID) PIPE
DP	DRAIN PIPE

DESCRIPTION OF VAV BOXES			
VAV BOX CFM	L	H	W
100-600	300	250	200
600-1000	600	250	250
1000-1500	650	250	300
1500-2000	700	300	300
2000-3000	800	445	500
3000-4000	1000	500	500
4000-5000	1000	500	500
5000-5500	1000	500	500
6000-7000	1000	500	500

NOTES:

1. VAV BOXES TO BE INSTALLED IN EVERY SUPPLY AIR BRANCH
2. DEDICATED AC SYSTEM IS PROPOSED FOR SERVER ROOM & UPS ROOM TO MAINTAIN REQUIRED AMBIENT 24X7, CONFIRM IF ANY OTHER.
3. ALL RETURN AIR BAFFLE TO BE INSTALLED ABOVE FALSE CEILING.



1 THIRD FLOOR PLAN
Scale: 1:125

NOTES:

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ARCHITECT:

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MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:125

ISSUED DATE: 26.12.2024

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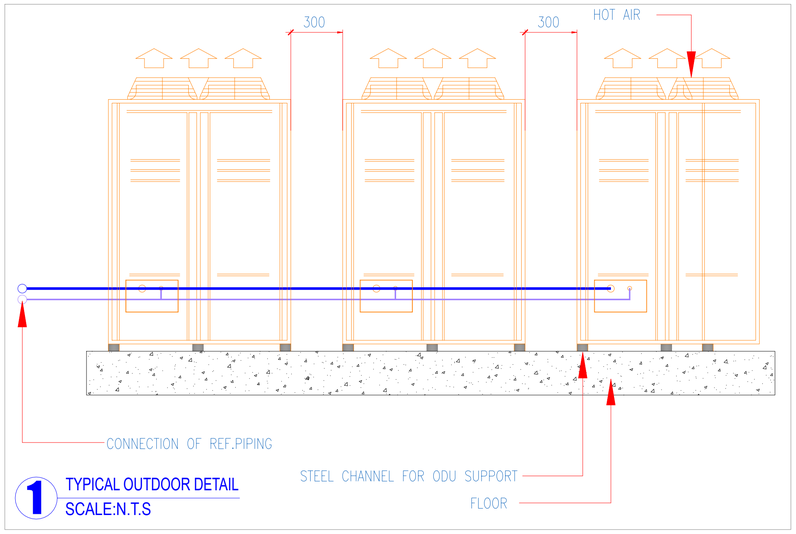
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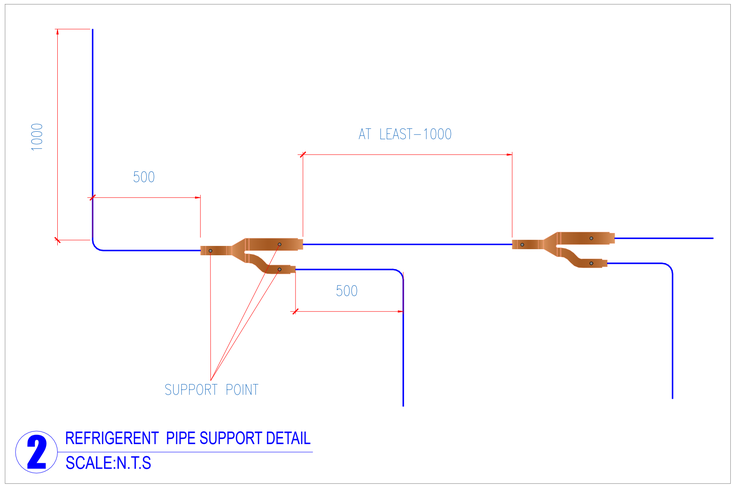
J BLOCK THIRD FLOOR PLAN - MECHANICAL

PE-J-TD-M-201

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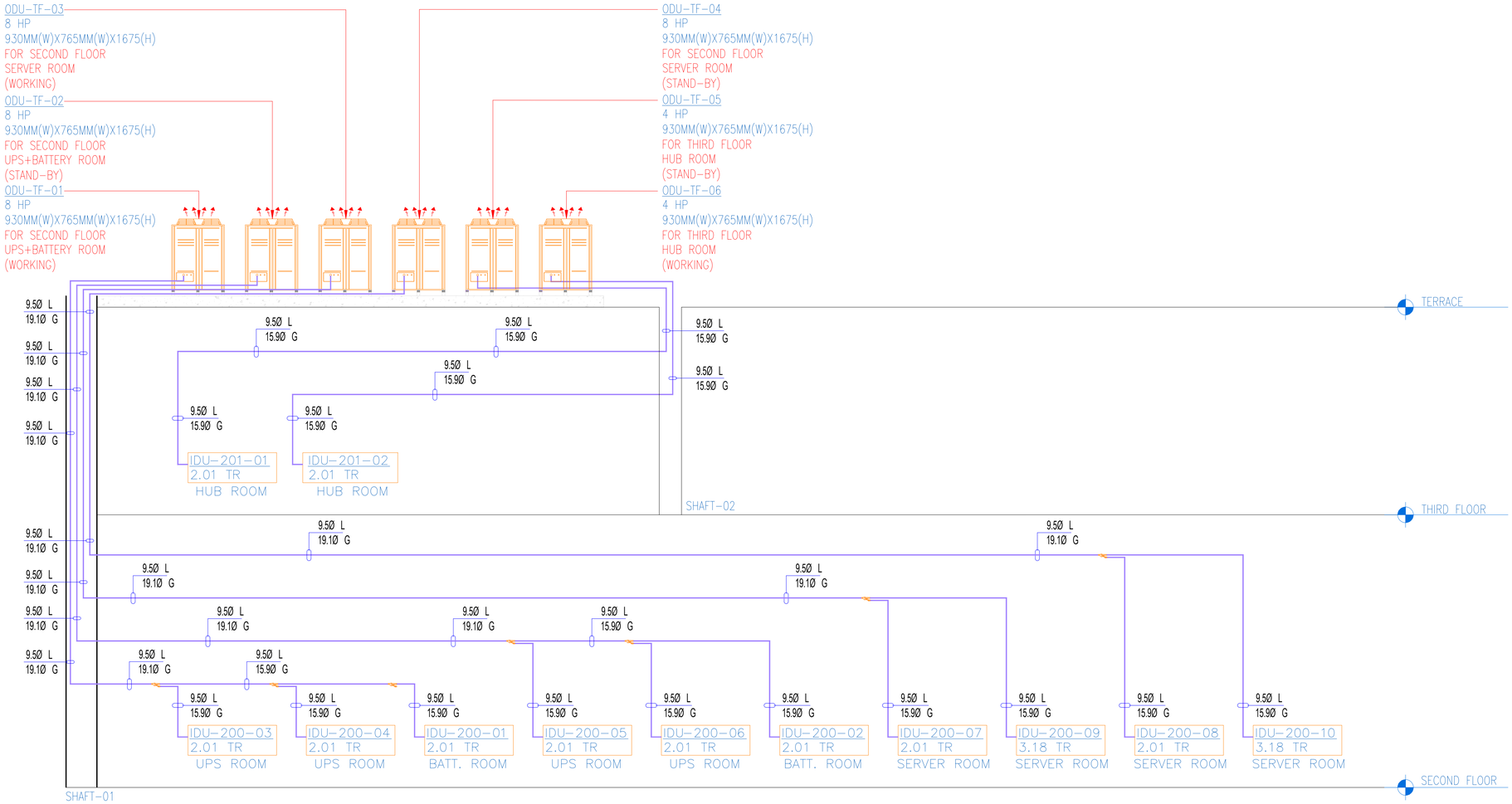


1 TYPICAL OUTDOOR DETAIL
SCALE:N.T.S



2 REFRIGERENT PIPE SUPPORT DETAIL
SCALE:N.T.S

MECHANICAL LEGEND	
SYMBOL	DESCRIPTION
IDU-01	INDOOR UNIT
ODU-01	VRV OUTDOOR UNIT
	Y-JOINT
RGP	REFRIGERANT (GAS) PIPE
RLP	REFRIGERANT (LIQUID) PIPE



1 SINGLE LINE DIAGRAM
Scale: N.T.S

NOTES:

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TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: N.T.S

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

J BLOCK SINGLE LINE DIAGRAM - MECHANICAL

PE-J-TD-M-300

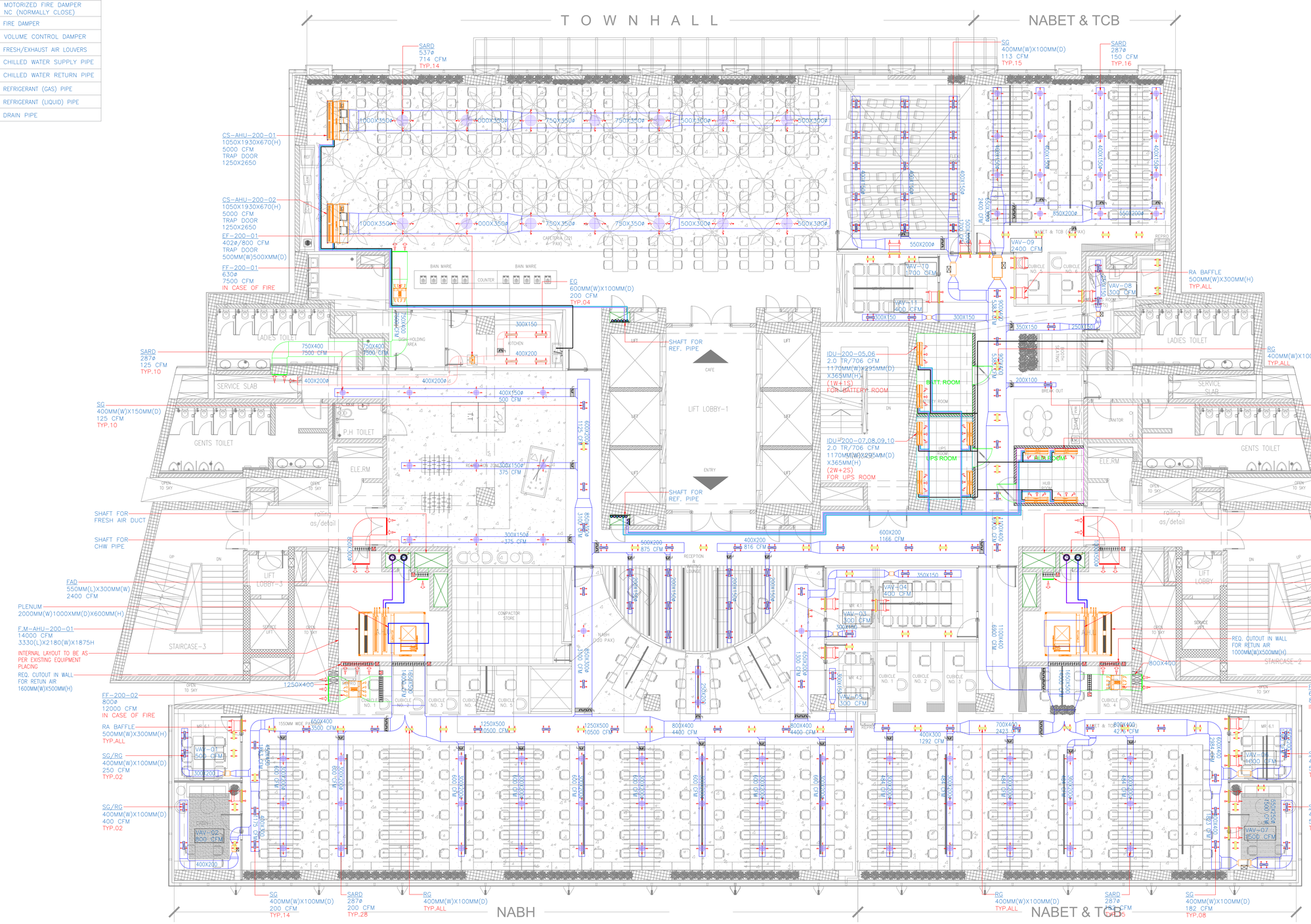
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MECHANICAL LEGEND	
SYMBOL	DESCRIPTION
SAD	SUPPLY AIR DUCT
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DESCRIPTION OF VAV BOXES			
VAV BOX CFM	L	H	W
100-600	300	250	200
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1000-1500	650	250	300
1500-2000	700	300	300
2000-3000	800	445	500
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5000-5500	1000	500	500
6000-7000	1000	500	500

NOTES:

1. VAV BOXES TO BE INSTALLED IN EVERY SUPPLY AIR BRANCH
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1 FIRST FLOOR PLAN
Scale: 1:100

NOTES:

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FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

K BLOCK FIRST FLOOR PLAN - MECHANICAL

PE-K-TD-M-200

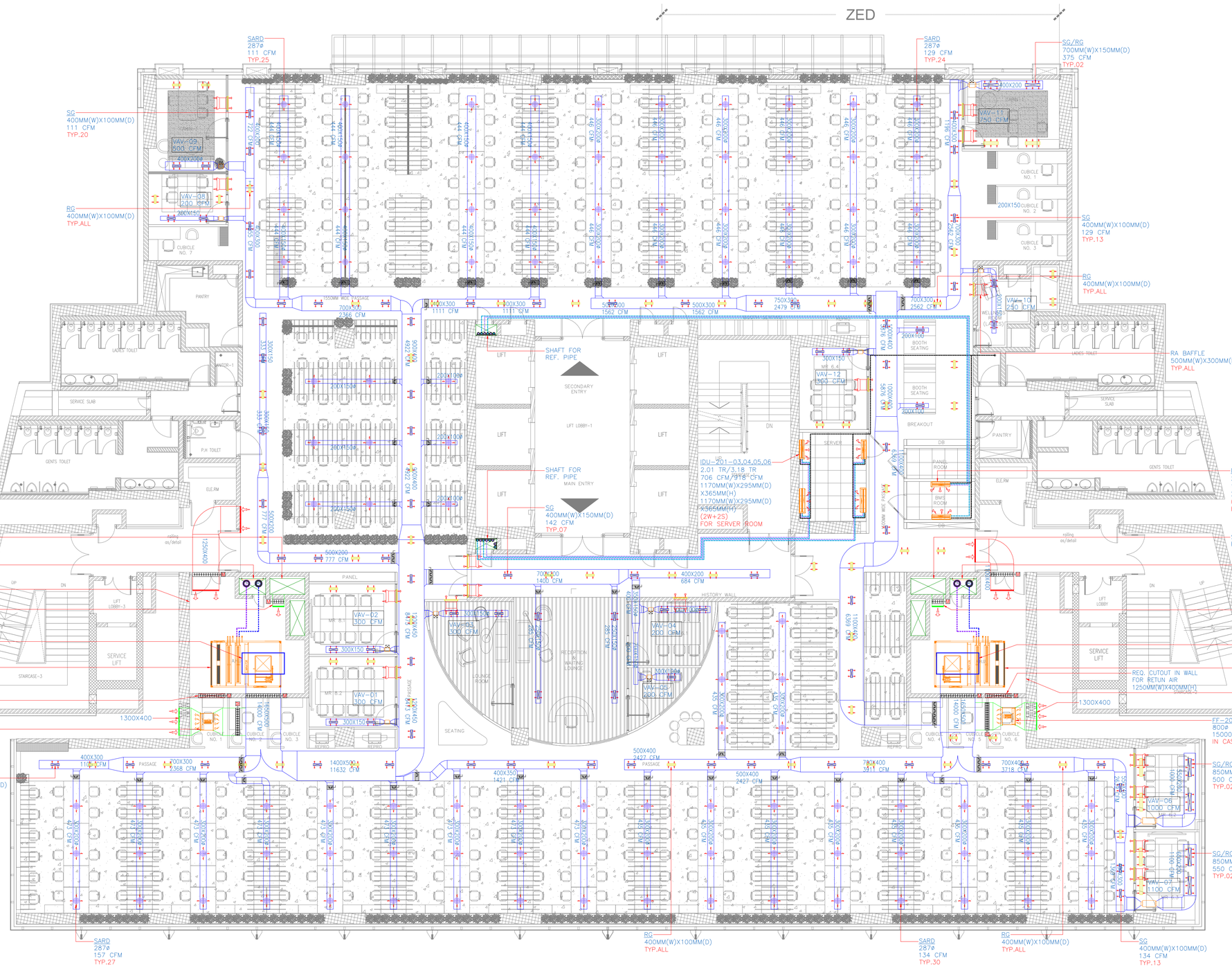
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SYMBOL	DESCRIPTION
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RG	RETURN AIR GRILLE
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DP	DRAIN PIPE

DESCRIPTION OF VAV BOXES			
VAV BOX CFM	L	H	W
100-600	300	250	200
600-1000	600	250	250
1000-1500	650	250	300
1500-2000	700	300	300
2000-3000	800	445	500
3000-4000	1000	500	500
4000-5000	1000	500	500
5000-5500	1000	500	500
6000-7000	1000	500	500

NOTES:

1. VAV BOXES TO BE INSTALLED IN EVERY SUPPLY AIR BRANCH
2. DEDICATED AC SYSTEM IS PROPOSED FOR SERVER ROOM & UPS ROOM TO MAINTAIN REQUIRED AMBIENT 24x7. CONFIRM IF ANY OTHER.
3. ALL RETURN AIR BAFFLE TO BE INSTALLED ABOVE FALSE CEILING.



1 SECOND FLOOR PLAN
Scale: 1:100

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING.
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSE

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: 1:100

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

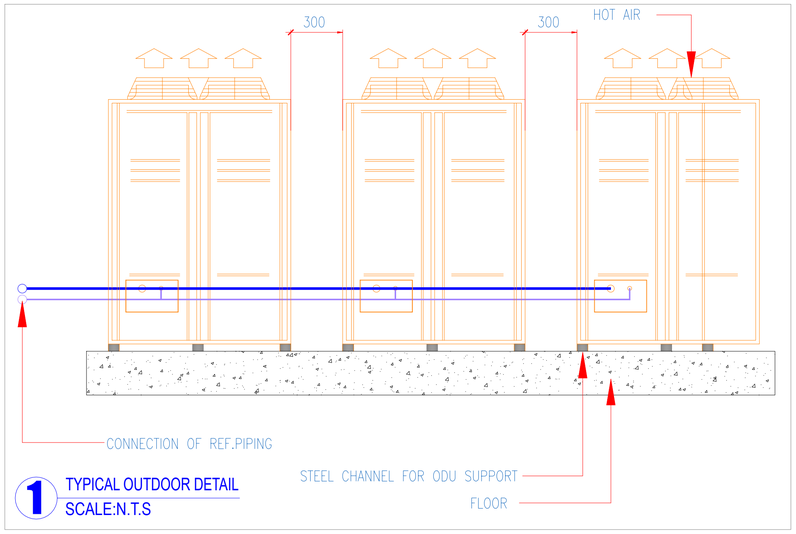
APRVD BY:

DRAWING TITLE:

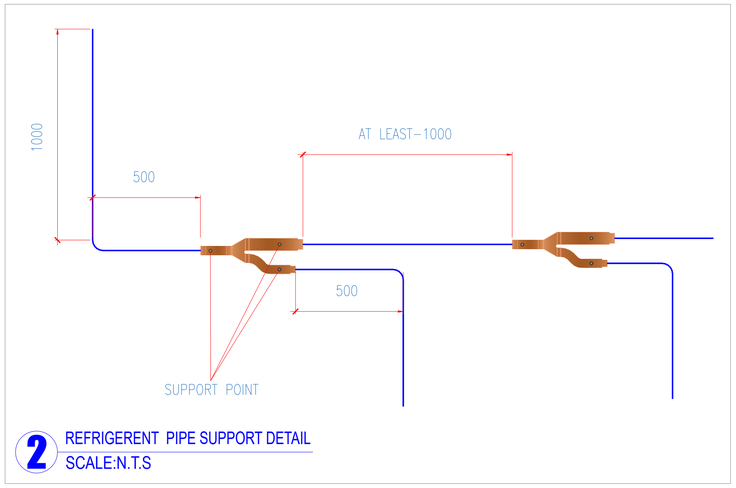
K BLOCK SECOND FLOOR PLAN - MECHANICAL

PE-K-TD-M-201

NO REUSE OR MODIFICATION OF DRAWING IN WHOLE OR PART IS PERMITTED WITHOUT THE WRITTEN PERMISSION OF THE CONSULTANTS

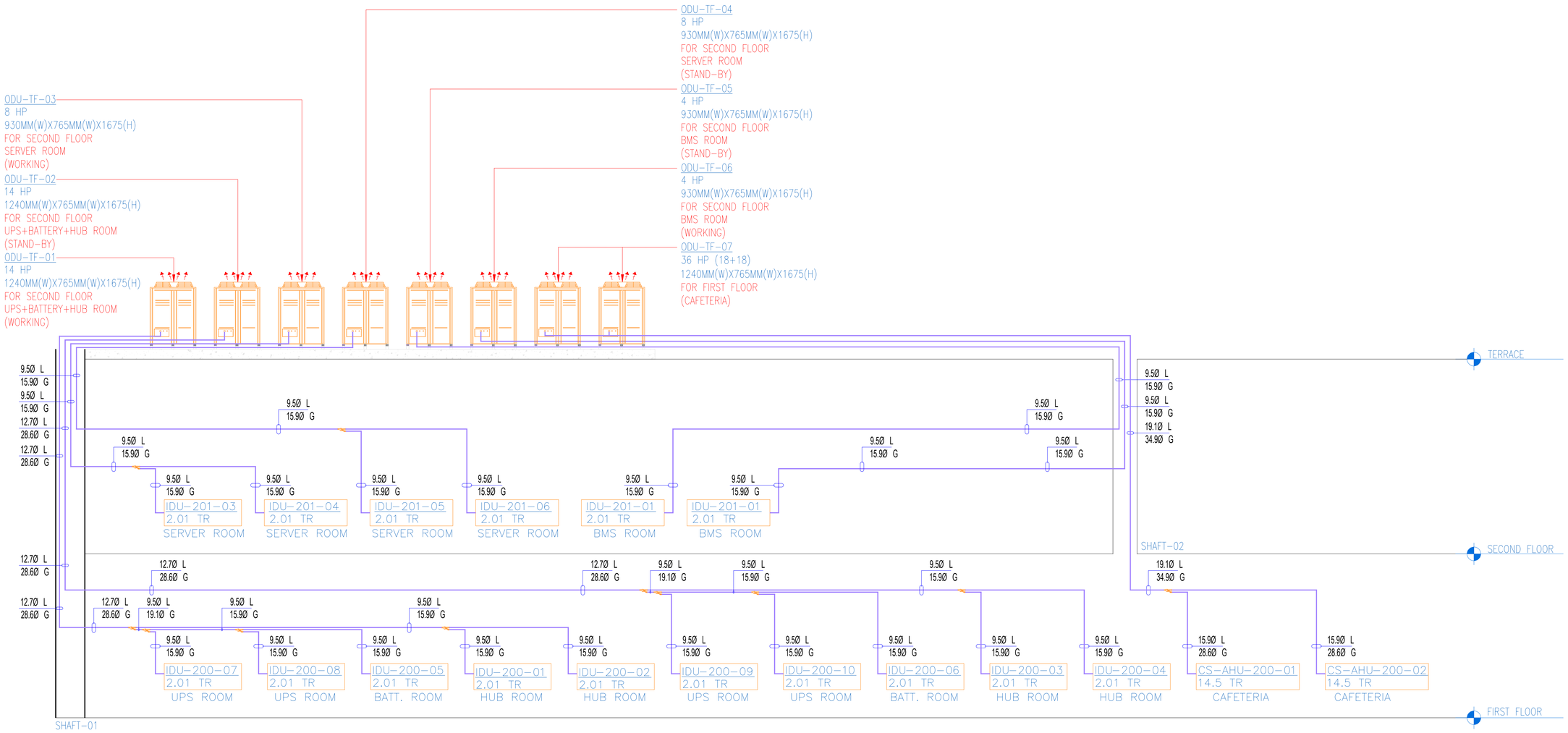


1 TYPICAL OUTDOOR DETAIL
SCALE:N.T.S



2 REFRIGERENT PIPE SUPPORT DETAIL
SCALE:N.T.S

MECHANICAL LEGEND	
SYMBOL	DESCRIPTION
IDU-01	INDOOR UNIT
ODU-01	VRV OUTDOOR UNIT
	Y-JOINT
RGP	REFRIGERANT (GAS) PIPE
RLP	REFRIGERANT (LIQUID) PIPE



1 SINGLE LINE DIAGRAM
Scale: N.T.S

NOTES:

1. ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE SPECIFIED.
2. THE DRAWING DIMENSIONS ARE TO BE READ AND NOT SCALED FROM THE DRAWING.
3. ANY DISCREPANCIES SHALL BE BROUGHT TO THE NOTICE OF THE DRAWING ISSUER.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH OTHER RELEVANT DRAWINGS & SPECIFICATIONS GIVEN IN THE TENDER DOCUMENT.
5. ONLY THE LATEST REVISION OF THE DRAWINGS SHALL BE CONSIDERED VALID FOR ALL PURPOSES.

PROJECT:

QCI

KEY PLAN:

BASE PLAN REFERENCE:

ARCHITECTURE: 23.12.2024

STRUCTURE: 23.12.2024

ARCHITECT:

STRUCTURE:

MEP CONSULTANT:

ISSUE STATUS:

TENDER DRAWING

REVISION:

Rev. No.	Description

NORTH:

FORMAT: A1 SIZE

SCALE: N.T.S

ISSUED DATE: 26.12.2024

DRAWN BY:

CHECKED BY:

APRVD BY:

DRAWING TITLE:

K BLOCK SINGLE LINE DIAGRAM - MECHANICAL

PE-K-TD-M-300

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Annexure - G

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT NAUROJI NAGAR, DELHI

Mechanical Works

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL OF INDIA
QCI Creating an Ecosystem for Quality

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PART I: GENERAL

1.1 SCOPE OF WORK

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

The system includes:

a) All chilled water/refrigerant piping works including insulation and its wrapping, pressure testing, protection, hanging and support works for all space.
b) All duct works including insulation, pressure testing, protection, hanging and support works for the all space.
c) Supply and installation of electrical panel for HVAC equipment's.
d) Electrical and control wiring from panel to HVAC equipment in case of VRV/VRF/DX units.
e) Electrical wiring from panel to Outdoor and control cabling from outdoor to indoor units. Electrical wiring of indoor units.
f) SITC of all equipment that includes,
    a. Ceiling suspended cassettes.
    b. Chilled water supply/return pipe.
    c. Ducting
    d. Air distribution product
    e. Ventilation Fan
g) Foundations for equipment including foundation bolts and vibration isolation spring/pads.
h) Suspenders, brackets and floor/wall supports for suspending/supporting ducts and pipes.
i) Suspenders and/or cable trays for laying the cables and Refrigerant pipe.
j) Sealing of all floor slab/ wall openings provided by the lead contractor or contractor for pipes and cables, from fire safety point of view, after laying of the same.
k) Painting of all exposed metal surfaces of equipment and components with appropriate colour.
l) Making openings in the Walls/Floors/Slabs or modification in the existing openings wherever provided for carrying refrigerant pipe line, ducts, cables etc.
m) Providing wooden/ metallic frames for fixing grills/diffusers.
n) Making good all damages caused to the structure during installation and restoring the same to their original finish.
o) All electrical associated works as per BOQ and drawings, specifications.

1.2 RELATED DOCUMENTS

These Specifications shall be read in conjunction with the General conditions of contract, schedule of work, drawings and other documents connected with the work.

1.3 TERMINOLOGY

The definition of terms used in these specifications shall be in accordance with IS: 3615-"Glossary of terms used in refrigeration and air-conditioning". Some of the commonly used terms are defined in last chapter of the specification.

PART II: APPLICABLE CODESANDSTANDARDS

1. APPLICATION CODES AND STANDARDS

Supply, erection, testing and commissioning of all equipment's shall comply with the requirements of Indian Standards and code of practice given below as amended up to the date of submission of Tender. All equipment and material being supplied shall meet the requirements of relevant standard and codes.

A. GENERAL:

ASHRAE-2008	Systems and Equipment's
IS 3615	Glossary of terms used in refrigeration & air-conditioning
IS : 3696	Safety code for scaffolding and ladders,
IS: 3696	Code for practice for safety and health Requirements in electrical and gas welding & cutting operations
IS: 325	Three phase induction Motors
IS: 655 (Latest Rev.)/ BIS Code	Ducting Fabrication

B. SHEET METAL WORK:

IS: 737	Aluminum Sheets/Wires
IS: 277-1977	Galvanized Sheets/Wires
IS: 655 (Latest Rev.)/ BIS Code	Ducting Fabrication

C. NOISE & VIBRATION:

IS: 2264	Preferred frequencies for acoustical measurement.
IS : 3483	Code of practice for noise reduction in industrial buildings.
IS: 8418	Specification for horizontal centrifugal self-priming pumps.

D. EARTHING:

IS: 3043 : 1966	Code of practice for earthing
IS : 3151 : 1965	Earthing transformer
IS: 12776 : 1989	Galvanized stand for earthing

E. FUSES:

IS: 2208 : 1966	HRC fuses links up to 650 V
IS : 2086 : 1963	Carrier and bases used in rewire able type electric fuses up to 650 V
IS: 3106 : 1966	Code of practice for maintenance of Fuses

F. MOTOR :

IS: 325	3 Phase induction motor
IS : 996	Specs for single phase small AC and universal motor
IS: 3106 : 1966	Code of practice for maintenance of Fuses

G. SAFETY CODES :

IS: 660	Safety code for mechanical refrigeration
IS : 659	Safety code for air conditioning
IS: 3016	Safety code for precaution for precaution in welding and cutting operation
IS: 5216	Code for safety procedure and practice in electrical work
IS: 3696	Code for scaffolds and ladders.

Note: All codes/ Standards with latest amendments/ Issues shall be referred.

All codes mentioned in the DBR documents shall be referred.

HEATING VENTILATION & AIR-CONDITIONING

PART III - VARIABLE REFRIGERANT FLOW SYSTEM

1. GENERAL

The units shall be wall-mounted. The units include pre-filter, fan section and coil section. The housing of units shall be light weight powder coated galvanized steel. Units shall have an attractive external casing for supply and return air. The VRF units shall match with the capacities given in schedules and drawings. The approval shall be taken before order placement from Engineer in charge.

1.1. INSTALLATION:

The indoor units shall be hanged clamped with proper supporting and outdoor units mounted on MS frame with rubber pads or vibration isolation. The contractor shall supply the required charge of refrigerant, lubricant and other consumables, for commissioning and testing of the equipment.

All the equipment shall be thoroughly tested and checked for leaks. All safety controls shall be suitably set and a record of all setting shall be furnished to the project supervisor.

Providing and fixing M.S. structural support for condensing unit with vibration isolator pad in-between support and structure and vibration isolation suspender and pads for evaporating units.

1.2. DIMENSIONS:

Dimensions given in figures shall be taken in preference to scaled dimensions in all cases. Before commencing any work, the sub-contractor shall get clarifications wherever necessary from engineer-in-charge.

1.3. PAINTING:

Shop coats of paint that have become marred during transportation or erection shall be cleaned off with mineral spirits, wire brushed and spot primed over the affected areas, then coated with enamel paint to match the finish over the adjoining shop- painted surfaces.

1.4. CONDENSATE DRAIN PIPING:

All pipes to be used for condensate drain shall be Insulated & all joints should be Gluing or solvent cementing as per manufacturer recommendation.

1.5. REFRIGERANT PIPING:

i) All refrigerant pipes and fittings shall be type 'L' hard drawn copper tubes and wrought copper fitting suitable for connection with silver solder.
ii) All joints in copper piping shall be swaged joints using low temperature brazing. Before joining any copper pipe or fittings, its interior shall be thoroughly cleaned be passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while construction of the joints. Subsequently, it shall be thoroughly blown out using nitrogen.
iii) Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg per Sq.cm.
iv) After the refrigerant piping installation has been completed the refrigerant piping system shall be pressure tested using, Freon mixed with nitrogen at a pressure of 20 Kg per Sq. cm. (High side) and 10 Kg

per Sq. cm (Low side) pressure shall be maintained on the system for a minimum of 12 hours. The system shall then be evacuated to a minimum vacuum of 70 cm. of mercury and held for 24 hours, during which time change in vacuum shall not exceed 12 cm of mercury. Vacuum shall be checked with vacuum gauge. Vacuum to be achieved using a vacuum pump. Use of compressor for vacuuming is not permitted. All refrigerant piping shall be installed strictly as per the instructions and recommendations of air conditioning equipment manufacturers.

v) The copper thickness of pipe shall be 20G/22G (0.7 to 1 mm)

vi) Sleeves shall be provided around refrigerant pipes crossing the wall and wooden partition.

vii) Refrigerant pipes should be supported on grooved wooden (teak wood only) strips suitable to accommodate insulated refrigerant pipes. The piping should be clamped to these wooden strips using a 'C' clamp. The distance between two supports should not be more than 5 ft.

viii) Refrigerant piping design for VRV system shall be submitted by the vendor for final approval.

ix) Insulation should be or equivalent make and of closed cell tubing type of specifications give in Duct insulation section.

x) Clean the outer surface of refrigerant copper piping. Insert the pipes in tubular Join two ends of tubular insulation using suitable adhesive. Tape the joints with masking tapes of the same material. All outdoor piping to be protected with (For ref. Piping,) Woven Fiberglass cloth, 7 mil thickness and 200 gsm weight, with factory laminated, self-adhesive backing should be used. This needs to be finished with 2 coats of UV painting.

1.6. POWER SUPPLY:

Power supply near the indoor unit will be provided from the Socket/Main LT panel using Distribution Boards (DBs) by lead contractor with suitable MCBs.

Power supply from MCB to indoor unit and from outdoor unit to Indoor unit to be provided by the sub-contractor along with earthing.

PART IV - FACTORY BUILT CEILING SUSPENDED AIR HANDLING UNIT

1.1 SCOPE

This chapter covers the detailed requirements of factory built double skin ceiling suspended air handling unit (CS AHU) for central air conditioning system. The configuration and details of each CSAHU shall be verifying and co-related with individual building sch.

1.2 FACTORY BUILT CEILING SUSPENDED AIR HANDLING UNIT (CS AHU)

1.2.1 TYPE

The ceiling suspended air handling unit shall be of double skin construction, draw through type in sectionalized construction consisting of blower section, coil sectionfilter section and drain pan. Unless otherwise specified, the unit shall be horizontal type and ceiling mounted.

1.2.2 RATING

i) The capacity of the cooling coil, the air quantity from the blower fan and static pressure of blower fan shall be as laid down in the tender documents. Where these parameters as calculated by the tenderer exceed the specified values, the coils and the blower fan shall satisfy these calculated values.
ii) The coil shall be designed for a face velocity of air not exceeding 400 ft/min.
iii) The requisite static pressure demanded by the air circuit shall be developed by the fan at the selected operating speed. The static pressure value shall not in any case be less than as mentioned in BOQ. The fan motor HP shall be suitable to satisfy these requirements and the drive losses.
iv) The air outlet velocity from the blower fan shall not exceed 610 m/min.
v) Noise level at a distance of 2M from AHU shall not exceed 60 dBA.

1.2.3 MATERIAL AND CONSTRUCTION

1.2.3.1 HOUSING / CASING

i) The housing/ casing of the air handling unit shall be of double skin construction. The housing shall be so made that it can be delivered at site in total semi knocked down conditions depending upon the requirements. The main framework shall be of suitable structural sections. The entire framework shall be assembled using mechanical joints to make a sturdy and strong framework for various sections. Framework of all air handling units shall be made of thermal break hollow extruded aluminum profile.
ii) Double skin panels shall be minimum 25mm thick made of 0.8mm pre-plasticized and pre-painted with PVC guard, GSS sheet on outside and 0.8mm 275 GSM galvanized sheet inside with polyurethane foam insulation of density not less than 40 kg/cum injected in between by injection molding machine. These panels shall be joined and connected to the framework/ supports with soft rubber gasket in between (if necessary) to make the joints airtight and low air leakage potential. The gaskets shall be inserted within groove in extruded aluminum profile of the framework.

iii) Frame work for each section shall also be joined together to make the joints air tight. Suitable doors with nylon handles and all access panels should be operable with allen key/ suitable locking arrangement. Aluminium die-cast powder coated/ Nylon hinges & latches shall be provided for access to various panels for maintenance. However, AHU in the form of complete single unit shall also be acceptable with access door(s) for maintenance to various sections. The entire housing shall be mounted on galvanized steel channel frame work made out of G.I. sheet of thickness not less than 2mm.

1.2.3.2 DRAIN PAN

Drain pan shall be made out of minimum 1.2 mm stainless steel sheet externally insulated (If Drain pan is outside the unit), with 10mm thick closed cell nitrile rubber/ equivalent suitable insulation with necessary dual

slope to facilitate fast removal of condensate. Necessary supports will be provided to slide the coil in the drain pan.

1.2.3.3 COOLING COIL

i) The coil shall be made from seamless solid drawn copper tubes. The minimum thickness of tube shall be 0.42 mm for cooling coils.

ii) The depth of the coil shall be such as to suit the requirements, viz. re-circulated air applications, or 100 % fresh air applications and the bypass factor required shall be specified in the tender specifications. The coil shall be 6 or 8 rows deep for normal re-circulated air application and 8 rows deep for all outdoor air application, unless otherwise specified in the tender specifications. In case of 8 rows deep coils, it shall be made of 2x4 rows deep coils with a spacing of 200mm between the two coils, access door and independent drain pan.

iii) U bends shall be of copper, jointed to the tubes by brazing, soft soldering shall not be used.

iv) Each section of the coil shall be fitted with flow and return headers to feed all the passes of the coil properly. The headers shall be of copper and shall be complete with water in/out connections, vent plug on top and drain at the bottom. The coil shall be designed to provide water velocity between 0.6 to 1.8m/s in the tubes.

v) The fins shall be of aluminum. The minimum thickness of the fins shall be 0.15 mm nominal. The no. of fins shall not be less than 4-5 per cm length of coil. Fins may be of either spiral or plate type. The tubes shall be mechanically expanded to ensure proper thermal contact between fins and tubes. The fins shall be evenly spaced and upright. The fins bent during installation shall be carefully realigned. For coastal areas fins shall be phenolic coated and for 100% FA application fins shall be hydrophilic type.

vi) The coil shall be suitable for use with the refrigerant specified or with water as the case may be. Refrigerating coils shall be designed for the maximum working pressure under the operating conditions. Water coils shall be designed for a maximum working pressure of 10 kg./sq.cm.

1.2.3.4 AIR FILTERS

The air used in an air-conditioning system must be filtered to maintain a clean atmosphere in the conditioned space. The concentration of contaminants in the air and the degree of cleanliness required in the conditioned space will determine the type of filter or filters that must be used.

1.2.3.4.1 TYPE OF FILTERS

i) **Pre-filters:** Cleanable metallic viscous type filter made out of aluminum wire mesh or of dry cleanable synthetic type minimum 50mm thick, shall be provided on the suction side of AHU as standard equipment with the unit. These filters shall have the efficiency of 90% down to 10-micron particle size. When these filters become loaded or full of dirt, it is removed from service and replaced by another filter. The dirty filter can then be washed in a cleaning solution in a tank, dried and then given a bath of viscous oil. Face velocity across these filters shall not exceed 500 FPM.

ii) **EI-filters:** These filters shall have efficiency of 99% down to 3-micron particle size to maintain PM 2.5 inside the space.

iii) **MERV8 filter**: It includes corrosion resistant frame, Pleated Synthetic media sandwich in HDPE and metallic mesh, For lower carbon footprint; Initial Pressure Drop (IPD) </=50 Pa (+/- 5Pa), final Pressure drop (FPD) should not be less than 250 Pa, Ease of maintenance.

iv) **MERV14 filter**: It includes Media shall be made of micro glass fibers with a water repellent binder and shall be a dual density construction with coarser fibers on the air entering side and finer fibers on the air leaving side. The molded end panels are to be made of high impact polystyrene plastic and center support members shall be made of high impact plastic. No metal components are to be used.For lower carbon

footprint; Initial Pressure Drop (IPD </= 75 Pa (+/- 10%) and final pressure drop shall not be less than 450Pa. Multiple mini-pleat media packs, assembled into a series of V-banks, permit substantially more media to be contained in the filter — up to 60% more than standard rigid cartridge filters. Maximum effective media area provides greater airflow capacity, low resistance, high dust holding capacity, and unusually long service life.

1.2.4 INSTRUMENTS AND VALVES

The following instruments shall be provided at the specified locations in the AHUs for the dual, chilled water water system and cooling coil:

i) Pressure gauges at the inlet and outlet of the coil with tubing and gauge cock
ii) Thermometers at the inlet &outlet of coil with tubing & gauge cock
iii) Butterfly valve at the inlet and outlet of coil
iv) PICV valve at the outlet of coil
v) Y-strainer at the inlet of coil
vi) Cooling coil connected to vrf outdoor units

1.2.5 INSTALLATION

The air handling unit shall be so installed as to transmit minimum amount of vibration to the building structure. Adequate vibration isolation shall be provided by use of rubber/ neoprene pads and/or vibration isolation spring mountings.

PART V-DUCTING

1. Factor fabricated (As per SMACNA):

This section deals with supply, erection, testing & balancing of GI sheet metal duct work and air registers conforming to specifications as given below:

Duct Material

All the ducts shall of LFQ (Lock Forming Quality) grade prime G.I. raw material furnished with accompanying Mill Test Certificates. Galvanizing shall be 120gms/Sq.m (total coating on both sides).

In addition, if deemed necessary, sample of raw material, selected at random by owner's site representative shall be subject to approval and tested for thickness and zinc coating at contractor's expense.

The G.I. raw material should be used in coil-form (instead of sheets) so as to limit the longitudinal joints at the edges only, irrespective of cross-section dimensions.

Governing Standards:

Unless otherwise specified here, the construction, erections, testing and performance of the ducting system shall conform to the SMACNA standards and Addendum of SMACNA

Duct connectors and Accessories:

All the transverse duct connectors (Flanges\Cleats) and accessories related hardware such as support system shall be zinc coated (galvanized).

Fabrication standards:

All the ductwork including straight sections, tapers, elbows, branches, shoe pieces, collars, terminal boxes and other transformation pieces shall be factory-fabricated. Equivalency will require fabrication by utilizing the following machines and process to provide the requisite quality of ducts and speed of supply.

Coil lines to ensure location of longitudinal seams at corners\folded edges only to obtain the required duct rigidity and low leakage characteristics. No longitudinal seams permitted along any side of the ducts.

All ducts, transformation pieces and fittings shall be made on CNC profile cutters for required accuracy of dimensions, location and dimensions of notches at the folding lines.

All edges shall be machines treated using lock-formers and rollers for furning up edges.

Selection of G.I. and Transverse Connectors:

- Duct construction shall be in compliance with 1" (250 Pa) w.g. static norms as per SMACNA.
- All transverse connectors shall be 4-bolt system.
- To avoid any leakage additional sealant shall be used.
- The specified class of transverse connectors and duct gauge for a given duct dimensions shall be 1" (250 Pa) pressure class.
- Non-toxic, AC-application grade P.E. or PVC gasketing shall be provided between all mating flanged joints. Gasket sizes shall conform to flange manufacturer's specification.

Duct construction

The fabricated duct dimensions shall be as per approved drawings and all connecting sections shall be dimensionally matched to avoid any gaps.

Dimensional Tolerances: All fabricated dimensions shall be within + 1.0mm of specified dimension. To obtain required perpendicularity, permissible diagonal tolerance shall be +1.0mm per meters.

Each duct pieces hall be identified by coded sticker, which shall indicate specific part number, job name, drawing number, duct sizes and gauge.

Ducts shall be straight and smooth on the inside. Longitudinal seams shall be airtight and at corners, which shall be either Pittsburgh or snap button punch as per SMACNA practice, to ensure air tightness.

Changes in dimensions and shape of ducts shall be gradual (between 1:4 and 1:7) turning vanes or air splitters shall be installed in all bends and duct collars designed to permit the air to make the turn without appreciable turbulence.

Plenum shall be factory fabricated panel type and assembled at site.

Factory fabricated ducts shall have the thickness of the sheet as follows and length of the piece not more than 1200mm and should have beading at every 300mm.

Recommended SMACNA standard at 4 feet Transverse Joint Reinforcement

Duct Static Pressure In Inches	**1”**	**2”**	**3”**	**4”**	**6”**
Duct Size (mm)					
150-250	B-26	B-26	B-26	B-26	C-26
251-300	B-26	B-26	B-26	C26	C-24
301-350	B-26	C26	C26	C26	C-24
351-400	B-26	C26	C26	D-26	D-24
401-450	C26	C26	C26	D-26	E-24
451-500	C26	C26	D-24	D-24	E-24
501-550	C26	C26	D-24	E-24	F-22
551-600	C26	D-26	E-24	E-24	F-22
601-650	C26	D-26	E-24	E-24	F-22
651-700	C26	D-26	E-24	F-22	G-22 R
701-750	C26	E-24	E-24	F-22	G-20
751-900	D-26	E-24	F22	G-22 R	H-20 R
901-1000	E-24	F-22	G-22R	H-20 R	I-18
1001-1200	E-24	G-22	H-20R	I-18	I-18
1201-1300	F-22	H20	I-18	I-18	J-18 R
1301-1500	F-22	H-20 R	I-18	I-18 R	-
1501-1800	H-22	I-18	J-18 R	-	-

Duct Static Pressure In Inches	1"	2"	3"	4"	6"
1801-2100	I-20	J-18 R	-	-	-
2101-2400	I-18	J-18 R	-	-	-
2401-2700	I-18	-	-	-	-

Note: SMACNA - sheet Metal & Air Conditioning Contractor National Association Inc. "HVAC Duct construction standard metal & flexible"- Third Edition 2005 USA.

In 1" static pressure i.e. comforts cooling application optional "C&S and C&SS cleats joints can be used Upto 450mm duct size use C&SS cleats.

Over 750 mm duct size use TDF/TDC flanges with respective gauges as mentioned above.

Alphabets B, C, D, E, F, G, H, I and j per SMACNA 2005, transverse joint reinforcement table 1-12m (T-25b flanged) and TDC addendum.

R means reinforcement with Zeebar Stiffener / Joint Tie Rod /Mid Tie Rod.

The gauges, joints and bracing for sheet metal ductwork shall further conform to the provisions as shown on the drawings.

Ducts larger than 600 mm shall be cross broken, duct sections up to 1200 mm length may be used with bracing angles omitted

Changes in section of duct work shall be affected by tapering the ducts with as long a taper as possible. All the branches shall be taken off at not more than 45 DEG. Angle from the axis of the main duct unless otherwise approved by the Engineer-in-charge.

* Ducts 2250 mm and larger require special field study for hanging and supporting methods.

In addition to above the following points should be also taken into account while fabrication of ducts.

- All ducts of size larger than 450mm shall be cross broken.
- All ducts shall be supported from the ceiling / slab by means of MS rods of dia 9mm with MS angle of size 40 x 40 x 5 mm at the bottom with neoprene pad in between the duct & MS angle. The ducts shall be suspended from the ceiling with the help of dash fasteners. Provision for necessary ancillary materials required for hanging the ducts shall be arranged by the contractor.
- The vanes shall be provided wherever required and shall be securely fastened to prevent noise & vibration.
- The rubber gasket shall be installed between duct flanges in all connections and joints.
- All flanges and supports should be primer coated.
- The flexible joints shall be fitted to the delivery side of AHU fans with Fire Retardant Double canvass. The length of flexible joints should not be less than 150 mm and not more than 300 mm between faces.
- The ducting work can be modified if deemed necessary in consultation with the Engineer in Charge to suit actual site conditions in the building.
- Box Type Dampers & Splitters

  These dampers shall be provided in the ducting work for proper control and balancing of air distribution. All dampers shall be louver type robust construction. These dampers shall be fitted with easily accessible operating mechanism, complete with links, levers, quadrant for proper control and setting in a desired position. The position of the handle of the damper operating mechanism shall be clearly visible and shall indicate the position of the damper in the duct. All dampers, splitters shall be fabricated out of G.S. sheet of two gauges higher than the duct piece having these fittings. Dampers

shall be installed in duct at all required locations. No extra payment shall be made separately since these form part of Air Circulation System.

NOTE: In case angle iron supports are not feasible to be installed for supporting the ducts due to height constraint then the contractor shall support the ducts with M.S flats of at least double the thickness of the angle iron supports.

2. SHEET METAL DUCT (SITE FABRICATED):

GENERAL:

Supply, fabrication, installation and testing of all sheet metal ducts & supply, installation, testing and balancing of all grilles, registers and diffusers, in accordance with these specifications and the general arrangement shown on the drawings.

Duct work shall mean all ducts, casings, dampers, access doors, joints, vanes, stiffeners, hangers and supports etc.

All ducts shall be fabricated according to ASTM 525A from galvanized steel sheets of zinc grade G27 or Z90 of the following thickness as indicated in schedule of quantities & as described in the relevant latest IS code.

RECTANGULAR DUCT:

Dimensions of Ducts	GI sheet		Type of Joints	Type of Bracing
	Thickness (mm)	Gauge		
Upto 600	0.63	24	G.I. Flange at 2.5 Centre	Cross Bracing
601 to 750	0.63	24	-------	------
751 to 1500	0.80	22	25x25x3mm angle iron frame with 8mm dia nuts and bolts.	25x25x3mm M.S. angle bracing at 1500mm from joints.
1501 to 2250	1.0	20	40x40x5mm angle iron be cross braced diagonally with 10mm dia nuts & bolts at 125 centre.	40x40x3mm M.S. angle bracing at 1200mm from joints or 40x40x3 mm M.S. angle diagonal bracing.
2250 and above	1.25	18	50x50x6mm angle iron frame with 10mm dia nuts & bolts at 125 centre.	50x50x3mm M.S. angle bracing at 1200mm from joints or 50x50x3 mm M.S. angle diagonal bracing.

THICKNESS OF SHEET FOR ROUND DUCTS (FROM ISS: 655):

Diameter of Duct (mm)	Thickness of sheet (mm)	
	G.I. Sheets	Aluminium sheets
150 to 500	0.63	0.80
501 to 750	0.80	0.80
751 to 1000	0.80	1.00
1001 to 1250	1.00	1.50
1251 and above	1.25	1.80

Sheet metal ducts shall be fabricated out of galvanized steel sheets conforming to BIS 655, BIS 277, BIS 737. Sheets used shall be produced by Hot dip process and galvanizing shall be Class VIII.

HANGERS FOR DUCT:

Duct Size (mm)	Spacing (M)	Size of MS angle (mm x mm)	Size of rod dia (mm)
Upto 750	2.4	25 x 3	8
751 to 1500	2.4	40 x 5	10
1501 to 2250	2.4	50 x 5	12
2251 to above	2.4	50 x 5	12

FABRICATION:

All ducts irrespective of size shall be fabricated and installed in workman like manner, generally conforming to relevant latest IS code.

- Ducts so identified on the drawings shall be acoustically lined with thermal insulation as described in the section `Insulation' and as indicated in schedule of quantities. Duct dimensions shown on drawings are overall sheet metal dimensions inclusive of the acoustic lining, where required and indicated in schedule of quantities.

- Ducts shall be straight and smooth on the inside with neatly finished joints. All joints shall be made air tight.

- Changes in dimensions and shape of ducts shall be gradual. Curved elbows, unless otherwise indicated, shall have a centre line radius equal to one and a half times the width of the duct. Air turns shall be installed in all vanes, arranged to permit the air to make the turn without appreciable turbulence. Suitable vanes shall be provided in duct collar to have uniform/ proper air distribution.

- Ducts shall be fabricated as per details shown on drawings. All ducts shall be rigid and shall be adequately supported and braced where required with standing seams, tees, or angles of sample size to keep the ducts true to shape and to prevent bulking, vibration, breathing or oil canning.

- All sheet metal connections, partitions and plenums required to confine the flow of air to and through 18g GI/16-gauge aluminium, thoroughly stiffened with 25mm x 25mm x 3mm angle iron braces and fitted with all necessary doors as required to give access to all parts of the apparatus. Access Doors shall be not less than 45cm x 45cm in size.

INSTALLATION:

All ducts shall be installed generally as per the drawings and in strict accordance with approved shop drawings to be prepared by the Contractor.

i. The Contractor shall provide and neatly erect all sheet metal work as may be required to carry out the intent, of these specifications and drawings. The work shall meet with the approval of Owner's site representative in all its parts and details.

ii. All necessary allowances and provisions shall be made by the Contractor for beams, pipes, or other obstructions in the building, whether or not the same are shown on the drawings. Where necessary to avoid beams or other structural work, plumbing or other pipes, and/ or conduits, the ducts shall be transformed, divided or curved to one side, the required area being maintained, all as per the site requirements.

iii. If a duct cannot be run as shown on the drawings, the contractor shall install the duct between the required points by any path available, in accordance with other services and as per approval of Owners site representatives.

iv. All duct work shall be independently supported from building structure. Duct shall be supported to the ceiling with the help of anchor fasteners by drilling holes in concrete slab and inserting anchor fasteners and bolts. All horizontal ducts shall be rigidly and securely supported, in approved manner with trapeze hangers formed of MS rods and angle iron under ducts at not greater than 2.4 meter centers. All vertical duct work shall be supported

v. By structural members at each floor.
If duct is passing through in such areas where space between ceiling slab to false ceiling is more than 1500 mm than duct should be supported by wall mounted brackets of 40x40x3 mm angle.

Ducting over furred ceiling shall be supported from the slab above, or from beams, after obtaining approval of Owner's site representative. In no case shall any duct by supported from false ceiling hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other contractors on the building.

vi. Where metal ducts or sleeves terminate in wood work, tight joints shall be made by means of closely fitted heavy flanged collars. Where ducts pass through brick or masonry opening and wooden frame work shall be provided within the opening and crossing ducts provided with heavy flanged collars on each side of wooden frame work, so that duct crossing is made leak-proof.

vii. All ducts shall be totally free from vibration under all conditions of operation. Whenever duct work is connected to fans, air handling units or blower coil units that may cause vibrations in the ducts, ducts shall be provided of closely woven, rubber impregnated double layer canvas or neoprene coated fibre glass fire resistant flexible connection. The flexible connections located close to the unit, in mutually perpendicular directions. The flexible sleeve at least 10cm long securely bonded and bolted on both sides. Sleeve shall be made smooth and the connecting duct work rigidly held by independent supports on both ends. The flexible connection shall be suitable for pressures at the point of installation and shall be class 'O' smoke rated.

viii. Air conditioning unit and exhaust fans shall be connected to duct work by inserting at air inlet and air outlet a double canvass sleeve. Each sleeve shall minimum 150mm securely bolted to duct and the connecting duct work rigidly held in line with unit inlet or outlet and shall be class 'O' smoke rated.

ix. All ducts above 450 mm are to be cross broken to provide rigidity to the ducts.

3. Volume Control Dampers

i) At the junction of each branch duct with main duct and split of main duct, splitter dampers must be provided. Dampers shall be two gauges heavier than gauge of the large duct, and shall be rigid in construction to the passage of air.
ii) The volume control dampers shall be of opposed blade type, lever operated and complete with locking devices, which will permit the dampers to be adjusted and locked in any positions. Quantity of volume control dampers for ducts, plenum and grills shall be covered separately in BOQ.
iii) Automatic and manual volume opposed blade dampers shall be complete with frames and bronze bearings as per drawings. Dampers and frames shall be constructed of 1.6 mm steel and blades shall not be over 225 mm wide. The dampers for fresh air inlet shall additionally be provided with fly mesh screen, on the outside, of 0.8 mm thickness with fine mesh specking.
iv) Wherever required for system balancing, provide a volume balancing opposed blade damper with quadrant and thumb Scroll lock. Provide damper rod and damper block with upset screws. Quantity of volume control dampers shall be covered separately in BOQ.
v) After completion of the duct work, dampers are to be adjusted and set to deliver the required amounts of air as specified on the drawings.
vi) A hinged and gasketed access panel shall be provided on duct work at each control device that may be located inside the duct work.

To be as per standard specification respective to Delhi Scheduled Rates (DSR-Item No.-16.13)

4. Actuator for Motorized Volume Control Damper:

Electronic actuation shall be provided. The actuator shall be direct coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a "V" bolt design with associated "V" shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. Spring return actuators shall have a "V" clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or set screw type fasteners are not acceptable. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable. All spring return actuators shall be capable of both clockwise or counterclockwise spring return operation by simply changing the mounting orientation. Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range. An actuator capable of accepting a pulse width modulating control signal and providing full proportional operation of the damper is acceptable. All actuators shall provide a 2 to 10 VDC position feedback signal. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for AC or more than 8 watts for DC applications. Actuators operating on 120 VAC power shall not require more than 10 VA. Actuators operating on 230 VAC power shall not require more than 11 VA. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb torque capacity shall have a manual crank for this purpose. All proportional actuators shall have an external, built-in switch to allow the reversing of direction of rotation. Actuators shall be provided with a conduit fitting and a minimum three-foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections. Actuators shall be CE certified as meeting correct safety requirements and recognized industry standards. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a 2-year manufacturer's warranty, starting from the date of installation.

5. Fire Dampers

i) Fire dampers shall be provided in all the supply air ducts and return air ducts (where ever provided in the drawings), return air passage in the air-handling unit room and at all floor crossings. Access door will be provided in the duct before each set of fire dampers.

ii) Fire dampers shall be multi blade louvers type. The blade should remain in the air stream in Open position & shall allow maximum free area to reduce pressure drop &noise in the air passage. The blades and frame shall be constructed with minimum 1.6mm thick galvanized sheet &shall be factory fitted in a sleeve made out of 1.6mm galvanized sheet of minimum 400mm long. It shall be complete with locking device, motorized actuator & control panel.

iii) Fire dampers shall be motorized smoke & fire dampers type. It shall be supplied with spring loaded UL (Underwriters Laboratories) stamped motorized link to close fire damper in the event of rise in duct temperature. Fire damper shall also close on receipt of fire alarm signal to cut off air supply instantaneously. An electric limit switch shall also be operated by the closing of fire damper, which in turn shall switch off power supply to AHU blower motor as well as strip heaters.

iv) Fire dampers shall be CBRI tested &certified for 90 minutes rating against collapse & name penetration as per UL 555-1995(Under writers laboratories)

v) Fire dampers shall be compatible with the fire detection system of building & shall be capable of operating automatically through an electric motor on receiving signal from fire alarm panel.

vi) Necessary wiring from fire alarm panel up to AHU electric panel shall be provided by the lead contractor& further from AHU electric panel to fire damper shall be provided by sub-contractor.

6. Actuator for Motorized Fire/Smoke Damper:

Electronic actuation shall be provided with spring return mechanism. The actuator shall be direct coupled over the shaft, enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The fastening clamp assembly shall be of a "V" bolt design with associated "V" shaped toothed cradle attaching to the shaft for maximum strength and eliminating slippage. All actuators shall have a "V" clamp assembly of sufficient size to be directly mounted to an integral jackshaft of up to 1.05 inches when the damper is constructed in this manner. Single bolt or set screw type fasteners are not acceptable. The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. Mechanical end switches or magnetic clutch to deactivate the actuator at the end of rotation are not acceptable. For power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing. Non-mechanical forms of fail-safe operation are not acceptable. All actuators shall be capable of both clockwise and counterclockwise spring return operation by simply changing the mounting orientation. All 24 VAC/VDC actuators shall operate on Class 2 wiring and shall not require more than 10 VA for holding and 30VA for running in AC applications. Actuators operating on 230 VAC power shall not require more than 17 VA for holding and 30VA for running. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for manual position of dampers. All actuators should be form-fit with minimum IP54 degree of protection. Actuators shall be provided with a conduit fitting and a minimum three-foot electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections. Actuators shall be either CE or UL555 certified as meeting correct safety requirements and recognized industry standards. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque and shall have a 2-year manufacturer's warranty, starting from the date of installation. All actuators should be maintenance free.

7. Access Panels:

A hinged and gasket access panel shall be provided on duct work at each control device that may be located inside the duct work.

8. Miscellaneous:

i) All ducts above 450 mm are to be cross broken to provide rigidity to the ducts.
ii) All duct work joints are to be true right angle or approaching with all sharp edges removed.
iii) Smoke rated sponge rubber gaskets also to be provided behind the flange of all grilles.
iv) Each branch from the duct, leading to a grille, shall be provided with an air deflector to divert the air into the grille through the branch.
v) Inspection doors measuring at least 450 mm x 450 mm are to be provided in each system at an appropriate location, as directed by Project Manager/Engineer-in-charge/Consultants.
vi) Diverting vanes must be provided at the bends exceeding 600 mm and at branches connected into the main duct without a neck.
vii) Proper hangers and supports should be provided to hold the duct rigidly, to keep them straight and to avoid vibrations. Additional supports are to be provided where required for rigidity or as directed by Project Manager/Engineer in charge/Consultants.
viii) The ducts should be routed directly with a minimum of directional change.
ix) The duct work shall be provided with additional supports /hangers, wherever required or as directed by the directed by Project Manager/Engineer in charge/Consultants, at no extra cost.
x) All duct supports, flanges, hangers and damper boxes etc. shall be either zinc coated or given 2 coats of anti-corrosion red oxide paint before installation and one coat of aluminum paint after the erection, at no extra cost.
xi) All angle iron flanges to be welded electrically and holes to be drilled.
xii) All the angle iron flanges to be connected to the GSS ducts by rivets at 100 mm centers.
xiii) All the flanged joints, to have a 3 mm neoprene rubber gasket to the flanges with Adhesive.
xiv) The G.S.S. Ducts should be lapped 6 mm across the flanges.
xv) The ducts should be supported by approved type supports at a distance not exceeding 2.4 meters and at every vertical floor penetration.
xvi) Sheet metal connection pieces, partitions and plenums required shall be constructed of 1.25 (18 gauge) sheet thoroughly stiffened with 25 mm x 25 mm angle iron braces and fitted with access doors.
xvii) Readymade (factory fabricated) flanges shall be used for all ducting.
xviii) All duct joints shall be filled up by silicon.
xix) All duct penetrations in fire rated walls and slabs shall be filled up by fire resistant materials of fire rating not less than fire rating of wall / slab.
xx) All ducts immediately behind the grilles/diffusers etc. are to be given two coats of black paint in matt finish unless noted otherwise.
xxi) Wherever ducts are acoustically lined the duct size shall be increased by the thickness of the duct lining.
xxii) Wherever MVCDs are provided, an access door shall be provided for the maintenance.

9. Air Outlet and Inlets (Supply and Return)

i) All air outlets and intakes shall be made of extruded aluminum sections & shall present a neat appearance and shall be rigid with mechanical joints.
ii) Square and rectangular wall outlets shall have a flanged frame with the outside edges returned or curved 5 to 7 mm and fitted with a suitable flexible gasket between the concealed face of the flanges and the finished wall face. The core of supply air register shall have adjustable front louvers parallel to the longer side to give upto 22.5 degrees vertical deflection and adjustable back louvers parallel to the shorter side to achieve a horizontal spread air pattern to at least 45 degrees. Return air grilles shall have only front louvers. The outer framework of the grilles shall be made of not less than 1.6 mm thick aluminum sheet. The louvers shall be of aero foil design of extruded aluminum section with minimum thickness of 0.8mm at front and shall be made of 0.8mm thick aluminum sheet. Louvers may be spaced 18 mm apart.

iii) Square and rectangular ceiling outlets/intakes shall have a flange flush with the ceiling into which it is fitted or shall be of anti-smudge type. The outlets shall comprise an outer shell with duct collar and removable diffusing assembly. These shall be suitable for discharge in one or more directions as required. The outer shell shall not be less than 1.6 mm thick extruded section aluminum sheet. The diffuser assembly shall not be less than 0.80 mm thick extruded aluminum section.

iv) Circular ceiling outlets/intakes shall have either flush or anti smudge outer cone as specified in the tender specifications. Flush outer cones shall have the lower edge of the cone not more than 5 mm below the underside of the finished ceiling into which it is fitted. Anti-smudge cones shall have the outer cone profile designed to reduce dirt deposit on the ceiling adjacent to the air outlet. The metal sheet used for construction of these shall be minimum 1.6 mm thick extruded aluminum sheet.

v) Linear diffusers shall have a flanged frame with the outside edges returned 3.5 mm and shall have one to four slots as required. The air quantity through each slot shall be adjustable. The metal sheet used for the construction of these shall be minimum 1.6 mm thick extruded aluminum sheet.

vi) Grilles and diffusers constructed of extruded aluminum sections shall have grille bars set straight, or deflected as required. These shall be assembled by mechanical interlocking of components to prevent distortion. These grilles and diffusers shall have a rear set of adjustable blades, perpendicular to the face blades for deflection purposes.

vii) All supply air outlets shall be fitted with a **VOLUME CONTROL DEVICE**, made of extruded aluminum gate section. The blades of the device shall be mill finish/ block shade pivoted on nylon brushes to avoid rusting & rattling noise, which shall be located immediately behind the outlet and shall be fully adjustable from within the occupied space without removing any access panel. The volume control device for circular cutlets shall be opposed blade radial/shutter type dampers, or two or more butterfly dampers in conjunction with equalizing grid. Opposed blade dampers shall be used for square and rectangular ceiling/ wall outlets and intakes.

viii) All the products supplied by contractor should supplement 'in performance by selection curves of product ratings from the manufacturer.

ix) Laminar supply air diffusers shall be made of 2mm thick powder coated aluminum sheet duly insulated with 5mm thick dosed cell polyethylene foam insulation having factory laminated aluminum foil and joints covered with self-adhesive aluminum tape and having holes 2/3 mm dia. including frame work.

x) <u>STAINLESS STEEL GRILLS (Wherever applicable)</u>

Stainless Steel supply grilles shall be as per the sizes and mounting types shown on the plans and schedule. The deflection blades shall be available parallel to the short dimension of the grille.

Construction shall be of stainless steel with a 1 3/8-inch wide border on all sides. Screw holes shall be countersunk for a neat appearance. Corners shall be welded with full penetration resistance welds.

Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published test performance data. Blades shall be spaced on ¾-inch centers. Blades shall have friction pivots on both ends to allow individual blade adjustment without loosening or rattling. Plastic blade pivots are not acceptable.

Optional opposed-blade volume damper shall be constructed of heavy gauge steel, aluminum, or 304 stainless steel. Damper must be operable from the face of the grille.

The manufacturer shall provide published performance data for the grille. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

10. Fresh Air Intakes

i) Fresh air intake is taken through HRW.
ii) Branch is connect to HRW header duct and adjustable damper need to be added at the other end. grills/Louvers shall be made of extruded aluminum sections.

11. Back Draft Dampers

The dampers shall be installed at the outlet of the unit. The damper should be air-tight and should be in a position to prevent back flow. Dampers shall be opposed blade in 18G and 20G blades in G.I construction. Damper shall be operated manually through lever and constructed with suitable links and levers.

12. Testing:

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 balancing of air quantities thorough each air outlet shall be recorded and submitted to Consultant/Client for approval.

All ducts will be pressure tested for leakage. The entire ducting shall be tested for leakage with help of soap solution if required. The Contractor shall arrange, on his own, duct leakage system required for pressure testing of duct.

The ducting work shall be completed with inspected chamber as per US standard for taking out samples and inside duct cleaning shall be provided at required length.

Test and Balance report shall be submitted after proper testing and balancing of the system.

Bending Radius:
All bends should be made as large as possible and should have a radius of not less than the diameter of the duct in use. This reduces un-favorable pressure losses and is particularly important for metal-based products which are more susceptible to stress rupturing. Double bends should be avoided, however if un-avoidable, ensure that each radius is not less than R = 2 x D.

Straps:
The hanging straps should support the flexible duct with a minimum of half the circumference surface in contact, and without reducing the effective inside diameter of the duct. It is also recommended that the minimum width of material to be used for the hanging straps should be at least 25mm.

Flexible Duct to Conventional Duct Connection:
Extra care should be taken when making flexible connection to fix conventional ducts, etc., and ensure that they do not become too stressed. An additional support is recommended to obviate this potential problem.

Metal based flexible duct products are particularly prone to fracturing due to stress caused as a result of sharp connections.

Steel Wire Rope Hangers & Supports:
Wire Hangers shall be used to suspend all static HVAC Air Distribution services.

Wire Hangers should consist of a pre-formed wire rope sling with a range of end fixings to fit various substrates and service fixings, these include a ferruled loop, permanently fixed threaded M6 (or M8, M10) stud, permanently fixed nipple end with toggle, at one end or hook or eyelet, cladding hook, barrel, wedge anchor, eyebolt anchor or any other end fixture type or size as per manufacturers recommendation and

design. The end fixings and the wire must be of the same manufacturer with several options available. The system should be secured and tensioned with a Hanger self-locking grip (double channel lock)at the other end. Once the grip is locked for safety purpose unlocking should only be done by using a separate setting key and should not be an integral part of the self-locking grip. Only wire and/or supports supplied and/or approved, shall be used with the system.

a. Wire Hangers should have been independently tested by Lloyds Register. APAVE, TUV, CSA, Chiltern International fire, ADCAS, Intertek, ECA, and SMACNA, approved by CSA and comply with the requirements of DW/144 and BSRIA – wire Rope Suspension systems. Wire rope should be manufactured to BSEN 12385: 2002

b. The contractor shall select the correct specification of wire hanger to use for supporting each particular service from table 1 below. Each size is designated with a maximum safe working load limit (which incorporates a 5:1 safety factor).

The correct specification of wire hanger required is determined using the following formula.

Weight per meter of object suspended (kg) X distance between suspension points (m) = weight loading per Hanger suspension point (kg).

Where the installed wire rope is not vertical then the working load limit shall be reduced in accordance with the recommendations give in the manufacturer's handbook.

The contractor shall select the correct length of wire rope required to support the service. Specials can be made, check with manufacturer. No in–line joints should be made in the rope.

The standard range of Hanger Kits should contain galvanized high tensile steel wire rope or stainless-steel wire rope as per the application, the minimum specification is as above and should be manufactured to BS 302 (1987), BSEN12385. Comply with manufacturer's load ratings and recommended installation procedures. Note the testing is done to the minimum breaking load of the wire thus giving a minimum safety factor of 5: 1.

HVAC Supports – Hanger Supports are suitable for: Rectangular duct, Spiral Duct, Oval Duct, Fabric Duct, Desertification fans, Air Conditioning Units, Plenum Boxes, Fan Coil Units, Diffusers.

13. Ducting Supports:

All ductwork shall be independently supported from building construction. All horizontal ducts shall be rigidly and securely supported, in an approved manner, with hangers formed of galvanized steel wire ropes and galvanized steel angle/channel or a pair of brackets, connected by galvanized steel wire hangers under ducts, rigid supports may be provided at certain interval if need be. The spacing between supports should be not greater than 2.4 meter. All vertical ductwork shall be supported by structural members on each floor slab. Duct supports may be through galvanized steel insert plates or Toggle end wire fixing left in slab at the time of slab casting. Galvanized steel cleat with a hole for passing the wire rope hanger shall be welded to the plates. Trapeze hanger formed of galvanized steel wire rope shall be hung through these cleats. Wherever use of metal insert plates is not feasible, duct support shall be through dash/anchor fastener driven into the concrete slab by electrically operated gun. Wire rope supports shall hang through the cleats or wire rope threaded studs can be screwed into the anchor fasteners. In case of PEB structure Loop and Catenary system can be used based on the site conditions as per approved suspension system drawings.

All horizontal ducts shall be adequately secured and supported. In an approved manner, with trapeze Hangers formed of galvanized steel wire rope in a cradle support method (refer to typical drawings) under ducts at no greater than 3000mmcentre, for 3001mm-above appropriate size angle along with neoprene pad in between the duct & MS angle should be used with prior approval. All vertical duct work shall be supported by structural

members on each floor slab. Duct support shall be through dash / anchor fastener driven into the concrete slab by electrically operated gun. Hanger wires shall then hang around the ducting. Rigid supports shall be used in conjunction with wire rope hangers to assist with alignment of services where recommended for by the manufacturer. Rigid support must also be used in conjunction with wire rope hangers with duct work at each change of direction or connection or as per approved drawings. Support ducting in accordance with Schedule I at the end of this Section. In cases of Spiral ducting the wire can be wrapped directly around the ducting without the need for a spiral ducting clamp for sizes above 1100 a cradle support should be provided, refer to manufacturer's recommendations.

Ducting over furred ceiling shall be supported from the slab above or from beams after obtaining approval of Construction manager/consultant. In no case shall any duct be supported from false ceiling Hangers or be permitted to rest on false ceiling. All metal work in dead or furred down spaces shall be erected in time to occasion no delay to other Contractor's work in the building. All supports of pipe shall be taken from structural slab/wall by means of fastener.

14. Measurement for Ducting and Grilles/Diffusers

- Unless otherwise specified, measurements for ducting for the project shall be on the basis of centre-line measurements described herewith:

- Duct Work shall be measured on the basis of external surface area of ducts. Duct measurements shall be taken before application of the insulation. The external surface area shall be calculated by measuring the perimeter comprising overall width and depth, including the corner joints, in the centre of each duct section, multiplying with the overall length from flange face to flange face of each duct section and adding up areas of all duct sections. Plenums shall also be measured in similar manner.

- For tapered rectangular ducts, the average width and depth shall be considered for perimeter, whereas for tapered circular ducts, the diameter of the section midway between large and small diameter shall be adopted, the length of tapered duct section shall be the centre line distance between the flanges of the duct section.

- For special pieces like bends, tees, reducers, branches and collars, mode of measurement shall be identical to that described above using the length along the centre line.

- The quoted unit rate for external surface of ducts shall include all wastage allowances, flanges and gaskets for joints, nuts and bolts, hangers and angles with double nuts for supports, rubber strip 3 mm thick between duct and support, vibration isolator suspension where specified or required, inspection chamber / access panel, splitter damper with quadrant and lever for position indication, turning vanes, straightening vanes, and all other accessories required to complete the duct installation as per the Specifications. These accessories shall NOT be separately measured nor paid for.

- Special Items for Air Distribution shall be measured by the cross-section area perpendicular to air flow, as identified herewith:

- Grilles and registers - width multiplied by height, excluding flanges. Volume control dampers shall form part of the unit rate for registers and shall not be separately accounted.

- Diffusers - cross section area for air flow at discharge area excluding flanges. Volume control dampers shall form part of unit rate for supply air diffusers and shall not be separately accounted.

- Linear diffusers - shall be measured by cross-sectional areas and shall exclude flanges for mounting of linear diffusers. The supply air plenum for linear diffusers shall be measured with ducting as described earlier.

- Flexible connection - shall be measured by their cross-sectional area perpendicular to the direction of air flow.
- Fire Damper-shall be measured by their cross-sectional area perpendicular to the direction of air flow and actuators shall be on counting basis.

PART VI- WATER PLUMBING WORK

1.1 SCOPE

This chapter covers the requirements of plumbing work in chilled water, hot water, water in condenser circuit, **Refrigerant Plumbing and drains**, to be executed as part of heating, ventilating and air conditioning.

1.2 HYDRONIC DESIGN

Pipe sizes shown in tender documents are purely for contractor's guidance. The contractor shall be responsible for selection of sizes as per detailed engineering to be done by him. Plumbing design to be done by the Air-conditioning contractor shall conform to the following:

i) Water velocity in pipes shall not exceed 2.5 m/sec.
ii) Butterfly/Ball valves shall be provided at
    a. Suction and delivery sides of pumps
    b. Inlet and outlet of each condenser, chiller, cooling tower, hot water generator, AHU, TFA, CSAHU Cooling/Heating Coil.
    c. All drain connections from equipments
    d. Inlet & outlet of every heat exchanger coil, namely for CSAHU's, FCU's, convector etc.
iii) Non return (Check) valve shall be provided at the delivery of each pump. This shall be of swing type.
iv) PICV valve shall be provided at the outlet side of chiller, condenser, heating and cooling coils to regulate the maximum flow rate up to value preset as desired.
v) Air vent valves shall be provided at all high points in the piping system for venting with a size of 25 mm for pipes up to 100 mm and 40 mm for larger pipes.

