DOCUMENT NO. :	202210-GBU-S1-SCD-AF_CGH-01
VERSION NO. :	R3
PURPOSE :	SUBMISSION
NO. OF PAGES:	110

GUJARAT BIOTECH UNIVERSITY

SCOPE OF WORK

REPORT NO.: 202210-GBU-S1-SCD-AF_CGH-01

DATED: 06.06.2024

CLIENT

ARCHITECTS

SGA DESIGN LAB

	-	06.06.2024
OBSERVATION	**REVISION**	**DATE**

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1. SCOPE OF WORKS – GENERAL

The below mentioned scope of works in this section shall include entire scope of works to be executed as per value structure mentioned in including but not limited to Works described under (BOQ) (i.e., civil, structural, Landscape, Hardscape, Architecture, Interior, finishing etc.

The scope under this section shall also include but not be limited to all civil and structural works including Architecture works, Interior and Finishing works.

1.1. The CMA shall design, procure, and install a 1:50 scale physical model of the building and site layout with the approval of the DTA showing the topography, road network, building blocks, elevation features, landscape area, open spaces and other existing features at site. This model would be installed at the designated location in the site prior to the start of construction and also use this model at the time of ground-breaking ceremony which is organized by CMA on-board.

1.2. The scope of work comprises construction and completion of civil, structural and all other allied works in accordance with technical specifications and/or all other connected relevant documents/ specifications and its maintenance thereof and except in so far as the Contract otherwise provides, the provision of all labor, materials, construction plant of temporary or permanent nature, works and everything whether of a temporary or permanent nature, required in and for such construction, completion and rework so far as the necessity for providing the same is specified in or reasonably to be inferred from the contract. Rework thereof means complete rectification/remedy of the defects to arrive at zero defects during the defect's liability period for the duration as mentioned in the CMA contract. The CMA shall give all notices; pay all taxes, fees, and duties etc. that are required for all work including temporary works.

1.3. Broadly the scope of civil work covers the following buildings, structures, facilities and works: Civil & Structural works for buildings / external civil works as listed below:

- Demolition of Existing structures
- Site grading
- Earth Work & Anti-Termite Treatment
- Roads and Drains
- Animal Facility and Containment Green House Facility
- Architecture works
- RCC and structure works
- Façade cladding & Roofing works
- Rainwater collection sump
- Interior works
- Finishing works
- Miscellaneous Work
- External Development with Landscaping
- Hard-Scape
- External utilities

1.3.1. The scope of work shall be inclusive but not limited to sub structure and super structures and allied works as required for successful completion of construction works.

1.3.2. All works shall be carried out in accordance with the technical requirements of the specification and as directed by Authority / DTA.

1.3.3. The scope of the civil works to be carried out includes but not limited to the following items:

- Clearing of site vegetation, excavation in all types of soil, soft rock, hard rock, site grading (as per required level) etc.
- Back-filling of area wherever specified, and filling of foundations and drainage work as specified. The excavated reusable material in general shall be used by the CMA for back filling purpose.
- CMA to discuss and get approval from Authority regarding dumping of excavated earth and waste material.
- Waterproofing treatment of roof, tanks and sunken areas
- CMA shall submit all tests/ warranty/guarantee certificates for the works like waterproofing, anti-termite, etc. (DTA to elaborate this list and update in the document) to the Authority.
- PCC below all foundations and grade slabs.
- Underside bedding of pathways and landscape
- Dewatering during construction as required.

1.4. Providing facilities (QA & QC laboratory for testing of materials) throughout the contract period for sampling the construction materials for testing as and when required as per the specification and as directed by the DTA/Authority.

1.5. Procurement, Supply and Storage of materials like cement, aggregates, reinforcement steel couplers, HT steel wire / strands, wire fabric, admixture, concrete blocks, expansion joint materials, sealants, structural steel etc.

1.6. Production of concrete in fully computerized batching plant and placing with concrete pumps / placer booms/ tower cranes etc. in various buildings

1.7. Re-do of defect works rejected by Authority / DTA.

1.8. Formwork for concrete and Expose Concrete.

1.9. Precast concrete covers

1.10. Reinforced concrete work in raft, isolated footings, walls, columns, slabs, beams, underground tanks and trenches etc.

1.11. Reinforcement work

Fabrication & erection of structural steel work, embedded parts, pipe sleeves, etc. including painting.

1.12. Fixing expansion joint materials and caulking of joints.

1.13. Brick / Autoclaved Aerated Concrete masonry works.

1.14. Finishing works - Partition walls, GI sheet/aluminum perforated screen, plastering, flooring, painting, etc.

1.15. Providing and laying flooring as per specifications.

1.16. For approach to the site from road, care should be taken to coordinate existing levels of respective structures in order to ensure smooth access to the project site. Works essential for this shall be done by bidder at no additional cost.

1.17. External Development with Landscaping – Water Feature, Hardscape and Softscape and and lighting complete in all respects.

1.18. The complete list of items of work shall be as per the schedule of quantities given in Schedule- 3 and schedule-11 in this Contract document.

1.19. Preparing Mock-ups for all finishing items, furniture pedestals, railings, cladding etc

1.20. Preparing and submitting shop drawings of all the mentioned items, as and when required.

1.21. Disposal of excess excavated earth as directed by DTA/Authority.

1.22. Any additional work needed for the project's improved/smooth operation/commissioning that was not previously indicated shall be included in the scope of work.

1.23. Discrepancies in the drawings

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

1.24. Materials

All materials to be supplied by the Contractor shall be new, best of their kind and shall confirm to the latest Indian standards. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the Contractor at his own expenses.

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

The Contractor shall submit shop drawings of all the custom-built equipment, including pumping system, pump house layout, piping, valves, positions of all types of sleeves in structural members and drainage network etc, he proposes to install to the DTA's for approval.

The contractor shall also submit catalog, manufacturer’s drawings, equipment characteristics data, performance charts as required by the DTA.

1.24.1. INSTRUMENTS FOR MEASUREMENT AND TESTING

The Contractor shall provide, free of cost, all equipment, instruments, labour and all other allied assistance required by the DTA or their representatives for measurement and testing of the works.

1.24.2. BATTERY LIMIT

All the service lines of Mechanical, Electrical, Plumbing and Firefighting systems shall be laid, installed and terminated in complete with required civil infrastructure and accessories and in between the utility building/designated points and the Gallery to achieve complete provision and functionality of the services to the Residential and allied Facilities.

1.24.3. MISCELLANEOUS

All sundry equipments, fittings, assemblies, accessories, hardware items,

foundation bolts, supports, termination lugs for electrical connections, cable glands, junction boxes and all other items which are useful and necessary for proper assembly and efficient working of the various equipments and components of the work shall be deemed to have been included in this Contract, irrespective of the fact whether such items are specifically mentioned in the Contract or not.

In addition, components/materials, which may not be specifically stipulated in the Contract document, but which are necessary for satisfactory installation and/or operation of any portion of the work, shall also be provided within the contract rates without any extra cost. Contractor shall carry out and complete the work in all respects to the satisfaction of Authority as per the Contract Agreement and as directed by DTA and as required.

Unless and otherwise mentioned in the Contract documents the following works shall have to be done by the contractor, and therefore the cost shall be deemed to be included in the Contractor's scope:

- Furnishing of all labor, skilled and unskilled, supervisory and administrative personnel, erection tools and tackles, testing equipment, implements, supplies, consumables like welding rods and gas, oil and grease, cleaning fluids, insulating tape, anti-corrosive paints, jute cotton waste etc., and hardware for timely and efficient execution of the erection work.
- Transport vehicles necessary for efficient transportation of equipment from Authority's stores to site of erection and excess materials back to Authority's stores (if applicable).
- Complete assembly, erection and connection, testing and commissioning, putting into successful and satisfactory commercial operations of above equipment.
- The items of work to be performed on all equipment and materials shall include but not limited to the following:
- Receiving, unloading and transportation at site. (To Authority's or Contractor's stores and from there upto actual place of erection).
- Opening, inspecting and reporting all damages and short supply items.
    - Arranging to repair and/or re-order all damaged and short supply items.
    - Storing at site with suitable all-weather protection.
- Assemblies, erection and complete Installation.
- Necessary coordination between work done by other Contractors.
- Final check-up, testing and commissioning in presence of Authority's representative.
    - Obtaining Authority's written acceptance of satisfactory performance.
    - Compliance with these specifications and/or approval of any of the Contractor's documents shall in no case relieve the Contractor of his contractual obligations.
    - All work to be performed and supplied shall be as a part of contract requiring specific approval/review of Authority or his DTA.
- The Contractor shall carry out all necessary coordination with regard to subcontracted equipment. The Authority shall communicate only with the Contractor for all matters pertaining to the contract.
- The Contractor needs to submit all the relevant drawings, quality assurance plan

for all the supply items under Contractor scope, based on the approval from Authority/DTA, the Contractor need to submit the inspection call a week ahead, the same shall be inspected by Authority/DTA at vendor / sub vendor works, based on the clearance the same needs to be dispatched to site.

- Makes of equipment / components shall be as per list of approved makes indicated in the Schedule 3. Deviation to this is not acceptable. For equipment / components where make is not specified, Contractor shall obtain specific approval from Authority / DTA prior to ordering.
- The Contractor shall supply maintenance tools including special tools, if required, for attending to the equipment supplied at no extra cost.
- Installation / Erection of the equipment / Auxiliary systems supplied by Contractor in Contractor's scope.
- All site test reports in specified format maintained by Contractor duly approved by Authority shall be handed over to Authority after completion of job.
- Approved drawings/shop drawings, layout, and pipe route layout to be maintained at site for the purpose of cross-reference during installation.
- Operation and Maintenance manual to be supplied for all types of machinery, W.T.P., S.T.P. and other related items.

1.25. Schedule 2 (part c) documents & drawings/approval

Note :-

The below mentioned scope of documents and drawings/approvals in this section shall be applicable to all the aforementioned categories of works.

1.26. General

List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this tender document. These drawings are meant for Contractor's guidance only. The Authority will not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.

1.27. Civil drawings

Contractor shall submit all structural steel fabrication drawings based on structural steel GA GFC drawings issued to the contractor. Contractor to develop connection design and details, along with erection drawings etc. and submit for DTA review/approval. Any approval from DTA or Authority will not relieve the Contractor of his contractual obligations and his responsibilities for correctness of designs, dimensions, materials of construction, weights, quantities, design details, assembly fits, performance requirements and conformity of the supplies with the Indian Statutory Laws as may be applicable, nor does it limit the Authority's rights under the contract.

1.28. Architectural drawings

1.29. Drawings for approval on award of the work / shop drawings

Contractor shall have to submit shop drawings for all relevant items like, Steel door, rolling shutter, railings, Gypsum walls, wall linings, automatic glass doors, glass partitions, Aluminum Composite panels, Structural Glazing, Screen wall with perforated aluminum panel, specialized interior and theming work etc. as mentioned in the technical specification and BOQ. Contractor is supposed to take approval of all shop drawings before procurement and execution of any specific item.
Mockup samples and finishing material boards for applicable items and wherever asked by DAT/ Authority to be provided as per instruction of Authority/DTA.