1.3 PIPE MATERIALS

Pipes shall be of the following materials.

i) Mild steel medium class (Black steel) tube conforming to IS: 1239 for sizes upto 150mm.
ii) Welded black steel pipe, class 2, conforming to IS: 3589, for sizes greater than 150mm. These pipes shall be factory rolled & fabricated from minimum 6mm thick M.S. Sheet for pipes upto 350mm dia. & from minimum 7mm thick M.S. sheet for pipes of 400mm dia. & above.

1.4 PIPE JOINTS

Joints in black steel pipes shall be of any of the following types.

i) Screwed joints and union joints screwed to pipes, upto 25 mm size.
ii) Butt welded joints for pipe sizes above 25mm. electric welding shall be used for sizes 100mm and above.
iii) Flanges joints with flanges as per IS: 6392 for all sizes. Flanges may be steel welded neck type or slip on type welded to pipe, or alternatively screwed type.

1.5 VALVES

i) The material of butterfly valves (Flanged Construction) shall be as under:
    Body - Cast iron
    Disc - Cast Bronze or Stainless Steel
    Seat - Either integral or Nitrile rubber
    O-ring – Nitrile/Silicon
ii) Balancing valve shall be of cast iron flanged construction with Ethylene propylene diene monomer (EPDM)/ Spheroidal Graphite (SG) iron with epoxy coated disc with built in pressure drop measuring facility (pressure test cocks) to compute flow rate across the valve. The test cocks shall be long enough to protrude out of pipe insulation.

iii) Non return valves shall be of gun metal construction upto 65 mm, the metal conforming to class 2 of IS: 778. For 75 mm and above, the valve shall be of bronze or gun metal, body being of cast iron. While screwed or flanged ends may be provided upto 65 mm, flanged ends shall be provided for larger sizes.
iv) Air vent valves shall be of gunmetal body.

1.6 STRAINERS

i) Strainers shall be of 'Y" type or pot type as specified. 'Y' strainers shall be provided on the inlet side of each air-handling unit and pump in chilled water and condenser water circuit. Pot strainers, where specified, shall be provided in return water headers, for chilled water and condenser water if enough floor area is available in the refrigeration plant room, as an alternate to individual Y type strainers with pumps. The strainers shall be designed to the test pressure specified for the gate valves. Filtration area of Y-strainer shall be minimum our times the connecting pipe size.
ii) They shall be provided with equal size isolating gate valves on either side so that the strainers may be cleaned without draining the system.

Strainers shall have a removable bronze/stainless steel minimum 1mm thick screen with 3 mm perforations and permanent magnet. Strainers shall be provided with flanges or threaded sockets as required. They shall be designed so as to enable blowing out accumulated dirt and facilitate removal and replacement of screen without disconnection of the main pipe.

1.7 INSTRUMENTS

a) Pressure gauge of appropriate range and 150 mm. dial size shall be provided at the following locations.
    i. Supply and return of all heat exchange equipments.
    ii. Suction and discharge of all pump sets.
b) The pressure gauge shall be duly calibrated before installation and shall be complete with shut off cocks.
c) Direct reading industrial type thermometer of appropriate range shall be provided at the inlet and outlet of all heat exchange equipments. The thermometers shall be installed in separate wells.
d) Flow meter of orifice type shall be provided for measuring the flow through each condenser and chiller.

1.8 CONDENSATE DRAIN PIPING:

- Pipes used for condensate drain of Split air conditioner and FCU shall be Insulated heavy class PVC pipe duly insulated with 6 mm thick closed cell nitrile rubber tubular insulation & all joints should be Gluing or solvent cementing as per manufacturer recommendation.
- Pipes used for condensate drain of CSAHU, FCU shall be Insulated medium class GI pipe duly insulated with 6 mm thick closed cell nitrile rubber tubular insulation & all joints should be Gluing or solvent cementing as per manufacturer recommendation.

1.9 FLEXIBLE CONNECTIONS

- The Flexible connections shall be flanged type expansion joint. Flanges shall be non-compressible and mechanically strong type and the Neoprene rubber shall be provided in between the flange ends.
- The connections shall work for a temperature range of minus 10°C to 70°C.
- The length and working pressure of bellows shall be as follows:

Nominal Bore (mm)	Length (mm)	Pressure (Bars)
20-25	125	15
32-200	150	15

- Connections shall be provided with control roads to control the excessive elongation or compression of piping systems.

- It shall have torsional movement upto 3° without damage.
- The drain piping shall be medium class galvanized steel as per relevant latest IS code.
- The fittings shall be of 'R' brand or equal forged with screwed connections.
- The gate valves shall be of gun metal as described earlier.
- Pipe crosses shall be provided at bends, to permit easy cleaning of drain line or plugged tees.
- The drain line shall be provided upto the nearest drain trap and pitched towards the trap.
- Drain lines shall be provided at all the lowest points in the system, as well as at equipment, or to remove condensate and water from pump glands.

1.10 INSTALLATION

- The installation work shall be carried out in accordance with the detailed drawings prepared by the Contractor and approved by the Engineer-in-charge.
- Contractor shall utilize the structural provisions for Air-conditioning services wherever provided by the lead contractor in the building and make his own arrangements for additional changes.
- Expansion loops or joints shall be provided to take care of expansion or contraction of pipes due to temperature changes.
- Tee-off connections shall be through equal or reducing tees, otherwise ferrules welded to the main pipe shall be used. Drilling and tapping of the walls of the main pipe shall not be resorted to.
- Wherever reducers are to be made in horizontal runs, eccentric reducers shall be used if the piping is to drain freely, in other locations, concentric reducers may be used.
- Open ends of piping shall be blocked as soon as the pipe is installed to avoid entrance of foreign matter.
- All pipes using screwed fittings shall be accurately cut to the required size and threaded in accordance with IS: 554 and burs removed before laying.
- Piping installation shall be supported on or suspended from structure adequately. The contractor shall design all brackets, saddles, clamps, hangers etc. and shall be responsible for their structure integrity.
- Pipe supports, preferably floor mounted shall be of steel, adjustable for height and prime coated with zinc chromate paint and finish-coated gray. Spacing of pipe supports shall not be more than that specified below:

Nominal Pipe size (mm)	**Spacing (Meters)**
12 and 15	1.25
20 and 25	2.00
32, 40, 50 and 65	2.50
80, 100 and 125	2.50
150 and above	3.00

- Extra supports shall be provided at the bends and at heavy fittings like valves to avoid undue stress on the pipes. Pipe hangers shall be fixed on walls and ceiling by means of metallic or rawl plugs or approved shear fasteners.
- Insulated piping shall be supported in such a manner as not to put undue pressure on the insulation.
- Anti-vibration pads, springs or liners of resilient and non-deteriorating, material shall be provided at each support, so as to prevent transmission of vibration through the supports.
- Pipe sleeves of diameter larger than the pipe by least 50 mm shall be provided wherever pipes pass through walls and the annular spaces shall be filled with felt and finished with retaining rings.
    a. Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe with a 12 mm thick rubber pad or any other resilient material as approved by the Engineer-in-charge.
    b. The space in the floor cut outs around the pipe work (after insulation work where applicable) shall be closed using cement concrete (1:2:4 mix) or steel sheet, from the fire safety

considerations, taking care to see that a small annular space is left around the pipes to prevent transmission of vibration to the structure.

c. Riser shall have suitable supports at the lowest point.

- Where pipes are to be buried under ground, the top of the pipes shall be not less than 75cms from the ground level. Where this is not practicable, permission of the Engineer-in-charge shall be obtained for burying the pipes at lesser depth. The pipes shall be surrounded on all sides by sand cushion of not less than 15cms. After the pipes have been laid and top sand cushion provided, the trench shall be refilled with the excavated soil and any extra soil shall be removed from the site of work by the contractors.
- All pipes and their steel supports shall be thoroughly cleaned and given one primer coat of Zinc chromate before being installed.
- After all the water piping has been installed, pressure tested in accordance with clause 8.13, all exposed piping in the plant room shall be given two finish coats of paint, approved by the Engineer-in-Charge. Similar painting work shall be done over insulated pipe work, valves etc. The direction of flow of fluid in the pipes shall be indicated with identifying arrows.
- 3mm gasket shall be used for flanged joints.
- Cut-outs in floor slabs shall be sealed with cement concrete or steel plate after the plumbing work is done, from the fire safety point of view.

PART VII–REFRIGERANT PIPING WORK

1.1 SCOPE

This chapter covers the requirements of plumbing work in Refrigerant Piping, Normal water and drains, to be executed as part of heating, ventilating and air conditioning.

1.2 PIPING DESIGN

Pipe sizes shown in tender documents are purely for sub-contractor's guidance. The sub-contractor shall be responsible for selection of sizes as per detailed engineering to be done by him. Piping design to be done by the Air-conditioning contractor shall conform that

Plumbing drawings showing the sizes of valves, layout and other details shall be prepared and shall be got approved from the Engineer-in-Charge before the execution of the plumbing

Work.

1.3 REFRIGERANT PIPING

Refrigerant piping shall be designed and installed so as to:

- Ensure circulation of adequate refrigerant at all loads.
- Ensure oil return to crank case of compressor positively and continuously.
- Keep pressure losses within limits, especially in suction lines.
- Prevent oil/liquid refrigerant from entering the compressor when the compressor is working as well as when it has stopped.
- Prevent trapping of oil in evaporator or suction lines, which may return to the compressor in the form of slug.
- The refrigeration system shall be equipped with controls for pump down system so that the evaporator and suction line are emptied before the compressor shuts off, thus preventing liquid refrigerant and oil from entering the compressor when restarted.
- Refrigerant lines shall be sized to limit pressure drop between evaporator and condensing unit to less than 0.2 kg. Per sq.cm. (3 psi).
- Seamless soft copper tubing, type L shall be used to make connections to equipment, wherever required or specified.
- Flare fittings e.g. flare nuts, tees, elbows, reducers etc. shall all be of brass.

All refrigerant piping for the air conditioning system shall be constructed from soft seamless upto 19.1mm and hard drawn copper refrigerant pipes for above 19.1mm with copper fittings and silver-soldered joints. The refrigerant piping arrangements shall be in accordance with good practice within the air conditioning industry, and are to include charging connections, suction line insulation and all other items normally forming part of proper refrigerant circuits.

All joints in copper piping shall be sweat joints using low temperature brazing and or silver solder. Before joining any copper pipe or fittings, its interiors shall be thoroughly cleaned by passing a clean cloth via wire or cable through its entire length. The piping shall be continuously kept clean of dirt etc. while constructing the joints. Subsequently, it shall be thoroughly blown out using nitrogen.

After the refrigerant piping installation has been completed, the refrigerant piping system shall be pressure tested using nitrogen at pressure of 20Kg per sq.cm and 10 Kg per sq.cm (low side). Pressure shall be maintained in the system for 24 hours. The system shall then be evacuated to minimum vacuum if 700mm hg and held for 24 hours.

The air-conditioning system supplier shall be design sizes and erect proper interconnections of the complete refrigerant circuit.

	Pipe Size in mm (OD)	Wall Thickness in mm
a)	41.3	1.4
b)	38.1	1.3
c)	34.9	1.2
d)	31.8	1.1
e)	28.6	1.0
f)	25.4	1.0
g)	22.2	1.0
h)	19.1	1.0
i)	15.9	1.0
j)	12.7	0.8
k)	9.5	0.8
l)	6.4	0.8

The suction line pipe size and the liquid line pipe size shall be selected according to the manufacturers specified outside diameter. All refrigerant pipes shall be properly supported and anchored to the building structure using steel hangers, anchors, brackets and supports which shall be fixed to the building structure by means of inserts or expansion shields of adequate size and number to support the load imposed thereon.

1.4 DX TYPE UNIT DRAIN PIPING:

Condensate from the Indoor 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 rigid PVC pipe of 6 Kg/cm sq. pressure rating with water tight threaded connections. Leading from the Indoor unit to a suitable drain point as per the drawings. Complete drain piping shall be made leak proof and water tight by means of precise installation and the use of leak proof sealant / adhesives.

Drain lines shall be provided at all the lowest points in the system, as well as at equipment, where leakage of water is likely to occur, or to remove condensate and water from pump glands.

1.5 PIPE INSULATION

a. Refrigerant Pipe Insulation

The whole of the liquid and suction refrigerant lines including all fittings, valves and strainer bodies, etc. shall be insulated with 19mm /13 mm thick elastomeric nitrile rubber Class “O”with aluminium foil as specified in BOQ.

b. Drain Pipe Insulation

Drain pipes carrying condensate water shall be insulated with 6 mm thick elastomeric nitrile rubber insulation. For proper drainage of condensate, U Trap shall be provided in the drain piping (wherever required). All pipe supports shall be of pre-fabricated& pre painted slotted angle supports, properly installed with clamps etc.

1.6 BALANCING

i) After completion of the installation, all system shall be adjusted and balanced to deliver the refrigerant quantities as specified and required to meet the cooling in each space.
ii) Testing and Balance report shall be submitted in coordination with the design documents.

1.7 MEASUREMENTS OF PIPING, FITTINGS, VALVES, FABRICATED ITEMS:

1. PIPES: Including refrigerant piping, drain piping and all other piping required to be executed at site for completion of the work:

i) All pipes shall be measured in linear meter (to the nearest cm) along the axis of the pipes and rates shall be inclusive of all fittings and branches e.g. tees, bends, reducers, elbows etc. deduction shall be made for valves in the line.

ii) Exposing reinforcement in wall and ceiling and floors of possible and making good the same or installing anchor fasteners and inclusive of all items as specified in specifications and Schedule of Quantities.

iii) Rates quoted shall be inclusive of providing and fixing vibration pads and wooden pieces, wherever specified or required by Project Coordinator.

iv) Flexible connections, wherever required or specified shall be measured as part of straight length of same diameter, with no additional allowance being made for providing the same.

v) The length of the pipe for the purpose of payment will be taken through the centerline of the pipe and all fittings (e.g. tees, bends, reducers, elbows, etc.) as through the fittings are also presumed to be pipe lengths. Nothing extra whatsoever will be paid for over and above for the fittings for valves and flanges.

2. STRUCTURAL SUPPORTS

Structural supports including supports fabricated from pipe lengths for pipes shall be measured as part of pipe line and hence no separate payment will be made. Rates shall be inclusive of hoisting, cutting, jointing, welding, cutting of holes and chases in walls, slabs or floors, painting supports and other items as described in specifications, drawings and schedule of quantities or as required at site by Project Coordinator.

1.8 EXPANSION OR CONTRACTION:

The contractor shall provide for expansion and contraction of all piping installed by the use of swing connections and expansion loops.

1.9 ARRANGEMENT AND ALIGNMENT OF PIPING (To be coordinated with other Trades):

i) All piping shall be arranged and aligned in accordance with the drawings as specified. Where special conditions are encountered in the field, the arrangement and alignment of piping shall be as directed by the Project Manager/Engineer-in-charge/Consultants.

ii) The piping shall be installed in a uniform manner, parallel to or perpendicular to walls or ceilings, and all changes in directions shall be made with fittings. The horizontal piping shall be run at right angles and shall not run diagonally across rooms or other piping. Wherever possible all piping shall be arranged to provide maximum head room.

iii) All piping shall be installed as directly as possible between connecting points in so far as the work of other trades permits. Where interference occurs with another trade whose work is more difficult to route, this contractor shall reroute his pipes as required to avoid interference, at the discretion of the Project Manager/Engineer-in-charge/ Consultants.

iv) All piping shall be carefully installed to provide for proper alignment, slope and expansion.

v) The stresses in pipe lines shall be guided and pipes shall be supported in such a manner that pipe lines shall not creep, sag or buckle.

vi) The piping shall be grouped wherever practical and shall be installed uniformly in straight parallel lines in either vertical or horizontal positions.

PART VII–MECHANICAL VENTILATION

1.1 SCOPE

This chapter includes supply air fans, exhaust air fans etc.

1.2 CABINET INLINE FANS

i) SCOPE

The scope of comprises of supply, erection, testing and commissioning of inline fans conforming to these specifications and in accordance with the Schedule of Quantities and drawings.

ii) TYPE

Fans shall be single inlet single width (SISW) type / Double Inlet Double Width (DIDW). Fan shall have directly driven forward curved centrifugal impeller, running in a metal scroll balanced to give quiet and vibration free operation. Fan motor assembly shall be statically and dynamically balanced.

The fan shall be assembled in such a manner that the motor and impeller can be easily removed and reinstalled after servicing.

The air handling capacities, maximum motor H.P., Static pressure shall be as shown on Drawing and in Schedule of Quantities.

iii) MATERIAL

a) Fans casing shall be manufactured from galvanized steel sheets.
b) All other metal parts shall be hot dip galvanized.

iv) MOTOR

a) The fan motor shall be equipped with motor with speed regulator giving volume control from 0 to 100% of output.
b) Motors shall be with class 'F' insulation wired to an externally mounted weather proofed terminal box.
c) Motor name plate horsepower shall exceed brake horsepower by minimum of 10%. Motor shall be designed especially for quiet operation and motor speed shall not exceed 1500 RPM.

v) INSTALLATION

a) Fan shall have rigid supports and fitted to both ends of the casing.
b) Wherever the fans are to be suspended from ceiling or mounted on the wall, the contractor shall include supply and fixing of all the material that may be required to complete the installation in all respect.
c) Fan inlet and outlet connections shall be by means of flexible canvas connections.

vi) TESTING

Fan after installation shall be tested for capacities, power consumption, noise level and vibration and results shall confirm to the approved data furnished by the contractor.

vii) ELECTRIC POWER CONSUMPTION

Single phase, 220 V, 50 Hz power supply point within 2 meter from the fan shall be available. All further wiring shall be in the scope of the HVAC contractor.

PART VIII- INSPECTION, TESTING AND COMMISSIONING

1.1. SCOPE

This chapter covers initial inspection and testing of All major equipment's such as VRV/VRF, Air handling units, panels, fans shall be got inspected by the engineer in charge / customer at works by the AC contractor, if he so desires. All routine and Type tests shall be carried out and the test reports shall be submitted for approval before dispatch. The engineer in charge is free to witness any or all tests. In any case the OEM test certificates shall be submitted to the engineer in charge for verification of the same before the payments for the same can be processed. The AC contractor shall inform the engineer in charge well in time about the date of readiness of the equipment for inspection and testing.

1.2. INITIAL INSPECTION AT MANUFACTURER'S WORKS (IF REQUIRED)

i) Salient features such as model, size, physical dimensions, and other details of various sections, fan motor details, fan dia, static pressure etc. shall be verified against the contract requirements.
ii) Manufacturer's internal test certificates for the motor and air handling unit shall be furnished and scrutinized as per contract requirements.
iii) Test certificate for static and dynamic balancing of the fan/ blower should be furnished. Fan balancing may be witnessed by Engineer-in-Charge or his authorized representative.
iv) Salient features like type, material, no. and gauge of fins and tubes and no. of rows of cooling coil shall be furnished and verified with reference to contract requirements during stage inspection.
v) Hydraulic pressure to the extent of 10 Kgf/sq.cm or pneumatic pressure of 21kgf/ sq.cm shall be applied to cooling coil and this pressure should be maintained for 1 hour and no drop should be observed indicating any leaks.

1.3. VRV/VRF UNITS & FANS

i. Salient features such as model and make shall be checked as per the contract requirement and shall be related with name plate/performance curves.
ii. The manufacturer's test certificate shall be furnished and verified.
iii. The test certificates shall be correlated with the equipment serial no.

1.4. Electric Motor

The motor shall be of approved make. The OEM's test certificates shall be furnished and verified with the name plate and serial no. The requirement shall be as per technical data submitted.

1.5. INITIAL INSPECTION AT SITE

1.5.1. FOR ASSOCIATED WORKS AT SITE:

i) Inspection of raw materials to be used for fabrication and assembly and inspection of Manufacturer's Certificates.
ii) Inspection of welding including welder's qualification as desired by inspection Engineers. Inspection of fabricated items.
iii) Pressure testing of pipe fittings used for the refrigerant and water services.
iv) Pressure testing, leak testing of complete piping network for chilled water and condenser water.
v) Vacuum missing and gas/oil charging for refrigeration system.
vi) Checking of electrical circuits (power & controls) and checking functioning of controls of refrigerant systems and other circuits of air conditioning plant.
vii) Checking of calibration of controls and instrumentation
viii) Performances testing of complete
ix) The above inspection procedure is given for general guidance and information of vendors and inspection of Purchaser/Consultant is strictly not limited to these and Inspection Engineer of Purchaser/Consultant will have full right to have detailed inspection at any stage right from placement of order to completion of project as desired by Inspection Engineer, Co-ordination of Inspection Agency of Purchaser/Consultant with his Factory/Sub-vendor's Factory/Erection Site will be the sole responsibility of successful vendor after placement of order for complete

1.6. FINAL INSPECTION

After completion of entire installation as per specifications in all respects, the AC contractor shall demonstrate trouble free operation of the entire installation simultaneously. The test readings shall be recorded in a mutually acceptable format. All tests shall be carried out by the AC contractor at his own expenses. However necessary utilities such as power and water shall be provided by the owner free of cost.

The tests shall include but will not be limited to the following:

i. To check satisfactory functioning of all equipment installed
ii. Clean all equipment to remove foreign material and construction dirt and dust with Vacuum cleaner.
iii. Verify that the equipment is secure on mounting and supporting devices and that connection for piping, ductwork and electrical are complete.
iv. Verify proper thermal overload protection is installed in motors, starters, and disconnects.
v. Perform cleaning and adjusting specified as per OEM.
vi. Check proper motor `rotation direction and verify fan wheel / pump free rotation and smooth bearing operations.
vii. Reconnect drive system and align belts.
viii. Lubricate bearings, pulleys, belts, and other moving parts with factory recommended lubricants.
ix. Set outside-air / supply air dampers to minimum outside-air setting.
x. Install temporary throw away filters for initial run and finally install clean filters.
xi. Verify manual and automatic volume control, and fire dampers in connected ductwork system are in the full-open position.
xii. Replace fan and motor pulleys as required to achieve design conditions.
xiii. Measure and record motor electrical values for voltage and amperage.
xiv. Shut unit down and reconnect automatic temperature control operators.

xv. Cooling / heating capacity of various Indoor units shall be computed from the measurements of air flow and dry and wet bulb temperatures of air entering and leaving the coil. Flow measurements shall be by a calibrated rotating vane anemometer and temperature measurements by accurately calibrated mercury-in-glass thermometers. Computed ratings shall conform to the specified capacities and quoted ratings. Power consumption shall be computed from measurements of incoming voltage and input current, whereas, noise level at various locations within the conditioned spaces shall be measured by a sound pressure level meter.

NOTE:

i. All measuring instruments such as thermometer, Psychrometers, Pressure gauges, anemometers, Flowmeter, dB Meter, Tong tester, etc. or any other necessary instrument shall be arranged by the AC contractor at his own expense.
ii. The instruments shall be new and shall have a valid calibration certificate from a renowned test lab.
iii. The plant shall be run initially and all equipment's shall be adjusted to give desired results as per contract. Thereafter the plant shall be test run for 96 hours as described above and the readings shall be demonstrated in the required format. The test shall be witnessed by the owners and engineer in charges representative. In case the conditions are not achieved during the initial run test the plant shall be readjusted and the new dates for tests shall be determined. The entire test shall be repeated and satisfactory results shall have to be obtained. Only after satisfactory test the installation shall be taken over by the customer and warranty period for one year shall commence.
iv. The test readings shall be suitably adjusted for the absence of Peak ambient conditions, fouling factor, and available load.
v. The snag list prepared jointly after initial test shall be attended to by the vendor during a maximum of 30 days from the start of warranty period. Failure to do so shall result in corresponding increase of warranty period.

1.7. TESTING REQUIREMENTS AND PROCEDURES

Balancing of all air and refrigerant systems and all tests as called for in the specification shall be earned out by the HVAC contractor in accordance with the specifications and relevant local codes if any. Performance tests of individual equipment and control shall be carried out as per manufacturer's recommendation. All tests and balancing shall be carried out in the presence of Engineer-in-charge or his authorized representative.

The whole system balancing shall be tested with microprocessor based hi-tech instruments with an accuracy ±. 0.5%. The instrument shall be capable of storing data and then down loading into a P.C. The HVAC contractor shall provide a minimum but not limited to the following instruments:

a) Microprocessor based calculation meter to measure DB and WB temperature, RH and Dew point
b) Velocity meter to measure air volume and air velocity
c) Pitot tube -Electronic rotary vane Anemometer
d) Accubalance flow measuring hood

The contractor shall be responsible to provide necessary sockets and connections for fixing of the testing instruments, probes etc.

1.7.1. AIR SYSTEMS

Systems are to be balanced by first adjusting the total flow at the fan, then by adjusting main dampers and branch dampers. Only final minor adjustments are to be made with register and diffuser dampers. Balancing of the air system shall be accomplished without causing objectionable air noise. Baffles and orifice plates required for proper air balance shall be furnished and installed by the contractor. Basically, the following tests and adjustments are required.

i) Test and balance all fan systems to provide proper cfm/ cmh.

ii) Adjust fresh air return air and exhaust dampers to provide proper air quantities in all modes of control.
iii) Test and record fresh air, return air and mixed air temperature at all air handling units. Test and record data at all coils after air and hydronic systems are balanced. Measure wet and dry bulb temperature on cooling coils.
iv) Make point tube transverse at all main supply and return ducts to set proper air quantities. Adjust all zone and branch dampers to proper cfm/cmh.
v) Test and adjust each register, grills, diffuser or other terminals equipment to within 5% of design air quantity. Each opening shall be defined on the test report by size manufacturer's model, room location, design cfm and actual cfm. Outlets shall be adjusted to minimize objectionable drafts.
vi) Test and record static pressure drop across all filters and major coils.
vii) High velocity duct systems shall be tested for leakages. If excessive or audible leakage is detected, the defect shall be repaired by the contractor. Sufficient static pressure readings shall be taken from the air handling units to the terminal units to establish system static pressure.
viii) Test and balance VAV boxes per design document to meet minimum and maximum airflows.

1.7.2. REFRIGERATION SYSTEM

Systems are to be balanced by opening all valves, closing all by-pass and setting all mixing valves to full coil flow. Water systems shall be cleared of Verify that the system has been properly cleaned, flushed and treated before testing. Basically, the following tests and adjustments are required.

1.7.3. BALANCING TOLERANCE:

1. Duct leakage Rates (at operating pressures)

Low pressure ducts (0 to 0.5kPa)	3% of full flow
Medium Pressure Ducts (0.5 to 3kPa)	1% of full flow
High Pressure Ducts (Greater than 3kPa)	1% of full flow

2. Air flow rates

Under 70 L/S	10% of flow
Over/ at 70 L/S	5% of flow

Procedure:

i) Review all pertinent plans, specifications, shop drawings and other documentation to become fully familiar with the systems and their specified and intended performance.
ii) Furnish equipment and instruct sheet metal trade on proper use for conducting duct leakage tests. Conduct first test as a way of instructing the above trades in the presence of the Departments representative.
iii) Test relative barometric pressures in various building area, as deemed necessary by the Department's representative and at least in an areas served by different systems.
iv) Test performance and continuously record on a 24 hour basis, temperature and humidity levels where control equipment is provided for that purpose in certain critical areas.
v) Before commissioning of the equipment, the entire electrical installation shall be tested in accordance with relevant BIS codes and test report shall be furnished by a qualified and authorized person.

1.7.4. REPORTS

Provide 3copies of the complete balancing and testing reports to the department. Report shall be neatly typed and bound suitable for a permanent record. Report forms shall contain complete test data and equipment data as specified and safety measures provided.

1.7.5. FINAL DOCUMENTATION

i) The contractor shall leave the system operating in complete balance with water and air quantities as shown on drawings. Set stops on all balancing valves and lock all damper quadrants in proper position. Secure all automatic damper and valve linkages in proper positions to provide correct operating ranges. Proper damper positions shall be marked on ducts with permanent indication. Notify the department of any areas marginal or unacceptable system performance.

ii) The above tests and procedures are mentioned herein, for general guidance and information only, but not by way of lamination to the provisions of conditions of contract and design/ performance criteria.

iii) Upon commissioning and final handover of the installation, the HVAC contractor shall submit (within 4 weeks) to the engineer-in-charge 6 (six) portfolios of the following indexed and bound together in hard cover ring binder (300 x 450 mm) in addition to the completion drawings.
   a) Comprehensive operation and maintenance manual
   b) Test certificates, consolidated control diagram and technical literature on all controls.
   c) Equipment warranties from manufacturers.
   d) Commissioning and testing reports
   e) Rating charts for all equipment
   f) Log books as per equipment manufacturers standard format
   g) List of recommended spares and consumables
   h) Any special tools required for the operation or the maintenance of the plant shall be supplied free with the plant.

iv) At the close of the work and before issue of final certificate of completion by the Engineer-in-charge, the contractor shall furnish a written guarantee indemnifying the department against defective materials and workmanship for the Defects liability period. The contractor shall hold himself fully responsible for reinstallation or replace free of cost to the department.
   a) Any defective material or equipment supplied by the contractor
   b) Any material or equipment supplied by the department which is proved to be damaged or destroyed as a result of defective workmanship by the contractor.

1.8. SUBMITTALS:

1.8.1. SUBMITTALS SHALL BE SUBMITTED FOR THE FOLLOWING EQUIPMENTS:

i) Ceiling suspended air handling unit
ii) MS chilled water piping
iii) Valves
iv) Slot Diffuser
v) Grille/Diffuser
vi) Ventilation Fan
vii) Starter Panel

1.8.2. REQUIRED SUBMITTAL SHOULD CONTAIN THE FOLLOWING INFORMATION ALSO.

i) System summary sheet
ii) Sequence of operation
iii) Shop drawing indicating dimensions, required clearances and location and size of each field connection
iv) Power and control wiring diagrams
v) System profile analysis including variable speed pump curves and system curve. The analysis shall also include pump, motor and VFD efficiencies, job specific load profile, staging points, horsepower and kilowatt/hour consumption.

vi) Equipment data sheets.

APPENDIX-A (TERMINOLOGY)

I. AIR CONDITIONING
The process of treating air so as to control simultaneously its temperature, humidity, purity, distribution and air movement and pressure to meet the requirements of the conditioned space.

II. DRY-BULB TEMPERATURE
The temperature of air as registered by an ordinary thermometer.

III. WET-BULB TEMPERATURE
The temperature registered by a thermometer whose bulb is covered by a wetted wick and exposed to a current of rapidly moving air.

IV. DEW POINT TEMPERATURE
The temperature at which condensation of moisture begins when the air is cooled at same pressure.

V. HUMIDITY
It is the amount of water vapour present in a certain volume of air.

VI. RELATIVE HUMIDITY
Ratio of the actual water vapor in the air as compared to the maximum amount of water that may be contained at its dry bulb temperature. When the air is saturated, dry bulb, wet bulb and dewpoint temperatures are all equal.

VII. ENTHALPY
A thermal property indicating the quantity of heat in the air above an arbitrary datum in kilo joules per kg of dry air (or in Btu per pound of dry air).

VIII. PSYCHROMETRY

Psychometric is the science involving thermo dynamic properties of moist air and the effect of atmospheric moisture on materials and human comfort. It also includes methods of controlling thermal properties of moist air.

IX. PSYCHROMETRIC CHART

A Psychometric chart graphically represents the thermodynamic properties of moist air. If two properties are known, all the other properties can be determined with the help of psychometric chart.

X. EVAPORATIVE AIR COOLING

The evaporative air-cooling application is the simultaneous removal of sensible heat and the addition of moisture to the air. The water temperature remains essentially constant at the wet-bulb temperature of the air. This is a process in which heat is not added or removed from the air.

XI. POSITIVE VENTILATION

The supply of outside air by means of a mechanical device, such as a fan.

XII. ATMOSPHERIC PRESSURE

The pressure of air exerted on the surface of earth by the atmospheric column is called atmospheric pressure. At sea level, the atmospheric or barometric pressure is 760mm column of mercury (29.92 in Hg/406.8-inch water column/101.325 Kpa).

Generally atmospheric pressure is used as a datum for indicating the system pressures inair-conditioning and accordingly, pressures are mentioned above the atmospheric pressure or below the atmospheric pressure considering the atmospheric pressure to be zero. A 'U' tube manometer will indicate zero pressure when atmospheric pressure is measured.

XIII. INDOOR AIR QUALITY (IAQ)

Indoor air quality refers to the nature of conditioned air that circulates throughout the space/ area where one works or lives, i.e. the air we breathe when we are indoor. IAQ refers not only to comfort which is affected by temperature, humidity and odours but also to harmful biological contaminants and chemicals present in the conditioned space.

Bad Indoor Air Quality can be a serious health hazard. Carbon dioxide (C02) has been recognized by ASHRAE as the surrogate ventilation index or the only measurable variable for the indoor air contaminants.

BUILDINGS RELATED ILLNESSES (BRI)

BRI are attributed directly to the specific air-borne building contaminants like the outbreak of the legionnaire's disease after a convention and sensitivity pneumonitis with prolonged exposure to the indoor environment of the building.

XIV. SICK BUILDING SYNDROME (SBS)

SBS is a term, which is used to describe the presence of acute non-specific symptoms in the majority of people caused by working in buildings with an adverse indoor environment It could be a cluster of complex irritative symptoms like irritation of the eyes, blackened nose and throat, headaches, dizziness, lethargy, fatigue irritation, wheezing, sinus, congestion, skin rash, sensory discomfort from odours, nausea, etc. These

symptoms are usually short-termed and experienced immediately after exposure, and may disappear when one leaves the building.

XV. THERMAL TRANSMITTANCE

Thermal transmission through unit area of the given building unit divided by the temperature difference between the air or some other fluid on either side of the building unit in 'steady state' conditions.

XVI. THERMAL ENERGY STORAGE

Storage of 'Cold Energy' sensible, latent or combination for use in central system for air-conditioning or refrigeration is called thermal energy storage. It uses a primary source of refrigeration for cooling and storing 'Cold Energy' for reuse at peak demand or for backup as planned.

XVII. SHADE FACTOR

The ratio of instantaneous heat gain through the shading device to that through a plain glass sheet of 3mm thickness.

XVIII. SENSIBLE HEAT FACTOR (SHF)

Sensible heat factor is the ratio of sensible heat to total heat, where total heat is the sum of sensible and latent heat.

XIX. SUPPLY AIR

The air that has been passed through the conditioning apparatus and taken through the duct system and distributed in the conditioned space is termed as supply air.

XX. RETURN AIR

The air that is collected from the conditioned space and returned to the conditioning equipment is termed as return air.

XXI. RE-CIRCULATED AIR

The return air that has been passed through the conditioning apparatus before being re-supplied to the space is called re-circulated air.

XXII. DUCT SYSTEM

A continuous passageway for the transmission of air which in addition to the ducts may include duct fittings, dampers, plenums and grilles &diffusers.

XXIII. PLENUM

An air compartment or chamber to which one or more ducts are connected and which forms part of an distribution system.

XXIV. SUPPLY AND RETURN AIR GRILLES &DIFFUSERS

Grilles and diffusers are the devices fixed in the air-conditioned space for distribution of conditioned supply air and return of air collected from the conditioned space for recirculation.

XXV. FIRE DAMPER

A closure which consists of a normally held open damper installed in an air distribution system or in a wall or floor assembly and designed to close automatically in the event of a fire in order to maintain the integrity of the fire separation.

XXVI. SMOKE DAMPER

A smoke damper is similar to fire damper. However, it closes automatically on sensing presence of smoke in air distribution system or in conditioned space.

XXVII. FIRE SEPARATION WALL

The wall provides complete separation of one building from another or part of a building from another part of the same building to prevent any communication of fire of any access or heat transmission to wall itself which may cause or assist in the combustion of materials of the side opposite to that portion which may be on fire.

XXVIII. REFRIGERANT

The fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and low pressure of the fluid and rejects heat at a higher temperature and higher pressure of the fluid, usually involving changes of state of the fluid.

XXIX. GLOBAL WARMING POTENTIAL (GWP)

Global Warming can make our planet and its climate less hospitable and more hostile to human life. It is, therefore, necessary to reduce emission of greenhouse gases such as Co2, Sox, Nox and refrigerants. The potential of are refrigerant to contribute to Global Warming is called its GWP. Long atmospheric life time of refrigerants results in Global Warming unless the emissions are controlled.

XXX. OZONE DEPLETION POTENTIAL (ODP)

The potential of refrigerant or gasses to deplete the Ozone in the atmosphere is called ODP. The ODP values for various refrigerants are as under: -

R-11	1.000
R-12	0.820
R-22	0.034
R·123	0.012
R-134a	Nil

Due to high OPD of 1, R-22 &R-123 their use in the air conditioning and refrigeration is being phased-out.

APPENDIX-B (SCHEDULE OF TECHNICAL DATA)

Contractor should furnish technical data as mentioned below, of the equipment and accessories offered by him as per scheme given in schedule of equipment and Bill of Quantities.

A) FRESH AIR FAN

1. Manufacturer
2. Type
3. Model
4. Overall dimensions (mm)
5. Operating Weight (kg.)
6. No. of fans

7. Outlet velocity (Mts. Per min)
8. Tip speed (Mts per min)
9. Vibration isolator
10. Noise Level at 1 m distance:

B) CEILING SUSPENDED AIR HANDLING UNIT

1.0	Make	
1.1	Casing	
1.2	Coil	
2.0	Type:	horizontal/ vertical
3.0	Dimension	M x M x H (M)
4.0	Cooling coil	
4.1	Coil area	Sq.m
4.2	No. of rows	Nos.
4.3	No. of fins/cm	
4.4	Tube dia (Outer dia)	mm
4.5	Thickness of tube	mm
5.0	Material of casing:	CRCA/GI
6.0	Air quantity at max. Speed And 1 m long duct collar	CMH
7.0	Air quantity at min. Speed And 1.0 m. Long duct collar	CMH
8.0	Whether auxiliary drain pan Provided:	Yes/No.
9.0	Make & model of room thermostat.	

APPENDIX-C (TESTING AND MEASUREMENT NOTES)

A. TEST INSTRUMENTS

1. All instruments for testing shall be provided by the air conditioning contractor.
2. Thermometers used for measurement of temperature of *water l* refrigerant shall have graduation of 0.1 deg C and shall be got calibrated from N.P.L. or any recognized test house beforehand.
3. Thermometers used in the psychrometers shall have graduations of 0.2 deg C and shall be calibrated as at (2) above.
4. Pressure gauges shall also be got calibrated beforehand from a recognized test house.
5. Orifice type of flow meters shall be used for measuring flow rate through the condensers and chillers.

B. CAPACITY COMPUTATIONS

1. Air handling unit (chilled water type):

The capacity shall be computed from the water temperature and water flow measurement a tolerance of + 5% from the tender documents value shall be acceptable in the capacity so computed. Air quantity shall be measured in the supply duct and checked with the quantity specified in the tender documents. A tolerance of ±10% in the air quantity shall be acceptable. The enthalpy difference of air entering and leaving the coil shall be computed from air temperature and recorded.

2. Air handling unit (DX type):
The capacity shall be computed from the air quantity measured in the supply air duct and the enthalpy difference between the air entering leaving coil. Air quantity measured shall be checked with that recorded in the tender documents. A tolerance of ±10% from tender documents value shall be acceptable.

3. For the purpose of system capacity, the refrigeration tonnage obtained from the main refrigeration plant will be accepted.

4. If due to any reason, internal load mentioned in the tender specifications is not available psychometric computations for actual load conditions will, be done and the plant, if found satisfactory will be accepted.

APPENDIX-D (MAINTENANCE)

This section covers the maintenance schedule during 2-year free warranty period and 3 year paid subsequent warranty period.

The maintenance provided during the warranty period shall be fully comprehensive and shall include but not limited to all equipments, labour part and emergency calls providing and site response within 24 hours. However, during the maintenance period after the warranty is over, the materials shall be arranged by the department if any replacement is warranted. However consumable materials shall be arranged by the department during 5 yrs. Period including that of warranty period.

The maintenance shall also include a minimum of 24month preventive maintenance visits by qualified personnel who are thoroughly familiar with the type of equipment and system provided for this project.

APPENDIX – E (PREAMBLE TO SCHEDULE OF QUANTITIES)

1. All items of work under this Contract shall be executed strictly to fulfill the requirement laid down under" Basis of Design" in the specifications. Type of equipment, material, specification, methods of installation and testing and type of control shall be In accordance with the specification, approved shop drawing and relevant Indian Standards, however capacity of each component and their quantities shall as fulfill the above mentioned requirement.
2. The unit rate for all equipment's or materials cost in RUPEES for equipment and material including all taxes and duties and also including forwarding, freight, insurance and transport into Contractor's store at site storage' installation 'testing balancing 'commissioning and other work required.
3. The rate for each item of work included in the Schedule of Quantities shall' unless expressly stated otherwise, include cost of:

i. All materials. Fixing materials. Accessories, appliances tools, plants, equipment transport, labour and incidentals required in preparation for and in the full and entire execution as per Specification and Drawings.
ii. Wastage on materials and labour.
iii. Loading, transporting, unloading, handling/double, hoisting to all levels. Setting, fitting, and fixing in position, protecting, disposal of debris and other labour necessary in and for the full and entire execution and for the job in accordance with the contract documents, good practice and recognize principals.
iv. Liabilities, obligations, and risks arising out of Conditions of Contract.

4. All requirements of Specification, whether such requirements are mentioned in the item or not. The Specification and Drawing where available, are to be read as complimentary to and part of the Schedule of Quantities and any work called for in one shall be taken as required for all.
5. In the event of conflict between Schedule of Quantities and other documents including the Specification, the most stringent shall apply. The interpretation of the Engineer in charge shall be final and binding.
6. All equipment, quantities, and technical data indicated in this Schedule are for Contractor's guidance only; these are based on the documents prepared by the Consultant. This schedule must be read in conjunction with other documents. The Contractor shall be paid for the actual quantity of work executed by him in accordance with the approved Shop Drawing at the contract rates.
7. This Schedule shall be fully priced and the extensions and totals duly checked. The rates for all items shall be filled in INK including NIL items.
8. No alteration whatsoever is to be made to the text or quantities of this schedule unless Consultant authorizes such alteration in writing. Any such alterations, cuts or additions shall unless authorized in writing, be disregarded when tender documents are considered.
9. In the event of an error occurring in the amount of the Schedule, as a result of wrong extension of the unit rate and quantity, the unit rate quoted by the tenderer shall be regarded as firm and the extensions shall be amended on the basis of rates.
10. Any error totaling the amount column and in carrying forward total shall be corrected, any error, in description or in quantity, omission of items from this Schedule shall not vitiate this corrected but shall corrected and deemed to be variation required by the engineer in charge.
11. The Contractor shall procure and bring Materials/ Equipment to the site only on the basis of drawing approved for construction and shop drawings and not on the Contractor's requisition for Engineer in charge supplied materials.

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

Electrical Works

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI
Creating an Ecosystem for Quality

Date: 26th Dec. '2024

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I. PREFACE

A. Tropical Conditions

All equipment/material supplied against respective Specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

- Ambient temperature : 45 degree Celsius
- Annual Average Relative humidity : 50%
- Isokeraunic level (days per year) : 50
- Seismic Zone : Zone-4
- Climate type : Moderately hot and humid tropical, climate, conducive to rust and fungus growth

B. Tolerence and Creepage Distances

Tolerances (on all the dimensions) and creepage distances shall be in accordance with provisions made in the relevant Indian/IEC/BIS standards and in these specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

C. System Particulars

- Secondary system voltage - 415V
- Frequency- 50Hz ±3%
- No. of phases- 3 phase, 4 wire
- System neutral- Solidly earthed

D. General:

The Electrical Installation work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply authority and Fire Insurance regulations so far as these become applicable to the installation.

The scope includes the jobs to be performed for all equipment and materials furnished under this specification. The scope is however not limited to the items detailed below:

- Design, manufacture, testing at manufacturers works packing and dispatch.
- Transportation to site and insurance.
- Receiving at site, unloading, handling, opening, inspecting, reporting and submitting claims in case of damages and short supply items.
- Arranging to repair/re-ordering all damaged and short supply items.

II. SPECIFICATION

A. LT Cables and Terminations

1. Scope

- Supplying, laying, testing and commissioning of 1.1kV grade power cables and control cables suitable for 415V, 3Phase, 50Hz AC supply and also for 230V, 1Phase, 50Hz AC supply.
- Handling, loading, unloading and storage of AC cables.
- Civil works, piping works and ducting works required for cable laying as per tender document.
- Cable termination using double compression brass glands and lugs (cu lugs for cu cables and Al lugs for Al cables) as specified

2. Definitions

The definitions shall be as per IS 7098-Part 1, IEC 60050-461 and IEC 60502-2. Abbreviation used to define the following are stated in front of the entity

Aluminum Conductor - A
XLPE Insulation - 2X
Steel round wire armor - W
Steel strip armor - F
Steel Double round wire armor - WW
Steel Double strip armor - FF
Non-magnetic (A1.) round wire armor - Wa
Non-magnetic (A1.) strip armor - Fa
PVC outer sheath - Y

3. Codes & Standards

The contractor is required to follow all relevant IS and IEC codes as per latest amendments, however in particular following codes may be applied in addition.

- IS 7098-Part 1- Specifications for XLPE insulated thermoplastic sheathed cables, for working voltage up to 1.1kV (including 1.1kV)
- IS-1255 - Code of practice for installation and maintenance of power cable up to 33KV rating
- IEC 60502-1- Standard for cables for rated voltage from 1KV up to 6kV (Um=1.2kV)
- IEC-60050-461- Definitions for cables.
- IEC-60811 - Common test methods for cable insulation.
- IS : 3961- Part 2: Recommended current ratings for cables.
- IS : 8130 Conductors for insulated cables.
- IS : 583 XLPE Insulation and outer sheath of electric cables.
- IS : 10418 Specification for drums for electric cables.
- NEC- 2008 - National electrical code.
- NBC-2016 - National building code.
- IER-1956: Indian electricity rules.
- IEA-2007: Indian electricity act 2007
- Any other local bye-law or supply company norm as applicable.

4. Specifications

- **LT Cables (AC & DC):**

  - ❖ Cables shall be XLPE insulated PVC sheathed, Al or Copper conductor as specified.
  - ❖ Cable shall be heavy duty type.
  - ❖ Stranded Aluminum/Copper conductor shall be used.
  - ❖ All Aluminum/Copper XLPE cables insulation shall be of high grade Cross- linked Polyethylene for insulation for extrusion process. Cores laid up.
  - ❖ The inner sheath shall be bonded over with thermoplastic material for protection against mechanical and electrical damage.
  - ❖ Armoring should be provided over the inner sheath to guard against mechanical damage.
  - ❖ Armoring should be Galvanized steel wires or galvanized steel strips as specified.
  - ❖ In single core cables used in A.C. wires/strips, round steel wires should be used; where diameter over the inner sheath does not exceed 13 mm, flat steel armor should be used.
  - ❖ Insulation shall be of XLPE type as per latest IS general-purpose insulation for maximum rated conductor temp 90 degree C.
  - ❖ The Conductor shall be stranded Aluminum/Copper circular/sector shaped and compacted.
  - ❖ In multi core cables the core shall be identified by red, yellow, blue and black coloring of insulation.
  - ❖ Conductor shall be of electrolytic Aluminum/Copper conforming to IS: 8130 and are compact circular or compact shaped. I

- ❖ In Inner sheath laid up cores shall be bonded over with thermo-plastic material for protection against mechanical and electrical damage.
- ❖ Insulation, inner sheath and outer sheath shall be applied by extrusion and lapping up process only. The outer sheath shall have FRLS properties.
- ❖ Repaired cables or cables made up of re-used copper / aluminium shall not be used.
- ❖ The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground buried installations with uncontrolled back fill and chances of flooding by water.
- ❖ Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables.
- ❖ Both ends of the cables shall be properly sealed with PVC/Rubber caps so as to eliminate ingress of water during transportation, storage and erection.
- ❖ Embossing of outer sheet: the following details on the other sheet of cable at a regular interval of 1(one) meter:
  - ➢ Conductor size, type of insulation and voltage grade.
  - ➢ Manufacturer's name along with ISI mark

- ❖ Typical parameters for AC cables shall be as follows :
  - ➢ Rated Maximum Voltage: 1.1 kV (rms)
  - ➢ Rated Frequency: 50 Hz
  - ➢ Rated Power Frequency Withstand Voltage (1 min): 3 kV (rms)
  - ➢ Rated short time withstand current for 1 sec: as per fault level
  - ➢ Conductor material: Aluminium / Cu. as per cable schedule.

- ❖ Typical parameters for DC cables shall be as follows :
  - ➢ Rated Maximum Voltage: 1.5 kV
  - ➢ Maximum permissible DC voltage : 1.8 kV
  - ➢ Voltage withstand for 5 minutes : 6.5kV
  - ➢ Rated short time withstand current for 1 sec: as per fault level
  - ➢ Conductor material: Aluminium / Cu. as per cable schedule.

- **LT cable termination:**

  - ❖ All cable glands shall be made out of brass and of good quality as approved.
  - ❖ All cable glands shall be of double or single compressions type as mentioned in BOQ for different cable sizes
  - ❖ Termination/ Joining of power and control cables shall be done by means of compression methods using solder less tinned copper or Aluminum terminal lugs.
  - ❖ For control cables terminations, ring tongue or reducer pin type lugs shall be used to suit the purpose.
  - ❖ Proper crimping tools with crimping paste shall be used to maintain proper conductivity and avoid any air gap.

- **Cable Tags:**

  - ❖ Cable tag shall be made out of stainless steel minimum 1.2 mm thick and 25 mm x 100 mm size with holes provided to tag the cable.
  - ❖ Following information shall be engraved in the cable with good quality material and the lettering height shall be 4.5mm
    - ➢ Source of the Cable from where it is supplied power.
    - ➢ Destination where the cable is terminated.
    - ➢ No of cores of cables.
    - ➢ Cross sectional area of the cable
    - ➢ Complete notation as described under definition part of cable specification.

5. Installation, Testing and Commissioning

- Cables shall be stored in a dry covered place to prevent exposure to climate conditions and wear and tear of wooden drums and it should be preferably concrete surface.
- All drums should be stored in such a manner as to leave sufficient space between them for air circulation. It

is desirable for drums to stand on battens directly placed under the flange.

- In no case should the drums be stored “on the flat” i.e. flange horizontal.
- Both ends of the cables shall be properly sealed with PVC/Rubber caps so as to prevent ingress of water, miniaturization of cores and armors during transportation, storage and erection.
- On receipt of cable drums visual inspection of drums should be carried out for any damages to these cables.
- While unloading the cables certain precautions are to be taken to ensure the safety of cables. The cable end to be opened on one side and tested for its insulation and continuity.
- The cable drums should not be dropped or thrown from the trucks/railway wagons etc. during unloading operations as shock may cause serious damage to cable layers.
- A crane may be used for unloading cable drums. While lifting the cable drums with crane, it is recommended that the lagging should be left in place to prevent the flanges from crushing on the cables.
- If crane is not available a ramp should be prepared with approximate inclination of 1: 3 or 1: 4.
- The cable drums should be rolled over the ramp by means of ropes and winches. Additionally a sand bed at the foot of the ramp may be prepared to brake the rolling of the cable drum.
- Cable should not be dragged along the earth surface. Drums should be rolled in the direction of arrow only.
- For laying of cables special care is to be taken to prevent sharp bending, kinking, twisting.
- Cable should be unwound from drum by proper mounting the cable drum on a cable wheel making sure the spindle is strong enough to carry the weight without bending and that it is lying horizontally in the bearings, so as to prevent the drum creeping to one side or the other, while it is rotating.
- The maximum safe pulling force (when pulled by pulling eye) proper and safe method of pulling of cable should be used depending upon the site conditions to avoid any kind of damage to the cables. Following pulling forces to be noted.

    - ❖ Aluminum Conductor cables: 3.0 Kg/mm2
    - ❖ Copper conductor cables: 5 Kg/mm2

- Special care is to be taken while laying cable at bends. Following are the recommended bending radius for power and control cables.

Sr. No.	Voltage rating (kV)	PVC / XLPE cables	
		Multi core	Single core
1	Up to 1.1 kV	12D	15D

D = D is over all diameter of cable.

- Armored cables are to be laid on cable trays/ underground as per relevant design drawing and specifications.
- All flexible cables shall be laid inside exposed / canceled conduits (rigid / flexible)/ raceways or as per relevant design drawing and specifications.
- After the cable trench has been properly excavated and straightened, it shall be covered with 100 mm thick layer of sand, the cable shall then be lifted and placed over the sand cushion.
- It may be planned to lay down the cables in stacks under the trench and under such circumstances, cables shall be laid with the help of angular supports or cable trays suitable to take the load of the cable.
- In case the cable is laid with the help of angular supports inside the trench, such supports shall be provided at a regular intervals so that the cable does not sag due to its weight.
- After laying the cable the complete trench shall be filled with sand / earth up to 200 mm depth from the ground level.
- A layer of silver sand along with a good quality caution tape with warning written in Hindi and regional language shall be laid throughout along the length of the trench at this level to indicate that electrical cables are running below and the area shall not be further excavated without suitable precautions and permissions.
- The complete trench may then be backfilled with earth up to ground level.

- Riggers shall ensure that while laying, the cable should not be subjected to any form of damage. Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable.
- The cables shall not be laid in such a fashion that one cable crosses over the other. Proper spacing shall be left between two cables as mentioned in the GFC or as specified or directed by engineer-in-charge.
- Drain points shall be ensured inside these trenches so that in case of water logging, the water ejects out through these drain points as a result of natural gradient provided.
- Man-holes shall be provided at strategic locations so as to ease the pulling of cables and maintenance. The manhole shall be covered with suitable covers of mentioned material and dimensions as per GFC.
- When laid in cable trays above ground, power cables to be placed at the bottom most layer and control cables at the top most layer. In case of multi core power cables, cables shall be laid side by side with spacing not less than half the diameter of larger cable.
- Multi-core cables shall be clamped by means of mild steel galvanized saddles. All cables below 1.1 KV single core cables if any should be clamped by means of non-magnetic saddles.
- The saddles / clamps shall not be placed at the intervals more than 1500 mm for horizontal and 1200 mm for vertical runs.
- Multi core control cables can be laid touching each other in cable racks and wherever required may be taken in two layers. These cables should be clamped by means of PVC straps for horizontal and vertical runs. Fabricated aluminum clamps may be used at regular intervals.
- All the cable shall be properly identified at regular intervals and care shall be exercised in laying cables to avoid forming kinks.
- The relative position of the cables, laid on the cable tray shall be preserved and the cables shall not cross each other.
- At all changes in direction in horizontal and vertical planes, the cable shall be bent smooth with a radius as recommended by the manufacturers.
- All cables shall be laid with minimum half diameter gap and shall be clamped at every meter to the cable tray and shall be tagged for identification with cable tag and clamped properly.
- Tags shall be provided at both ends and all changes in directions both sides of wall and floor crossings.
- All cable shall be identified by embossing on the tag the information as laid down under this specification.
- If there is a need to joint the cable due to finishing of cable in cable drum such joints shall be made through the approved straight through joints and jointing kits as directed by and approved by engineer-in-charge at site.
- Cables shall be fully tested (both type and routine test) as per the specification laid under Indian standards. In particular following test shall be done at site.

    - ❖ Insulation resistance test.
    - ❖ Continuity test.

B. Cable Trays and Raceways

1. Scope

The scope of work shall include:

- Supplying, laying, testing and commissioning of cable trays, raceways and its allied accessories.
- Handling, loading, unloading and storage of cable trays and raceways
- Civil works associated with the said job.

2. Definitions

The definitions shall be as per NEMA-VE-2

Accessory: Components used to supplement the function of a straight section or fitting. Examples include, but are not limited to, dropout, cover, conduit adapter, hold-down device, and divider cable tray support.

Span: The distance between the center lines of supports.

Cable tray system: A section or assembly of sections, and associated fittings, forming a mechanical system used to support cables and raceways.

Channel cable tray: A fabricated structure consisting of a one-piece ventilated- or solid-bottom channel section.

Connector: A component that joins any combination of cable tray straight sections and fittings.

3. Codes & Standards

The contractor is required to follow all relevant IS and IEC codes as per latest amendments, however in particular following codes may be applied in addition.

- NEMA VE-2 -2013
- IS 1079, 2029, 2639 - Cable trays and their accessories
- NEC- 2008 - National electrical code.
- NBC-2016 - National building code.
- IER-1956: Indian electricity rules.
- IEA-2007: Indian electricity act 2007
- Any other local bye-law or supply company norm as applicable.

4. Specifications

- **Perforated cable tray:**

  - The construction of the cable trays shall be as per the approved GA drawing from Vendor.
  - The construction of cable tray shall follow NEMA standards.
  - The cable trays shall be with perforations not more than 17.5% and factory fabricated out of MS, angle iron, tee, bends, sections, flats and perforated sheet for different loads.
  - All accessories shall follow NEMA VE-2 standards

- **Raceways:**

  - The proposed Raceway system shall be metallic adaptable raceway system.
  - The raceways shall have suitable strength to pass under floor without breaking.
  - The raceways must have smooth surfaces both inside and outside. The raceway shall have Z- section, hole with thread for cover screw, coupler plate, cover, junction box, fly cover, inspection box flushed to the finished floor at suitable distances etc as required.
  - The screw for cover fixing shall be counter sunk type and shall be fully adjustable type.

5. Installation, Testing and Commissioning

- The Complete installation of cable trays shall be in accordance with NEMA VE-2 standards.
- Before installing cable in the cable tray, examine cable paths to ensure all areas are free of debris that may interfere with cable installation.
- Cable tray should never be used as a walkway.
- Most cable installations require the use of cable pulling tools On horizontal straight runs, cables generally ride on rollers mounted in or on cable trays.
- These rollers should be properly spaced, depending on the size and weight of the cable, to prevent the cable from sagging and dragging in the cable tray during the pull.
- Cable manufacturer shall be contacted for information regarding proper roller spacing. Cables may be fastened to the cable tray by means of cable clamps or cable ties. Generally, cables shall be fastened every 450 mm (18 in) on vertical runs.

- Although not required by the NEC, single conductor cables can be fastened on horizontal runs to maintain spacing and ensure that the cable is confined within the cable fill area.
- When using cable clamps, the clamps should be sized correctly and tightened only enough to secure the cable without indenting the jacket.
- The same precaution should be observed with cable ties, and they should be applied with a pressure limiting device.
- Extremely long vertical drops introduce a new set of issues requiring special consideration.
- The weight per meter (foot) of the cable multiplied by the number of meters (feet) in the vertical drop, in many cases, exceeds the load carrying capacity of the cable tray component. The one or two rungs supporting this weight are likely to be damaged, and the vertical load could exceed the allowable cable tension.
- The cable weight should be supported in such a manner as to prevent damage to the cable tray or cable during this type of installation.
- As the cable is installed, intermediate supports should be installed on the vertical drop to break the cable load into segments supported at multiple places.
- Once the cable is installed in an open cable tray system, care must be taken to protect the exposed cables from falling objects or debris that could cause damage to the cable.
- In areas where the cable tray is to be covered, covers should be installed as soon as possible. Temporary protection for the cables and cable tray can be constructed of available wood or metal materials until the risk of damage has passed.
- Before installing a metallic adaptable raceway system clear marking shall be done at site for the route where the raceway is planned to be laid.
- The location of junction boxed shall then be identified and marked upon the same routing.
- The raceways shall be laid in straight sections exposed in service room area (as per drawings) and proper alignment shall be ensured for the same.
- The coupler plates shall be provided at regular interval as specified in approved construction methodology.
- All bolted connections shall be checked for their tightness and strength.
- Inspection boxes shall then be laid and fixed at the strategic locations.
- Raceways shall be protected by the means of thermacol or any water proof cover after their installation.
- Complete installation shall be in accordance with seismic requirements.

C. Earthing

1. Scope

The scope of work shall include:

- Supplying, laying testing and commissioning of earthing
- Civil works associated with earthing
- Interconnections to earth grid.

2. Definitions

The definitions shall be as per IEEE-80-2000 and other relevant IS/IEC standards.

3. Codes & Standards

The contractor is required to follow all relevant IS and IEC codes as per latest amendments, however in particular following codes may be applied in addition.

- IEEE-80-2000 - Code of practice for AC substation grounding.
- IS-3043 - Code of practice for earthing
- NEC- 2008 - National electrical code.

- NBC-2016 - National building code.
- IER-1956 : Indian electricity rules.
- IEA-2007 : Indian electricity act 2007
- Any other local bye-law or supply company norm as applicable.

4. Specifications

- **Earth Electrode**

  - The earth electrode is the main component of the earthing system which is in direct contact with the ground and thus provides a means of releasing or collecting earth leakage currents. The material should have good electrical conductivity & should not corrode in a wide range of soil conditions.
  - The earth electrode shall be maintenance free type copper bonded rod of suitable length and dia as per calculations / schedules .
  - The copper bonded rod shall have a cu coating thickness of 250 microns.
  - These electrodes shall be buried underground at a suitable depth (preferably along the corners of earth grid) to form a bonded mesh / grid of earth electrodes.
  - Earth enhancement material (Back fill compound) shall be a superior conductive material that improves earthing effectiveness especially in areas of poor conductivity such as rocky ground, sandy soil & areas of moisture variation.
  - It shall be placed around earth electrode to improve the conductivity of earth electrode & ground contact area.
  - The material shall be supplied in sealed moisture proof bags. These bags shall be marked with the name of the manufacturer or trade name, quantity, batch no., date of manufacture etc.
  - It shall have following characteristics.
    - It should have low resistivity preferably bellow 0.2 ohm-meter (Resistivity shall be tested by making a 20cm cube of the material & checking the resistance across the opposite faces of the cube.).
    - It shall not depend on the continuous presence of water to maintain its conductivity.
    - It should be a little alkaline in nature with pH value of > 7 &< 9. Test certificate from NABL approved laboratory to be provided for the compound so designed.
    - It should have better hygroscopic properties to absorb moisture. It should absorb & release the moisture in the dry weather condition and help in maintaining the moisture around the earth electrode.
    - It should have capacity to retain more than 10% moisture at 105ºC. Test certificate for the same from NABL approved laboratory shall be submitted.
    - Material shall be in granular form of size 0.1mm to 3mm and shall absorb water to the extent of @ 51%. Specific gravity of BFC material shall be between 2.5 to 2.7.
    - Material shall be nontoxic, nonreactive, nonexplosive& noncorrosive.
    - Material shall be thermally stable between temperature range of -10ºC to 60ºC.
    - Material shall not decompose or leach out with time.
    - It shall not pollute the soil or local water table & shall meet environmental friendly requirement for landfill.
    - It should expand & swell considerably & remove entrapped air to create strong connection between earth electrode & soil.
    - It should diffuse in to the soil pores & create conductive roots enlarging conductive zone of the earth pit.
    - It shall not require periodic charging treatment or replacement. It shall not cause burns, irritation to eye, skin etc. Minimum quantity requirement per pit of size 5'x5'x10' shall be 75Kg. and for 300mm bore type pit shall be 50 Kg.

5. Installation, testing and commissioning of earth strips

- Make 5ft x 5ft x 10ft. earth pit. If it is not possible to make such a pit due to hard rocky soil or any other reasons, 300mm bore up to 10 ft. deep shall be made using earth auger or any other method.
- Sleeve the soil and remove the gravels and stones. If soil quality is good (without murum& rocks) then add some quantity of earth enhancement material in the soil for using as backfill.
- If the soil seems unusable (Containing large quantity of gravel, stones, murum, sand etc.)the replace the soil

with black cotton soil.

- Insert the electrode at the centre of the earth pit and arrange to keep it vertical in the pit.
- Arrange for adequate quantity of water supply for the pit. (Approx. 600 litres).
- Fill the pit with the backfill material and keep on adding the earth enhancement material surrounding the electrode and simultaneously watering the pit.
- With a steel bar or pipe keep on peking the soil and stirring intermittently for removing the air pockets and proper settlement of the pit
- .Procedure to be repeated till completion of the filling of the earth pit along with the packing materials and sufficient watering & adequate ramming.
- The pit shall be very compactly rammed and watering for 2-3 days and addition of soil if required be done.
- Make trench of 600mm (Depth) x 300mm wide for connecting the earth pit to nearest point of connection.
- Construct inspection chamber with cover for the installation.
- Measure the earth resistance as per IS-3043-1987 code of practice. Earth resistance value shall be less than 1 ohm in nonrocky/non-sandy surface by single electrode installation.
- The bidder shall install earthing material required for the system and individual equipment earthing. All work such as cutting, bending, supporting, soldering, coating, drilling, brazing, clamping, bolting and connecting into structures, pipes, equipment frames terminals, rails or other devices shall be in the bidder's scope of work. The bidder shall also carryout the excavation and trenching work involved. The bidder shall also back-fill and reinstates the trenches after installation of earthing conductors.
- Metallic frames of all electrical equipments shall be earthed by two separate and distinct connections with earthing system.
- Neutral connection shall never be used for the equipments earthing.
- On completion of the installation, continuity of all conductors and joint shall be tested. In case of contract for complete earthing, the supplier/licensed electrical contractor shall quote his rates for erection of complete earth mat with earth electrodes separately

D. Sub Mains and Point Wiring

1. Scope

The scope of this section comprises the supply, delivery, erection, testing and commissioning of following:

- Wiring for power and UPS outlets, heavy duty sockets, and industrial plugs.
- Wiring from distribution boards to different switchboards and from there onwards to individual points like light points, Bell Buzzers, Fan points, small exhaust fan points etc for all internal areas.
- Switchboards, power plugs and its accessories like gang box, front plate, switches etc.
- Wires and its accessories like conduits, Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/conduit terminations.
- Ceiling rose, Connectors, Holders etc. for light points, Fan points, Bell buzzers, small exhaust fan points etc for all internal areas.
- Conduit/channel as the case may be, accessories for the same and wiring cables between the switch box and the point outlet, loop protective earthing of each fan/ light fixture.
- All fixing accessories such as clips, screws, Phil plug, raw plug etc. as required.
- Metal or PVC switch boxes (as specified) for control switches, regulators, sockets etc, recessed or surface type, and phenolic laminated sheet covers over the same.
- Control switch or MCB, as specified.
- 3 pin or 6 pin socket, ceiling rose or connector as required. (2 pin and 5 pin socket outlet shall not be permitted.)
- Connections to ceiling rose, connector, socket outlet, lamp holder, switch etc.
- Bushed conduit or porcelain tubing where wiring cables pass through wall etc. However In areas where false ceiling are provided, termination of wires should beat the fittings. Flexible conduits from ceiling junction box to the fittings shall be provided duly coupled at both ends. This shall be included within the scope of point wiring.)
- Interconnecting wiring between switches within the switch box on the same circuit.

2. Definitions

Sub-Mains wiring: Sub mains wiring is defined as wiring from distribution boards to respective switchboards (including the first switchboard wired from DB and switchboards looped with this first switch board) and power outlets for all internal areas. Wiring for DB controlled light points are also considered in sub-mains wiring.

Point wiring: Point wiring is defined as wiring from Switchboards to individual points like light points, Bell Buzzers, Fan points, small exhaust fan points etc for all internal areas.

3. Codes & Standards

The relevant sections of Indian Standard Specifications as more particularly stated herein and broadly to all the codes, status and regulations as applicable shall be strictly enforced and adhered to. More particularly following codes should be strictly followed.

- National Electrical Code - 2008
- National Building Code - 2016
- IS: 694 - Specification for PVC insulated cables for working voltage up to and including 1100 volts.
- IS: 732 - Code of practice for Electrical Wiring Installation.
- IS: 8130 - Specification for Conductors for Insulated Electric Cables & Flexible cords.
- IS: 9938 -Recommended Colors for PVC Insulation for LF Wires and Cables.
- IS: 3043 - Code Of Practice of Earthing.
- IS: 3202 - Climate proofing of Electrical Work.
- IS: 2509 of 1973 - Rigid non-metallic conduits for Electrical Work

4. Specifications

- **Wires:**

  The wires shall be made from bright electrolytic annealed bare copper conductor with strands as specified under IS:694. Solid conductor wires shall not be accepted. The wires shall be PVC (Poly vinyl chloride) insulated confirming to BIS specifications and shall be specified by the manufacturer for working voltage up to and including 1100 volts. The total gauge of wire shall be strictly in accordance with what has been specified in IS:694.The wires shall be FRLS-H (Fire resistant low smoke Halogen free) with appropriate and acceptable mechanical strength so that the insulation does not gets damaged while pulling these wires in conduit. Unless otherwise specified in BOQfollowing sizes of wires shall be used for different applications:

  - ❖ Wires from DB to Lighting switchboard (along with internal loop within such switchboard) shall be 2 x 2.5 sq.mm. + 1 x 2.5 sq.mm. earth wire.
  - ❖ Wires from DB to 6A switchboard (along with internal loop within such switchboard) shall be 2 x 2.5 sq.mm. + 1 x 2.5 sq.mm. earth wire.
  - ❖ Wires from DB to 16A& 6/16A switchboard (along with internal loop within such switchboard) shall be 2 x 4 sq.mm. + 1 x 4 sq.mm. earth wire.
  - ❖ Wires from DB to Industrial sockets shall be 2 x 6 sq.mm. + 1 x 6 sq.mm. earth wire.

- **Thimbles/lugs**

  The wires shall be terminated with the help of crimping lugs at both the terminals. These lugs shall be non-insulated made of tin plated copper, suitable for termination of 1.5 sqmm / 2.5 sqmm / 4 sqmm / 6 sqmm of copper wires. The lugs shall be suitable for 1100V and the min temperature rating for these lugs shall be 150 degree Celsius. The lugs shall be pin type with pin designed in such a fashion to prevent damage to the wire from over tightening and ensure a reliable electrical connection. The lugs shall have good wire contact and good tensile strength. The lugs shall ensure quick and easy wire insertion.

- **PVC conduits and accessories/non-metallic conduit pipes and accessories**

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

circular in cross-section. The conduits shall be designated by their nominal outside diameter. No non-metallic conduit less than 20 mm in diameter shall be used. The conduit wiring system shall be complete in all respect including accessories. Rigid conduit accessories shall be normally of grip type while flexible conduit accessories shall be of threaded type. 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. Saddles for fixing conduits shall be heavy gauge non-metallic type with base. For all sizes of conduit, the size of clamping rod shall be 4.5 mm (7 SWG) diameter. All the conduits shall be FR (Fire resistant) type.

- **Metallic conduits and accessories**

All rigid conduit pipes shall be of steel and be ISI marked. The wall thickness shall be not less than 1.6 mm (16 SWG) for conduits up to 32 mm dia and not less than 2 mm (14 SWG) for conduits above 32 mm dia. These shall be solid drawn or reamed by welding, and finished with galvanized or stove enameled surface. No steel conduit less than 20 mm in diameter shall be used. The conduit wiring system shall be complete in all respects, including their accessories. All conduit accessories shall be of threaded type, and under no circumstances pin grip type or clamp grip type accessories shall be used.
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. Saddles for surface conduit work on wall shall not be less than 0.55 mm (24gauges) for conduits up to 25 mm dia and not less than 0.9 mm (20 gauges)for larger diameter. The corresponding widths shall be 19 mm & 25 mm. The minimum width and the thickness of girder clips used for fixing conduits to steel joists, and clamps shall be as per Table below.

The minimum width and the thickness of the ordinary clips or girder clips shall be as per Table below. Also shown the maximum no. of wire that can be drawn inside conduit.

	Width	Thickness
20 mm & 25 mm	19 mm	20 SWG (0.9144 mm)
32 mm & above	25 mm	18 SWG (1.219 mm)

Nominal cross sectional area of conductor in sq.mm	*20 mm*		*25 mm*		*32 mm*		*38 mm*		*51 mm*		*64 mm*	
	S	*B*	*S*	*B*	*S*	*B*	*S*	*B*	*S*	*B*	*S*	*B*
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
1.50	5	4	10	8	18	12	–	–	–	–	–	–
2.50	5	3	8	6	12	10	–	–	–	–	–	–
4	3	2	6	5	10	8	–	–	–	–	–	–
6	2	–	5	4	8	7	–	–	–	–	–	–
10	2	–	4	3	6	5	8	6	–	–	–	–
16	–	–	2	2	3	3	6	5	10	7	12	8
25	–	–	–	–	3	2	5	3	8	6	9	7
35	–	–	–	–	–	–	3	2	6	5	8	6
50	–	–	–	–	–	–	–	–	5	3	6	5
70	–	–	–	–	–	–	–	–	4	3	5	4

- **Modular GI Box:**

All the back boxes used shall be concealed GI type with loop in loop out holes marked which shall be removed at the time of jetting conduit inside the same. Size of such holes shall be suitable to take a 32mm diameter conduits. All such back box shall be made from pre-galvanized GI sheet metal with a wall thickness of 1.2mm and confirming to BS:4662:2006. All such back box shall be provided with Brass Earth terminals and adjustable lugs. The metallic box shall be duly painted with anti-corrosive paint before erection. An earth terminal with stud and 2 metal washers and terminal block shall be provided in each back box for

termination of protective conductors and for connection to socket outlet/metallic body of fan regulator etc. A metal strip shall be welded/screwed, to the metal box as support if tumbler type of control switches, sockets and/or fan regulators in flush pattern. Clear depth of the box shall not be less than 60 mm and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern.

- **Modular Base and cover plate**

  The front plate shall have smooth surface from both the side and shall be properly matching the fixing alignment. Perfect alignment shall be maintained while fixing of the back boxes. The color shall be as per the architect's directives.

- **Switch - Socket Outlets**

  Wall receptacle (switch /sockets) outlets shall been closed type flush mounted made up of superior grade GE plastic polycarbonate with high mechanical electrical and thermal properties, suitable for 240 volts, 50Hz, ac. All switches socket outlets and fan regulators shall be fixed on metal strips which shall be screwed / welded to the box. All switches shall be in accordance with IS 3854:1997. The terminals and contacts shall be bimetallic silver contacts designed to withstand high overload conditions, high quality brass and copper contacts shall be used for fixed / moving contacts and there shall be a sufficient clearance of minimum 5mm between fixed and moving contacts to break the arc during switch operation. The terminals shall also be made from high quality brass. All sockets shall comply IS 1293: 2005.All receptacle outlets shall be shuttered type. Three/Six pin Universal type sockets shall be used and these shall be mounted inside the switch boxes on adjustable flat M S strips / plates with tapped holes and brass machine screws, leaving ample space at the back and sides for accommodating wires. 5pin socket outlets will not be permitted. The third pin shall be connected to earth through protective (loop earthing) conductor. 2 pin or 5 pin sockets shall not be permitted to be used. Conductors connecting electrical appliances with socket outlets shall be of flexible type with an earthing conductor for connection to the earth terminal of plug and the metallic body of the electrical appliance. All such outlets shall be tested for an impact test value of 1NM, through a hammer stroke from a distance of 270mm from such outlets. The universal 6/16A sockets shall be capable to take the plugs for both 6A and 16A. No adapter shall be permitted.

- **Telephone Socket Outlets:**

  Telephone sockets used shall be RJ-11 suitable for all kind of telephones and cable to take both paired cable and CAT-7 / CAT6e / CAT-6 wires. The operating temperature for such receptacles shall be -20 degree C to +60 degree C and IP-20 rated. Master telephone outlets shall be equipped with surge protection devices and ringing capacitors.

- **TV antenna socket outlet:**

  TV sockets used shall be suitable for all kind of TV and coaxial cable to take relevant coaxial wires. The terminations shall be single screw type with fully enclosed PCBs with angled connectors provided. The operating temperature for such receptacles shall be -20 degree C to +60 degree C and IP-20 rated.

- **Call Bells or Buzzer:**

  The call bells or buzzers shall confirm to IS : 2268 : 1994 and shall be so constructed that, in normal use, there will be no electrical or mechanical failure that might impair compliance with the standard. The insulation shall not be damaged and contact and connections shall not work loose as a result of heating, vibration etc. Moreover, overload protection, if any, shall not operate under normal running condition. The call bell or buzzer shall withstand the test of electric strength as given in 16.4 of IS 302-I (1979). The call bells and buzzers shall operate satisfactorily at the over voltage and under voltage as specified below:

- **Blanking Plate:**

  Blanking plates shall be modular type single module made up of polycarbonate with high mechanical electrical and thermal properties, the minimum thickness shall be 1.7 mm and all such blanking plates shall be suitable for fixing in the existing switchboard. The dimensions of these blanking plate shall be such that there remains no gap between the blank plate and the front plate of the switchboard.

- **Electronic fan regulator:**

  Step Type Electronic regulators should be used instead of resistance type regulators for controlling speed of fans. The fan regulator must be modular type with steps 1 to 5 for speed regulation of fan and another separate step for off. The fan regulator shall be engraved with good quality lettering showing the step range 1 to 5 and "OFF" step. The color shall be as per the architect's directives.

Rated Voltage	**Under Voltage**	**Over Voltage**
Single value	Rated voltage + 10 percent	Rated voltage - 10 percent
Range of Voltage	Maximum voltage of the range+ 10 percent	Minimum voltage of the range - 10 percent

- **Industrial Socket:**

  Industrial sockets shall comply to IEC : 60309.1.2002, with minimum IP rating of IP42 or specified otherwise in tender drawings and BOQ. All such sockets shall be splash proof. However where-ever specified in drawings these may be water sealed type sockets. The marking and dimensions shall be as per standards. The plugs shall be provided with suitable earthing terminal and electrical interlocking such that the lug doesn't comes out of the socket till the supply is there in plug. Accessories with earthing contact shall be provided with an earthing terminal. Metal-clad fixed accessories with an internal earthing terminal can, in addition, be provided with an external earthing terminal, which, except for flush type socket-outlets, shall be visible from the outside. Earthing contacts shall be directly and reliably connected to the earthing terminals, except that the earthing terminal of socket-outlets incorporated in the output circuit of an isolating transformer shall not be connected. Accessible metal parts of accessories with earthing contact, which may become live in the event of an insulation fault, shall be reliably connected to the internal earthing terminal(s) by construction. Accessories with enclosures of rubber or thermoplastic material, and parts of elastomeric such as sealing rings and gaskets, shall be sufficiently resistant to ageing. The construction of such Industrial plugs shall comply with IEC: 60309.1.2002. All such industrial plugs shall be suitable for 415V/240V, 3Phase/1Phase, 50Hz ac supply as specified in tender drawings and BOQ for the mentioned current ratings.

- **Miniature Circuit Breaker (MCB):**

  MCB should be trip free, quick make and quick break type. MCB should be suitable for interchangeable line/ load connections. The MCB shall have minimum 10 KA breaking capacity with (Ics=Icu=10kA), where Ics is service breaking capacity and Icu is ultimate breaking capacity defined as per IS-13947. MCBs shall have ISI mark as per IS8828-1996 (IEC60898).The MCB shall be suitable for temperature up to 50 deg C without de-rating. All outgoing feeder MCB shall be provided with clip on type auxiliary contact to interface. Terminal of MCB shall be provided with insulated separators between the phases and also on both end. The size and design of the terminal should be adequate to accommodate aluminum/ copper cable required for the rated current of the MCB. It should confirm to current limiting principle class –3 to ensure extremely low let through energy (I^2t) under fault conditions. It should have 'two position' DIN clip ensuring easy mounting and removal. It should confirm C.E. Marking (confirmation to European standards), based upon the tripping characteristics the MCB shall be described as B, C or D curves and the same must be mentioned in bold upon the MCB. All MCB shall have a mention of Full load current, short circuit current, utility voltage, frequency, tripping characteristics (B, C, and D), basic 3 line diagram. The poles of MCBs shall have minimum self-resistance as per latest IEC standards.

- **Sheet Steel Enclosure:**

  The enclosure shall be made from sheet steel of 1.6 mm thickness and of required size and dimensions to accommodate the industrial socket in required manner as directed by Engineer-in-charge. All such enclosures shall be dust / vermin proof, corrosion resistive and as be IP rated as specified in tender drawings / Tender BOQ. All such enclosure shall be provided with a chained metal cover for the socket outlets.

- **Adapter:**

The adapter shall be used to for housing industrial sockets or any switch/socket assembly of 3/4/8 module. The adapter shall be made from high quality polycarbonate and the transparent flap shall be made up of PVC/Fiber with good thermal and mechanical strength. The complete assembly shall be press fit type.

- **Ega Box**

  Boxes and fittings are indicated on Drawings in approximate locations unless dimensioned. Adjust box location up to accommodate intended purpose. Floor boxes shall be totally flush with the adjacent floor finish on all sides.
  The floor box shall be provided with a quick-fix, metal base box and Opening lid to an angle of 30°, with integrated cable outlets, can be installed in two positions and can easily be removed during installation and use. The lid can be fitted with a floor material insert.
  Box can be screw fitted to floor tile by using holes in mounting frame (If hole in tile is outside maximum tolerance use self-tapping screws of required thickness as per recommendation of OEM). Base shall be detachable from mounting frame by releasing screws which enables the base to be connected to the services and left under floor tiles for protection until the carpet, lid and trim are fitted Cable routers can also be removed.

- **Switches:**

  Wall receptacle (switch) shall been closed type flush mounted made up of superior grade GE plastic polycarbonate with high mechanical electrical and thermal properties, suitable for 240 volts ,50Hz,ac. All switches shall be fixed on metal strips which shall be screwed / welded to the box. All switches shall be in accordance with IS 3854 :1997. The terminals and contacts shall be bimetallic silver contacts designed to withstand high overload conditions, high quality brass and copper contacts shall be used for fixed / moving contacts and there shall be a sufficient clearance of minimum 5mm between fixed and moving contacts to break the arc during switch operation. The terminals shall also be made from high quality brass. All such outlets shall be tested for an impact test value of 1NM, through a hammer stroke from a distance of 270mm from such outlets.

- **Angle Holders / Brass Batten / Connecters :**

  An Angle holder/ brass batten / ceiling rose / connector shall not be used on a circuit, the voltage of which normally exceeds 250V. Only one flexible cord shall be connected to an Angle holder/ brass batten / ceiling rose / connector. Specially designed ceiling roses/ connectors shall be used for multiple pendants. An Angle holder/ brass batten / ceiling rose / connector shall not embody fuse terminal as an integral part of it. Angle holders shall be used for wall mounted light fixtures while brass battens shall be used for tube fittings.

E. Fixtures and Fan

1. Scope

The scope of this section comprises the supply, delivery, erection, testing and commissioning of following:

- Ceiling fans and wall fans.
- Supply, Installation, storage, safety, security and handling of lighting fixtures.

2. Codes & Standards

The relevant sections of Indian Standard Specifications as more particularly stated herein and broadly to all the codes, status and regulations as applicable shall be strictly enforced and adhered to. More particularly following codes should be strictly followed.

- National Electrical Code - 2008
- National Building Code - 2016

3. Specifications

- **Light fixture**

  - ❖ The light fixtures and fittings shall be assembled and installed complete and ready for service, in accordance with details, drawings, manufacturer's instructions and to the satisfaction of the Project Manager.
  - ❖ Wires brought out from junction boxes shall be encased in PVC coated GI flexible pipes for connecting to fixtures concealed in suspended ceiling. The flexible pipes shall be provided with a checknut at the fixture end.
  - ❖ Down lighter fixtures specified with overall lengths are subject to change and shall be checked with conditions of the job and installed as directed.
  - ❖ All suspended fixtures shall be mounted rigid and fixed in position in accordance with drawings, instructions and to the approval of the Project Manager.
  - ❖ Fixtures shall be suspended true to alignment, plumb, level and capable of resisting all lateral and vertical forces and shall be fixed as required.
  - ❖ All suspended light fixtures etc. shall be provided with concealed suspension arrangement in the concrete slab/roof members. It is the duty of the Contractor to make these provisions at the appropriate stage of construction.
  - ❖ All switch and outlet boxes shall be bonded to earth with insulated stranded copper wire as specified.
  - ❖ Wires shall be connected to all fixtures through connector blocks.
  - ❖ Flexible pipes, wherever used, shall be of make and quality approved by the Project Manager

F. MCCB, MCB and Distribution Board

1. Scope

The scope of this section comprises the supply, delivery, erection, testing and commissioning of following:

- Distribution boards considered for all internal and common areas. This also includes items for switchgears used inside the distribution boards and its accessories.
- All internal wirings including neutral and earthing connections inside DB. This should however not include the earth connection from DB to earth pit.
- Complete Installation of distribution board in recess / surface as required.
- Dressing of Distribution board.
- Testing and commissioning of distribution board in accordance with relevant IS standards.
- Tagging of each distribution board.
- Mounting of switchgear inside distribution boards.
- Switchgears (MCCB/MCB) in existing cubical enclosure.

2. Definitions

- **TPN DB :** It is defined as a three pole and neutral (TPN) distribution board also call flexi or horizontal type TPN DB which consist of a three phase incoming suitable for 415V, 50Hz and single phase outgoings in each phase respectively suitable for 240V, 50Hz. This is suitable for 3 Phase distribution scheme where the load demand or number of circuits are more and one phase is not sufficient.

- **SPN DB:** It is defined as a single pole and neutral distribution board which consist of a single phase incoming and single phase outgoings suitable for 240V, 50Hz distribution scheme.

- **VTPN DB :** It is defined as a Vertical three pole and neutral (VTPN) distribution board which consist of a three phase incoming suitable for 415V, 50Hz and outgoings are provided with module in such a manner that both single phase and three phase outgoings can be tapped from this DB. This DB finds its application

where three phase outgoings are required from a distribution boards.

- **Ways:** For three phase DB it is defined as the total number of clear outgoings in each phase and for single phase DB it is defined asthe total number of clear outgoings.

- **Module:** It is defined as space required by one single pole MCB inside a DB.

- **Switchgear:** It is defined as electrical device used for switching purpose inside a distribution board, distribution panel, cubical or switchboard. It comprises of following:

  - ISO : Isolator
  - MCB : Miniature Circuit Breaker
  - RCCB : Residual current circuit breaker
  - RCBO : Residual current break over
  - MCCB : Molded case circuit breaker

3. Codes & Standards

The relevant sections of Indian Standard Specifications as more particularly stated herein and broadly to all the codes, status and regulations as applicable shall be strictly enforced and adhered to. More particularly following codes should be strictly followed.

- National Electrical Code - 2008
- National Building Code - 2016
- IS 8623:1977 - Distribution boards
- IS 2675: 1983 - Enclosed distribution fuse boards and cutouts for voltages not exceeding 1000 V Ac and 1200 V Dc
- IEC 439-3 IEC for Distribution boards up to 250A with door
- BS EN 60439-3 -Low-Voltage Switchgear and Control gear Assemblies.

4. Specifications

- **Distribution Board (DB)**

  Distribution board shall be made up of sheet steel thickness of minimum 16 guage with powder coating, completely dust / vermin / corrosion free with ingress protection rating of IP 43. The board shall have adequate space for termination of incoming and outgoing cables. Removable un-drilled top & bottom gland plates, should be suitable for wall, column mounting type B. The distribution shall be double door type with provision of front operated, fully lockable, hinged door. The distribution boards shall have protection against mechanical impact index of minimum IK08. Neoprene gasket, shall be provided to make distribution box air tight and free from moisture. Inner door shall be fixed up with screws with cut-outs for MCB operation. Each such distribution board shall have din rails for mounting switchgears those shall be made up of galvanized steel, passivized with a thick layer. The ampere ratings of these din rails shall typically be 1.5 times the full load current carrying capacity of the mounting switchgear. The dimensions shall be so selected so that the switchgear gets easily and tightly mounted in the din rail. The distribution board shall have neutral bars of current rating equivalent to phase bars for each phase. Neutral bars of individual phases shall be isolated with each other so that leakage on any one phase doesn't affect the other healthy phases. The clearances among various components inside the distribution board shall comply with mentioned codes and standards. Each neutral bar shall have tinned plated bolts to terminate neutrals of respective circuits to the neutral bar and each neutral bar of respective phase shall be provided with arc flash insulating covers. Terminal blocks shall be suitable for termination of conductor/ cable of required size but minimum rated cross section of the terminal blocks should be 6 sq. mm. Terminal block shall be made of flame retardant polyamide material.
  Color terminal blocks and FRLS wires for easy identification of RYB Phases, Neutral and Earth. DB shall be provided with a detachable cassette for safe removal of MCBs, RCCBs. Detachable plate with Knock out holes shall be provided at the top/ bottom of board. Copper bus-bar of at least 1.5 times the rating of incomer MCB / MCCB, along with, neutral bars, earth bars. Board shall be suitable for operation on 3 Phase / single phase, 415 / 240 volts, 50 cycles, 4 wire system, with neutral grounded at transformer. The selection, design and construction of bus bars shall conform to IS specifications and the latest amendments. The bus bars shall be air insulated and made of high conductivity, high strength cu. Bus bars. Direct access or

accidental contact with bus bars and primary connections shall not be possible. Bus bars shall be rated in accordance with service conditions and the rated for continuous and short time current ratings specified in SLD / data sheets. Maximum temperature of the bus bar and bus bar connections, under operating conditions, while carrying rated normal current at rated frequency shall not exceed 85 degree C.

- **Switchgear (MCB/RCCB/RCBO)**

MCB should be trip free, quick make and quick break type. MCB should be suitable for interchangeable line/ load connections. The MCB shall have minimum 10 KA breaking capacity with (Ics=Icu=10kA), where Ics is service breaking capacity and Icu is ultimate breaking capacity defined as per IS-13947. MCBs shall have ISI mark as per IS8828-1996 (IEC60898).The MCB shall be suitable for temperature up to 50 deg C without de-rating. All outgoing feeder MCB shall be provided with clip on type auxiliary contact to interface. Terminal of MCB shall be provided with insulated separators between the phases and also on both end. The size and design of the terminal should be adequate to accommodate aluminum/ copper cable required for the rated current of the MCB. It should confirm to current limiting principle class –3 to ensure extremely low let through energy (I^2t) under fault conditions. It should have 'two position' DIN clip ensuring easy mounting and removal. It should confirm C.E. Marking (confirmation to European standards), based upon the tripping characteristics the MCB shall be described as B, C or D curves and the same must be mentioned in bold upon the MCB. All MCB shall have a mention of Full load current, short circuit current, utility voltage, frequency, tripping characteristics (B, C, and D), basic 3 line diagram. The poles of MCBs shall have minimum self-resistance as per latest IEC standards.
The RCCB shall have sensitivities of 30mA and 100mA as specified in the design drawing or SLD or BOQ. The RCCB shall comprise of a core balance current transformer built in to calibrate the differential current between any phase and neutral. The RCCB shall have a mention of its sensitivities engraved upon it.
Residual current break over shall be rated for overload, short circuit as well as earth leakage and shall be capable to provide protection against all three of these fault conditions. The RCBO shall be quick make quick break type. It should confirm to current limiting principle class –3 to ensure extremely low let through energy (I^2t) under fault conditions. It should have 'two position' DIN clip ensuring easy mounting and removal.

- **Switchgear (MCCB)**

MCCB should be provided with door operating mechanism having interlock, defeat and padlocking facility. The Molded Case Circuit Breaker (MCCB) shall conform to IEC 947 – 2.The MCCB shall be suitable for ambient temperature up to 55 deg C without de-rating. The MCCB should trip free, quick make and quick break type and should be equipped with a current limiting feature. MCCB shall have spreader links and terminal shroud as a feature for safety and proper heat dissipation. The MCCB shall indicate its suitability for isolation and this should appear clearly with the symbol as specified in IS 13947. All MCCBs shall be microprocessor type with overload, short circuit and earth fault releases unless otherwise specified. For the entire range, Service Breaking capacity (Ics) shall be equal to Ultimate Breaking capacity (Icu), (Icu = Ics =100%). The MCCB shall have following setting options available. No dip switches shall be installed for settings. Test knob and trip reset unit of the breaker shall be fully activated . Any accessories required for the same shall be included. The complete assembly shall be BMS compatible.

- Overload setting (L) 0.4-1 x In
- Short circuit setting (with time delay)(S) 2 –10 x Ir
- Time delay (td) 0-500 m sec
- Short circuit setting (Instantaneous) (I) 11 x In
- Where In = nominal current of MCCB &Ir = rated current to which it is set.
- Ground Fault Setting with time delay (0-300ms) (G) : 0.1-1 x In
- Neutral setting (N) (where ever required): 0.5-1 x In

All MCCB's shall be provided with additional 2 spare NO+NC contact, a shunt trip coil and an under voltage coil auxiliary along with alarm switches, Front door operating mechanism with door interlock defeat facility. Release shall have inbuilt memory and true RMS sensing.

Frame sizes of MCCB's shall be of following standard sizes.

MCCB Rating	Frame Size
100 amps & below 100 amps	100 amps.
More than 100 amps up to 160 amps	160 amps.
More than 160 amps up to 250 amps	250 amps.
More than 250 amps up to 400 amps	400 amps.
More than 400 amps up to 630 amps	630 amps.
More than 630 amps up to 800 amps	800 amps.

The breaking capacities of MCCB's are mentioned panel wise. MCCB's shall be of following standard ratings.

MCCB Rating	Frame Size
25 KA & above.	25 KA
Above 25 KA up to 35 KA.	35 KA
Above 35 KA up to 50 KA	50 KA
Above 50 KA up to 70 KA	70 KA.

- **Blanking plate for DB**

  Blanking plate shall be made up of minimum 18 gauge sheet steel and shall be suitable for fixing inside any type of distribution board. The dimensions shall be selected in such a fashion so that it completely covers exposed din bars. Holes made in these blanking plates for fixing nuts and bolts shall be made a site only with a drill machine of required dia and extra holes shall be plugged in with a fire sealant.

- **Isolator**

  All isolators and switches shall be two position type (ON/OFF) heavy duty, load break, quick make and break type and suitable for front of board operation and shall conform to I.S. 4064.The isolators for motor feeders shall be of "Motor Duty" type adequate for interruption of locked rotor current of motors (excepting for motors rated 50 Kilowatts and above).Switches and isolators provided in the switch boards shall be interlocked with door to prevent opening and closing of the door in the closed (ON) position of the isolators. All live terminals on the isolating / switches shall be adequately shrouded to prevent accidental contact and danger to the personnel.

5. Installations, Testing & Commissioning

- Distribution boards shall be flushed in the wall and a niche shall be made after measuring the actual depth of DB so that the distribution box gets properly fitted inside niche. In case of surface mounted distribution board the location shall be confirmed in co-ordination with architect and civil team.
- The distribution board shall be properly aligned and the leveled within tolerance of +/- 2mm and shall be ensured with a water level indicator or a laser gun whichever available.
- DB shall have peel able poly layer on the cover for protection from cement, plaster, paints etc. during the construction period.
- The holes made in sheet steel enclosure for cable termination shall be made only through drill machine or approved cutting tool with marking of dia done prior to cutting or drilling. Extra left out holes shall be filled neatly with fire retardant sealant.
- The enclosure shall be tightly fixed. No spare nuts-bolts shall be left out un-tightened / open inside the DB enclosure in any case.
- Gland plates where ever used for cable termination shall be tightly fixed and shall be earthed.
- Din bar shall be mounted in a linear horizontal fashion in case of TPN/SPN DBs and may be in vertical fashion only in case of VTPN DB. Din bars shall not be allowed to cut once fixed and installed inside DB. The excess exposed part of din shall be covered with blanking plate. In case if the din needs to be cut after installation or if so directed by the engineer in charge. The complete din bar needs to be dismantled from DB first and then cutting shall be done.
- Switchgears shall be mounted on din tightly and accurately with incoming poles facing top and outgoing pole facing bottom.
- Internal wiring of distribution board shall be terminated into respective switchgears, earth bars and neutral bars only with the help of pin type lugs / thimbles. However for body earthing of DB cu. C / U type lugs can be used.
- Termination lugs shall be tightly fixed and connected and there shall not be any bare wire strand jetting out

of the lugs. Suitable crimping tool shall be used. And terminal wires shall be coved with heat shrinkable sleeves whose color coding has to match with the color of the wire used.

- For complete internal wiring the size of phase earth and neutral conductor shall be equal and as specified for that particular circuit.
- Color coding shall be followed for internal wiring also in a similar pattern as described in chaper-1 wiring under the specification document.
- Ferruling shall be neatly done after completing the circuit wiring with good quality ferrules and ferrules shall be so installed that the letters are easily visible from front side without adjusting the ferrule. Only factory marked and made ferrules shall be acceptable. The ferrules shall clearly depict circuit name and number as per GFC drawing.
- The door of DB shall be aligned properly and there shall be no air gap left after closing the DB door. Gaskets shall be used to make DB free from moisture.
- Site fabricated DBs shall not be acceptable.
- DB shall have Padlocking arrangement and shall be pad locked after complete installation.
- Distribution board shall be fully tested (both type and routine test) for its components as per the specification laid under Indian standards. In particular following test shall be done:
  - Continuity test (both earth continuity and loop continuity)
  - Insulation resistance test.
  - Contact resistance test.
  - Primary injection test.
  - Trip test and trip unit reset test with Test knob of breaker.
  - RCCB sensitivity test with earth leakage test kit ranging up to 50ma, 100ma and 300ma.
  - Phase rotation test.

- After testing is done. The distribution board shall be functionally checked for its functioning and shall be commissioned thereafter.

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

LT Panels Works

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI Creating an Ecosystem for Quality

Date: 26th Dec. '2024

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I. PREFACE

A. Tropical Conditions

All equipment/material supplied against respective specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

- Ambient temperature: 45 degrees Celsius
- Annual Average Relative humidity: 50%
- Climate type: Moderately hot and humid tropical, climate, conducive to rust and fungus growth

B. Tolerance and Creepage Distances

Tolerances (on all the dimensions) and creepage distances shall be in accordance with provisions made in the relevant Indian/IEC/BIS standards and in these specifications. Otherwise, the same will be governed by good engineering practice in conformity with required quality of the product.

C. System Particulars

- Secondary system voltage - 433V
- Frequency- 50Hz ±3%
- No. of phases- 3 phase, 4 wire
- System neutral- Solidly earthed

D. General:

The Electrical Installation work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply authority and Fire Insurance regulations so far as these become applicable to the installation.

The scope includes the jobs to be performed for all systems, equipment and materials furnished under this specification. The scope is however not limited to the items detailed below:

- Design, manufacture, testing at manufacturers works packing and dispatch.
- Transportation to site and insurance.
- Receiving at site, unloading, handling, opening, inspecting, reporting and submitting claims in case of damages and short supply items.
- Installation, testing and commissioning of equipment and systems as mentioned in contract or bill of quantities.
- Arranging to repair/re-ordering all damaged and short supply items.

A. LT Panel (Partial Type Tested Assembly):

1. Codes & Standards

The equipment should conform in all respects to the relevant latest editions of the following Indian Standards or other equivalent National or International Standards:

- National Electrical Code - 2008
- National Building Code - 2016
- IEC 60439- Low Voltage Switchgear and Control gear Assemblies.
- IS 13947/ IEC 60947
- IEC 60529 - Degrees of protection provided and enclosures for low voltage switchgear and control gear.

- IS 11353 - Guide for uniform system of marking Identification of Busbar and Terminals
- IS 8828/IEC-60898-Miniature Circuit Breaker
- IS 13947/ IEC 60947 - Low-voltage switchgear and controlgear
- IS 13947/ IEC 60947- Part 1: General Rules
- IS 13947/ IEC 60947 Part 2: Circuit-breakers
- IS 13947/ IEC 60947 Part 3: Switches, disconnectors, switch-disconnectors and fuse combination units
- IS 13947/ IEC 60947 Part 4: Contactors and Motor-starters
- IS12640/ IEC 61008–Residual Circuit breakers
- IS 2707 - Current Transformers.
- IS 13703-1993 - HRC Fuse Links
- IS 2705 - Current Transformer
- IS 3231 - Relay
- IS 1248 - Indicating Instruments
- IS 722 - Integrating Instruments
- IS 6875 - Control Switches & Push Buttons
- IS2804 - Shunt Capacitor for Power System
- IS 13779 – AC Electric Meters /Static Meters
- IS 5082 – Electrolytic Aluminium Busbar, Trunking Systrem, Rod Tubes and section of Electrical Purposes

In addition to the above, the L.T. Panel board shall meet all applicable Indian Electricity Rules. Fire Insurance regulations and other local statutory codes. All requirement and its components shall be new and of superior quality in all respects.

2. General Requirements

This section pertains to general requirements for construction, components, wiring, bus bars, painting installation connections and commissioning of all LT Panel boards as per detailed bill of quantities. All panels shall be extensible and fully compartmentalized (Form IIIB).The Panel shall have proper space with required clearance for incoming / outgoing cables, switchgear, CTs, PTs, Ammeter, Voltmeter, selector switches, Insulated and properly supported compartmentalized bus bars with heat shrinkable sleeves along with the other control circuit accessories within the panel and any other electrical component mentioned or required.

Notes:

- Capacitor bank shall not be considered inside any panel unless specified specifically.
- Spare outgoings shall be provided with meter, only where specified as per BOQ or Single line diagram.
- Microprocessor based MCCBs shall be provided with inbuilt O/L, S/C, E/F and instantaneous trip protection.
- ALL MCCBs shall be provided with On/Off/Trip indication.
- ACB shall be provided with minimum On/Off/Trip/Spring Charge/Control Supply/Service/Test/Ready to closeindication.
- MCCBs with rating upto 160A shall be thermal Magnetic with adjustable setting and shall be microprocessor based release for rating above 200A unless otherwise specified (Except at Main isolation Panel outgoings where all the MCCBs to be MP Based unless otherwise mentioned in BOQ)
- The incomers with thermal magnetic based MCCBs shall be provided with external earth fault protection.

3. Design parameters

The 433V system shall be suitable for the following parameters:

- Rated Voltage: 433 V, 3 Phase & Neutral.
- Rated Frequency: 50Hz.
- Fault Level: As specified in SLD.
- Ingress Protection Class for enclosure: IP 43(for all indoor panels) and IP 55(for all outdoor panels).
- Voltage variations +/- 5%
- Frequency variations +/- 3%
- Maximum Allowable Bus Bar Temperature: Temperature rise shall be as prescribed in relevant IEC Standard,
- Operation Duty : Continuous

4. Construction Features

- All the LT panels shall be used to provide power to all sort 433 V/ 230 V equipment /systems and shall be totally enclosed, completely dust, vermin proof and highly corrosion-resistive.
- All panels shall be metal clad enclosed, self-supporting, front operated, free standing or wall mounted. The panel boards shall be designed of the requisite vertical sections, which when coupled together shall form continuous switchboards. It should be readily extensible on both sides by addition of vertical sections after removal of the end covers or as otherwise called for the in the bill of quantities.
- The panel boards shall be constructed only of materials capable of with-standing the mechanical, electrical and thermal stresses as well as the effects of humidity, which are likely to be encountered in normal service. The design shall ensure that weight of the components is adequately supported without deformation or loss of alignment during transit or during operation. The design shall ensure generous availability of space for ease of installation and maintenance of cabling, and adequate safety for working in one vertical section without coming into accidental contact with live parts in an adjacent suction.
- The panels shall be fabricated out of high quality CRCA sheet, suitable for indoor or outdoor installation as called for as per bill of quantities. CRCA sheet steel shall be 2 mm thick for structure, 1.6 mm thick for doors, covers shrouds and 3 mm thick for gland plate and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.
- When covers are provided in place of doors, generous overlap shall be assured between sheet steel surfaces with closely spaced fasteners to preclude the entry of dust. The total height of the panel should not be more than 2400 mm. The total depth of the panel should be adequate to cater for proper cabling space.
- All sheet steel work forming the exterior of switch boards shall be smoothly finished. Leveled and free from flaws. The corners should be rounded. The apparatus and circuits in the panels shall be so arranged as to facilitate their operation and maintenance and at the same time to ensure the necessary degree of safety.
- The front framed structure shall be designed to house the components contributing to major weight of the panel, such as circuit breaker cassettes, fuse switch units, changeover switches, main horizontal bus-bars, vertical risers and other front mounted accessories.
- The panels shall be arranged of adequate size to facilitate enough space for maintenance and cooling. The size shall be designed in such a way that the internal space is sufficient for hot air movement, and the electrical component does not attain temperature more than 40 degree Celsius. Openings shall provide for natural ventilation, but the said openings shall be screened with fine weld mesh.
- Functional units such as circuit breakers and fuse switches shall be arranged in multi-tier formation. All the Incoming Air Circuit Breakers shall be housed in a single tier formation only. Air circuit breaker for outgoing feeders can be of two-tier formation. Metallic/insulated barriers shall be provided within vertical sections and between adjacent sections to ensure prevention of accidental contact with main bus bars and vertical risers during operation, inspection or maintenance of functional units and front mounted accessories.
- All doors/covers providing access to live power equipment circuits shall be provided with tool operated fasteners to

prevent unauthorized access. Cable entries and terminals shall be provided in the switchboard to suit the number, type and size of aluminum conductor power cables and copper conductor control cable specified in the detailed specifications. Provision shall be made for top or bottom entry of cables as required.

- Generous size of cabling chambers shall be provided, with the position of cable gland and terminals such that cables can be easily and safely terminated. The minimum depth of the panel shall be restricted to suit for this purpose. Barriers or shrouds shall be provided to permit safe working at the terminals of one circuit without accidentally touching that of another live circuit. Cable risers shall be adequately supported to withstand the effects of rated short circuit without accidentally touching that of another live circuit.
- The terminal blocks shall be provided at convenient location for cable termination. The distance between the terminal strip and gland plate shall be kept in such a way that the cables can be properly dressed & no cable tension is transferred on the terminal strip / or equipment.
- The gland plates shall have knock able type holes of appropriate size and number in conformity with number, and size of incoming and outgoing cables. Minimum 30% extra knock able holes shall be provided on each gland plate. Alternatively the panels shall provided with removable sheet plates at top and bottom to drill holes for cable / conduit entry at site. Non-magnetic gland plates shall be used where single core cables are used for three-phase supply.
- The structure shall be mounted on a rigid base frame fabricated using ISMC channel of minimum 75 mm x 75 mm x 5 mmor as per the weight of the panel.
- Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be fully sealed with neoprene gaskets and shall be lockable.
- All panels and covers shall be properly fitted and secured with the frame, and holes in the panel correctly positioned. Fixing screw shall enter into holes taped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of panels.
- The panels shall be designed to facilitate easy inspection, maintenance and repair. All panels shall be sufficiently rugged in design and shall support the equipment without distortion under normal and short circuit condition they shall be suitably braced for short circuit duty as mentioned in bill of quantities. All insulating material used in the construction of the equipment shall be of non-hygroscopic material, duly treated to withstand the effects of high humidity, high temperature tropical ambient service conditions.

5. Painting

- All sheet steel material shall undergo rigorous metal treatment seven-tank process after all the necessary shearing and other mechanical works are completed. After the seven-tank process powder coating treatment shall be adopted using powder of reputed make. After the powder coating is complete welding in the panel or any sort of shearing, bending or cutting activity shall not be done.
- All sheet steel work shall be phosphate in accordance with the procedure mentioned below and in accordance with relevant standards for phosphatizing iron and steel.
- Oil, grease and dirt shall be thoroughly removed by emulsion cleaning. Rust and scale shall be removed by pickling with dilute acid followed by washing with running water, rinsing with slightly alkaline hot water and drying. A recognized phosphate process to facilitate durable coating of the paint on the metal surface and also to prevent the speared of rustling in the event of the paint film being mechanically damaged. This again, shall be followed by hot water rinsing to remove traces of phosphate solution. After phosphatizing through rinsing shall be carried out with clean water followed by final rinsing with dilute dichromate solution and oven drying. Passivation in de-oxalate solution to retain and augment the effects of phosphatizing.
- Powder Coating with suitable primer and having total coating thickness of 60 - 80 micron shall be applied. The sheet steel shall be given for proper shot blasting / surface finish to make it free from all impurities. It shall be then provided with two primer coat and then powder coated (electro-statically) with final paint shade RAL7032 as per IS

– 5 or unless otherwise specified.

6. Switchgear Compartment

Each circuit breaker and switch fuse units shall be housed in separate compartments and shall be enclosed from all sides. Sheet steel hinged lockable door shall be duly inter locked with the breaker / switch fuse units in ON and OFF position. Safety interlocks shall be provided for non-opening of the door when the breaker is in ON position. The door shall not form integral part of the draw out position of the circuit breaker. All instruments and indicating lamp shall be mounted on the compartment door. Sheet steel barriers shall be provided between the tires in a vertical section.

7. Instrument Compartment

Separate and adequate compartment shall provided for accommodating instruments, indicating lamp, control contactors, relays and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, switch fuse units, bus bars and connections.

8. Bus Bars

The selection, design and construction of bus bars shall conform to IS specifications and the latest amendments. The bus bars shall be air insulated and made of high conductivity, high strength Aluminum or Tinned Copper. Bus bars shall be located in air-insulated enclosures and segregated from all other compartments of the cubicle. Direct access or accidental contact with bus bars and primary connections shall not be possible.

The busbar shall be for three phases and neutral system with separate neutral and earth bar. The busbar shall be of rectangular cross section designed to withstand full load current for phase busbar and full rated current for neutral busbar and shall be extensible type on either side. The busbar shall have uniform cross section throughout the length and shall be rated for the frame size of the main incoming breaker.

A main horizontal aluminum grounding bus, rated to carry maximum fault current, extending along the entire of the panel shall be provided. The ground bus shall be provided with two-bolt drilling with GI bolts and nuts at each end to receive the main Earthing grid.

Maximum temperature of the bus bar and bus bar connections, under operating conditions, while carrying rated normal current at rated frequency shall not exceed 85 degree C.

The current density of the bus bars shall not be less than 1 Amp / sq mm. The size of the bus bar shall be chosen on the basis of temperature rise limit of bus-bar for continuous rated current at rated frequency and also on the basis of temperature rise limit at rated short circuit current for 1 sec and mechanical stress capacity at rated peak short circuit current.

Bus bars shall be rated in accordance with service conditions and the rated for continuous and short time current ratings specified in single line diagram / bill of quantities / data sheets. The busbar shall be supported on unbreakable, non hygroscopic SMC insulated supports at sufficiently close interval to prevent busbar sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 50 KA RMS symmetrical for one second and a peak short circuit withstand of 105 KA minimum. The neutral as well as the earth bar should also be capable of withstanding the electrical & mechanical stresses equivalent to phase bus bars.

Connections from the main bus bars to functional circuits shall be arranged and supported so as to withstand without any damage or deformations the thermal and dynamic stresses due to short circuits currents.

The size of bus-bars should be indicated in the shop drawings or technical submittals and shall be subject to the

purchaser's / consultant's approval. Bus bar calculations shall be furnished by the concerned vendor for approval.

The busbar and interconnection shall be insulated with heat shrinkable PVC sleeves and be colour coded in red, Yellow, Blue and Black to identify the three phases and neutral of the system.The busbar shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick FRC sheet to avoid any accidental contact.

Appropriate clearances and creepage distance shall be provided for the bus bars system to minimize the possibility of a fault. Minimum clearances in mm are mentioned below:

- Between Phase to Phase - 30mm
- Between Phase to Neutral - 25mm
- Between Phase to Earth - 30mm
- Between Neutral to Earth - 25mm

When, for any reason, the above clearances are not available, suitable insulation shall be provided. Clearances shall be maintained during normal service conditions. Creepage distances shall comply with those specified in relevant standards.

All busbar connection shall be done by drilling holes in busbars and connecting by cadmium or chromium plated bolt and nuts. Additional cross section of busbar shall be provided to cover-up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts. All connection between busbar and circuit breaker / switches and between circuit breaker/ switches and cable terminals shall be through solid aluminum or copper strips of proper size to carry full rated current. These strips shall be insulated with insulating strips.

9. Electrical Power & Control Wiring Connection

Terminal for both incoming and outgoing cable shall be suitable for 1100 volts grade, aluminum/copper conductor PVC insulated and sheathed, armoured cable and shall be suitable for connections of solder less sockets for the cable size as indicated on the appended drawing panels. Both control and power wiring shall be brought out in cable alley for ease of external connections, operation and maintenance. Both control and power terminals shall be properly shrouded.

10% spare terminal shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block so that not more than one outgoing wire connected per terminal. Terminal strip for power and control shall preferably be separated from each other by suitable barriers of enclosures.

Wiring inside the module for power, control protection and instrument etc. shall be done with use of 1100 V confirming to IS 694 and IS 8130. Power wiring inside the starter module shall be rated for full current rating of contactor, but not less than 4 sq mm cross section area. For current transformer circuits, 2.5 sq mm-copper conductor wire shall be used. Other control wiring shall be done with 1.5 sq mm copper conductor wires. Wires for connections to the door shall be flexible. All conductors shall be crimped with solder less sockets at the ends before connections are made to the terminals.

Control power for the motor starter module shall be taken from the respective module switchgear outgoing from R phase and Neutral. Control wiring shall have control fuse (HRC type). Particular care shall be taken to ensure neat and orderly laying of the wiring. Identification ferrules shall be tagged to all the wire termination for ease of identification and to facilitate and testing.

"CUPAL" washers shall be used for all copper and aluminum connections. Final wiring diagram of the power and control circuit with ferrules number shall be submitted as a part of documents submitted for purchaser's / consultant's approval.

10. Performance Characteristics

All switchgears and panels shall be capable of satisfactory operation for the application, duty and other requirements as specified in these specifications, enclosed data sheets/drawings. Air circuit breakers, molded case circuit breakers and switches shall be suitable for switching duty of motors, capacitors and other devices shown on drawing.

11. Safety Features

The safety shutter shall be provided in breaker panels, which shall prevent in advertent contact with isolating contacts when breaker is withdrawn from the Cradle. It shall be possible to interchange two breakers of two different rating.

There shall be provision of positive earth connection between fixed and moving portion of the ACB either through connector plug or sliding solid earth mechanism. Earthing bolts shall be provided on the cradle or body of fixed ACB. Arc chute covers shall be provided wherever necessary.

It shall be possible to bolt the draw-out frame not only in connected position but also in TEST and DISCONNECTED position to prevent dislocation due to vibration. All live parts of MCCB and switches when doors are opened after switching them OFF shall be shrouded with insulators of adequate size and strength so that to prevent accidental contacts of the live parts.

B. Generic Components for PTTA Assemblies:

1. Switchgear (MCB/RCCB/RCBO)

MCB should be trip free, quick make and quick break type. MCB should be suitable for interchangeable line/ load connections. The MCB shall have minimum 10 KA breaking capacity with (Ics=Icu=10kA), where Ics is service breaking capacity and Icu is ultimate breaking capacity defined as per IS-13947. MCBs shall have ISI mark as per IS8828-1996 (IEC 60898/IEC 60947. The MCB shell have rated impulse voltage withstand of 6kV. The MCB shall have electrical life 20,000 operations up to 32A and 12,000 operation up to 63A. The MCB shall have 50% lower watt loss as required by IS/IEC 60898 from 6A to 63A

MCB shall give visible flag indication when MCB trips on Short Circuit Fault. MCB shall have provision for a padlock to prevent unauthorized access. The MCB shall have safety shutter to avoid any wrong insertion of cable

.The MCB shall be suitable for temperature up to 45 Deg C preferably without de-rating or else suitable switchgear with deration for 45 deg C ambient shall be provided, shall be suitable for Pollution Degree-3 and shall have RoHS Compliance. All outgoing feeder MCB shall be provided with clip on type auxiliary contact to interface. Terminal of MCB shall be provided with insulated separators between the phases and also on both end. The size and design of the terminal should be adequate to accommodate aluminum/ copper cable required for the rated current of the MCB. It should confirm to current limiting principle class –3 to ensure extremely low let through energy (I^2t) under fault conditions. It should confirm C.E. Marking (confirmation to European standards), based upon the tripping characteristics the MCB shall be described as B, C or D curves and the same must be mentioned in bold upon the MCB. All MCB shall have a mention of Full load current, short circuit current, utility voltage, frequency, tripping characteristics (B, C, and D), basic 3 line diagram. The poles of MCBs shall have minimum self resistance as per latest IEC standards.

The RCCB shall have sensitivities of 10 MA, 30mA and 100mA as specified in the design drawing or SLD or BOQ.The RCCB shall have electrical life 20,000 operations up to 32A and 12,000 operation up to 63A and shall be suitable for Pollution Degree Class-3. The RCCB shall comprise of a core balance current transformer built in to calibrate the differential current between any phase and neutral. The RCCB shall have a mention of its sensitivities engraved upon it.

Residual current break over shall be rated for overload, short circuit as well as earth leakage and shall be capable to provide protection against all three of these fault conditions. The RCBO shall be quick make quick break type.It should confirm to current limiting principle class –3 to ensure extremely low let through energy (I^2t) under fault conditions.

2. Switchgear (MCCB)

- MCCBs shall comply with standards IS/IEC 60947-1 & 2. The breaking capacity performance certificates shall be available for category A to the above mentioned standards.
- The MCCB shall be suitable for ambient temperature up to 50 deg C without de-rating or else suitable switchgear with deration for 50 deg C ambient shall be provided. The MCCB should trip free, quick make and quick break type. MCCB shall have spreader links and terminal shroud as a feature for safety and proper heat dissipation.
- MCCB shall have a designed operational voltage (Ue) of 550V AC (50/60Hz), insulation voltage (Ui) of 750 V (AC 50/60 Hz) & impulse voltage (Uimp) of not less than 8kV.
- MCCB shall not have any line load bias
- MCCB shall comply with the environmental directives like RoHS.
- MCCB should have visual alarm pre-overload, over-load and over temperature.
- The MCCBs shall have a rated service breaking capacity (Ics) equal to the 100% of ultimate breaking capacity (Icu) at 415V and as per system fault levels (refer SLD).
- For maximum safety, the power contacts shall be insulated in an enclosure made of a thermosetting material from other functions such as the operating mechanism, the case, the trip unit and auxiliaries (ON/OFF/Trip Contact, Shunt, Under Voltage etc.). All poles shall operate simultaneously for circuit breaker opening, closing and tripping. MCCBs shall be actuated by a toggle or rotary-handle that clearly indicates the three distinctive positions: ON, OFF and TRIPPED. MCCBs shall be equipped with a “push to trip” button in front to test operation and simultaneous opening of all poles together.
- Microprocessor MCCB’s complete assembly shall be BMS compatible. In case of 4 pole MCCB neutral shall be defined and capable of offering protection up to full current rating with possibility of adjustment at site. Neutral Overload protection shall be provided for 3 pole MCCBs with provision for external neutral CT sensing.
- MCCBs shall be designed to prevent access to live parts when the cover is removed , means main current path of the circuit breaker should be isolated from auxiliary section i.e. MCCB shall offer class –II front face as per IEC standards 61140 and 60664-1
- The MCCBs shall have single frame size upto maximum rating available with OEM to reduce the requirement of spares management.
- Following separate Field installable auxiliary contacts for signalizing different functions shall be provided with all MCCBs
    - open/closed position contact
    - trip signaling contact
    - Electrical fault trip signaling contact

- Rotary handle shall ensure IP40 for direct type and IP 54 for extended Rotary handle.
- MCCB shall have provision for Rear connection - MCCB mounting on a back plate with suitable holes enables rear connection. The rear connections are simply fitted to the device connection terminals.
- MCCBs shall have thermal magnetic trip units up to 200A and microprocessor trip units above 200A.
- Thermal magnetic trip units shall have variable overload settings preferably from 087 to 1 Ir or better and fixed short circuit settings.
- Microprocessor trip units shall have variable overload settings from 0.4 to 1 Ir and variable short circuit settings from 1.5 to 10Ir or better.
- MCCB's should be provided with auxiliary contacts for signaling different functions, as: open/ closed position, fault signal and shunt trip coil for remote/emergency tripping of MCCB.
- All microprocessor based MCCBs should have precise current setting in one step.
- For 3 phase 4 wire system External Neutral CT should be provided for Neutral Overload and E/F sensing in case of 3 Pole MCCBs. Electronic trip units shall comply with the requirements as specified in Appendix F (EMC / EMI Compatibility) of IEC 60947-2 or EN 60947-2.
- For Motor application, motor duty type MCCBs shall be selected with reference to Type 2 coordination chart provided by the manufacturer. All MCCBs above 63A shall be provided with Silver Plated Copper Spreader Links for enhancing termination capacity.
- Where ever it is required based on electrical distribution network need, MCCB shall have Earth Fault Protection as a provision. Earth fault shall be inbuilt in Microprocessor based MCCBs.
- All MCCB's shall be provided with additional 2 spare NO+NC contact, a shunt trip coil and an under voltage coil auxiliary along with alarm switches, Front door operating mechanism with door interlock defeat facility. Release shall have inbuilt thermal memory and true RMS sensing.

3. Air Circuit breaker

- ACB shall comply with standards IS/IEC 60947-1 & 2 with latest amendments.
- ACB shall have a rated operational voltage of 415V AC, rated insulation voltage of 1000 volts AC, rated impulse voltage of 12kV.
- ACB should have an operational designed voltage of 690 V for Ics=100% Icu for Icw=1 Sec.
- ACB shall be of 3pole or 4pole (as per BOQ), air-break, molded case design for longer life along with less maintenance requirement.
- ACB shall be suitable for Pollution Degree-4.
- The moving parts of 4 pole circuit breaker shall have operating mechanism, primary and secondary isolating devices, auxiliary switches, mechanical position indicators, all mounted on a rigid sturdy steel frame work. Primary and secondary disconnecting devices shall be self-aligning type of fully isolating.

- All ACBs shall preferably be of single frame size up to 2500A or better to optimize requirement for spares management.

- ACB shall have a Ready to close mechanism preferably having a ready to close mechanical indication on front of ACB. All EDO ACBs ready to close indication contact which shall be used to give a single indication via indicating lamps on panel door if ACB is ready to be closed, after checking all the given conditions (UV release energized, Shunt release de-energized, spring charged, Breaker is not "ON", Breaker has not tripped on fault, Breaker is not mechanically interlocked with other breaker and ACB is not racked in completely in service position) ensuring safety for user and electrical distribution.

- ACB shall be type tested & certified for compliance to standards from–CPRI, ERDA / any accredited international lab. The circuit breaker shall be suitable for 415 V ± 10%, 50Hz supply system. Manufacturer should submit **Combined sequence test certificate** from CPRI/ERDA

- ACB shall comply with the environmental directives like RoHS.

- The circuit breakers shall be sheet metal enclosed flush front, draw out type and shall be provided with a trip free manual operating mechanism with mechanical "ON" -"OFF" indications. Shunt trip and closing coil suitable for 24 Volts D.C. shall be provided. The Circuit breakers shall be for continuous rating, and shall be suitable for 50 KA fault level for one second at 415 volts (ICS=ICU=ICW=100%).

- It should be possible to know the control voltage ratings for all electrical accessories without opening the panel door and should be click fit type to reduce maintenance shut-down time. Circuit breaker shall be designed to close and trip without opening the circuit breaker compartment door. The operating handle and the mechanic al trip push button shall be at the front of the breaker panel and integral with the breaker.

- The ACB's shall be withdrawal type.

- ACB shall have minimum Mechanical life of 20000 operations.

- All ACBs shall have over temperature protection of release.

- Programmable digital contact shall be provided with possibility to configure for pre alarm like over load, over temperature etc, and trip functions like OL/SC/EF/OT etc.

- The operating mechanism of ACB shall be of the Open/Closed/Open stored-energy spring type. The closing time shall be less than or equal to 30ms, and of fast opening type with break time of breaker should be =15ms to ensure higher life of distribution cables.
- Shunt trip and closing coil (having common AC/DC supply upto 250V) shall be continuous rated. For Incomer ACBs delayed type under voltage release shall be used to avoid nuisance tripping during voltage surges.

- ACBs shall have minimum 4 change-over auxiliary contacts, available to be used for indication and interlocking, rated at minimum 10A 240/380V 50 Hz and shall be wired on chassis/cradle. There should be facility to add one more set of 4 contacts if required

- Pre wired Fault trip contact should be provided with Release as standard. Spring charge indication required for EDO ACB only.

- Draw-out ACBs shall preferably be provided with a mechanical latch on chassis which latches the ACB at Connected-Test-Disconnected positions while racking in and racking out the circuit breaker. This feature will help the operator in placing the circuit breaker at right position inside the chassis and can help in avoiding the accident.

- The racking handle of the breaker shall be stored on the air circuit breaker in such a manner as to be accessible without defeating the door interlocking.
- All air circuit breakers shall be fully tropicalized as standard & suitable for terminating copper or aluminum bus bars. Both fixed & draw-out circuit breakers shall have single pole-pitch. ACBs shall be provided with top horizontal and bottom vertical terminal adapters on both sides for proper cable connections/bus duct connections. Terminal orientation for top and bottom side shall preferably be possible to be changed from vertical to horizontal or vice versa on site as per cable/bus duct entry. Rest of the ACBs shall have both side vertical terminal adaptors for better heat dissipation.
- Air circuit breaker shall be provided with microprocessor release, which should preferably be self powered with in-built battery back-up. External 24V Auxillary supply or Power Supply Module can be used wherever required.
- The circuit breaker control unit shall measure the true r.m.s value of the current
- Circuit breaker trip unit shall have a display for measurement of current. It shall be possible to view last 10 trip/alarm/position cause and trip history on trip unit. The release should have indication of different fault on release chassis. All trip units provided shall have thermal memory as standard.
- All trip units shall be EMC/EMI tested
- The protection release shall have following protections as standard: -
    - Adjustable over load current (Ir) settings from 40% to 100% of rating of ACB (In). Over load time setting (tr) from 0.5s, 1s, 2s, 4s…….24s as field selectable curves.
    - Short circuit setting (Isd) from 1.5 to 10 times of Ir setting, Short circuit time delay adjustable from 0 to 400 msec.
    - Instantaneous (Ii) protection with an adjustable pick-up and an OFF position.
    - Earth fault setting adjustable in absolute Ampere with time delay settings from 0 to 400ms.
- Individual fault trip indication LEDs (For overload, short circuit, earth fault and trip unit failure) shall be available on the trip unit which shall function even if the display fails.
- The release should provide local LED indication for identification of type of fault, without requiring using external power supply. The fault indication should be available for a period of at least 60 hours, after tripping in the absence of main supply or battery back-up.
- I2t ON / I2t OFF options shall be available for short-circuit & earth fault protections which can be used to ensure discrimination with upstream circuit breaker or fuse
- The trip unit shall have integral test facility to verify the healthiness and to avoid external calibration.
- It shall be possible to change the protection settings on line and the circuit breaker need not be switched off while adjusting the settings.
- Preferably ACBs in main isolation panel shall be provided with zone selective interlocking which helps in reducing the thermal and dynamic stress on installation during short circuit and ground faults. The releases shall be suitable to communicate between incomer breaker and outgoing breakers enabling zone selective interlocking. The manufacturer shall supply all equipment like ZSI module, power supply and wiring connectors to implement ZSI.

- It shall be possible to view the percentage loading of three phases at once on trip unit via LEDs or LCD display to help the user in identifying the current load balancing of the network. This will help in preventing the deterioration of loads affected by load balancing by identification of the balancing related issue.

- All 4 Pole ACBs shall have fully rated neutral equal to rating of the breaker & shall be protected against over-load faults with provisions for settings neutral unprotected, neutral protection at 0.5In and neutral protection at 1.0 In to ensure precise neutral protection.

- The cradle shall be so designed and constructed as to permit the smooth withdrawal and insertion of the breaker into it. The movement shall be free from jerks, easy to operate and shall be on steel balls/rollers and not on flat surfaces. The modules shall be totally inter chargeable, for same rating.

  There shall be 3 distinct and separate positions of the circuit breaker on the cradle.

  - Service: Both main and secondary isolating contacts in service.
  - Test Main isolating contacts separate and secondary isolating contacts in service.
  - Isolated: Both main and secondary isolating contacts in isolated.

- There shall be provision for locking the breaker in all three positions. The breaker shall be provided with interlock to prevent the breaker from being withdrawn or replaced except in the fully isolated position. Interlock shall also be provided to prevent the breaker from closing without in service position.

- Separate limit switches with minimum 4 'NO' + 4 'NC' potential free contacts, each shall be provided for 'Test' & 'Service' position of the breaker. 6 'NO' + 6 'NC' breaker auxiliary contacts shall be provided as spare.

- ACB maintenance trolley shall be provided by the contractor to rack out ACB and prior to fixing product data shall be approved from the consultant and vendor shall provide all auxiliaries for ACB (as required during the time of product data approval) at no additional cost.

4. Contactors

All contactors and bi-metal relays should conform to IS - 13947 - 4/IEC - 947-4 standards. Contactors should be suitable for requisite duty and the contactor shall be designed to operate even in severe operating conditions.

The Contactors shall be suitable for switching and controlling squirrel cage and slipping motors as well as other AC loads such as solenoids, capacitors, lighting loads, heating loads and transformer loads.

The contactors shall be suitable for operation in service temperature up to 50 C without de-rating The contactors and bimetal relays shall have been tested for type-2 co-ordination at 50 KA, 415 V 50 Hz as per IS 13947 for both fuse protected as well as fuse-less motor feeders. The Contactor shall have coil of 220/240 V AC or as may be specifically asked for. The design of the current carrying parts, contact system and the magnet system should be such that it should increase reliability of electrical and mechanical endurance. Auxiliary contact should have double break parallel bridge contact mechanism. For operator safety the contactors above 45 Amp.Should have arc-chamber. The construction of the arc chamber should be such that there is no emission of arc by-products on the surrounding equipment.

The contactor shall have funnel shaped cable entries, cable end stops and predetermined insertion depths. Contactor below 63 Amp shall have captive screws preventing the screws from falling. Main contacts should be of silver alloy to have long contact life; it should withstand to keep the contact bounce to minimum and should be shrouded with an arc chute. Both moving and fix contacts should be accessible for inspection or replacement without disturbing terminal

wiring.

The magnet system should have laminated construction to minimize the losses. Coils should withstand high temperature and ensure low power consumption. Coil should be resin cast/encapsulated. It should have inter layer insulation. Contactor should have facility to mount add-on auxiliary contact block. Mechanical interlocks should be provided for sequential operations if required. Contactor should be comfortably mounted in any position on a vertical plane. Contactor should be capable of handling high transient currents, which occurs at a high time of switching of capacitors.

It's Insulation voltage level should be – 1000 v. Contactor shall be designed to have Mechanical endurance of the order of minimum 15 million operations or better. Contactor should operate without deration from - 30° C to +50°C

5. Current Transformer

Current transformers shall comply with the requirements of IS. 2705. They shall have ratios, outputs as specified in SLD. The current transformers shall be core type with cast resin/encapsulated secondary winding. CTs shall withstand stresses originated from short circuit. These shall be mounted on the switchboard stationary part.

The secondary CT leads from all panels should be terminated on the front of the board on easily accessible shorting type terminal connectors so that operation and maintenance can be carried out when the panels are in service.

CT's shall be given heat run test. CT's shall be of class 1 accuracy unless otherwise specified.

6. Indicating Instrument

All indicating instruments shall be digital of flush mounting industrial patterns, conforming to the requirements of I.S.

The instruments shall have non-reflecting bezels, clearly divided and indelibly marked scales and shall be provided with zero adjusting devices in the front. Integrating instruments shall be of flush mounting switchboard pattern, complying with the requirements of I.S.

7. Protection Relay

The protection relay should be microprocessor based & have 12 mm, 8 values, Set values, Trip data and Trip History for analysis and troubleshooting.

All Protection Relays should be conforming to following IS/IEC standards:

- IEC 61000-4-8 Power Frequency Magnetic Test
- IEC 61000-4-11 Voltage Dips and Interruption Test
- IEC 61000-4-12 Ring Wave Test
- IEC 61000-4-5 Surge Immunity
- IEC 61000-4-3 Radiated Electromagnetic Field Test
- IEC 61000-4-4 Electrical Fast Transient test
- IEC 61000-4-2 Electrostatic Discharge Test
- IS 8686/IEC 60255-22-1 High Frequency Disturbance Test
- IS 8686/IEC 60255-5 Impulse Test
- IS 3231/IEC 60255-5 Dielectric Test

The Protection relay should have built in Self Supervision and Self-Testing Feature & Self diagnostic ensure continuous reliability. The protection relay should have separate indication for Power On, Programming Mode and Relay fault.

The protection relay shall have RS 485 port/MOD BUS for Communication with BMS system. The Hardware/Software Protocol for the same shall be given without any additional cost. The protection Relay shall have minimum 4 No of user programmable output relays. The protection relay should have a test feature for maintenance and checking purpose. The protection relay shall have 3 phase characteristics, which shall be adjustable over wide range to provide discrimination between a multiplicity of devices.

8. Control Switches

Control Switches shall be of the heavy-duty rotary type with escutcheon plates clearly marked to show the operating position. They shall be semi-flush mounting with only the front plate and operating handle projecting. Circuit breaker control switches shall be of the spring return to neutral type, while instrument selector switches shall be of the stay-put type.

9. Push Button

- Push buttons should be of the momentary contact, push to actuate type.
- Push Buttons should be panel mounted, flush type having 22.5 mm Ø.
- Push Buttons should be spring returns type.
- Lock and key head with Push turn facility.
- Modular blocks should contain NO-NC contact.
- It should be snap-fit type for easy assembly.
- Double break self-cleaning contacts for prolong life.
- NO-NC contact block should be colour coded for easy identification.
- Push Buttons should have transparent shroud & rubber shroud to enhance protection against ingress as per IP- 67.
- It should withstand operating voltage as well as frequent operation.
- It should have finger proof shrouded terminals.

10. Control Wiring

All Control wiring shall be carried out with 1100 Volts grade single core PVC cable conforming to IS694 having stranded copper conductors of minimum 1.5 sq mm for potential circuits and 2.5 sq. mm. section for current transformer circuit.

Wiring shall be neatly bunched, adequately supported and properly routed to allow for easy access and maintenance.

Wires shall be identified by numbered ferrules at each end. The ferrules shall be of the ring type and of non-deteriorating material. They shall be firmly located on each wire so as to prevent free movement. All control circuits fuses shall be mounted in front of the panel and shall be easily accessible.

11. Terminal Blocks

Terminal blocks shall be of Elmex /connect well make of the suitable type. Insulating barriers shall be provided between adjacent terminals. CT Terminal blocks shall be shorting type.

Terminal blocks shall have a minimum current rating of 10 Amps &650 volt grade rating complete with insulated barriers. Provisions shall be made for label inscriptions.

- It should have snap fit action.
- It should have captive-screws and self-lifting washers.
- Withstand temp range from –30° C to 100° C.
- Terminal Connectors should have flame retardant property confirming to UL-94, V-2.

- Terminal Block should be suitable for commonly used DIN Rail – 35 X7.5 mm and mounting channel 'C' shaped Std.32 mm.
- Terminal Block should be suitable for commonly used DIN Rail – 35 X7.5 mm and mounting channel 'C' shaped Std.32 mm.
- The construction material should be of high quality like polyamide 6/6 and contacts of Nickel plated brass. Labels shall be of anodized aluminum, with white engraving on black background. They shall be properly secured with fasteners.

12. Multifunction Meter

All the meters shall be housed in a separate compartment and accessible from front only. Lockable doors shall be provided for the metering compartments. All meters and indicating instruments shall be in accordance with relevant Indian Standard. The meters shall be flush mounted. Indicating lamps shall be LED type. The meters shall be digital counter type with LCD/LED display. It shall be flush mounted on panel. The size shall be at least 96 mm x 96 mm at the front side. The Class of accuracy of the meters shall be 1. The meters shall be calibrated as per CT secondary current and directly from the LT voltage, self-powered and suitable for 3 phases, 4 wire system.

Meter should be confirming to following IS/IEC standards.

- IEC 61000-4-8 Power Frequency Magnetic Test
- IEC 61000-4-11 Voltage Dips and Interruption Test
- IEC 61000-4-12 Ring Wave Test
- IEC 61000-4-5 Surge Immunity
- IEC 61000-4-3 Radiated Electromagnetic Field Test
- IEC 61000-4-4 Electrical Fast Transient test
- IEC 61000-4-2 Electrostatic Discharge Test
- IEC 1036 Accuracy
- IS 8686/IEC 60255-22-1 High Frequency Disturbance Test
- IS 8686/IEC 60255-5 Impulse Test
- IS 3231/IEC 60255-5 Dielectric Test
- IS13779 Operating Temperature
- IS 722 3 Phase Watt -Hour Meter with Maximum Demand Indicator
    - Sampling rate of 32 or 64 samples / cycle
    - Frequency : 50/60Hz
    - Aux supply: 80-300VAC / DC
    - Measuring circuit burden should be lesser than 0.2 VA
    - Aux burden < 5VA
    - Meter shall be suitable for CT secondary 1A /5A
    - It should be possible to program CT ratio and PT ratio on site through key pad provided at the front facia of the meter. Programming shall be achievable only through password protected feature provided in the meter.
    - Direct access key for Basic, Power, Energy parameters
    - Menu driven feature on front facia.
    - Meters shall have RS485 port with MODBUS RTU protocol
    - All meters shall have protection of IP 51 from front end preventing from dust and moisture.

Multifunction meters have been classified into categories and shall be provided accordingly on each panel as specified in single line diagram of each panel. The unit shall have necessary arrangements communication port RS 485 for energy metering. Categories for multifunction meters are as follows:

- MFM-1: Multifunction meter with THD, KVARH, KVAR, PF, V, A, Hz
- MFM-2: Multifunction meter with KWH, KVAR, PF, V, A, Hz.
- MFM-3: Multifunction meter with KWH, V, A Equivalent to
- MFM-4: Multifunction meter with PF, V, A, Hz Equivalent to

13. Isolators

All isolators and switches shall be two position type (ON/OFF) heavy duty, load break, quick make and break type and suitable for front of board operation and shall conform to I.S. 4064.The isolators for motor feeders shall be of "Motor Duty" type adequate for interruption of locked rotor current of motors (excepting for motors rated 50 Kilowatts and above).Switches and isolators provided in the switch boards shall be interlocked with door to prevent opening and closing of the door in the closed (ON) position of the isolators. All live terminals on the isolating / switches shall be adequately shrouded to prevent accidental contact and danger to the personnel. Properly rated co-coordinating fuses (HRC type) shall be provided for every outgoing feeder unless otherwise indicated. The fuse shall be non-deteriorating high rupturing capacity link type mounted in suitable fuse carrier / fuse base and conform to I.S. 3106.

14. Load Manager

The load manager shall be micro-controller based unit capable to measures a host of electrical parameters and display them on a 128 x 64 backlit LCD, It shall have load management feature and shall have six numbers of output relay contacts apart from CT/PT contacts. These outputs shall be individually field programmable for both the parameter on which to generate alarm as well as the values on which to activate alarm and deactivate it. In addition to this flexibility in terms of load management, the load manager shall also have RS485 port. RS485 supports MODBUS RTU protocol for connections to EMS/SCADA. The unit shall be made for three phase four wire system. The installation type, CT ratios and PT ratios shall be site selectable. The Load Manager with its six relay contacts shall be capable to be used as a Demand Controller. The method of Demand calculation i.e. sliding window, fixed window shall be selected at site. The device shall have all the features needed to implement a robust electrical load management system. It shall be programmable / configurable to suit most control and communication needs. The load manager shall be capable to measure following parameters:

- Voltage (Volts L-N & L-L) VL-N Accuracy: 0.5% of Reading VL-L Accuracy: 1.0% of Reading.
- Current (Amps IR, IY, IB) Accuracy: 0.25% of Reading.
- Line Frequency 45 to 55 Hz, Accuracy: 0.3% of Reading.
- Active Power (P) Accuracy: 0.5% of Reading (For IPFI>0.5).
- Reactive Power (Q) Accuracy: 1.5% of Reading (Between 0.5 Lag to 0.8 Lead).
- Apparent Power (S) Accuracy: 0.5% of Reading.
- Power Factor For Individual phases and System. Accuracy: 0.5% of Reading (IPFI≥0.5) Range of Reading: 0.05 to 1.000 Lag/Lead.
- Total Active Energy (KWh) Range of Reading: 0 to 9999999.9 KWh Accuracy: Class 0.5 as per IS14697.
- Total Apparent Energy (KVAh) Range of Reading: 0 to 9999999.9 KVAh Accuracy: Class 0.5 as per IS14697.
- Total Reactive Energy (KVARh) Range of Reading: 0 to 9999999.9 KVARh Accuracy: Class 1.0
- 3 rd to 15 thHarmonics(Odd) for all Voltages with THD.
- 3 rd to 15 thHarmonics(Odd) for all Currents with THD.
- Active Power (KW) Demand - Sliding & Fixed, Selectable.
- Apparent Power (KVA) Demand - Sliding & Fixed, Selectable

The device shall also have following features:

- Display 128 X 64 Graphical LCD with Operating temp 10°C to 50°C.
- Data Logging Buffer 2 MB, Non-volatile memory, capable of holding 19691 records Logging Duration Site selectable.
- RS485 Modbus-RTU protocol
- Communication USB 8.0 Pen-drive For downloading logged data

15. Test and report

- Type Test

  - ❖ Type test shall be conducted on one unit of each type of panel with rated bus-bar and circuit breaker mounted with the unit in accordance with relevant IS and shall be as mentioned below: Verification of Temperature rise limit.
  - ❖ Verification of the short circuit withstand strength.
  - ❖ Verification of mechanical operation
  - ❖ Verification of degree of protection.
  - ❖ Type 2 co-ordination test
  - ❖ Breaker - Duty cycle
  - ❖ Mechanical endurance
  - ❖ Electrical endurance
  - ❖ Routine tests shall be conducted on all panels and Distribution boards in accordance with relevant IS codes and shall be as mentioned below:
  - ❖ Insulation resistance test (IR value) by 1000V megger before HV test. Dielectric test by applying 2.2 KV for 1 min and noting leakage reactance.
  - ❖ Insulation resistance test by 1000 V megger after H.V test.
  - ❖ Functional controls check for panels.
  - ❖ Logic simulation test.
  - ❖ Current injection test.
  - ❖ Bus-bar purity test

- Inspection

  Inspection of the panels shall include inspection of wiring and electrical operational tests where necessary, Dimensional & Visual verification.

  Checking of Protective Measures and electrical continuity of the protective circuits. Primary and Secondary Injection Test for Checking of all Meters and Relays Checking of control Circuit by simulating the conditions. Any such simulator in case required shall be arranged by contractor / manufacturer / sub-contractor etc.

- Acceptance Test

  All the tests carried out in the routine test shall be asked for acceptance test and test shall be carried out in similar way except the dielectric test which shall be carried out at 75% of the routine test voltage.

- Testing

  The Capacitor bank shall be subject to tests as specified in relevant Indian Standards at the factory and the test certificates shall be furnished. Residual voltage after switching of the capacitors shall not be more than 50 Volts after one minute. Insulation resistance shall be tested with a 1000 Volts meggar between phases and phase to earth. Each discharge resistors shall be tested for its working.

16. Installation, Testing & Commissioning

- The complete Panel assembly shall be installed in accordance with the manufacturer's installation drawing duly

approved by "The consultant "

- The panels needs to be grouted considering the seismic zone requirement.
- Panels shall be properly aligned and the leveled within tolerance of +/- 2mm and shall be ensured with a water level indicator or a laser gun whichever available. No shim shall be allowed to make a panel level suitably.
- All live sections and compartments shall be covered with insulation barriers.
- All the components of the panel shall be easily accessible.
- The location of installation shall be cleaned and co-ordination shall be made with other disciplines.
- Grouting holes shall be provided from inside and the panel shall be suitably and tightly bolted. No tuck welding with base channel is allowed.
- Panels shall have peel-able poly layer on the cover for protection from cement, plaster, paints etc. during the construction period.
- The holes made in enclosure for cable termination or anything else shall be made only through drill machine or approved cutting tool with marking of dia done prior to cutting or drilling. Extra left out holes shall be filled neatly with fire retardant sealant.
- The Panel shall be tightly grouted. No spare nuts-bolts shall be left out un-tightened / open inside the DB enclosure in any case.
- Gland plates where ever used for cable termination shall be tightly fixed and shall be earthed.
- Size of Horizontal and vertical bus bars shall be equal.
- Switchgears above 63A shall be mounted on bus bars tightly and accurately.
- Termination lugs shall be tightly fixed and connected and there shall not be any bare wire strand jetting out of the lugs. Suitable crimping tool shall be used. And terminal wires shall be coved with heat shrinkable sleeves whose color coding has to match with the color of the wire used.
- Color coding shall be followed for internal wiring also in a similar pattern as described in chaper-1 wiring under the specification document. Bus bar shall be tagged for phase indication.
- Panel compartments shall be provided with space heaters and lights operated by door limit switches.
- Capacitors Panels shall be provided with fans controlled by door limit switch and thermostat.
- The door of panel shall be aligned properly and there shall be no air gap left after closing the DB door. Gaskets shall be used to make DB free from moisture.
- Panel shall have Padlocking arrangement and shall be pad locked after complete installation.
- Panel board shall be fully tested (both type and routine test) for its components as per the specification laid under Indian standards. In particular following test shall be done:

    - ❖ Continuity test (both earth continuity and loop continuity)
    - ❖ Insulation resistance test.
    - ❖ Contact resistance test.
    - ❖ Primary injection test.
    - ❖ Trip test and trip unit reset test with Test knob of breaker.
    - ❖ CT testing (Polarity, Knee voltage)
    - ❖ Phase rotation test.
    - ❖ HV test on bus bar
    - ❖ Space heater Testing
    - ❖ Control wiring checks

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

UPS Works

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI
Creating an Ecosystem for Quality

Date: 17th Dec. '2024

Revision: R0

PART 1 - GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of the contract including general conditions and other applicable specification sections in the project manual apply to the work specified in this Section.

SUMMARY

Scope: The scope of work under this contract comprises Supply and Installation work for UPS. The work shall be executed and completed under this contract in every respect in conformity with the current rules and regulations of the local electricity authority, the Indian Standard Institution, and with the directions of and to the satisfaction of the Architect/Consultant. The Contractor shall supply all labour and supply and install all materials, appliances, equipment necessary for the complete provision and testing of the whole Electrical Installation as specified herein and shown on the drawings. This also includes any material, appliances, equipment not specifically mentioned herein or noted on the drawings as being furnished or installed but which are necessary and customary to make complete installation. The work shall include all incidental jobs connected with electrical installation such as cutting/drilling and grouting for fixing of equipment etc.

Section Includes: The work specified in this section includes but shall not be limited to a three-phase on-line double conversion solid state UPS. The UPS shall operate in conjunction with the existing building electrical system to provide high quality power conditioning back-up power protection and distribution for electronic equipment loads. The system shall consist of integrated input isolation transformer in separate enclosure with solid state IGBT based power factor corrected rectifier and IGBT based inverter along with a 100 percent rated for continuous duty static switch, battery bank, touch screen LCD display plus synoptic status/control panel inbuilt synchronizing circuitry possibility to parallel connection for power and redundancy as described herein.

REFERENCES

General:
The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the contract documents unless otherwise specified.

International Organization for Standardization (ISO):

ISO 9001:2015 - "Quality Management Systems - Requirements."
ISO 14001:2015 - '' Environmental Management Systems-Requirements''
ISO 45001:2018 - '' Occupational Health and Safety Management Systems-Requirements''.

Product Standards & Certifications :

IEC/EN 62040-1:2008/A1:2013, Un-interruptible Power Systems, Part 1: General and Safety requirements
IEC/EN 62040-2:2006, Uninterruptible Power Systems, Part 2: EMC requirements
EN 62040-3 Uninterruptible power systems (UPS). Method of specifying the performance and test requirements
Product must have PeP certification with pep ecopassport referenced number and also RoHS directive 2011/65/EU.
Proposed UPS must have type test certificate as per IEC 62040-3 from NABL accredited lab in India. In the case of non-availability of same rating type test certificate, then the respective series must have minimum lower rating and higher rating model type test certificate as a confirmation for the submitted rating of the proposed series . Type test certificate of applicable ratings must to be submitted with technical bid.

Following the provisions of the Directives:
2014/35/EU February 26, 2014 "LOW VOLTAGE"2006/95/CE
2014/30/EU February 26, 2014 "ELECTROMAGNETIC COMPATIBILITY"

UPS DEFINITIONS

Purpose: The purpose of this specification is to define the design, manufacture and testing characteristics required in view of supplying, putting into operation and maintaining an Uninterruptible Power Supply system (referred to as a UPS in the rest of this document).

Brief description:

The UPS system shall be made up of identical parallel-connected UPS units (same power rating) operating in double-conversion mode (also called on-line mode); it shall be a VFI UPS (as per standard IEC 62040-3).

Each individual UPS unit shall comprise the following components, described below in this specification:

- IGBT based PFC rectifier.
- External integrated input Copper wound K1 type isolation transformer
- Built-in battery charger with standard capacity for Lithium Ion battery charging
- 3Level IGBT Inverter
- Inbuilt phase sequence correction & protection.
- 7'' touch screen user and communications interface
- All other devices required for safe operation and maintenance, including circuit breakers, switches, etc.
- Static bypass (via a static switch) for each UPS unit
- Manual maintenance bypass for each UPS unit
- Battery temperature sensor

System Requirements:

The UPS shall ensure continuity of electric power to the load within the specified tolerances without interruption upon failure or deterioration of the normal AC source (utility power) for a maximum protection time determined by the capacity of the backup batteries installed.

OPERATING PRINCIPLES

System Typology:

Each single-UPS unit shall operate in double-conversion mode (also called on-line mode); it shall be a VFI-type UPS (as per standard IEC 62040-3), made up of the following components described in detail in this specification. The UPS should be continuous duty, highly reliable and solid state. It should be modular in design so that any individual section can be easily isolated or added in future for increasing capacity.

Normal operation (normal AC source available):
The rectifier supplies the inverter with DC current while the charger simultaneously floats charges the battery. The load is continuously supplied with dependable electrical power by the inverter.

Operation on battery power (normal AC source not available or outside tolerances):
Upon failure or excessive deterioration of the normal AC source, the inverter shall continue to supply the load from battery power without interruption or disturbance, within the limits imposed by the specified battery backup time.

Battery recharge (normal AC source restored):

When the normal AC source is restored, the rectifier shall again power the inverter, without interruption or disturbance to the load, while the charger automatically recharges the battery. The UPS system shall ensure equal sharing of the total load between the various parallel-connected units.
Recharge characteristic: Intermittent charging with prevailing state of complete rest and control of the battery status.

Parallel operation and redundancy

a. The units shall operate in parallel with redundancy, with the load shared equally between the units.
b. If a major fault occurs on any unit, it shall automatically disconnected & total load transferred to other
c. If the remaining unit(s) are sufficient to supply the load, it/they shall remain in operation.
d. If the total available power is insufficient, the load shall be automatically transferred, with-out interruption, to the bypass AC source, if it is within tolerances.

Transfer to bypass AC source:

1. In the event of an overload exceeding system capabilities (short-circuits, heavy inrush currents, etc.) the load shall be automatically transferred, instantaneously and without interruption, to the bypass AC source, on the condition that bypass power is available and within tolerances.
2. To that end, synchronization of each inverter in phase and frequency with the bypass source shall be automatic. Transfer of the load back to the UPS-unit outputs shall be automatic or manual. During transfer, the load shall not suffer an outage or disturbance in the supply of power.
3. To ensure transfer in complete safety, the system shall simultaneously control the static switches.
4. On request, the UPS system may automatically transfer the load with a micro-interruption if a major fault occurs on the UPS system and if synchronization with the bypass source has not been established.

UPS maintenance:

1. For maintenance purposes, all electronic components shall be accessible from the front of the UPS.
2. In addition, a built-in manually operated mechanical bypass system shall be installed in each UPS unit;
3. For personnel safety during servicing or testing, this system shall be designed to isolate the UPS units while continuing to supply power to the load from the bypass AC source. Transfer to the manual bypass mode and back shall be possible without interruption to the load.
4. The UPS shall also include a device making it possible to isolate the rectifiers and the chargers from the normal AC source.

PART 2 - SYSTEM DESCRIPTION

2.1 Technical Characteristics

UPS Design Requirements:

1. Output Power Continuous Rating: The continuous output power rating as per BOQ at PF=0.9
2. Input Voltage: [400] V AC, -20 % ~ +15 %, Three-phase, 5 wires 3Ph +N + PE.