1.30. MEPF

1.31. General

List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this tender document. These drawings are meant for Contractor's guidance only. The Authority will not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.

1.32. Fire Fighting works:

Tender drawings for approval /as built drawings/ installation/instruction manual/statutory regulation approval

Tender drawings

- The drawings appended with the tender documents are intended to show the areas for various equipment, tentative pipe routes. The equipment offered shall be suitable for installation in the spaces shown in these drawings.

1.33. Drawings for approval on award of the work / shop drawings

The contractor shall prepare and submit following drawings and get them approved from the DTA before the start of the work. The approval of drawings however does not absolve the contractor of his responsibility to supply the equipment/materials as per agreement. In case of any contradiction between the approved drawings and agreement the decision of the Authority shall be final and binding on the contractor.

- Lay out drawings of the equipment to be installed in the pump room and terrace.
- Drawings showing the detail of erection of entire equipment including their foundations.

- Fire drawings showing the layout of the entire piping, dia. and length of pipes, hydrant, air vessel, valves and isometric drawings showing connections to various equipment.
- Sprinkler drawing indicating layout and sizes of pipe, location of valves, sprinklers etc.
- Electrical wiring diagrams for all electrical equipment and controls including the sizes and capacities of the various cables and equipment
- Dimensioned drawings of all electrical and control panels,
- Drawings showing details of supports for pipes, cable trays etc.
- Any other drawings relevant to the work.

1.34. As built drawings

The following laminated drawings shall be submitted by the contractor while handing over the installation to the Authority. Out of this one of the sets shall be laminated on a hard base for display in the fire control room. In addition, one set soft copy will be given on compact disc.

- Installation drawings giving complete details of all the equipment, including their foundations.
- Fire drawings giving sizes and lengths of all the pipes and the sizes and locations of all types of valves and including isometric drawings for the entire piping including the pipe connections to the various equipment.
- Line diagram and layout of all electrical control panels giving switchgear ratings and their arrangement, cable feeder sizes and their layout.
- Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.
- Schematic diagrams.

1.35. Documents to be furnished on completion of installation

The following documents shall be furnished to the Authority by the contractor on completion of work: -

- As built drawings as mentioned above
- Manufacturer's technical catalogs of all equipment and accessories.
- Operation and maintenance manual of all major equipment, detailing all adjustments, operation and maintenance procedures.
- Approval of drawing/scheme by District fire officer.
- Warranty, Guarantee certificates of all applicable equipments and works as desired by the Authority

1.36. Instruction manual / training

The contractor shall furnish required copies of detailed instruction and operation manual to the DTA. The contractor shall guide Authority/ Authority's staff for operation and maintenance of the entire installation for at least fifteen days.

The manual shall contain detailed technical data and drawings for each equipment installed, the erection, testing, operation and maintenance procedures, spare parts manual and recommended spares.

1.37. Statutory regulation approvals

Approval from local fire authorities as may be required as per local byelaws. (The contractor's responsibility shall be limited to the work executed by him.)

The installation will be offered for inspection by local bodies (Chief Fire Officer). The contractor or his representative shall attend such inspection of the Chief Fire Officer, extend all test facilities as are considered necessary, rectify and comply with all observations of the Chief Fire Officer which are part of the agreement and arrange for obtaining necessary clearance certificate in favor of the Authority. In case the contractor fails to attend the inspection and make desired facilities available during inspection, the Authority reserves the right to provide the same at the risk and cost of the contractor and impose penalty for the same. The installation will be accepted by the Authority only after receiving clearance from the Chief Fire Officer for the work executed by the contractor under the agreement.

1.38. HVAC:

Tender drawings for approval /as built drawings/ installation / instruction manual / statutory regulation approval

The drawings forming part of the tender documents, are indicative only, of the general arrangement of the entire installation. The Contractor shall follow these drawings and specifications in preparation of his shop drawings and subsequent installation. He shall check the drawings of other trades to verify space for his installation and other coordination. The Contractor shall examine all relevant architectural, structural, plumbing, electrical and other services layout drawings before preparing the shop drawings for this installation and report to the Authority any discrepancy and obtain clarifications. Any changes found necessary for coordination and installation of this work with other services and trades shall be made with prior approval of the Authority without any cost to the Authority

1.39. Drawings for approval on award of the work / shop drawings

After the award of the Contract, the contractor shall furnish for the approval of the Authority, the detailed shop drawings of all equipment and materials including plant room, ducting, piping, ventilation system, electrical work associated with the HVAC system required to complete the project as per Specifications and as required by the Authority.

These drawings shall contain details of construction, size, and arrangement, operating clearances, performance characteristics and capacity of all items of equipment, as also the details of all related items of work by other Contractors. Each item of equipment proposed shall be a standard catalog product of an established manufacturer, as per specifications.

If the Authority makes any amendments in the above drawings, the contractor shall submit drawings with the amendments duly incorporated, along with the drawings on which corrections were made. After final approval has been obtained from the Authority, the Contractor shall submit shop drawings for the exclusive use of and retention by the Authority.

No material or equipment may be delivered or installed at the job site until the contractor has in his possession, the approved shop drawings for the particular material or equipment.

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

Samples, drawings, specifications, catalogs, pamphlets and other documents submitted for approval shall be in duplicate, each item in each set shall be properly labeled, indicating the specific service for which material or equipment is to be used, giving reference to the governing section and clause number of specifications clearly identifying in ink the items and the operating characteristics.
Approval rendered on shop drawings shall not be considered as a guarantee of measurements of building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail nor does it in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract.

Where the Contractor proposes to use an item of equipment other than that specified or detailed on the drawings which requires any redesign of the structure, partitions, foundations, piping, wiring or any other part of the mechanical, electrical or architectural layout, all such redesign and all new drawings and detailing required thereof, shall be prepared by the Contractor at his own cost and approved by the Authority.

1.40. Documents to be furnished on completion of installation

Required copies of operation manuals/catalogs of all standard equipment are to be furnished by the contractor immediately after commissioning of the plant.

Required copies of write up on preventive maintenance, troubleshooting and operating instructions of the system along with as-built drawings are to be supplied by the Contractor at the time of commissioning.

On completion of the work in all respects, the Contractor shall supply five portfolios (300x450 mm), each containing complete set of drawings on approved scale, clearly indicating complete plant room layouts, ducting and piping layouts, location; wiring and

sequencing of automatic controls, location of all concealed piping, valves, controls, dampers, wiring and other services. Each portfolio shall also contain consolidated control diagrams and technical literature on all controls. The Contractor shall frame under glass, in the air-conditioning plant room, one set of these consolidated control diagrams.

1.41. Internal and external plumbing

1.42. Tender drawings for approval /as built drawings/ operation and maintenance manuals manual/statutory regulation approval material samples and shop drawings

It shall also be the responsibility of the Contractor to submit without any extra charge the samples of the materials/equipment as and when asked by the DTA. If the Contractor wishes to use an alternative make due to non-availability of the approved one, he should take the prior approval of the DTA. Under such situations the Contractor shall show such promptness as not to hamper the progress of the work.
The Contractor shall submit for DTA's approval the shop drawings of all the custom- built equipment, including pumping system, pump house layout, piping, valves, positions of all type of sleeves in structural members, piping layout for soil/waste/rainwater disposal and water supply, sewerage and drainage network etc., he proposes to install.

The contractor shall also submit catalog, manufacturer’s drawings, equipment characteristics data, performance charts, test certificate as required by the DTA.

The plumbing drawings issued from time to time to the contractor are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the services drawings as far as the civil and other trades works are concerned.

1.1.1. As built drawings and operation and maintenance manuals

The contractor shall submit, after the completion of the work, required set of prints of the as built drawings / Completion drawings, giving the following information:

- Position of all sanitary fixtures.
- Runs of all water lines with diameters on all floors and vertical risers / drops.
- Runs of all soil, waste, vent & rainwater piping with diameters on all floors and vertical stacks.
- Position and sizes of all types of control valves and all other plant and equipment.
- Position, Run, Sizes, ground levels and Invert Levels of all manholes and catch pits of external sewer lines / drain lines / water lines.
- Position of cleaning eye / access doors and opening panels in soil/waste disposal system.
- Original installation and Maintenance manual, test certificate of all types of

equipment.
- Location of all mechanical equipment with layout and piping connections.

1.43. STATUTORY REGULATION APPROVALS

All sanitary and water supply works shall be carried out only by those Contractors who are licensed
by the concerned local authorities to execute this type of work.

It shall be the responsibility of the Contractor to comply with the regulations laid down by the local authorities. The Contractor shall also be responsible for obtaining all the statutory approvals/certificates for the work from the concerned Departments and these certificates shall be handed over to the Architects/Authorities at the completion.

It shall also be the responsibility of the contractor to get the sewerage & water supply connections from the concerned authorities. However, the Authority will bear all the statutory expenditures.

1.44. Electrical:

Internal electrical works

- Tender drawings for shop drawings/statutory regulation approval/ completion drawings / as built drawings
- The engineering activities shall comprise the submission for approval of the following from Authority.
- Quality assurance procedures.
- Factory manufacturing & testing / testing procedures.
- Detailed coordination with other services, shop drawings for various electrical layouts such as equipment layout, lighting layouts, cabling layouts, earthing layouts, including equipment installation and cable termination details etc. Prior to the start of work.
- Preparation of bill of materials for cabling, earthing and miscellaneous items etc.
- Lighting panel schedule.
- Interconnection drawing.
- Protection coordination drawings/tables for complete power system.
- Shop inspection and testing procedures.
- Preparation of as built drawings.

1.45. Statutory regulation and approvals

- All electrical works shall be carried out only by those Contractors who are licensed by the concerned local authorities to execute this type of work. Only “A” Class government approved contractors shall execute the job.
- The contractor shall obtain all approval of drawing / electrical safety and permits required for the electrical installation work. All actual fee payable in this regard

will be reimbursed against receipt/documentary evidence. On completion of work, the contractor shall obtain NOC from SEB & Chief Electrical Inspector, a copy of the same shall be delivered to the Authority through DTA. The Authority shall have full power regarding the materials or work that were tested by an independent agency at the contractor's expenses in order to prove their soundness and adequacy. The contractor will rectify the defects/suggestions pointed out by an independent agency through the Authority at his own expense.

- The installation shall comply in all respects with the requirements of Indian Electricity Act 1910, Indian Electricity Rules (IER) 1956 and other related Laws and Regulations as amended up to date, there under and special requirements, if any, of the State Electricity Boards etc. The Contractor is liable to furnish the list of authorized licensed persons/ employed/deputed to carry out the works/perform the assigned duties to fulfill the requirement of Rule No.3 of IER 1956 as amended up to date
- The electrical drawings issued from time to time to the contractor are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the electrical drawings as far as the civil and other trades works are concerned. If there is any discrepancy due to in-complete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Contractor either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the DTA and his decision would be final and binding on the Contractor.