Output Voltage: [400] V AC, Three-phase, 3Ph + N

4. Input Current: Max 212A @ 400V AC at nominal load, nominal voltage & maximum charging

5. Output Current: Max 144A @ 400V AC

AC Input Characteristics:

1. Voltage: 400V AC, -20 % ~ +15 %, Three-phase, 5 wires 3Ph +N + PE.
2. Frequency: 50Hz ± 5Hz compatibility
3. Power Factor: ≥ 0.99 lagging.
4. Input Current Harmonic Distortion: Less than 3% at 100% load.
5. Isolation Transformer: Copper wound K1 type input isolation transformer in separate enclosure

AC Output Characteristics:

- Voltage: 400V AC, ±1% steady state variation phase-to-phase voltage , Three-phase, 4-wires.
- Frequency: 50Hz, ±2% (Inverter Sync with Mains); 50Hz, ±0.001 percent when free running.
- Voltage Stability: ±1.0% for balanced load, ±2.0% for unbalanced load.

- Voltage Distortion: < 1% total (THD) linear loads, < 5% total (THD) nonlinear loads.
- Voltage Transient (Step Load) Response: ±5% for load step changes from 100% to 20% and from 20% to 100%. The system returns to the ±1% range in rms value in less than 20ms.
- Voltage Recovery Time: Return to within 1% of nominal value within 20 milliseconds (one cycle).
- Phase Angle Displacement: 120°±1° for balanced load; 120° ±2° for 100% unbalanced load.
- Crest Factor: 3:1
- Slew Rate: 2HZ/Sec(adjustable)
- Power Factor: 0.9 at the rated kilo volt amperes (KVA).
- Inverter Overload Capability: 125% for 10Mins, 150% for 60Sec, 100ms > 150%
- Bypass Overload Capability: 150% for continuously ; 200% for 1 cycle

Battery:

- Type of Battery: Lithium ION (NMC+LMO)
- Cell Voltage Nominal : 3.8V/Cell
- Cycle life (6C, 25 °C): >2500 @100% DOD
- Design life (25 °C) : 15 years
- Specific energy (capacity) : 90~120Wh/kg Pls Remove
- Charge (C-rate) : 1C typical, charges to 3.65V; (4.2V) 3h charge time typical
- Operating Temperature : 20-30 °C
- Storage Temperature : 0 °C~45 °C
- Integrated Battery Management System (BMS) allows for full monitoring and control, optimizing the usage and performance of the battery.
- Communication interface : RS485 & CAN & TCP / IP; Dry contacts
- Certification : UL1973, UL9540A, IEC62619, IEC62477, IEC62620, ICC-ES AC156, Remove EN61000-6-2 & EN61000-6-4, UN38.3
- IP rating : IP20
- Battery bank must be sized for 60Mins backup under 1.0PF (Uniformity Power factor) load condition with minimum of 60Mins BOL autonomy and minimum of 50mins as EOL autonomy. Battery sizing calculation must to be submitted .
- Warranty : 5Years

Environmental Requirements:

1. The UPS shall operate under the following environmental conditions:
a. Temperature:
1) UPS Module Operating: 0 °C to 40 °C.
2) Non-Operating (Storage): -10 °C to 70 °C.
b. Relative Humidity (Operating and Storage): 0 to 95% percent non-condensing.
c. Operating Altitude : Up to 1000 meters above sea level.
d. Audible Noise: < 65 dB at 1m.

2.2 MODES OF OPERATION

A. UPS module shall be designed to operate as a double conversion, on-line reverse transfer system in the following modes.

Normal: The inverter shall continuously supply power to the critical load. The PFC rectifier shall derive power from the utility AC source and supply DC power to the inverter while simultaneously float charging the battery.

Emergency: Upon failure of the utility AC power source, the critical load shall be supplied by the inverter, which, without any interruption, shall obtain its power from the battery.

Recharge: Upon restoration of the utility AC power source (prior to complete battery discharge), the PFC rectifier shall power the inverter and simultaneously recharge the battery.

Bypass Mode: The static bypass transfer switch shall be used to transfer the load to the bypass without interruption to the critical power load. This shall be accomplished by turning the inverter off. Automatic re-transfer or forward transfer of the load shall be accomplished by turning the inverter on.

2.3 COMPONENT DESCRIPTION

PFC Rectifier and Battery Charger: Incoming AC power shall be converted to a regulated DC output voltage by an IGBT (insulated gate bipolar transistor) power factor correction (PFC) rectifier. The PFC rectifier shall provide high quality DC power to charge the batteries and power the inverter and shall have the following characteristics:
Input Power Factor Correction (PFC): The PFC rectifier shall be power factor corrected so as to maintain an input power factor of 0.99 lagging to unity at 100 percent load levels to ensure generator compatibility and avoid reflected harmonics from disturbing loads sharing the utility power.

Input Harmonic Current Suppression: The PFC rectifier shall produce a sinusoidal input AC current on each phase with low harmonic content, limiting THD on the UPS input to below 3 percent at 100 percent load levels.
Input Phase reversal Correction: The ups shall auto correct and adjust the Input phase sequence to avoid battery discharge and continuity of supply to load whenever there is phase sequence change for input power supply.
Battery Testing : Auto & Manual battery testing Shall be available in the UPS

Inverter: The UPS output shall be derived from a variable frequency with 3Level Inverter Pulse Width Modulated (PWM) IGBT inverter design. The inverter shall be capable of providing the specified precise output power characteristics while operating over the battery voltage range.

Static Bypass – 100%Rated, Continuous Duty: The static bypass transfer switch shall be solid state, rated for 100% continuous duty without mechanical contactor device in parallel for higher reliability and consistent response time and shall operate under the following conditions:

1. Uninterrupted Transfer: The static bypass transfer switch shall automatically cause the bypass source to assume the critical load without interruption after the logic senses one of the following conditions:
a. Inverter overload exceeds unit's rating.
b. Battery protection period expired, and bypass current is available.
c. Inverter failure.
2. Interrupted Transfer: If the bypass source is beyond the conditions stated below, the UPS shall make an interrupted transfer.
a. Bypass voltage greater than +10% ~ -10% from the UPS rated output voltage.
b. Bypass frequency greater than ±1Hz ~ ±5Hz (programmable) from the UPS rated output frequency.
3. Automatic Uninterrupted Forward Transfer: The static bypass transfer switch shall automatically forward transfer power, without interruption, after the UPS inverter is turned on after an instantaneous overload-induced reverse transfer has occurred and the load current returns the UPS's nominal rating or less.
4. Manual Transfer: A manual static transfer shall be initiated from the UPS control panel by turning the UPS inverter off.
5. Overload Ratings: The static bypass transfer switch shall have the following overload characteristics:
a. Up to 150% for continuously ;
b. 200% for 1 cycle
6. Back feed protection: UPS shall be equipped with standard contractor at Bypass path in case failure of static switch faults in and to secure the available source with reverse power
7. Separate cabinet based isolation transformer at input side for proper galvanic isolation & reliability of system.
8. UPS must have rectifier walk-in time to be designed at 5 - 30Sec (selectable)
9. For Modular hot-swappable UPS, AC-AC Efficiency in normal operation from AC-AC efficiency 25% to 100 % load shall be > 95%. For Monolithic UPS, AC-AC Efficiency in normal operation shall be > =90% including transformer losses @ 100% loading as applicable
10. Product with PeP certification & must comply to 2014/35/EU February 26, 2014 "LOW VOLTAGE" & 2014/30/EU February 26, 2014 "ELECTROMAGNETIC COMPATIBILITY"
11.Product must comply to IEC/EN 62040-1,IEC/62040-2,IEC/EN 62040-3 along with CE/UE complied

2.4 SYSTEM CONTROLS AND INDICATORS

DSP-Controlled Logic:

1. The full UPS operation shall be provided using DSP-controlled logic. Operation and parameters shall be firmware-controlled, thus eliminating the need for manual adjustments or potentiometers. The logic shall include, but shall not be limited to, a self-test and diagnostic circuitry such that a fault shall be isolated down to the printed circuit assembly or plug-in power assembly level. Every printed circuit assembly or plug-in power assembly shall be monitored. Diagnostics shall be performed via a PC through the local diagnostics port on the UPS.
2. The UPS shall include, but shall not be limited to, a standard easy-to-use control and indicator panel. Included shall be a 7'' Touch Screen LCD display, LED indicators and synoptic diagram to show the overall running status of the UPS.
3. Display shall facilitate operation by offering the functions listed below:
a. Operating information supplied on the screens.
b. The display shall assist the user by providing step-by-step help in the user's language.
c. LED mimic diagram. The mimic diagram shall enable display of installation parameters, configuration, operating status and alarms and indication of operator instructions for switching operations (i.e., bypass).
d. It shall be possible to display the following measurements through Front Panel 7'' Touch LCD Display :
Input Voltage R Y B
Input Current R Y B
Input Frequency
Input PF
Bypass Voltage R Y B
Bypass Frequency
Battery Voltage +/-
Battery Charge / Discharge Current
Battery status
Battery Temperature (Option)
Battery capacity rate %
Remaining Backup Time in minutes
Output Voltage R Y B
Output Frequency
Output Current R Y B
Output Load in % R Y B
Output Power in W / VA
Output / Load CF
Warning History
Mimic Power flow Diagram
Configuration settings
Event Log : 1000 Events with Date & time

f. Additional information shall be provided in view of accelerating servicing of the system.
g. Log of time-stamped events. This function shall store in memory and make available, for automatic or manually initiated recall, time-stamped logs of important status changes, faults, and malfunctions complete with an analysis and display of troubleshooting procedures.

Front Panel LCD Display: The UPS control panel shall provide display should capable of show schematic diagram, readings of input, rectifier, inverter & bypass, Alarms, event logs up to 1000nos, history & user parameter settings.
LED Status Indicators: The UPS control panel shall provide three LEDs that shall signal the following status conditions.
Green LED: Online with load protected
Yellow LED: Battery Run, UPS on Bypass or Minor fault.
Red LED: Major fault, load not protected.

Audible Alarm Reset: The UPS shall provide an audible alarm that can be stopped using the user interface. If a new alarm is sensed after the original alarm has been silenced, it shall reactivate the audible alarm. Below alarm

signaling must be available
Battery weak or faulty
Output short circuit
EPO mode
UPS over temperature
Inverter overload
Utility Low or battery disconnected
By pass overload

Remote Emergency Power Off (REPO): The UPS shall be equipped with provisions for remote emergency power off and dry contact input that shall be used to command UPS shutdown remotely.

Communication Interface: RS-232 & USB connector with serial output shall be provided for field diagnostics as standard communication interface.
Dry Contacts: The UPS shall be provided standard with a programmable input/output relay board. This board shall have eight dry contacts (i.e., six for input signals and two for output signals).
1. Contacts shall be programmed as:
General Alarm
Mains Fault
Battery Low
Inverter out of tolerance
Bypass Operation
Booster OK & not (BCB open)
Inverter Operation
Bypass OK

2. The contacts shall be normally open and shall change state to indicate the operating status. The contacts shall be rated at 120 VAC voltage 1A current and also option for 24V/50V DC voltage 1A current resistive load.

2.5 MECHANICAL DESIGN AND VENTILATION

Enclosure: The UPS shall be housed in a freestanding enclosure with dead front construction. The mechanical structure of the UPS shall be sufficiently strong and rigid to withstand handling and installation operations without risk. The sheet metal elements in the structure shall be protected against corrosion by a suitable treatment, such as zinc electroplating, bi-chromating, epoxy paint, or an equivalent. Enclosure to be of IP20 based.
Cable Access: The standard UPS available shall accommodate bottom entry cables (top entry shall be optional).
Ventilation and Heat Rejection: The UPS shall be designed for forced air cooling. Air inlets shall be provided from the front and top of the UPS enclosure. Air exhaust shall be from the top portion of the unit. Full load heat rejection with Axial fans

3.1 DATA SHEET OF MODULAR UPS

SR. NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
1	Make & Model Name	Bidder to confirm	
2	Technology	APFC IGBT based rectifier and 3-Level IGBT Inverter based double conversion online VFI-SS-111 (Performance Comply to IEC 62040-3)	
3	Architecture	Tower design with integrated copper (external) Output isolation transformer K-13 type	

SR. NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
4	Input voltage range	3-Phase 320-478V AC under load variation of min of 30% to 100	
5	Input rectifier type	Advance PFC based IGBT rectifier	
6	Input current harmonics(THDi)	< 3% @ full load	
7	Input power factor	≥ 0.99	
8	Voltage harmonics	<0.5%	
9	Soft start/Power Walk-in facility (5-30 Secs)	Required	
10	Sheet thickness (mm)	2 mm sides 3 mm base plate & 1.6 mm front door	
11	Degree of protection	IP-20	
12	Cable entry	Standard as Bottom entry	
13	Acoustic noise level	<65dbA	
14	Isolation Transformer	Should be available at input final Output externally in same type cabinet with Cu winding of K-13 type min	
15	VFI-SS-111 Waveform	Should be available	
16	Output voltage	400V, 3ph, 4w, 50Hz AC ±1 % (380,400 selectable) effectively earthed	
17	AC voltage accuracy (steady state) over entire load, load pf & dc voltage range	±1 %for balanced load	
	AC-AC efficiency 25% to 100 % load	>=95%	
18	Transient (Dynamic) voltage regulation	±5% at 20- 100% load step with Pk – Pk value	
19	Transient recovery	Return to steady state condition. within 20ms after Disturbance	
20	Voltage wave form	Sinusoidal	
21	Range of adjustment of ac output voltage	380/400/415V	
22	Phase displacement	1200 ±10 for balance load 120° ±2° for unbalance load	
23	Nominal frequency	50 Hz	
24	Overload	125% of rated load for 5mins 150% of rated load for 30sec	
25	In rush current	Maximum 25% of full load current (energizing rectifier with inverter at no load)	
26	Built in static /Bypass	Required	
27	Inverter and Static Bypass change over time	0ms	
		Up to 150% of UPS output rating	

SR. NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
28	Bypass Overload	as continuous & 1000% for 1 cycle	
29	Transfer time	Less than 5 milli secs.	
30	Manual Bypass switch	Required Inbuilt	
31	Charging current	Setting min 10% of AH capacity Settable with 2.35 Volts boost charging	
32	Type of battery	Lithium Ion Battery Bank (NMC+LMO) technology	
	Certification of Lithium-Ion battery	UL9540A, UL1973, EN61000-6-2, EN61000-6-4	
33	Charger unit	IGBT DC – DC Charger with Temperature compensation charging	
34	Backup Time	15Mins/60Mins (Battery Sizing Calculation to be submitted)	
35	Load Power Factor	0.9 lagging/Unity	
36	True autonomy / measurement	7'' Touch Screen Monitor Panel	
37	Temp. compensated. charger	Required	
38	Automatic battery load test	Mandatory	
39	DC Battery Breaker with shunt trip protection	Required	
40	Cold start Facility	Required	
41	PROTECTION		
42	Over Load	Required	
43	Short circuit (SC)	Required	
44	Input low voltage	Required	
45	Output over voltage	Required	
46	Battery over charging	Required	
47	Battery over Discharging	Required	
48	DC Over current	Required	
49	ENVIRONMENTAL		
50	Ambient temperature range	Up to 40 Deg C	
51	Acoustic Noise	< 65 dB from 1 Meter	
	Audio -Visual Display		
	Audio Alarm		
	Over Load	Required	
	Short circuit (SC)	Required	
	Input low voltage	Required	
	Output over voltage	Required	
	Battery over charging	Required	
	Battery over Discharging	Required	
	DC Over current	Required	
	DC Over Voltage	Required	
	Battery On Load	Required	
	Battery Low	Required	
	Fuse failure	Required	
	Fan failure	Required	

SR. NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
	Inverter failure	Required	
	Visual Display		
	Input/Output voltage	Required	
	Output current .	Required	
	Input/ Output frequency	Required	
	Output power in KVA and KW	Required	
	Output load power factor	Required	
	Output load crest factor	Required	
	battery DC voltage	Required	
	Charging current	Required	
	Discharging Current	Required	
	Autonomy Time	Required	
	Event logs	Required	
	Auto Paging	Required	
	Diagnostic system	Required	
	Single line mimic diagram	Required	
	Telemonitoring with software	Required	
	Capability to parallel up to similar 6UPS	Required	
	Ventilation	Forced air cooling with integral co axial fans	
	Battery management	Standard battery management feature must be available as inbuilt to UPS.	
	Certifications	Product must have valid CE/UE, , PeP and Type Test certificate as described above from NABL accredited lab to be submitted as part of TDS submission. Also all mentioned ISO certificates of UPS OEM must be submitted. Required battery OEM relevant certificates as required above to be submitted with tech bid.	
	Electrical Drawing (AutoCAD drawn)	Offered Solution SLD, UPS GAD, Battery Bank GAD, Required room Layout must be provided	

3.2 DATA SHEET OF MONOLITHIC UPS

SR.NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
1	Make & Model Name	Bidder to confirm	
2	Technology	APFC IGBT based rectifier and 3-Level IGBT Inverter based double conversion online VFI-SS-111 (Performance Comply to IEC 62040-3)	

SR.NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
3	Architecture	Tower design with integrated copper (external)Output isolation transformer K-13 type	
4	Input voltage range	3-Phase 320V AC ~ 460V 340-478V AC under load variation of min of 30% to 100	
5	Input rectifier type	Advance PFC based IGBT rectifier	
6	Input current harmonics (THDi)	< 3% @ full load	
7	Input power factor	≥ 0.99	
8	Voltage harmonics	<0.5%	
9	Soft start/Power Walk-in facility (5-30 Secs)	Required	
10	Sheet thickness (mm)	2 mm sides 3 mm base plate & 1.6 mm front door	
11	Degree of protection	IP-20	
12	Cable entry	Standard as Bottom entry	
13	Acoustic noise level	<65dbA	
14	Isolation Transformer	Should be available at input Output side externally in same type cabinet with Al winding Cu winding of K-13 type min	
15	VFI-SS-111 Waveform	Should be available	
16	Output voltage	400V, 3ph, 4w, 50Hz AC ±1 % (380,400 selectable) effectively earthed	
17	AC voltage accuracy (steady state) over entire load, load pf & dc voltage range	±1 %for balanced load	
	AC-AC efficiency 25% to 100 % load	>=90%	
18	Transient (Dynamic) voltage regulation	±5% at 20- 100% load step with Pk – Pk value	
19	Transient recovery	Return to steady state condition. within 20ms after Disturbance	
20	Voltage wave form	Sinusoidal	
21	Range of adjustment of ac output voltage	380/400/415V	
22	Phase displacement	1200 ±10 for balance load 120° ±2° for unbalance load	
23	Nominal frequency	50 Hz	
24	Overload	125% of rated load for 5mins 150% of rated load for 30sec	
25	In rush current	Maximum 25% of full load current (energizing rectifier with inverter at	

SR.NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
		no load)	
26	Built in static /Bypass	Required	
27	Inverter and Static Bypass change over time	0ms	
28	Bypass Overload	Up to 150% of UPS output rating as continuous & 1000% for 1 cycle	
29	Transfer time	Less than 5 milli secs.	
30	Manual Bypass switch	Required Inbuilt	
31	Charging current	Setting min 10% of AH capacity Settable with 2.35 Volts boost charging	
32	Type of battery	SMF-VRLA Battery	
33	Charger unit	IGBT DC – DC Charger with Temperature compensation charging	
34	Backup Time	60Mins (Battery Sizing Calculation to be submitted)	
35	Load Power Factor	0.9 lagging/Unity	
36	True autonomy / measurement	7'' Touch Screen Monitor Panel	
37	Temp. compensated. charger	Required	
38	Automatic battery load test	Mandatory	
39	DC Battery Breaker with shunt trip protection	Required	
40	Cold start Facility	Required	
41	PROTECTION		
42	Over Load	Required	
43	Short circuit (SC)	Required	
44	Input low voltage	Required	
45	Output over voltage	Required	
46	Battery over charging	Required	
47	Battery over Discharging	Required	
48	DC Over current	Required	
49	ENVIRONMENTAL		
50	Ambient temperature range	Up to 40 Deg C	
51	Acoustic Noise	< 65 dB from 1 Meter	
	Audio -Visual Display		
	Audio Alarm		
	Over Load	Required	
	Short circuit (SC)	Required	
	Input low voltage	Required	
	Output over voltage	Required	
	Battery over charging	Required	
	Battery over Discharging	Required	
	DC Over current	Required	
	DC Over Voltage	Required	

SR.NO.	PARTICULARS	REQUIREMENTS	CONFIRMATION BY BIDDER
	Battery On Load	Required	
	Battery Low	Required	
	Fuse failure	Required	
	Fan failure	Required	
	Inverter failure	Required	
	Visual Display		
	Input/Output voltage	Required	
	Output current .	Required	
	Input/ Output frequency	Required	
	Output power in KVA and KW	Required	
	Output load power factor	Required	
	Output load crest factor	Required	
	battery DC voltage	Required	
	Charging current	Required	
	Discharging Current	Required	
	Autonomy Time	Required	
	Event logs	Required	
	Auto Paging	Required	
	Diagnostic system	Required	
	Single line mimic diagram	Required	
	Telemonitoring with software	Required	
	Capability to parallel up to similar 6UPS	Required	
	Ventilation	Forced air cooling with integral co axial fans	
	Battery management	Standard battery management feature must be available as inbuilt to UPS.	
	Certifications	Product must have valid CE/UE, , PeP and Type Test certificate as described above. Also all mentioned ISO certificates of UPS OEM must be submitted. Required battery OEM relevant certificates as required above to be submitted with tech bid.	
	Electrical Drawing (AutoCAD drawn)	Offered Solution SLD, UPS GAD, Battery Bank GAD, Required room Layout must be provided	

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

Passive Networking Works

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL OF INDIA
QCI
Creating an Ecosystem for Quality

Date: 26th Dec. '2024

Revision: R0

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I. PREFACE

A. Tropical Conditions

All equipment/material supplied against respective Specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

- Ambient temperature : 45 degree Celsius
- Annual Average Relative humidity : 50%
- Isokeraunic level (days per year) : 50
- Seismic Zone : Zone-4
- Climate type : Moderately hot and humid tropical, climate, conducive to rust and fungus growth

B. Tolerance and Creepage Distances

Tolerances (on all the dimensions) and creepage distances shall be in accordance with provisions made in the relevant Indian/IEC/BIS standards and in these specifications. Otherwise the same will be governed by good engineering practice in conformity with required quality of the product.

II. Special Points for Passive Components:

- All copper & Fiber component should be from single OEM as per the makes given in the tender documents.
- All passive components should be RoHS (Restriction of Certain Hazardous Substances) complied. Declaration-RoHS Should be clearly mentioned on datasheet of each Passive Component.
- The manufacturer of Passive component should be a technology development partner with any of the leading Manufacturer of Active Component.
- Bidder has to submit an authorization letter from the OEM only specific to this work. All bids without the authorization letter will be liable to be rejected.
- All work related to fiber including digging, laying of HDPE Pipe/Hume Pipe/Conducting will be in the bidders scope. The Bidder Should take in consideration all the cost involved for the same, nothing shall be paid extra on account for this.
- Bidder has to support the complete system for one year after the completing the installation and assign one dedicated resource for the same for one year on their own cost only.
- Bidder should have adequate facilities, manpower and staff for installation testing and commissioning and can provide after sales services. OEM has to authorize their System Integrator in this regards stating that they will Support the solution through their SI.

1. OEM Eligibility Criteria for Passive Products

Sr. No.	Eligibility Criteria	Compliance with Document
1	OEM of Passive Networking Products must be registered in India for more than 15 years.	
2	OEM of Passive Networking Products shall have their own ISO 9001:2008 and 14001 certified copper and fiber components manufacturing facility in India.	

Sr. No.	Eligibility Criteria	Compliance with Document
3	OEM of Passive Products should have atleast 1 RCDD Residing in India is preferred.	
4	OEM must not propose any mix of Co-branded equipment. All Products (Cat6 and Fiber) shall be of same brand name written on each quoted product.	
5	All the Passive Products (Cat6 and Fiber) Shall be from Single OEM & offered products should have Min. 25 years of performance warranty.	
6	OEM shall be TIA Full Committee Member and its name shall be available on TIA Website.	

2. CAT6 U/UTP 4 Pair LSZH CABLE

Details	Specification	Compliance
Type	23 AWG Solid Bare Copper, Unshielded Twisted 4 Pair, Category 6, TIA / EIA 568-2.D, ISO/IEC 11801 & NEC Articles UL 444.	
Application	Premise Horizontal Cable, Gigabit Ethernet, 100BaseTX, 100BaseVG ANYLAN, 155ATM, 622ATM, NTSC/PAL Component or Composite Video, AES/EBU, Digital Video, RS-422, 250MHz Category 6, IEEE 802.3bt Type 1, Type 2, Type 3, Type 4	
Conductors	Solid Bare Copper	
Insulation	Polyethylene / Polyolefin	
Jacket	LSZH jacket complying to: Fire rating IEC 60332-1 Toxicity IEC 60754-1 Smoke density IEC 61034-1	
Pair Separator	Cross-member **(+)** fluted Spline.	
ETL Test Report	ETL Transmission Test Report as per ANSI/TIA-568.2-D Min. 250 MHz to be provided with Minimum 4 Connector Channel NEXT Headroom of 3dB.	

Details	Specification	Compliance
Packing	Box of 305 meters	
Cable Outer Diameter	5.8 mm	
Propagation Delay Skew	≤ 45ns/100m or Better (ETL/UL Tested)	
Bend Radius	4 * Cable Diameter	
Impedance	100 Ohms + / - 15 ohms,	
Maximum Capacitance	ETL Report to be submitted for below parameters:- Max. Capacitance Unbalance: ≤ 20 pF/100 Mtr Max. Mutual Capacitance :- ≤ 5.0 nF/100m	
Max. DCR	<= 7.3 Ohms Max /100 mtr (ETL/UL Tested)	
PoE Capability	IEEE 802.3bt Type 1, Type 2, Type 3, Type 4	
Performance characteristics as per ANSI/TIA-568.2-D	Max. Attenuation: 32.8dB/100m Min. NEXT : 38.3 dB Min. PS NEXT : 36.3 dB Min. ELFEXT : 19.8 dB Min. PSELFEXT : 16.8 dB Min. Return Loss: 17.3 dB Min. ACR : 5.5 dB Min. PSACR :3.5 dB	
ROHS Compliant	ROHS/ELV Compliant	
Operating Temperature Range	-20 to +75 Deg C	

Details	Specification	Compliance
Test Reports	Test Reports from any NABL Accredited Lab needs to be submitted for below test at time of bidding.. 1. Oxygen Index Test 2. Smoke Density Test 3. Halogen Acid Test with Acidity & Conductivity Test 4. Vertical Flame Test IEC 60332-1 5. Temperature Index Test	

3. Cat 6 Unshielded Modular Jack (without PCB)

Parameters	Specifications	Compliance
Type	Cat6 Modular Jacks shall meet and exceed channel specification of Category 6 transmission requirements for connecting hardware, as specified in Commercial building telecommunications Cabling standard and ISO/IEC 11801:2002 second edition. when used as a component in a properly installed UTP channel.	
Front Connection	Lead Frame : Copper Allow with 50u inch Gold over Nickel	
Rear Connection	IDC: Copper Alloy with Nickel Plating	
Connector Body	Plastic: UL940V-0	
Housing	Encapsulated Lead Frame technology (Without PCB)	
Accessories	-Jack should support uniform hassle free termination technology and be able to ensure performance in each termination without dependency on expertise of technician. - Integrated bend-limiting strain-relief unit for cable entry with locking facility at IDC contact point	
Termination Interface	Front Mated Connection: 750 Cycles or Better	
	Rear Mated Connection: 20 Cycles (Gas Tight IDC Connection) or Better	
Jack Details	Connector/hardware retention of at least 88.5 N Plug /connector retention of at least 50N Storage temperature range of -40 Deg C to +70 Deg C.	

Parameters	Specifications	Compliance
IEEE Specification (PoE)	IEEE 802.3at type 1 and 2 (up to 30W). CoC to be provided.	
Termination Pattern	TIA / EIA 568 A and B	
Performance	1 Gbps support for 100 MT Channel Link	
Guaranteed Bandwidth	250 Mhz Guaranteed Bandwidth for 100 MT Channel Link	
Approvals (Proof to be provided along with Bid)	UL Listed	
	ETL verified to TIA / EIA Cat 6. Should be part of the registered 4 connector channel as per Intertek / ETL report	
UL Rating	UL 94V-0	
Other Specifications	UL 1863, IEC 60603-7, FCC part 68-F	
RoHS	Compliant	
Feature	The jacks shall not have an integrated spring shutter as the shutter malfunctions and causes operational issues in Panel.	
Safety listing	ACA and Bi-national standard listed.	
Operating Temperature	-10° to 60°C	
Dielectric Strength	1,000 V RMS @ 60 Hz for 1 minute (Signals to Ground)	
Termination Process	Termination of cable on IO through Termination Tool to minimize any manual termination like punch down. All the four pairs should get crimped and cut together with the help of the tool. Pairs should be separated via mechanism in the termination process to avoid any cross talk issue at Jack. Tool-less jack is not required because the tool-less jack is installer dependent, whereas the termination using a tool has consistent terminations ir-respective of the installer.	
Cat6 Jack	Should be covered under 25 year warranted solution from OEM. All the four pairs should get crimped and cut together with the help of the tool.	

4. Cat 6 Unshielded Patch Cords, LSZH, ETL Tested

Details	Specification	Compliance
Type	Unshielded Twisted Pair, Category 6, TIA / EIA 568-C.2 & ISO/IEC 11801, IEC 60603-7, FCC Part 68 Subpart F Specifications.	
Conductor	Cat6 Patch Cord should be 4 Twisted Pair, 24 AWG Stranded Bare Copper Conductors. Contact Blade should be Phosphor bronze plated with 50u'' gold over 100u'' nickel undercoat.	
Length	1 MT , 3 MT	
Plug Protection	Factory fitted Strain relief boots on either side	
Performance Characteristics	Max. Current Rating should be 1.5 Amp Min. Insulation Resistance should be 500MOhm Max. Contact Resistance should be 20mOhm Dielectric Strength should be 1000 VAC (RMS)	
Jacket	LSZH	
Outer Diameter	≤ 6.0 mm	
Operating Environment Range	The patch cord should have Insertion Life of 750 mating cycles Pull force of min. 89 Newton, Operating Temperature range of -20 Deg C to +60 Deg C	
Boot	Clear / Transparent with Snagless feature	
Third Party Verification	4 Connector ETL/UL Test Report 600 Mhz for ANSI/TIA-568-2.D needs to be submitted along with bid. This Patch Cord shall be part of ETL/UL test report of 4 connector channel submitted for quoted Cat6 cable.	

5. CAT6A U/UTP LSZH CABLE

Details	Specification	Compliance
Type	23 AWG Solid Bare Copper, Unshielded Twisted 4 Pair, Category 6A, confirming to TIA 568.2.D, Class EA - ISO/IEC 11801:2002	
Conductors	Solid Bare Copper 23 AWG	
Insulation	Polyolefin/Poylethylene	

Details	Specification	Compliance
Jacket	LSZH jacket complying to: Acid Gas Emission pH per IEC 60754-1 : ≥ 4.3 Acid Gas Conductivity per IEC 60754-2 : ≤ 10µs/mm Smoke density IEC 61034-2 : ≥ 60% Light Transmittance Flame Test: IEC 60332-1 Third Party Test Report of above parameters needs to be enclosed with bid.	
Pair Separator	+ Shape Spline	
Suitable Applications:	Premise Horizontal Cable, 10 Gigabit Ethernet, 100BaseTX, 100BaseVG ANYLAN, 155ATM, 622ATM, NTSC/PAL Component or Composite Video, AES/EBU Digital Audio, AES51, RS-422, Noisy Environments, PoE	
Guaranteed Bandwidth	500 Mhz for 100 MT Channel	
Packing	Box of 305 meters	
Cable Nominal Outer Diameter	7.2 mm	
Max. Delay Skew	45 ns @ 100M	
Bend Radius (Installation)	50 mm	
Maximum Conductor DC Resistance:	DCR @ 20°C (Ohm/100 m) < 8.0	
Third Party Verification for Cable	Cable ETL Test Report for compliance to 61156-5 as referenced in ISO/IEC 11801-1 for Min. 500Mhz or Higher Cable ETL Test Report for Alien crosstalk for ANEXT, AFEXT, PS ANEXT. All above test reports to be submitted along with bid	
Nom. Mutual Capacitance	Capacitance (nF/km) < 56	
Nom. Velocity of	67 % or Better	

Details	Specification	Compliance
Propagation		
Temperature Range Operation	-20 Deg C to +60 Deg C	
IEEE Requirement	IEEE 802.3bt Type 1, Type 2, Type 3, Type 4	
RoHS	Yes	
Test Report	Enclose ETL 4 Connector Channel Test Report as per ANSI/TIA-568.2-D Category 6A Standard.	

6. Cat 6A Unshielded Modular Jack

Parameters	Specifications	Compliance
Type	Modular Jacks shall meet and exceed channel specification of ANSI/TIA/EIA-568-C.2 Category 6a and ISO/IEC 11801:2002/Amd 1:2002 Ed2 when used as a component in a properly installed UTP channel.	
Front Connection	RJ 45 : 50uin Gold plated contacts over Nickel	
Rear Connection	Copper alloy, Gold plated contacts over Nickel or IDC	
Connector Body	PBT glass reinforced UL94V-0 or Plastic	
Accessories	Jack should support uniform hassle free termination technology and be able to ensure performance in each termination without dependency on expertise of technician.	
Termination Interface	Front Mated Connection: 750 Cycles Min.	
	Rear Mated Connection: 20 Cycles Min.	
IEEE Specification (PoE)	IEEE 802.3bt type 3 and 4 (up to 100W)	
	Cisco UPOE (up to 60W) and Power over HDBase-T (up to 100W)	
Performance tests	Modular Jacks shall be tested for performance to ANSI/TIA/EIA-568-C.2	
Guaranteed Bandwidth	Min. 500 Mhz or higher Guaranteed Bandwidth for 100 MT Channel Link	
Approvals	UL Listed, UL2043 Air Handling Spaces	
UL Rating	UL 94V-0	
Other Specifications	UL 1863, IEC 60603-7, FCC part 68-F	

Parameters	Specifications	Compliance
RoHS	EU Directive 2002/95/EC Compliant	
Feature	The jacks shall not have an integrated spring shutter as the shutter malfunctions and causes operational issues in Panel.	
Operating Temperature	-10° to 60°C	
Dielectric Strength	1,000 V RMS @ 60 Hz for 1 minute (Signals to Ground)	
Termination Process	Termination of cable on IO through Universal Termination Tool to minimize any manual termination like punch down. All the four pairs should get crimped and cut together with the help of the tool. Pairs should not be separated in termination process to avoid any cross talk issue at Jack. Tool-less jack is not required because the tool-less jack is installer dependent, whereas the termination using a tool has consistent terminations ir-respective of the installer.	
Cat6A Jack	It should be covered under 25 year warranted solution from OEM.	
Third Party Test Report	Enclose 4 Connector ETL/UL/3P Test Report ANSI/TIA – 568 Cat6 6A, ISO/IEC 11801 (Class Ea), EN 50173 (Class Ea) and IEEE 802.3-2012.	

7. Cat 6A Unshielded Patch Cords, LSZH

Parameters	Specifications	Compliance
Type	Modular Cord shall meet and exceed channel specification of ANSI/TIA/EIA-568-B.2 Category 6a and ISO/IEC 11801 2nd edition (2002) & Amendment 2 (2010) up to 500 MHz when used as a component in a properly installed UTP channel. It should also comply to EN 50173-1 (2002) & EN 50173-1 Amendment 1 (2009).	
Conductor	Stranded copper, 7/26AWG	
Insulation	Foam Polyethylene/PE	
Plug Boot	Clear boot with PVC material, Snagless	
Plug Housing	Polycarbonate (PC)	
Plug contact blade	Phosphor bronze plated with 1.27um gold over 2.54um nickel undercoat	
Insertion Life	750 Cycles or Better	

Parameters	Specifications	Compliance
Operating/Storage Temperature Range	-20 to +60 Deg C	
Channel compliance certificate	Certificate by Intertek (ETL)/UL/3P for the 4-Connectors and 3 Connectors channel testing to the Cat 6A Cabling system as per the ANSI/TIA 568 C.2 standards, ISO/IEC 11801 and EN 50173-1. Document to be submitted.	
Guaranteed Bandwidth	500 Mhz or Better Guaranteed Bandwidth	
Sheath Material	LSZH	
Flame Rating	IEC 60332-3 or higher	
Outer Diameter (Nominal)	6.1 ± 0.3 mm	

8. 24 Port, 1U Jack Panel, Unloaded (For Cat6 and Cat6A)

Parameters	Specifications	Compliance
Type	- 24 Port 1RU Unloaded Straight Patch Panel - 19" rack mountable. - Patch panels Ports should be individually replaceable & Consistent port-to-port performance.	
Ports	24 Ports in 1RU and 48 Ports in 2RU	
Cable management	Panel shall have in-built cable manager at the rear end	
Height	1U (1.75”)	
Feature	The jacks shall not have an integrated spring shutter as the shutter malfunctions and causes operational issues in panels.	
Storage Temperature Range	-40Deg C to +70 Deg C	
Operating Temperature range	-10Deg C to +60 Deg C	
Color and Material	Black Color SPCC Steel Frame Material with ABS Front Plastic Panel	
RoHS	EU Directive 2011/65/EU (ROHS II)	

9. Face Plate, UK Style, 6C Type, White Color, Square with Shutters

Details	Specification	Compliance
Type	**Simplex/Duplex/Quad**	
Material	Fire -retardant Plastic UL-94 V0, ABS, UK Style.	
Acceptability	Should be able to accept Cat6A, Cat6 and Cat5e information outlets	
Mounting screws	2 pcs, M3.5 x 25mm	
Compliant	RoHS	
Dimensions	(H x W x D) 86 x 86 x 10 mm	

10. 6/12 Core Singlemode Outdoor Armored Fiber Cable

Details	Specification	Compliance
Cable	12 Core Singlemode 9/125, Central Loose Tube Cables, High mechanical and rodent protection provided for Outdoor – Corrugated Steel Tape Armor (CST), complying to 9/125 ITU G.652D	
Application	Cable should be suitable for Structured (premises) wiring systems: For outdoor use in structured (data) wiring systems such as industrial backbone, campus backbone, building backbone (riser). Suitable for direct burial. Easy to install in ducts, tunnels and trenches.	
Jacket	Black UV resistant HDPE outer jacket. Glass yarns and two steel wires embedded in jacket as strength members.	
Loose Tube Construction	Central tube, jelly filled (non-dripping and silicon-free) with up to 12 fibers. Individually colour coded optical fibres.	
Optical Properties	Core: 9.2 +/- 0.4 um Cladding: 125 +/- 0.7 um Loose Tube fibres: Ø 250 ± 15 µm 1310 Wavelength (nm) : 0.36 Attenuation max. (dB/km) 1550 Wavelength (nm) : 0.22 Attenuation max. (dB/km) Zero Dispersion Wavelength : 1302 – 1322 nm	

Details	Specification	Compliance
	Core-Clad Concentricity Error : ≤ 0.5 µm Clad Non-Circularity : ≤ 0.7 % Cutoff Wavelength : ≤ 1260 nm PMD (ps/km) : ≤ 0.1 Point Loss @ 1310nm & 1550nm : 0.05 dB Refractive Index @1310nm : 1.467 Refractive Index @1550nm : 1.468	
Warranty & Putup	Std. delivery length: 2000 ± 105m Minimum Warranty: 25 years.	
Temperature Range	-40 to +70 °C	
Physical Properties	Bending radii tube (Installation & Operation) : 20 x OD mm Cable Max. Tensile Strength Installation (Short Term): 2000 N Cable Max. Crush Resistance Installation (Short Term): 3000 N/100mm Nominal Cable OD : 9.2 mm Max. RoHS for Outer Jacket Buffer Tube Material : PBT – Polybutylene Terephthalate	

11. 12/24 Fiber Port 1U Rack Mount Fiber Enclosure (LIU) including Splice Trays, Pigtails and Couplers

Details	Specification	Compliance
Fiber Interface Unit	Fiber Patch Panel Typically used in Server rooms, Network rooms, Data Centres and Small offices Can be mounted directly on any 19" rack or cabinet. It should be able to accommodate a variety of Fiber connectors and terminated to fiber cables using Splicing or other methods.	
Type	Fiber LIU should be 1U (1.75”), 19 Inch Rack Mount.	
	12/24/48Fiber Port should be available in 1U Rack Mount LIU.	
	LC Type Connectors will be required.	
Features & Compatibility	Each 1U LIU should be able to accommodate atleast 48 fibers in LC type connectors.	
	12/24/48 Fiber Splice trays should loaded in LIU with Pigtails, Splice Tubes, Min. 2 x PG13.5 Gland, Cable Ties and Velcro	

Details	Specification	Compliance
	Straps	
	Panel Material – Powdered Coated Steel	
	Couplers in adapter strip should be colored to specify OM4 and shall meet Pigtail and Patch Cord Color	
	Operating Temp Range: -10^{o}C to +60^{o}C	
	Storage Temp Range: -40^{o}C to +70^{o}C	
	EU Directive 2011/65/EU (ROHS II)	
Pigtails Parameters factory loaded in Panel	LC - Simplex, Singlemode OS2, Min. 2 Mtr, 0.9mm Tight Buffer	
Standard	Optical Fiber Pigtail should comply with TIA 568.3-D	
Optical Performance	Insertion Loss of <=0.30dB	
Optical Performance	Return Loss of ≥ 55dB	
Connector Standard	IEC 61754, TIA 604	
RoHS	EU Directive 2011/65/EU (ROHS II)	

12. Fiber Patch Cords, LC-LC Duplex, Singlemode OS2, 3MT

Details	Specification	Compliance
Type	2mm Duplex Zipcord or Better Singlemode OS2	
Outside Diameter	(Duplex): 2.0mm or Better	
Jacket Material	LSZH	
Length	3 MT	
Cable Crush Resistance	500 N/100mm	
Insertion Loss	≤ 0.30 dB	
Return Loss	≥ 55dB	
RoHS Certified	Yes	
Cable/Connector Standard	IEC 61754, TIA 604, TIA 568.3 D, IEC 60793-2-10, IEC 60793-2-50	
Flame Standard for LSZH	IEC 60332, IEC 60794-2-50, IEC 60754, IEC 61034	
ANSI/TIA	ANSI/TIA-568.3-D (shall be mentioned in data sheet)	

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

Security Works

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI Creating an Ecosystem for Quality

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I. PREFACE

A. Tropical Conditions

All equipment/material supplied against respective Specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

- Ambient temperature : 45 degree Celsius
- Annual Average Relative humidity : 50%
- Isokeraunic level (days per year) : 50
- Seismic Zone : Zone-IV
- Climate type : Moderately hot and humid tropical, climate, conducive to rust and fungus growth

B. General:

The Security work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply authority and Fire Insurance regulations so far as these become applicable to the installation.

The scope includes the jobs to be performed for all equipment and materials furnished under this specification. The scope is however not limited to the items detailed below:

- Design, manufacture, testing at manufacturers works packing and dispatch.
- Transportation to site and insurance.
- Receiving at site, unloading, handling, opening, inspecting, reporting and submitting claims in case of damages and short supply items.
- Arranging to repair/re-ordering all damaged and short supply items.

II. SPECIFICATION

A. Intelligent and Addressable Fire Detection & Alarm System

1. Scope

- This specification outlines the requirements for an intelligent, addressable fire detection and alarm system.

- The work described in this specification consists of all labour, materials, equipment and services necessary and required to complete, test and commission the fire detection and alarm system. Any material not specifically mentioned in this specification or not shown on drawings but required for proper performance and operation shall be provided and installed for a complete and operational system, by the contractor at no extra cost.

- The contractor shall furnish, and install complete and ready for intended use and operation, an intelligent, addressable fire detection and alarm system including Fire panel (s), initiating devices (manual pull stations, addressable smoke, heat detectors etc.) indicating devices (hooters, bells, visual warning signals, etc.) and supervisory devices, annunciators, wiring apparatus and accessories.

- The installation and locations of equipment and devices in the building shall be governed by the specifications and drawings with due regard to actual site conditions, manufacturers' recommendations, ambient factors affecting the equipment and other operations in the vicinity. If any departure from the specifications or drawings is necessary, approval shall be obtained from the Engineer-in-Charge before work is started thereon.

- Materials and equipment shall be new, first grade, standard, current models of the manufacturer and shall be suitable for this system. Where two or more pieces of equipment performing the same function are required, they shall be exact duplicates produced by the same manufacturer.

- All materials, devices, and equipment shall be compatible with the circuits or systems in which they are utilized.

- The Contractor shall submit specific catalogue cuts for each of the item specified in BOQ for approval from Engineer in charge before procurement.

2. Definitions

- **Alarm Indicating Circuits**

  Circuits to which alarm indicating devices are connected. Alarm indicating devices are audible or visual devices for warning building occupants. They include but are not limited to alarm bells, hooters and visual warning signal lights.

- **Alarm Initiating Circuits**

  Circuits to which automatic or manual alarm initiating devices are connected. Alarm initiating devices include manual pull stations, addressable fire (smoke) detectors, beam detectors and other emergency reporting devices.

- **Alarm Signal**

  A signal which signifies a state of emergency requiring immediate notification of the fire services.

- **Smoke, Heat Detectors**

  A detector which detects heat or smoke and is Analog Addressable type with switches/codes etc. to define the Detector.

- **Manual Call Point**

  A device which shall be addressable type with switches/codes etc. to define the station. Function shall be similar to that of a conventional Manual Call Box.

- **Hooter**

  A device which shall be able to give audible alarm through it and controlled from the Fire Alarm Panel. It can also be used for Public Address during emergency situation.

- **Fault Isolator**

  This equipment shall be placed in the electrical wiring and shall be able to isolate electrical short circuiting and loose wiring. The isolator shall be able to keep the part of the electrical circuit in operation that is connected directly to the Fire Alarm Panel.

- **Fire Alarm Panel**

  This refers to the microprocessor based Panel that shall be connected to the various Detector loops. There shall be multiple looping/zoning as indicated on the drawing. The panel shall be able to watch individual Detectors for performance as well as to give pin point location of fire alarm. Hooter Alarm as well as facility for cutting off of A.H.Us and electrical power is also included in this panel.

- **Loop**

  A loop or a zone shall mean a 2 wire circuit connecting at least 240 detectors and devices in any combination

- **Control Modules**

  These shall on getting the signal from the Fire Alarm Panel shall trip AHUs power supply etc. as required.

3. Requirements

This installation shall be made in accordance with the drawings, specification, local codes and local fire authorities having jurisdiction over this project.

4. Reference Standards

The design, supply, installation, testing and commissioning of the entire fire detection and alarm system shall conform to BS:5839 or NFPA 71 and 72. The Detectors shall conform to relevant codes for Fire Alarm System.

The system installed shall comply with the following codes/publications:

- IS 2175
- IS 2189
- IS 11360
- IS 732
- UL "UNDERWRITERS" laboratory/NFPA/FM/VDS/FOC for addressable detector, fire panel.
- EN 54
- BS 5445

5. Tests at Site

All commissioning tests at site will be in line with BS : 5839 or NFPA 71 and 72. Following test shall be conducted

- Loop Checking
- Checking of smoke detectors, Heat detectors etc. by simulation.
- Functional tests for fire alarm panel.
- The Mock trial of the complete Fire Detection and Alarm system.

6. Tests at Manufacturer's Work

- Tests certificates will be furnished for approval of all Fire alarm devices and system devices.
- All routine tests as per relevant codes for the Fire Alarm Panel, shall be conducted and results furnished to the Engineer-in-Charge.

7. Shop Drawings

Shop drawings submitted by the Contractor shall contain the following:

- Block Diagram showing all detectors and devices area wise, their connectivity to the panel including wire description.

- Point-to-point wiring diagrams showing the points of connection and terminals used for all electrical field connections in each system, all equipment or systems which are supervised and controlled by the fire alarm system. Diagrams shall show all connections from field devices to the control panel initiating modules, output modules, switches, relays and terminals. Diagrams shall show interconnection of all devices, modules, output modules, switches, relays and terminals.

- Custom Build software for project with loop/device annunciation description and automatic control functions for each specific loop/device.

8. Power Supply

- The control panel shall derive 230 Volts power from main supply. A standby power supply shall be immediately available in the event of failure of normal supply and shall automatically be connected so as to maintain the equipment in condition such that fire alarm originating from the operation of Detector can be given. The standby battery as secondary supply shall be such that when charged by associated battery charging equipment it can operate independently for a period of 12 hours. It shall have enough power supply to cope with additional load resulting in alarm originated from two separate zones for the one hour. Batteries shall be of Lead Acid type and sealed Maintenance free.

- Suitable arrangements shall be incorporated to prevent secondary batteries from discharging through the charging equipment in the event of its breakdown or a failure in the supply.

- In addition to the batteries, a battery charger suitable for operation on the auxiliary power available in the plant as specified above shall be supplied. The capacity of the charge shall be such that the same can boost charge the battery (within 8 hrs) while supplying the rated load of the fire detection and annunciation system. Facilities shall be provided to limit the voltage supplied to fire detection and alarm system to their rated values during the time of boost charging. The charger shall normally supply the battery trickle charging current and the DC load of the fire detection and alarm system. In case the AC supply on the input side of the charger fails the necessary power for the complete fire detection and alarm system shall be supplied by the battery.

- Visible and audible annunciation for troubles or failure in the power supply system like "charger Failure", "Battery Low Voltage", etc. shall be provided.

- Battery earth/fault indication/annunciation shall be included in the panel.

9. FIRE ALARM SYSTEM DEVICES

- **General**
  Each device shall be assigned a unique address via easily understood decade (01 to 99) switch. Address selection via binary switches or by jumpers is not acceptable. Devices which take their address from their position in the

circuit are unacceptable because if devices are later added, existing addresses, descriptors and commands need to be reprogrammed.

Devices shall receive power and communication from the same pair of conductors. For fault isolating modules a separate power wiring which shall be fault tolerant shall be provided.

Each device shall contain screw terminals with rising plates for positive termination suitable for 1.5 sq.mm. copper conductor wire.

- **Addressable Manual Stations**

Manual stations shall be of rugged die cast construction designed for semi-flush mounting. Plastic stations will not be acceptable. Stations shall be of the break-glass design and must be opened to be reset. Closing the box after opening it shall automatically perform the reset function. It shall be possible, for testing purposes, to initiate an alarm without breaking the glass. All stations shall be furnished with a spare glass break rod.

Provisions shall be made such that the address cannot be changed merely from opening the station.

- **Addressable Analog Detectors**

All fire sensors shall mount on a common base to facilitate the changing of sensor type if building conditions change. **The base shall be incompatible with conventional detectors to preclude the mounting of a non-intelligent device.**

If the Fire Alarm Panel determines that the sensor is in alarm, the Fire Alarm Panel shall command the sensor LED to remain on to indicate alarm.

Each sensor shall be capable of being tested for alarm via command from the Fire Alarm Panel.

Each sensor shall respond to Fire panel scan for information with its type identification to preclude inadvertent substitution of another sensor type. The Fire Alarm panel shall operate with the installed type but shall initiate a mismatch (trouble) condition until the proper type is installed or the programmed sensor type changed.

Each sensor shall respond to Fire Alarm Panel scan for information with an analog representation of measured fire related phenomena (smoke density, particles of combustion, temperature). Such response proves end-to-end sensor including the operation of the sensor electronics. **Systems which only monitor the presence of a conventional detector in an addressable base shall not be acceptable.**

The Detector shall meet the requirements of either EN 54 or shall be listed with UL. It shall be possible to test the Detector's working both from the Panel as well as locally by means as designed by the Contractor and approved by the Engineer-in-Charge. The approved coverage per Detector for unhampered areas shall not be less than 50 sq. M. The detector shall be capable of being reset automatically after any alarm condition.

- **Addressable Analog Heat Detectors**

The Detector shall be Analog, Addressable Detector with its own manually set digital code and be able to give a

single digitised output to the Fire Alarm Panel regarding its condition. The Detector shall employ the thermistor principle for heat sensing and the fixed temperature setting shall be at 60 degrees Centigrade. It shall be able to communicate with the Fire Alarm Panel by the Pulses emitted from the Panel.

The Base of the Detector shall be interchangeable with other Smoke Detectors and the construction shall be of flame retardant material. LEDs shall be provided to indicate locally alarm condition.

It shall be able to withstand temperature variations from 0o C to 50o C. Further, relative Humidity (non Condensing type) upto 95% shall not hamper its performance.

It shall have in built safety device to monitor the removal and pilferage of the Detector. The Detector also must have facility for remote indication. The quiescent current flow must not exceed 50 milli amps. and alarm condition current shall be maximum 60 milli amps.

- **Alarm Hooters**

  Alarm hooters shall be suitable for indoor, or outdoor, application with the appropriate 4 x 4 in. electrical box. All hooters shall be 24 V DC operated. The minimum sound level shall be 90 db at 10 feet. Hooters shall be surface semi-flush mounted.

- **Monitor Module**

  The monitor module shall provide an addressable input for N.O. or N.C. contact devices such as manual stations, waterflow switches, sprinkler supervisory devices, etc.

  It shall provide a supervised initiating circuit. An open-circuit fault shall be annunciated at the Fire Alarm panel (Subsequent alarm shall be reported).

  The device shall contain an LED which blinks upon being scanned by the Fire Alarm panel. Upon determination of an alarm condition of an alarm condition, the LED shall be latched on.

- **Addressable Control Module**

  Addressable Control Module shall be provided to operate dry contacts for switching ON OFF Pressurisation fans, AHU' s etc. in case of fire etc. It shall have a built in type identification to automatically identify this device to the control panel. It shall have internal circuitry & relay powered directly by two-wire loop.

- **Fault Isolator Device**

  The Fault Isolator Device shall detect and isolate a short-circuited segment of a fault-tolerant loop. The device shall automatically determine a return to normal condition of the loop and restore the isolated segment. The fault isolator device shall be placed every [20] devices to limit the number lost in the event of a short-circuit.

10. Fire Alarm Panel

Fire Alarm panel shall be provided with 80 character backlit Liquid Crystal Display (LCD) Annunciator, function key pad, and printer as specified below. Necessary software and hardware shall be furnished at the location shown on the drawings.

- **Automatic Functions**

  The alarm shall be displayed at the FP on an LCD display. The FP printer shall print out the same information displayed on the LCD display.

- **Manual Functions**

  At any time, the operator shall have the following manual capabilities at the FP by means of switches located behind a key locked cover:

  - ❖ Initiate an alarm summary display on the FP LCD display. This display shall step through all currently active alarm in the system.

  - ❖ Initiate a summary printout of all currently active alarms on the FP printer.

  - ❖ Initiate an "all point summary" printout on the FP printer recording the status of each system point (initiating circuits, indicating circuits, etc.)

  At any time the operator shall have the following manual capabilities at the FP under password control. Operator privileges and ID numbers of up to four digits shall be assignable only by the main operator or designated alternate. Actions taken by operators shall automatically be printed on the FP printer with operator initials, time and date.

  - ❖ Command output points to different mode. Such commands shall be printed with selected descriptors ON/OFF, ON/OFF/AUTO, OPEN/CLOSE, DAY/NIGHT, etc.

  - ❖ Modify system parameters. Full alphanumeric key pad shall be provided for operators to modify the following parameters:-

    - ➢ change sensor alarm and prealarm thresholds
    - ➢ update date and time
    - ➢ change point descriptions
    - ➢ change action messages

  - ❖ Select a system status report for printing on the FP printer. The following real time reports shall be provided:-

    - ➢ all point log
    - ➢ alarm summary
    - ➢ trouble summary
    - ➢ status summary
    - ➢ sensitivity log
    - ➢ disabled points log

- isolated points log
- disconnected points log
- logical group points log

The sensitivity log shall print the analog value of each addressable analog sensor.

- Select printing of a trend log which, when enabled, shall print the last 24 analog values for every addressable analog sensor taken at predetermined intervals selected by operator. Systems which limit the number of addressable analog sensors which can be trended are not acceptable.

- Select a sequence of preprogrammed commands which shall be automatically executed, in sequence, via a single command. Provide a minimum of 255 commands which can be divide among a minimum of seven sequences.

- Perform a walk test function such that a single operator can periodically check out all initiating devices on a loop. In walk test mode all initiators on the selected loop shall automatically be isolated. As each device is placed into an alarm or trouble condition the FP shall print the condition and automatically reset the device. No audible signals shall be initiated from the loop to prevent disruption of building occupants. If a loop is inadvertently left in the walk test mode it shall automatically reset to normal after a five minute idle time is exceeded.

- **System Supervision**

  - In the normal supervisory condition, only the green "POWER" LED, and green "RUN" LED shall be illuminated. The LCD display shall display "System Normal" and the current time and date.

  - The LCD display shall indicate the loss of power condition and the printer shall record same. Following restoration to normal AC power, the trouble indicators shall be automatically reset, and the printer shall record the return to normal condition.

  - The LCD display shall indicate the loop in trouble and the printer shall record same. Operation of a momentary "Silence" switch shall silence the audible trouble signal, but the visual "Trouble" LEDs shall remain on until the malfunction has been corrected and the system reset. The FP printer shall record this action.

  The FP shall contain an integral backlit LCD display of two lines of 40 characters each, **and a 40 character width printer**. Both display and printer shall be viewable through the FP door.

- **Programming**

  The LCD display and printer programming shall be accomplished on-site by means of a lap-top personal computer which shall plug into the FP. Modules requiring off-site programming are not acceptable. Programming functions shall include alarm/trouble type assignment, point descriptor assignment, etc. Data file for the LCD display and printer shall be stored in EEPROM.

- **Networking**

  An additional output drive card must be provided to facilitate networking between two or more panels.

11. Approval of Fire Detection and Alarm System

The Contractor has to get the drawings for Fire Detection and Alarm System approved from the local fire authorities. On completion of the work, the Contractor has get the installation approved and obtain a certificate from the local fire authorities and handover the same to the Construction Manager. **The fees required for obtaining the approval shall be reimbursed by the Construction /manager on actuals, on submission of documentary proof.** The contractor shall be responsible for obtaining the required approval from Tariff advisory committee and other statutory authorities.

12. Testing & Commissioning

- **Photothermal Smoke and Heat Detector**

  - ❖ The testing shall be carried out for each loop initially with one detector in a loop and subsequently two or more disassociated detectors in each loop with time gap between the detectors for alarm acknowledge and Reset.

  - ❖ An identified smoke detector will be subjected to smoke aspiration from burning paper or cigarette puffs, held at 0.3 m distance from the detector. The panel should indicate through piezo sounder and hooter that alarm signal has been transmitted throughout the system. This test shall be carried out in different loops as well as two loops simultaneously. This part of the detector test shall be repeated again after 24 hours gap.

  - ❖ The same test in the same sequence shall be carried out for heat detector but with the application of heat from a hair dryer-held at approximately 60 cm distance. Repeat testing of the same detector shall be carried out at 24 hours interval.

- **Combined Test**

  - ❖ The panel shall be checked for basic tests, such as, visual checking of input voltage and amperage. All loops one by one, shall be D-wired to check for fault signal indication in the panel.

  - ❖ Subsequently, in every loop of panel, a detector shall be subjected to smoke or heat test and signals shall be checked on the panel.

  - ❖ The hooter shall sound automatically and the piezo sounders shall also sound. It shall also be possible to check that the hooters of all panels sound automatically when the panels are auto moded.

  - ❖ The power source shall be cut off and checked for standby supply from the batteries. After six hours the power source shall be switched on to check for auto switch over to mains mode. The trickle charger shall take over the charging of the battery to its maximum cut off level with auto cut off. A set of discharged batteries shall be connected to the panel in place of the new batteries and the trickle/boost switch checked for charging of the batteries.

  - ❖ Tests shall be conducted for AC failure, charger failure, battery disconnected or battery failure. In all such cases the relevant indication should come and the sounder shall also sound alarm.

- **Manual Call Box**

  The manual call box glass shall be removed by unscrewing the back. The micro switch shall instantaneously give a fire signal in the panel.

- **Random Sample Testing**

  About 5% of all fire alarm components shall be subjected to random testing by connecting to the panels. All smoke detectors shall be tested as given above and later cleaned with a vacuum cleaner. Hooters shall also be tested through direct 24V supply. It shall be tested for 10 minutes.

- **Testing of Earthing system**

  The earth continuity conductor including metallic parts of the equipment's shall be tested for earth to electrical continuity. All tests shall be carried out as per IS 3043 and resistance of complete installation shall not be more than one ohm.

- **Commissioning and Acceptance Tests**

  The commissioning and acceptance tests shall be apart from the standard or routine tests prescribed and normally conducted by the manufacturer and will be irrespective of the fact whether the same are covered by such tests or not.

  - ❖ Each sounder circuit shall be energized separately and the sound level reading taken to check for conformity with the minimum standards.
  - ❖ Mains failure performance.
  - ❖ Battery disconnection test.
  - ❖ Open circuit of each sounder circuit to be tested.
  - ❖ Short circuit of each sounder circuit to be tested.
  - ❖ The results of the above tests either by fault warning or fire alarm shall be recorded in the log books which will be signed both by the Consultant and Engineer in charge.

B. Access Control System

1. Scope

This section covers the Supply, Installation, testing and commissioning of Access Control System.

The Access Control System shall be provided so that the entry of persons shall be controlled by card reader. The exit of persons shall also be controlled by Card reader.

2. Access Controllers

The access control unit shall have the capacity to connect via coaxial cable proximity card reading sensors and contact inputs for alarm and status report. Controller shall provide operation of electrified locking hardware by means of (2) plug in dry contact fused relays each with a rating of 3 amps.

The Unit shall be designed to operate properly within relative humidity range of 10% - 95% non-condensing and within a temperature range of -7° C to 50° C.

The Unit shall be wall mounted and all wiring connections shall be provided at the top. Power should be available from a separate/built in power supply unit capable of providing power to the unit, sensors and other annunciator devices.

The controller unit should have 2 nos RS. 232 data I/O ports for encoded data and be capable of being connected directly to a printer.

The Unit shall contain a minimum database of 10,000 keys with unique number identification. It should store user operating data and handle alarm reporting for upto (2) card reading sensors and report activity for upto (8) monitored inputs. It should initiate relay outputs commands based on card access activity, operator keyboard inputs, preprogrammed time schedules and switch inputs. System diagnostics and automatic alarming based on detected faults in sensors, cables or devices connected should be inbuilt.

The unit should provide off line diagnostics for checking the integrity of the RAM And EPROM memory.

The Unit should be capable of being connected with auto dial up modems to automatically report or send messages to local/remote terminals and be capable of off site programming via dial up modems.

The access controller shall have the following features defined:

3. Access Codes

Access codes shall define when and where the card holder will be granted access. Each access code shall have the capability of defining upto four time periods for each entry point in the system. A time period shall indicate time of day, day of week and holidays.

4. Key commands

The user shall be able to define upto 10,000 keys with a unique numeric identification. The user may bulk programme keys in groups and remove any key from the database. Any key usage shall be traced by the system and a key trace report generated. Key functions shall include:

Access

The access parameters shall be defined such that any single key can be programmed to open each entry/exit point during four different time periods. System shall be capable of having upto 64 different time intervals. Key access parameters may be modified at any time.

Antipass back

The unit shall have the capability of designating any key/(s) so that when it is used to enter an area it must be used to exit that area before it can be reused for entry. The system shall have two modes for this operation:

- Hard: Denies entry and reports pass back violation.
- Soft: Allows reentry but reports pass back violation.

Alarm Shunting

System shall have means to connect presence detecting devices to shunt alarms when unauthorized exit takes place.

Forced Entry Alarms

The system shall report forced alarms.

Passwords

System shall be capable of identifying eight different operators for terminal use. up to 12 character user definable passwords shall used to log onto the system. Up to 6 access levels having different function capabilities shall available.

Printed Data Output

The unit shall be capable of printing the following information without any external computer interface:

- Key codes, Names, Access Codes, Location, Key Trace Function.
- Monitored Point Parameters.
- Entry/Exit Point Parameters.
- Access Codes Parameters.
- User names, passwords, access levels.
- System status.

5. Proximity Card Reading Sensor

The proximity card reading sensors should connect to the control units via data lines. It shall detect command key codes when the key is within specified range from it.

The sensor shall read data encoded on proximity cards containing tuned circuits placed within the read range of the sensor and should not require any contact of the cards with the sensor.

It shall be totally sealed, weather proof, water resistant and tamper proof. The Card reader shall be mounted in a rugged weatherised polycarbonate housing to withstand harsh environments & provide a high degree vandal of resistance.

It shall be suitable to operate within relative humidity of 0% to 100% and temperature range of -30° C to + 65° C.

The Sensor shall be capable of being mounted on wall to ensure read from a minimum specified range. The sensor should have the capacity of being mounted behind any nonmetallic, non-conductive surface including glass.

When the proximity card is presented to the reader, the red LED shall flash green and beeper shall sound.

6. Proximity Cards

The Card shall have numeric encoded data in the form of passive tuned circuits within the card. Each card shall be encoded so that it is totally unique and exists in no other system. It shall have the capability to be programmed to operate at different locations.

The Card should be capable of generating an access number consisting of eight digits. It shall be made of heavy duty fibre glass epoxy with vinyl covering. It should be credit size and highly resistant to abrasion or bending.

The key should operate in temperatures ranging from - 30 degrees C - + 65 degrees C and from 0% - 100% relative humidity. The power for the card should be generated from the sensor.

7. System Software

The System software for the Access Control System shall be powerful and multifunctional. It shall be window based and shall be flexible to allow upgradation as and when new version of software is released.

It shall operate on a high quality computer based on the 486 processor or higher.

The Access control System Software shall be designed to grow as the project needs grow. Modular software shall allow for future system features to be added as management recognizes requirements.

- **Operator Interface/Operations**

  The system software shall fulfill the following requirements for operator monitoring and command functions:-

  - ❖ Menu driven screen selection shall allow even an infrequent operator to move through and manage the functions of the system easily and with a minimum of training. There shall also be no need to memorise complicated commands or procedures.

  - ❖ Function key control of actions must provide the ability to control the system with simple key strokes.

- **System Password Protection/Control**

  - ❖ Operator and password shall control access to all menus and screens and the corresponding capability of each screen.

  - ❖ The system shall be able to assign each and every operator a completely unique set of capabilities. The system shall protect the password screen by blanking out the password when the operator enters it.

- **Real Time Reporting & Display**

  The system shall process inputs in real time, using priority levels defined by the System Administrator. The System Administrator shall have the capability to assign priority levels.

  The system shall associate graphic maps with monitor points and must display maps in real time.

- **Real Time Status Reports**

  System status reports shall be available by monitoring device category and access category.

- **Override Command Capability**

  The system shall provide the operator the liability, based on pass word authorization to override pre set conditions. The override shall include:

  - ❖ Unlock/relock entry/exit points
  - ❖ Shunt/Unshunt monitor points
  - ❖ Open, limit or close the areas covered by specific controllers.

- **Graphics for Maps**

  Using simple keys to facilitate selection and placement of graphic symbols. The system should defines maps representative of site. The symbols should be associated with monitor points.

- **Diagnostics**

The software shall provide operators with the ability to examine the status of the system components and communications.

- **Audit Trail of All Operator Activity**

  The System Administrator shall be provided with the ability to the monitor and manage all actions performed by operators on the system. Audit trial records shall be saved to hard disk and not be able to be modified. The only possible actions for audit records shall be report retrieval and archiving for off line storage.

- **System Management**

  The software shall allow the system to perform the following functions:

  - ❖ The host computer shall provide control of all system administration functions via menu accessed screens. There shall be no need to memories complicated commands or to learn the syntax of the DOS operating system. System administrative functions shall include.
  - ❖ Adding and deleting system users and their passwords.
  - ❖ Performing system and database backups.
  - ❖ Displaying current system activity.
  - ❖ Performing transaction archives.
  - ❖ Initiating data transfer to remote devices.
  - ❖ Defining and maintaining user controlled fields
  - ❖ Performing alarm transaction cleanup.
  - ❖ The system shall define
  - ❖ Access control/security panic monitoring devices
  - ❖ Communication characteristics.
  - ❖ Grouping of doors and monitor points
  - ❖ Defining readers.
  - ❖ Defining reports.
  - ❖ Defining Card Numbers, Names, Cards Validity Dates & Expiration Dates.
  - ❖ Defining time periods/holidays.
  - ❖ Defining data grouping such as group time periods, doors, monitor points and key holders to ease data entry.
  - ❖ Data base Download to distributed Workstations

The host computer shall download all information pertinent to particular control unit. The System shall execute downloads automatically at predefined times or by manual activation.

- Reports

The System shall be able to execute reports without impacting the real time operation of the system. The System shall track and real time operation of the system. The System shall track and report the dates archived events available for reporting. It shall be able to generate reports for activity any time period.

The System shall separate reports by groups and shall provide reports for every data line maintained in the system.

The following predefined reports shall be available:

- Detail activity on the system within specified time intervals.
- Provide selective reporting of specific types of activity on the system within specified time intervals.
- Any time data is changed the system shall maintain an audit trail of the data changed and who made the change.

- Online Storage of Events

When the data base approaches a certain percentage of its limit, the system shall issue an alert to inform the operator of the condition and recommend that the operator perform an archive to floppy disk.

- Archiving Event

The system shall provide the ability to backup to floppy disk all events stored in the transaction file . In the events of hardware failure or need to execute a report using archived events must be able to be restored to the system.

- Backup Restoration of System Definition

The System shall provide the ability to backup to floppy disk definition, including both hardware and user information. In the data corruption, tampering or other loss of data integrity, the system definition shall be able to be restored to the Online System from the floppy disk.

- Access Control Operation

The Software shall capture all events that occur at installed access controllers and such event capture shall occur real time. The software shall provide the ability automatically to change state of certain devices or areas based on time.

If for any reason communication between the host computer and the access controllers is interrupted the controller shall continue to make its own decisions. While connected to the host computer, the system shall continuously update the controllers with necessary information to operate in fail soft mode.

The Software shall provide capability to trace activity of card holders at specific entry/exit points. The System shall provide a display that summarizes the current condition of all the monitor points.

- Security Management Operation

The Software shall capture all events that occur at installed panic buttons and such event capture shall occur real time.

The event capture shall be reported to the host computer and the event updated on the layout maps on a real time basis.

The Software shall provide capability to display status of panic buttons.

The Software shall be upgradeable to take on additional monitor points and access controllers as required from time to time. It shall also be upgradeable for real time control of CCTV system.

The Software should be capable of recording all events of the Fire Detection and Alarm system as installed by the Client.

C. IP C.C.T.V. System

1. Scope

This section covers the design, supply, installing, testing and commissioning of Closed Circuit Television system comprising Cameras, recorder, switches and monitors.

- The IP camera family shall include a choice of
  - ❖ Fixed-format Mega pixel dome models.
  - ❖ Fixed-format Mega pixel Bullet models.
- Fixed-format High resolution dome models. These IP cameras shall offer M-JPEG, H.264 and MPEG-4 video compression in order to align with or optimize network bandwidth and video storage provisioning.
- These IP cameras shall include megapixel-resolution models, and shall offer several lens options.
- The Megapixel-resolution IP cameras shall be supplied with Megapixel lenses. The housing enclosure for megapixel cameras shall be IP66 compliant. Suitable mounting accessories are supplied as per the mounting needs.
- All cameras shall support a Power over Ethernet (PoE) interface.
- The dome cameras shall offer a sensor based true wide dynamic range of 100 db.
- The bullet cameras shall offer a sensor based true wide dynamic range of 100db.
- The cameras shall be capable of generating (At Least) up to 2 simultaneous video streams, with the following attributes:
  - ❖ Individual camera feeds shall be recorded by the VMS at different compression, resolution and capture rate settings simultaneously.
  - ❖ An adaptive transmission algorithm shall throttle these video streams to a preset maximum data rate or scale that rate based on variable network bandwidth available at the time of transmission.
- All IP cameras shall provide backlight compensation.

2. IP Dome Cameras

- Camera Type IP Dome Camera
- Sensor 1/2.8", 2.0 megapixel, progressive scan, CMOS
- Lens - 2.8 ~ 12mm@ F1.6
- True WDR up to 120dB at Full Resolution
- Illumination - Colour: 0.002Lux (F1.6, AGC ON), 0 Lux with IR
- Up to 30m (98ft) IR range
- IR ON/OFF – Auto / Manual
- Shutter - Auto/Manual, 1 ~ 1/100000s
- Defog – Digital defog
- True Day/Night Functionality IR-cut filter with auto switch (ICR)
- Video Compression - 265, H.264, MJPEG
- Frame Rate - Main Stream: 2MP (1920*1080), Max 30fps; Sub Stream: 2MP (1920*1080), Max 30fps; Third Stream: D1 (720*576), Max 30fps
- H.264 code profile - Baseline profile, Main Profile, High Profile
- Video Bit rate - 128 Kbps~16 Mbps
- 9:16 Corridor Mode - Supported
- Privacy Mask, Motion Detection, Flexible Cropping, Bit Rate, Control, Multi-Streaming, Multicasting, and Forensic Zooming
- Total Power Over Ethernet (PoE) Solution
- Audio compression, 2 way audio, suppression supported, sampling rate-8khz
- Digital noise reduction - 2D/3D DNR
- Flip - Normal/Vertical/Horizontal/180°/90°Clockwise/90°Anti-clockwise
- Compression Type H.264 (MPEG-4, Part 10) / Motion JPEG
- Network Protocols RTSP, RTP/TCP, RTP/UDP, HTTP, DHCP, TFTP, QoS, IPv4, IPv6, 802.1x
- Industry Standard ONVIF (Profile S, Profile G, Profile T), API
- Certification - CE: EN 60950-1, UL: UL60950-1, FCC: FCC Part 15
- Real-time Motion Detection
- Backlight Compensation
- IP66, IK-10,12VDC/24VAC/PoE

3. IP Bullet Cameras

- Camera Type IP Indoor Bullet Camera
- Sensor 1/2.8", 2.0 megapixel, progressive scan, CMOS
- Lens - 2.8 ~ 12mm@F1.6
- True WDR up to 120dB at Full Resolution
- Illumination - Colour: 0.002Lux (F1.6, AGC ON), 0 Lux with IR
- Up to 50m (164ft) IR range
- IR ON/OFF – Auto / Manual
- Shutter - Auto/Manual, 1 ~ 1/100000s
- Defog – Digital defog
- True Day/Night Functionality IR-cut filter with auto switch (ICR)
- Video Compression - 265, H.264, MJPEG
- Frame Rate - Main Stream: 2MP (1920*1080), Max 30fps; Sub Stream: 2MP (1920*1080), Max 30fps; Third Stream: D1 (720*576), Max 30fps
- H.264 code profile - Baseline profile, Main Profile, High Profile
- Video Bit rate - 128 Kbps~16 Mbps
- 9:16 Corridor Mode - Supported
- Privacy Mask, Motion Detection, Flexible Cropping, Bit Rate, Control, Multi-Streaming, Multicasting, and Forensic

Zooming

- Total Power Over Ethernet (PoE) Solution
- Audio compression, 2 way audio, suppression supported, sampling rate-8khz
- Digital noise reduction - 2D/3D DNR
- Flip - Normal/Vertical/Horizontal/180°/90°Clockwise/90°Anti-clockwise
- Compression Type H.264 (MPEG-4, Part 10) / Motion JPEG
- Network Protocols RTSP, RTP/TCP, RTP/UDP, HTTP, DHCP, TFTP, QoS, IPv4, IPv6, 802.1x
- Industry Standard ONVIF (Profile S, Profile G, Profile T), API
- Certification - CE: EN 60950-1, UL: UL60950-1, FCC: FCC Part 15
- Real-time Motion Detection
- Backlight Compensation
- IP66, IK-10,12VDC/24VAC/PoE.

4. Server Storage NVR

- IP Video Input - 32-ch
- Two-way Audio Input - 1-ch, RCA
- Incoming Bandwidth- - 320 Mbps
- Remote Users – 128
- Protocols - SNMP,P2P, UPnP, NTP, DHCP, PPPoE
- HDMI/VGA Output - HDMI1/VGA: 1920x1080p /60Hz, 1920x1080p /50Hz, 1600x1200 /60Hz, 1280x1024 /60Hz, 1280x720 /60Hz, 1024x768 /60Hz, HDMI2: 4K (3840x2160) /60Hz
- CVBS Output - 1-ch, BNC
- Recording Resolution - 5MP/4MP/3MP/1080p/960p/720p/D1/2CIF/CIF
- Audio Output - 1-ch, RCA
- Synchronous Playback - 16-ch
- Corridor Mode Screen - 3/4/5/7/9/10/12/16/32
- Decoding format - H.265, H.264
- Live view/ Playback 5MP/4MP/3MP/1080p/960p/720p/D1/2CIF/CIF
- Capability - 3 x 12MP@25, 4 x 4K@30, 8 x 4MP@30, 16 x 1080P@30, 32 x 960P@25, 36 x 720P@30, 64 x D1
- Hard disk SATA - 8 SATA interfaces
- Capacity - Up to 10TB for each HDD
- eSATA – 1 eSATA interface

ii.

- VCA Detection - Face detection, Intrusion detection, Cross line detection, Audio detection, Defocus detection, Scene change detection, Auto tracking
- VCA Search - Face search, Behavior search
- Statistical Analysis **-** People counting
- Array Type - RAID 0, 1, 5, 6, 10
- Network Interface - 2 RJ45 10M/100M/1000M self-adaptive Ethernet Interfaces
- Serial Interface - 1 x RS232, 1 x RS485
- USB Interface - Rear panel: 2 x USB2.0, 1 x USB3.0
- Alarm In – 16 ch
- Alarm out – 4 ch

5. Layer-2 PoE Distribution Switch

- **General Features & Performance**

  - ❖ Rack Mountable
  - ❖ Minimum switching capacity: 216 Gbps or more

- ❖ Minimum forwarding rate: 130 Mpps or more
- ❖ Minimum DRAM 512 MB and 128 MB Flash
- ❖ Should support internal redundant power supply
- ❖ Should provide wire-speed and non-blocking performance on all the ports
- ❖ Minimum IPv4 & IPv6 Routes : 250
- ❖ MAC addresses support: 16,000
- ❖ VLANs support: 1000 active VLANs
- ❖ Should be IPv6 ready from day 1
- ❖ Should support IEEE 802.3az EEE (Energy Efficient Ethernet)
- ❖ Should support 9K or higher Jumbo frames
- ❖ Should support minimum 8 ports in a single Ether Channel group or equivalent protocol for Bandwidth aggregation.
- ❖ Should have Net Flow or sFlow from day one.

- **Interfaces**

  - ❖ Minimum of 24 x 10/100/1000 BaseT POE+ RJ 45 Ethernet Ports (must provide POE+ power on all 24 ports simultaneously).
  - ❖ Minimum 4x 10GBaseX SFP+ ports for uplinks
  - ❖ Should have dedicated flexstack or equivalent stacking with minimum 80 Gbpsvia 40G ports or more Stacking bandwidth to stack up to 8 switches into a single virtual switch. Necessary stacking modules / ports / cables needs to be supplied from day 1.
  - ❖ Should support sub 50ms ring protection as per IEEE 802.17/equivalent protocol.

- **Layer-II Features**

  - ❖ Should support IEEE 802.1Q VLAN encapsulation
  - ❖ Should support 802.1d, 802.1s, 802.1w & 802.3ad protocols
  - ❖ Should support Spanning-tree root guard to prevent other edge switches becoming the root bridge
  - ❖ Should support PVST / PVST+ or equivalent spanning tree protocol
  - ❖ Should support Unidirectional Link Detection Protocol (UDLD) or equivalent protocol to allow unidirectional links failure detection
  - ❖ Should support Link Layer Discovery Protocol (LLDP) / CDP or equivalent protocol
  - ❖ Should have Layer 2 IEEE 802.1p (class of service [CoS]), 8 hardware queues per port, Per-port QoS configuration, Differentiated services code point (DSCP) marking, CoS-based egress queuing, Egress strict-priority queuing and ACL-based QoS classification (Layers 2, 3, and 4)
  - ❖ Should support IGMP snooping v1, v2 & v3

- **Security**

  - ❖ RADIUS / TACACS, which allows centralized control of the switch and restrict unauthorized users from altering the configuration
  - ❖ Should support IEEE 802.1x to provide port-based user authentication
  - ❖ Should support port security and Secure Shell (SSH)

- **Management**

  - ❖ Should have a Manageability through a common network-management software on a per-port and per-switch basis
  - ❖ Should support SNMP versions 1, 2, and 3 and RMON
  - ❖ Should support Network Time Protocol (NTP)
  - ❖ Configuration through the CLI, console, Telnet, SSH and Web Management

- ❖ Should support Trivial File Transfer Protocol (TFTP) to reduce the cost of administering software upgrades by downloading from a centralized location
- ❖ Should have dedicated out of band 10/100/1000 base Ethernet port and dedicated serial console port.

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

ACTIVE NETWORKING SYSTEM

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI Creating an Ecosystem for Quality

Date: 26th Dec. '2024

Revision: R0

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II. SPECIFICATION 3

I. PREFACE

A. Tropical Conditions

All equipment/material supplied against respective Specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

- Ambient temperature : 45 degree Celsius
- Annual Average Relative humidity : 50%
- Isokeraunic level (days per year) : 50
- Seismic Zone : Zone-IV
- Climate type : Moderately hot and humid tropical, climate, conducive to rust and fungus growth

B. General:

The Security work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply authority and Fire Insurance regulations so far as these become applicable to the installation.

The scope includes the jobs to be performed for all equipment and materials furnished under this specification. The scope is however not limited to the items detailed below:

- Design, manufacture, testing at manufacturers works packing and dispatch.
- Transportation to site and insurance.
- Receiving at site, unloading, handling, opening, inspecting, reporting and submitting claims in case of damages and short supply items.
- Arranging to repair/re-ordering all damaged and short supply items.

II. SPECIFICATION

- **Special Condition for System Integrator:**
- The Contractor will supply and install the equipment necessary to meet the requirements and provide all labour and materials, whether or not described in full, necessary to produce complete and fully operational systems in accordance with the intent of this document.
- The Contractor/ Agency must familiarize himself with the site drawings and the scope of the facilities that is required in the various areas. Should ensure that agency is aware of the operational requirements under which the systems and associated facilities are to be installed and used.
- All employees used by the contractor/agency to install this system must be competent technicians who are experienced in the installation and interconnection of systems.
- Bidder shall be authorized by the manufacturer of the major components of the system to sell their products and initiate warranty service on the same items for this project. Manufacturing authorization letter must be submitted for this Work addressing to Client stating that bidder is authorized to provide sales and services on behalf of OEM.
- In view of the above, commissioning and programming will have to be carried out to integrate all the system architecture hardware and software

- **Submittals:**
    - Compliance Statement- (Mandatory)
    - Datasheet- (Mandatory- Relevant Pages only)
    - Bill of Quantity- (Mandatory)
    - Drawings as required
    - Manufacture Authorization Letter (Mandatory)
    - OEM Partner Certification
    - No Deviation Certificate (for Technical Compliance) on OEM latter head (Mandatory).
- **Makes and Models**: - It is mandatory to provide make and model of the items and their subcomponents as has been sought in the technical bid. Please note that substituting required information by just brand name is not enough. Bidder should not quote hardware or software items which are impending End of Life or End of Support during the contractual period.
- **Software, Drivers and Manuals**: - The bidder shall supply along with each item, all the related documents, Software Licenses and necessary media of the software loaded in the equipment without any additional cost. The media and documents shall be in English. These will include, but not restricted to, User Manual, Operation Manual, Other Software and Drivers etc.
- **Warranty:** The Contractor/ Agency shall Warranty that all provided material and equipment will be free from defects, workmanship and will remain so, for a period of 12 months from after equipment/materials have put into the service or from date of final acceptance of system by Engineer In charge / Consultant whichever is earlier.
- The Contractor/ Agency shall provide summary of all equipment's serviced quarterly during this Warranty period to facility in charge. The report shall clearly mention services rendered, parts replaced and repairs performed.
- **Software & Programming:**
- Any software, license or programming, whether or not specifically mentioned, but if required for successful installation, testing, commissioning and functioning of the all equipment and systems installed by the contractor, the same shall be in the scope of the contractor. All such software required shall be fully-loaded, genuine, latest versions, shall be as per OEM's specifications/ recommendations, shall not be trial versions or limited- feature or limited-period versions (unless the specified Model no. / Code no. means so) and shall not involve any extra or recurring cost.
- The rate quoted by the contractor shall be inclusive of all such required software and programming and the contractor shall be responsible for making the entire system operational as per tender specification and no extra shall be paid to the contractor on this account.

- **Compatibility of System**

- It shall be contractor's obligation to ensure that all the software, hardware, equipment, and ITsystems, including input-output connectors/ port/ terminals, are seamlessly compatible with one another. Any specific provisions, if required to be made on this account this, shall be done by the contract without compromising the performance of the IT system and without any extra cost. The rate quoted by the contractor shall be inclusive of all such required software and programming and no extra shall be paid to the contractor on this account.
- The contractor shall ensure that the equipment being proposed are the prevalent models/ series of the OEM.

Technical Specification of LAN System

Core Switch

Core Switch		
S. No	**Specifications**	**Compliance (Yes/No)**
1	**General Features**	
2	Switch should be 1U and rack mountable in standard 19" rack.	
3	Switch / Switch's Operating System should be tested for EAL 2/NDPP or above under Common Criteria Certification .	
4	Switch should be MTCTE (Mandatory Testing & Certification Of Telecommunication Equipment) Certified and Certificate issued by TEC (Telecommunication Engineering Center), Department of Telecommunications must be submitted.	
5	Switch should be quoted with 05 years of TAC Support & 5 years Hardware Warranty with advance hardware replacement.	
6	Switch should have minimum 4 GB RAM, 4 GB Flash and 6MB packet buffer or more.	
7	Switch should support operating temperature from 0^0 to 45^0 degree celsius.	
8	**Hardware Architecture**	
9	Switch should have 24 Ports of 1/10G SFP+, 4 Ports of 1/10G SFP+ or 4 porand 2 x 40G or 1 x 100G QSFP28 Uplink/Stacking Ports from Day 1. Switch should support total of 4 x 40G QSFP28 or 1 x 100G QSFP28 Ports in future by installing the interface module. Switch should support 1G Base T & 10G Base-T Copper RJ-45 Transceiver to connect with any legacy device with 1Gbps port. Switch must be supplied with redundant hot swapable fan trays & dual redundant power supply.	
10	I.Switch should support physcial stacking of 200Gbps and up to 8 Switches or more in a single stack. II. Switch should also support long distance stacking upto 10KMs. III. Switch should support aggregated stacking bandwitdh of 1600Gbps or more.	
11	Switch should have the following interfaces: I. USB Type-C, RJ-45 Serial Port for Serial Console Management II. USB Type-A for external file storage III. RJ-45 Ethernet Port for Out of Band Network Management	
12	**Performance**	
13	Switch shall have minimum 1Tbps of switching fabric and 800 Mpps of forwarding rate.	
14	Switch shall have minimum 96K MAC Addresses and 4000 VLAN.	

15	Should support minimum 90K IPv4 and 8K IPv6 routes or more	
16	Switch shall have 8K multicast groups or more.	
17	Switch should support 512 or more STP Instances.	
18	Switch should support trunking, 32 ports per trunk & min. 256 trunk groups or more	
19	Switch must support MACSEC Protocol.	
20	Switch must support High Availability (HA) functionality using M-LAG (Multi-Chassis Link Aggregation Group)/MC-LAG (Multi-Chassis Link Aggregation Group)/ VPC (Virtual Port Channel) etc. with independent management & Control Plane	
21	**Layer 2, Layer 3 & Security Features**	
22	Switch should support IEEE Standards of Ethernet: IEEE 802.1D, 802.1s, 802.1w, 802.1x, 802.3ad, 802.3x, 802.1p, 802.1Q, 802.3, 802.3u, 802.3ab, 802.3z, UDLD and VXLAN.	
23	Switch must have IPv4 & IPv6 routing static routing, ECMP, RIP, RIPnG, OSPFv2, OSPFv3, VRRP, VRRP-E (IPv4 & IPv6), VRRP v3 -IPv6, PIM-SM, PIM-SSM, PIM-DM, PIM-Passive (IPv4 & IPv6), MSDP, BGP4, BGP4+ (IPv6), VRF, PBR and QoS features from Day 1	
24	Switch should support RSPAN, ER-SPAN, LLDP, Configuration Archive, Replace & Roll Back.	
25	Switch shall have 802.1p class of service, marking, classification, policing and shaping and eight egress queues.	
26	Switch should support management & authentication features like sFlow or equivalent, SSHv2, SNMPv2c, SNMPv3, NTP, MAC Authentication, Web Authentication, Flex Authentication, RADIUS, Encrypted Syslog (RFC 5425), RADSEC (RFC 6614) and TACACS+ Authentication.	
27	Switch should support IPv6 Binding Integrity Guard, IPv6 Snooping, IPv6 RA Guard, IPv6 DHCP Guard, IPv6 Neighbor Discovery Inspection and IPv6 Source Guard.	
28	Switch should support 802.1x authentication and accounting, IPv4 and IPv6 ACLs and Dynamic VLAN assignment	
29	Switch must support protection Dynamic ARP Inspection, DHCP Snooping, Protection against Denial of Service (DOS) attacks	
30	During system boots, the system's software signatures should be checked for integrity. System should capable to understand that system OS are authentic and unmodified, it should have cryptographically signed images to provide assurance that the firmware & BIOS are authentic.	
31	Switch must support Open Flow 1.3 or latest for SDN (Software Defined Networking), REST API, Ansible for automation	
32	**Manageability**	
33	Should support manageability using on prem Centralized Management platform using Web based Graphical User Interface (GUI) and also should be remotely manageable from the Cloud.	
34	It shall support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch for management/monitoring	
35	All Switches Core, Distribution and Access Switches shall have the similar commnad line for ease of operation & maintenance	
36	**Mandatory Certification & Compliance**	
37	Switch shall conform to IS 13252-1 or IEC 60950-1 or IEC: 61368-1 Annex-A for Safety requirements of Information Technology Equipment as per TEC Standard. TEC certificate to be furnished along with the bid.	
38	Switch shall conform to TEC EMI EMC Standard EN 55032 Class A/B or CISPR32 Class A/B or CE Class A/B or FCC Class A/B	

39	Switch shall conform to TEC EMI EMC Standard EN/IEC 61000-4-2, EN61000-4-3, EN61000-4-4, EN61000-4-5, EN 61000-4-6, EN 61000-4-11, EN 61000-4-29 Annex B and ROHS 6.	
40	OEM should not share land border with India. Declaration on the OEM letter head to be submitted for the same.	
41	OEM should have ISO 9001:2015 certification	
42	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	
43	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	

48 Port Non PoE Access Switch

48Port Non PoE Access Switch		
S No.	**Specifications**	**Compliance (Yes/No)**
1	**Product details - Please specify**	
1.1	Please mention Make, Model No. and Part Code.	
2	**Architecture & Port Density**	
2.1	Access Switch should provide 48 x 10/100/1G RJ45 Ports and 4x 1G/10G/25G SFP+ Slots, for Stacking/Uplinks, from Day 1.	
	Hardware, including modules, or Software, including licenses, to support all the speeds listed above, should be available from Day 1	
2.2	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support aggregated stacking bandwidth of 800Gbps or more and 8 switches per stack or more.	
3	**Performance**	
3.1	Should provide Switch Fabric Bandwidth Capacity of 296 Gbps, or more.	
3.2	Should provide Packet Forwarding Capacity of 220 Mpps, or more.	
4	**MAC Address and Route Table**	
4.1	Should support up to 32K MAC addresses, or more.	
4.2	Should support 16K IPv4 routes and 4K IPv6 routes, or more.	
5	**Physical Attributes**	
5.1	Should support 4GB RAM, 8GB Flash and 4MB Packet buffer or better	
6	**Layer 2 features**	
6.1	Should support Jumbo Frames (up to 9K bytes).	
6.2	Should support 4K Active VLANs, with the following features;	
	- Port based VLANs	
	- Dual-Mode VLANs	
	- MAC-based VLANs	
	- Dynamic VLAN Assignment	

	Dynamic MAC-based VLAN Activation	
	Dynamic Voice VLAN Assignment	
	VLAN mapping or VLAN Translation	
6.3	Should support Spanning Tree Protocols, with the following features;	
	802.1D Spanning Tree	
	802.1W Rapid Spanning Tree Protocol (RSTP)	
	802.1s Multiple Spanning Tree	
	802.1s Multiple Spanning Tree enhancement (MSTP+)	
	Fast Port Span, Fast Uplink Span or Equivalent	
	Compatibility with PVST/PVST+, PVRST+ and PVST+ or Equivalent	
	BPDU Guard	
	Root Guard for STP & MSTP	
	Port Loop Detection	
	Spanning Tree path cost method changes	
	MSTP path-cost configuration	
6.4	Should support Link Aggregation Groups (LAG), with the following features;	
	Static LAG	
	802.3ad Link Aggregation Control Protocol (Dynamic LAG)	
	Dynamic insertion and removal of ports	
	Support for LAG between different default port speeds	
6.5	Should support 802.1q Tunneling, with the following features;	
	802.1ad (Q-in-Q) tagging	
	Q-in-Q BPDU tunneling	
	Selective Q-in-Q	
6.6	Should support Private VLANs, with the following features.	
	PVLANs with dual mode support	
	PVLAN with LAG	
6.7	Should support VLAN Registration Protocol, with the following features;	
	Multiple VLAN Registration Protocol (MVRP)	
	MVRP with Per-VLAN STP and Per-VLAN RSTP	
6.8	Should support the following features;	
	Unicast Reverse Path Forwarding (uRPF)	
	Remote Fault Notification (RFN)	
	Link Fault Signaling (LFS)	
	Uni-Directional Link Detection (UDLD) on Tagged and Untagged Ports	
	To limit Unknown Unicast Packet Flooding (UUFB)	
	Virtual Extensible LAN (VXLAN)	
7	**Layer 3 features**	
7.1	Should support the following IPv4 and IPv6 Layer 3 Routing features;	
	Routing Between Directly Connected Subnets	
	Host routes & Virtual Interfaces	
	IPv4 & IPv6 Static Routes	
	RIP v1/v2 & RIPng	

	ECMP	
	OSPF v2, OSPF v3	
	PIM-SM, PIM-SSM, PIM-DM, PIM passive	
	Policy Based Routing (PBR)	
	VRRP v2 & VRRP v3	
	Non-Stop Routing (NSR)	
	GRE IP Tunnels	
	IPv6 over IPv4 tunnels and VRF	
	DHCP Server	
	MSDP	
8	**Quality of Service (QoS) & Traffic Management**	
8.1	**Should support the following Quality of Service (QoS) features;**	
	ACL Mapping and Marking of ToS/DSCP (CoS)	
	ACL Mapping and Marking of 802.1p	
	ACL Mapping to Priority Queue	
	Classifying and Limiting Flows Based on TCP Flags	
	DiffServ Support	
	Honoring DSCP and 802.1p (CoS)	
	Dynamic Buffer Allocation for QoS Priorities	
	Separate QoS Queuing for Unicast and Multicast	
	Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP	
	Priority for PFC	
8.2	Should support the following Traffic Management features;	
	ACL-based Rate Limiting	
	Traffic Policies	
	Broadcast, Multicast, and Unknown Unicast Rate Limiting	
	Inbound Rate & Outbound Rate Limiting	
	CPU Rate Limiting	
9	**Software Defined Networking (SDN)**	
9.1	Should support the following SDN features and functionality;	
	OpenFlow v1.0 & v1.3	
	Hybrid Switch Mode	
	Hybrid Port Mode	
	Support for Multiple Controllers	
10	**Security**	
10.1	Should support the following Security features;	
	Layer 3 & Layer 4 ACLs	
	Layer 2 ACLs (MAC)	
	DHCP Snooping	
	DHCP Client & Server	
	Dynamic ARP Inspection	
	Neighbor Discovery (ND) Inspection	

	Protection against Denial of Service (DoS) Attacks	
	MAC Port Security	
	RADIUS/TACACS/TACACS+	
	Secure Copy (SCP)	
	Secure Shell (SSHv2)	
	Trusted Platform Module	
	Protected Ports	
	IP Source Guard (v4 & v6)	
	IPv6 RA Guard	
	RADSEC	
10.2	The Switch should support the following Authentication features;	
	Authentication, Authorization, and Accounting (AAA)	
	802.1X Authentication and Accounting	
	MAC Authentication and Accounting	
	Web Authentication	
	802.1x with Dynamic ACL Assignment	
	802.1x with Dynamic VLAN Assignment	
	802.1x and MAC Authentication on the same port	
	802.1x Authentication with IP Source Guard Protection	
	MAC Authentication with IP Source Guard Protection	
	MAC Authentication with Dynamic VLAN Assignment	
	MAC Authentication with Dynamic ACLs	
	MAC Authentication with 802.1x	
	802.1x together with Denial of Service (DoS) Attack Protection	
	Periodic Re-authentication for MAC Authentication	
	Periodic Re-authentication for 802.1x	
11	**Monitoring & Manageability**	
11.1	The Switch should support the following Monitoring & Management features;	
	RSPAN	
	NTP	
	LLDP & LLDP-MED	
	Cisco Discovery Protocol (CDP) for IPv4 and IPv6 Traffic or equivalent	
	Automation with Ansible & RESTCONF	
	DHCP Auto Configuration	
	SNMP v1, v2, and v3	
	Mirroring based on Port, IP ACL, MAC ACL and VLAN	
	Configuration Archive, Replace & Roll back	
	IP DHCP binding scalability of minimum 2K Devices	
11.2	Should support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch management/monitoring.	
11.3	Should support manageability using Network Management Software with Web based Graphical User Interface (GUI) and Cloud based Management Solutions.	
11.4	Should support NetFlow or sFlow or equivalent.	

12	**Mandatory Compliance & Warranty and support:**	
12.1	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	
12.2	The Switch OS should be EAL/NDPP and ROHS6 Certified. Certificate needs to be enclosed along with the bid	
12.3	The Switch must be MTCTE Certified and TEC certificate shall be submitted	
12.4	The Switch should be quoted with Five (5) Years of TAC Support and 5 years Hardware Warranty with advance hardware replacement.	
12.5	Bidder needs to submit bid specific MAF from the OEM.	
12.6	OEM should not share land border with India. OEM needs to share declaration on the letter head for the same	
12.7	OEM should be ISO 9001:2015 certified. Certificate to be enclosed	
12.8	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	
12.9	The switch should have MTBF of >800K Hours at 25° C	

24Port Non PoE Access Switch

24Port Non PoE Access Switch		
S No.	**Specifications**	**Compliance (Yes/No)**
1	**Product details - Please specify**	
1.1	Please mention Make, Model No. and Part Code.	
2	**Architecture & Port Density**	
2.1	Access Switch should provide 24 x 10/100/1G RJ45 Ports and 4x 1G/10G/25G SFP+ Slots, for Stacking/Uplinks, from Day 1.	
	Hardware, including modules, or Software, including licenses, to support all the speeds listed above, should be available from Day 1	
2.2	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support aggregated stacking bandwidth of 800Gbps or more and 8 switches per stack or more.	
3	**Performance**	
3.1	Should provide Switch Fabric Bandwidth Capacity of 248 Gbps, or more.	
3.2	Should provide Packet Forwarding Capacity of 184 Mpps, or more.	
4	**MAC Address and Route Table**	
4.1	Should support up to 32K MAC addresses, or more.	
4.2	Should support 16K IPv4 routes and 4K IPv6 routes, or more.	
5	**Physical Attributes**	
5.1	Switch should be 1U and rack mountable in standard 19" rack.	
5.2	Should support 4GB RAM, 8GB Flash and 4MB Packet buffer or better	
6	**Layer 2 features**	
6.1	Should support Jumbo Frames (up to 9K bytes).	
6.2	Should support 4K Active VLANs, with the following features;	

	Port based VLANs	
	Dual-Mode VLANs	
	MAC-based VLANs	
	Dynamic VLAN Assignment	
	Dynamic MAC-based VLAN Activation	
	Dynamic Voice VLAN Assignment	
	VLAN mapping or VLAN Translation	
6.3	Should support Spanning Tree Protocols, with the following features;	
	802.1D Spanning Tree	
	802.1W Rapid Spanning Tree Protocol (RSTP)	
	802.1s Multiple Spanning Tree	
	802.1s Multiple Spanning Tree enhancement (MSTP+)	
	Fast Port Span, Fast Uplink Span or Equivalent	
	Compatibility with PVST/PVST+, PVRST+ and PVST+ or Equivalent	
	BPDU Guard	
	Root Guard for STP & MSTP	
	Port Loop Detection	
	Spanning Tree path cost method changes	
	MSTP path-cost configuration	
6.4	Should support Link Aggregation Groups (LAG), with the following features;	
	Static LAG	
	802.3ad Link Aggregation Control Protocol (Dynamic LAG)	
	Dynamic insertion and removal of ports	
	Support for LAG between different default port speeds	
6.5	Should support 802.1q Tunneling, with the following features;	
	802.1ad (Q-in-Q) tagging	
	Q-in-Q BPDU tunneling	
	Selective Q-in-Q	
6.6	Should support Private VLANs, with the following features.	
	PVLANs with dual mode support	
	PVLAN with LAG	
6.7	Should support VLAN Registration Protocol, with the following features;	
	Multiple VLAN Registration Protocol (MVRP)	
	MVRP with Per-VLAN STP and Per-VLAN RSTP	
6.8	Should support the following features;	
	Unicast Reverse Path Forwarding (uRPF)	
	Remote Fault Notification (RFN)	
	Link Fault Signaling (LFS)	
	Uni-Directional Link Detection (UDLD) on Tagged and Untagged Ports	
	To limit Unknown Unicast Packet Flooding (UUFB)	
	Virtual Extensible LAN (VXLAN)	
7	**Layer 3 features**	
7.1	Should support the following IPv4 and IPv6 Layer 3 Routing features;	

	Routing Between Directly Connected Subnets	
	Host routes & Virtual Interfaces	
	IPv4 & IPv6 Static Routes	
	RIP v1/v2 & RIPng	
	ECMP	
	OSPF v2, OSPF v3	
	PIM-SM, PIM-SSM, PIM-DM, PIM passive	
	Policy Based Routing (PBR)	
	VRRP v2 & VRRP v3	
	Non-Stop Routing (NSR)	
	GRE IP Tunnels	
	IPv6 over IPv4 tunnels and VRF	
	DHCP Server	
	MSDP	
8	**Quality of Service (QoS) & Traffic Management**	
8.1	Should support the following Quality of Service (QoS) features;	
	ACL Mapping and Marking of ToS/DSCP (CoS)	
	ACL Mapping and Marking of 802.1p	
	ACL Mapping to Priority Queue	
	Classifying and Limiting Flows Based on TCP Flags	
	DiffServ Support	
	Honoring DSCP and 802.1p (CoS)	
	Dynamic Buffer Allocation for QoS Priorities	
	Separate QoS Queuing for Unicast and Multicast	
	Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP	
	Priority for PFC	
8.2	Should support the following Traffic Management features;	
	ACL-based Rate Limiting	
	Traffic Policies	
	Broadcast, Multicast, and Unknown Unicast Rate Limiting	
	Inbound Rate & Outbound Rate Limiting	
	CPU Rate Limiting	
9	**Software Defined Networking (SDN)**	
9.1	Should support the following SDN features and functionality;	
	OpenFlow v1.0 & v1.3	
	Hybrid Switch Mode	
	Hybrid Port Mode	
	Support for Multiple Controllers	
10	**Security**	
10.1	Should support the following Security features;	
	Layer 3 & Layer 4 ACLs	
	Layer 2 ACLs (MAC)	

	DHCP Snooping	
	DHCP Client & Server	
	Dynamic ARP Inspection	
	Neighbor Discovery (ND) Inspection	
	Protection against Denial of Service (DoS) Attacks	
	MAC Port Security	
	RADIUS/TACACS/TACACS+	
	Secure Copy (SCP)	
	Secure Shell (SSHv2)	
	Trusted Platform Module	
	Protected Ports	
	IP Source Guard (v4 & v6)	
	IPv6 RA Guard	
	RADSEC	
10.2	The Switch should support the following Authentication features;	
	Authentication, Authorization, and Accounting (AAA)	
	802.1X Authentication and Accounting	
	MAC Authentication and Accounting	
	Web Authentication	
	802.1x with Dynamic ACL Assignment	
	802.1x with Dynamic VLAN Assignment	
	802.1x and MAC Authentication on the same port	
	802.1x Authentication with IP Source Guard Protection	
	MAC Authentication with IP Source Guard Protection	
	MAC Authentication with Dynamic VLAN Assignment	
	MAC Authentication with Dynamic ACLs	
	MAC Authentication with 802.1x	
	802.1x together with Denial of Service (DoS) Attack Protection	
	Periodic Re-authentication for MAC Authentication	
	Periodic Re-authentication for 802.1x	
11	**Monitoring & Manageability**	
11.1	The Switch should support the following Monitoring & Management features;	
	RSPAN	
	NTP	
	LLDP & LLDP-MED	
	Cisco Discovery Protocol (CDP) for IPv4 and IPv6 Traffic or equivalent	
	Automation with Ansible & RESTCONF	
	DHCP Auto Configuration	
	SNMP v1, v2, and v3	
	Mirroring based on Port, IP ACL, MAC ACL and VLAN	
	Configuration Archive, Replace & Roll back	
	IP DHCP binding scalability of minimum 2K Devices	

11.2	Should support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch management/monitoring.	
11.3	Should support manageability using Network Management Software with Web based Graphical User Interface (GUI) and Cloud based Management Solutions.	
11.4	Should support NetFlow or sFlow or equivalent.	
12	**Mandatory Compliance & Warranty and support:**	
12.1	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	
12.2	The Switch OS should be EAL/NDPP and ROHS6 Certified. Certificate needs to be enclosed along with the bid	
12.3	The Switch must be MTCTE Certified and TEC certificate shall be submitted	
12.4	The Switch should be quoted with Five (5) Years of TAC Support and 5 years Hardware Warranty with advance hardware replacement.	
12.5	Bidder needs to submit bid specific MAF from the OEM.	
12.6	OEM should not share land border with India. OEM needs to share declaration on the letter head for the same	
12.7	OEM should be ISO 9001:2015 certified. Certificate to be enclosed	
12.8	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	
12.9	The switch should have MTBF of >800K Hours at 25° C	

48 Port POE Switch

48Port Gigabit PoE Access Switch		
Sl. No	**Specifications**	**Compliance (Yes/No)**
1	**Product details - Please specify**	
1.1	Please mention Make, Model No. and Part Code.	
2	**Architecture & Port Density**	
2.1	Access Switch should provide 48 x 10/100/1G PoE+ RJ45 Ports and with minimum 740 watts of PoE power budget and 4x 1G/10G/25G SFP+ Slots, for Stacking/Uplinks, from Day 1.	
	Hardware, including modules, or Software, including licenses, to support all the speeds listed above, should be available from Day 1	
2.2	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support aggregated stacking bandwidth of 800Gbps or more and 8 switches per stack or more.	
3	**Performance**	
3.1	Should provide Switch Fabric Bandwidth Capacity of 296 Gbps, or more.	
3.2	Should provide Packet Forwarding Capacity of 220 Mpps, or more.	
4	**MAC Address and Route Table**	
4.1	Should support up to 32K MAC addresses, or more.	
4.2	Should support 16K IPv4 routes and 4K IPv6 routes, or more.	
5	**Physical Attributes**	

5.1	Switch should be 1U and rack mountable in standard 19" rack.	
5.2	Should support 4GB RAM, 8GB Flash and 4MB Packet buffer or better	
6	**Layer 2 features**	
6.1	Should support Jumbo Frames (up to 9K bytes).	
6.2	Should support 4K Active VLANs, with the following features;	
	Port based VLANs	
	Dual-Mode VLANs	
	MAC-based VLANs	
	Dynamic VLAN Assignment	
	Dynamic MAC-based VLAN Activation	
	Dynamic Voice VLAN Assignment	
	VLAN mapping or VLAN Translation	
6.3	Should support Spanning Tree Protocols, with the following features;	
	802.1D Spanning Tree	
	802.1W Rapid Spanning Tree Protocol (RSTP)	
	802.1s Multiple Spanning Tree	
	802.1s Multiple Spanning Tree enhancement (MSTP+)	
	Fast Port Span, Fast Uplink Span or Equivalent	
	Compatibility with PVST/PVST+, PVRST+ and PVST+ or Equivalent	
	BPDU Guard	
	Root Guard for STP & MSTP	
	Port Loop Detection	
	Spanning Tree path cost method changes	
	MSTP path-cost configuration	
6.4	Should support Link Aggregation Groups (LAG), with the following features;	
	Static LAG	
	802.3ad Link Aggregation Control Protocol (Dynamic LAG)	
	Dynamic insertion and removal of ports	
	Support for LAG between different default port speeds	
6.5	Should support 802.1q Tunneling, with the following features;	
	802.1ad (Q-in-Q) tagging	
	Q-in-Q BPDU tunneling	
	Selective Q-in-Q	
6.6	Should support Private VLANs, with the following features.	
	PVLANs with dual mode support	
	PVLAN with LAG	
6.7	Should support VLAN Registration Protocol, with the following features;	
	Multiple VLAN Registration Protocol (MVRP)	
	MVRP with Per-VLAN STP and Per-VLAN RSTP	
6.8	Should support the following features;	
	Unicast Reverse Path Forwarding (uRPF)	
	Remote Fault Notification (RFN)	
	Link Fault Signaling (LFS)	

	Uni-Directional Link Detection (UDLD) on Tagged and Untagged Ports	
	To limit Unknown Unicast Packet Flooding (UUFB)	
	Virtual Extensible LAN (VXLAN)	
7	**Layer 3 features**	
7.1	Should support the following IPv4 and IPv6 Layer 3 Routing features;	
	Routing Between Directly Connected Subnets	
	Host routes & Virtual Interfaces	
	IPv4 & IPv6 Static Routes	
	RIP v1/v2 & RIPng	
	ECMP	
	OSPF v2, OSPF v3	
	PIM-SM, PIM-SSM, PIM-DM, PIM passive	
	Policy Based Routing (PBR)	
	VRRP v2 & VRRP v3	
	Non-Stop Routing (NSR)	
	GRE IP Tunnels	
	IPv6 over IPv4 tunnels and VRF	
	DHCP Server	
	MSDP	
8	**Quality of Service (QoS) & Traffic Management**	
8.1	Should support the following Quality of Service (QoS) features;	
	ACL Mapping and Marking of ToS/DSCP (CoS)	
	ACL Mapping and Marking of 802.1p	
	ACL Mapping to Priority Queue	
	Classifying and Limiting Flows Based on TCP Flags	
	DiffServ Support	
	Honoring DSCP and 802.1p (CoS)	
	Dynamic Buffer Allocation for QoS Priorities	
	Separate QoS Queuing for Unicast and Multicast	
	Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP	
	Priority for PFC	
8.2	Should support the following Traffic Management features;	
	ACL-based Rate Limiting	
	Traffic Policies	
	Broadcast, Multicast, and Unknown Unicast Rate Limiting	
	Inbound Rate & Outbound Rate Limiting	
	CPU Rate Limiting	
9	**Software Defined Networking (SDN)**	
9.1	Should support the following SDN features and functionality;	
	OpenFlow v1.0 & v1.3	
	Hybrid Switch Mode	
	Hybrid Port Mode	

	Support for Multiple Controllers	
10	**<u>Security</u>**	
10.1	Should support the following Security features;	
	Layer 3 & Layer 4 ACLs	
	Layer 2 ACLs (MAC)	
	DHCP Snooping	
	DHCP Client & Server	
	Dynamic ARP Inspection	
	Neighbor Discovery (ND) Inspection	
	Protection against Denial of Service (DoS) Attacks	
	MAC Port Security	
	RADIUS/TACACS/TACACS+	
	Secure Copy (SCP)	
	Secure Shell (SSHv2)	
	Trusted Platform Module	
	Protected Ports	
	IP Source Guard (v4 & v6)	
	IPv6 RA Guard	
	RADSEC	
10.2	The Switch should support the following Authentication features;	
	Authentication, Authorization, and Accounting (AAA)	
	802.1X Authentication and Accounting	
	MAC Authentication and Accounting	
	Web Authentication	
	802.1x with Dynamic ACL Assignment	
	802.1x with Dynamic VLAN Assignment	
	802.1x and MAC Authentication on the same port	
	802.1x Authentication with IP Source Guard Protection	
	MAC Authentication with IP Source Guard Protection	
	MAC Authentication with Dynamic VLAN Assignment	
	MAC Authentication with Dynamic ACLs	
	MAC Authentication with 802.1x	
	802.1x together with Denial of Service (DoS) Attack Protection	
	Periodic Reauthentication for MAC Authentication	
	Periodic Reauthentication for 802.1x	
11	**<u>Monitoring & Manageability</u>**	
11.1	The Switch should support the following Monitoring & Management features;	
	RSPAN	
	NTP	
	LLDP & LLDP-MED	
	Cisco Discovery Protocol (CDP) for IPv4 and IPv6 Traffic or equivalent	
	Automation with Ansible & RESTCONF	
	DHCP Auto Configuration	

	SNMP v1, v2, and v3	
	Mirroring based on Port, IP ACL, MAC ACL and VLAN	
	Configuration Archive, Replace & Roll back	
	IP DHCP binding scalability of minimum 2K Devices	
11.2	Should support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch management/monitoring.	
11.3	Should support manageability using Network Management Software with Web based Graphical User Interface (GUI) and Cloud based Management Solutions.	
11.4	Should support NetFlow or sFlow or equivalent.	
12	**Mandatory Compliance & Warranty and support:**	
12.1	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	
12.2	The Switch OS should be EAL/NDPP and ROHS6 Certified. Certificate needs to be enclosed along with the bid	
12.3	The Switch must be MTCTE Certified and TEC certificate shall be submitted	
12.4	The Switch should be quoted with Five (5) Years of TAC Support and 5 years Hardware Warranty with advance hardware replacement.	
12.5	Bidder needs to submit bid specific MAF from the OEM.	
12.6	OEM should not share land border with India. OEM needs to share declaration on the letter head for the same	
12.7	OEM should be ISO 9001:2015 certified. Certificate to be enclosed	
12.8	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	
12.9	The switch should have MTBF of >800K Hours at 25° C	

24 Port POE Switch

24Port Gigabit PoE Access Switch		
Sl. No	**Specifications**	**Compliance (Yes/No)**
1	**Product details - Please specify**	
1.1	Please mention Make, Model No. and Part Code.	
2	**Architecture & Port Density**	
2.1	Access Switch should provide 24 x 10/100/1G PoE+ RJ45 Ports and with minimum 370 watts of PoE power budget and 4x 1G/10G/25G SFP+ Slots, for Stacking/Uplinks, from Day 1.	
	Hardware, including modules, or Software, including licenses, to support all the speeds listed above, should be available from Day 1	
2.2	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support aggregated stacking bandwidth of 800Gbps or more and 8 switches per stack or more.	
3	**Performance**	
3.1	Should provide Switch Fabric Bandwidth Capacity of 248 Gbps, or more.	
3.2	Should provide Packet Forwarding Capacity of 184 Mpps, or more.	

4	**MAC Address and Route Table**	
4.1	Should support up to 32K MAC addresses, or more.	
4.2	Should support 16K IPv4 routes and 4K IPv6 routes, or more.	
5	**Physical Attributes**	
5.1	Switch should be 1U and rack mountable in standard 19" rack.	
5.2	Should support 4GB RAM, 8GB Flash and 4MB Packet buffer or better	
6	**Layer 2 features**	
6.1	Should support Jumbo Frames (up to 9K bytes).	
6.2	Should support 4K Active VLANs, with the following features;	
	Port based VLANs	
	Dual-Mode VLANs	
	MAC-based VLANs	
	Dynamic VLAN Assignment	
	Dynamic MAC-based VLAN Activation	
	Dynamic Voice VLAN Assignment	
	VLAN mapping or VLAN Translation	
6.3	Should support Spanning Tree Protocols, with the following features;	
	802.1D Spanning Tree	
	802.1W Rapid Spanning Tree Protocol (RSTP)	
	802.1s Multiple Spanning Tree	
	802.1s Multiple Spanning Tree enhancement (MSTP+)	
	Fast Port Span, Fast Uplink Span or Equivalent	
	Compatibility with PVST/PVST+, PVRST+ and PVST+ or Equivalent	
	BPDU Guard	
	Root Guard for STP & MSTP	
	Port Loop Detection	
	Spanning Tree path cost method changes	
	MSTP path-cost configuration	
6.4	Should support Link Aggregation Groups (LAG), with the following features;	
	Static LAG	
	802.3ad Link Aggregation Control Protocol (Dynamic LAG)	
	Dynamic insertion and removal of ports	
	Support for LAG between different default port speeds	
6.5	Should support 802.1q Tunneling, with the following features;	
	802.1ad (Q-in-Q) tagging	
	Q-in-Q BPDU tunneling	
	Selective Q-in-Q	
6.6	Should support Private VLANs, with the following features.	
	PVLANs with dual mode support	
	PVLAN with LAG	
6.7	Should support VLAN Registration Protocol, with the following features;	
	Multiple VLAN Registration Protocol (MVRP)	
	MVRP with Per-VLAN STP and Per-VLAN RSTP	

6.8	Should support the following features;	
	Unicast Reverse Path Forwarding (uRPF)	
	Remote Fault Notification (RFN)	
	Link Fault Signaling (LFS)	
	Uni-Directional Link Detection (UDLD) on Tagged and Untagged Ports	
	To limit Unknown Unicast Packet Flooding (UUFB)	
	Virtual Extensible LAN (VXLAN)	
7	**Layer 3 features**	
7.1	Should support the following IPv4 and IPv6 Layer 3 Routing features;	
	Routing Between Directly Connected Subnets	
	Host routes & Virtual Interfaces	
	IPv4 & IPv6 Static Routes	
	RIP v1/v2 & RIPng	
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	OSPF v2, OSPF v3	
	PIM-SM, PIM-SSM, PIM-DM, PIM passive	
	Policy Based Routing (PBR)	
	VRRP v2 & VRRP v3	
	Non-Stop Routing (NSR)	
	GRE IP Tunnels	
	IPv6 over IPv4 tunnels and VRF	
	DHCP Server	
	MSDP	
8	**Quality of Service (QoS) & Traffic Management**	
8.1	Should support the following Quality of Service (QoS) features;	
	ACL Mapping and Marking of ToS/DSCP (CoS)	
	ACL Mapping and Marking of 802.1p	
	ACL Mapping to Priority Queue	
	Classifying and Limiting Flows Based on TCP Flags	
	DiffServ Support	
	Honoring DSCP and 802.1p (CoS)	
	Dynamic Buffer Allocation for QoS Priorities	
	Separate QoS Queuing for Unicast and Multicast	
	Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP	
	Priority for PFC	
8.2	Should support the following Traffic Management features;	
	ACL-based Rate Limiting	
	Traffic Policies	
	Broadcast, Multicast, and Unknown Unicast Rate Limiting	
	Inbound Rate & Outbound Rate Limiting	
	CPU Rate Limiting	
9	**Software Defined Networking (SDN)**	

9.1	Should support the following SDN features and functionality;	
	OpenFlow v1.0 & v1.3	
	Hybrid Switch Mode	
	Hybrid Port Mode	
	Support for Multiple Controllers	
10	**<u>Security</u>**	
10.1	Should support the following Security features;	
	Layer 3 & Layer 4 ACLs	
	Layer 2 ACLs (MAC)	
	DHCP Snooping	
	DHCP Client & Server	
	Dynamic ARP Inspection	
	Neighbor Discovery (ND) Inspection	
	Protection against Denial of Service (DoS) Attacks	
	MAC Port Security	
	RADIUS/TACACS/TACACS+	
	Secure Copy (SCP)	
	Secure Shell (SSHv2)	
	Trusted Platform Module	
	Protected Ports	
	IP Source Guard (v4 & v6)	
	IPv6 RA Guard	
	RADSEC	
10.2	The Switch should support the following Authentication features;	
	Authentication, Authorization, and Accounting (AAA)	
	802.1X Authentication and Accounting	
	MAC Authentication and Accounting	
	Web Authentication	
	802.1x with Dynamic ACL Assignment	
	802.1x with Dynamic VLAN Assignment	
	802.1x and MAC Authentication on the same port	
	802.1x Authentication with IP Source Guard Protection	
	MAC Authentication with IP Source Guard Protection	
	MAC Authentication with Dynamic VLAN Assignment	
	MAC Authentication with Dynamic ACLs	
	MAC Authentication with 802.1x	
	802.1x together with Denial of Service (DoS) Attack Protection	
	Periodic Reauthentication for MAC Authentication	
	Periodic Reauthentication for 802.1x	
11	**Monitoring & Manageability**	
11.1	The Switch should support the following Monitoring & Management features;	
	RSPAN	
	NTP	

	LLDP & LLDP-MED	
	Cisco Discovery Protocol (CDP) for IPv4 and IPv6 Traffic or equivalent	
	Automation with Ansible & RESTCONF	
	DHCP Auto Configuration	
	SNMP v1, v2, and v3	
	Mirroring based on Port, IP ACL, MAC ACL and VLAN	
	Configuration Archive, Replace & Roll back	
	IP DHCP binding scalability of minimum 2K Devices	
11.2	Should support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch management/monitoring.	
11.3	Should support manageability using Network Management Software with Web based Graphical User Interface (GUI) and Cloud based Management Solutions.	
11.4	Should support NetFlow or sFlow or equivalent.	
12	**Mandatory Compliance & Warranty and support:**	
12.1	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support aggregated stacking bandwidth of 800Gbps or more and 8 switches per stack or more.	
12.2	The Switch OS should be EAL/NDPP and ROHS6 Certified. Certificate needs to be enclosed along with the bid	
12.3	The Switch must be MTCTE Certified and TEC certificate shall be submitted	
12.4	The Switch should be quoted with Five (5) Years of TAC Support and 5 years Hardware Warranty with advance hardware replacement.	
12.5	Bidder needs to submit bid specific MAF from the OEM.	
12.6	OEM should not share land border with India. OEM needs to share declaration on the letter head for the same	
12.7	OEM should be ISO 9001:2015 certified. Certificate to be enclosed	
12.8	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	
12.9	The switch should have MTBF of >800K Hours at 25° C	

24Port Multigigabit PoE Access Switch

24Port Multigigabit PoE Access Switch		
Sl. No	**Specifications**	**Compliance (Yes/No)**
1	**Product details - Please specify**	
1.1	Please mention Make, Model No. and Part Code.	
2	**Architecture & Port Density**	
2.1	Access Switch should provide 24 x 10/100/1G/2.5Gbps PoE+ RJ45 Ports and with minimum 740 watts of PoE power budget and 4x 1G/10G/25G SFP+ Slots, for Stacking/Uplinks, from Day 1.	
	Hardware, including modules, or Software, including licenses, to support all the speeds listed above, should be available from Day 1	

2.2	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support aggregated stacking bandwidth of 800Gbps or more and 8 switches per stack or more.	
3	**Performance**	
3.1	Should provide Switch Fabric Bandwidth Capacity of 320 Gbps, or more.	
3.2	Should provide Packet Forwarding Capacity of 237 Mpps, or more.	
4	**MAC Address and Route Table**	
4.1	Should support up to 32K MAC addresses, or more.	
4.2	Should support 16K IPv4 routes and 4K IPv6 routes, or more.	
5	**Physical Attributes**	
5.1	Switch should be 1U and rack mountable in standard 19" rack.	
5.2	Should support 4GB RAM, 8GB Flash and 4MB Packet buffer or better	
6	**Layer 2 features**	
6.1	Should support Jumbo Frames (up to 9K bytes).	
6.2	Should support 4K Active VLANs, with the following features;	
	Port based VLANs	
	Dual-Mode VLANs	
	MAC-based VLANs	
	Dynamic VLAN Assignment	
	Dynamic MAC-based VLAN Activation	
	Dynamic Voice VLAN Assignment	
	VLAN mapping or VLAN Translation	
6.3	Should support Spanning Tree Protocols, with the following features;	
	802.1D Spanning Tree	
	802.1W Rapid Spanning Tree Protocol (RSTP)	
	802.1s Multiple Spanning Tree	
	802.1s Multiple Spanning Tree enhancement (MSTP+)	
	Fast Port Span, Fast Uplink Span or Equivalent	
	Compatibility with PVST/PVST+, PVRST+ and PVST+ or Equivalent	
	BPDU Guard	
	Root Guard for STP & MSTP	
	Port Loop Detection	
	Spanning Tree path cost method changes	
	MSTP path-cost configuration	
6.4	Should support Link Aggregation Groups (LAG), with the following features;	
	Static LAG	
	802.3ad Link Aggregation Control Protocol (Dynamic LAG)	
	Dynamic insertion and removal of ports	
	Support for LAG between different default port speeds	
6.5	Should support 802.1q Tunneling, with the following features;	
	802.1ad (Q-in-Q) tagging	
	Q-in-Q BPDU tunneling	

	Selective Q-in-Q	
6.6	Should support Private VLANs, with the following features.	
	PVLANs with dual mode support	
	PVLAN with LAG	
6.7	Should support VLAN Registration Protocol, with the following features;	
	Multiple VLAN Registration Protocol (MVRP)	
	MVRP with Per-VLAN STP and Per-VLAN RSTP	
6.8	Should support the following features;	
	Unicast Reverse Path Forwarding (uRPF)	
	Remote Fault Notification (RFN)	
	Link Fault Signaling (LFS)	
	Uni-Directional Link Detection (UDLD) on Tagged and Untagged Ports	
	To limit Unknown Unicast Packet Flooding (UUFB)	
	Virtual Extensible LAN (VXLAN)	
7	**Layer 3 features**	
7.1	Should support the following IPv4 and IPv6 Layer 3 Routing features;	
	Routing Between Directly Connected Subnets	
	Host routes & Virtual Interfaces	
	IPv4 & IPv6 Static Routes	
	RIP v1/v2 & RIPng	
	ECMP	
	OSPF v2, OSPF v3	
	PIM-SM, PIM-SSM, PIM-DM, PIM passive	
	Policy Based Routing (PBR)	
	VRRP v2 & VRRP v3	
	Non-Stop Routing (NSR)	
	GRE IP Tunnels	
	IPv6 over IPv4 tunnels and VRF	
	DHCP Server	
	MSDP	
8	**Quality of Service (QoS) & Traffic Management**	
8.1	Should support the following Quality of Service (QoS) features;	
	ACL Mapping and Marking of ToS/DSCP (CoS)	
	ACL Mapping and Marking of 802.1p	
	ACL Mapping to Priority Queue	
	Classifying and Limiting Flows Based on TCP Flags	
	DiffServ Support	
	Honoring DSCP and 802.1p (CoS)	
	Dynamic Buffer Allocation for QoS Priorities	
	Separate QoS Queuing for Unicast and Multicast	
	Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP	
	Priority for PFC	

8.2	Should support the following Traffic Management features;	
	ACL-based Rate Limiting	
	Traffic Policies	
	Broadcast, Multicast, and Unknown Unicast Rate Limiting	
	Inbound Rate & Outbound Rate Limiting	
	CPU Rate Limiting	
9	**Software Defined Networking (SDN)**	
9.1	Should support the following SDN features and functionality;	
	OpenFlow v1.0 & v1.3	
	Hybrid Switch Mode	
	Hybrid Port Mode	
	Support for Multiple Controllers	
10	**Security**	
10.1	Should support the following Security features;	
	Layer 3 & Layer 4 ACLs	
	Layer 2 ACLs (MAC)	
	DHCP Snooping	
	DHCP Client & Server	
	Dynamic ARP Inspection	
	Neighbor Discovery (ND) Inspection	
	Protection against Denial of Service (DoS) Attacks	
	MAC Port Security	
	RADIUS/TACACS/TACACS+	
	Secure Copy (SCP)	
	Secure Shell (SSHv2)	
	Trusted Platform Module	
	Protected Ports	
	IP Source Guard (v4 & v6)	
	IPv6 RA Guard	
	RADSEC	
10.2	The Switch should support the following Authentication features;	
	Authentication, Authorization, and Accounting (AAA)	
	802.1X Authentication and Accounting	
	MAC Authentication and Accounting	
	Web Authentication	
	802.1x with Dynamic ACL Assignment	
	802.1x with Dynamic VLAN Assignment	
	802.1x and MAC Authentication on the same port	
	802.1x Authentication with IP Source Guard Protection	
	MAC Authentication with IP Source Guard Protection	
	MAC Authentication with Dynamic VLAN Assignment	
	MAC Authentication with Dynamic ACLs	
	MAC Authentication with 802.1x	

	802.1x together with Denial of Service (DoS) Attack Protection	
	Periodic Reauthentication for MAC Authentication	
	Periodic Reauthentication for 802.1x	
11	**Monitoring & Manageability**	
11.1	The Switch should support the following Monitoring & Management features;	
	RSPAN	
	NTP	
	LLDP & LLDP-MED	
	Cisco Discovery Protocol (CDP) for IPv4 and IPv6 Traffic or equivalent	
	Automation with Ansible & RESTCONF	
	DHCP Auto Configuration	
	SNMP v1, v2, and v3	
	Mirroring based on Port, IP ACL, MAC ACL and VLAN	
	Configuration Archive, Replace & Roll back	
	IP DHCP binding scalability of minimum 2K Devices	
11.2	Should support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch management/monitoring.	
11.3	Should support manageability using Network Management Software with Web based Graphical User Interface (GUI) and Cloud based Management Solutions.	
11.4	Should support NetFlow or sFlow or equivalent.	
12	**Mandatory Compliance & Warranty and support:**	
12.1	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	
12.2	The Switch OS should be EAL/NDPP and ROHS6 Certified. Certificate needs to be enclosed along with the bid	
12.3	The Switch must be MTCTE Certified and TEC certificate shall be submitted	
12.4	The Switch should be quoted with Five (5) Years of TAC Support and 5 years Hardware Warranty with advance hardware replacement.	
12.5	Bidder needs to submit bid specific MAF from the OEM.	
12.6	OEM should not share land border with India. OEM needs to share declaration on the letter head for the same	
12.7	OEM should be ISO 9001:2015 certified. Certificate to be enclosed	
12.8	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	
12.9	The switch should have MTBF of >500K Hours at 25° C	

8 Port Multigigabit PoE Access Switch

8Port Multigigabit PoE Access Switch		
Sl. No	**Specifications**	**Compliance (Yes/No)**
1	**Product details - Please specify**	
1.1	Please mention Make, Model No. and Part Code.	
2	**Architecture & Port Density**	

2.1	Access Switch should provide 4 x 100/1G/2.5Gbps PoE+ RJ45 Ports, 4 x 100/1/2.5/5/10Gbps and 2 x 1/10/25Gbps SFP28 ports for for Stacking/Uplinks. Switch should have minimum 240 watts of PoE power budget from Day 1.	
	Hardware, including modules, or Software, including licenses, to support all the speeds listed above, should be available from Day 1	
2.2	Should support Virtual Switching System (VSS) or Virtual Chassis (VC) or Virtual Switching Extension (VSX) or equivalent Switch Clustering/Stacking feature, where the Switch Clustering feature should combine multiple switches into a single network element. Switch should support stacking of 8 switches per stack or more.	
3	**Performance**	
3.1	Should provide Switch Fabric Bandwidth Capacity of 200 Gbps, or more.	
3.2	Should provide Packet Forwarding Capacity of 148 Mpps, or more.	
4	**MAC Address and Route Table**	
4.1	Should support up to 32K MAC addresses, or more.	
4.2	Should support 16K IPv4 routes and 4K IPv6 routes, or more.	
5	**Physical Attributes**	
5.1	Switch should be 1U and rack mountable in standard 19" rack.	
5.2	Should support 4GB RAM, 8GB Flash and 4MB Packet buffer or better	
6	**Layer 2 features**	
6.1	Should support Jumbo Frames (up to 9K bytes).	
6.2	Should support 4K Active VLANs, with the following features;	
	Port based VLANs	
	Dual-Mode VLANs	
	MAC-based VLANs	
	Dynamic VLAN Assignment	
	Dynamic MAC-based VLAN Activation	
	Dynamic Voice VLAN Assignment	
	VLAN mapping or VLAN Translation	
6.3	Should support Spanning Tree Protocols, with the following features;	
	802.1D Spanning Tree	
	802.1W Rapid Spanning Tree Protocol (RSTP)	
	802.1s Multiple Spanning Tree	
	802.1s Multiple Spanning Tree enhancement (MSTP+)	
	Fast Port Span, Fast Uplink Span or Equivalent	
	Compatibility with PVST/PVST+, PVRST+ and PVST+ or Equivalent	
	BPDU Guard	
	Root Guard for STP & MSTP	
	Port Loop Detection	
	Spanning Tree path cost method changes	
	MSTP path-cost configuration	
6.4	Should support Link Aggregation Groups (LAG), with the following features;	
	Static LAG	
	802.3ad Link Aggregation Control Protocol (Dynamic LAG)	
	Dynamic insertion and removal of ports	

	Support for LAG between different default port speeds	
6.5	Should support 802.1q Tunneling, with the following features;	
	802.1ad (Q-in-Q) tagging	
	Q-in-Q BPDU tunneling	
	Selective Q-in-Q	
6.6	Should support Private VLANs, with the following features.	
	PVLANs with dual mode support	
	PVLAN with LAG	
6.7	Should support VLAN Registration Protocol, with the following features;	
	Multiple VLAN Registration Protocol (MVRP)	
	MVRP with Per-VLAN STP and Per-VLAN RSTP	
6.8	Should support the following features;	
	Unicast Reverse Path Forwarding (uRPF)	
	Remote Fault Notification (RFN)	
	Link Fault Signaling (LFS)	
	Uni-Directional Link Detection (UDLD) on Tagged and Untagged Ports	
	To limit Unknown Unicast Packet Flooding (UUFB)	
	Virtual Extensible LAN (VXLAN)	
7	**Layer 3 features**	
7.1	Should support the following IPv4 and IPv6 Layer 3 Routing features;	
	Routing Between Directly Connected Subnets	
	Host routes & Virtual Interfaces	
	IPv4 & IPv6 Static Routes	
	RIP v1/v2 & RIPng	
	ECMP	
	OSPF v2, OSPF v3	
	PIM-SM, PIM-SSM, PIM-DM, PIM passive	
	Policy Based Routing (PBR)	
	VRRP v2 & VRRP v3	
	Non-Stop Routing (NSR)	
	GRE IP Tunnels	
	IPv6 over IPv4 tunnels and VRF	
	DHCP Server	
	MSDP	
8	**Quality of Service (QoS) & Traffic Management**	
8.1	Should support the following Quality of Service (QoS) features;	
	ACL Mapping and Marking of ToS/DSCP (CoS)	
	ACL Mapping and Marking of 802.1p	
	ACL Mapping to Priority Queue	
	Classifying and Limiting Flows Based on TCP Flags	
	DiffServ Support	
	Honoring DSCP and 802.1p (CoS)	
	Dynamic Buffer Allocation for QoS Priorities	

	Separate QoS Queuing for Unicast and Multicast	
	Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP	
	Priority for PFC	
8.2	Should support the following Traffic Management features;	
	ACL-based Rate Limiting	
	Traffic Policies	
	Broadcast, Multicast, and Unknown Unicast Rate Limiting	
	Inbound Rate & Outbound Rate Limiting	
	CPU Rate Limiting	
9	**Software Defined Networking (SDN)**	
9.1	Should support the following SDN features and functionality;	
	OpenFlow v1.0 & v1.3	
	Hybrid Switch Mode	
	Hybrid Port Mode	
	Support for Multiple Controllers	
10	**Security**	
10.1	Should support the following Security features;	
	Layer 3 & Layer 4 ACLs	
	Layer 2 ACLs (MAC)	
	DHCP Snooping	
	DHCP Client & Server	
	Dynamic ARP Inspection	
	Neighbor Discovery (ND) Inspection	
	Protection against Denial of Service (DoS) Attacks	
	MAC Port Security	
	RADIUS/TACACS/TACACS+	
	Secure Copy (SCP)	
	Secure Shell (SSHv2)	
	Trusted Platform Module	
	Protected Ports	
	IP Source Guard (v4 & v6)	
	IPv6 RA Guard	
	RADSEC	
10.2	The Switch should support the following Authentication features;	
	Authentication, Authorization, and Accounting (AAA)	
	802.1X Authentication and Accounting	
	MAC Authentication and Accounting	
	Web Authentication	
	802.1x with Dynamic ACL Assignment	
	802.1x with Dynamic VLAN Assignment	
	802.1x and MAC Authentication on the same port	
	802.1x Authentication with IP Source Guard Protection	

	MAC Authentication with IP Source Guard Protection	
	MAC Authentication with Dynamic VLAN Assignment	
	MAC Authentication with Dynamic ACLs	
	MAC Authentication with 802.1x	
	802.1x together with Denial of Service (DoS) Attack Protection	
	Periodic Reauthentication for MAC Authentication	
	Periodic Reauthentication for 802.1x	
10.3	The Switch should support Cisco ISE/Aruba ClearPass/other Authentication solutions	
11	**Monitoring & Manageability**	
11.1	The Switch should support the following Monitoring & Management features;	
	RSPAN	
	NTP	
	LLDP & LLDP-MED	
	Cisco Discovery Protocol (CDP) for IPv4 and IPv6 Traffic or equivalent	
	Automation with Ansible & RESTCONF	
	DHCP Auto Configuration	
	SNMP v1, v2, and v3	
	Mirroring based on Port, IP ACL, MAC ACL and VLAN	
	Configuration Archive, Replace & Roll back	
	IP DHCP binding scalability of minimum 2K Devices	
11.2	Should support Integrated Standard based Command Line Interface (CLI), Telnet, TFTP, HTTP access to switch management/monitoring.	
11.3	Should support manageability using Network Management Software with Web based Graphical User Interface (GUI) and Cloud based Management Solutions.	
11.4	Should support NetFlow or sFlow or equivalent.	
12	**Mandatory Compliance & Warranty and support:**	
12.1	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	
12.2	The Switch OS should be EAL/NDPP and ROHS6 Certified. Certificate needs to be enclosed along with the bid	
12.3	The Switch must be MTCTE Certified and TEC certificate shall be submitted	
12.4	The Switch should be quoted with Five (5) Years of TAC Support and 5 years Hardware Warranty with advance hardware replacement.	
12.5	Bidder needs to submit bid specific MAF from the OEM.	
12.6	OEM should not share land border with India. OEM needs to share declaration on the letter head for the same	
12.7	OEM should be ISO 9001:2015 certified. Certificate to be enclosed	
12.8	OEM should have 7-8 RMA depots in India for faster replacements . Details to be shared on the OEM letter head.	
12.9	The switch should have MTBF of >500K Hours at 25° C	

Fiber SFP Module

10G SFP+ SR Optics (300 Meters)

SN	Specifications	Compliance (Yes/No)
1	SFP should support Multi-Mode Fiber 850nm.	
2	SFP should support OM3 Multi-Mode Fiber Cable	
3	SFP should be 802.3ae compliant and shall support a distanc up to 300 Meters	
4	SFP should have LC Connector	
5	SFP should be protocol independent & Hot-Swappable	
6	SFP should be MSA, ROHS 5 & 6 Compliant	
7	SFP should support Digital Optical Monitoring	
8	SFP should support operating temperature from (0^0 C to 70^0C)	

10G SFP+ LR Optics (10 KM)		
SN	**Specifications**	**Compliance (Yes/No)**
1	SFP should support Single-Mode Fiber 1310nm.	
2	SFP should support Single-Mode Fiber Cable	
3	SFP should be 802.3ae compliant and shall support a distanc up to 10 Kilometers	
4	SFP should have LC Connector	
5	SFP should be protocol independent & Hot-Swappable	
6	SFP should be MSA, ROHS 5 & 6 Compliant	
7	SFP should support Digital Optical Monitoring	
8	SFP should support operating temperature from (0^0 C to 70^0C)	

Wireless Controller

Wireless Controller		
S. No	**Specification**	**Compliance (Yes/No)**
1	Wireless Controller should be tested for EAL 2/NDPP or above under Common Criteria Certification . Certificate must be submitted.	
2	Wireless Controller should be MTCTE (Mandatory Testing & Certification Of Telecommunication Equipment) Certified and Certificate issued by TEC (Telecommunication Engineering Center), Department of Telecommunications must be submitted.	
3	Wireless Controller should be quoted with 05 years of TAC Support & 5 years Hardware Warranty with advance hardware replacement	
4	Wireless Controller should support operating temperature from 0^0 to 40^0 degree celsius.	
5	Wireless Controller should have minimum of 4 x 1Gigabit Ethernet & 4 x 10Gigabit Ports or more. 4x10G Multimode SFP+ transceivers to be supplied with the controller	

6	Wireless Controller should support 1+1 Internal Redundant Power Supply.	
7	Controller should be able to manage the required number of APs on a single appliance from day one and should be scalable up to 2000 AP on single appliance and 6000 AP in a clustered configuration.Cloud Based solution will not be accepted. The controller or the solution should be able to monitor and manage the required number of switches.	
8	Support for N:1 redundancy for controller. In case primary controller goes down all features should be supported by redundant controller. Software/ Cloud Based Controller Solution will not be accepted.	
9	Each Controller or its cluster should have capacity to handle 40,000 or more Concurrent devices.	
10	Redundancy Features: WLC must support Active: Active with N+1 redundancy.	
11	Controller should support minimum 2000 WLAN's.	
12	The proposed WLAN solution must support a distributed forwarding/local breakout architecture in which only client authentication is tunneled to the centralized controller; all client data traffic is forwarded directly on towards its destination via the clients default gateway. Further: a.Specify any loss of functionality, caveats or loss of capacity/performance is exhibited by the solution in this distributed forwarding mode. b.On a per WLAN (SSID) basis there must be an option to tunnel traffic to the controller either unencrypted or encrypted format	
13	Controller should provide air-time fairness between the different speed clients – slower clients should not be starved by the faster clients and faster clients should not adversely affected by slower clients.	
14	Controller should have the Ability to map SSID to VLAN and dynamic VLAN support for same SSID.	
15	Controller should support automatic channel selection for interference avoidance.	
16	Controller should support external Captive Portal Integration - Web-services based API for external web-portals to integrate with the controller	
17	Controller should have the capability to limit/prevent clients from using static IP addresses thereby enhancing network efficiency and preventing network conflicts.	
18	The controller or WLAN solution should support client troubleshooting feature that allows an administrator to focus on a specific client device and its connectivity status. The tool should track the step-by-step progress of the client's connection, through 802.11 stages, RADIUS, EAP authentication, captive portal redirects, encryption key setup, DHCP, roaming, and more (depending on WLAN type).	
19	For troubleshooting purpose the administrator of the controller must have the ability to remotely capture 802.11 and/or 802.3 frames from an access point without disrupting client access.	

20	In order to have good visibility on the utilization of an AP, the controller or proposed solution should be able to provide the following statistics for each AP: a. List of all the SSIDs deployed on each of the radio of the AP. b. Number of client devices associated on each radio c. Average client RSSI. d.Data sent/received e. Air Time utilization (%RX, %TX, %Busy) f. Statistics on retransmitted packets g. Graphical collation of various trend and troubleshooting data such as estimated channel capacity, current channel utilization, number of associated clients, RF pollution, other APs detected	
21	The controller or proposed solution should support Role-based Access Controls that can provide policy controls on a single SSID such as: a.Time of day access b.VLAN assignment c.Per device rate limiting d.Deny/Allow specified device OS types	
22	The controller should support in built spectrum analysis feature.	
23	The controller should support the ability to create different zones in which AP can be grouped logically or physically based on location for example different buildings of a campus can be configured as different zones so that each zone will have different configuration and policies.	
24	The controller should support Hotspot 2.0 (pass point).	
25	Access points can discover controllers on the same L2 domain without requiring any configuration on the access point.	
26	Access points can discover controllers across Layer-3 network through DHCP or DNS option	
27	WIRELESS SECURITY & Authentication: Open, 802.1x/EAP, PSK, WISPr, WPA, WPA2-AES. Fast EAP-SIM re-authentication. EAP-SIM, EAP-AKA, EAP-AKA over WLAN for 802.1X Wi-Fi. It should also support WPA3 and Enhanced Open	
28	**To aid to physically locating rogue devices in conjunction with scanning at the APs the controller should be able to list/classify detected Rogue Devices. Further:** a) The information presented must include information about the detecting AP(s) and the rogues signal strength relative to them. It should display rogues on a map b)The controller should be able to send a filtered notification to the administrator when a rogue device has been detected c)Neighbouring APs should be capable of de-authenticating clients from a malicious rogue device i.e. one which is spoofing the BSSID or SSID of a genuine managed AP. d) The controller or proposed solution should support rogue classification policy. The policy should support rules for AdHoc Networks, Clear to Send (CTS) Abuse, De-Authentication Flood, Disassociation Flood, Request to Send (RTS) Abuse, Excessive Power, MAC (BSSID) Spoofing, Same Network, NULL SSID and SSID Spoofing.	

	e)The WLAN or proposed solution should support Known, Ignore, Malicious and Rogue as part of WIPS classification types.	
29	WLC Should support L2 Client Isolation so User cannot access each other's devices. Isolation should have option to apply on AP or SSID's.	
30	Support for Walled Garden "Walled Garden" functionality to allow restricted access to select destinations by unauthorized wireless users.	
31	The proposed architecture should be based on controller-based Architecture with thick AP deployment. While Encryption / decryption of 802.11 packets should be able to perform at the AP.	
32	The controller should provide a captive portal to authenticate Guest users that are not part of the organization via a Guest pass key. Further the solution must provide:	
	a. Provide a web-based application that allows non-technical staff to create Guest passes that are valid for a time limited duration	
	b. Allow the IT Administrator to view and delete individual Guest passes	
	c. Allow for batch generation of Guest passes	
	d. Provide customizable Guest portal and guest pass instructions.	
33	The controller or overall solution must also support Self registration of Guests.	
34	The controller must be capable of identifying device host OS type and the host name. Further the solution must be able to utilise the host OS information to provide per WLAN policy based access such as allow/deny access, rate limit and assign to VLAN	
35	When Wireless Mesh is enabled, the controller should be able to show the mesh topology on floor plans in a graphical format.	
36	The Wireless Mesh should support self-healing whereby if Root AP goes down then the Mesh AP should be able to automatically find and connect to another Root AP	
37	WLC should be able to present a customizable dashboard with information on the status of the WLAN network.	
38	The WLAN solution should support import of floor plans for indoor AP.	
39	WLC should be able to raise critical alarms by sending an email. The email client on the controller should support SMTP outbound authentication and TLS encryption.	
40	The controller or its integrated solution must support APIs for easier management and integration with existing network management devices. Provide the list of APIs supported.	
41	WLC or integrated solution should provide customized reporting of historical WLAN information.	

42	Controller should support Filtering of Alarms and event Log based on APs, SSID or Zones	
43	Controller should support Syslog support towards external syslog server	
44	Controller should support per SSID or dynamic Per user bandwidth Rate Limiting	
45	Controller should support Self-healing (on detection of RF interference or loss of RF coverage) and vendor should provide their Interference mitigation techniques.	
46	System must support Band Steering where 5 Ghz clients are forced to connect over 5Ghz Radio to provide better load balancing among 2.4Ghz and 5Ghz Radios.	
47	WLC shall support Quality of Service features like 802.11e based QoS enhancements, WMM or equivalent and U-APSD to provide best performance on Video applications.	
48	The controller should provide Application recognition to allow the administrator to gain insight on the applications in use and the bandwidth they consume per system and per user.	
49	The Controller or WLAN solution should support Wired network (Network Switch) & Wireless Access Point (Indoor & Outdoor) management from single management interface.	
50	The Controller or WLAN solution should support switch registration and authentication	
51	The Controller or WLAN solution should support Switch inventory (model, FW version, last backup, etc)	
52	The Controller or WLAN solution should support Health and performance monitoring (status, traffic stats, errors, clients etc) with alarms	
53	The Controller or WLAN solution should support switch Firmware Upgrade	
54	The Controller or WLAN solution should support Switch configuration file backup and restore	
55	The Controller or WLAN solution should support Client troubleshooting - search by Client MAC to find the AP/switch port for that client	
56	Bidder needs to submit bid specific MAF from the OEM.	
57	OEM End-of-sale declaration shall not have been released for the quoted model at the time of the bid submission.	
58	Wireless Controller shall conform to TEC EMI EMC Standard EN/IEC 60950-1, EN 55022, EN 61000-3-2, EN61000-3-3. TEC certificate shall be submitted	
59	Wireless Controller should be capable to integrate with Cloud Based Network Analystics Engine to provide Wireless Performance Insights, KPIs and what are the applications (Top N apps) that are consuming the most network bandwidth, monitors application traffic arriving from users (Top N talkers)	

60	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support	

Indoor WiFi Access Point

WiFi6 Indoor WiFi Access Point		
S. No	**Specification**	**Compliance (Yes/No)**
	General Features	
1	Access Point should be tested for EAL 2/NDPP or above under Common Criteria Certification or Certificate issued by Indian Common Criteria Certification Scheme (IC3S) Certificate must be submitted.	
2	Access Point should be MTCTE (Mandatory Testing & Certification Of Telecommunication Equipment) Certified and Certificate issued by TEC (Telecommunication Engineering Center), Department of Telecommunications must be submitted.	
3	Access Point should have been approved by Wireless Planning Commission (TRAI, Govt. of India), ETA Certificate must be submitted.	
4	Access Point must be Wi-Fi Alliance Cetified to ensure the interoperatibility with othe make client deivces.	
5	Access Point should be quoted with 05 years of TAC Support & 5 years for Hardware Warranty .	
6	Access Point should support operating temperature from 0^0 to 50^0 degree celsius.	
	Radio Specifications	
7	Access Point should be dual-band, dual-radio indoor access point which should support six spatial streams 4x4:4 SU/MU-MIMO on 5GHz and 2x2:2 SU/MU-MIMO on 2.4GHz.	
8	Access Point should support IEEE 802.11 a/b/g/n/ac/ax standards.	
9	Access Point should support total data rates of 2974 Mbps (5Ghz: 2400Mbps & 2.4Ghz: 574 Mbps)	
10	Access Point should support Channelization at 20 Mhz, 40Mhz, 80 Mhz, 160/ 80+80Mhz	
11	Access Point should provide 26dBm transmit power on both radios as per TRAI-WPC Regulatory Norms. Access Point should have -96dBm or lower receive sensitivity.	
12	Access Point should have adaptive antenna technology for performance optimization and interference mitigiation features. Access Point should provide better coverage and performance utlizing multi-directional antenna patterns and polarization with maximal ratio combining.	

13	Access Point should direct the radio signals per-device on a packet-by-packet in real time to support high deivce density environments. Antenna should operate without the need for device feedback to support devices using legacy standards.	
	Interface & Power Requirements	
14	Access Point PoE port should have 1 x 2.5Gbps PoE+ and 1 x 1Gbps Ethernet Port and 1 x USB Port	
	Networking Requirements	
15	Access Point should have capacity to handle minimum 500 concurrent devices.	
16	Access Point should support minimum 30 SSID or more.	
17	Access Point should have built-in/ external support for BLE and Zigbee for IoT integration	
18	Access Point should have built-in diagnostics tools such as Spectrum Analyzer to analyse the RF Channel for Interference & Client speed test etc.	
19	Access Point should support Airtime Fairness, Client Load Balancing, Airtime Based WLAN Prioritization.	
20	Access Point should be flexible harwdare to be deployed as Standalone, Controller less (Cluster), Controller Based (Hardware or Software), Cloud Based Controller without changing the Hardware.	
21	Access Point should support Dual Stack (IPv4 & IPv6), IEEE 802.1Q, Band Balancing, QoS, Layer 2/3 & 4 Access Control List.	
22	Access Point should be able to act as WIPS Sensor, Location Analytics Engine & Network Analytics Engine.	
23	Access Point should support Flexconnect or Site-Survivability, in case the controller goes down the Access Point must be able to handle the client traffic without any disruption.	
	Security & Monitoring	
24	Access Point should support AES Encrypted GRE Based Tunnel for Data Forwarding.	
25	Access Point should support auth/encryption methods for WLAN configuration: WPA-2 AES, PSK, WPA3, WPA2/WPA3 Mix, OWE. It should support Role Based Access Control, Rate-Limiting, Device Fingerprinting and 802.11r Fast Roaming.	
26	Access Point should support WMM Power Save, Tx Beamforming, LDPC, STBC, 802.11r/k/v, Hotspot 2.0, Captive Portal and WISPr.	
	Management Features	
27	Access Point should have administration access trhough HTTPS GUI, SSH & CLI. It should provide WLAN Configuration for standalone operation and provisioning tools for controller/ cloud operations.	