1.46. Shop drawings

The contractor shall prepare detailed coordinated electrical shop drawing and cable Schedule with other relevant services and submit to the DTA for approval or the DTA before commencing the work. The shop drawings shall indicate all setting out details, physical dimensions, layouts and positions of various services, such as

- Conduiting for entire electrical and low voltage works
- Switches / outlets / Switch Boxes
- Distribution Boards.

All work shall be carried out on the approval of these drawings. However, approval of these drawings do not relieve the contractor of his responsibility for providing a maintenance free and fool proof system including any missing component/accessories to meet with the intent of the specifications. Contractor will submit 2 prints for preliminary approval and finally six prints for distribution.

1.47. Completion drawings / as built drawings

On completion of the work and before issue of certificate of virtual completion, the contractor shall submit to the DTA required sets of prints along with soft copy

of 'As Built' drawings of the work along with originals including write up (troubleshooting, installation, operation and maintenance manual with instructions) incorporating all such changes and modifications during engineering and execution.
These drawings must provide:

- Run and size of conduits, inspection, junction and pull boxes.
- Size of conductor in each circuit.
- Location and ratings of sockets and switches controlling the light/fan and power outlets.
- Location and details of distribution boards, mains, switches, switch gears and other particulars.
- A complete wiring diagram as installed and schematic drawings showing all connections in the complete electrical system.
- Location of telephone / TV outlets, junction boxes and sizes of various conduits.

1.48. External Electrical Works

The engineering activities shall comprise the submission for approval of the following from Authority. Basic engineering documents e.g., overall single line diagram, overall cable layout, testing, type test at Factory and report, guaranteed particulars of all equipment and maintenance manuals.

- Quality assurance procedures.
- Factory manufacturing & testing / testing procedures.
- Field testing and commissioning procedures.
- Basic engineering calculations viz. fault level calculations, voltage drop calculations. (For bus duct, cables & switch boards etc.)
- Control and protection schemes with relay setting charts with back-up calculations etc.
- Load sharing and annunciation scheme,
- Sizing calculation for cable and cable trays.
- Calculation for earthing system.
- Contractors shall be responsible for:
  Detailed coordination with other services, shop drawings for various electrical layouts such as equipment layout, lighting layouts, cabling layouts, earthing layouts, including equipment installation and cable termination details etc. Prior to the start of work.

- Preparation of bill of materials for cabling, earthing and miscellaneous items etc.
- Cable schedule.
- Lighting/power panel schedule.
- Interconnection drawing.
- Protection coordination drawings/tables for complete power system.
- Shop inspection and testing procedures.
- Field testing and commissioning procedures.
- Preparation of as built drawings.

1.49. Statutory regulation and approvals:-

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

The contractor shall obtain all sanctions, electrical loads, approval of drawing / Electrical Substation from the concerned authorities / electrical safety and permits required for the electrical installation work. All actual fee payable in this regard will be reimbursed against receipt/documentary evidence. On completion of work, the contractor shall obtain NOC from SEB & Chief Electrical Inspector, a copy of the same shall be delivered to the Authority through DTA. The Authority shall have full power regarding the materials or work that were tested by an independent agency at the contractor's expenses in order to prove their soundness and adequacy. The contractor will rectify the defects/suggestions pointed out by an independent agency through the Authority at his own expenses.

The installation shall comply in all respects with the requirements of Indian Electricity Act 1910, Indian Electricity Rules (IER) 1956 and other related Laws and Regulations as amended up to date, there under and special requirements, if any, of the State Electricity Boards etc. The Contractor is liable to furnish the list of authorized licensed persons/ employed/deputed to carry out the works/perform the assigned duties to fulfill the requirement of Rule No.3 of IER 1956 as amended up to date.

The electrical drawings issued from time to time to the contractor are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings required to conform to the building construction shall be made by the Contractor at his own expenses. The architectural drawings shall take precedence over the electrical drawings as far as the civil and other trades works are concerned.

- Earthing details with location of pits and conductor run
- HT Panel
- Transformers
- D G Sets with exhaust pipe run, cooling system
- LT Panel Boards
- Control and relay panels
- Capacitor panels
- Schematic diagram for power distribution
- Bus Ducts
- Cable layouts
- Control wiring
- Cable trays
- Lightning Protection

All work shall be carried out on the approval of these drawings. However,

approval of these drawings do not relieve the contractor of his responsibility for providing a maintenance free and fool proof system including any missing component/accessories to meet with the intent of the specifications. Contractor will submit 2 prints for preliminary approval and finally six prints for distribution.

1.50. Completion drawings / as built drawings

On completion of the work and before issue of certificate of virtual completion, the contractor shall submit to the DTA required sets of print along with soft copy of 'As Built' drawings of the work along with originals including write up (troubleshooting, installation, operation and maintenance manual with instructions) incorporating all such changes and modifications during engineering and execution.

These drawings must provide:

- Location of all earthing stations, route and size of all earthing conductors etc.
- Layout and particulars of all cables.
- Location and details of PCC's, MCC's, capacitor control panels, PLC, D.G. set panel and relay panels with description detailed control wiring diagram.
- Layout of cable trays with support and their fixing details.
- Layout and particulars of the bus duct with fixing details
- Battery & battery charger

1.50.1. Drawings and Information

To be furnished in accordance with the supplier's data requirements. Generally following drawings shall be furnished:

- General Arrangement (GA) Drawings for Battery giving basic room requirements. Floor/wall finish, number of air-changes, requirements of exhaust fans and sinks etc.
- Installation, operation, maintenance manual for battery.
- Charging and discharging characteristics of batteries.
- Other technical particulars as called for in data sheets.

1.50.2. Instrumentation

- **Access control system:**

- Manufacturer's Product Data: Submit manufacturer's data sheets indicating systems and components proposed for use.
- Shop Drawings: Submit complete shop drawings indicating system components, wiring diagrams and load calculations.
- Record Drawings: During construction maintain record drawings indicating location of equipment and wiring. Submit an electronic version of record drawings for the Security Management System not later than Substantial Completion of the project.

- Operation and Maintenance Data: Submit manufacturer's operation and maintenance data, customized to the Security Management System installed. Include system and operator manuals.
- Maintenance Service Agreement: Submit a sample copy of the manufacturer's maintenance service agreement, including cost and services for a two year period for Authority's review.

1.50.3. Cctv control system:

- General: Submittals shall be made in accordance with the conditions of the Contract and Submittal Procedures Section.
- Shop Drawings and Schematics: Shall depict system in final proposed "as built" configuration.
  The following must be provided:
- Connection diagrams for interfacing equipment
- List of connected equipment
- Locations for all major equipment components to be installed under this specification
- Product Data: The following shall be provided:

- **Technical datasheets**
  - A complete set of instruction manuals
  - Quality Assurance Submittals: The following shall be submitted:
  - Checkout Report: The Contractor shall provide the Authority with a checkout report for each system. The report shall include:
  - A complete list of every device
  - The date it was tested, and by whom
  - If retested, the date it was retested, and by whom
  - The final test report shall indicate that every device was tested successfully
  - Manufacturer's Instructions: The contractor shall deliver a set of System Operation and Maintenance Manuals (if available) to the Authority.
  - Notice of Completion: When the final acceptance has been satisfactorily completed, the Authority shall issue a notice of completion to the Contractor
- **Fire detection & alarm system:**
  - Tender drawings for shop drawings/statutory regulation approval/ completion drawings / as built drawings

1.50.4. Tender drawings

The drawings appended with the tender documents are intended to show the areas for various detectors, MCP, conduits, panels etc. The equipment offered shall be suitable for installation in the spaces shown in these drawings.

- Drawings for approval on award of the work / shop drawings

  - The contractor shall prepare and submit following drawings and get them approved from the DTA before the start of the work. The approval of drawings however does not absolve the contractor of his responsibility to supply the equipment/materials as per agreement. In case of any contradiction between the approved drawings and agreement the decision of the

Authority/DTA shall be final and binding on the contractor.

- Fire Alarm drawings showing the Location of all devices, detectors, manual call points, hooters and response indicators, exit signs, control panel etc. and conduits showing connections to various equipment.
- Electrical wiring diagrams for all electrical equipments and controls including the sizes and capacities of the various cables and equipments
- Dimensioned drawings of all electrical and control panels,
- Run and size of conduit with number of wires on all floors.
- Position of all control panels etc.
- Any other drawings relevant to the work.

1.50.5. Completion drawings

- The following laminated drawings shall be submitted by the contractor while handing over the installation to the Authority. Out of this one of the sets shall be laminated on a hard base for display in the fire control room. In addition, one set will be given on a compact disc.
- Line diagram and layout of all electrical control panels giving switchgear ratings and their arrangement, cable feeder sizes and their layout.
- Control wiring drawings with all control components and sequence of operations to explain the operation of control circuits.
- Location of all detectors, manual call points, hooters and response indicators.
- Run and size of conduit with number of conductors each.
- **Schematic diagrams.**
    - Documents to be furnished on completion of installation

- The following documents shall be furnished to the Authority by the contractor on completion of work: -

- Completion drawings as mentioned above
- Manufacturer's technical catalogs of all equipments and accessories
- Operation and maintenance manual of all major equipment, detailing all adjustments, operation and maintenance procedures.
- Approval of drawing/scheme by District fire officer.
- Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with any one of the referenced standards, completely with specifications and Vds approval or equal.
    - Instruction manual / training

- The contractor shall furnish in 3 copies detailed instruction and operation manual to the DTA/DTA. The contractor shall guide Authority's / Authority's staff for operation and maintenance of the entire installation for at least fifteen days.
-
- The manual shall contain the basis of design, detailed technical data and drawings

for each equipment installed, the erection, testing, operation and maintenance procedures, spare parts manual and recommended spares for a 3 years period of maintenance of each equipment.

- The drawings accompanying the tender document are indicative of the nature of work and issued
- for tendering purposes only. The purpose of these drawings is to enable the Contractor to bid in line with the requirements of the Authority. However, the contractor shall prepare drawings for all systems based on tender drawings and Bill of materials and submit the same for DTA approval. Construction shall be carried out as per approved construction drawings/ specifications issued/ approved by the DTA during execution of work. Detailed construction drawings based on which actual execution of work is to proceed will be to the Contractor progressively based on the detailed construction program evolved after the award of work and based on construction progress achieved by the Contractor.
- Prospective Contractor shall be deemed to have studied the drawings enclosed with tender or displayed for scrutiny and fully understood the nature and magnitude of the work before submitting the bids.
- Where the Contractor has to prepare drawings, Contractor shall submit the drawings to DTA and the approval in writing of the DTA shall be obtained before commencing fabrication.
- After each job completion, the Contractor shall prepare 'As-Built' drawings. Final certified ‘As- Built’ drawings shall be submitted by the CMA to Authority in bound volumes with one set of reproducible original sepia plus ten sets of prints.
- Contractor shall submit equipment manufacturer’s drawing for all supply items for the review of DTA in Two sets of prints and the approval in writing of the DTA shall be obtained before commencing manufacture. However, it is to be understood that the review of drawings shall not absolve the basic responsibility of the Contractor to check total compliance to specifications included in tender document. Final drawings in bound volumes with one set of reproducible original sepia plus two sets of prints shall be submitted by Contractor.

2. SCOPE OF WORK –CIVIL WORKS (ARCHITECTURE & STRUCTURE)

The scope of work under this section covers the construction of Residential and allied Facilities building architectural works as follows:

2.1. Scope

- The civil skeletal structure made of RCC foundation, columns, beams, slabs, lift structure and other miscellaneous civil works to be made available on or before execution of Architectural items.
- Scope of construction will comprise of all superstructure works like brickwork, plaster, finishing, flooring, painting, doors, window, false ceiling, false flooring or cavity flooring, structural glazing, skylight, automated gates, rolling shutters, decorative exterior finishes, cladding, sculpture integrated to exterior if any, internal wall cladding, aluminum and gypsum decorative features, ACP cladding at interior and exterior of the building, waterproofing wherever applicable, hardscape work outside the buildings or in courtyard, paving work and construction related to external parking, drainage, making provisions for MEP works, finishing in all aspect after installation of MEP system and all other allied works related to construction of state of art Gallery along with making provisions for glass cleaning and other maintenance of finishing of the building.
- The scope will include complete solution for facade treatment comprised of design, supply, storage, fabrication and handing over in good condition of items like Textured painting, structural glazing, ACP/Aluminum screen cladding, sky light treatment, stainless steel decorative railing work with or without Glass panels, GRC Jali work, MS decorative grill and gate as will be indicated in design and Bill of quantities.
- Construction of partition work, using non-masonry materials like Gypsum board, Calcium silicate board, Cement Board, Aluminum or CRCA or GI framework with panel inserts using Particle board, block board, plywood, gypsum panels, WPC, glass, Aluminum composite Panels along with providing all clips, gaskets, sealants, beads, providing insulations, joint fillers all complete as per design and Specification. Provisions for doors, windows, service opening, louvers, exhaust fans should be made as per details as will be provided from time to time during or prior to construction.
- Scope of partition includes treatments of partitions with painting, decorative and acoustic paneling, , provision for mounting of light fixture and switches, junction boxes and other electromechanical assemblies in partitions etc as per design and Specification.
- Scope of partition includes providing shop drawings, fabrication details based on basic layout and construction of partitions as per approved specification.
- Scope will include supply and installation of all sorts of sanitary systems, Earthenware, ceramic, stainless steel and chromium plated brass sanitary fixture and related plumbing and disposal system.
- The scope includes construction of all utilities, provision of crossing over services at necessary locations. The scope will also include enclosure to DG, transformer etc as per design.

- Scope includes design, supply, and construction of water body if anything stated in detail, preparation of construction drawings with allied nozzles, plumbing, water overflow, disposal and recycling system provisions, Pump, underwater lighting fixture and other electro-mechanical equipment, and execution of the total system as per approved drawing.
- The scope is limited up to the boundary of the Residential and allied Facilities in general. But for services and drainage, sewerage, rainwater harvesting systems, HVAC system and inlet water line etc. the scope may be extended up to utility building or nearest tapping / outfall point whatsoever is applicable.
- Scope includes Submission of Shop drawings or fabrication drawings or assembly drawing whatsoever is applicable for fabricated items.
- Scope includes gathering samples of Architectural materials, display, preparation of material selection and approval board, multiple alternative physical mockup and any other formalities required for material approval by Authority/DTA and consultant.
- Shop drawings for all vendor-based items, facade, glazing, aluminum screen cladding, all electrical works, signages, water recirculation system for water body, all glass works, door windows, irrigation, STP, mist plaza, radiant cooling, pumps, and any other CMA/vendor specific items, will be provided by CMA with all necessary data and requirement of DTA.
- The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by CMA and get approved by the DTA prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- CMA shall make his own arrangements for drawing and distribution of water and electricity. CMA shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.
- List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for CMA's guidance only. The Authority will not entertain any claim for compensation because the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.
- One permanent benchmark will be furnished and all other layout, fixing levels etc. shall be done by the CMA at his own cost. The CMA shall protect and maintain, during execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.
- "Good for Construction" drawings will be furnished to the CMA progressively during the execution of the work and as further data becomes available, to supplement the tender drawings. These drawings will show all dimensions and clearances of the structures, loadings where necessary, material to be furnished and size of each member, definite location of openings, reinforcing steel details, embedded parts and piping. "Good for Construction" drawings will be revised, and fresh revised copies issued to the CMA from time to time by the DTA to adopt them in work to the final designs and to suit the physical conditions encountered during the progress of the works.
- "Good for Construction" drawings issued by the DTA shall form part of these

specifications. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for proper and entire completion of the work and shall be read in conjunction with the relevant specifications and codes of practice. The decision of Authority / DTA shall be final, on any issue arising out of any discrepancies.

- Authority has carried out Soil investigations and the extract from the report is attached as Schedule 3A as reference. However, the CMA shall note that there is neither express nor implied guarantee, as to either the accuracy of the records or any interpretation of them. The information about the site of work and site conditions in the Tender Documents is given in good faith for guidance only but the CMA shall satisfy himself regarding all aspects of site conditions. The CMA must satisfy himself regarding the character and volume of all work under this tender and expected surface, sub- surface and/or subsoil water to be encountered. The location of the works and the general site particulars are as generally shown on the Site plans attached in tender drawings.
- For any structural steel fabrication, all the shop drawings shall be prepared by CMA.
- For structural steel fabrication, the CMA shall submit the erection methodology immediately within 20 days of coming on board. The erection methodology shall be submitted based on the 'Good for Construction' drawings and the same shall be discussed with DTA/ Authority beforE finalization.
- For structural steel fabrication, CMA shall prepare the entire roof structure in REVIT/TEKLA and showcase the erection sequence as well as precise connections.
- For the steel structure, the CMA shall prepare the entire structure in REVIT/TEKLA model and showcase the erection sequence and methodology. The erection methodology shall be worked out entirely by the CMA and the CMA shall also have to co-relate the same with the erection methodology of main steel roof.
- The erection methodology for the Structural Steel have to be developed considering there can be no change or revision done in the material, size, structural design or architectural intent.
- The grade of steel to be used shall be from 250Mpa up to 450Mpa for UB/I-section, plates or box sections etc.
- Any increase in the steel quantities due to the erection methodology requirements shall have to be borne by the CMA.
- All the temporary supporting systems for erection shall be considered as part of the erection cost which have to be included in the quoted rates.
- Polycarbonate roofing shall be used for the roof covering over the main steel structure. The shop drawings for the sheeting along with the design and quantity of its aluminum or MS purlins shall be accounted/done/provided by the CMA. The slopes for the rainwater disposal shall be managed by the CMA through their varying profiled purlins used for supporting the Polycarbonate sheets. All these purlins for supporting Polycarbonate roofing and provision for slope shall be resting on the main the structure.
- CMA shall submit the expansion joint details for vertical and horizontal at all floors and joints.
- Fireproofing of all the steel structures shall be for 2 hours. CMA to account for all

the fire paint costs in their rate for steel structure. All exposed (visibly seen) steel elements shall be painted/coated using either intumescent or vermiculite of approved shade/color (by DTA/Authority) and others may be treated/coated using cementitious fire rated coatings from approved standard manufacturers and agencies.

2.2. Anti-Termite Treatment

The Contractor must take special care in performing anti-termite treatment since the construction site / project location is prone to termite infestation.

2.2.1. Chemicals

The chemicals used for the soil treatment shall be any one or combination of the following with the concentration shown against each aqueous emulsion: Chemicals concentration: Imidacloprid 30.50 SC (by weight)
The quantity of all chemicals will be as per CPWD Specifications or as per manufacturers specification.

2.2.2. Treatment of column pits, wall trenches and basement excavations.

The bottom surface and sides (up to a height of 30 cm from the bottom) of the excavations made for column pits and trenches shall be treated with the chemical emulsion mentioned above at 5 litres/ sq. meter of surface area.

2.2.3. Treatment to Backfill Earth

After the column foundations and wall foundations come up, the backfill in immediate contact with the foundation structure shall be treated with the chemical emulsion at the rate of 15 litres/ Sq.m of the vertical surface of the sub-structure for each side. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete or masonry surfaces of the columns and walls so that the earth in contact with these surfaces is well treated with the chemical.

2.2.4. Treatment for R.C.C Framed Structures

The treatment described above applies essentially to masonry foundations where there are voids in the joints through which termites can seek entry into the superstructure. Hence the foundations require to be completely enveloped by a chemical barrier. In the case of RCC framed structures with columns and plinth beams, the concrete mix is rich and dense (being 1:2:4 or richer), it is unnecessary to start the treatment from the bottom excavations for columns, plinth beams and basement walls. The treatment shall start at depth of 50cm below ground level. From this depth, the backfill around the columns, beams and RCC basement walls shall be treated at the rate of 15-liters/ Sq.m. of the vertical surface. The other details of the treatment shall be as laid down above.

2.2.5. Treatment of Top Surface of Plinth Filling

After the earth filling is completed in the plinth area and before the dry rubble packing or sub grade is laid, the entire surface of the filled earth shall be treated with the chemical emulsion at the rate of the 5 litres per Sq.m. Light rodding may be carried out

in the soil surface to facilitate absorption of the emulsion.

2.2.6. Treatment at Junction of Walls and Floor

Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall surface from the ground level up to the level of the filled earth surface. To achieve this, a small channel 3 x 3 cm shall be made at all the junctions of wall and columns with floor (before laying the sub grade) and rod holes made in the channel up to the ground level 15 cm apart and the rod moved backward and forward to break up the earth and chemical emulsion poured along the channel at the rate of 15 litre/ Sq.m of the area of the vertical surface of the wall surface of the sub-structure so as to soak the soil right to the bottom. The soil should be tamped back into place after this operation.

2.2.7. Treatment to Soil along External Perimeter of Building

Finally, the earth around the external perimeter of the building up to a depth of 30cm shall be treated at the rate of 4.5 litres per running meter of plinth wall. To facilitate this treatment, solid
M.S. rods should be driven into the soil as close as possible to plinth wall at intervals of 15 cm and up to a depth of 30 cm and the rods moved backwards and forwards in a direction parallel to the wall to break up the earth so that the chemical emulsion mixes intimately with soil.

2.2.8. Treatment of Soil Surrounding Pipes, Wastes and Conduits

When pipes, wastes and conduits enter the soil inside the area of the foundation, the soil surrounding the point of entry must be loosened around each such pipe waste or conduit for a distance of 15 cm and up to a depth of 7.5 cm before the treatment is commenced. When they enter the soil external to the foundations, they shall be similarly treated unless they stand clear of the walls of the building by about 7.5 cm for a distance of over 30 cm.

2.2.9. Termite Proof Course or DPC (PCC) in Plinth

Where there is the provision of a damp-proof course in the construction, it is located just below the level of the filled earth. Although this acts as an effective barrier impervious to termite entry the PCC surface should be treated at 5 litres per Sq.m immediately after the course is laid and the concrete is green.