	If controller dis-allows GUI/CLI access it should follow the same policy/ rule.	
28	Access Point should have recovery SSID for easy access to Console (CLI) when the AP is unreachable through network.	
	Certification	
29	Access Point shall conform to UL-2043 Plenum, EN 62311 Human Safety/ RF Exposure, WEEE & ROHS Standard.	
30	Access Point shall conform to TEC EMI EMC Standard EN/IEC 61000-4-2, EN61000-4-3, EN61000-4-5.	
31	All Switches, Optical Transceivers, Wireless Controller and Wireless Access Point should be from the same OEM for better interoperatibility, ease of administration and ease of technical support.	

WiFi 6 Outdoor WiFi Access Point

WiFi6 Outdoor WiFi Access Point		
S.No.	**Specifications**	**Compliance (Yes/No)**
1	The APs should support IEEE 802/11a/b/g/n/ac/ax standards with Dual Band Concurrent 2x2:2 streams (2.4GHz) + 2x2:2 streams (5GHz)	
2	The proposed access point should be 802.11ax (Wi-Fi 6) and Operate in dual band radio.	
3	The AP Should supports on both bands for the capacity of 2.4GHz 802.11b/g/n/ac/ax 574 Mbps and 5 GHz 802.11b/g/n/ac/ax 1200 Mbps	
4	The AP shall have 1 ports, auto MDX, auto-sensing 10/100/1000 Mbps, RJ-45 port	
5	The access point should be capable to be managed as standalone or through Hardware/virtual controller/Cloud based controller or it should work as a controller based on the site requirement.	
6	The Outdoor AP should support 40 MHz channelization on 2.4GHz and 20/40/80 MHz channelization on 5 GHz. It should also support MU-MIMO.	
7	The access point should be able to operate in full MIMO mode with 802.3af/at POE.	
8	Antenna should dynamically choose antenna patterns in real-time environment to establish the best possible connection with every device. Should support at least 64 antenna patterns combinations.	
9	AP should have adaptive antenna technology for performance optimization and interference mitigation features. Antenna should provide better coverage and performance utilizing multi-directional antenna patterns and polarization diversity with maximal ratio combining .	

10	Since the WLAN network will be using an unlicensed band the solution should have mechanisms that reduce the impact of interference generated by other radio equipment operating in the same band. Please Describe techniques supported.	
11	The access point should be able to detect clients that have dual band capability and automatically steer those client to use the 5GHz band instead of the 2.4GHz band.	
12	The antennas to be dual polarised and should be integrated inside the access point enclosure to minimize damage and create a low profile unit that does not stand out visually. The antennas could be omnidirectional or directional as per the requirement or site survey done by the vendor.	
13	The access point should support 802.1q VLAN tagging	
14	The access point should support WPA2/3 enterprise authentication. AP should support Authentication via 802.1X and Active Directory.	
15	Implement Wi-Fi alliance standards WMM, 802.11d, 802.11h and 802.11e	
16	The Access Point should provide for concurrent support for high definition IP Video, Voice and Data application without needing any configuration change. This feature should be demonstrable.	
17	Channel selection based on measuring throughput capacity in real time and switching to another channel should the capacity fall below the statistical average of all channels without using background scanning as a method.	
18	Should support Transmit power tuning in 1dB increments in order to reduce interference and RF hazards	
19	Device antenna gain (integrated) must be at least 3dBi.	
20	AP should support AES encrypted GRE-based tunnel for data forwarding.	
21	AP Should support auth/encryption methods for WLAN configuration: Open, WEP, WPA2-AES, PSK, WPA3-SAE, WPA3-OWE, IEEE 802.1X/EAP, AAA, AES-GCMP-256.It should also support Role-Based Access Control, rate-limiting, device fingerprinting, 802.11w MFP and 802.11r Fast roaming.	
22	Should support 500 or more clients per AP and SSID up to 15 per radio	
23	Should support IPv6 from day one	
24	For troubleshooting purposes, the administrator should have the ability to remotely capture 802.11 and / or 802.3 frames from an access point without disrupting client access.	
25	Operating Temperature:-20°C to 65°C	
26	Operating Humidity: up to 95% non-condensing.	
27	The Outdoor AP should be IP67 rated & Wind Survivability Up to 266km/h (165 mph)	
28	Should be WiFi certified, and WPC approved; ETA certificate and TEC certificate to be enclosed	

29	**Certifications** Wi-Fi Alliance: Wi-Fi CERTIFIED a, b, g, n, ac Wi-Fi CERTIFIED ax WPA, WPA2 and WPA3 WMM, Wi-Fi Vantage Passpoint	
30	**Regulatory Compliance** EN60950 Safety/Equivalent Indian Standard EN60601 Medical/Equivalent Indian Standard EN 62311 Human Safety/RF Exposure /Equivalent Indian Standard ROHS UL 2043 Plenum	
31	Warranty & suppory: 5 years advance replacement warranty and 5 years OEM 24/7 TAC support	

AAA for 1500 users with 4 devices each

AAA for 1500 users with 4 devices each			
S.No	**Description**	**Features**	**Compliance (Yes/No)**
1	Make	Please specify the make and model	
		The offered solution can be onprem or cloud based. In case of onprem solution, server to be supplied by the bidder with all the necessary Operating system, required RAM ,CPUs to cater the required number of devices mentioned in the subsequent clause.	
2	Functionality	Solution should support Authorisation, Authentication & Accounting (AAA), network access control (NAC), BYOD and Guest Access by incorporating identity, physical/device information and conditional elements on a single platform.	
		Should support variety of authentication methods (802.1 X, MAC auth and web auth) for Wired and wireless networking equipment.	
		Solution should support up to 1500 users with 4 devices each from day 1. Licenses/Subscription to be considered accordingly.The solution should be scalable to support 10K users or more in future.	
		Solution should provide facility for phased implementation approach by starting with role based access management and later incorporating end point health of security measurement.	

		Solution should support RADIUS server for client device authentication and TACACS+ for network device authentication with logging.	
		Solution should have device profiling functionality	
		Solution should have integrated support for Microsoft windows end points for health and posture assessment check to ensure only users complying to policy defined by administrator are allowed to connect on the network.	
		Authentication or authorization support for LDAP, AD, SAML 2.0 & O Auth	
		The solution should have the following features	
		Built-in guest management and device/user on boarding.	
		Web based management interface with dashboard.	
		Reporting and analysis with custom data filters.	
		Data repository for user, device, transaction information.	
		Rich polices using identity, device, and health of conditional elements.	
		Integrated network based device profiler utilizing collection via SNMP, AD, and HTTP.	
3	BYOD	Support for popular smart devices and traditional computing platforms.	
		Ability to support iOS and Android.	
		The system should correlate user, device, and authentication information for troubleshooting and tracking purposes. It should offer a high-level overview of the devices on the network and their associated users.	
		The system should support automated device onboarding, allowing for secure access through a self-service portal.	
		The system should be able to integrate with Active Directory, allowing authentication of BYOD users based on their identity and device attributes.	
4	Guest Access	**Solution must be capable of providing**	
		Self provisioned Guest access users should be available from day one.	
		Ability to send automated SMS or email credentials to the guest users.	
		Solution should provide at least 5000 SMS for (OTP) based authentication from Day 1	

		The system should allow for the configuration of account details, including time frames and bandwidth limits. Once the account's time frame expires, the user account should automatically become inactive.	
		Solution must be capable of providing advertising services.	
		Guest solution should manage the individual guest credentials in database.	
		Ability to perform caching of MAC address post guest authentication to avoid the need for guest to re-authenticate during the period of their visit.	
		The solution should support auto-login for the self-registration workflow, eliminating the need for guests to retrieve account credentials from SMS or email for their initial login.	
		The solution should support bulk import of guest accounts and provide the capability to send credential notifications via email.	
		A post-login session statistics page should be displayed to users, allowing them to monitor their usage of the assigned quota.	
		The solution should feature a location-based captive portal that displays different landing pages depending on the guest's network connection location.	
		The solution should offer fully customizable self-registration pages for guest account creation.	
5	Licenses/Subscription & support	5 years	
6	Mandatory compliance	All switches, WiFi, WLC, Transceivers, AAA should be from the same OEM for better interoperatability, management and support.	

Firewall

ATC features	
The Proposed Solution should support Web management, CLI management & should have dedicated Management Port (RJ45) from day one.	Required
Firewall should have the fesability of PoE/PoE+ ports in the appliance to power up PoE devices like Acces points, without any external dependency.	Required

Firewall should support non-repudiation to strengthen logging data security/privacy	Required
Should have built in zero trust network access funtionality in additon to VPN. Should support DNS security , OEM should offer it sown DNS servre IP's that can add as an intital layer of DNS security.	Required
Must have SD-WAN capability and have feature to create SLA profile with Jitter,Latency,Packet Loss. And same should be demonstrated by OEM/Vender in post bid POC if requested.	Required
SDWAN feature must have source,destination,service,application and users base policy creation capability. Also shuld be able to load balance or load share traffic across multiple gateways on the basis of SLA paramaters. And same should be demonstrated by OEM/Vender in post bid POC if requested.	Required
NGFW Firewall Should have Pre-defined dashboards for Traffic, Security, and User behaviour analysis report. Granular Web & Application usage reporting, Network & Threats (IPS, TP, Wireless), VPN, Email, Compliance like HIPAA, PCI, GLBA, CIPA reports and Export reports as HTML, PDF, Excel.	Required
The solution should support Active Directory, eDirectory, RADIUS, LDAP and TACACS+, Server authentication agents for Active Directory SSO, STAS, SATC, Single sign-on: Active directory, eDirectory, RADIUS Accounting.	Required
Azure AD integration, Support for creating users with UPN format for RADIUS authentication.	Required
Firewall should support TLS 1.3 inspection of encrypted traffic. If required bidders should showcase same	Required
If required, all technically qualified bidders should showcase the product capabilities through a demonstration at our premises	Required
OEM Should be SOC2 Type 2 compliant	Required
OEM Should be ISO 9001 & ISO 27001	Required
The OEM should not have been blacklisted by any State & Central government and PSU within the last 5 years.	Required
The NGFW Firewall OS family or Hardware should be certified under security related functions EAL4+,ICSA Lab Firewall	Required

Certification, MTCTE certification from TEC.	
Manufacturer Authorization (MAF), Make In India OEM Letter, Escalation Matrix for Support	Required
Make In India OEM Letter, should be class 1 MII.	Required

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT

NAUROJI NAGAR, DELHI

AUDIO VIDEO SYSTEM

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI Creating an Ecosystem for Quality

Date: 26th Dec. '2024

Revision: R0

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II. SPECIFICATION 3

I. PREFACE

A. Tropical Conditions

All equipment/material supplied against respective Specification shall be suitable for satisfactory continuous operation, storage & maintenance under tropical conditions as specified below:

- Ambient temperature : 45 degree Celsius
- Annual Average Relative humidity : 50%
- Isokeraunic level (days per year) : 50
- Seismic Zone : Zone-IV
- Climate type : Moderately hot and humid tropical, climate, conducive to rust and fungus growth

B. General:

The Security work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations and requirements of the Local Electricity Supply authority and Fire Insurance regulations so far as these become applicable to the installation.

The scope includes the jobs to be performed for all equipment and materials furnished under this specification. The scope is however not limited to the items detailed below:

- Design, manufacture, testing at manufacturers works packing and dispatch.
- Transportation to site and insurance.
- Receiving at site, unloading, handling, opening, inspecting, reporting and submitting claims in case of damages and short supply items.
- Arranging to repair/re-ordering all damaged and short supply items.

II. SPECIFICATION

Audio Video Solution with Video Conference System

The scope of service for the AV System Integrator (AVSI) is to Supply, Install, Test & Commission and Maintenance the systems as per the design given in the tender drawings and the specifications included in this document. It is the responsibility of the AVSI to read the tender documents through completely and understand all of the requirements and have to take consent and approval from EIL and Consultant jointly.

Special Condition for System Integrator:

- The Contractor will supply and install the equipment necessary to meet the requirements and provide all labour and materials, whether or not described in full, necessary to produce complete and fully operational systems in accordance with the intent of this document.
- The Contractor/ Agency must familiarize himself with the site drawings and the scope of the facilities that is required in the various areas. Should ensure that agency is aware of the operational requirements under which the systems and associated facilities are to be installed and used.

- All employees used by the contractor/agency to install this system must be competent technicians who are experienced in the installation and interconnection of professional audio visual systems.
- Bidder shall be authorized by the manufacturer of the major components of the system to sell their products and initiate warranty service on the same items for this project. Major components of the system shall include, but not be limited to, data/video projectors, display panels, video processing equipment such as switchers, audio processing equipment, power amplifiers, speakers, etc.
- Manufacturing authorization letter must be submitted for this Work addressing to Client stating that bidder is authorized to provide sales and services on behalf of OEM.
- In view of the above, commissioning and programming will have to be carried out to integrate all the system architecture hardware and software – to synchronized Audio, Video controlled through Control Processors, etc. complete
- **Submittals:**
    - Compliance Statement- (Mandatory)
    - Datasheet- (Mandatory- Relevant Pages only)
    - Bill of Quantity- (Mandatory)
    - Drawings as required
    - Manufacture Authorization Letter (Mandatory)
    - OEM Partner Certification
    - No Deviation Certificate (for Technical Compliance) on OEM latter head (Mandatory).
- **Makes and Models**: - It is mandatory to provide make and model of the items and their subcomponents as has been sought in the technical bid. Please note that substituting required information by just brand name is not enough. Bidder should not quote hardware or software items which are impending End of Life or End of Support during the contractual period.
- **Software, Drivers and Manuals**: - The bidder shall supply along with each item, all the related documents, Software Licenses and necessary media of the software loaded in the equipment without any additional cost. The media and documents shall be in English. These will include, but not restricted to, User Manual, Operation Manual, Other Software and Drivers etc.
- **Warranty:** The Contractor/ Agency shall Warranty that all provided material and equipment will be free from defects, workmanship and will remain so, for a period of 12 months from after equipment/materials have put into the service or from date of final acceptance of system by Engineer In charge / Consultant whichever is earlier.
- The Contractor/ Agency shall provide summary of all equipment's serviced quarterly during this Warranty period to facility in charge or EIL. The report shall clearly mention services rendered, parts replaced and repairs performed.

Software & Programming:

- Any software, license or programming, whether or not specifically mentioned, but if required for successful installation, testing, commissioning and functioning of the all equipment and systems installed by the contractor, the same shall be in the scope of the contractor. All such software required shall be fully-loaded, genuine, latest versions, shall be as per OEM's specifications/ recommendations, shall not be trial versions or limited- feature or limited-period versions (unless the specified Model no. / Code no. means so) and shall not involve any extra or recurring cost.
- The rate quoted by the contractor shall be inclusive of all such required software and programming and the contractor shall be responsible for making the entire system operational as per tender specification and no extra shall be paid to the contractor on this account.

Compatibility of System

- It shall be contractor's obligation to ensure that all the software, hardware, equipment, and AV systems, including input-output connectors/ port/ terminals, are seamlessly compatible with one another. Any specific provisions, if required to be made on this account this, shall be done by the contract without compromising the performance of the AV system and without any extra cost. The rate quoted by the contractor shall be inclusive of all such required software and programming and no extra shall be paid to the contractor on this account.
- Similarly, the contractor shall ensure that the speaker's wattage and corresponding amplifiers are selected and proposed in a manner that they are compatible with one another.
- The contractor shall ensure that the equipment being proposed are the prevalent models/ series of the OEM.

Size of LED / Video Wall Display Panel

- The contractor shall supply the LED display panel as per the specifications given in the Bidding document. However, a variation in screen diagonal size of the LED panel up to +5'' (Plus Five inches) shall be acceptable as decided by Engineer in charge, whose decision shall be final in this regard. The bidder shall quote the price accordingly and no extra amount shall be paid on account of this.

Connector / Adaptors / Convertors / Ports

- The connectors/ adaptors/ convertors/ports required in making connections between various equipment, cables or terminating cables into equipment shall be provided and installed by the contractor as per industry standards, design and site requirements, if not specified in the bidding document. The rates quoted by the contractor for equipment and cables shall be inclusive of connectors (except in case SOR items is available for such connector in the bidding document) and no extra shall be paid to the contractor on account of this.

Power and LAN Supply to the AV Equipment

- The contractor shall take power and LAN connections for the Audio-Visual equipment from the prescribed electrical and LAN points already installed in each of the rooms. It shall be contractor's obligation to ensure necessary coordination in this regard with Engineer in Charge and other agencies working at site. The rates quoted by the contractor shall be inclusive of this and no extra shall be paid to the contractor on account of this. Decision of Engineer in charge regarding the same shall be final and binding upon the contractor

Hardware, Accessories and Mounting etc.

- The contractor shall provide all necessary hardware, accessories, mounting kits etc. required for appropriately and safely mounting the equipment shall be as per the requirements of the equipment, OEM's recommendations (if any), site conditions, technical specifications and as approved by Engineer in charge. The rates quoted by the contractor shall be inclusive of this and no extra shall be paid to the contractor on account of this. (except in case SOR items is available for such connector in the bidding document).

Operating Conditions

- All Equipment enlisted in this tender shall be suitable for operating under following environmental conditions or as specified in individual Equipment Data Sheet, whichever is stringent:

Sl No	Environmental parameter	Range
1	**Operating Temperature**	**5˚C - 40˚C**
2	**Operating Humidity**	**15% - 80% RH**
3	**AC Voltage supply (for equipment that operates on AC voltage supply)**	**110V - 240V AC @ 50-60 Hz**

- There may be equipment which operate on DC supply or Power-over-Ethernet (PoE) as per manufacturer's specifications. The contractor shall supply and install the equipment along with the necessary adaptor, power cords, Ethernet cables/ cords (in cases where Ethernet cable is meant only for supply of power and not for communication or LAN), or any other provision required as per manufacturer's specifications. The rates quoted by the bidder shall be inclusive of this and no extra amount shall be paid to the contractor on account of this.

Detailed Specification:

1. **Integrated / Modular Direct View LED Video Wall Screen:**

- Minimum 135" Screen Size
- 1.5 mm Pixel Pitch or less

- Full HD (1920x1080) Resolution or more
- Pixel Density: 409600 Pixel / Sq. meter or more
- Die Cast Al Cabinet Type
- Brightness 500 nits (cd/m2) or more
- Viewing Angle: 160 x 160 degree
- 16 bits data processing
- Refresh rate ≥ 3840 Hz
- Contrast ratio 3000:1 or more
- with Integrated LED Controller with Standard Inputs 3 HDMI, Audio in , 3 USB,
- In built / external Media Player with 16 GB RAM; 64 GB Storage,
- 7 years Signage License with mounting arrangement.

2. 98" Professional Ultra HD Display Panel

- 4K UHD (3840x2160) Resolution
- Brightness 500 Nits or more,
- Viewing angle (horizontal / vertical): 178 / 178 degree,
- Display Colours: 1.07 Billion or more
- Panel technology: IPS / Direct LED,
- Contrast ratio (typical) 1100:1 or more
- Inbuilt OS: Android / Windows/ OEM Specific OS
- Connectivity: Video Input: 2 HDMI 2.0, 1 USB 2.0, 1 DP, Audio In, Audio Out,
- Control: RS232, Ethernet, Built-in Wi-Fi, Haze: 25%,
- 2x10W Built-in speakers,
- Memory:8 GB, CE, FCC, Class A, BIS Certified.

3. 75" Professional Ultra HD Display Panel:

- 4K UHD (3840x2160) Resolution
- Brightness 500 Nits or more,
- Viewing angle (horizontal / vertical): 178 / 178 degree,
- Display Colours: 1.07 Billion or more
- Panel technology: IPS / Direct LED,
- Contrast ratio (typical) 1100:1 or more
- Inbuilt OS: Android / Windows/ OEM Specific OS
- Connectivity: Video Input: 3 HDMI 2.0, 1 USB 2.0, 1 DP, Audio In, Audio Out,
- Control: RS232, Ethernet, Built-in Wi-Fi, Haze: 25%,

- 2x10W Built-in speakers,
- Memory:8 GB, CE, FCC, Class A, BIS Certified..

4. 65" Professional Ultra HD Display Panel:

- 4K UHD (3840x2160) Resolution
- Brightness 500 Nits or more,
- Viewing angle (horizontal / vertical): 178 / 178 degree,
- Display Colours: 1.07 Billion or more
- Panel technology: IPS / Direct LED,
- Contrast ratio (typical) 1100:1 or more
- Inbuilt OS: Android / Windows/ OEM Specific OS
- Connectivity: Video Input: 3 HDMI 2.0, 1 USB 2.0, 1 DP, Audio In, Audio Out,
- Control: RS232, Ethernet, Built-in Wi-Fi, Haze: 25%,
- 2x10W Built-in speakers,
- Memory:8 GB, CE, FCC, Class A, BIS Certified..

5. 55" Professional Ultra HD Display Panel:

- 4K UHD (3840x2160) Resolution
- Brightness 500 Nits or more,
- Viewing angle (horizontal / vertical): 178 / 178 degree,
- Display Colours: 1.07 Billion or more
- Panel technology: IPS / Direct LED,
- Contrast ratio (typical) 1100:1 or more
- Inbuilt OS: Android / Windows/ OEM Specific OS
- Connectivity: Video Input: 3 HDMI 2.0, 1 USB 2.0, 1 DP, Audio In, Audio Out,
- Control: RS232, Ethernet, Built-in Wi-Fi, Haze: 25%,
- 2x10W Built-in speakers,
- Memory:8 GB, CE, FCC, Class A, BIS Certified..

6. 32" Professional Ultra HD Display Panel:

- FHD (1920x1080) Resolution
- Brightness 400 Nits
- Viewing angle (horizontal / vertical): 178 / 178 degree
- Panel technology: IPS / Direct LED
- Contrast ratio (typical) 1100:1

- Inbuilt OS: Android / Windows/ WebOS
- Connectivity: Video Input: 2 HDMI 2.0, 1 USB 2.0, 1 DP, Audio In, Audio Out
- Control: RS232, Ethernet
- Built-in Wi-Fi
- 2x10W Built-in speakers
- Memory:8 GB, CE, FCC, Class A, BIS Certified etc all complete

7. Fixed Wall Mount

- Capable of holding up to 75 kg
- Supports 32" to 90" displays
- VESA Compliant etc. all complete

8. Fixed Wall Mount

- Capable of holding up to 110 kg
- Supports 75" to 98" displays
- VESA Compliant etc. all complete

9. Adjustable Drop Universal Flat Screen Ceiling Mount;

- With of 625mm - 950mm adjustable drop
- Screen size: up to 65"
- Max load: 50kg
- Tilt adjustment: +/-15° etc. all complete

10. Floor Mount Trolley:

- Universal in design to fit 65" to 98" displays
- Can hold weight up to 120 kg
- VESA compliant etc. all complete.

11. Cable Cubby with flip top:

- Cover and multi-format cables
- 2 Universal Power, 2 USB Charger
- 1 HDMI, 1 USB-C, 1 Ethernet Cable,
- made of steel and aluminium etc. all complete

12. Network PTZ Conference Camera:

- 12x optical zoom and 60° horizontal FoV
- 1/2.8” low-noise CMOS Sensor
- Sensor Scanning Mode: Progressive
- Horizontal Rotation Range: ±170°
- Vertical Rotation Range: -30° to +90°
- Image rotation for ceiling mounting
- White Balance: Auto, indoor, outdoor, one-push, manual, specified colour temperature
- IP Stream Resolutions: H.264 @ 360p, 270p or 180p
- A single network cable for video, power and control data transport
- HDMI 2.0 and 3G-SDI Outputs, IP Stream
- Distribute video via the LAN network anywhere it is needed
- User-configurable resolution and quality for IP streams (up to 1080p
- Power Over Ethernet (PoE) support etc. all complete

13. HD Visual Communications System:

- SIP, H.323
- 6-Site Connection
- Dual Network
- Enabling High-Definition Web Conferences
- Video Compression Method: H.261 (mainstream only), H.263, H.263+, H.263++ (reception only), H.264 High Profile, H.264 Baseline Profile,
- Video Input: 2 HDMI, 1 PC
- Video output: 2 HDMI, IP mode
- NAT Traversal mode
- IP / NAT Traversal mode etc. all complete.

14. Intel Celeron Mini-PC:

- Windows 10 IOT License
- One time Up to 4 users wireless screen shares & Quad-view Support
- Preinstalled suite of Video conferencing apps
- 720p Camera Support
- Single Display Support
- Online dashboard support with wireless keyboard and mouse etc. all complete

15. All-In-One-Conferencing Device:

- 4K Ultra HD camera equipped with advanced AI features,
- Consists of six beamforming MEMS microphone capsules which automatically focuse on the person speaking in the room
- One Priority Zone and up to three Exclusion Zones shall be adjustable
- Using Dante for adding extension mics and/or a 2nd external USB camera
- 4 full range loudspeakers with passive radiator
- Frequency response 100 Hz - 18 kHz,
- Max. SPL (output) 84 dB SPL,
- Interfaces: 2 HDMI 2.0 Outputs, USB-C 3.1 (Gen 1), 1 USB-A (USB 3.1 (Gen1)),
- Dual Ethernet,
- Brand Agnostic Integration etc all complete
- (combination of same make devices are allowed to achieve given specification)

16. Round Ceiling Mounted Beamforming Microphone Array:

- Shall consist of 15 pre-polarized condenser microphone capsules,
- Shall use beamforming technology that automatically focuses on whoever is speaking in the room and always follows the person around the room,
- Microphone array shall have a Dante interface for digital audio output,
- Supporting both single-cable (PoE + Control + Dante) and split mode cabling (PoE + Ctrl / Dante) on a second RJ45 port,
- Microphone sensitivity shall be 0 dBV/Pa (1020 mV/Pa).
- Maximum sound pressure level shall be 98 dB SPL,
- Dynamic range shall be 81 dB(A),
- including a flush-mount installation kit etc all complete.

17. Wireless Presentation Platform:

- Wireless AV platform allows simultaneous content sharing for up to four 1080p presenters
- Wireless screen casting with iOS, Android, Mac, Chromebook, and Windows devices through native AirPlay, Google Cast, or Miracast protocols
- Dynamic Layout Mode automatically adapts to incoming or disconnected source content
- Instructor Mode allows a user to manage content, adjust audio volume, upload and play media content, stream YouTube and switch between layouts
- Supports YouTube Live streaming
- Supports cloud-based digital signage platforms
- Local storage available for playback of images and video.

18. Universal Switcher with HDMI and USB-C connectivity – Type 1:

- 1 HDMI Inputs, 1 USB-C connectivity (4K Video, Audio, Data, Power charge)
- 1 HDMI Outputs
- USB-C input connectivity for 4K Video, Audio, Data, and Power (Video, Audio, Data and Power over a single USB-C connection).
- 4 USB-A 3.0 Connection (for USB Devices) 1 USB-B 3.0 Connection (for PC hosts)
- USB 3.1 Gen 1 connectivity for any type of USB devices (Camera, speakerphone, touch monitor, USB-HID devices etc.)
- USB host switching, Separate USB 3.1 Host switching layer for multiple USB hosts and USB devices
- Analog audio de-embedding
- Charging via USB-C up to 60w
- Supports HDMI 4K signal formats (4K UHD @60Hz RGB 4:4:4, up to 18 Gbps)
- DP Alt Mode, HDMI 2.0, HDMI 1.x, DVI Signal Support, HDCP 1.x, HDCP 2.2 support
- Audio de-embedding
- GPIO control ports
- Device control via Ethernet (TCP/IP)
- Uncompressed video up to 18 Gbps datarate (600 MHz pixel clock) etc all complete.
- Combination of same make devices are allowed to achieve given specification) etc all complete

19. Universal Switcher with HDMI and USB-C connectivity- Type 2:

- 2 HDMI Inputs, 2 USB-C connectivity (4K Video, Audio, Data, Power charge)
- 2 HDMI Outputs
- USB-C input connectivity for 4K Video, Audio, Data, and Power (Video, Audio, Data and Power over a single USB-C connection).
- 4 USB-A 3.0 Connection (for USB Devices), 2 USB-B 3.0 Connection (for PC hosts)
- USB 3.1 Gen 1 connectivity for any type of USB devices (Camera, speakerphone, touch monitor, USB-HID devices etc.)
- USB host switching, Separate USB 3.1 Host switching layer for multiple USB hosts and USB devices
- Analog audio de-embedding
- Charging via USB-C up to 60w each port
- Supports HDMI 4K signal formats (4K UHD @60Hz RGB 4:4:4, up to 18 Gbps)
- DP Alt Mode, HDMI 2.0, HDMI 1.x, DVI Signal Support, HDCP 1.x, HDCP 2.2 support
- Audio de-embedding
- GPIO control ports
- Device control via Ethernet (TCP/IP)
- Uncompressed video up to 18 Gbps datarate (600 MHz pixel clock) etc all complete.

- Combination of same make devices are allowed to achieve given specification) etc all complete

20. HDMI 2.0 Matrix Switcher, 4HDMI Inputs, 3 Outputs:

- 4HDMI Inputs, 3 Outputs, with breakout Audio
- Occupancy Sensor input and various control features
- Supports HDMI 4K signal formats (4K UHD @60Hz RGB 4:4:4, up to 18 Gbps),
- HDMI 2.0, HDMI 1.x, DVI Complaint
- HDCP 1.x, HDCP 2.2 support
- GPIO control ports,
- Device control via Ethernet (TCP/IP).

21. 8 Inputs and 8 Outputs HDMI 2.0 Compatible Full 4K Matrix Switcher:

- 8 Inputs and 8 Outputs HDMI 2.0 Compatible Full 4K Matrix Switcher
- Supports HDMI 4K signal formats (4K UHD @60Hz RGB 4:4:4, up to 18 Gbps)
- HDCP 2.2 and HDCP 1.4 compliant with cross conversion capabilities
- HDMI 2.0, HDMI 1.4 and DVI 1.0 compliant
- HDR and Low Latency Dolby Vision support
- Audio de-embedding
- HDCP 2.2 and HDCP 1.4 compliant
- Advanced EDID Management
- Fully non-blocking switching architecture etc. all complete.

22. Digital Wireless Conference System: Wireless Access Point:

- Supports the following functions and capabilities,
- Based on standard WiFi5 standard, IEEE802.11ac,
- Clean channel manager that scans for the optimal channel use,
- Operates in the limited access DFS channels maximizing the available spectrum,
- Support upto 128 or more wireless devices, 3 x 2 MIMO antenna design with diversity to mitigate multipath effect resulting in robust wireless link,
- Omni directional radiation pattern with range of 40m or more,
- Highly secure by using WPA2 enterprise encryption,
- Browser based configuration and monitoring software included,
- Device discovery by physical button on WAP or via integrated web-based software,

- Self healing channel switching seamlessly switches to another channel when interference encountered or radar is detected on DFS channel,
- Battery remaining meeting time visualization and low battery warning,
- Audio routing for external processing or distance conferencing,
- Camera protocols providing device information to integrate 3rd party camera control systems,
- Mix-Minus mode,
- Dante port: 1 x Dante port (8 x 8 channels),
- Balanced analog IN and OUT,
- Recording capabilities: internal (4GB) or external storage (upto 500GB) and file download (MP3),
- Number of open microphones, interpretation channels: 6 or more,
- Latency : 16 ms,
- Audio: 48 kHz / 24 bit,
- Frequency response: 20 - 20 kHz,
- THD (22 - 22000 Hz): < 0.02 %,
- Dynamic range: > 90 dB,
- Signal to noise ratio: > 95 dBA,
- RF frequency bands: 2.4 Ghz / 5 GHz or better,
- Multi-purpose mounting plate,
- Certification: CE,
- PoE+ power adapter comes with power plug set etc all complete.

23. Digital Wireless Conference System: Tabletop wireless conference unit for Chairman/Delegate:

- With removable microphone capability,
- Multifunctional button for Chairman / Delegate,
- Button for request-to-speak and priority functionality when unit is configured as chairperson or dual delegate/two request-to-speak functions button compatibility,
- Built-in high-quality loudspeaker, minimum 1W or better,
- Frequency Response: 200-20,000 Hz or better,
- Speaker shall automatically muted when the microphone is active, to prevent acoustic feedback,
- Unit provides information used by the clean channel manager for frequency coordination and interference avoidance,
- Dual antenna for optimized signal reception even in challenging and high RF reflective environments,
- Supports WIFI5, WPA2 enterprise encryption,
- Push & Lock USB-C type microphone connector,
- Dual 3.5 mm stereo jack sockets for headphones with single volume control,
- Hot swap capable dual battery compartment,

- Option for power the units via USB-C adapter,
- Rechargeable lithium Ion battery with long hours backup of 12hrs on single charge (included),
- Certification: CE; BIS etc all complete.

24. Digital Wireless Conference System: Short Stem Removable:

- 98 MM microphone is equipped with USB C-based push and lock connector,
- Microphone Size: 97 × 33 × 33 mm,
- Polar Pattern: Cardioid,
- Max SPL @ 1kHz: 105 dB SPL or better,
- Signal-to-noise ratio referred to 1 Pa: 74 dB or better,
- Sensitivity @ 1 kHz : -35 dBV/Pa or better,
- Frequency response: 125 to 15000 Hz or better,
- Microphone with Ring Indicator to light up Red when active and Green when in Request,
- USB-C-based microphone connector,
- Connection: Push & Lock,
- Certification: CE etc all complete.

25. Digital Wireless Conference System: Advanced Audio License with the following functions and capabilities.

- Create new custom configurations,
- Activate a prepared audio configuration, Edit, duplicate and delete a configuration,
- Switch between existing configurations,
- Visualize the various routing groups as a matrix,
- Set routing options,
- Manage all inputs and outputs (auxiliary and Dante levels),
- Set mix minus and number of mix minus groups,
- Route translation channels to Dante,
- Select microphones or loudspeakers as always active for user input and output groups in customs configurations,
- Set dynamics for all in-room delegates and Interpreter

26. Digital Wireless Conference System: Charging station:

- 10 or more battery slots with charge process indication at a time - Charging time to full charge of only 2h, LAN port. Rack mountable, 1U rack space, Smart battery monitoring, Built-in web based software with upgrade capabilities

27. 400 MM Podium Gooseneck Microphone:

- 400 MM Podium Gooseneck Microphone with green light status ring,

- Pre-polarized condenser microphone with cardioid pickup pattern which provides uniform 120° angle of acceptance,
- Frequency response: 50 Hz - 20 kHz: Output impedance: < 100 Ω,
- Sensitivity: 15 mV/Pa, Max. sound pressure level: 130 dB,
- Power supply microphone: 12 V - 48 V along with XLR-5M connector
- with Shock Mount etc all complete.

28. Wireless Handheld Microphone Set:

- Dynamic Microphone type, Cardioid
- Pick-up pattern, RF output power 10 mW,
- Input sensitivity (capsule) 1.5 mV/Pa,
- antenna switching diversity via internal antennas,
- frequency response 50 to 16,000 Hz (–3 dB),
- Audio adjustment range 45 dB, adjustable in 5-dB steps, Line/Mic level 20 dB, switchable, Operating time approx. 10 hours, rugged ABS housing etc all complete

29. Wireless Bodypack with head Microphone Set:

- Condenser Microphone type, Cardioid Pick-up pattern, RF output power 10 mW, Input sensitivity (capsule) 1.5 mV/Pa, antenna switching diversity via internal antennas, frequency response 50 to 16,000 Hz (–3 dB), Audio adjustment range 45 dB, adjustable in 5-dB steps, Line/Mic level 20 dB, switchable, Operating time approx. 10 hours, rugged ABS housing etc all complete

30. Digital Signal Processor:

- With minimum 12 Mic/Line inputs and 12 Line outputs.
- Shall support phantom power on each microphone input.
- AEC channels - 16 or more with 200ms tail length for Analog and Networked Microphones.
- Minimum 32x32 Dante channels and support for up to 128x128 Network audio channels via Dante /AES67 or similar protocol.
- POTS and SIP Softphone integration for Audio conferencing.
- USB-B port supporting AV USB Bridging for software or web-based conferencing applications emulating USB Audio (Speakerphone) and USB Video (Camera) driver.
- 24 bit-A/D-D/A converters or better,
- 48 kHz Sample rate or better,
- Input frequency response of 20 Hz to 20 kHz or better,
- Input dynamic range > 109 or better.

31. Hardware or Software based control system:

- with required ports to control the devices mentioned in BOQ with perpetual licenses to connect Wall/Table mount touch screen controllers and iOS and Windows devices as wireless touch controller etc all complete

32. Network I/O Expander:

- 4 bi-directional RS232 serial ports, One port includes RS422 and RS485 compatibility, Power over Ethernet (PoE) capable, Daisy-chain up to four expanders on a single network run etc all complete

33. Two-way, Ceiling-mount loudspeaker with back can:

- Continuous Power - minimum 30 Watts or better,
- Sensitivity- minimum 89 dB SPL or better,
- Coverage Angle -110° or less,
- Maximum Peak SPL - minimum 110 dB or better,
- Rated Impedance - 8 Ohms.
- Transformer Tapping - 70V/100V(30,15,7.5watts) or better.
- Transducers - LF - minimum 6.5-inch or better, HF- .86-inch coaxially mounted with LF or better,
- Should include OEM supplied mounting brackets etc all complete

34. 8 Channel Class D Amplifier:

- 200. Watt at 4 Ω, 8 Ω, 70 V or 100 V on each channel,
- FlexAmp Technology allows each pair of amplifier channels to deliver up to 400 W total power, in any ratio,
- Frequency response at 8 Ω 20 Hz – 20 kHz +/- 0.5 dB,
- Signal to Noise > 103 dB, Input impedance >10k,
- balanced or unbalanced,
- UL, CE, RoHS / WEEE compliant etc all complete

35. 10" High Definition Touch Screen Controller:

- Projective capacitive (PCAP) multi-touch, Power over Ethernet, 24-bit color display, 1920 × 1200 Pixel Resolution, Brightness 450 Nits, PoE (Power over Ethernet) Wall mount kit etc all complete

36. 1/ 2 / 3 / 5 Meter Premium High Speed HDMI 2.0b flexy cable:

- Bandwidth up to 18Gbps
- Up to 4096 x 2160 @ 6 0Hz at RGB 4:4:4 video resolution
- Support High Dynamic Range (HDR10)
- Dolby Vision and Hybrid log–gamma (HLG) video

- Consumer Electronics Control (CEC)
- Audio Return Channel (ARC) and HDMI Ethernet Channel (HEC)

37. 10 / 15 Meter Premium High-Speed HDMI 2.0b Hybrid Optical Active Cable:

- Bandwidth up to 18Gbps
- Up to 4096 x 2160 @ 60 Hz at RGB 4:4:4 video resolution
- Supports EDID, HDCP2.2, HDR, CEC, ARC etc all complete

38. 2 Meter Full-featured Type-C ProAV cable

- 4K Video; USB 2.0 & 3.2 Gen 2x2 Data;
- 100W/5A PD Charging,
- 4 Lane DisplayPort Alt mode (4K60FPS Video and Audio),
- USB3.2 Gen 2x2 20Gbps (10Gbps/lane) SuperSpeedPlus (4K Webcam, SSD storage) etc all complete

39. 10 Meter USB 3.1 Gen1 SuperSpeed Active Extension Cable:

- Type A / male to Type A / female, Native USB2/USB1 and USB3 extension
- Supporting peripherals via USB 2.0 up to 480 Mbps (Mouse, Keyboard, Thumb Drive, Speakerphone and Webcam)
- Plug and play compatible with PC, Mac, and Linux etc all complete

40. Microphone Cable: 2 Conductor 22 AWG Tinned Copper, PE Insulation, 85% Tinned Copper Braid Shield, Cotton Braid, PVC Jacket (as per actual) etc all complete.

41. 2 Conductor 16 AWG Speaker Cable, stranded Bare copper conductors, PVC/Nylon insulation, PVC jacket (as per actual) etc all complete

42. CAT 6 Cable, 4 Pair, 24 AWG, Solid Bare Copper Conductor (as per actual)

43. Rack Structure 16 / 24 U

- Air Cooled AV Equipment Rack with 4 Nos. of Vertical Power Strips, Cantilever Selves, Cable routing perforations, 4 No. of Spin Wheels etc. all complete.

End of Document

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT NAUROJI NAGAR, DELHI

Plumbing Works

Date: 17th Dec. '2024
Revision: R0

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1. GENERAL PROVISIONS, PRODUCTS AND EXECUTION

General Provisions

Description

The scope of works for all plumbing works and system comprises engineering, supply, delivery, installation, testing and commissioning, handover, training, maintenance and warranty all as described or reasonably implied in the Contract. The Contractor is obliged to provide fully functioning works and systems in conformance with the requirements of the Contract. In the event certain items are not fully described or indicated in the Contract, but deemed essential by the Engineer (in all reasonableness) for the performance of the works and systems, then the provision of such items shall form part of the Contractors scope of works at no additional cost to the Employer.

The Contractor shall be responsible to co-ordinate the equipment and services and shall produce properly coordinated shop drawings to demonstrate the installation comply with the performance requirement of plumbing system with shop drawing, calculations and details.

Shop drawings shall take into account actual measurement and setting out dimensions/levels obtained and determined by the Contractor on site, actual equipment/material used, actual routing of services, co-ordination with all installation and site conditions/constraints.

Water Supply:

The water available is transferred to each fixture unit via gravity feed supply/hydro-pneumatic supply available at each floor by the building. All the individual floor branches are to be provided with isolation valve and Pressure reducing valve shall be installed at appropriate locations to limit the pressure as per industry standards. The hanging, clamping and support arrangements must be robust to meet the requirements of the system as per international standards.

Soil waste system:

Double stack system for soil, waste system with anti-syphonage and venting system to be provided from all the fixtures as per industry standards.No 90 degree bends are allowed anywhere in the installation. Each and every section of soil and waste system must be accessible and easily maintainable. The clean out plugs and valves have to be accessible and must be coordinated with structural and architectural drawings and provisions made thereon. The hanging, clamping and support arrangements must be robust to meet the requirements of the system as per international standards.

2. SCOPE OF WORK

i. Making Connections of the sanitary fixtures with existing utilities.
ii. All associated interfacing works with other trades including electrical, fire alarm and protection, air conditioning and ventilation, etc
iii. To provide all material, labor & supervision, equipment tools, appliances, services etc.
iv. Builder's work including breaking & making good of wall, floor, etc., equipment foundation pads, sleeves, etc.
v. Identification of all services
vi. Hoisting of heavy equipment.
vii. Coordination with Client and external agency to obtain incoming water supply, discharge points to soiland waste system as required (The contractor to evaluate the feasibility of connections of spil and waste pipes as per design sheet as the external levels are very challenging)
viii. To bring any discrepancy to the notice of the engineer prior to finalizing the contact. Claim or variation by the contractor not brought the notice of the engineer prior to the tender shall not be entertained.
ix. The contractor shall also include the site visit to inspect the existing installation and survey the rerouting of existing equipment ,duct, pipe work, supports, Electrical services and the operational process equipment to provide a complete intended operational installation.

The contractor shall ensure that his program of work is arranged and agreed with the client/PMC such that regular production process is not disturbe.

Other works as shown on the drawings and described elsewhere in the Contract documents.

Quality Assurance

Comply with the current applicable codes, ordinances, and regulations of the authority or authorities having jurisdiction, the rules, regulations and requirements of the utility companies/authorities serving the project and the Owner's insurance underwriter.

Reference standard for Water Supply, Drainage and Sanitation

a. National Building Code (2005) - Part IX
b. IS Codes and Plumbing Standards
c. Plumbing Handbook, SP-35-1987
d. CPHEEO Manual (Govt. of India) - 1999
e. Uniform Plumbing Code- 2008

Drawings, specifications, codes and standards are minimum requirements. Where requirements differ, the more stringent apply.
The Engineer reserves the right to inspect and reject any part of the Works not complying. The
Contractor shall replace such rejected works without cost variation and delay to the Contract.
Approval or acceptance by the Engineer shall not relieve the Contractor of his responsibilities under the Contract for the quality of materials and the standard of workmanship in the Works.
No work shall be covered up or put out of view without the agreement of the Engineer. The Contractor shall provide/allow the Engineer full opportunity for the examination and measurement of any work which is about to be covered or put out of view. Upon request by the Engineer, the Contractor shall expose their works and allow/provide access to the Engineer to inspect any part of the Works during the course of the manufacturing or site installation/erection.
When requested by the Engineer, the Contractor shall submit evidence including written certificates and full testing reports from approved/recognized testing organization certifying that his proposed equipment or material has been tested and conform to the specified standard.

Climate Conditions

The Contractor shall warrant that all materials and equipment are suitable for continuous use and operation in the climatic conditions encountered on site.
All equipment and materials shall be fully tropicalized and suitable for intended use in the peculiar local climate and operating conditions.

Equipment and Materials

Provide products and materials that are new, clean, free of defects, and free of damage and corrosion.
Products and materials shall not contain asbestos or any other material which is considered hazardous by the authority having jurisdiction.
Replace materials of less than specified quality and relocate work incorrectly installed as directed by the Engineer.
Provide name/data plates on major components of equipment with manufacturer's name. Model number, serial number, capacity data and electrical characteristics attached in a conspicuous place.
Install materials and equipment with qualified trade people.
Maintain uniformity of manufacturer for equipment used in similar application and sizes.
All pipes under building and those subject to traffic especially under roads shall be protected with reinforced concrete.
Acoustic lagging shall be provided for horizontal drainage pipes.
Client/Engineer shall have right to ask the contractor to supply any particular specified manufacturer's items.
For all works, use only new material and equipment's. For material not specified, use high quality commercial item. If a manufacturer is specified on a similar item, then the same manufacturer may be proposed for the non-specified items. Obtain approval of all other manufacturer from the consultant.
Fully lubricate equipment where required.
Follow manufacturer's instructions for installing, connecting, and adjusting equipment, testing and commissioning. Provide a copy of such instructions and equipment maintenance manual for the equipment during installation.
Equipment capacities, ratings, etc., are scheduled or specified for job site operating conditions. Equipment sensitive to altitude shall be de-rated with the method of de-rating identified on the submittals.

Energy consuming equipment shall meet local energy ordinances and by-laws.

Equipment Selection

The capacities of all plant and equipment described in the Contract are minimum capacities and the Contractor shall take into account of the offered equipment capacities to meet the performance requirement in the Contract and actual installation requirements.

Physical sizes of all plant and equipment shall suit the space allocated, taking into account the requirement for access and proper maintenance.

Any proposal to deviate from the Specification and Drawings is subject to the Engineer's approval at his sole discretion. Upon approval, any necessary changes to the engineering and installation as a result of these deviations shall be the responsibility of the Contractor.

Proposed equipment shall be submitted for approval by the Engineer before ordering is placed. All necessary information requested by the Engineer for the review of the proposal shall be submitted.

Coordination of Work

Contract documents establish scope, materials and quality but are not detailed installation instruction.

Coordinate work with related trades and furnish, in writing, any information necessary to permit the work of related trades to be installed satisfactorily and with the least possible conflict or delay.

The drawings show the general arrangement of equipment and appurtenances. Follow these drawings as closely as the actual construction and the work of other divisions will permit. Provide off-sets, fittings, and accessories which may be required but not shown on the drawings. Investigate the site, and review drawings of other divisions to determine conditions affecting the work, and provide such work and accessories as may be required to accommodate such conditions.

The drawings show only the general run of services and approximate location of equipment, outlets, panels, etc. Any significant changes in location of equipment, outlets, panels, etc., necessary in order to meet field conditions shall be brought to the determine attention of the Engineer for review before such alterations are made. Modifications shall be made at no additional cost to the Contract.

Carefully check space requirements with other division works to ensure that equipment can be installed in the space allotted.

Wherever work interconnects with work amongst different installation, coordinate with other trades to insure that they have the information necessary so that the Contractor may properly install the necessary connections and equipment. Identify items requiring access in order that the Trade will know where to install access doors and panels.

Consult amongst installation so that, wherever possible, motor controls and distribution equipment are of the same manufacturer.

Furnish and set sleeves for passage of risers through structural masonry and concrete walls and floors and elsewhere as required for the proper protection of each riser passing through building surfaces.

Provide fire stopping around all pipes, conduits, sleeves, etc., which pass through fire compartments.

Provide required supports and hangers for equipment suitably so as not to exceed allowable loading of structures.

Wherever the work is of sufficient complexity, prepare additional detail drawings to scale to coordinate the work with the work of other trades. Detailed work shall be clearly identified on the drawings as to the area to which it applies. Submit these drawings to the Engineer for review. At completion include a set of these drawings with each set of record drawings.

Coordinate with the local utility companies/authorities for their requirements for service connections and provide all necessary provisions, grounding, materials, equipment, labor, testing, and appurtenances.

Before commencing works, examine adjoining works on which this work is in any way affected and report conditions which prevent performance of the works. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

The Contractor is responsible to any modifications required due to service not properly coordinated.

Examination of Site

Prior to the submitting of bids, visit the project site and become familiar with all conditions affecting the proposed installation and make provisions as to the cost thereof.

The Contract Documents do not make representations regarding the character or extent of the sub-soils, water levels, existing structural, Plumbing & Sanitary and electrical installations, above or below ground, or other sub-surface conditions which may be encountered during the work, based on examination of the site or other

information. Failure to examine the drawings or other information does not relieve the Contractor of responsibility for satisfactorily completion of the work.

Cutting and Patching

Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of other equipment, layout the work carefully in advance. Repair any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc., using skilled trade people of the trades required at no additional cost to the Contract.
Provide prior 15 days information to the civil contractor for the slots, chases, openings and recesses through floors, walls, ceilings, and roofs as required. Where these openings are not provided, provide cutting and patching to accommodate penetrations. If the above work is specified in the scope of Plumbing contractor in the GCC or in any other subsequent section, the same shall be done by the contractor at no additional cost to the Contract.

Sealing of Penetrations

Fire Rated Penetrations
Where services penetrate any fire rated barrier, the Contractor shall seal the penetration with the use of an appropriate material to ensure the integrity of the fire barrier.
The Contractor shall seal the cable enclosures through fire rated barriers to ensure the integrity and rating of the fire barrier.

Acoustic Penetrations
Where services penetrate acoustic barriers, sealant shall be supplied and installed to maintain the acoustic separation at least equal to the barrier penetration.

Mounting Heights
Verify exact locations and mounting heights with the Engineer before installation.

Waterproofing

Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, walls, and the like. If such penetration is necessary, make penetration prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
Restore waterproof integrity of walls or surfaces after they have been penetrated without additional cost to the Contract.

Supports

Support work in accordance with the best industry practice. Provide supports, hangers, auxiliary structural members and supplemental hardware required for support of the work, complete with finishing paint.
Provide supporting frames or racks extending from floor slab to ceiling slab for work indicated as being supported from walls where the walls are incapable of supporting the weight. In particular, provide such frames or racks in electric closets and equipment room.
Provide supporting frames or racks for equipment which is installed in a free standing position.
Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members, rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
Adequate support of equipment (including outlet, pull and junction boxes and fittings) shall not depend on ducts, pipe, electric conduits, raceways, or cables for support.
Provide required supports and hangers for equipment so that loading will not exceed allowable loading of structure. Equipment and supports shall not come in contact with work of other trades.

All pipe work shall be adequately supported. All support installation shall be in accordance with relevant Indian/British standards Specification and codes of practice, except where modified or extended by the contract document.
All supports shall be specifically designed for the outside diameter of the pipe concerned (including specific packing).Oversize brackets will be rejected.
Electro plated clamps will not be accepted, all support shall be of galvanized.
Installation shall be as per specification and manufacturer recommendation.
Tailor made angle supports will be provided as thrust supports wherever applicable.
Supports for G.I Pipes, Steel pipes, CI pipes etc. to be provided and get approved.
Specify maximum spacing between the pipe supports for horizontal & vertical pipes for GI and CI pipes etc. & spacing length in meter.
Piping to all equipment and control valves shall be supported to prevent strain or distortions in the connected equipment valves and controls valves. Piping shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional supports after these items are removed.
All piping work runs should include color identification system (red, blue, white, etc.) with arrow indicating directions.

Fastenings

Fasten equipment to building in accordance with the best industry practice.
Where weight applied to the attachment points is 45 kg or less, conform to the following as a minimum:

1 .	Wood	:	Wood screws
2 .	Concrete and solid masonry	:	Bolts and expansion shields
3 .	Solid metal studs	:	Machine screws in tapped holes or with welded

Where weight applied to the building attachment points exceeds 45 kg, but is 135 kg or less, conform to the following as a minimum:
At concrete slabs provide 60 cm x 60 cm x 13 cm steel fishplates on top with through bolts. Fishplate assemblies shall be chased in and grouted flush with the top slabs screed line, where no fill is to be applied.
At steel decking or sub-floor for all fastenings, provide through bolts and threaded rods. The tops of bolts and rods shall be set at least one inch below the top fill screed line and grouted in. Suitable washers shall be used under bolt heads or nuts. In cases where the decking or sub-floor manufacturer produces specialty hangers to work with his decking or sub-floor such hangers shall be provided.
Where weight applied to building attachment points exceeds 135 kg, coordinate with and obtain the approval of Engineer and conform to the following as a minimum:
Provide suitable auxiliary channel or angle iron bridging between building structural steel elements to establish fastening points. Bridging members shall suitably welded or clamped to building steel. Provide threaded rods or bolts to attach to bridging members.
For items which are shown as being ceiling mounted at locations where fastening to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging tying to the building structural elements.
Wall mounted equipment may be directly secured to wall by means of steel bolts. Groups or arrays of equipment may be mounted on adequately sized steel angles, channels, or bars.
Equipment mounting should be as per manufacturer's recommendations.

Identification

Identify equipment with permanently attached black phenolic nameplates with 13 mm high white engraved lettering. Identification shall include equipment name or load served as appropriate. Nameplates shall be attached with cadmium plated screws; peel and stick tape or glue on type Color, name plates is unacceptable.
Services runs shall be properly identified as per the requirements in the Contract.
Provide labels/tags as per local authority requirement.
Submit samples to engineer for approval.

Color codes, material, sizes for identification of pipes, valves, equipment, shall comply as per Indian standards/BS1780.
See individual section for additional identification requirements.

Equipment Pads and Anchor Bolts

Provide concrete pads under all floor mounted electrical equipment. Equipment pads shall conform to the shape of the piece of equipment it serves with a minimum 25 mm margin around the equipment. 28 day, 175 kgs. /square cm concrete reinforced with 15 cm x 15 cm welded wire mesh. Trowel tops and sides of pad to smooth finishes, equal to those of the floors, with all external corners bull nose to a 20 mm radius. Shop drawings stamped UNALTERED shall be used for dimensional guidance in sizing pads.
Provide galvanized anchor bolts for all equipment placed on concrete equipment pads, inertia blocks, or on concrete slabs. Provide bolts of the size and number recommended by the manufacturer of the equipment and locate by means of suitable templates. Equipment installed on vibration isolators shall be secured to the isolator. Secure the isolator to the floor, pad, or support as recommended by the vibration isolation manufacturer.
Coordinate with structural works for loading.
For inertia base, point load for pump and motor as per approved material submittals.
Specify inertia base details.

Delivery, Dry age and Hauling

Provide dry age, hauling, hoisting, shoring and placement in the building of equipment specified and be responsible for the timely delivery and installation of equipment as required by the construction schedule. If any item of equipment is received prior to the time it is required, the Contractor shall be responsible for its proper storage and protection until the time it is required. Pay for all costs of demurrage or storage.
If equipment is not delivered or installed at the project site in a timely manner as required by the project construction schedule, the Contractor shall be responsible for resulting disassembly, reassembly, manufacturer's supervision, shoring, general construction modification, delays, overtime cost, etc., at no additional cost to the Contract.

Testing Of Systems

Provide a detailed schedule of completion indicating when each system is to be completed and outlining when field testing will be performed. Submit completion schedule for review within one month after the notice to proceed by Engineer or Owner's Representative has been given. Update this schedule periodically as the project progresses.
Comply with the project construction schedule for the date of final performance and acceptance testing, and complete work sufficiently in advance of the Contract completion date to permit the execution of the testing prior to occupancy and Contract closeout. Complete any adjustments and/or alterations which the final acceptance tests indicate as necessary for the proper functioning of all equipment prior to the completion date.
Carry out all test specified. Carry out all test required by Authorities having jurisdiction. Test equipment to the requirement of the manufacturer.
All tests shall be arranged in cooperation with the consultants and his engineer and all other concern parties and shall be subjected to at least 24 hours' notice in writing of the time, location and nature of the test to be performed. No test shall be considered valid unless the consultant is present.

Electrical Power Supply Interfaces

The Contractor shall provide power supply points/isolators at certain designated locations within the development for all plumbing and electrical installations as indicated on the drawings. It is the responsibility of the Contractor to coordinate and make connections to these power supply points/isolators and to provide all the necessary 'down-stream' power supply distribution board/network to the Plumbing & Sanitary system's control panels, equipment, sensors, field devices, etc.

Spare Parts and Tools

The Tenderer is obliged to provide, with his tender, a written guarantee that the spare parts for the Works or other equal and approved spare parts will be available for a period of fifteen (15) years beyond the issue date of Taking Over Certificate for the Works. Failure to provide the guarantee may, at the sole discretion of the Employer, result in the Tender being rejected.

The Contractor to submit with his Tender his recommended lists of spares parts for three years operation and maintenance covering all systems and sub-systems of the specification. This list should be priced and the price fixed so that the Employer can, at his discretion, order these spare parts in part or in whole at any time up to the issue of the Performance Certificate without any increase in price.

Samples

Samples showing fabrication techniques, quality and workmanship of component parts, compatibility of accessories shall be submitted for approval, upon request by the Engineer.
Before commencing of the work the contractor shall submit in writing for the written approval of the engineer details of all apparatus & fittings which he proposes to use in the works. The contractor shall prepare or obtain and promptly submit to the engineer free of charge for his written approval samples of material & particular as required. All material supplied which are not equal to the approved samples will be rejected .After being approved the engineer shall retain such samples, as standard reference until the completion of the work if he so desires.

Warranties

The Contractor shall warrant that the capacity, rating or duty of all equipment used in the installation shall not be less than the performance specified on the Drawing or in the Specification when operating under the specified conditions and in accordance with the equipment manufacturer's instructions. Any equipment/system not meeting this requirement shall be rejected. All pumps, equipments and units shall be provided with an extended 5 year guarantee including supply, labor & consumables incorporating the standard 1 year warranty provided on the plumbing equipment and system including maintenance in warranty/guarantee period. Contractor to provide the specified one without additionally cost to contract.

Protection of Materials, Personnel and Property

All material and goods shall be delivered to the site in new condition, properly packed and protected against damage due to handling, adverse weather or other circumstances, and be kept in packing case or under protective covering until required for use.
Any items suffering damage in transit or on site shall be rejected and replaced without extra cost and time to the Contract.
The Contractor shall be entirely responsible for all apparatus; equipment and materials furnished by him in connection with his works, and special care shall be taken to protect all parts thereof in such a manner as may be necessary or as directed.
Protection shall include covers, crating, sheds, stores or other means to protect the apparatus, equipment and materials from the weather, water damage, and corrosion and to prevent dirt, grit, plaster or other foreign substances from entering the working parts of machinery or equipment. Special care shall be taken to keep all opening of pipes, ducts, and etc. closed while in storage or during the course of delivery and erection/installation.
The Contractor shall take precautions to avoid unnecessary damage among the M&E installation.
All precautions shall be taken for the safety of personnel on site. The Contractor shall also confirm to the general regulations governing personnel on the site and must keep to the working space allocated for their use.

Interfacing with All Services and Systems

The Contractor shall provide all necessary provisions for interfacing amongst installation, services, and equipment for satisfactory functioning of the works under scope and will also interface with other trades if required.

Structural Expansion Joints and Settlement Joints

The Contractor shall make adequate provisions of flexible joints/connectors and/or expansion loops where services pass through structural expansion joints. The locations of these expansion joints are shown on the Architectural/structural drawings. The provisions of flexible joints/connections shall take into account the movement allowance. Detailed calculations shall be submitted by the Contractor to justify the selection of these flexible joints/connectors.

For settlement joints shown on the structural drawings or required by the construction of structural works, the Contractor shall co-ordinate that any installation which passes through settlement joints shall be executed after the complete casting of both side of the joint.
The Contractor shall co-ordinate to ensure that all services installed under metal roof and skylight shall have adequate provisions to take into account the movement and deflection of the roof structure and the cladding.

Painting

Generally, all metal surfaces requiring painting shall be provided with two coats of asphalt aluminum paint, primer coated, and two coats of finished paint.
No painting shall be done on damp surfaces.
The Contractor shall submit color scheme for the entire Works to the General Contractor for co-ordination and submission for approval by the Engineer.
Painting requirements as stated in codes and regulations or generally required by local authorities shall also be provided.

Safety Equipment and Notices

The Contractor shall supply and install the following (but not limited to) safety equipment and notices for each switchboard/control panel in the respective switch rooms and plant rooms: -

(a) Solid rubber insulated mats complying with relevant IS codes in front of and extending the full length of the control panel/switchboards.
(b) Copies of all statutory safety notices, regulations and instructions for resuscitation and treatment after electrical shock.
(C) Danger signs on the switchboards/control panels.

A copy of the main single line diagram, varnished and mounted on suitable hard backing and framed (in glass panel), showing clearly the full details of the electrical and Plumbing & Sanitary systems as supplied and installed.
Any other Notices as required by all local Authorities.

Quality Assurance/Quality Control (QA/QC)

The Contractor, prior to the commencement of the Works, shall submit for the Engineer's approval comprehensive QA/QC programmed for the installation which shall include, but not be limited to the following: -

1. QA/QC program of the manufacturing process of equipment;
2. Method statement of all site erection/installation works;
3. Method of protection for material/equipment during delivery, and stored on and off the site; and
4. Testing and commissioning program, procedures, etc.

The QA/QC program and procedures shall generally be in conformance with the guidelines of ISO 9000.
All equipment, material and items incorporated in the Works under this Contract are to be new and of top-class quality.
Equipment/material of non-reputable make may not be accepted solely at the discretion of the Engineer.
The use of electrically dissimilar metals in contact with each other shall be avoided. If this is not possible, the contact surfaces of the two metals shall be insulated from each other by an approved method.
All work under this Contract shall be performed in a skilful and workmanlike manner and in accordance with best workshop practice.
All components shall be easily accessible for maintenance/replacement.
All instrumentation and equipment required for inspection, testing and commissioning shall be calibrated and maintained by the Contractor. The Contractor shall submit all valid calibration records from manufacturer and/or recognized approved laboratories and testing authorities before the use of such instrumentation and equipment.

Progressive Record/As-Built Drawings

During the course of the Contract, the Contractor shall keep progressive record drawings of all installation works.

The contractor shall prepare as built drawings capturing accurate record of the works as installed by the contractor.
As-built drawings shall be developed and produced during the course of the installation and, when requested by the Engineer, for substantiating of monthly progress claims.
As-built drawings shall be submitted prior to the issue of Taking over Certificate by the Engineer.
As-fitted schematic system diagrams, properly framed, shall also be provided and mounted on the wall inside each plant room.
Submission of approved 5 sets of "as-built" or "as manufactured" drawings shall be in the following manner:

1. One (1) set of special quality plastic film transparency for all drawings;

2. Two (2) sets of computer soft copy in CD ROM;

3. Five (5) bound sets of paper prints for all drawings; and

4. Additional set of as-built drawings in addition to the above as specified in the Contract Preliminaries and reasonably requested by the Engineer shall also be provided.

The retention sum or final payment will not be released until all such drawing and records have been received and approved by the consultant/client.
All as-built drawings shall show equipment mounting details, foundation details, pumps, piping and support details with detailed schedule of all equipment's & their accessories.

As-Built Drawings Submissions

5 sets of As-built drawings shall be provided as required by the Engineer.
The Contractor shall ensure that the submissions are made properly and in a timely fashion and will not delay the inspections and testings by the authorities. All as-built drawings shall be produced based on the latest architectural plans.

Testing and Commissioning/Performance Guarantee test

The Contractor shall be responsible for obtaining all necessary licenses as required by all relevant authorities before operation of any equipment/system.
All testing and commissioning to enable proper operation of the works shall be completed to the satisfaction of the Engineer in accordance with the construction programme or before the issuance of Taking over Certificate, whichever is earlier.
All final adjustments and final balancing of the equipment/system operation shall be completed before the date of testing and commissioning.
The complete testing and commissioning are deemed to be concluded successfully only when the installation operated properly within the specified limits of its rating continuously without failure of any kind.
Carryout performance Guarantee test to demonstrate performance. The Contractor shall establish the dates by which permanent utilities shall be available for testing and commissioning of equipment and take this into account in his programme, or make suitable arrangements to test and commission with temporary power based on programme.
The Contractor shall arrange for all submissions to Authorities and pay the cost of statutory inspections and certificates.
Testing & commissioning of water, sanitary and drainage system, etc. shall be as per relevant standard code of practice.
The Contractor shall submit pre-commissioning and post commissioning check list for the entire installation.

Attendance to Occupation Permit Application

The Contractor shall provide all necessary attendance to inspections by the Engineer and authorities for the purpose of Occupation Permit application.

Operation and Maintenance Instructions Manual

The Operation and Maintenance Instruction manual shall be in A4 size paper and be bound in rigid covers covered and engraved with lettering giving the Employer's name, project name, Engineer's name.
Final draft manuals must be submitted for the Engineer's review before Taking Over Certificate is issued. After acceptance by the Engineer, the Contractor shall submit five (5) sets and a soft copy of this manual for record before Taking Over certificate is issued.
In general, each manual shall consist, but not be limited to the following section:-

1. General

   This section shall include the purpose of the manual and brief description of the manual directory.
2. System Description

   This section shall include the following as a minimum:-
3. Description of the overall system.

   General operation of plant, starting up and shutting down procedures, location of each equipment, normal and emergency operation of systems/equipment, control settings and tolerances.
   Size and capacity of all the major equipment and components of the system.
   The proposed initial setting of protective devices and other adjustable components of the system. Space shall be reserved for the insertion of final commissioned and accepted settings.
   Normal sequence of equipment and plant operation and alternative sequence to maintain operation of part of the total facilities during abnormal circumstances.

4. Technical Specification

   This section shall include the technical descriptions and functions of all equipment and components and shall generally include:
   Schedules of equipment showing quantities, locations, types, operating duties.
   Technical description of all systems and equipment, including circuit diagrams of each printed circuit board and component layout diagram for each printed circuit board installed for this project.
   Wiring diagrams.
   Manufacturer's drawings.
   Equipment list, stating the make, model, serial number, accepted settings (after commissioning).
   Catalogues, certificates and performance data sheets for all equipment.
5. Maintenance

   This section shall include the required operating and maintenance procedures of all the equipment.
   This shall include the following as a minimum:-
   - Inspection manual for all system/equipment;
   - Operation manual for all system/equipment;
   - Procedure of changing components of equipment requiring regular replacement;
   - Maintenance instructions, calibration procedures and fault finding instructions for all systems;
   - Precautions when carrying out operation and maintenance procedures;
   - Storage and inventory systems; and
   - Procedures for system fault finding.

6. Safety

   This section shall include the following as a minimum: -
   - Proper procedure of equipment operation;
   - General description of plant hazards, where appropriate, including the following: -
   - Protection against electrical hazards;
   - Protection against Plumbing & Sanitary and physical hazards;
   - Protection against fire and explosion hazards;
   - Protection against chemical hazards;
   - Protection during fuel and chemical handling; and First aid and accident reporting.

7. Directory of Suppliers

This section shall list the name of suppliers and agents of each type of equipment, materials and accessories. Correspondence address, telephone number, fax number, pager number, and E-mail address shall be included.

8. List of Spares/Consumables

   This section shall list all the spares, consumable materials, and maintenance tools that will be maintained and kept to ensure continued satisfactory operation of the equipment and systems.

9. Organization of Maintenance Team

   This section shall include detailed organization of the Maintenance team deployed for the defect Notification Period with names and CV's, of all key staff. Contact telephone or email id for emergency and/or twenty-four (24) hour call shall also be included.

10. List of As-Built Drawings

    This section shall contain a full list of all "as-built" and "as-manufactured" drawings.

Taking over Procedure

The Contractor shall adhere to the sequence of handover described below:

- The Contractor shall submit the arrangement of the commissioning to the satisfaction of the Engineer. The Engineer reserves the right to reject any person.
- The installation shall be 'practically complete' following satisfactory commissioning, performance guarantee and the submission of final commissioning data prior to the issuance of Taking over Certificate by the Engineer. It is solely the Contractor's responsibility to ensure that all plant/equipment shall have their respective warranty by the respective equipment/plant supplier directly.
- A joint inspection shall be held among the Employer, Engineer and Contractor to establish an outstanding works and defects list. All outstanding works/defects shall be completed within one month from the date when the Taking over Certificate was issued.
- If, at the end of the one month's period from the date of issuing the Taking over Certificate, any defects/outstanding works mentioned in the list still exist, the Engineer is empowered to appoint a body to rectify all defects/outstanding works and deduct the cost involved from the Contract sum.
- The Contractor shall also refer to other requirements in the relevant clauses of the Contract. Before the Taking over Certificate is issued, the following must be completed:
- 5 Sets of Operation and Maintenance Instructions Manual, test data and "as-built" drawings must be submitted. Computer "soft" copies of these manuals and drawings shall also be submitted.
- 5 sets of copy from the manufacturer of relevant code compliance certification for the equipments and other accessories used in the projects and mentioned in this document.
- The Employer or his representative must be fully trained in the operation of the system. A written acknowledgment from the Employer shall be required.
- All tools and spares shall be handed over. A written acknowledgment from the Employer shall be required.
- Written confirmation from the Contractor to indicate the installation is completed according to Performance Requirement.
- Submit and obtain approval by the Engineer. Adhere to maintenance schedule for the installation during the Maintenance and Defect Notification Period.

As-New Conditions

At the time of handover of the Works after the Taking over Certificate, the whole installation shall be in 'as-new' conditions. The Contractor shall, during the course of the Contract, protect all plant and equipment and shall restore/repaint as necessary before handover of the installation.

Defect Notification Period

Defects Notification Period for Plumbing & Sanitary systems shall be 12 months. The period commencing on the date of issue of the Taking-Over Certificate. During the Defect Notification Period, the Contractor shall provide a 24-hour 'call-out' service to repair any equipment that has broken down.
Immediately answering the breakdown calls, the Contractor shall attend to such calls within a maximum time limit of 2 hours during night and 1 hour during daytime of receiving such calls.
During the Defect Notification Period, the Contractor shall at his own cost rectify and make good with all faults or defects in the works, which in the opinion of Engineer, is due to faulty materials, workmanship. The Contractor shall indemnify the employer and/or the General Contractor against any damage or injury to the Building contents and/or occupants arising from such faults or defects.
If the Contractor fails to remedy such faults or defects within a reasonable time, the Employer may proceed to do so at the expense of the Contractor and without prejudice to such other rights as the Employer may have under the Contract.
The Contractor shall also refer to other requirements in the relevant clauses of the contract.

Vermin Proofing and Cleaning

On completion of the installation, the Contractor shall check and ensure that all cable entries, openings, core holes, etc. are properly sealed with fire rated material and rendered vermin proof and water tight. The floors, trenches and surroundings shall be cleaned, mopped, and left in a clean, dust free state on completion. Building works and paint work of equipment damaged during the installation works shall be made good to the satisfaction of the Engineer.
All costs involved in the above shall be deemed to be included in each installation.

Contractor's Obligations for Production of Shop Drawings

The Contractor's obligations for the production of Shop Drawings shall, in addition to other requirements specified elsewhere in the Contract Documents, include the following:

- Adjustments and enhancement of services as a result of space co-ordination to provide sufficient installation and maintenance access to facilitate easy future operation and maintenance
- Re-routing and re-organization of services to achieve the clear headroom/ceiling height Adjustments and enhancements to suit the construction works on site
- Adjustments and enhancements to suit equipment/systems offered
- Adjustments and enhancements to suit public utility connections
- Adjustments and enhancements to suit existing public utilities locations for avoiding diversions of these existing utilities
- Adjustments and enhancements due to coordination and interfacing with other trades (e.g. power supply, water supply, electro-magnetic compatibility, etc.)
- Changes required as a result of certain construction sequence and methods
- Adjustments and modifications of the installation arrangement to suit the specified phased completion and early hand-over areas
- Adjustments and/or enhancements to correct or clarify any discrepancies in the Contract Documents, Working Drawings, Specification and other performance requirement subject to the approval of the Engineer.

- The Contractor shall be responsible and liable for the preparation of all Shop Drawings necessary or required under the Specifications and/or for the construction of the Works. The Shop Drawings prepared by the Contractor shall be based on the Contract Document. These Shop Drawings shall be subject to the approval of the Engineer.

- During the course of the Contract, the Contractor shall produce and commence submission of detailed shop drawings sufficiently early for the Engineer's review. These shop drawings shall be submitted progressively in accordance with the construction programme. Clearance or approval of any such drawings by the Engineer shall not relieve the Contractor from any specified performance or material requirements, nor nullify the Engineer's right to reject unsatisfactory works on the site. A minimum period of twenty-one (21) days shall generally be allowed for the review of each shop drawing submission by the Engineer. The Contractor is deemed to have allowed for this 21 day review period for each submittal in his Construction Schedule.

- Installation works carried out by the Contractor before the relevant shop drawings submitted and approved by the Engineer are at the Contractor's own risk.

- Shop drawings shall show at least the following general categories of information:

- Penetrations through floors, walls, and other structural members;

- Plinth details/RL;

- Equipment positions and operating weights;

- Entry positions on structural drawings, access routes, weight of equipment or components during delivery to site;

- Services access openings;

- Location, details of concealed/buried conduits, inserts, and pipes;

- Temporary openings in floors/walls;

- Detailed workshop and manufacturing drawings;

- Equipment schedules;

- Electrical wiring and control diagram;

- General layout plans and sections (1:50 scale for plans and 1:20 scale for sections);

- Schematic diagram;

- Support and mounting details;

- Material/Component specifications;

- Setting out dimensions and level; and

- Interfacing details and co-ordination with Architectural, structural and all installation Works.

In preparing the Shop Drawings, the Contractor shall provide all construction-related engineering input and undertake construction co-ordination, inter-facing, cross-checking's, sequencing and construction detailing subject to the absolute approval of the Engineer.

Shop drawings shall be constantly updated to reflect modifications and changes agreed/accepted by the Engineer and to reflect changes issued by Engineer's instructions.

Shop drawings produced shall be properly coordinated with the other services and works of all installation. Where required for proper co-ordination and to achieve required headroom, the Contractor shall make modification of services layout/routing, duct aspect ratios, pipe work gradient, etc. (from those shown on the Contract Drawings) and reflect all these on the shop drawings for the Engineer's approval.

The Contractor shall co-ordinate and provide on time the details of builders works required to be incorporated into the construction works. For builder's work information has already been given on the Drawings or the Contract drawings, such information are to be checked by the Contractor to ensure suitability and sufficiency for his works.

Engineer's comments and corrections made on shop drawings shall not relieve the Contractor of his contractual responsibilities to comply with requirements of the Specification and Drawings.

Shop drawings shall be updated progressively to reflect "as-built" conditions.

In preparing the Shop Drawings, the Contractor shall co-ordinate the information in the Contract, engineering the installation and demonstrates the installation adequacy, practicality, suitability, compliance of any statutory requirements and integrity of other information in the Contract Documents. The Contractor shall not be entitled to any increase whatsoever to the Contract Sum for the Works or any extension of time to complete the Works.