Where there is no provision for a DPC, the top surface of the masonry course just below the level of plinth filling mentioned above should be soaked with the chemical emulsion at the rate of 5 litres per Sq.m. of the surface. The application should be carried out slowly to enable the masonry surface to absorb the emulsion.

2.2.10. Guarantee

The Contractor shall guarantee the anti-termite work for a period of 10 years from date of completion. The guarantee will cover the surfaces treated and will bind the Contractor to perform remedial measures, at his expense including but not limited to repeat of anti-termite work in the affected area/zone.
Contractors must ensure that the work is done through a professional pest control operator who is a member of Indian Pest Control Association or other recognized

professional body. A list of termite control jobs successfully undertaken for Government Departments, Statutory bodies or large private organizations are to be provided to prove that they are capable of handling anti- termite work.

2.3. General Terms and Conditions

Detailed Role & Responsibility as Per Categories: -

2.4. Management Team

- Managing the whole Construction site by coordinating with the Human resource appointed under CMA for operation & maintenance
- Supervising the staff appointed for the operation and maintenance of the whole Construction site under the guidance of GBU
- Managing coordination between the human resource, Construction site and GBU guidelines.
- Taking corrective actions required for smooth operations of the Construction site
- Preparing the yearly plan, calendar & strategy for the Construction site.
- Submitting the monthly and yearly report to GBU on performance of the Construction site
- Maintaining the visitor flow record of the Construction site.
- Maintain the inventory list of all the equipment installed at the Construction site as per the BOQ.
- Maintain the service record and annual maintenance data of all the equipment.
- Maintain the record and emergency contact numbers of all the manufacturers and CMAs as per the equipment list.
- Management team will be responsible for conducting or organizing training & development sessions for the other staff on the regular basis.
- To make sure all the operations & maintenance team are following up the rules & regulations.
- The Technical team properly maintains all the tools & inventories is being regularly checked by the management team.
- Prepare and maintain the proper procedures & schedules
- Develop solutions with the technical team and manufacturers for the smooth functioning of the Construction site.
- Checking the stock inventory of critical parts in the stores
- Take corrective and proactive actions in case of equipment failure or shutdowns.
- In case of pre-planned shutdown, management needs to inform and take necessary approval from GBU
- Procurements and purchase will be done after approvals from GBU for the Construction site functioning & up gradation services.
- Maintain all the record of handover & take over list from the manufacturer/ Interior vendors.
- Help GBU in crisis management, Traffic management, and visitor management.

2.5. Technical services

- Should provide AMC for all equipment installed in the project as per the BOQ for a period of 5 years.

- Inspect assigned systems for documentation and operating parameters.
- Check and update the panel maintenance schedule
- For any abnormal condition, CMA needs to check the root cause & preempt it.
- Ensure calibration of instruments per schedule.
- Determine critical parts and working stock inventory requirements.
- Provide suggestions if any parts of equipment are end of life.
- Typical work will include, but is not limited to, maintenance of interior and installation lighting systems. Included are the repair or replacement of fixtures and controls, and the replacement of bulbs and ballasts.
- CMA shall submit GBU in advance any requirements for major maintenance or refurbishing of equipment. Such work shall be performed on a project basis, upon approval of GBU on actuals after the defect liability period.
- The instruments shall be used within the manufacturing range for that equipment.
- All spanners, wrenches and required hand tools must be in good working order.
- All powered tools must be equipped with individual ELCB to prevent main tripping.

Safety Guidelines

- The CMA must know and follow their duties related to safety for all personnel. These guidelines are applicable to contractors as well as sub-contractors deployed by them at the site.
- All CMA staff /workmen should be provided with a pre-approved uniform and shall work within the Authority premises in their prescribed uniform.
- The CMA shall provide prior information to the Authority representative about any hazardous material being brought on the site and shall ensure security storage of such material.
- The CMA must not remove or displace any guard, fencing or other safety equipment, which is designed to protect personnel or machinery or any place where safety equipment has been provided without the written permission of Authority representatives.
- The CMA must leave work areas in a clean, tidy and safe condition at the end of each working period.
- The CMA must provide consumables, tools and equipment based on applicable regulations / codes / guidelines.
- The CMA should ensure that proper qualified / trained / licensed personnel carry out the jobs and that proper supervision is done for all jobs.
- Any power / compression / percussion tools must be used by trained personnel with proper safety precautions during operation / storage.
- The CMA should ensure that their personnel do not consume alcohol / do not smoke / do not take drugs, tobacco on site.
- All workmen of the CMA or their subcontractors must have valid identifications and identity cards issued, shall display at all times during duty hours.

2.6. Operations and Maintenance for General Requirements from CMA

- CMA shall provide sufficient staffing coverage to provide services as documented

in the base contract specs.

- CMA's employees are expected to be uniformed and present a professional appearance at all times. CMA will provide labor, training and management of the staff at our locations. CMA will provide detailed job descriptions for all positions as well as proposed manpower broken out overall and per shift.
- CMA's employees must be able to understand and respond to emergency instructions from Emergency Response Team members and Public Address notifications.
- Individuals tasked with responding to Help Desk i.e calls on reception desk for gallery requirement, emergency purpose, lost and found requirement, museum visit duration, requirement of public announcement requirement etc. calls must be able to communicate well enough to take verbal directions from remote operators, interact with visitors when clarifications are needed and follow issues through to completion.
- CMA shall strive to meet visitors' requests within the parameters established by the Authority. CMA to jointly develop and meet Authority's expectations in the facilities appearance & cleanliness.
- CMA must be able to respond to emergencies or provide special response in support of the Authority's Dedicated Emergency Response Team (ERT), 24 hours a day,7 days a week, 365 days a year for incidents including as per laid scope of work.
- CMA may be asked to provide a proposal to the Authority Asset Manager, or his representative for any work outside the Scope of Work identified herein. CMA may receive approval to proceed with any additional work.
- While on site, breaks and lunch must be taken in designated areas only.
- There shall be NO IMPACT to any Authority facility or system resulting from services rendered by CMA under this Scope of Work.
- CMA shall provide Authority with schedule and area maps depicting time & days of services to be performed. CMA shall adjust schedules as necessary to meet individual area security or access requirements.
- CMA is expected to wear appropriate PPE during the performance of all critical tasks.
- CMA to ensure 100% uptime for all the critical equipments
- CMA may be required to assist in areas outside scope of work as related to custodial support, but not to affect normal operations unless approved by Authority.
- CMA will be required to procure and/or source appropriate contractors and vendors to perform the works outlined within this scope of work where necessary on behalf of Authority in line with purchase procedure.
- CMA must ensure each contract meets the stipulated Authority procurement guidelines

Benchmark Cost/ Services

- Periodically Review all Contracts for performance levels
- Meet with all Contractors on a periodic basis to discuss performance levels and shall keep a record/ report of the same.
- Recommend methods to improve efficiency and achieve additional savings
- Timely renewal of existing Contracts

3. SCOPE OF WORK –SPECIALISED WORKS OF ANIMAL FACILITY AND CONTAINMENT GREEN HOUSE FACILITY

The scope of work under this section covers the construction of Animal & Containment Green House and allied Facilities building specialised works in compliance with the following regulations

- CCSEA (Committee for the Control & Supervision of Experiments on Animals),
- AAALAC International,
- Guide for the Care and Use of Laboratory Animals –By National Research Council/National Institutes of Health
- GLP (Good Laboratory Practices),
- ASHRAE Guildines

3.1. ANIMAL FACILITY

The proposed block is a B+G+2 storied structure housing Animal Facility in Ground and first floors and terrace for equipment's. An integrated basement is proposed which shall comprise of support services for the Animal Facility and Containment Green House facility viz. Plant Room, ETP and parking spaces.

The building will be RCC framed structure with masonry work and other general features as required by the users.

Internal furnishing and indoor environment will be as per CPSEA guidelines. The scope of work shall include construction of civil structure and establishment of Animal Facility and Containment Green House facility including panel partition work, electrical works, Public health engineering works(toilets civil work is complete) etc. complete in all respect. All the fixed equipment and system like Autoclave, Bio-Safety Cabinets, Pass Box, HVAC system and its components (including A/C plant, air handlers, exhaust systems, filters, controls etc.), Hot water generator (for hot water shower during winters), Air compressor, Un-interrupted power supply system, door interlocks, Access Control System, building management system, Fire Detection & Alarm System, fire extinguishers and any other equipments/systems essentially required to meet the intent and purpose of setting up of Animal Facility and Containment Green House.

The scope of works shall also include:

Supply and installation of following equipments and systems:

- Autoclaves
- Bio-Safety Cabinets
- Pass Box
- HVAC system and its components (including A/C plant, air handlers, exhaust systems, air distribution ducting, filters, controls etc.)
- Hot water generator (for hot water shower during winters)

- Process Air compressor
- Inverter for Emergency Light
- UPS with Batteries
- Door interlocks and Access Control System
- Building Management System
- Fire Detection & Alarm System
- Laboratory Surveillance (CCTV) System
- Access control system.
- LAN System & Intercom System
- Portable Fire extinguishers

For internal furnishing and finishing contractor has to prepare shop drawings and designs and got approved by GBU before any ordering and execution.

FUNCTIONAL AREAS The size and nature of a facility will determine whether areas for separate service functions are possible or necessary. Sufficient animal area required to: Ensure separation of species or isolation of individual projects when necessary; Receive, quarantine, and isolate animals; and Provide for animal housing In facilities that are small, maintain few animals or maintain animals under special conditions (e.g., facilities exclusively used for housing germfree colonies or animals in runs and pens) (6) some functional areas listed below could be unnecessary or included in a multipurpose area. Specialized laboratories or Individual areas contiguous with or near animal housing areas for such activities as surgery, intensive care, necropsy, radiography, preparation of special diets, experimental manipulation, treatment, and diagnostic laboratory procedures containment facilities or Equipment, if hazardous biological, physical, or chemical agents are to be used Receiving and storage areas for food, bedding Pharmaceuticals and biologics, and supplies Space for administration, supervision, and direction of the facility Showers, sinks, lockers and toilets for personnel An area for washing and sterilization equipment and supplies, An autoclave for equipment Food, and bedding; and separate areas For holding soiled and cleaned equipment An area for repairing cages and equipment An area to store wastes prior to incineration or removal

CRITICAL CONSIDERATIONS TO BE FOLLOWED IN DESIGNS

The proposed Animal Facility and Containment Green House shall be constructed in accordance with CDC Guidelines as minimum. Some of the minimum essential critical considerations for construction of the proposed Animal Facility and Containment Green House Facility shall be as under :

- Restricted and controlled access shall be provided for entry into the laboratory
- Access Control System for tracking & recording of entry / exits shall be provided