3. SECTION - I SANITARY FIXTURES & FITTINGS

1. SCOPE OF WORK

1.1 Work under this section shall consist of furnishing all labor as necessary and required to completely install all Sanitary Fixtures, brass and chromium plated fittings and accessories as required by the drawings and specified hereinafter or given in the Schedule of Quantities.

1.2 Without restricting to the generally of the foregoing the Sanitary Fixtures shall include all Sanitary Fixtures (supplied by client) , C.P. fittings and Accessories etc. necessary and required for the Building.

1.3 Whether specifically mentioned or not all Fixtures and appliances shall be provided with all fixing devices, nuts, bolts, screws, hangers as required.

1.4 Testing of all fixture and fittings.

2. GENERAL REQUIREMENTS

2.1 All Fixtures and fittings shall be provided with all such accessories as are required to complete the item in working condition whether specifically mentioned or not in the Schedule of Quantities, Specifications and Drawings.

2.2 All Fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per Architectural/Interior designer's requirements. Wherever necessary the fittings shall be centered to dimensions and pattern desired.

2.3 Fixing screws shall be half round head Chromium Plated brass with C.P. washers wherever required as per directions of Project Manager.

2.4 All Fittings and Fixtures shall be fixed in a neat workmanlike manner true to Levels and Heights shows on the drawings and in accordance with the manufacturer's recommendations. Care shall be taken to fix all Inlet and Outlet Pipes at correct positions. Faulty locations shall be made good and any damage to the finished floor, tiling or terrace shall be made good at Contractors cost.

2.5 When directed, Contractor shall install Fixtures and accessories in a mock-up room for the approval of the Project Manager. Sample room Fixtures may be reused on the works if undamaged, but no additional payment for fixing or dismantling shall be admissible.

3. FLUSHING CISTERN

3.1 The flushing cisterns shall be automatic or manually operated high level or low level as specified, for water closets and urinals. A high level cistern is intended to operate with minimum height of 125 cm and a low level cistern with a maximum height of 30 cm between the top of the pan and the under side of the cistern.

3.2 Cisterns shall be of following type (i) Vitreous China (IS 774) for Flushing type (ii) Automatic Flushing Cistern (IS 2326) and (iii) Plastic cisterns (IS 7231).

Vitreous China Cisterns : The thickness of the body including cover shall be not less than 6 mm for vitreous China cisterns. The outlet of each syphon or stand pipe shall be securely connected to the cistern by means of lock nut. The cistern shall be free from manufacturing faults and other defects affecting their utility. All working parts shall be designed to operate smoothly and efficiently. Cistern shall be mosquito proof. A cistern shall be considered mosquito proof only if there is no
clearance any where which would permit a 1.6 mm wire to pass through in the permanent position of the cistern i.e. in the flushing position or filling position.

The breadth of a low level cistern, from front to back shall be such that the cover or seat, or both, of water closet pan shall come to rest in a stable position when raised.

The cistern shall be supported on two cast iron brackets of size as approved by the Engineerin-Charge and embedded in cement concrete 1:2:4 block 100 x 75 x 150 mm. These shall be properly protected by suitable impervious paint. Alternatively the cisterns shall have two holes in the back side above the overflow level for screwing into the wall, supplemented by two cast iron wall supports. A 5 litres cistern, however, may be supported by larger brackets cast on the body of the cistern.

The cistern shall have a removable cover which shall fit closely on it and be secured against displacement. In designs where the operating mechanism is attached to the cover this may be made in two sections, but the section supporting the mechanism shall be securely bolted or screwed to the body. The outlet fitting of each cistern shall be securely connected to the cistern. The nominal internal diameter of cistern outlet shall be not less than 38 ± 1mm for low level cisterns respectively. The length of the outlet of the cistern shall be 37 ± 2 mm.

Ball valve shall be of screwed type 15 mm in diameter and shall conform to IS 1703. The float shall be made of polyethylene as specified in IS 9762. (The design shall permit the cistern to fill in rapidly and close effectively when the level of water reaches the working water level.)

In the case of manually operated cisterns the siphonic action of the flushing cistern shall be capable of being rapidly brought into action by the operating lever, but shall not self siphon or leak. When tested according to IS 774 the discharge rate shall be 10 ± 0.5 litre in 6 seconds and 5 ± 0.5 litre in 3 seconds for cisterns of capacities 10 litre and 5 litre respectively. The cisterns shall be so designed that there is not appreciable variation in the force of flush during the discharge of the required quantity of water. The cistern shall have a discharge capacity of 5 & 10 litres as specified.
When required to give a full flush, they shall respectively discharge 5 litres and 10 litres with variation of ± 0.5 litres.

The flush pipe shall be of (a) medium quality galvanised iron having internal diameter of 38 ± 1 mm for low level cistern. The flush pipe shall be of suitable length with bends etc. As required for fixing it with front or back inlet W.C. Pan. (b) Polyethylene pipes low density conforming to IS 3076 or high density (c) Unplasticised PVC pipes. For high density polyethylene and unplasticised PVC pipes, the outside diameter of the pipes shall be 40 mm. When PVC plumbing pipes are used the outside diameter of the pipe shall be 40 mm for high level cisterns and 50 mm for low level cisterns.

In case of low level cistern the flush pipe shall be a vertical pipe 30 cm long and having a nominal internal dia 38 ± 1 mm (except plastic flush pipes).

Over Flow Pipe

a) GI overflow pipe shall be of not less than 20 mm nominal bore and shall incorporate a noncorrodible mosquito proof brass cover having 1.25 mm dia perforation, screwed in a manner which will permit it to be readily cleaned or renewed when necessary. No provision shall be made whereby the overflow from the cistern shall discharge directly into the water closet or soil pipe without being detected. The invert of the overflow pipe in the case of high level and low level cisterns shall be 19 mm minimum above the working water level. In case of overflow due to any reason water should drain out through the over flow pipe and not through the siphon pipe.

b) The plastic overflow pipes shall be manufactured from high density polyethylene conforming to IS 4984 or unplasticised P.V.C. conforming to IS 4985.

Inlet and Overflow Holes: The cistern shall be provided with inlet and overflow holes, situated one at each end which shall be capable of accommodating an overflow pipe of not less than 20 mm nominal bore and a 15 mm size ball valve. The holes shall be cleanly cast or drilled and the adjacent surfaces shall be smooth.

4. Draining Board

Draining board made of Glazed fireclay conforming to C.P.W.D. Specifications and as per directions of Engineer-in-Charge, shall be provided. The size of the board shall be as specified. The entire surface including bottom of the board shall be finished smooth.

5. M.S. Stays and Clamps

The clamps shall be made from 1.5 mm thick M.S. flat of 32 mm width, bent to the required shape and size to fit tightly on the socket, when tightened with nuts & bolts. It shall be formed of two semicircular pieces with flanged ends on both sides with holes to fit in the screws, bolts and nuts 40 mm long. The stay shall be minimum one metre long of 10 mm dia M.S. bar. One end of the stay shall be bent for embedding in the wall in cement concrete block of size 20 x 10 x 10 cm in 1:2:4 mix (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size). The concrete shall be finished to
match with the surrounding surface.

6. **Plastic Seat and Covers for Water Closet**

The seat and cover shall be of thermosetting or thermoplastic conforming to IS 2548 (Part-1) or of thermoplastic confirming to IS 2548 (Part-2) as specified. Unless otherwise specified these shall be of closed pattern.

Thermosetting plastic used shall conform to grade 2 or 3 of IS 1300 when it is phenolic plastic or IS 3389 when of urea formaldehyde.

Thermo plastic materials used may be of Polystyrene conforming to type 2 or 3 of IS 2267 or of polypropylene, Appendix A of IS 2548. In public buildings where rough and heavy use of seats and covers are common, plastic seats shall be moulded out of thermosetting materials, phenolic or urea formaldehyde only and the underside of the seat shall be flat with solid moulding.

The hinging device shall be bronze or brass with nickel chromium plating confirming to IS 1068 and the seat shall have not less than three rubber or plastic buffers of size 25 mm x 40 mm x 10 mm for closed front seats and not less than four for open front seats, which shall be securely fixed to the underside of the seat unless otherwise specified. The cover shall be fitted with the same number of buffers as provided for the seat .

Seats shall have a smooth finish and shall be non absorptive and free from cracks and crevices. They shall be capable of being easily cleaned and shall not be adversely affected by common solvents or household cleanser.

Strength: The seats shall withstand without permanent distortion of the seat or hinge fittings or damage to any finish, a load of 1150 N for 30 minutes applied in the manner prescribed in IS 2548.

7. SINKS

Kitchen sinks shall be of white glazed fire clay confirming to IS 771 (Part-2) with up to date amendments. The kitchen sink shall be of one piece construction with or without rim but without overflow.

Stainless steel kitchen sink shall be of sizes as specified and shall be conforming to IS 13983.

8. TOWEL RAIL

The towel rail shall be of PTMT as specified and as per direction of Engineer-in-charge.

9. TOILET PAPER HOLDER

The toilet paper holder shall be of CP brass or vitreous china as specified and of size and design as approved by the Engineer-in-Charge. It shall be fixed in position by means of C.P. brass screws and rawl plugs embedded in the wall.

10. URINALS

Bowl Type Urinals: Urinal basins shall be of flat back or corner wall type lipped in front. These shall be of white vitreous china conforming to IS 2556-(Part 6). The urinals shall of one piece construction. Each urinal shall be provided with not less than two fixing holes of minimum dia 6.5 mm on each side. Each urinal shall have an integral flushing rim of suitable type and inlet or supply horn for connecting the flush pipe. The flushing rim and inlet shall be of the self draining type. It shall have a weep hole at the flushing inlet of the urinals. At the bottom of the urinal an outlet horn for connecting to an outlet pipe shall be provided. The exterior of the outlet horn shall not be glazed and the surface shall be provided with grooves at right angles to the axis of the outlet to facilitate fixing to the outlet pipe. The inside surface of the urinal shall be uniform and smooth throughout to ensure efficient flushing. The bottom of pan shall have sufficient slope from the front towards the outlet such that there is efficient draining.

Half Stall Urinals : They shall be of white vitreous China conforming to IS 2556 (Part 6). They shall be of one piece construction with or without an integral flushing box rim and provided with slots or alternative fixing arrangement at the flat back end. They shall be provided with ridges where integral flushing rim is not provided in the sides of the interior of the bowl, to divert the water towards the front line of the urinal where integral flushing box rim is specified, water spreaders provided shall conform to IS 2556 Part-6 (Fig. 17.13) . These shall be vitreous China of one piece construction with integral flush inlet. The tolerance of ± 4 per cent may be allowed on the dimensions specified.

Urinal Partition Slabs : Urinal Partition slabs shall be provided, as specified in the item of work.

11. WASH BASIN

Wash basins shall be of white vitreous china conforming to IS 2556 (Part -I) and IS 2556 (Part-4). Wash basins either of flat back or angle back as specified shall be of one piece construction, including a combined overflow. All internal angles shall be designed so as to facilitate cleaning. Each basin shall have a rim on all sides, except sides in contact with the walls and shall have a skirting at the back. Basins shall be provided with single or double tap holes as specified. The tap holes shall be 28 mm square or 30 mm round or 25 mm round for pop up hole. A suitable tap hole button shall be supplied if one tap hole is not required in installation. Each basin shall have circular waste hole to which the interior of basin shall drain. The waste hole shall be either rebated or beveled internally with dia meter of 65 mm at top. Each basin shall be provided with a non-ferrous 32 mm waste fitting. Stud slots to receive the brackets on the underside of the wash basin shall be suitable for a bracket with stud not exceeding 13 mm diameter, 5 mm high and 305 mm from the back of basin to the centre of the stud. The stud slots shall be of depth sufficient to take 5 mm stud. Every basin shall have an integral soap holder recess or recesses, which shall fully drain into the bowl. A slot type of overflow having an area of not less than 5 sq. cm, shall be provided and shall be so designed as to facilitate cleaning of the overflow.

Where oval shape or round shape wash basins are required to be fixed these shall be fixed preferably in RCC platform with local available stone topping either fully sunk in stone top or top flush with the stone topping as directed by Engineer-in-Charge.

The wash basins shall be one of the following patterns and sizes as specified (Fig. 17.14).
(a) Flat back: 630 × 450 mm, 550 × 400 mm, 450 × 300 mm
(b) Angle back: 600 × 480 mm 400 × 400 mm

White glazed pedestals for wash basins, where specified shall be provided. The quality of the glazing of the pedestal shall be exactly the same as that of the basin along with which it is to be installed. It shall be completely recessed at the back to accommodate supply and waste pipes and fittings. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from the floor to top of the rim of basin 75 to 80 cm. All the waste fittings shall be brass chromium plated, or as specified.

12. WATER CLOSET (EUROPEAN TYPE WC)

Water closets shall be of white vitreous china conforming to IS 2556 (Part-1) and 2556 (Part-2), as specified and shall be of "Wash down type". The closets shall be either of the two patterns (Pattern I & Pattern II) and sizes as shown in Fig. 17.22 & 17.23 as specified. The closets shall be of one piece construction. Each water closet shall have not less than two holes having a minimum diameter of 6.5 mm for fixing to floor and shall have an integral flushing rim of suitable type. It shall also have an inlet or supply horn for connecting the flushing pipe of dimensions as shown in table in Fig. 17.20 & 17.21 the flushing rim may be boxed or open type. In the case of box rims adequate number of holes, on each side together with a slot opposite the inlet shall be provided. The flushing rim and inlet shall be of the self draining type. The water closet shall have a weep hole at the flushing inlet. Each water closet shall have an integral trap with either 'S' or 'P' outlet with at least 50 mm water seal. For P trap, the slope of the outlet shall be 14 deg. below the horizontal. Where required the water closet shall have an antisiphonage 50 mm dia vent horn on the outlet side of the trap with dimension conforming to those given in Fig. 17.22 and on either right or left hand or centre as specified set at an angle of 45 deg. and invert of vent hole not below the central line of the outlet. The inside surface of water closets and traps shall be uniform and smooth in order to enable an efficient flush. The serrated part of the outlet shall not be glazed externally. The water closet, when sealed at the bottom of the trap in line with the back plate, shall be capable of holding not less than 15 litres of water between the normal water level and the highest possible water level of the water closet as installed.

13. GENERAL REQUIREMENTS FOR INSTALLATION OF W.C. PAN

The work shall be carried cut, complying in all respects with the requirements of relevant bye laws of the local body in whose jurisdiction the work is situated.

Any damage caused to the building, or to electric, sanitary, water supply or other, installations etc. therein, either due to negligence on the part of the contractor, or due to actual requirements of the work, shall be made good and the building or the installation shall be restored to its original condition by the contractor. Nothing extra shall be paid for such restoration works except where otherwise specified.

For making good the damage to the under mentioned items of work, the specifications as given in the following paras shall apply, unless directed otherwise.

Masonry Work: The masonry work shall be made good by using the same class of bricks, tiles or stones as was damaged during the execution of the work. The mortar used shall be cement mortar 1:5 (1 cement: 5 fine sand) or as directed by the Engineer-in-Charge.

Plain Concrete Work : Concrete work for sub-grade of the flooring, foundations and other plain concrete works shall be cement concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size). A coat of neat cement slurry shall be applied at the junction with old work, before laying fresh concrete.

Cement concrete flooring and R.C.C work: Cement concrete 1:2:4 (1 Cement : 2Coarse sand : 4 graded stone aggregate 20 mm nominal size) shall be used after applyinga coat of neat cement slurry at the junction with old work, and the surface finished to match with the surrounding surface.

Plastering: Cement plaster 1:4 (1 cement: 4 sand) shall be used. The sand shall be fine or coarse, as used in the original work. The surface shall be finished with two or more coats of white wash, colour wash, distemper or painting as required, but where the surface is not to be white washed, colour washed, distempered or painted, it shall be finished as required to match with the surrounding surface.

Other Items: Damage to any other item shall be made good as directed by the Engineer-in Charge.

Note: In all the above operations the damaged portion shall be cut in regular geometric shape and cleaned before making good the same.
All exposed G.I., C.I. or lead pipes and fittings shall be painted with approved quality of paint and shade as specified. The painting work shall conform to specification described under SH: Painting.
All sanitary and plumbing work shall be carried out through licensed plumbers.
On completion of the work the site shall be cleaned and all rubbish disposed off as directed by the Engineer-in-Charge.
Various sanitary fittings described under 17.1 including fixing shall be enumerated individually or in combination under relevant items of works as described below. When used in combination, specifications as described under relevant paras shall apply but nothing extra shall be paid for making connections required for successful functioning of the combination.

14. INSTALLATION OF DRAINING BOARD

Fixing
One end of the board shall rest on sink and the other end shall be supported on C.I. bracket embedded in cement concrete (1:2:4) block 100 × 75 × 150 mm. The brackets used shall be of cantilever type or wall fixed type as for the sink.

Painting
The brackets shall be painted with two or more coats of approved paint.

Measurements
Draining board shall be measured in numbers.

Rate
The rate shall include the cost of all materials and labour involved in all operations.

15. INSTALLATIONS OF FLUSHING CISTERN

Fixing
Low Level Cistern: The cistern shall be fixed on C.I. cantilever brackets which shall be firmly embedded in the wall in cement concrete (1:2:4) block 100 x 75 x 150 mm. Connection between cistern and closet shall be made by means of 40 mm dia flush bend with rubber or G.I. inlet connection as specified.

Automatic Cistern: Clause 17.4.1.1 shall apply except that CP Brass stop cock shall be provided for cistern having a capacity of more than 5 liter. The main & distribution flush pipe shall be fixed to the wall by means of standard pattern holder bat clamp shown in Fig. 17.5.
Painting
The brackets shall be painted, if specified, with two or more coats of paint of approved shade and quality.

Measurements
Cistern, including all fittings, shall be measured in numbers.

Rate
The rate shall include the cost of all materials and labour involved in all the operations described above.

16. INSTALLATION OF SEAT AND COVER TO WATER CLOSET

Fixing

The seat shall be fixed to the pan by means of two corrosion resistant hinge bolts with a minimum length of shank of 65 mm and threaded to within 25 mm of the flange supplied by the manufacturer along with the seat. Each bolt shall be provided with two suitably shaped washers of rubber or other similar materials for adjusting the level of the seat while fixing it to the pans. In addition, one non ferrous or stainless steel washer shall be provided with each bolt. The maximum external diameter of the washer fixed on the underside of the pan shall not be greater than 25 mm. Alternative hinging devices as supplied by the manufacturer of the seat can also be used for fixing with the approval of Engineer-in-Charge.

Measurements

Seat with cover shall be measured in numbers.

Rate

Rate shall include the cost of all the materials and labour involved in all the operations described above.

17. INSTALLATION OF SINK

The installation shall consist of assembly of sink C.I. brackets, union and G.I. or P.V.C. waste pipe.

Fixing

The sink shall be supported on C.I. cantilever brackets, embedded in cement concrete (1:2:4) block of size 100 x 75 x 150 mm. Brackets shall be fixed in position before the dado work is done. The C.P. brass or P.V.C. union shall be connected to 40 mm nominal bore G.I. or PVC waste pipe which shall be suitably bent towards the wall and shall discharge into a floor trap. C.P. brass trap and union and waste shall be paid separately. The height of front edge of sink from the floor level shall be 80 cm.

Measurements

The sinks shall be measured in numbers.

Rate

Rate shall include the cost of all materials and labour involved in all the operations described above but shall not included the cost of waste fitting and brackets which shall be paid for separately.

18. INSTALLATION OF URINAL LIPPED, HALF STALL (SINGLE OR RANGE)

17.9.0 Urinal installation shall consist of a lipped urinal (Single or range), an automatic flushing cistern, G.I. flush and waste pipe. The capacity of flushing cistern and relevant size of flush pipe for urinals in a range shall be as prescribed in Table 17.3.
Waste pipe shall be of 40 mm nominal bore G.I. pipe and shall be paid separately.

Fixing

Urinals shall be fixed in position by using wooden plugs and screws. It shall be at a height of 65 cm from the standing level to the top of the lip of the urinal, unless otherwise directed by the Engineer -in-Charge. The size of wooden plugs shall be 50 mm × 50 mm at base tapering to 38 mm × 38 mm at top and of length 5.0 cms. These shall be fixed in the wall in cement mortar 1:3 (1 cement: 3 fine sand). After the plug fixed in the wall, the mortar shall be cured till it is set.

TABLE 17.3

No. of Urinals	Capacity of Flushing Cistern	Size of Flush Pipe (Galvanised Iron)	
		Main	Distribution
One	5 Litres	15 mm	15 mm
Two	10 Litres	20 mm	15 mm
Three	10 Litres	25 mm	15 mm
Four	15 Litres	25 mm	15 mm

Each urinal shall be connected to 32 mm dia waste pipe which shall discharge into the channel or a floor trap. The connection between the urinal and flush or waste pipe shall be made by means of putty or white lead mixed with chopped hemp.

Measurements
Urinals shall be measured in numbers.

Rate
Rate shall include the cost of all the materials and labour involved in all the operations described above.

19. INSTALLATION OF STALL URINAL (SINGLE OR RANGE)

The installation shall consist of stall urinal (single or range), automatic flushing cistern, C.P. brass standard flush pipes, C.P. brass spreader and C.I. trap with tail piece and outlet grating of C.P. brass. Capacity of flushing cistern and relevant size of flush pipe, C.I. trap shall be as prescribed in Table 17.4.

TABLE 17.4

No. of Urinals in range	*Capacity of Flushing cistern*	*Size of Flush Pipe (Chromium Plated)*		*Diameter of C.I. Traps*
		Main	*Distribution*	
One	05 Litres	15 mm	15 mm	50 mm
Two	10 Liters	20 mm	15 mm	50 mm
Three	15 Litres	25 mm	15 mm	80 mm
Four	15 Litres	25 mm	15 mm	80 mm

Fixing
The floor slab shall be suitably sunk to receive the stall urinal. Where the floor slab is not sunk, the stall urinal shall be provided over a platform. The lip of the stall urinal shall be flush with the finished floor level adjacent to it. The stall urinal shall be laid over a fine sand cushion of average 25 mm thickness. A space of not less than 3 mm shall be provided all -round, in front, sides and filled with water proofing plastic compound. Care shall be taken that after the sub-grade for the floor is cast, one week should lapse before urinals are installed. The trap and fittings shall be fixed as directed by the Engineer-in-Charge. Payment for the floor and its sub-grade shall be made separately.

Measurements
Stall urinals shall be measured in numbers.

Rate
The rate shall include the cost of all the materials and labour involved in all the operations described above.

20. INSTALLATION OF WASH BASIN

The installation shall consist of an assembly of wash basin, pillar taps, C.I. brackets, C.P. brass or P.V.C. union, as specified. The wash basin shall be provided with one or two 15 mm C.P. brass pillar taps, as specified. The height of top of the rim of wash basin from the floor level shall be within 750 mm to 800 mm.

Fixing
The basin shall be supported on a pair of C.I. cantilever brackets conforming to IS 775 and be embedded in cement concrete (1:2:4) block 100 x 75 x 150 mm. Use of M.S. angle or Tee section as bracket is not permitted. Brackets shall be fixed in position before dado work is done. The brackets have been shown in Fig. 17.15. The wall plaster on the rear shall be cut to rest over the top edge of the basin so as not to leave any gap for water to

seep through between wall plaster & skirting of basin. After fixing the basin, plaster shall be made good and surface finished matching with the existing one. S.C.I. floor traps conforming to IS 1729 having 50 mm water seal (minimum 35 mm in two pipe systems with gully trap) should be used. Waste pipes laid horizontally should have gradient not flatter than 1 in 50 and not steeper than 1 in 10.

The waste water from wash basin shall be discharged directly to vitreous semi-circular open drain, discharging to a floor trap and finally to the vertical stack (Fig.17.15) on upper floors and in case of ground floor, the waste water shall be discharged either directly to the gully trap or through the floor trap (Fig. 17.16). C.P. brass trap and union are not to be used in such situations. If waste pipe is concealed or crosses the wall, waste water shall be discharged through non ferrous trap like PVC Engineering plastic or C.P. brass and union (Fig. 17.17) to vertical stack. The C.P. brass trap and union shall be paid for separately. Where so specified a 20 mm G.I. puff pipe terminating with a perforated brass cap screwed on it on the outside of the wall or connected to the antisyphon stack shall be provided.

Measurements
Wash basins shall be measured in numbers.

Rate
The rate shall include the cost of all the materials and labour involved in all the operations described above.

21. INSTALLATION OF TOWEL RAIL

It shall be fixed in position by means of C.P. brass screws on wall surface by PVC dash fasteners, firmly embedded in wall.

Measurements
Tower rails shall be measured in numbers.

Rate
Rate shall include the cost of all the materials and labour involved in all the operations described above.

22. INSTALLATION OF STAINLESS STEEL SINK

Stainless steel A ISI 304 (18/8) kitchen sink.
The installation shall consist of assembly of sink C.I. brackets, union and G.I. or P.V.C. waste pipe.

Fixing
The stainless steel sink shall be fixing as per IS:13983 and shall be supported on C.I. cantilever brackets, embedded in cement concrete (1:2:4) block of size 100 x 75 x 150 mm. Brackets shall be fixed in position before the dado work is done. The C.P. brass or P.V.C. union shall be connected to 40 mm nominal bore G.I. or PVC waste pipe which shall be suitably bent towards the wall and shall discharge into a floor trap. C.P. brass trap and union and waste shall be paid separately. The height of front edge of sink from the floor level shall be 80 cm.

DIMENSIONS AND TOLERANCES
Thickness of Sheet/Strip Nominal thickness of stainless steel sheet/ strip used in the construction of sink shall be not less than 1.00 mm before forming. Thickness at any point of sink, after forming, shall not be less than 0.75 mm.

Depth of Bowls
The depth of the sink bowl shall be 150 mm minimum, when measured from the top edge of the bowl to the base of the sink.

NOTE - Depth of smaller bowl shown in Fig. 1 for Type E2 and E3 may be reduced up to 100 mm.

Internal Dimensions of Bowls

The minimum internal dimensions, when measured on the bowl centre lines across the top of the bowl shall be 380 mm x 340 mm for rectangular bowls and 360 mm for round bowls.

NOTES I. There is no restriction on bowl shape provided the minimum dimensions given in this clause are complied with.
1. Internal width of smaller bowl for Type E2 and E3 may be reduced as per the manufacturers design.

Bowl Locating Limits
The distance between the edge of the sink bowl and the end of the sink shall be 15 mm minimum for sit-on type sinks and 30 mm minimum for inset type sinks. Depth of the collar provided for inset sinks shall be 10 ± 2 mm, For sinks designed for use with a 600 mm wide work top, the distance between the edge of the sink bowl and the front of the sink shall be 50 mm minimum and in the case of sinks designed for use with 500 mm wide worktop, the distance shall be 45 mm minimum.

Both single and double bowl sink shall be set a minimum of 10 mm from gridline.

Measurements
The sinks shall be measured in numbers.

Rate
Rate shall include the cost of all materials and labour involved in all the operations described above but shall not included the cost of waste fitting and brackets which shall be paid for separately.

23. TOILETS FOR THE DISABLED

Where specified, in washroom facilities designed to accommodate physically disabled, accessories shall be provided as directed by the Owner's Site Representative.
Stainless steel garb brass of required size suitable for concealed or exposed mounting and opened non-slip gripping surface shall be provided in all washroom. The flushing cistern/valve shall be provided with chromium plated long handles.

24. CUTTING CHASE IN MASONRY WALL

Cutting chasing in brick masonry wall shall be has specified in item no. 18.22.

Filling chases
After sand cast iron/ centrifugally cast/spun iron pipe etc. are fixed in chases, the chases shall be filled with cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 12.50 mm nominal size) or cement mortar 1:4 (1 cement: 4 coarse sand) as may be specified or otherwise directed by the Engineer-in Charge and made flush with the masonry surface. The concrete surface shall be roughened with wire brushes to provide a key for plastering.

Measurements
Chases shall be measured in running meter correct to a cm.

Rates
The rate shall include the cost of labour the materials involved in all the operations described above excluding the cost of providing pipes etc. which shall be paid separately.

25. INSTALLATION OF WALL MOUNTING WATER CLOSET (WC)

Installation
It shall consist of white vitreous china extended wall mounting WC of size 780x370x690 mm of approved shape, brand and manufacture with duel flush fitting of flushing capacity 3 Ltr / 6 Ltr (adjustable to 4 Ltr/8 Ltr) including seat cover and cistern fittings, nuts, bolts and gasket etc. complete in all respect as per direction of Engineer-in-Charge. Wall mounting water closet shall be of white vitreous China confirming to IS 2556 (Part 16) : 2002. For general requirement relating to terminology, materials, manufacture, glazing, defects, minimum thickness,

tolerances, performance and methods of tests shall confirm to IS 2556 (Part 1). Wall mounted water closet shall be of one piece construction. Each wall mounted water closet shall be provided with fixing arrangement and shall have an integral flushing rim of suitable type. It shall have an inlet for connecting the flushing pipe of dimension confirming to IS 2556 and mentioned in Table No.2. The flushing rim may be box or open rim type or a combination of both. In case of box rim, adequate number of holes and slot be provided. The flushing rim and the inlet shall be of the self draining type and weep hole shall be provided at the flushing inlet of the wall mounted water closet.
The WC shall be provided with not less than two fixing holes to enable the WC to be securely installed to the wall using metallic corrosion resistant bolts and nuts and an independent concealed support frame. The support frame (metal hanger or carrier), depending on the design shall be securely attached to the building structural members so that no strain is transmitted to WC connector or any part of the plumbing system.

Each wall mounted water closet shall have an integral trap and P type outlet confirming to IS 2556 (Part 16): 2002 and mentioned in Fig. 25 & Fig. 26. Inside surface of water closet and trap shall be uniform and smooth in order to ensure an efficient flushing. The outlet if without serration, shall be glazed and if same is with serration, may not be glazed.

Marking
Each piece of wall mounted water closet shall be cleary and indelibly marked at a suitable place with the following:-
(a) Name of trade mark of the manufacturer and
(b) Batch/lot numbers.

BIS certification marking
Wall mounted water closet shall be marked with the standard mark. The use of Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made.

General requirement for installation of WC
The specification described in 17.2 shall be hold good so far as it is applicable.
All sanitary and plumbing work shall be carried out through licensed plumbers.
On completion of the work the site shall be cleaned and all rubbish disposed off as directed by the Engineer-in-Charge.

Measurement
Wall mounted water closet shall be measured in numbers.

26. MEASUREMENT

Rates for fixing of Sanitary Fixtures Accessories, urinal partitions shall include all items and operations stated in the respective specifications and Schedule of Quantities and nothing extra is payable.
Rates for all items under specifications above shall be inclusive of cutting holes and chases and making good the same, C.P. screws, nuts, bolts and any fixing arrangements required and recommended by Manufacturers, Testing and Commissioning.

27. FINAL INSTALLATION

The contractor shall install all sanitary fixtures and fittings in their final position in accordance with approved trial assemblies and as shown on drawings. The installation shall be complete with all supply and waste connections. The connection between building and piping system and the sanitary fixtures shall be through proper unions and flanges to facilitate removal/replacement of sanitary fixtures without disturbing the built in piping system. All unions and flanges shall match in appearance with other exposed fittings.
Fixtures shall be mounted rigid, plumb and to alignment. The outlets of water closet pans and similar appliances shall be examined to ensure that outlet ends are butting on the receiving pipes before making the joints. It shall be ensured that the receiving pipes are clear of obstruction. When fixtures are being mounted, attention shall be paid to the possibility of movement and settlement by other causes. Overflows shall be made to ensure that

necessary anchoring devices have been provided for supporting water closets, wash basins, sinks and other appliances.

28. **PROTECTION AGAINST DAMAGE**

The contractor shall take every precaution to protect all sanitary fixtures against damage, misuse, cracking, staining, breakage and pilferage by providing proper wrapping and locking arrangement till the completion of the installation. At the time of handing over, the contractor shall clean, disinfect and polish all the fixtures and fittings. Any fixtures and fittings found damaged, cracked chipped stained or scratched shall be removed and new fixtures and fittings free from defects shall be installed at his own cost to complete the work.

4. SECTION – II INTERNAL DRAINAGE (SOIL, WASTE & VENT PIPES)

Testing

The pipe system should be tested after installation as follows:

(a) **Water Test**

The pipes shall be tested after installation & before the appliances are connected, preferably in sections so as to limit the static head of 4.5m. The pipe shall be filled with water for at least 30 minutes (to be confirmed). After filling, pipes shall be struck with a hammer and inspected for blow holes and cracks. Then it will be necessary to seal all openings and leaks at joints immediately as observed during the test and all defective pipes shall be rejected and removed from the site. Pipes with minor sweating shall be accepted at the discretion of the Project Manager.

(b) **Smoke Test**

Alternatively, the Contractor may test all Soil and Waste stacks by smoke testing machine. The smoke test shall be carried out as under:

Smoke shall be pumped into the stack after plugging all inlets and connections at the lowest points from a smoke testing machine which consists of a bellow & burner. The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detected by sight as well as by smell, if there is leak at any points of the pipe. The top end shall however be left open. The stack shall then be observed for leakness and all defective pipes and fittings removed or repaired as directed by the Project Manager. A test register shall be maintained and all entries shall be signed and dated by Contractors and Project Manager.

MEASUREMENTS

General

Rates for all items quoted shall be inclusive of all work and items given in the above mentioned specifications and Schedule of Quantities and applicable for the work under floor, in shafts or at ceiling level at all heights and depths.

All rates are inclusive of cutting holes and chases in RCC and masonry work and making good the same.

All rates are inclusive of pre testing and on site testing of the installations, materials and commissioning.

Pipes (Unit of measurement. Linear meter to the nearest centimeter)

Soil and waste pipes shall be measured overall along the center line correct to a centimeter including all fittings along its length. The rate for these pipes shall be inclusive of all fittings, clamps, solvent jointing and all other items described in the Schedule of Quantities. Traps structural clamps and cement concrete shall however be paid separately under the relevant item.

Hubless Centrifugally Cast (Spun) Iron Pipes and Fittings soil, waste and ventilating pipes, fittings and accessories shall conform to IS 15905. The hubless centrifugally cast (spun) iron pipes shall have plain both ends (spigot type), without sockets. The pipes and fittings shall be true to shape, smooth and cylindrical, their inner and outer surface being as nearly as practicable concentric. They shall be sound and shall be free from cracks, taps, pinholes and other imperfections and shall be neatly dressed and carefully fettled. All pipes and fittings shall emit a clear ringing sound when struck with a light hand hammer. The ends of pipes and fittings shall be reasonably square to their axis. The hubless centrifugally cast iron pipes shall be 3.0 metre or more in length. All pipes and fittings shall be coated internally and externally with the epoxy coating material at the factory, the fitting being preheated prior to total immersion in a bath containing a uniformly heated composition. The coating material shall have good adherence and shall not scale off. The tolerance in diameter of pipes shall be as prescribed in Table-17.2A below :

Table-17.2A
External Diameters and Tolerances

Sl. No.	Nominal size *DN (in mm)*	External Diameter *DE (in mm)*	Tolerance on External diameter DE *(in mm)*
(1)	(2)	(3)	(4)
1	50	58	+2 -1
2	75	83	+2 -1
3	100	110	+2 -2
4	150	160	+2 -2
5	200	210	+2.5 -2.5

The thickness of fittings and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The nominal & minimum thicknesses of pipes & fittings shall be as per Table-2 below:

Table-2
Nominal & Minimum Thickness of Pipes & Fittings

Sl. No.	Nominal size (DN)	Thickness 'e' mm			
		Pipe		Fittings	
		Nominal	Minimum	Nominal	Minimum
(1)	(2)	(3)	(4)	(5)	(6)
i)	50	3.5	3.0	4.2	3.0
ii)	75	3.5	3.0	4.2	3.0
iii)	100	3.5	3.0	4.2	3.0
iv)	150	4.0	3.5	5.3	3.5
v)	200	5.0	4.0	6.0	4.0

Joints: The pipes and fittings may assembled using various types of joints, The joints are intrinsic components of the drainage, whose characteristics and tolerances shall be specified in the manufactures catalogues. Taking into account the different applications of cast iron pipe work systems, various joint designs are permitted provided that they satisfy the requirement to this standard. The joints shall incorporate one or more EPDM rubber gasket(s) to ensure leak tightness and prevent direct contact between the ends of pipes, fittings and accessories. Materials for coupling of clamping components shall usually be made from:

(a) Ductile iron of grade 500/7 as per IS 1865, or

(b) Stainless steels in accordance with IS 1570 (Part 5) in order to ensure resistance to corrosion and a stabilization against the austenitic stainless steel with at least 17 percent chrome and 9 percent nickel of equivalent, or from material of comparable resistance.

(c) Ductile iron couplings of clamping components shall be coated internally and externally.

(d) All parts of the joints shall free from defects likely to compromise their suitability for use.

COMMISSIONING

After successful testing of the different soil and waste pipes in parts, the Contractor shall provide all facilities including necessary piping's, labors, tools and equipment etc. for carrying out testing and commissioning of the entire soil waste and rain water system complete as per requirement in the presence of Client representative/Consultant, whenever and as may be required. Generally, the following test/inspection has to be carried out:-

To check any leakages/seepages in the soil, waste and rain water pipes and doing water testing and smoke testing of the complete soil, waste and rain water piping system, in totality in sequential method as per site conditions.

To check that the access doors are available at all junction points in the entire soil and waste piping system and they are placed at proper approachable and accessible locations.

Providing supply/ drainage connection to all Kitchen for setting the above equipment in operation shall be the responsibility of Plumbing Contractor including the material required for the same.

1. FIXING AND JOINTING OF PIPES AND FITTINGS

The specifications described in sub-head 12.0 shall apply, as far as applicable, except that the joint shall be lead caulked. All soil pipes shall be carried up above the roof and shall have sand cast iron terminal guard.

Height of Ventilating Pipes

The ventilating pipe or shaft shall be carried to a height of at least 60 cms above the outer covering of the roof of the building or in the case of a window in a gable wall or a dormer window it shall be carried up to the ridge of the roof or at least 2 metres above the top of the window wherever applicable and to be ensured. In the case of a flat roof to which access for use is provided it shall be carried up to a height of 2 metres above the roof and shall not terminate within 2 metres, measured vertically from the top of any window opening which may exist up to a horizontal distance of 3 meters from the vent pipe into such building and in no case shall be carried to a height less than 3 metres above plinth level. In case the adjoining building is taller, the ventilating pipe shall be carried higher than the roof of the adjoining building, wherever it is possible.

The pipes above the parapet shall be secured to the wall by means of M.S. stay and clamps as Specified.

The connections between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning. The waste from lavatories, kitchen, basins, sinks, baths and other floor traps shall be separately connected to respective waste stack of upper floors.

Jointing

The interior of the socket and exterior of the spigots shall be thoroughly cleaned and dried. The spigot end shall be inserted into the socket right up to the back of the socket and carefully centered by two or three laps of treated spun yarn, twisted into ropes of uniform thickness, well caulked into the back of the socket. No piece of yarn shall be shorter than the circumference of the pipe. The jointed pipe line shall be at required levels and alignment. The leading of pipes shall be made by means of ropes covered with clay or by using special leading rings. The lead shall be melted so as to be thoroughly fluid and each joint shall be filled in one pouring.

The following precautions shall be taken for melting lead:

(a) The pot and the ladle in which lead shall be put shall be clean and dry.

(b) Sufficient quantity of lead shall be melted.

(c) Any scum or dross which may appear on the surface of the lead during melting shall be skimmed off.

(d) Lead shall not be overheated.

After the lead has been run into the joint the lead shall be thoroughly caulked. Caulking of joints shall be done after a convenient length of the pipes has been laid and leaded.

The leading ring shall first be removed and any lead outside the socket shall be removed with a flat chisel and then the joint caulked round three times with caulking tools of increasing thickness and hammer 2 to 3 kg. weight. The joints shall not be covered till the pipe line has been tested under pressure.

Use of collars for jointing is not permitted in any concealed or embedded location. However, in exposed locations where full length pipes cannot be fixed due to site constraints, collars (and not loose sockets) may be used subject to the following:
(a) No two consecutive joint shall be with the use of collars.
(b) The joint of collar with the cut/spigot end of the pipe shall be made on the ground in advance and tested against leakage before fixing.
(c) Cut/spigot end of the pipes shall be inserted in the collars up to the projection inside the collar and jointing shall be done as in the case of socket and spigot joint. The jointed pipe line shall be at required level/slope and alignment.

Testing
In order to ensure that adequate lead is poured properly into the joints and to control waste in use of lead, at the beginning of work three or four sample joints shall be made and the quantum of lead per joint approved by the Engineer-in-Charge. All sand cast iron/cast iron (Spun) pipes and fittings including joint shall be tested by smoke test to the satisfaction of the Engineer-in-Charge and left in working order after completion. The smoke test shall be carried out as under:
Smoke shall be pumped into the pipes at the lowest end from a smoke machine which consists of a bellow and burner. The material usually burnt is greasy cotton waste which gives out a clear pungent smoke which is easily detectable by sight as well as by smell, if there is leak at any point of the drain.

As marked in fig	*Pipe dia (size in mm)*			
	50	75	100	150
a	76	101	129	181
b	50	75	100	150
c	10	10	10	10
d	79	89	95	108
e	89	101	114	140

Painting
All sand cast iron/cast iron (Spun) pipes and fittings shall be painted with shade to match the colour of the background as directed by the Engineer-in-Charge.

Measurements
a. The pipes shall be measured net when fixed in position excluding all fittings along its length, correct to a cm.
b. When collars are used for jointing SCI pipes these shall be measured as fittings and shall be paid for separately.
c. No allowance shall be made for the portions of the pipe lengths entering the sockets of the adjacent pipes or fittings. The above shall apply to both cases i.e. whether the pipes are fixed on wall face or embedded in masonry.
d. No deduction shall be made in the former case from the masonry measurement for the volume of concrete blocks embedded therein. Similarly no deduction shall be made for the volume occupied by the pipes from the masonry when the former are embedded in the later.

5. SECTION – III WATER SUPPLY SYSTEM

CPVC PIPES & FITTINGS
The pipes shall be CPVC (Chlorinated Poly Vinyl Chloride) material for hot & cold water supply piping system with pipes as per CTs SDR -11 at a working pressure of 320 PSI at 23 deg C and 80 PSI at 82 deg.C, using solvent welded CPVC fittings i.e. Tees, Elbows, Couples, Unions, Reducers, Brushing etc. including transition fittings (connection between CPVC & Metal pipes / GI) i.e. Brass adapters (both Male & Female threaded and all conforming to ASTM D-2846 with only CPVC solvent cement conforming to ASTM F-493, with clamps / structural metal supports as required /directed at site including cutting chases & fitting the same with cement concrete / cement mortar as required, including painting of the exposed pipes with one coat of desired shade of enamel

paint. All termination points for installation of faucets shall have brass termination fittings. Installation shall be to the satisfaction of manufacturer & Project Manager. Pipes from 65 mm to 150 mm dia shall be Schedule 40 for CWC & Schedule 80 for HWS / HWR.

TECHNICAL DETAILS

Outside Diameters and Wall Thickness for CPVC 4120, SDR 11 Plastic Pipe									
Nominal Size		**Outside Diameter, in. (mm)**		**Wall Thickness, in. (mm)**		**Pressure Rating. PSI (Kg/Cm^2)**			
(in.)	**(mm)**	**Average**	**Tolerance**	**Minimum**	**Tolerance**	**73.4° F**	**(23°C)**	**180°F**	**82°C**
½	(15)	0.625 (15.9)	±0.003 (±0.08)	0.068(1.73)	+0.020 (+0.51)	400	(28.1)	100	(7.0)
¾	(20)	0.875 (22.2)	±0.003 (±0.08)	0.080(2.03)	+0.020 (+0.51)	400	(28.1)	100	(7.0)
1	(25)	1.125 (28.6)	±0.003 (±0.08)	0.102(2.59)	+0.020 (+0.51)	400	(28.1)	100	(7.0)
1 ¼	(32)	1.375 (34.9)	±0.003 (±0.08)	0.125(3.18)	+0.020 (+0.51)	400	(28.1)	100	(7.0)
1 ½	(40)	1.625 (41.3)	±0.004 (±0.10)	0.148(3.76)	+0.020 (+0.51)	400	(28.1)	100	(7.0)
2	(50)	2.125 (54.0)	±0.004 (±0.10)	0.193(4.90)	+0.023 (+0.58)	400	(28.1)	100	(7.0)

Outside Diameters and Wall Thickness for CPVC 4120, SDR 13.5 Plastic Pipe									
Nominal Size		**Outside Diameter, in. (mm)**		**Wall Thickness, in. (mm)**		**Pressure Rating. PSI (Kg/Cm^2)**			
(in.)	**(mm)**	**Average**	**Tolerance**	**Minimum**	**Tolerance**	**73.4°F**	**(23°C)**	**180°F**	**82°C**
½	(15)	0.625 (15.9)	±0.003 (±0.08)	0.055(1.40)	+0.020 (+0.51)	320	(22.5)	80	(5.6)
¾	(20)	0.875 (22.2)	±0.003 (±0.08)	0.065(1.65)	+0.020 (+0.51)	320	(22.5)	80	(5.6)
1	(25)	1.125 (28.6)	±0.003 (±0.08)	0.083(2.12)	+0.020 (+0.51)	320	(22.5)	80	(5.6)
1 ¼	(32)	1.375 (34.9)	±0.003 (±0.08)	0.102(2.59)	+0.020 (+0.51)	320	(22.5)	80	(5.6)
1 ½	(40)	1.625 (41.3)	±0.004 (±0.10)	0.120(3.06)	+0.020 (+0.51)	320	(22.5)	80	(5.6)

2	(50)	2.125 (54.0)	±0.004 (±0.10)	0.157(4.00)	+0.023 (+0.58)	320	(22.5)	80	(5.6)

Outside Diameters and Wall Thickness for CPVC SCHEDULE 40 (AS PER ASTM F 441)								
Part No.	**Nom (in.)**	**Size (mm)**	**Average OD (inch)**	**Average OD (mm)**	**Min. Wall Thick**	**Min. Wall Thick**	**Max. Work Pre. At 23°C PSI**	**Max. Work Pre. At 23°C (kg/cm^2)**
FP40-212	2 ½"	65	2.875	73.02	0.203	5.16	300	21.09
FP40-003	3"	80	3.500	88.90	0.216	5.49	260	18.28
FP40-004	4"	100	4.500	114.30	0.237	6.02	220	15.47
FP40-006	6"	150	6.625	168.28	0.280	7.11	180	12.66
FP40-008	8"	200	8.625	219.08	0.322	8.18	160	11.25
FP40-100	10"	250	10.750	273.05	0.365	9.27	140	9.84
FP40-120	12"	300	12.750	323.55	0.406	10.31	130	9.14

Outside Diameters and Wall Thickness for CPVC SCHEDULE 80 (AS PER ASTM F 439)								
Part No.	**Nom (in.)**	**Size (mm)**	**Average OD (inch)**	**Average OD (mm)**	**Min. Wall Thick**	**Min. Wall Thick**	**Max. work Pre. At 23°C PSI**	**Max. work Pre. At 23°C (kg/cm^2)**
FP40-212	2 ½"	65	2.875	73.02	0.276	7.01	420	29.53
FP40-003	3"	80	3.500	88.90	0.300	7.062	370	26.01
FP40-004	4"	100	4.500	114.30	0.337	8.56	320	22.50
FP40-006	6"	150	6.625	168.28	0.432	10.97	280	19.69
FP40-008	8"	200	8.625	219.08	0.500	12.70	250	17.57
FP40-100	10"	250	10.750	273.05	0.593	15.06	230	16.17

Joining Pipes & Fittings

a. Cutting:
Pipes shall be cut either with a wheel type plastic pipe cutting or hacksaw blade and care shall be taken to make a square cut which provides optimal bonding area within a joint.

b. Deburring / Beveling:
Burrs and fittings should be removed from the outside and inside of pipe with a pocket knife or file otherwise burrs and fittings may prevent proper contact between pipe and fittings during assembly.

c. Fitting preparation:
A clean dry rag/cloth should be used to wipe dirt and moisture from the fitting sockets and tubing end. The tubing should make contact with the socket wall 1/3 or 2/3 of the way into the fitting socket.

d. Solvent Cement Application
Only CPVC solvent cement confirming to ASTM-F493 should be used for joining pipe with fittings. An even coat of solvent cement should be applied on the pipe end and a thin coat inside the fitting socket, otherwise too much of cement solvent can cause clogged water ways.

e. Assembly:
After applying the solvent cement on both pipe and fitting socket, pipe should be inserted into the fitting socket within 30 seconds, and rotating the pipe ¼ to ½ turn while inserting so as to ensure even distribution of solvent cement with the joint. The assembled system should be held for 10 seconds (approximately) in order to allow the joint to set up.

An even bead of cement should be evident around the joint and if this bead is not continues remake the joint to avoid potential leaks.

Set & Cure times:
Solvent cement set and cure times shall be strictly adhered to as per the below mentioned table.
Minimum Core prior to pressure testing at 150 PSI

Ambient Temperature during Core period	Pipe Size	
	½ " - 1"	1.¼" - 2"
Above 15 deg. C	1 Hr	2 Hrs
4-15 deg.C	2 Hrs	4 Hrs
Below 4 deg C	4 Hrs	8 Hrs

Special care shall be exercised when assembling flow guard systems in extremely low temperature (below 4°C) or extremely high temperature (above 45°C) In extremely hot temperatures, make sure that both surfaces to be joined are till wet with cement solvent when putting them together.

f. Testing

Once an installation is completed and cored as per above mentioned recommendations, the system should be hydrostatically pressure tested at 150 psi (10 Bar) for one hour. During pressure testing, the system should be fitted with water and if a leak is found, the joint should be cut out and replacing the same with new one by using couplers.

Transition of Flow guard CPVC to Metals

When making a transition connection to metal threads, special Brass / plastic transition fitting (Male and female adapters) should be used. Plastic threaded connections should not be over torqued Hard tight puts one half turn should be adequate.

Threaded Sealants

Teflon tape shall be used to make threaded connections leak proof.

Solvent Cement

Only CPVC solvent cement conforming to ASTMF 493 should be used for joining pipe with fittings and valves. Flow guard CPVC cement solvent have a minimum shelf life of 1 year. Aged cement solvent will often change color or being to thicken and become gelatinous or jelly like and when this happens, the cement should not be used. The cement solvent should be used within 30 days after opening the company's seal and tightly close the seal after using in order to avoid its freezing. The freezed cement solvent should be discarded immediately and fresh one should be used. The CPVC solvent cement usage should be adhered to as given in table below :

Diameter of pipe in inch (flow guard)	½"	¾"	1"	¼"	1½"	2"
Approx. nos. of joints which can be mode per liter of solvent cement.	200 Nos.	180 Nos.	150 Nos.	130 Nos.	100 Nos.	70 Nos.

Hangers and supports

For Horizontal runs, support should be given at 3 foot (90 cm) intervals for diameters of one inch and below and at 4 foot (1.2m) intervals for larger sizes.
Hangers should not have rough or sharp edges which come in contact with the tubing.
Supports should be as per the below mentioned table:

Size of Pipe	21°C	49°C	71°C	82°C
Inch	Ft.	Ft.	Ft.	Ft.
½"	5.5	4.5	3.0	2.5
¾"	5.5	5.0	3.0	2.5
1"	6.0	5.5	3.5	3.0
1¼"	6.5	6.0	3.5	3.5
1½"	7.0	6.0	3.5	3.5
2"	7.0	6.5	4.0	3.5

SCHEDULE - 40

Recommended Support spacing (in feet)

Nom. Pipe Size		Temperature °C					
(In)	(mm)	23	38	49	60	71	82
2 ½	65	7 ½	7	7	6 ½	6	3 ½
3	80	8	7	7	7	6	3 ½
4	100	8 ½	7 ½	7 ½	7	6 ½	4
6	150	9 ½	8	8	7 ½	7	4 ½
8	200	9 ½	8	8	7 ½	7	5

SCHEDULE - 80

Recommended Support spacing (in feet)

Nom. Pipe Size		Temperature °C					
(In)	(mm)	23	38	49	60	71	82
2 ½	65	8	7 ½	7 ½	6 ½	4 ½	4
3	80	8	8	7 ½	7	4 ½	4
4	100	9	9	8 ½	7 ½	5	4 ½
6	150	10	9 ½	9	8	5 ½	5

GUNMETAL VALVES

Valves 65mm dia and below shall be heavy Gunmetal Full way Valves or Globe Valves or Ball valves conforming to I.S. 778-1971 of 20 Kg/cm^2 class. Valves shall be tested at manufacturer's works and the same stamped on it. All Valves shall be approved by the Project Manager before they are allowed to be used on work.

VALVES

All valves (gate, globe, check, safety) shall be of gun metal suitable for the particular service as specified. All valves shall be of the particular duty and design as specified. Valves shall either be of screwed type or flanged type, as specified, with suitable flanges and non-corrosive bolts and gaskets. Tail pieces as required shall be supplied along with valves. Gate, globe and check valves shall conform to Indian Standard IS: 776 and non-return valves and swing check type reflux to IS: 5312.

Sluice valves, where specified shall be flanged sluice valves of cast iron body. The spindle, valve seat and wedge nuts shall be gunmetal. They shall generally have non-rising spindle and shall be of the particular duty and design as specified. The valves shall be supplied with suitable flanges, non-corrosive bolts and asbestos fiber gaskets. Sluice valves shall conform to Indian standard IS: 780 and IS: 2906.

Ball valves with floats to be fixed in storage tanks shall consist of cast brass lever arm having copper balls (26 SWG) screwed to the arm integrally. The copper ball shall have bronze welded seams. The closing/opening mechanism incorporating the piston and cylinder shall be non-corrosive metal and include washers. The size and construction of ball valves and float shall be suitable for desired working pressure operating the supply system. Where called for brass valves shall be supplied with brass hexagonal back nuts to secure them to the tanks and a socket to connect to supply pipe.

Globe valves on Hot-water line shall be union bonnet with stem/disc and body seat ring of SS. Suitable for temperature up to 80° C.

All valves shall be suitable for the working pressure involved.

SI.No	Type of Valve	Size	Construction	Ends
a.	Isolating Valve	15 mm to 50 mm 65 mm and above	Gun Metal Gun Metal	Screwed Flanged
b.	Sluice Valve & Butterfly Valve	65 mm and above	Cast Iron	Flanged
c.	G.M. non return valve	15 mm to 50 mm 65 mm above	Gun Metal Gun Metal	Screwed Flanged
d.	Flap Type – Non return valve	65 mm and above	Cast Iron	Flanged

6. SECTION – I V HANDING OVER PROCEDURE

The Contractor shall before finally handing over the completed work in his scope to the Owner, submit the documents as per the Contract and as directed by the Project Manager. Given below the checklist for the reference of the Project Manager.

Packages/	Sanitary Fixtures	Soil, waste & vent pipes	Water supply system	Sewerage/ drainage system	Water tanks
Final cleaning					
List of inventory					
Training Conducted on					
Operation Manual					
Maint. Manual					
As built P&I Diag/ SLD					
Defects Liability Period/ Warranty					
Commissioning report					
Test reports/ Certificates					
List of essential spares					
Address/ Contact nos. of Vendors					
Remarks					

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT NAUROJI NAGAR, DELHI

Fire Protection Works (Sprinkler System)

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL® OF INDIA
QCI
Creating an Ecosystem for Quality

Date: 17th Dec. '2024
Revision: R0

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1. GENERAL

A. SCOPE

The scope of this section consists of but is not necessarily limited to supply, installation, testing and commissioning of the fire protection system. The philosophy of the system is as follows:

The Fire Suppression System shall comprise the Fire Hydrants System, the Sprinkler System (Wet type), and Hand Appliances.

Water from the overhead/UGT RCC Fire Water Storage Tanks, shall be supplied for the uses listed below:

a. Fire Hydrant/Sprinkler System (Pressurized) both for the internal landing valves and the hose reels at landings.

b. Sprinkler System (Wet Type)

c. Contractor shall ensure that all false ceiling voids greater than 800 mm are provided with sprinklers.

d. Contractor shall ensure Hydro Testing for the complete system.

i. **DRAWING**

The work shall be carried out in accordance with the Architectural drawings, structural drawings and approved shop drawings. The shop drawings shall be correlated before the executions of work.

The tender drawings accompanying these specifications are design drawings and generally are schematic. They do not show every offset, T, Cross, Y, junction coupling/flanges etc., which are required for installation in the space provided. The contractor shall prepare detailed shop drawings by following these drawings, as closely as is practicable, with necessary additional bends, elbows or junctions etc., where required to suit local site conditions, from actual site measurement taken, get the same approved from the Consultants in good time & follow then at site, without additional cost to the Owner. The Owners reserve the right to make any reasonable change in outlet location prior to roughing in. All connections and appurtenances, shown in the various diagrams, shall be included in the finished job. The contractor shall visit the site prior to bidding, to familiarize himself with all conditions.

It shall be the contractor's responsibility to co-ordinate with all others for proper and adequate installation clearances.

ii. ORDINANCE, CODE AND REGULATIONS

The Contractor shall obtain the necessary approval of the drawings and the schemes from the local authority/NBC as called for. The contractor shall also take care of any other requirement so that insurance cover can be obtained, if required at minimum premium at a later date.

Unless, otherwise approved the product shall bear the mark of approval of ISI as required by the Governing bodies, code and ordinances and local authorities, whose permission are required for occupation of the building on completion.

iii. MEASUREMENT LINES & LEVELS

Check dimension at the building site and establish lines and levels for the work specified.
All pipes, water mains, or gas mains, telephone and electric cables etc., met within the course of excavation, shall be carefully protected and supported without any extra charge.

iv. **Automatic Sprinkler**

In addition to all provisions of Wet riser and Down comer system described in Para 2.4.1, in automatic sprinkler system, water lines of various size are laid throughout the area to be protected and sprinkler heads are provided at regular interval so that water from sprinkler heads cover the entire area under fire. 2.4.4.2 Sprinkler has two functions to perform i.e. to detect fire and then to provide adequate distribution of water to control or extinguish it. Sprinkler heads operate at pre- determined temperature todischarge water overtheaffected area below. Only those sprinkler heads operate which are in the vicinity of fire i.e. those which become sufficiently heated. 2.4.4.3 Lines for sprinklers shall be separate or common with wet riser system depending upon requirements mentioned in Appendix-A. 2.4.4.4 The area to be protected by sprinkler is divided in to various zones. For detecting operation of sprinkler in a zone, flow switches are provided which are wired to an annunciation panel installed in the Fire Control Room. In the event of operation of sprinkler(s) in an affected area, the annunciation panel ppedc 19 will give audio-visual alarm and indicate the affected zone. This arrangement will be independent of fire alarm system. 2.4.4.5 The sprinkler shall be installed only where there is no danger of freezing of waterin the pipes at any time.

2. PIPE WORK

➢ GENERAL REQUIREMENTS

- All materials shall be of the best quality conforming to the specifications and subject to the approval of the Consultants.
- Pipes shall be fixed in a manner as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc.
- Pipes shall be securely fixed to walls and ceilings by suitable clamps and supports (galvanized after fabrication) at intervals specified. Only approved type of anchor fasteners shall be used for RCC slabs and walls / floors etc.
- Valves and other appurtenances shall be so located that they are easily accessible for operations, repairs and maintenance.
- Pipes and fittings shall be fixed truly vertical, horizontal or in slopes as required in a neat workman like manner.
- Pipe accessories such as gauges, meters, control devices, etc. shall have the same working pressure rating as the associated pipe work. All pipe work shall be free from burrs, rust and scale and shall be cleaned before installation. All personnel engaged on welding operations must possess a certificate of competence issued by an acceptable / recognized authority.

➢ PIPING

Pipes of following types are to be used:

- Mild steel black pipes as per IS: 1239 heavy grade (for pipes of sizes 150 mm N.B. and below) suitably lagged on the outside to prevent soil corrosion. M.S. pipes buried below ground shall also be suitably be lagged with 2 layers of 400-micron polythene sheet over 2 coats of bitumen.
- Steel pipelines upto 150 mm dia shall be as per IS: 1239, Part-II (heavy grade) while pipelines above 150 mm dia shall be as per I.S.:3589.
- All pipe clamps and supports shall be fabricated from MS steel sections and shall be factory galvanized before use at site. Welding of galvanized clamps and supports shall not be permitted.
- Pipes shall be hung by means of expandable anchor fastener of approved make and design. The hangers and clamps shall be fastened by means of galvanized nuts and bolts. The size/diameter of

the anchor fastener and the clamps shall be suitable to carry the weight of water filled pipe and dead load normally encountered.

- Hangers and supports shall be thoroughly galvanized after fabrication. The selection and design of the hanger & support shall be capable of carrying the sum of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipeline movements as necessary. All guides, anchor braces, dampener, expansion joint and structural steel to be attached to the building/structure trenches etc. shall be provided. Hangers and components for all piping shall be approved by the Consultants.

- The piping system shall be tested for leakages at 2 times the operating pressure or 1.5 time shut-off pressure, whichever is highest including testing for water hammer effects.

- Flanged joints shall be used for connections for vessels, equipment, flanged valves and also on two straight lengths of pipelines of strategic points to facilitate erection and subsequent maintenance work.

- For pipes underground installation the pipes shall be buried at least one meter below ground level and shall have 230 mm x 230 mm masonry or concrete supports at least 300 mm high at 3m intervals. Masonry work to have plain cement concrete foundation (1 cement: 4 coarse sand: 8 stone aggregate) of size 380x380x75 thick resting on firm soil.

- Mains below ground level shall be supported at regular intervals not exceeding 3.0 meters and shall be laid at least 2.0 meter away from the building.

➢ **PIPING INSTALLATION & SUPPORT**

- Tender drawings indicate schematically the size and location of pipes. The Contractor, on the award of the work, shall prepare detailed working drawings, showing the cross-sections, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports. He must keep in view the specific openings in buildings and other structure through which pipes are designed to pass.

- Piping shall be properly supported on, or suspended from, on stands, clamps, hangers as specified and as required. The Contractor shall adequately design all the brackets, saddles, anchor, clamps and hangers, and be responsible for their structural stability.

- Pipe work and fittings shall be supported by hangers or brackets so as to permit free expansion and contraction. Risers shall be supported at each floor with Galvanized steel clamps. To permit free movement of common piping support shall be from a common hanger bar fabricated from Galvanized steel sections.

- Pipe hangers shall be provided at the following maximum spacing's:

Pipe Dia (mm)	**Hanger Rod Dia (mm)**	**Spacing between Supports (m)**
Up to 25	6	2
32 to 50	6	2.5
65 to 80	8	2.5
80 to 100	10	2.5
125 to 150	10	3.0

- The end of the steel rods shall be threaded and not welded to the threaded bolt.

- All pipe work shall be carried out in a proper workman like manner, causing minimum disturbance to the existing services, buildings, roads and structure. The entire piping work shall be organized in consultation with other agencies work, so that area can be carried out in one stretch.

- Cut-outs in the floor slab for installing the various pipes area are indicated in the drawings. Contractor shall carefully examine the cut-outs provided and clearly point out wherever the cut-outs shown in the drawings, do not meet with the requirements.

- Pipe sleeves, larger diameter than pipes, shall be provided wherever pipes pass through walls and slab and annular space filled with fiberglass and finished with retainer rings.

- The contractor shall make sure that the clamps, brackets, saddles and hangers provided for pipe supports are adequate or as specified / approved by consultants. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

- All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before lying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal runs, eccentric reduces shall be used for the piping to drain freely. In other locations, concentric reduces may be used.

- Automatic air valves shall be provided at all high points in the piping system for venting. All valves shall be of 15mm pipe size and shall be associated with an equal size gate valve. Automatic air valves shall be provided on hot water risers.

- Discharge from the air valves shall be piped through a pipe to the nearest drain or sump. All pipes shall be pitched towards drain points.

- Pressure gauges shall be provided as shown on the approved drawings. Care shall be taken to protect pressure gauges during pressure testing.

➢ **PIPE FITTINGS**

- Pipe fittings mean tees, elbows, couplings, unions, flanges, reducers etc and all such connecting devices that are needed to complete the piping work in its totality.

- Forged steel fittings of approved type with “V” groove for welded joints shall be used for pipes of all sizes.

- Fabricated fittings shall not be permitted for pipes diameters 50mm and below.

- When fabricated fittings are used, they shall be fabricated, welded in workshops. They shall be inspected by Project Manager before dispatch from the workshop. The welding procedures of the workshop should have been approved by the rules for sprinkler system and applicable to hydrant and sprinkler system. For “T” connection, pipes shall be drilled and reamed. Cutting by gas or electrical welding shall not be permitted.

➢ **JOINTING**

Welded Joints:

- Joints between MS pipes and fittings shall be made with the pipes and fittings having “V” groove and welded with electrical resistance welding in an approved manner. But welding without “V” groove shall not be permitted.

- All joints in the pipe line with screwed fittings shall be seal welded after testing and the weld plus the adjoining portion shall be given two coats of zinc rich primer.

Flanged joints (65 mm dia and above)

- Flanged joints with flanges conforming to IS: 6392 shall be provided on Straight runs at intervals not exceeding 25-30m on pipe lines of 50 mm dia and above and as directed by the Project Manager.

- For jointing all types of valves, appurtenances, pumps, connections with other type of pipes, to water tanks and other places necessary and as required for good engineering practice and as shown/noted on the drawings.

- Flanges shall be with GI bolts and nuts and 3mm insertion gasket of natural rubber conforming to IS: 11149.

Unions (up to 50 mm dia.)

- Approved type of dismountable unions shall be provided on pipe lines of 40 mm dia and smaller dia, in locations similar to those specified for flanges.

➢ **PROCEDURE FOR PYPKOTE / COATEK APPLICATION**

- Surface Preparation - The pipe surface shall be cleaned by a wire brush.

- Application of Primer - Primer is to be applied on pipes immediately after cleaning. This is to prevent any further accumulation of rust on the pipe. This is a cold applied primer and is applied by brush.

- Application of 4 mm bitumastic Tape - After the primer is applied on the pipe, it is allowed to dry for about 30 min. till it becomes touch dry. Before adhering the tape to the pipe, it is advisable to gently heat the primer coated pipe by a run of LPG torch. Remove the bottom polyethylene from the tape & then heat bottom surface of the tape by LPG torch or any heat source & start wrapping the tape to the pipe by heating the primer coated pipe & by removing the bottom polyethylene from the tape before wrapping better adhesion between the tape & pipe is obtained. Overlaps are maintained with a minimum of 15.0 mm.

- Tape coating of weld joints - The tape is applied over the weld joints after the necessary welding & testing methods of the joints is completed. The procedure for application of tape shall be the same as bare pipe procedure. Overlaps on each side of the weld joints shall be 50 mm.

- A final coat of White wash with water-based cement paint is done immediately over the entire coated pipe.

3. VALVES

BUTTERFLY VALVE

The butterfly valve shall be suitable for waterworks and rated for 300 P.S.I

- The body shall be of cast iron to IS: 778in circular shape and of high strength to take the water pressure. The disc shall be heavy duty cast iron with anti-corrosive epoxy or nickel coating.

- The valve seat shall be of high grade elastomer or nitrile rubber. The valve is closed position shall have complete contact between the seat and the disc throughout the perimeter. The elastomer rubber shall have a long life and shall not give away on continuous applied water pressure. The shaft shall be EN 8 grade carbon steel.

- The valve shall be fitted between two flanges on either side of pipe flanges. The valve edge rubber shall be projected outside such that they are wedged within the pipe flanges to prevent leakages.

BALL VALVE –

- The ball valve shall be rated to IS778.
- The ball valve shall be made forged brass and suitable for test pressure of pipe line. The valve shall be internally threaded to receive pipe connections.
- The ball shall be made from brass and machined to perfect round shape and subsequently chrome plated. The seat of the valve body-bonnet gasket and gland packing shall be of Teflon.
- The handle shall be provided with PVC jacket. The handle shall also indicate the direction of 'open' and 'closed' situations. The gap between the ball and the Teflon packing shall be sealed to prevent water seeping.
- The handle shall also be provided with a lug to keep the movement of the ball valve within 90°. The lever shall be operated smoothly and without application of any unnecessary force.

GUN METAL VALVES

- Gun metal Valves shall be used for smaller dia. pipes, and for threaded connections. The Valves shall bear certification as per IS: 778
- The body and bonnet shall be of gun metal to IS: 318. The stem gland and gland nut shall be of forged brass to IS: 6912. The hand wheel shall be of cast iron to IS: 210.
- The Hand wheel shall be of high-quality finish to avoid hand abrasions. Movement shall also be easy. The spindle shall be non-rising type.

NON-RETURN VALVE

- Non-Return valves shall be cast iron double flanged with cast iron body and gunmetal internal parts conforming to IS: 5312 (Part:1)

4. FIRE HYDRANTS

INTERNAL HYDRANT

- Contractor shall provide on each landing and other locations as shown on the drawings single headed gunmetal landing valve with 100 mm dia inlet as per IS:5290, with shut off valves having cast iron wheels as shown on the drawings. Landing valve shall have flanged inlet and instantaneous type outlets as shown on the drawings.
- Instantaneous outlets for fire hydrants shall be standard pattern and suitable for fire hoses.
- Contractor shall provide for each internal fire hydrant station two numbers of 63 mm dia. 15 m long rubberized fabric lined hose pipes with gunmetal male and female instantaneous type coupling machine would with GI wire (hose to IS:636 type 2 and couplings to IS:903 with IS certification), fire hose reel, gunmetal branch pipe with nozzle to IS:903. This shall be measured and paid for separately.
- Contractor shall provide standard fire hose reels of 20mm dia high pressure dunlop rubber hose 36 m long with gunmetal nozzle, all mounted on a circular hose reel of heavy duty mild steel construction having cast iron brackets. Hose reel shall be connected directly to the wet riser with

an isolating valve. Hose reel shall conform to IS:884 and shall be mounted vertically . This shall be measured and paid for separately.

- Each internal hydrant hose cabinet shall be provided with a drain in the bottom plate. The drain point shall be lead away to the nearest general drain.

- Each internal hydrant hose cabinet containing items as above shall also be provided with a nozzle spanner and a Fireman's Axe. The cabinet shall be recessed in the wall as directed. This shall be measured and paid for separately.

- Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

HOSE REEL

- Hose reel shall conform to IS : 884, heavy duty, 20 mm dia length shall be 30 metre long fitted with gun metal chromium plated nozzle, mild steel pressed reel drum which can swing upto 170 degree with wall brackets of cast iron finished with red and black enamel complete.

FIRE HOSE REEL

- All hose pipes shall be of 63 mm diameter RRL/ CP as required, conforming to IS : 636 or IS : 8423. The hose shall be provided with copper alloy delivery coupling. The hose shall be capable of withstanding a bursting pressure of 35.7 Kg/Sq.cm without undue leakage or sweating. Hose shall be provided with instantaneous spring-lock, type couplings.

BRANCH PIPE

- Branch pipes shall be of gun metal with loaded tin bronze ring at the discharge and to receive the nozzle and provided at the other with a leaded tin bronze ring to fit into the instantaneous coupling. Nozzle shall be of spray type of diameter of not less than 16 mm and not more than 25 mm. Nozzle shall be of loaded tin bronze branch pipe and nozzle shall be of instantaneous pattern conforming to Indian Standard - 903.

HOSE CABINET

- Hose cabinet shall be provided for all internal and external fire hydrants. Hose cabinets shall be fabricated from 16 gauge MS/SS (as per SOQ) powder coated sheet of fully welded construction with hinged double front door partially glazed (3 mm glass panel) with locking arrangement, stove enamelled fire red paint (shade No. 536 of IS:5) with "FIRE HOSE" written on it prominently (size as given in the schedule of quantities). Cabinet surfaces in contact with the walls shall not be powder coated but instead given two coats of anti-corrosive bitumastic paint.

INTERNAL HOSE CABINET

- Hose cabinet shall be of glass fronted with hinged door & lock. The cabinet shall be made of 16 gauge thick MS/SS (as per SOQ) sheet and spray painted to shade No. 536 of IS:5. The hose cabinet shall be of size to accommodate the following:

  i. Landing Valves (Single headed)
  ii. Hose pipe (2 length of 15M)
  iii. Hose reel (30 mtr.)
  iv. Branch pipes, nozzles (1/2 sets)
  v. Fire man's axe and hand appliances

FLEXIBLE PIPE

- Sprinkler flexible pipe (UL Listed) of stainless steel complete with 15 NPT on reducer thread with maximum working pressure of 175 PSI test pressure of 875 PSI (Burst) with branch line (Inlet) 25mm NPT male thread to sprinkler head (Outlet) 15mm NPT female thread with reducer, nipple, 2 side brackets, center bracket, stockbar of following sizes complete as required.
  i. 700mm
  ii. 1000mm
  iii. 1200mm

5. SPRINKLER SYSTEM

General Specification

- The scope of work shall include supply, commissioning, testing of the system as a whole. The sprinkler heads are to be fixed into heavy quality black steel pipes, conforming to IS 1239 or any other approved specification. The size of pipe will vary from 20 mm to 150mm to suit the hydraulics of the system. The System shall conform to CFO Rules for the installation of sprinkler systems in general for 'Ordinary Hazard' category-in respect of design, density and spacing of sprinkler heads.

- Reduction in pipe sizes shall not be made by use of bushings. All piping shall be done by means of welding, screwed & flanged jointing as per codes.

- Due care shall be taken that sprinklers are not applied with paint at the time of applying paint to piping and fittings.

- All control, drain, test and alarm valves shall be provided with signs to identify their purposes, functions, direction of flow the satisfaction of the Consultants.

Quartzoid Bulb Automatic Sprinkler

- Sprinkler heads shall be made of brass/quartzoid bulb sufficiently strong, in compression to withstand any pressure, surge or hammer likely to occur in the system. The yoke & body shall be made of high-quality gun metal brass with arms streamlined to ensure minimum interference with the spread of water. The deflector of suitable design shall be fitted to give even distribution of water over the area commanded by the sprinkler.

- The bulb shall contain a liquid having a freezing point below any natural climatic figure and a high coefficient of expansion. The temperature rating of the sprinkler shall be stamped on the deflector & the color of the liquid filled in the bulb shall be according to the temperature rating as per NFPA standard. The sprinkler heads shall be of type & quality approved by the local fire brigade authority. The inlet shall be screwed.

- The sprinklers shall have 15mm nominal size of the orifice for ordinary hazard.

- The orifice size shall be marked on the body or the deflector of the sprinkler.

- Metal guards for protection of sprinkler against accidental or mechanical damage shall be provided as desired by the Project Manager.

- Contractor shall submit detailed submittal and discharge spray pattern for the Sprinkler for the approval of consultant.

Operating Temperature

- The Operating temperature at which the quartzoid bulb of the sprinkler head shall actuate, shall be 68 degree C or as specifically mentioned.

Sprinkler Installation

- Sprinkler heads shall be located in positions shown on the drawings. While slight relocation may result from building construction features or interference from other services, the maximum spacing between sprinkler heads and coverage area shall not exceed those stipulated in the TAC regulations and the NFPA 13-1994 Rules.

- Allowance shall be made for such relocations within a radius of 1500 mm of the indicated positions without additional cost. The Fire Protection Services Trade shall co-ordinate with the ceiling Trade to set out the sprinkler locations to suit the site location of the unit grid. In general, all sprinklers shall be located at the centre of the ceiling unit and a provision of about 10% more sprinklers and pipe work than required in TAC and NFPA Rules shall be included in this sub-contract. Chrome plated wire mesh guards shall be used to protect the sprinkler heads which are liable to accidental or mechanical (at no extra cost) damage.

Flow Requirements

- The flow requirement for sprinkler heads shall be specifically approved for the designated area of installation.

Flow Switch

- Flow switch shall have a paddle made of flexible and sturdy material of the width to fit within the pipe bore. The terminal box shall be mounted over the paddle/ pipe through a connecting socket. The Switch shall be potential free in either N O or N C position as required. The switch shall be able to trip and make / break contact on the operation of a single sprinkler head. The terminal box shall have connections for wiring to the Annunciation Panel. The flow switch shall have connections for wiring the seat shall be of S.S to the Annunciation Panel. The flow switch shall have IP: 55 protections.

- The flow switch work at a triggering threshold bandwidth (flow rate) of 4 to 10 GPM. Further, it shall have a 'Retard' to compensate for line leakage or intermitted flows.

Pipes for Drainage:

- Sprinkler pipes shall be so installed that the system can be thoroughly drained. As far as possible all pipes shall be arranged to drain to the installation drain valve as shown in the drawing for ordinary hazard system.

- In the case of basement & other areas where sprinkler pipe-work is below the installation drain valve & in other trapped points in the system, auxiliary valves of the following sizes shall be provided.

  - 20 mm valves for pipes upto 50mm dia.
  - 25 mm valves for 80mm dia pipe.
  - 50 mm valves for pipes larger than 80mm dia.

System Design

- The entire sprinkler installation shall be designed to make it a hydraulically balanced system. The pressure requirement at typical floors shall be designed between 2.5 bar and 3.5 bar.

6. COMMISSIONING & GUARANTEE

➢ SCOPE OF WORK

- Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

- Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

- On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

- All tests shall be made in the presence of the Architect or his representative or any inspecting authority. At least five working days' notice in writing shall be given to the inspecting parties before performing any test.

- Water flow rates of all equipment and in pipe lines through valves shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

- Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in water supply lines for ease of installing pressure gauge, temperature gauge & rota meters. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

- Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

➢ PRECOMMISSIONNIG

- On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

- Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipe work and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.

- All strainers shall be inspected and cleaned out or replaced.

- When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment.

- The pre-treatment chemical shall:-

  i. Remove oil, grease and foreign residue from the pipe work and fittings;

  ii. Pre-condition the metal surfaces to resist reaction with water or air.

  iii. Establish an initial protective film;

iv. After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.

v. Details and procedures of the pre-treatment shall be submitted to the Architect for approval.

vi. Check all clamps, supports and hangers provided for the pipes.

vii. Check all the equipment, piping and valves coming under hot water system and operate each and every valve on the system to see if the valves are functioning properly. Thereafter conduct & hydro test of the system as for (b) above.

viii. Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

7. STATUTORY AUTHORITIES' TESTS AND INSPECTIONS

- As and when notified in writing or instructed by the Architect, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Architect as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

- The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

- The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect for checking before submission.

- The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Architect may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

- The Contractor shall notify the Architect at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Architect without delay.

8. FINAL ACCEPTANCE TESTS

- Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

- Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary, replace the equipment without further payment in order that the required performance is obtained.

- Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

9. REJECTION OF INSTALLATION / PLANT

- Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Architect either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Architect.

- After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Employer.

10. WARRANTY AND HANDOVER

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

11. HANDING OVER OF DOCUMENTS

- All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner's site representative and all testing and commissioning documents shall be handed over to the Owner's site representative.

- The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner's site representative.

12. PIPE COLOUR CODE:

S. No.	Pipe Lines	Ground / Base Color	First Color Band	Second Color Band
1	Fire System	Post Office Red		

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT NAUROJI NAGAR, DELHI

Fire Extinguishers

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI
Creating an Ecosystem for Quality

Date: 17th Dec. '2024
Revision: R0

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1. **HAND HELD FIRE EXTINGUISHERS**

- **HAND APPLIANCES**

SCOPE

Work under this section shall consist of furnishing all labor, materials, appliances and equipment necessary and required to install fire extinguishing hand appliances as per relevant specification of various authorities.
Without restricting to the generality of the foregoing, the work shall consist of the following:
Installation of fully charged and tested fire extinguishing hand appliances of A B C powder type as required and specified in the drawings and schedule of rates.

GENERAL REQUIREMENTS

Hand appliances shall be installed in easily accessible locations with the brackets fixed to the wall by suitable anchor fasteners.
Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data.
All appliances shall be fixed in a true workmanlike manner truly vertical and at correct locations.
Distribution / installation of fire extinguisher to be in accordance to IS: 2190.

MEASUREMENT

Fire extinguishers shall be counted in numbers and include installation of all necessary items required as given in the specifications.

ABC TYPE DRY POWDER EXTINGUISHER

- The Extinguisher shall be filled with ABC grade 40, Mono Ammonium Phosphate 40% of IS 2171 from any approved manufacturer.

- The capacity of the extinguisher when filled with Dry Chemical Powder (First filling) as per IS 4308, Part II, shall be 5 Kg +/-2% or 10 Kg +/- 3%.

- The distribution of fire extinguishers to be as per IS 2190 – 2010.

- It shall be operated upright, with a squeeze grip valve to control discharge. The plunger neck shall have a safety clip, fitted with a pin, to prevent accidental discharge. It shall be pressurized with Dry Nitrogen, as expellant. The Nitrogen to be charged at a pressure of 15 Kg/cm2

- Body shall be of mild steel conforming to relevant IS Standards. The neck ring shall be also mild steel and welded to the body. The discharge valve body, shall be forged brass or leaded bronze, while the spindle, spring and siphon tube shall be of brass. The nozzle shall be of brass, while the hose shall be braided nylon. The body shall be cylindrical in shape, with the dish and dome welded to it. Sufficient space for Nitrogen gas shall be provided inside the body, above the powder filling.

- The Neck Ring shall be externally threaded - the threading portion being 1.6 cm. The filler opening in the neck ring shall not less than 50 mm. Discharge nozzle shall be screwed to the hose. The design of the nozzle shall meet the performance requirement, so as to discharge at least 85% of contents upto a throw of 4 mtrs, continuously, at least for 15 seconds. The hose, forming part of discharge nozzle, shall be 500 mm long, with 10 mm dia internally for 5 Kg capacity and 12 mm for 10 Kg capacity. It shall have a pressure gauge fitted to the valve assembly or the cylinder to indicate pressure available inside. The extinguisher shall be treated with anti-corrosive paint, and it shall be labelled with words ABC 2.5 cm long, within a triangle of 5 cm on each face. The extinguisher body and valve assembly shall withstand internal pressure of 30 Kg/cm2 for a minimum period of 2 minutes. The pressure gauge shall be imported and suited for the purpose.

- The Portable fire Extinguisher Dry Powder shall confirm IS:2171 9 (Third revision)

- The Portable fire Extinguisher Carbon Dioxide type shall confirm IS:2878 (Third revision)

WATER TYPE EXTINGUISHER (Gas Pressure Type)

- The Extinguishing medium shall be primarily water stored under normal pressure, the discharge being affected by release of Carbon Dioxide Gas from a 120 gms cylinder.

- The capacity of Extinguisher, when filled upto the indicated level, shall be 9 ltr +/- 5%

- The skin thickness of the Cylinder shall be minimum 4.0 mm, fabricated from Mild Steel sheet, welded as required, with dish and dome, being of same thickness, and of size not exceeding the diameter of body. The diameter of body to be not less than 150 mm and not exceeding 200 mm. The neck shall be externally threaded upto a minimum depth of 16 mm, and leaded tin bronze.

- The cap shall be of leaded tin bronze, and screwed on the body upto a minimum of 1.6 cm depth, with parallel screw thread to match the neck ring. The siphon tube to be of brass or G.I. and the strainer of Brass. The cartridge holder, knob, discharge fittings and plunger to be of Brass/Leaded tin bronze, and plunger of stainless steel, spring of stainless steel. The cap to have handle fixed to it. The discharge hose shall be braided nylon, of 10 mm dia and 600 mm long, with a nozzle of brass fitted at end.

- The extinguisher shall be treated for anti-corrosion internally and externally, and externally painted with Fire Red paint. The paint shall be stove enamelled/powder coated. The cartridge shall be as per IS, and have 60 gm net carbon dioxide gas for expelling. The extinguisher, body and cap shall be treated to an internal hydraulic pressure of 25 Kg/cm2. It shall have external marking with letter A, of 2.5 cm height, in block letters within a triangle of 5 cm each side. The extinguisher shall be upright in operation, with the body placed on ground and discharge tube with nozzle held in one hand to give a throw of not less than 6 mtr, and continue so for atleast 60 secs. The extinguisher body shall be clearly marked with ISI stamp (IS 940).

CARBON DIOXIDE EXTINGUISHER

- The Carbon Dioxide Extinguisher shall be as per IS: 2878

- The body shall be constructed of seamless tube conforming to IS:7285 and having a convex dome and flat base. Its dia shall be maximum 140 mm, and the overall height shall not exceed 720 mm.

- The discharge mechanism shall be through a control valve conforming to IS:3224. The internal syphon tube shall be of copper aluminium conforming to relevant specifications.

- Hose Pipe shall be high pressure braided Rubber hose with a minimum burst pressure of 140 Kg/cm2 and shall be approximately 1.0 meter in length having internal dia of 10 mm. The discharge horn shall be of high quality unbreakable plastic with gradually expanding shape, to convert liquid carbon dioxide into gas form. The hand grip of Discharge horn shall be insulated with Rubber of appropriate thickness.

- The gas shall be conforming to IS:307 and shall be stored at about 85 Kg/cm2. The expansion ratio between stored liquid carbon dioxide to expanded gas shall be 1:9 times and the total discharge time (effective) shall be minimum 10 secs and maximum 25 secs.

- The extinguisher shall fulfill the following test pressures:
  Cylinder: 236 Kg/cm2
  Control Valve: 125 Kg/cm2
  Burst Pressure of Hose: 140 Kg/cm2 minimum

- It shall be an Upright type. The cylinder, including the control valve and high pressure Discharge Hose must comply with relevant Statutory Regulations, and be approved by Chief Controller of Explosives, Nagpur and also bear IS marking.

- The Extinguisher including components shall be IS marked.

2. **COMMISSIONING & GUARANTEE**

➢ **SCOPE OF WORK**

- Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

- Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

- On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

- All tests shall be made in the presence of the Architect or his representative or any inspecting authority. At least five working days' notice in writing shall be given to the inspecting parties before performing any test.

- Water flow rates of all equipment and in pipe lines through valves shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

- Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in water supply lines for ease of installing pressure gauge, temperature gauge & rota meters. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

- Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

➢ **PRECOMMISSIONNIG**

- On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

- Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipe work and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.

- All strainers shall be inspected and cleaned out or replaced.

- When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment.

- The pre-treatment chemical shall:-

  i. Remove oil, grease and foreign residue from the pipe work and fittings;

  ii. Pre-condition the metal surfaces to resist reaction with water or air.

iii. Establish an initial protective film;

iv. After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.

v. Details and procedures of the pre-treatment shall be submitted to the Architect for approval.

vi. Check all clamps, supports and hangers provided for the pipes.

vii. Check all the equipment, piping and valves coming under hot water system and operate each and every valve on the system to see if the valves are functioning properly. Thereafter conduct & hydro test of the system as for (b) above.

viii. Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

3. **STATUTORY AUTHORITIES' TESTS AND INSPECTIONS**

- As and when notified in writing or instructed by the Architect, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Architect as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

- The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

- The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect for checking before submission.

- The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Architect may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

- The Contractor shall notify the Architect at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Architect without delay.

4. **FINAL ACCEPTANCE TESTS**

- Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

- Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary, replace the equipment without further payment in order that the required performance is obtained.

- Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

5. **REJECTION OF INSTALLATION / PLANT**

- Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Architect either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Architect.

- After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Employer.

6. **WARRANTY AND HANDOVER**

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

7. **HANDING OVER OF DOCUMENTS**

- All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner’s site representative and all testing and commissioning documents shall be handed over to the Owner’s site representative.

- The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner’s site representative.

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT NAUROJI NAGAR, DELHI

Gas Suppression System

भारतीय गुणवत्ता परिषद्
QUALITY COUNCIL®
OF INDIA
QCI
Creating an Ecosystem for Quality

Date: 17th Dec. '2024
Revision: R0

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1. **AUTOMATIC FIRE DETECTION AND GAS SUPPRESSION SYSTEM**

- **Scope:**

The scope covers the Supply, Installation, Testing, and Commissioning of an Automatic Clean Agent Flooding System complete for the server room with clean agent gas suppression cylinders, nozzles, valves, piping, and integration with the Main Fire Alarm Control Panel for status monitoring. The work shall be executed by an authorized and certified installer and shall include:

- Providing Automatic Gas Suppression System for the server room with adequate coverage based on room dimensions and fire load.
- Arrangement and supply of Clean Gas Agent for effective flooding and extinguishing fire inside the server room.
- Integration of audio-visual annunciation devices to provide alarms and indications in case of fire.
- Provision of all required components, piping, and accessories necessary for the successful commissioning of the system.

The gas suppression system for the server room shall consist of the following:

a. Clean Gas Suppression System with appropriate storage cylinders, suitable extinguishing agents, distribution nozzles, piping, and other necessary components.
b. Accessories and Equipment, including filling adaptors, pressure switches, control valves, and end-of-line fittings.
c. Status Monitoring and Integration with the Main Fire Alarm Control Panel to ensure suppression activation and discharge status are indicated.
d. Room coverage and cylinder sizing based on the approval of the Engineer-in-Charge.
e. Provision of all fittings, piping, nozzles, control valves, and related instrumentation for a fully functional and compliant system.

2. **Technical Specifications:**

- **Extinguishing Agent**

- The extinguishing agent shall be FK 5-1-12 (Fluoroketon).
- The agent must be non-corrosive, non-toxic, electrically non-conductive, and environmentally friendly.
- The agent shall conform to NFPA requirements.
- The agent concentration shall be designed to suppress Class A, B, and C fires effectively.

- **Clean Agent Storage Cylinders**
  - Cylinders shall be UL Listed and/or FM Approved and shall meet DOT/ISO standards.
  - Storage pressure: Typically 50 bar or as required by design calculations.
  - Material: Cylinders to be seamless and constructed from approved materials.
  - Cylinder capacity and quantity shall be determined based on the server room volume and required concentration.

- **Distribution Nozzles and Piping**

- Nozzles shall be designed for uniform and efficient clean agent distribution.
- Material: Stainless steel or other approved materials.
- Pipe ASTM A 106 Gr B Sch 40, pressure tested, and leak-proof and conforming to ANSI B 16.11
- Installation to ensure no obstruction of airflow or suppression agent discharge.

- **Pressure Switch**

- The system shall include pressure switches for monitoring the cylinder pressure and system activation.
- Output: Contacts for interfacing with the Main Fire Alarm Control Panel.

- Rating: IP65 or higher.

➢ **Valves and Actuation Mechanism**

- Valves shall be UL Listed/FM Approved and compatible with the clean agent used.
- Actuation shall be achieved through automatic detection and manual release options.
- A manual release station shall be provided for emergency discharge.

➢ **System Integration**

- The gas suppression system shall interface with the Main Fire Alarm and Control Panel.
- In case of activation, the system shall provide status monitoring (suppression discharge signal).
- Integration shall ensure activation of audio-visual alarms through horn and strobe systems.
- The system shall include an automatic delay timer for safe evacuation.

➢ **Audio-Visual Annunciation**

- Provide audio-visual indicators for activation, fault, and manual release conditions.
- Horn and strobe devices shall be UL Listed/FM Approved and meet the following:
  i. Sound Output: 85 dB(A) minimum at 1 meter.
  ii. Strobe Intensity: 75 cd minimum.

➢ **Detection and Activation System**

- Smoke/heat detectors shall be installed for automatic activation of the suppression system.
- Detectors shall conform to UL/FM standards and be suitable for server room environments.
- Detection system shall include:
  i. Double knock detection logic to prevent false activations.
  ii. Control panel integration for automatic/manual release.

➢ **Installation Requirements**

- Installation shall be carried out as per NFPA and relevant local fire safety codes.
- Cylinders, nozzles, and piping shall be installed as per design layout.
- The system shall be pressure-tested and performance-tested post-installation.
- Appropriate warning signage shall be placed at room entrances.

➢ **Regulatory Compliance**

- All system components, including detection devices, storage containers, valves, and annunciation devices, shall be UL Listed, FM Approved, and/or LPCB Approved.
- Clean agent used must comply with NFPA standards.

➢ **Testing and Commissioning**

- Functional testing of suppression agent discharge and nozzle performance.
- Testing of integration with the Main Fire Alarm Control Panel.
- Verification of pressure switch activation and audio-visual annunciation.
- Leak testing of pipes and system components.
- Demonstration of manual and automatic activation modes.

➢ **Documentation and Handing Over**

- As-built drawings indicating the system layout and components.
- Compliance certificates for UL/FM/LPCB approvals.

- System operation and maintenance manuals.
- Final handover to be done after successful demonstration and acceptance by the Engineer-in-Charge.

➢ **Regulatory Requirements:**

- All detecting devices, alarm devices, indicating equipment, containers, nozzles, and related components shall be UL Listed, FM Approved, and/or LPCB Approved.
- Installation shall comply with NFPA standards.
- The clean agent used shall conform to the specifications of FK 5-1-12 (Fluoroketon).

3. **COMMISSIONING & GUARANTEE**

➢ **SCOPE OF WORK**

- Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

- Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

- On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

- All tests shall be made in the presence of the Architect or his representative or any inspecting authority. At least five working days' notice in writing shall be given to the inspecting parties before performing any test.

- Water flow rates of all equipment and in pipe lines through valves shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

- Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in water supply lines for ease of installing pressure gauge, temperature gauge & rota meters. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

- Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

➢ **PRECOMMISSIONNIG**

- On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

- Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipe work and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.

- All strainers shall be inspected and cleaned out or replaced.

- When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment.

- The pre-treatment chemical shall:-

i. Remove oil, grease and foreign residue from the pipe work and fittings;

ii. Pre-condition the metal surfaces to resist reaction with water or air.

iii. Establish an initial protective film;

iv. After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.

v. Details and procedures of the pre-treatment shall be submitted to the Architect for approval.

vi. Check all clamps, supports and hangers provided for the pipes.

vii. Check all the equipment, piping and valves coming under hot water system and operate each and every valve on the system to see if the valves are functioning properly. Thereafter conduct & hydro test of the system as for (b) above.

viii. Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

4. **STATUTORY AUTHORITIES' TESTS AND INSPECTIONS**

- As and when notified in writing or instructed by the Architect, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Architect as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

- The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

- The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect for checking before submission.

- The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Architect may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

- The Contractor shall notify the Architect at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Architect without delay.

5. **FINAL ACCEPTANCE TESTS**

- Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

- Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary, replace the equipment without further payment in order that the required performance is obtained.

- Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

6. **REJECTION OF INSTALLATION / PLANT**

- Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Architect either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Architect.

- After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Employer.

7. **WARRANTY AND HANDOVER**

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

8. **HANDING OVER OF DOCUMENTS**

- All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner's site representative and all testing and commissioning documents shall be handed over to the Owner's site representative.

- The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner's site representative.

9. **PIPE COLOUR CODE:**

S. No.	Pipe Lines	Ground / Base Color	First Color Band	Second Color Band
1	Fire System	Post Office Red		

TECHNICAL SPECIFICATIONS

OFFICE FOR QCI AT NAUROJI NAGAR, DELHI

Panel Suppression System

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1. **AUTOMATIC FIRE DETECTION AND SUPPRESSION SYSTEM WITH LINEAR PNEUMATIC HEAT DETECTION TUBE**

- **Scope:**

  - The scope covers Supply, Installation, Testing and Commissioning of Automatic Clean Agent Flooding System complete for electrical panels with fire trace tube, cylinder, valves, integration with Main Fire Alarm Control Panel for status monitoring etc. The work to be executed by authorized & certified Fire Trace installer shall cover:

  - Providing Direct Panel Gas Flooding System with linear Fire trace tube inside the panels.
  - Arrangement of Clean Gas Agent for flooding inside the panels.
  - Audio-visual annunciation devices for indicating incidence of fire.
  - Any other item required to the successful commissioning of the system.

  - The electrical panel fire suppression system shall be complete with Direct Clean Gas storage cylinders for required capacities, extinguishing agent as specified, linear fire trace tubing, filling and end-of-line adaptors, pressure switches, control equipment and all necessary accessories and push in fittings to form a complete and working installation to protect the Electrical panel in case of fire.
  - The panels to be protected shall be determined as per the approval of the engineer-in-charge.
  - The system will have an interface with Main Fire Alarm and Control Panel. In case of fire in the concerned Panel, indication of Fire Trace discharge status should come in Main Fire Alarm and Control Panel.

- **Regulatory Requirements:**

  - All the detecting devices, alarm, indicating devices, containers and other related equipment shall be UL Listed and/or FM approved and/or LPCB approved.

  - All installations shall conform to NFPA requirements.

  - Clean Agent used should be HFC-227 ea (FM-200)/NOVEC-1230.

2. **COMMISSIONING & GUARANTEE**

- **SCOPE OF WORK**

  - Work under this section shall be executed without any additional cost. The rates quoted in this tender shall be inclusive of the works given in this section.

  - Contractor shall provide all tools, equipment, metering and testing devices required for the purpose.

  - On award of work, Contractor shall submit a detailed proposal giving methods of testing and gauging the performance of the equipment to be supplied and installed under this contract.

  - All tests shall be made in the presence of the Architect or his representative or any inspecting authority. At least five working days' notice in writing shall be given to the inspecting parties before performing any test.

  - Water flow rates of all equipment and in pipe lines through valves shall be adjusted to design conditions. Complete results of adjustments shall be recorded and submitted.

- Contractor shall ensure proper balancing of the hydraulic system and for the pipes / valves installed in his scope of work by regulating the flow rates in the pipe line by valve operation. The contractor shall also provide permanent Tee connection (with plug) in water supply lines for ease of installing pressure gauge, temperature gauge & rota meters. Contractor shall also supply all required pressure gauge, temperature gauge & rotameter for system commissioning and balancing. The balancing shall be to the satisfaction of Consultant / Project Manager.

- Three copies of all test results shall be submitted to the Engineer in A4 size sheet paper within two weeks after completion of the tests.

➢ **PRECOMMISSIONNIG**

- On completion of the installation of all pumps, piping, valves, pipe connections, insulation etc. the Contractor shall proceed as follows:

- Prior to start-up and hydraulic testing, the Contractor shall clean the entire installation including all fitments and pipe work and the like after installation and keep them in a new condition. All pumping systems shall be flushed and drained at least once through to get rid of contaminating materials. All pipes shall be rodded to ensure clearance of debris, cleaning and flushing shall be carried out in sections as the installation becomes completed.

- All strainers shall be inspected and cleaned out or replaced.

- When the entire systems are reasonably clean, a pre-treatment chemical shall be introduced and circulated for at least 8 hours. Warning signs shall be provided at all outlets during pre-treatment.

- The pre-treatment chemical shall:-

  i. Remove oil, grease and foreign residue from the pipe work and fittings;

  ii. Pre-condition the metal surfaces to resist reaction with water or air.

  iii. Establish an initial protective film;

  iv. After pre-treatment, the system shall be drained and refilled with fresh water and left until the system is put into operation.

  v. Details and procedures of the pre-treatment shall be submitted to the Architect for approval.

  vi. Check all clamps, supports and hangers provided for the pipes.

  vii. Check all the equipment, piping and valves coming under hot water system and operate each and every valve on the system to see if the valves are functioning properly. Thereafter conduct & hydro test of the system as for (b) above.

  viii. Fill up pipes with water and apply hydrostatic pressure to the system as given in the relevant section of the specification. If any leakage is found, rectify the same and retest the pipes.

3. **STATUTORY AUTHORITIES' TESTS AND INSPECTIONS**

- As and when notified in writing or instructed by the Architect, the Contractor shall submit shop drawing and attend all tests and inspections carried out by Local Fire Authorities, Water Authority and other Statutory Authorities, and shall forthwith execute free of charge any rectification work ordered by the Architect as a result of such tests and inspections where these indicate non-compliance with Statutory Regulations. Some of these tests may take place after the issue of Practical Completion of the Main Contract and the Contractor shall make all allowances in this respect.

- The Contractor shall be responsible for the submission of all necessary forms and shop drawings to the Statutory Authorities which shall conform in layout to the latest architectural plans submitted to and kept by these Authorities.

- The submission shall comply with the requirements set forth in the current Codes of Practice and circular letters of the Statutory Authorities. The shop drawings to be submitted shall be forwarded to the Architect for checking before submission.

- The Contractor shall allow for at least two submissions of complete sets of shop drawings to the Authorities, one to be made within six months after the award of the Contract but not less than six weeks before the inspection. The Architect may at his discretion instruct the Contractor for additional submissions to the Local Authorities whenever necessary.

- The Contractor shall notify the Architect at least seven days in advance of his application for local Authority tests and inspections. On receipt of a confirmed date for test and inspection the Contractor shall inform the Architect without delay.

4. **FINAL ACCEPTANCE TESTS**

- Following commissioning and inspection of the entire installation, and prior to issue of the Completion Certificate, the Contractor shall carry out final acceptance tests in accordance with a programme to be agreed with the Architect.

- Should the results of the acceptance tests show that plant, systems and/or equipment fail to perform to the efficiencies or other performance figures as given in this Specification, the Contractor shall adjust, modify and if necessary, replace the equipment without further payment in order that the required performance is obtained.

- Where acceptance tests are required by the relevant Authorities having jurisdiction, these tests shall be carried out by the Contractor prior to the issue of Completion Certificate to the acceptance of the Authorities.

5. **REJECTION OF INSTALLATION / PLANT**

- Any item of plant or system or component which fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or on completion at site may be rejected by the Architect either in whole or in part as he considers necessary/appropriate. Adjustment and/or modification work as required by the Architect so as to comply with the Authority's requirements and the intent of the Specification shall be carried out by the Contractor at his own expense and to the satisfaction of the Authority/Architect.

- After works have been accepted, the Contractor may be required to carry out assist in carrying out additional performance tests as reasonably required by the Architect/Employer.

6. **WARRANTY AND HANDOVER**

The Contractor shall warrant that all plant, materials and equipment supplied and all workmanship performed by him to be free from defects of whatsoever nature before handover to the Owner.

7. **HANDING OVER OF DOCUMENTS**

- All testing and commissioning shall be done by the Contractor to the entire satisfaction of the Owner’s site representative and all testing and commissioning documents shall be handed over to the Owner’s site representative.

- The Contractor shall also hand over all maintenance and operation manuals, all certificates and all other documentation as per the terms of the contract to the Owner’s site representative.

8. **PIPE COLOUR CODE:**

S. No.	Pipe Lines	Ground / Base Color	First Color Band	Second Color Band
1	Fire System	Post Office Red		

SPECIFICATIONS
FOR
INTERIOR
WORKS

SPECIFICATIONS FOR INTERIOR WORKS

1.1 FURNITURE AND FURNISHINGS

1.1.1 GENERALLY

1.1.1.1 General Requirements.

The section of the specification shall be read in conjunction with the Drawings, other Contract Documents and other sections of these specifications which shall be deemed to be complementary to one another. The Contractor carrying our this work shall be responsible for providing all plant, tools, materials and all things necessary for the proper execution, completion and maintenance of these works.

1.1.1.2 Dimensions

Figured dimensions shall be taken in preference to scaled dimensions in all cases. Before commencing any work the Contractor shall verify all requirements on the Site.

1.1.1.3 Samples

A Sample of every item of furniture / paneling / cladding / flooring / all other components, including their parts shall be submitted for approval before an order is placed or manufacture commences. Approved samples shall be used as standards of finish and workmanship.

1.1.1.4 Timber

Timber shall be of the species specified. It shall be of its kind, as set out in Section on Carpentry and Joinery, well seasoned and kiln dried with moisture content of 12% nominal. It shall be matched for colour and grains, free from worm holes or dead knots or other defects and sawn die square.

1.1.1.5 MDF

No Plywood shall be used. Preference is for MDF wherever possible along with recycle content wood such as agro boards, particle boards etc.

1.1.1.6 Joints and Adhesives

All joints shall be standard Mortise and tennon / dowel / dovetail / cross-halved / mitred / tongue & groove / rebated. Nailed butt joints will not be permitted except where shown in the drawings. Where mortise and tennon joints are shown in the drawings, tennon shall fit the mortises exactly. Adhesives shall be resin based for all carpentry work and as per approval of the Project Manager / Architect. Lap joints with glue shall be permitted in wood skirting.

1.1.1.7 Fastenings

Screws, nails etc, shall be of standard iron / wire unless otherwise shown on drawings. Screws and nails for outdoor furniture shall be of brass or other non-corrosive metal. Exposed fastenings shall match the finish of hardware. Where screws show on a finished surface, they shall, unless otherwise detailed, be sunk and the hole plugged with wood plug of the same wood and grain of the finished

surface. Nails on finished surfaces shall be neatly punched and the hole filled with wood filter to match. Filling putty over screw or nail holes shall not be permitted.

1.1.1.8 Hardware

Hinges, locks, latches, door tracks, nail hides etc shall be as specified or an approved substitute equal to or better than the specified.

1.1.1.9 Metal

Where metal legs, frames and the like are used, these shall be welded, brazed, bolted or as required, and on finished surfaces, welding, brazing, and riveting shall be ground so that no evidence of this is apparent on the final finish of the metal. All legs of case or cabinet furniture whether of wood or metal, shall be equipped with nylon glides or castors unless otherwise shown on the drawings.

1.1.1.10 Finish

Finishes shall be fully in accordance with the drawings and schedules. Where timber is in natural finish, pieces shall be matched for colour and grain before assembly. Where timber is stained the stain shall be matched throughout. Backs of wall-hung case of cabinet furniture shall be treated with an approved brand of wood preservative.

1.1.1.11 Upholstery

Where the upholstery fabric is patterned no upholstery fabrication is to commence until the Contractor has received clear instructions concerning the direction of the pattern and the method of its joining. Upholstery will be of first class workmanship with webbing, no-sag springs, coiled springs, padding and filling as specified. Covering fabrics will be sewn, tufted and corded as shown on the drawings or schedules.

1.1.1.12 Cushion Vents

Cushion vents shall be made in the back or underside of all seat cushions in sufficient number to allow air to escape easily and prevent torn seams.

1.1.2 DELIVERY, STORAGE, INSTALLATION AND PROTECTION

1.1.2.1 Delivery, Storage and installation of Furniture and Furnishing.

Furniture and furnishings shall be stored safe from fire, damp, theft or any other form of damage. When required all items of loose furniture shall be installed in the positions shown on the drawings

1.1.2.2 Protection

The Contractor shall protect and guard all fixed and loose items of furniture, fixtures, fittings and all other furnishing from fire, damp, theft or any other damage until the date of hand-over of the completed works. The Contractor shall make his own investigations to guard against local sources of attack and damage and take all necessary precautions for protection.

1.1.2.3 Completion

On completion of the installation of all work in this section the Contractor shall leave all work clean and perfect.

1.2 CARPENTRY AND JOINERY

1.2.1 GENERALLY

1.2.1.1 General Requirements

This section of the specifications shall be read in conjunction with the Drawings and other Contract Documents and other sections of this specification, which shall be deemed complimentary to one another. The Contractor shall be responsible for providing all plant, tools, materials and all things necessary for the proper execution, completion and maintenance of the works.

1.2.1.2 Delivery and Storage

All timber delivered to the site shall be carefully stored above ground in such a manner as to provide proper drainage, ventilation and protection from the weather and shall be stored in the proper manner according to each material type.

1.2.1.3 Definition of Carpentry

The definition of carpentry work shall be deemed to include fixing clips, blocking grounds, fittings, sub-frames, and rough-frames; and wood framing members include all wood work that are required to completely fabricate, finish and install any piece of furniture, partition etc.

1.2.1.4 Moisture Content of Carpentry

The moisture content of timber during manufacture, delivery to the Site, Storage, Site Working, Assembly and Installation shall have moisture content of 12% nominal.

1.2.1.5 Protection, Delivery and Storage

- While remaining in proper wrappers the timber shall be protected from extremes of temperatures and direct sunlight.
- Internal joinery and joinery timber shall be kept in its original wrappers before working, fixing and installing on Site.
- All joinery to be painted shall be approximately sealed with the specified primer to all faces before leaving its place of manufacture. All joinery to be varnished / spirit polished shall be sealed with at least one coat of specified varnish polish at all faces before leaving its place of manufacture. All joinery and joinery timber shall be wrapped in proper cover before and during transport and delivery to Site.
- Proper warping to external joinery and timber shall be removed on delivery to Site or as previously specified.

1.2.1.6 Timber

Timber shall be only re- growable specification accepted by IGBC and suitable for the purpose for which it is intended. It shall be seasoned, free of defects, which would affect strength or usability and shall be fault free, straight, non-splitting and dressed on all sides.

1.2.1.7 Timber Fixings

The carpentry timber shall be fixed with nails, spikes, bolts, screws, hangers, stirrups, ties, anchors or any other accessories which are required to develop the full strength of the members which they support or join and / or as directed by the Architect. All fixing in exterior locations shall be galvanized .

1.2.1.8 Fixing to Masonry or Concrete

Carpentry timber where fixed to solid masonry or concrete shall be secured with expansion bolts or other positive methods of mechanical fastening. Carpentry timber where fixed into hollow masonry shall be secured with toggle bolts of steel with nuts and washers.

1.2.1.9 Fibre Plugs

Fixing by means of wooden plugs will be permitted only where it is required and advisable in the opinion of the Project Manager / Architect.

7.2.1.10 Nailing Strips

Nailing strips unless otherwise required shall be continuous. Fixing strips shall be case into concrete where required by the Project Manager and shall be slightly undercut and finished flush with the finished rendered surface.

1.2.2 PROTECTION AND RETARDANT

All timber used shall be kiln seasoned. Fire Retardant paint shall be used on all hidden timber wherever indicated / specified anywhere in the drawings, specifications and the various parts of this Document.

1.2.3 WOOD, PLYWOOD, BOARD, VENEER & LAMINATE

1.2.3.1 Kailwood / Marandi

Wherever kailwood is specified it shall mean First Class Kailwood / Marandi /equivalent as per approval of the Project Manager / Architect / QCI

1.2.3.2 Teakwood

Not Applicable

1.2.3.3 Cedar / Beech Wood

Not Applicable

1.2.3.4 Plastic Laminate Veneer

a. Plastic decorative laminated veneer sheeting shall be ISI marked or the brand, catalogue number and colour indicated and approved. The laminated veneer shall be 1.5 mm thick on flat surfaces and 1 mm thick on curved surfaces unless otherwise approved.

b. Plastic laminate veneer shall be fire retardant to Class 1 of BS: 476 or ISI Code where specified.

c. Plastic laminate shall be veneered to mounting surface with an approved resin based adhesive, used in strict accordance with the manufacturer's instructions. Rubber based adhesives shall not be used. Sheeting shall not be applied to timber with moisture content of more than 15% or at a temperature of less than 15 deg C (59 deg F). The sheeting shall be applied only to close-grained plywood to ensure smooth ripple-free surface; it shall not be applied to open grained plywood such as Fir plywood. Underside surfaces of counter topes & shelves which are faced with plastic laminate shall have correspondingly thick backing sheet applied. Cabinet doors faced with laminate shall receive the same laminate on the reverse side and edges. Top sheets shall be placed on and over finished edges unless otherwise noted. Edges not faced with laminate, as at field joints, shall be machined and sealed. Butt jointing of laminates shall be minimized by using longest available lengths where required, and all butt joints shall be perfectly flush and sealed. Grain direction of wood grain laminated sheeting shall be as follows unless otherwise required by the Architect:

   a) Lengthwise on horizontal surfaces
   b) Vertical on vertical surfaces
   c) Horizontal on edges of top surfaces and shelves.
   d) No surface sanding of laminated plastics will be allowed.
   e) Unless otherwise specified, all laminated plastics shall have a standard matt or suede finish unless where mentioned.
   f) Samples of laminated plastics showing the surface texture and pattern shall be submitted for approval before fixing.

1.2.3.5 Particle Board / Graded Particle Board

a. The Particle board shall comply with ISI specifications and shall be one made from wood particles and flat pressed with synthetic resin and/or organic binder. Thickness shall vary as shown on drawings.
b. Particle board shall not be used externally or internally in any essentially damp surroundings.
c. Manufacturer and reference for Particle Board shall be subject to approval.

1.2.3.6 Storage of Sheet Materials

Sheet materials shall be transported and stored flat, with sufficient support to prevent bowing and warping and to prevent damage to edges and corners. Sheet materials shall be protected from weather and kept off the ground and in dry and well ventilated conditions.

1.2.3.7. Samples

The Contractor shall submit samples of all materials including large samples of veneer assemblies for approval. All materials prefabricated, delivered and assembled shall be in accordance with approved samples.

1.2.3.8 Delivery and Storage – Shop Fabricated Items

Shop fabricated items shall not be delivered to the Site of the works until that site is ready for such installation and the building is fully dry, and shall duly be packed in cartons, or otherwise protected whilst in transit. Installed work shall be adequately protected against at Contractor's own expense and to the satisfaction of the Project Manager.

1.2.4 JOINERY GENERALLY

1.2.4.1 General

a. Joinery shall be carried out strictly in accordance with the Drawings. Where joints are not specifically indicated recognised forms of joints shall be used, as per best practice.

b. Joinery shall conform to IS Standards

c. Where no dimensions are specified or shown on Drawings the Contractor shall space fixing battens, filet, grounds, studs and the like in accordance with the recommendations of the manufacturer of the sheets being fixed.

1.2.5 FOAM QUILTED AND PLASTIC LAMINATED PANELS

1.2.5.1 General

Reference should be made to sections of this specification, which relate to timber and plastic laminate veneers:

a. The panels shall be factory made and shall be selected timber veneer or plastic laminate veneer glued to plywood the edges of which shall be finished with hardwood lipping. The sizes and finishes of the panels shall be in accordance with the Drawings and Schedules.

b. The edges of the panels shall have a veneer strip applied to exactly match that of the finished "seen" face in colour, type and finish.

c. Where required post-formed edges in desired profiles would be provided.

1.2.5.2 Fire Rating

Panels shall be rendered flame retardant and conform to local fire regulations where specified.

1.2.5.3 Protection and Storage

a. Panels shall be delivered to Site in perfect condition and in their original coverings.

b. Panels shall be stored flat and stacked evenly in such a manner as to allow air to circulate around them freely and shall be protected from damp, sunlight and all other damage.

1.2.5.3 Installation

a. Panels shall not be installed until all plastering work is dry.

b. Panels shall be installed according to the drawing and schedules and to the manufacturer's recommendations.

c. Panels are to be securely fixed to walls with screws on painted mild steel "Z" slips at 600mm centres horizontal and 1200 mm centres vertically and shall be installed true and plumb on hardwood backing pieces as necessary.

d. Panel edges that are exposed after installation shall be sealed and made good with a veneer edging strip to match the factory finish.

e. On completion of installation the panels shall be left in perfect condition and properly protected against damage, damp, excessive heat, dirt and direct sunlight.

1.2.5.4 Samples

The Contractor shall submit a sample of each type of veneer for approval before general fabrication is started.

1.2.5.5 Construction and Fabrication of Foam Panels

a. Panels shall be constructed of fabric on foam on new timber framing with insulation quilt in-fill.

b. Framing shall be constructed of approved sections as per drawing and adequately braced to ensure rigidity. All outer exposed edges and corners shall be pencil rounded. Joints shall be subject to approval. Screws and nails shall be counter sunk and punched below the surface.

c. The fabric shall be back faced with synthetic foam. The foam shall cover all outer edges and corners of the framing and securely fixed in place to the back of the framing with approved marking cloth.

d. The fabric shall be evenly stretched over the foam covered framing to obtain a tight flat and evenly finished surface. The fabric shall be returned over the framing edges and lapped 50mm over the back face of the framing and securely fixed.

1.2.5.6 Protection Generally

a. Panels shall leave the factory in perfect condition and in protective wrappers and be properly protected from damage.

b. Panels shall be stacked in dry well-ventilated conditions off the ground. The original protective wrappers shall be removed immediately prior to installation of the panels.

c. The Contractor shall be responsible for protecting all items of work in this section in these areas of work forming part of his own expense any damaged work caused through lack of adequate protection or care in installation or handling.

d. The Contractor shall make his own investigation to guard against local sources of attack and damage and take all necessary precautions of protection.

1.2.6 FINISHES

1.2.6.1 Melamine Finish

Timber works shall be finished by the application of two coats of an acid catalysed clear lacquer (melamine) wherever it is indicated in the drawing. The finish shall be a satin, semi gloss finish and shall be carried out as follows:

a. The base shall be sand papered to the desired finish and coated with a colour tinge to give it shade. The shade shall be sealed with a coat of spirit finish.

b. After the base, first coat of lacquer shall be applied evenly by a soft cloth or by spray to give an even coat to the veneer surface.

c. After the first coat has fully dried, the lacquered surface shall be rubbed down in the direction of the veneer grain with very fine glass paper and left completely smooth and clean before the second coat is applied.

d. When the second coat of lacquer is fully dry, the surface shall be rubbed down in the direction of veneer grain with very fine wire wool dipped in a petroleum based wax to give lubrication.

e. Twenty-four hours after completion of this process the lacquered veneer surface shall be finished by burnishing with a soft cloth to an approved finish.

1.2.6.2 Paint and Polishing

a. All materials required for the works shall be of a specified and approved manufacturer, delivered to the site in the manufacturer's containers with the seals etc unbroken and clearly marked with the manufacturer's name or trademark with a description of contents and colour. All material to be stored on the Site of works.

b. Spray painting with approved machines will be permitted only if prior written approval has been obtained from the Architect. No spraying will be permitted in the case of priming coats or where soiling of adjacent surface is likely to occur. The nozzle and pressure to be so operated as to give an even coating throughout to the satisfaction of Architect. Thinning of paint made for brushing will not be allowed.

c. Wood preservation shall be Soligam or any other equal / approved impregnating wood preservative and all concealed woodwork shall be so treated.

d. All brushes, tools, pots, kettles etc used in carrying out the work shall be clean and free from foreign matter and are to be thoroughly cleaned out before being used with a different type or classes of material.

e. All iron or steel surfaces shall be thoroughly scrapped and rubbed down with wire brushes and shall be entirely free from rust, mill scale etc before applying the priming coat.

f. Surface of previous painted metal which are to be repainted shall be cleaned and flattened down as described in surfaces of previously painted woodwork. Minor areas of defective paint and any rust / loose scales shall be removed completely by chipping, scraping and wire brushing back to the bare metal and touched up with primer as described.

g. Surfaces of new wood-work which are to be painted are to be rubbed down for approval of the Architect prior to application of paint.

h. Surfaces of previously painted woodwork which are to be repainted shall be cleaned down with soap and water, detergent solution or approved solvent to remove dirt, grease etc whilst wet the surface shall be flatted down with a suitable abrasive and then rinsed down and allowed to dry. Minor areas of defective paint shall be removed by scraping back to a firm edge and the exposed surface touched up with primer as described and topped with putty. Where woodwork has been previously painted or polished and is to be newly polished, the same shall be prepared with scraping, burring off or rubbing down.

1.2.7 LATEX FOAM RUBBER

1.2.7.1 Material and Workmanship

a. Latex foam rubber shall be manufactured from foamed rubber latex together with added compounding ingredients of such nature & quality that the finished product complies with the specification requirements. Any special characteristics other than those prescribed in these

specifications, which may be desired for specific applications, shall be specified in the product specification as they may influence the choice of ingredients used.

b. Due to manufacturing conditions the material may have to be altered or repaired. The repaired or altered material shall be acceptable under the specification provided the material used in such repairs or alterations is of the same composition and quality as the original product and provided such alterations do not affect the serviceability, and shape beyond tolerances as provided in this specification.

c. Latex foam rubber products should be directly moulded / otherwise shaped or fabricated. When a product is fabricated, all joints should be as strong as the foam rubber itself.

d. Latex foam rubber of grade B, C or D shall be used in the back / arms and grade D, E or F shall be used in the seat.

e. Latex foam rubber shall be ISI marked.

1.2.7.2 Colour

The colour of the latex foam rubber products shall be as specified.

1.2.7.3 Odour

The latex foam rubber shall have no objectionable odour.

1.2.7.4 Dimensions

The actual length and width of a latex foam rubber product should be greater than the nominal dimensions by a small amount in order to admit the foam rubber being slightly compressed by a cover made to the nominal dimensions. It is advised that this amount should be sufficient to compensate for the negative manufacturing tolerances given in ISI 1741-60.

1.2.7.5 Packing

The latex foam rubber products shall be packed properly to avoid any damage to it.

1.2.8 HARDWARE

Hinges, locks, latches, door tracks etc shall be in SS brushed steel finish or as specified and as far as possible of specified manufacture. In case of any variation in quality, the substitute shall be equal to or better than the originally specified and the sample should be submitted to the Architect for prior approval.

1.2.9 METAL WORK

The Contractor shall furnish all materials, labour, operations, equipment, tools, plant and incidentals necessary and required for the completion of all metal work as called for in the Drawings. The Drawings and Specification cover the major requirements only. The supplying of additional fastenings, accessories, features and other items not mentioned specifically herein but which are necessary to make a complete installation shall be part of this Contract.

1.2.9.1 General

All metal work shall be free from defects importing strength, durability and appearance and shall be of the best commercial quality for purposes specified, made with structural properties to withstand safety strains, stresses to which they shall be normally subjected.

1.2.9.2 Samples

a. Samples of all typical metal work shall be fabricated assembled and erected or sub mitted to the Architect as directed by him for approval.

b. Where metal legs/frames/sheets etc are used, these shall be welded, brazed, bolted or riveted as required. On finished surfaces welding, brazing and riveting shall be neatly smoothed so that no evidence of this is apparent on the final finish of the metal which will be specified in the drawing.

c. On all legs, wood or metal, nylon glides or castors as indicated are to be installed.

1.2.9.3 Finish

a. This will be as indicated on the drawing and colour scheme charts and materials (timber, plastic laminates, lacquer, paints etc) must be as specified. No variation will be accepted unless it is with the prior approval of the Architect.

b. "Backs" of cabinets etc wall-hung shall be treated with an approved brand of wood preservative.

1.2.10 MIRROR

1.2.10.1 General Requirements

This section of the Specification shall be read in conjunction with the Drawings and Schedules and other section of the Specification which shall be deemed to be complimentary to one another. The Contractor carrying out this work shall be responsible for providing all plants, tools, materials and all things necessary for the proper execution, completion and maintenance of these works.

1.2.10.2 Samples

The Contractor shall submit samples of all glass and mirror types for approval. /these shall be obtained from an approved source.

1.2.10.3 Delivery and Storage

a. Delivered materials, shall match the approved samples, packaged materials shall be delivered in the original, unopened, labeled containers of the manufacturer clearly marked with their name and brand.

b. Mirror shall be stored while awaiting installation in a dry, well-ventilated location at a constant temperature maintained above dew point.

c. Handling of mirrors shall be kept to a minimum. Mirrors shall be protected against soiling, condensation, etching and the like.

1.2.10.4 Marking Mirror

Manufacturer's or job marking on mirror and adhesive for manufacturer's labels shall not be alkaline but shall be either neutral or slightly acidic so that it is removed after its installation.

1.2.10.5 Cutting Mirror

Cutting of mirrors shall be in accordance with site measurements or dimensions.

1.2.10.6 General

Mirror shall be fabricated from clear plate or float glass of the quality and finish shown in the Drawings and Schedules unless otherwise required.

1.2.10.7 Thickness

All fixed panel mirrors shall be 6mm thick imported unless otherwise stated having plus/minus 0.30mm tolerance.

1.2.10.8 Edges

All edges of mirrors shall be polished, beveled, corner mitered to ISI Specifications or as indicated in the drawing.

1.2.10.9 Drilling

All drilling of holes shall be carried out at the stage of fabrication. No chipping, starring and other visible imperfections around holes will be accepted.

1.2.10.10 Fixing

a. Panels shall be securely fixed with screw on "Z" clips at minimum 600mm centers horizontally and 1200 mm centres vertically.
b. Mirrors shall be fixed to backings by adhesive or special fixings as shown on the drawings or as otherwise specified using CP cap screws.
c. Screws shall be of brass with collars and screw-on domes unless otherwise specified.

1.2.10.11 Finish of Fixing

All visible metal fixings shall be of approved finish to match mirror finish and colour.

1.2.10.12 Adhesives

Adhesives shall be as recommended by the silvering manufacturer and used in accordance with the manufacturer's recommendations.

1.2.10.13 Joints

Paper thin joints shall separate all adjoining sections of mirrors.

1.2.10.14 Protection of Mirrors

a. Mirror shall be protected from paint, plaster, welding splatter, construction scum and the like. Should any such soiling occur, the mirror shall be promptly and completely washed off as specified below.
b. Mirror generally shall be protected with temporary wooden barricades or other warning devices as a deterrent against passing objects through glazed openings.

1.2.10.15 Cleaning

When directed by the Architect, the Contractor shall remove all markings and labels from mirror and wash the mirror with mild neutral or slightly acidic solution as recommended by the mirror manufacturer. Alkaline or abrasive solutions should not be used.

1.2.10.16 Protection

a. The Contractor shall be responsible for protecting all mirrors in those areas of work forming part of this Contract. The Contractor shall replace at his own expense any broken or damaged mirror caused through lack of adequate protection or case in insulation or handling.

b. The Contractor shall make his own investigation to guard against local source of attack and damage and take all necessary precautions for protection.

1.2.11 P O P PUNNING

1.2.11.1 General

Plaster of Paris punning (Plaster) is generally applied on already cement plastered surface to give it a smooth and even surface.

1.2.11.2 Preparation of Surface

Projecting burrs of mortar existing on cement plaster shall be removed. The surface shall be scrubbed clean with wire brushes. In addition the plastered surface shall be pock marked with pointed tool, at spacing of nor more than 4 cms c/c and depth of pock to be approx. 3 mm. This is to ensure a proper key for the plaster. The surface shall be cleaned of all grease marks etc.

1.2.11.3 Plaster of Paris

The Plaster of Paris shall be of semi-hydrate variety Calcium Sulphate. Its fineness shall be such that when sieved through a sieve of ISI sieve designation 3.35 mm for 5 minutes after drying the residue left on it shall be not more than 1% by weight. It shall not be too quick setting. Initial setting time should not be less than 13 minutes.

1.2.11.4 Application

The material will be mixed with water to a workable consistency. Plaster of Paris shall be applied directly on the wall plaster in suitable size panels and finished to a smooth surface by steel trowels. The plaster shall be applied in such a manner that it fully fills the gaps, and the thickness over the plastered surface is as specified in the description of the item.

The finished surface shall be smooth and true to plane, slopes or curves as required.

1.2.12 WOODEN FRAMES

Frames where asked for shall be of 1st Class Teak / Cedar / Oak / Beech wood of required size as described in the item. Sawing shall be truly straight and square in the direction of the grains, and a scantling shall be accurately planned smooth to the required dimensions before the same is fixed in position. A tolerance of plus minus 2 / 3 mm shall be allowed in the finished cross section. Joint marks or other defects shall be rejected. All exposed wood and plywood shall be straight grained of matched grain and colour and shall be approved by the Project Manager before being fabricated.

1.2.13 INSTALLATION

All interior and exterior doors, partitions, glazing, cabinet and other fixed wooden equivalent shall be properly installed in level, plumb and true to plane, after the plaster in the section for which it is intended is sufficiently dry. Butt joints shall be avoided wherever possible if unavoidable the joint shall be beveled. All exterior angles shall be mitred. Adjoining interior wood members shall match and harmonise.

1.2.14 WOOD PRESERVATIVE TREATMENT

The following treatment shall be applicable to all – rough carpentry and joinery work:

a. Oil type wood preservative of specified quality and approved make conforming to IS-216 shall be used.

b. Painting shall be done after the surface to be painted is made free from dirt, dust any foreign matter and all rough spots sand papered and cleaned. The surface must be perfectly dry before painting is commenced.

c. In addition to the above, all portions of timber in joinery work, abutting against or embedded in masonry / concrete shall be painted with boiling coal tar before being placed in position.

d. All joints in joinery work shall be coated adequately with white lead.

1.2.15 FIRE RETARDANT PAINTS ON WOODWORK

All woodwork exposed or unexposed done by the Contractor shall be coated in a colourless fire retarding paint of brand approved by CBRI and Fire authorities. The painting work shall be done by soft brushes, and by pencil brushes in corners etc. The rate would include providing all material brushes etc. No extra payment would be made for the same.

1.2.16 FLOOR SPRING AND PIVOT

Hydraulically regulated floor spring and pivot shall be conforming to IS for heavy duty performance. Suitable adjustments shall be made such that the closing time can be raised five seconds to twenty-five seconds. The oil filling shall work well in all seasons and shall not show any signs of leakage of oil under working conditions. The supplier shall supply along with the closer a wrench and spanner for carrying out adjustments. Payments shall be made per number and includes supply of all accessories, fixing the door pivot/ floor spring, anodizing / painting etc complete as per directions of Project Manager.

1.2.17 GRANULAR SURFACE TEXTURED APPLICATION

a. Surface textured finishes shall be applied directly on concrete surface or POP surface or Cement–Badarpur-Sand plastered surfaces whichever is applicable.

b. Any surface before the application as also the final application of the finishing coats itself shall be done as per the manufacturer's specification.

1.2.18 GLASS AND GLAZING

1.2.18.1 Extent and Intent

The Contractor shall furnish all materials, labour, tools, appliances, equipment and incidentals required to complete the installation of all glass and related items.

1.2.18.2 General

All glass shall be of the type, quality and substance specified. All glass shall be first class in every respect and conform to ISI: 1761-1960. The glass shall be 100% free from blisters, stains, scratches and bubbles so as not to distort visibility.

1.2.18.3 Glass Sizes

The Contractor shall cut glass sizes by field measurements or dimensionally approved shop drawings. The responsibility for correct glass sizes shall rest with the Contractor. No cracked, chipped or disfigured glass shall be accepted.

1.2.18.4 Glass Breakage

The Contractor shall replace all broken, damaged and disfigured glass caused in executing the work or by faulty installation before hand-over, at his own cost.

1.2.18.5 Materials

Glass for all glazing work shall be plain flat glass as called for in the Drawings and schedules. Flat glass for glazing shall be 6 mm / 8 mm thick special selected quality glass as called for, manufactured by Saint Gobain / Modifloat or other equivalent as approved by the Architect.

1.2.18.6 Toughened Glass

The toughening of glass, where called for shall be carried out by M/s. Hindustan Safety Glass Works or M/s. Atul Glass Works or any approved vendor to the best standards available standards.

1.2.18.7 Glazing Compound

Glazing putty for setting glass shall be approved quality (Shalimar or approved equivalent) suitable for use on metal windows and conforming to ISI 420-1953. Gasket and Glazing shall be of Neoprene or EPDM of approved quality and make.

1.2.18.8 Preparation of Frames and Glass

Before installation the Contractor shall ensure that

a. All glazing rebates are square, plumb and true in plane, clear, dry and dust free.
b. All frame adjustments are made prior to glazing.
c. All glass edges are clean, cut to exact sizes and grout properly allowing for expansion tolerance as recommended by the glass manufacturer.
d. All sashes shall be glazed in the closed position and shall not be opened until the compound is set.
e. All materials are used in strict accordance with the manufacturer's instructions.
f. Glass shall not be forced into place.
g. All rebates / beadings etc to be pre-polished.

1.2.18.9 Installation

The glass shall be set on Neoprene or EDPM blocks on all sides. Glass shall be bedded back and face and so installed as to achieve a completely water tight and rattle free installation. The odd glass where called for shall be set with smooth surface outside.

1.2.18.10 Completion

Upon the completion of the work all glass shall be thoroughly cleaned, paint or other marks removed. Any cracked, scratched, chipped or other defective glass shall be removed and replaced without cost of Owner. Any loose glass shall be set to the satisfaction of the Architect.

1.2.19 GYPSUM BOARD/GYPSUM PARTITIONS

a. All gypsum board partitions shall be carried out using the product hardware accessories, specifications and methods that come from the manufacturers (M/s. India Gypsum).

b. The same shall also held good for any work other than partitions that need to be done in gypboard.

c. All gypboard work will be inspected and approved by the representative of M/s. India Gypsum Ltd. in addition to the regular approvals from the Project Manager / Architect.

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	Supplementary Preambles
1	Before submitting this tender the contractor shall visit the site and satisfy himself as to the nature and extent of the work to be done and the value of the materials contained in the buildings or portions of the buildings to be demolished. No claim for any variations of the contract sum in respect of the nature and extent of the work or of inferior or damaged materials will be entertained
2	All demolition work is to be carried out in accordance with the Local By-laws and to the requirements of the Local Health Authorities. The contractor is to allow for giving notices and paying any fees related to Planning requirements.
3	In taking down and removing existing work the utmost care must be taken to avoid any structural or other damage to the remaining portions of the building. The Contractor will be held solely responsible for the safety and stability of the existing structures upto the whole period of the contract and must make good any damage at his own expense & cost and no any claim will be entertained in this regard for any reason whatsoever.
4	Existing services must be maintained at all times to the existing buildings. If it is found necessary to disconnect any service then suitable temporary or alternate services must be provided to the existing buildings.
5	The contractor will be held responsible for any damage caused to any persons or property and for the safety of the structures. Contractor to allow for protecting and indemnifying persons using the existing buildings from injury by virtue of the building operations, including providing necessary barriers, signs, etc. as and when required.
6	Old materials resulting from the alterations and demolitions exept where described to be re-used or handed over; are to be regularly removed from the site and not allowed to accumulate on or around the site
7	Prices for all works described throughout the Bills of Quantities are to include for making good, whether specifically mentioned or not in all trades except Painting, unless mentioned otherwise are applied, wherever found necessary.
8	The quoted rates must be inclusive of site house keeping and cost of all materials. No material will be given by Employer.
9	All wooden works shall be treated with anti-termite treatment & application of fire retardent paint shall be done as per manufactures specifications.
10	Base Rate shall mean the landed cost of material at site excluding all taxes and duties (Net of GST). Base rate also includes loading, transport, packing, forwarding, unloading and handling charges (FOR site) required for the works to be executed but exclude contractor's profit and overheads.
11	The item rate shall include cost of equipments and machineries, all leads and lifts, loading and unloading charges, transportation cost and conveyance of all material and all other incidental charges etc., complete for successful completion of work and as directed by the Engineer-in-charge.
12	The BOQ shall be read in conjunction with the available drawings, technical specifications.
13	All flooring items shall be inclusive of protection with adhesive sheet / cello bubble rollon till final handover to avoid breakage. Any breakage till final handover to Operations team shall be the responsibility of the contractor.
14	Storage and safety of materials shall be the responsibility of the Contractor.

	Supplementary Preambles
15	The rates shall be quoted considering all heights, leads and lifts unless mentioned.
16	Quoted rate to include all, lead, lift & transportation of unserviceable material/debries/malba to the dumping yard & all serviceable / Scrap material to Client's store as per the instruction of EIC and no any extra claim will be entertained against the said.
17	Any temporary barrication (if required) to carryout the works shall be done by the vendor at his expense and cost and nothing extra shall be paid for any reason whatsoever.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
1		This BOQ shall be read in conjunction with the General Conditions and Preliminaries, Specification of Materials and Workmanship, Drawings and all other BOQs of Quantities contained in these documents which shall be construed as being complementary to one another.
2		The Contractor shall provide and do everything reasonably necessary for the proper execution of the Works according to the true intent and meaning of the Drawings, the Specification and the Documents forming part of the Contract taken together the same as may or may not be particularly shown or described, provided that the same is reasonable to be inferred there from. If the Contractor should find any discrepancy in the Drawings or between the Drawings and the Specification or any other Documents forming part of the Contract, he shall immediately refer the same to the Employer's representative who shall decide which shall be followed.
3		The rates and prices herein shall be inclusive of all Works, materials and expenditure, whether separately or specifically mentioned or described in the Contract Documents or not, which are either indispensably necessary to carry out and bring to completion the works described in or to be inferred from the Contract documents taken as a whole or which may contingently become necessary to overcome difficulties and bring the said works so described or inferred to satisfactory completion.
4		For the purpose of valuation of variations, any omission or additions to the Contract Sum shall be based on measured quantities, applying the relevant unit rates (or pro-rated unit rate, as the case may be) found in the BOQs of Quantities. As such, the Contractor is advised to price each item contained in the BOQs in a fair and realistic manner.
5		Unless otherwise specifically stated in the BOQs, the following shall be deemed to include with all items: -
	i)	Labour and all costs in connection therewith
	ii)	Material and goods including materials required for lapping, jointing and the like and all costs in connection therewith such as materials conveyance and delivery
	iii)	Unloading, storing, returning packing, handling, hoisting and lowering materials
	iv)	Assembling, setting, fitting and fixing materials in position and all costs in connection therewith; such as handling waste and cutting waste.
	v)	Use of plant, tools and equipment and all cost in connection therewith
	vi)	All necessary protection, temporary staging, shoring, scaffolding, screens etc. and other temporary work required in connection therewith
	vii)	Executing the whole of the Works in confined spaces as and when directed by the Employer's representative
	viii)	All necessary protection of Contractor's works against damage and making good of all works disturbed in connection therewith
	ix)	Removing all debris from site compliance to the Leed /IGBC requirement. 50% of the construction waste to be recycled or re-used.
	x)	All other incidental works associated with the completion of the Works
	xi)	Establishment charges, overhead charges and profit
	xii)	All necessary house keeping shall be complied as per the instructions of Employer's representative and as per the Industries standards.
	xiii)	For direct PO's issued by Employer, handling and inland transport of import material till delivery at site.
	xiv)	Unit price to deem to include Power and Water charges.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
6		The BOQ items are not fully descriptive in themselves and are not meant to limit the scope of Works. The Contractor shall inspect the site and fully determine for himself the full scope of each item and price the same accordingly. No claim will be entertained from the Contractor concerning lack of knowledge on his part in pricing of these items.
7		The quality and extent of the Works shall be that as shown and/or described in the Drawings, the General Conditions and Preliminaries.
8		The Contractor shall verify for himself all sizes and dimensions stated in the items here under and be fully responsible for the accuracy of the same.
9		Quantity shall be measured in accordance with IS 1200 - Method of Measurement for Building and Civil Engineering works. Unless otherwise stated in the Standard Method of Measurement or herein, work shall be measured NET as fixed in position.
10		Co-ordination with other Contractors for installation, testing & commissioning and completion of system as per operational requirement and complete satisfaction to the Employer's Representative.
11		Wastages of items are deemed to be included in the unit price.
12		All ceilings shall be measured only on visible Horizontal planes. Vertical side of the Ceiling up to 600mm high are deemed to be included in the unit price and shall not be measured separately, if claimed will not be paid.
13		All Aluminum proprietary sections shall be measured based on actual visible length and all supports and associated works are deemed to be included in the unit price
14		All the cabinetries storages, racks shall be measured from the visible front elevation, unless and until specifically mentioned
15		All the counter top shall be measured from the visible plan area, unless and until specifically mentioned
16		All Proprietary system items need to be installed by authorized OEM and warranty certificate to be issued on the name of Employer.
17		Unless otherwise specified, all MS sections to be coated with Metal Primer and 2 coats of Enamel Paint.
18		All partitions shall be measured from finished floor level to bottom of true ceiling.
19		Glass partitions shall be measured based on the actual visible height of the glass partition, considering both length and height measurements. Regardless of whether it is explicitly specified, all glass used in the partitions shall be of 12mm thickness and toughened for durability and safety compliance.
20		All Column cladding face area shall be measured from true floor level to False Ceiling level. Cladding above the False ceiling level is deemed to be included in the unit price
21		The method of measurement for Blinds shall be only visible elevation area.
22		Contractor scope shall include supply and installation of appropriate protective layer for all type of flooring till handing over the facility to the complete satisfaction of Client.
23		All the paints shall be low VOC content as per the Leed /IGBC requirement / Clients's approval
24		Tenderer shall consider unique identification for the lockers in the office spaces / storages, meaning each locker will have a key unique to it. The Locks shall not be openable with Key for one locker with other(s).
25		The description provided are brief. The Contractor shall inspect the site, STUDY THE DRAWINGS AND DETAILS and fully determine for himself the full scope of each item and price the same accordingly. No claim shall be permissible for lack of knowledge on Contractor's part in pricing of these items.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
26		All Samples of tiles, fittings etc. Shall be presented after ensuring that the necessary quantities of the relevant item(s) for which the same are invited are available, (ex-stock, or otherwise) and shall be approved by the Client before placing of mass orders.
27		The rates quoted shall be inclusive of dismantling, demolishing and carting the material and making good of the surface.
28		All services works, any interface works with other vendors have to be completed before finishing of partition paneling, other wall finishes and false Ceiling works. Signoff shall be taken from the Engineer in charge before proceeding with the final finishing works.
29		All wood and wood based products shall be of FSC certified.
		Important : Below mentioned responsibilities falling under the scope of Civil & Interior works vendors:
30		Covering all gaps, such as those between the concrete slab and glazing facade, columns and walls, and inside the hub room false flooring and walls.
31		Scraping and cleaning the floor before carpet installation, including wet mopping and handover to the carpet installation team. Also, repairing any undulations and ensuring level surfaces.
32		The agency is responsible for cleaning and painting the lift, lift lobby, staircase, and any other areas designated for agency use during the project execution. These areas must be maintained in the same condition as received from the builder before commencing the project. Any costs associated with these activities will not be charged to the client's account.
33		Touching up and finishing all existing doors provided by the builder upon possession without any extra cost.
34		Filling or closing all unnecessary holes, gaps, and openings in walls, gypsum ceilings/partitions, and floors using appropriate joinery materials like block walls, partitions, gypsum boards, Bison boards, and ceilings. Additionally, applying fire sealant packing where required.
35		Adding horizontal sections for extra strength in partitions as per engineer's recommendations without extra cost.
36		Ensuring gypsum ceilings and walls have appropriate sections to prevent cracking, with metal/aluminum ceiling support till the true slab as guided by the designer.
37		Provision and arrangement of floor stand industrial fans for floor ventilation system at no additional charge. Provision of temporary light and power, and making own arrangements if provided power is insufficient, without extra cost.
38		Using exterior grade (waterproof) MDF for all areas where MDF is used.
39		Providing heat soaking test certificates for all toughened/laminated glass, along with purchased quantity details.
40		Using plywood for inner sides and high-density or waterproof MDF for external sides where finishing will be applied.
41		Covering and protecting all flooring using thick foam-type sheets or plywood as necessary.
42		Execution/installation of all listed items only after mock-up/product approval by Client.
43		Providing wood or PLY frames for junction boxes of underfloor raceway for GI/junction cover installation without extra charge.
44		Providing Bison board supports/backing for services as needed, as per site requirements and PM instructions without additional cost.
45		Sealing all service cut-outs in partitions with HILTI CP 620 as instructed by PM and Designer without extra charges.
46		No extra charges will be paid for laser cutting, factory cutting, tools/tackle, stencil charges, design charges, scaffolding, special instruments for installation, protection materials, taxes, transportation charges, wastage, lifting/shifting, and scrap from the basic price.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
47		Providing concealed MS frame/L angle or AL section wherever gypsum ceiling is cantilevered by 200 mm or 400 mm, without additional cost.
48		Providing extra bracing of MS, GI, or AL section from internal closed ceiling instead of wooden support Patti forming T shape with partition if gypsum partition is on the RED tendon marking, at no extra charge.
49		Finishing all exposed edges of laminate with 4mm thick pre-laminated L angle.
50		**Note:**
	*	Vendors are requested to visit the site and quote accordingly.
	*	Vendor shall follow safety, barricading needs to be done as per PM /clients instruction.
	*	The site should be cleaned and maintained to a professional standard by professional agencies before handing it over to the client. After the completion of work, the site should be left clean with a professional housekeeping finish, ensuring no broom cleaning is necessary.
	*	Vendors are requested to visit the site and check the availability of water, power, service lift, debris dumping yard, lighting and quote accordingly for the works mentioned below.
	*	Vendor to the check the work timings permitted from client / builder.
	*	Quoted rates should includes shifting, lifting, loading, unloading of materials.
	*	Quoted rates should includes scaffolding at all heights. considering all safety standards.
		Notes: Loose furniture & system furniture
51		All products proposed must be of reputed makes as specified in the list of makes
52		The vendor must mark the workstation footprints at the site before commencing production.
53		Any variations in site dimensions should be promptly communicated to the Client before production begins.
54		Samples proposed by the vendor must align with the schematic drawings provided and require client approval.
55		Approval of the finished product must be obtained by installing the finished mock-up before production begins.
56		Waste generated during the process must be disposed of by the vendor outside the premises in a dump yard allocated by the authorities.
57		Defective materials must be replaced by the vendor at no additional cost.
58		The quoted rate should include supply, transport, lead, lift, installation, safeguarding, and handing over the finished product to the Client/Client.
59		The vendor is responsible for rectifying all snags before handing over.
60		Shop drawings of all quoted furniture must be submitted during the technical bid meeting.
61		The vendor must address Health, Safety, Security, and Environment (HSSE) issues in all supplied furniture.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
62		All fabric/upholstery used must be fire-retardant & comply with BS5852
63		Provision must be made for fixing data and electrical outlets above the tabletop.
64		The cost of furniture marking during the shop drawing stage and after installation of False flooring should be included by the vendor.
65		Deep cleaning of all furniture before final handover is required.
66		Vendor must inform client about the brand Warranty against any manufacturing defects at the time of material selection. Relevant warranty certificates must be issued on the name of Client at the time of handing over .
67		Adhesives and sealants used for the furniture must comply with the VOC limits mentioned in the Leed /IGBC section.
68		All proposals must comply with Stripe Sustainability Standards scorecard.
69		Works shall be executed post approval of Mock-ups from Architect/PMC/Client with no additional cost.
70		Vendors shall submit the terms of warranty along with the priced bids.
71		Unless otherwise specifically stated in the BOQs, the following shall be deemed to include with all items:
	i)	Labor, transportation, lead, lift, duties, and all costs in connection therewith.
	ii)	Material and goods, including materials required for lapping, jointing, and the like, and all costs in connection therewith, such as materials conveyance and delivery.
	iii)	Unloading, storing, returning packing, handling, hoisting, and lowering materials.
	iv)	Assembling, setting, fitting, and fixing materials in position and all costs in connection therewith, such as handling waste and cutting waste as per the Leed /IGBC /IGBC requirements.
	v)	Quoted rate shall include for a mock-up for each type of chairs at the location indicated by the Architect / Client/ Project Manager.
	vi)	Approval shall be taken on the mock-ups before starting mass production.
	vii)	Fabric/Cushion upholstery to be fire and stain-resistant. * Fabric pattern/Color/Shade to be strictly as per Architect/ Client approval.
	viii)	Documents pertaining to Leed /IGBC criteria points, test certificates, Leed /IGBC approvals, Leed /IGBC affiliations shall be submitted along with the bids.
	ix)	Castors shall be provided as per the flooring (Carpet (Soft)/Hard floor).
	x)	The vendor to confirm the final quantity to the Client before releasing the PO as per final layout plan..
	xi)	Chairs to have any one of the following ergonomic certificates - BIFMA G1-2013, ANSI/HFES 100-2007, CSA Z412-00 (R2011), ISO 9241-5:1998
72		All manufacturing to begin based on approved shop drawing & GFC only and not as per the tender BOQ.
73		Vendor to include Freight and transit insurances up to delivery at the site in the quoted price.
74		Without all the above details, their bid submission shall be considered NULL & VOID.
75		Part Shipment is not allowed.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
76		Minimum acceptable parameters:
	i)	Recycled Content: All furniture must have Post-consumer or Pre-consumer recycled content and certificates stating the same. The contractor needs to enclose all details with the breakup of recycled content.
	ii)	VOC certificate: All adhesives and sealants used for the furniture must comply with the VOC limits mentioned in VOC limits as per the Leed /IGBC section. A certificate from the manufacturer confirming the same needs to be submitted by the contractor.
	iii)	Regional Materials Certificate: A certificate on Product Manufacturer Letterhead confirming that all the above-mentioned products are manufactured within an 500 km radius of the Project Site.
	iv)	FSC Certificate: All Laminates, Veneers, Ply, MDF Boards, or any other component made of Wood needs to be FSC certified. A certificate for the same needs to be furnished by the Contractor.
77		**CARPENTRY, JOINERY WORKS**
	i)	Unless otherwise specified the rates quoted shall be inclusive of Cost of materials, taxes, transport, labour, overheads and profit, etc.
	ii)	All internal woodwork shall be treated with anti termite and fire retardant paint
	iii)	All internal surfaces of cabinets, etc. in conventional carpentry works shall be finished with 0.8mm thick matt finished laminate of approved shade
	iv)	All under surfaces of furniture (tables, counters, etc.) to be finished with 0.8mm thick matt finished laminate of approved shade
	v)	All exposed horizontal / external surface shall be finished with 1.5mm thick laminate of approved make/shade/texture etc., unless otherwise specified.
	vi)	All exposed veneer shall be group matched natural cut plain veneer of approved make and shade.
	vii)	All exposed veneered, wood surfaces shall be finished with matt melamine polish to approved shade
	viii)	All exposed edges of plywood, blackboard etc. shall be finished with 6mm thick lipping beading of specified wood
	ix)	All plywood, blockboard for office areas shall be water resistant, termite/borer proof commercial grade of specified make.
	x)	All plywood, blockboard for wet areas (toilets/pantry) shall be termite/borer proof and waterproof marine grade of specified make.
	xi)	Timber used shall be kiln seasoned and should be free from shrinkage, warpage even after fabrication of furniture.
	xii)	Provision to be made for additional supports and reinforcement that may be required for stability and evenness at where curved partition is constructed
	xiii)	Contractor to make provisions of all necessary scaffoldings to facilitate high level installations.
	xiv)	Contractor to form openings on partition for services and to seal gaps using silicon sealant.
	xv)	Doors & ironmongery shall be installed strictly as per manufacturers guidelines and using relevant tools required for the same.
	xvi)	All items to have sample approved prior to commencement of mass production

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
	xvii)	All screws seen out side should be star SS.
	xviii)	Usage of self adhesive Bead ex for all exposed edges of Gyp board applications
	xiv)	In instances where two distinct materials meet on the wall paneling, and a groove is required to be displayed, the contractor is obligated to supply the aluminum U-channel for this purpose without any additional charges. The quoted rates should be inclusive and incorporated within the specified item in the Bill of Quantities (BOQ).
78		**FLOORING WORKS**
	i)	Receiving all materials supplied by the client / all vendors, unloading, storing at location specified by the project manager. No additional payment will be paid for any increase lead from this location conveying to work site & fixing in position. (If any materials supplied by Client)
	ii)	All finished flooring shall be covered with plaster of Paris of 6mm thick over a plastic film without any extra cost till handing over to the Client.
	iii)	Daily housekeeping of work areas which includes segregation of debris like cement based, plastic, glass, wood and collecting in containers provided to/by you, at an acceptable location inside the site premises.
	iv)	Granite slabs should be free of all defects and all grains / patterns shall be properly matched from the same lot. Any color / lot variation shall be rejected.
	v)	The minimum quality benchmark will be decided by the Client / Project manager based on mock up samples before commencing the work.
	vi)	Unless otherwise specified the rates quoted shall be inclusive of the Cost of material, taxes, transport, labor, overheads and profit, wastages etc.
	vii)	Base sub-grade/sub-floor to be prepared by cleaning all dust/loose particles, caked mortar droppings, etc. by scrubbing with steel wire brushes. Surface to be roughened if so required and surface cleaned with water and kept wet for minimum 12 hours. Cement mortar thickness shall be decided by vendor as per site condition, cement slurry to be laid on cleaned floor slab prior to start of preparation of cement bed for hard flooring works (This would enable binding between floor slab and hard floor)
	viii)	Finished work to be inclusive of cutting and polishing where specified/applicable
	ix)	Contractor to be responsible for hiring/operating of all machines/equipment. Approval to be obtained from Project Manager before operating. Special core cutting tools and equipment's to be used for making drill or cut outs in hard floor and dado finishes for making provisions for sanitary, plumbing and other service fixtures and fitting accessories.
	x)	Finished floor must be cured by keeping wet for at least 1 week after installation.
	xi)	Flooring to be cleaned, waxed or acid washed where applicable and as directed.
	xii)	Pointing to be done using matching colored grout as specified/directed approved Polymer grouts (Laticrete, Bal Endura)
	xiii)	All marble flooring/slabs to be polished using tin oxide only.
	xiv)	Slurry for marble flooring to be of white cement only.

GENERAL NOTES FOR ITEMS OF WORK FOR CIVIL INTERIOR AND ALLIED ASSOCIATED WORKS		
S. No.		**Description**
	xv)	Absolute cleaning of hard floor and dado finishes before hand over free from dirt and stains.