- Shower facility (Mandatory shower during exit) from Animal Facility and Containment Green House areas shall be provided with hot water supply during winters.
- Appropriate negative differential pressures in laboratory rooms/zones shall be maintained
- Air from the laboratories, animal areas and other areas shall be exhausted only after appropriate filtration & treatment as per guidelines/standards.
- Leak proof dampers with provision to prevent backflow of air shall be provided in supply and exhaust air systems of laboratories and other critical rooms for isolation of rooms/zones. Dampers will be tested for leakage before installation.
- Pressure balancing system to maintain room/zone pressures within specified set limits shall be provided which should be done automatically and shall be controlled through Building Management System.
- Standby exhaust systems shall be provided for Animal Facility and Containment Green House and animal rooms
- The door interlocks, BMS and exhaust blowers of Animal Facility and Containment Green House and animal room shall be provided with un-interrupted power supply system.
- The internal building finishes shall be monolithic, impervious, non-particle shredding, chemical resistant and suitable to withstand chemical use during decontamination/fumigation
- The doors of animal rooms shall be with gaskets and shall be with view panels as required. Door finishes shall be with chemical resistant, anti fungal and anti bacterial properties. Windows shall be non-openable type with toughened glass and shall be installed flushed with the walls
- All doors shall be leak proof and shall be tested for leakage by pressure decay method.
- Wall to wall, wall to ceiling and wall to floor corners shall be provided with approx. 3” coving to prevent accumulation of dust and to enable easy cleaning
- Suitable Building Management System (BMS) shall be provide for operation, control and monitoring of various systems and critical laboratory operating parameters like room/zone pressure, temperature, humidity etc.
- Ventilation Ducting shall be leak tested and shall be in chemical resistant material
- Emergency Hand / Eye wash station shall be provided at strategic locations
- Emergency exit facility from the Animal Facility and Containment Green House shall be provided for personnel exit in case of an emergency
- Laboratory work stations shall be of non particle shredding material and shall be chemical resistant to allow chemical disinfection/CIP.
- All electrical light fixtures, switch/sockets, controls, sensors etc. provided in the Animal Facility and Containment Green House laboratories and animal room shall be of sealed type, chemical resistant construction and shall be able to withstand fumigation with disinfectant chemicals.
- Fire detection and alarm system (FDA System) and fire fighting systems shall be provided as per the guidelines/standards.

3.1.1. Requirement and scope of work for Animal Facility as a part of Tender

- **MAIN ENTRANCE**:
  Upon entry to the Animal Facility it is noticed and recommended for rolling stair case electrically operated and ramp provision for physically challenged, if that is necessary for Central Government building compliance requirements.

- **TYPICAL ANIMAL ROOMS FINISHING:-**
  - Vinyl Flooring with smooth anti-scratch finishing ,
  - Powder coated galvanized iron puff panels for internal partition wall (80-100mm) finishing and walk able false ceiling with the same material with size of 50-60mm,
  - All animal doors must have powder quoted puff panels with vision panel of size 1ftx1.5 ft with push plate, handle, air tight with size of of 4ft x 7ft throughout the facility except Entry door with glass finishing, fire exit(120mins) and autoclave and washing area.
  - Clean room LED lights with aesthetics with suitable arrangements for 325-400 lux on meter from FFL .
  - Door interlocking system to control the cross movements of the people from animal rooms. All Animal rooms should be design with 3 electrical points on each long wall and two points on short wall with universal sockets of 5 and 15 amps.
  - There must be an arrangement for the 4 connections along the long wall for IVC AHU duct to the main exhaust ducting through 89mm size of IVC exhaust pipe
  - All animal rooms electrical points have UPS for the connections to IVC's.
  - All animal rooms must have access control to authorized personnel through system maintenance.
  - Pressure zoning should be maintained as mentioned: Clean corridors 12-15pa, Animal Rooms 10-12 pa and dirty or service corridor 0-5pa with 20-25 air changes per hour in animal rooms strictly and may be decreased in other service areas.
  - There must be a mechanism of 100% fresh air and 100% exhaust through proper exhaust system.
  - Provision of astrological dimmers on first floor strictly throughout and on ground floor restricted to animal rooms clean and dirty corridor.

- **Heating Ventilation and Air conditioning compliances:**
  - Rate of evaporation and quantity of water required per day to be calculated to meet the essential requirements of the facility

- Capacity of the terrace tank and filling terrace tank filling rate to be synchronized
- Different sizes for the supply water line for HVAC must be ensured before execution
- Minimum three makes of AHU's and HRW (DRI/BRYAIR/OSBURGE) to be mentioned in the document.
- Separate civil structure to be provided for the foundation of chilling units and AHU and plumbing and piping work from ground based chillers to AHU's should be into the scope of the tender work.
- All the HVAC units and chillers will be compatible with IBMS
- Chiller insulation thickness shall be 19mm to avoid the condensation on the piping's.
- Design temperature shall be 10degrees Celcius entering and 5 degree Celcius leaving
- BMS chillers parameters integration points should be available in the scope of the work.
- Ensured Independent AHU's for (a) all Animal rooms, (b) Rabbit Room (separate from other animal rooms), (c) Rabbit quarantine room, (d) Mouse quarantine Room, (e) clean corridor, (f) dirty corridor, (g) sterile store and autoclave unloading area, and (h) autoclave loading area with 100% redundancy. Necropsy room, Euthanasia and other room will have an FCU to be operated as and when required.
- All corridors must have supply air as well as return air through ducting exhaust system of HVAC and should not be any propelling exhaust fan in the facility.
- There is no necessity of ceiling fans throughout the facility except offices and staff rest room areas.

- **DIFFERENTIAL PRESSURE:**

  The relative air pressures in different areas of the facility was decided. It is suggested for the provision of individual Magnahelic Gauges wherever applicable or as a part of IBMS as central monitoring for each room to record the positive differential pressure in the facility and animal rooms.

  - Quarantine rooms (Mice and Rabbit) should be negative with respect to the rest of the facility, to be maintained by regulating the pressure with air-conditioning and powerful exhaust system.
  - The Clean Corridor must have air conditioning and must be positive with respect to the Animal Rooms.
  - The Dirty Corridor must have a powerful exhaust and be negative with respect to the clean corridor/animal rooms.
  - Animal rooms never ever be non-pressurized, and there should be no failure of the AHUs. There must be a provision for 100% standby, and a Building Monitoring System which will give an alarm /message, and that someone deputed by the Engineering Section will be on call at the Facility 24x7.
  - VALIDATION: Before the animal facility can be used, the HVAC system chillers system must be validated by checking all essential

parameters for temperature, humidity, and leakage and noise control by the turn key contract before handover

- **AUTOCLAVE UNLOADING ROOM:**
  To maintain the sterile conditions of unloading area, Dr. there is the need for HEPA air filtration to maintain the containment and the sterility of the autoclaved material. If the sterility is not maintained in unloading sterile area, chances of getting animal colonies contaminated are higher and doing autoclaving will be of no use. It was agreed that this area will be provided with a continuous supply of fresh air through pre-filters and HEPA filters and a strong exhaust system to remove heated air arising from autoclave. It would be necessary to periodically monitor the integrity of the HEPA filters.

- **STERILE STORE ROOM:**
  This room is to be used for storing autoclaved cages and bedding and assembling cages with bedding for the entire facility. He had many important suggestions/feedback for this room:
  - Ceiling suspended laminar air flow of approx. dimensions 4 ft by 2 ft be installed in the Sterile Store Area for the purpose of assembling sterile cages with bedding material. 1 meter should be the clearance height from table top to the suspended laminar air flow.
  - As personnel and material movement will be high in this area hence comfort Air conditioning will be required during work hours.
  - As in the Autoclave Unloading Area, it would be necessary to provide a continuous supply of fresh air through pre-filters and HEPA filters and an exhaust system, to maintain containment, relative humidity, and temperature and comfort conditions.

- **FOOD STORAGE ROOM:**
  With respect to feed receipt and storage for short term storage conditions planned for this facility, 18-20 degree C temperature is acceptable, provided it is maintained 24x7. The AC will drop the thermal conditions and humidity which are favorable for the growth of fungus on the food material. Hence it was decided that air conditioning through ducting cooling, and with air filtration, will be placed in this room and normal air changes shall be provided.

- **WASHING AND AUTOCLAVE LOADING ROOM:**
  This room should be supplied with fresh air (air-cooling) and exhausts to maintain comfortable working conditions. Completely air-tight finishing must be ensured between loading and sterile unloading area of autoclave to avoid exchange of environment from non sterile side to sterile side. It was clarified that soft water will be provided for the autoclaves and that a solar heater will

be useful if in the scope to pre-heat the water to be supplied for autoclaving in order to save energy costs.

- **REGARDING FACILITY EXHAUST:**
    - For the effective exhaust system it is recommended that lot of ammonia smell would be generated in the facility which can be exhausted through either water scrubbing, or pre heating through a coil, or activated charcoal treatment. It should be considered while awarding the work considering its recommendations. Return air from the facility need to be thoroughly worked out
    - It is confirmed that in all animal rooms there will be provision of 4 IVC AHU thimble connection provision in each animal rooms ceilings in the diameter of 89mm including rats and guinea pigs and rabbits rooms to exhaust the IVC. This provision will result in reducing ammonia and aerosol infections ensuring animal and human health inside the room.

- **TEMPERATURE:**
  It must be ensured in the scope of work for the provision of to maintain the temperature of each animals room individually between 18-22°C. This would depend on the species of animal in the room as well as the number/density of animals, which will vary from time to time. Therefore, there should be provision to control the temperature separately along with humidity and air changes monitoring.

Inside Conditions:

Season	Temperature		Relative Humidity	Outdoor Air Ventilation
Summer	20 +- 2 ˚C	69.8 + 2 ˚F	50% + 5	100% Fresh air
Winter	20 +- 2 ˚C	69.8 + 2 ˚F	35% + 5	100% Fresh air

- **FUMIGATION:**
  In case of fumigation for each of the animal rooms, individual control should be provided to close the inlet vent, to avoid fumes circulation in the adjacent and nearby areas. It was clarified that since the Animal Rooms have independent and 100% exhaust, fumigation will not affect any other room. Rooms must be kept closed after fumigation for 24 hours.

- **BUILDING MONITORING SYSTEM:**
  Ensure the compliance strictly in the scope of tender work for the integration of control on monitoring temperature, light-dark cycle and relative humidity in the animal rooms and other areas of the facility as laboratory animals are very sensitive to these factors. In case of any failure, alerts may be sent to responsible scientist/engineer through SMS. Messaging systems on mobiles must be ensured regarding these parameters for the in-charge of facility.

- **AIR CHANGES:**
  Animal rooms should have potential of 20 air changes per hour, whereas it will be maintained at 10-12 ACH in Animal rooms with IVCs, except in the Rabbit holding area and Quarantine rooms with 20 ACH. Rest of the facility will be maintained at 7-8ACH.

- **LIGHTING SYSTEM:**
  - lighting should be LED shadow free tube lights, 9 watt, with 12hr dark and 12 h light cycle (6 pm to 6 am). An automatic programmable astrological dimmer would be better, with 30 min range for increase and decrease of light (5: 30 am/pm to 6:00 am/pm).
  - Provision of emergency lights being provided in all places except inside the Animal rooms to avoid uninterrupted lights in the facility. The Clean Corridor and Procedure Room, Sterile Store Room must have emergency lighting, even though a generator back up has been provided. In the clean corridor the emergency lights may be placed at ground level so as not to allow light into the animal rooms through the view panel in the doors.
  - It is mandatory to meet light intensity upto 400 Lux in the animal rooms at one meter above the finished floor level.

NOISE MONITOR: Noise levels must be maintained in the animal rooms up to a maximum of 50 dB by taking care of installations of AHU and other heavy duty equipment. Periodic monitoring of equipment or other operational noise need to be conducted for ensuring levels as per the recommended standards.

- **HEAT RECOVERY:**
  It is suggested to include this technology which help to cool the incoming air by flowing the outlet air at the cooler temperature through coils surrounding the inlet air. This will reduce power consumption in the long run and will result as huge savings in future.

POWER/PLUG POINTS: Animal Rooms with IVC cages will have IVC-AHUs placed against the walls. Therefore at least three power plug points must be provided on both long walls in the animal rooms and two plug points on the short wall. Several plug points will be

needed in the Procedure each after one meter along with long and short wall of panels. Other service areas like Necropsy, clean corridors, dirty corridors, de-husking room, bio-waste room and other supportive areas must have two plug points each irrespective of their sizes. All plug points must have compatibility of dual 5 /15 Amp sockets suitable for any type of equipment.

125 Amp MCCBs for two autoclave and additional two 125 amp MCCBs shall be provided along the short wall in the autoclave and washing area.

GENERAL CONSTRUCTION

The shop drawings shall be submitted by the contractor for review and approval by the client/ Consultant. However some of the critical elements of the building and features are highlighted here under :

1- The internal building construction of Animal Facility and Containment Green House shall provide impervious and monolithic construction with non particle shredding material.

2- The internal partition and ceiling in Animal Facility and Containment Green House shall be capable to withstand high positive pressure of without any sag or buckling.

3- Wall to wall, wall to floor and ceiling to wall corners shall be provided with covings for easy cleaning.

4- The wall and ceiling surface finish in Animal Facility and Containment Green House areas shall provide impervious, monolithic, chemical resistant (organic solvents, acids and alkalis), antibacterial and antifungal finish and allow use of wide range of chemicals for fumigation of lab space.

5 The windows/ view panels shall be internally flushed with the wall. The window / view panel shall be in Powder Coated/Epoxy Painted/SS frame. The windows/view panel shall have double glass panels in 6 mm toughened glass.

6 The window frame and glass panels shall be sealed to prevent ingress of air inside the laboratory due to the negative pressure.

7 The doors frames and door shutters shall be in metallic construction with chemical resistant finish. Inspection windows in doors shall be provided as per requirement. The doors shall be provided with lip gaskets on sides and top and

drop down gasket at the bottom. The doors shall be complete with door closer, SS kick plate (wherever required), handle and key lock.

8 The Door frames and door shutters for Air-Locks and Showers shall be constructed in SS 304 and shall be provided with compressible door gaskets, to minimize the air flow through these doors. The doors shall be complete with door closers and handles. Door will be tested for air leakage.

9 Services like water, steam, compressed air etc. in laboratory and animal areas shall enter through ceiling mounted service pendants. All the joints and penetrations in the building shall be sealed with suitable sealing compound.

10 The drainage and effluent piping system from the Animal Facility and Containment Green House shall be in chemical resistant material (HDPE/SS-316). The floor traps shall provide air breaks suitable for high negative operating pressures of laboratory rooms. The floor traps shall also have provision for inserting and holding disinfectant chemical. The drain lines from the Animal Facility and Containment Green House areas shall be segregated from drain lines of other areas. whereas the drain lines from other areas shall be terminated to the normal sewer.

11 The Animal Facility and Containment Green House rooms shall be provided with stainless steel sink. The sink may be stand alone type or integrated with the work station, as per final layout drawing. The sinks in Animal Facility and Containment Green House shall be fitted with elbow operated taps. Each room shall be provided with an emergency eye wash facility.

12 The staircase area, reception, office etc. shall be provided in approved high quality internal finishing for good aesthetics.

Additional Conditions for internal furnishing items:

i) **Bio-safety Cabinet** should be of minimum Class II, Type B2.

ii) The lab shall be constructed, tested and commissioned as per International Standards.

iii) **Shower Temperature** should be 37 ± 3deg C and should be adjustable along with suitable thermometer and automation system.

iv) 100% Air Tight doors, shower doors, leak proof dampers required which must be tested before dispatch for leak testing by pressure decay method.

v) Door Material as specified

vi) Duct should be welded Air Tight of SS 304 and should have provision for leak test during operation and maintenance.

vii) All HEPA filters should have prefilter of 0.5 micron in the upstream side of supply and exhaust.

vii) All Effluent should be through U trap of chemical resistant material of minimum 5" height.

ix) All drain should be of HDPE/SS-316.Air vent line should also be laid for air vent. Air Filter should be provided in the air vent line to arrest escape of pathogens/aerosols

xi)All Engineering components should have redundancy/standby arrangement/system so that operation of containment lab is not hampered as lab will operate 24hours x 365 days.

xiii) All Electrical appliances should be energy efficient.

Xiv) Compressed Air Supply should be dust free, oil free and moisture free. Accordingly suitable air filter and dryer should be provided along with hydraulic testing arrangement for the reservoir.

Construction and Finishing :

The internal building finishing shall provide impervious and monolithic construction and all materials used for internal construction and finishing shall be non particle shredding type and chemical resistant. Joints like wall to wall, wall to floor and ceiling to wall shall be provided with covings for easy cleaning. The services like water, steam, compressed air etc. in laboratory and animal areas shall enter through ceiling mounted service pendants. All the joints and penetrations in the building shall be sealed.

3.2. CONTAINMENT GREEN HOUSE FACILITY

The containment Green House Facility shall be a single storied structure above the integrated basement. Entire facility to be transgenic compliant. All the compartments to be completely sealed to prevent pathogens The facility comprises of the following components

1. Hi-Tech Greenhouse Facility
2. Speed Breeding Facility
3. Plant phenomics facility

PART 1: HI-TECH GREENHOUSE FACILITY

S. no.	Requirements/Description brief	Units/Remarks
1.	No. of bays with multiple layout suggestions to select	2 nos.
2.	Steel Structure to be designed as per IS 800, IS 875 and other necessary IS standards considering zoning details using galvanised sections. BIS standards to be followed for structural steel.	
3.	Common buffer cum control room along with potting mix and autoclave facility	
4.	Cladding Includes Material Transportation to site , Erection, Installation , Commissioning , loading & unloading at site External Shading Net on roof – clear colour	
5.	Internal Screen	
6.	Air conditioning cooling system	
7.	Biotech heat convector gerat	
8.	Par light For photosynthesis	
9.	GI movable benches	
10.	Air curtain	
11.	Microprocessor based control panel	
12.	Ultra-fine fogging system & irrigation with Centralized RO Unit High-pressure ultra-fine fogging system with 15 to 20 microns of water particle size. All UPVC pipes & fittings in the GH.	
13.	Civil work	
14.	Complete plumbing work	

PART 2: SPEED BREEDING FACILITY

S. no.	Requirements/Description brief	Units/Remarks
1.	Cladding DL	2 nos.
2.	Photoperiodic RS-2 black out system	
3.	Spectral light vehicle SC-2 for plant canopy	
4.	Air conditioning cooling system	
5.	Air exchange ventilation	
6.	SSBF customized benches	
7.	Structure	
8.	Centralized control system • Software climate control master (CCM) • CMS -2 carbon dioxide controller	
9.	Ultra-fine fogging system & irrigation with Centralized RO Unit	

S. no.	Requirements/Description brief	Units/Remarks
	High-pressure ultra-fine fogging system with 15 to 20 microns of water particle size. All UPVC pipes & fittings in the GH.	
10.	Customized doors for speed breeding facility	
11.	Integrated fertigation system	
12.	Insect infestation IPM	
13.	Centralized RO system	
14.	Fire safety “Level 1”	

PART 3: HI-TECH CLIMATE CONTROLLED PHENOMICS INSFRASTRUCTRURE FACILITY

S. no.	Requirements/Description brief	Units/Remarks
1.	Infrastructure design	
2.	Cladding system	
3.	Air shower cabinet	
4.	Light arrangement	
5.	Cooling & Heating system	
6.	Climate control system • Microprocessor based control panel	
7.	Electrical fittings	
8.	Benching Station : Fixed Type	
9.	Internal Shading Screen - I	
10.	Internal Shading Screen - II	
11.	Motorized side ventilation	
12.	Ultra-fine fogging system & irrigation with Centralized RO Unit High-pressure ultra-fine fogging system with 15 to 20 microns of water particle size. All UPVC pipes & fittings in the GH.	
13.	Imaging units	

4. SCOPE OF WORKS - HVAC WORKS

4.1. GENERAL:

Heating, ventilation, and air conditioning (HVAC) system proposed for Animal Facility is designed to maintain the space temperature, humidity, Air-change rates at the required set point and maintain relative pressure differentials between spaces to prevent of cross contamination.

This report outlines the basis of preliminary design and summary of heat load estimation requirements and HVAC work for the upcoming building small animal facility building in GBU at Gandhinagar.

It is a two story building with floor to floor height is 4.5 meters & 3m below false ceiling.

4.2. LOCATION:

The proposed small animal facility GBU building is at Gandhinagar. The design data for Gandhinagar has been considered as given below.

Site Location	:	Gandhinagar, India,
Geographic location	:	Latitude: 23.2156° N, Longitude: 72.6369° E
Altitude	:	81 m above mean sea level.

4.3. BASIS OF DESIGN:

3.1 Outside Conditions:

Outdoor Design Conditions for cooling are considered based on Weather data published by ISHRAE in HVAC handbook Part 1 2007 for Gandhinagar is as follows:

Summer

Dry Bulb Temperature	:	108 Deg.F	(42.2 Deg. C)
Mean Coincident Wet Bulb Temperature	:	83 Deg F	(28.3 Deg. C)
RH	:	35%	

Monsoon

Wet Bulb Temperature	:	94 Deg.F	(34.4Deg. C)
Mean Coincident Dry Bulb Temperature	:	82 Deg.F	(27.8 Deg. C)
RH	:	60%	

Winter

Dry Bulb Temperature	:	65 Deg.F	(18.3Deg. C)
Mean Coincident Wet Bulb Temperature	:	57 Deg.F	(13.9 Deg. C)
RH	:	60%	

4.4. Inside Conditions:

Following indoor design conditions for centrally air conditioned spaces are proposed.

Season	Temperature		Relative Humidity	Outdoor Air Ventilation
Summer	21 ± 1 ˚C	69.8 ± 2 ˚F	Less than 60%	100% Fresh air
Winter	21 ± 1 ˚C	69.8 ± 2 ˚F	Less than 60%	100% Fresh air

4.5. Building Construction Data

4.1 WALLS - External - All outside wall are 230 thick of FLAG (fly ash lime bricks)
U = 0.2425 Btu / Hr Sqft ^{O} F (1.37 Watt / Sqm ^{O} K)

4.2 PARTITION WALLS - all internal partitions are 100mm and 50mm thick double skin sandwich type GSS/CRCA Powder coated Metallic Wall panels of 0.6 mm thickness on both sides with **100 mm** thick PUF in-filled with 40+/-2 Kg/m3 density insulation.
U = 0.1 Btu / Hr Sqft ^{O} F (0.565 Watt / Sqm ^{O} K)

4.3 ROOF - Exposed to sun - 150mm thick with 50mm XPS thermal insulation
U = 0.072 Btu / Hr Sqft ^{O} F (0.409 Watt / Sqm ^{O} K)

4.4 GLASS. - Windows are (Double Glass with following details)
SHGC = 0.2
U = **0.317 Btu / Hr Sqft ^{O} F** (1.8 Watt / Sqm ^{O} K)

4.5 FALSE CEILING SYSTEM- Double skin sandwich type GSS/CRCA Powder coated Metallic ceiling panels of 0.6 mm thickness on both sides, **80 mm** thick PUF in-filled with 40+/-2 Kg/m3 density insulation.

4.6 **FLOORING. -** 2 mm thick Ardex- Epoxy

5. Internal Loads for Air conditioning Heat load estimation

5.1 Mechanical Ventilation.

Toilet: Exhaust @ 7 ACPH with Air being sucked from return corridor.

5.2 Maximum Lighting Loads:

Space type	Task Lighting	Room Lighting (1)	
	W / person	W / m²	W / ft ²
Biomedical Laboratories	250	27	2.5
Animal Holding Areas	250	16	1.5
Animal Procedures	250	27	2.5
Offices	250	14	1.3
Corridors	N/A	11	1

5.3 Animal Density:

A typical 3 m (10 ft.) by 7 m (23 ft.) animal holding module shall be designed to the following animal population density & where ever type of animal is not mentioned, heat load calculation for that module is calculated for maximum occupancy:

Design Animal Density Heat Generated by Laboratory Animals

Species	Animals per Rack	Racks per Module	Animals per Module	Heat Generation, Btu/h per Normally Active Animal			Heat generation per module
	No	No	No	Sensible	Latent	Total	Btu/h
Mouse	300	5	1,500	1.11	0.54	1.65	2475
Rat	90	5	450	7.77	3.83	11.6	5220
Guinea pig	40	5	200	10.2	5.03	15.23	3046
Rabbit	8	5	40	39.2	19.3	58.5	2340
Cat	8	5	40	45.6	22.5	68.1	2724
Nonhuman primate	8	5	40	71.3	35.1	106.4	4256

5.4 Equipment Load:

Offices: 0.5w/sqft.

Remaining areas: Supplement heating will offset equipment load.

5.5 Occupancy

Corridors:	100 Sft/Person of carpet area.
Store / Loading/ unloading areas:	60Sft/Person of carpet area
Lab / Office / Mud/ Bench:	50 Sft/Person of carpet area.
Procedure areas:	40Sft/Person of carpet area
Modules/ Animal rooms:	As per animal density described in item 5.3

5.6 Ventilation

100% outside (FRESH) air shall be supplied at ACH mentioned in annexure, Individual zones will have separate exhaust.

6 USAGE / HOURS OF OPERATION:

Usage shall be 24 hours, 365 days. Air conditioning system proposed will be sufficient to meet peak cooling loads capacity and will operating efficiently at part-load conditions.

7 ESTIMATED SUMMER, MONSOON & WINTER LOADS - Refer annexure for details

8 COOLING REQUIREMENTS:

Cooling load at any time depends on building Structure, type of Glass, weather, occupancy, lighting, equipment load and Fresh Air (Ventilation). To maintain the required cleanliness we need to maintain difference pressure among different zones.

Air conditioning system design for Animal facilities shall be designed with special attention to air quality, room acoustics, supply air temperature, supply air humidity, airflow quantities, air velocity, and air diffusion and distribution within the space to provide summer, monsoon & winter thermal environmental control with optimum operating cost is proposed for this project.

Proposed building coming up shall be air conditioned using common **Air cooled central water chilling plant.** The Plant and Air Handling units will be placed on terrace. The exhaust fans will be placed in respective zones.

Considering 80% diversity on above load, proposed Capacity of Air cooled chillers shall be 3 x 140TR (2 Working and one stand by) with screw compressors and the capacity of

Air conditioning shall have central variable flow chilled water recirculation system for maximum energy conservation.

Pressure differential zones shall be created with the help of AHUs and exhaust fans (with VFDs) in Air Distribution & shall prevent cross contamination between individual spaces, air shall flow from areas of least contamination to areas of higher contamination potential, i.e., from "clean" to "dirty" areas.

Supply air grills / diffusers shall be located at ceiling level or close to ceiling level & the return / exhaust shall be at 300mm above finished floor level.

The central air conditioning system consisting of water chilling units associated with chilled water pumps with variable frequency drive, air handling units **with** variable frequency drive, chilled water piping with valves, air distribution system with grilles & diffusers, electrical panel, wiring, control wiring and earthling.

Individual room temperature & humidity sensors, for animal holding rooms, shall be located inside the general exhaust ductwork from each room at an accessible location.

9 Design Parameters:

9.1 Water Chilling Machine

Performance rating of the water chilling machine shall be based on the following design parameters:

Temperature of chilled water entering chiller	:	54° F (12.2° C)
Temperature of chilled water leaving chiller	:	44° F (6.67° C)
Fouling factor for chiller in FPS unit	:	0.0005
Ambient temperature for Air cooled condenser.	:	DB 108 ^{0}.F / WB 83
Refrigerant	:	HFC (R134a)
Minimum COP at ARI conditions (100% load)	:	2.90

9.2 Design parameter for selection of **Air Handling Unit** and its components shall be:

Maximum face velocity across pre-filters & fine filters	:	1.78 m/sec (350 fpm)

Maximum face velocity across cooling coils	:	2.54 m/sec (500 fpm)
Maximum fan outlet velocity	:	9.14 m/sec (1800 fpm)
Maximum fan speed	:	
a. Fan above 450 mm dia	:	1000 RPM
b. Fan up to and including 450 mm dia	:	1450 RPM
Maximum fan motor speed	:	1450 RPM

9.3 **Piping** shall be sized for the following design parameters:

Maximum velocity	:	1.2 m/Sec (4 fps) for piping 50 mm & under diameter.
	:	2.5 m/Sec (8.2 fps) for piping over 50 mm diameter.
Maximum friction	:	15 k Pa per 30 m Run
		(5 ft per 100 ft Run)

9.4 Design parameter for **Duct design** shall be:

Maximum flow velocity in ducts for air conditioning	:	7.5 m / sec (1500 fpm)
Maximum flow velocity in ducts for ventilation in pump room, boiler room, generator room, toilet exhaust & Kitchen exhaust.	:	7.5 m / sec – 12.5 m / Sec (1500 – 2500 FPM)
Maximum friction	:	0.65 Pa / M run
		(0.08 inch WG/100 ft run)

9.5 Exhaust / Ventilation Fan:

Maximum fan outlet velocity for fan up to 450 mm dia	:	9.14 m/sec (1800 fpm)

Maximum fan outlet velocity for fan above 450 mm dia	:	12 m/sec (2400 fpm)
Maximum fan speed for fans up to 450 mm dia	:	1440 RPM
Maximum fan speed for fans above 450 mm dia.	:	1000 RPM

9.6 Filtration:

For 100% fresh air at air handling units: three stage filtration shall be provided - Washable synthetic type air pre filters having 90% efficiency down to 10 microns, fine filter shall be 99% down to 5 microns and HEPA filters shall be provided for final stage filtration. HEPA Filter efficiency shall be at least 99.99% down to 0.3microns

To capture airborne animal hair/ dander and particulate count Washable synthetic type pre filters will be provided in ducted return / exhaust at 300mm above finished floor level.

9.7 Pressure relationships:

The HVAC system shall be adaptable so that pressure relationships can be modified as required over the life of the facility. Dirty elevator shafts shall have negative air pressurization in relation to all surrounding areas but shall be positive as compared to ambient.

Clean corridor will have positive pressure as compared to surrounding areas. Animal spaces shall be protected against contamination from outside sources, including particulates brought in from outside by the HVAC air flow. Animal rooms shall remain at a negative air pressure relative to clean corridors and other non-animal spaces.

Mud rooms are typically located between the clean corridor shall act as air lock & shall have change room Air shower, etc. it will have two sets of doors, one door to the clean corridor / protected area and one door to the common corridor. These two doors are interlocked so that only one door can be opened at a time. Mud room shall be negatively pressurized as compared to clean corridor and positively pressurized as compared to common corridor. Mud room shall be provided with both supply and exhaust air grilles

9.8. **Exhaust :**

Each zone will have dedicated exhaust fan and all exhaust fans shall be SISW type, shall have VFDs for control of air flow and duct static pressure. IVC if any will be connected to exhaust ducts.

9.9. **Redundancy:** Looking at the criticality of application - long duration tests, difficult to repeat, we cannot afford to have failure of HVAC system so we will have two working and one stand by concept for chillers and pumps and each AHU & Exhaust fan shall have standby.

9.10. BMS: Building management system is proposed to control and monitor complete HVAC system of the building.

Data Point Summary -GBU						
S. No.	**Description**	**AI**	**DI**	**AO**	**DO**	**Field Device**
1	**Water Chilling Units (3 Nos)**					
1.1	Chiller Start/Stop Command				3	To Chiller Panel
1.2	Chiller Auto Manual Status		3			From Chiller Panel
1.3	Chiller Run Status		3			From Chiller Panel
1.4	Chiller Trip Fault Status		3			From Chiller Panel
1.5	S & R & header Chilled Water Temp.	8				Immersion type temp. sensor
1.6	Chilled Water Flow Rate	3				Electromagnetic Type Flow meter
1.7	Chiller - butterfly Valves open/close command & Status		3			Motorized valve
1.8	Ambient Temperature + RH Feedback	3				Ambient T+RH Sensor
		14	**12**	**0**	**3**	
2	**Chilled water Primary Pumps(3 Nos)**					
2.1	Pump ON/OFF Command				3	Pump panel
2.2	Pump Run Status		3			From Water DP Switch
2.3	Pump Trip Status		3			From Pump MCC

2.4	Pump Auto/Manual Status		3			From Pump MCC
		0	9	0	3	
3	**Secondary Pumps with VFD (2 Nos)**					
3.1	Chilled Water Pump ON/OFF Command				2	To Pump MCC
3.2	Chilled Water Pump Run Status		2			DP switch

Data Point Summary -GBU

S. No.	Description	AI	DI	AO	DO	Field Device
3.3	Chilled Water Pump Trip Status		2			From Pump MCC
3.4	Chilled Water Pump Auto/Manual Status		2			From Pump MCC
3.5	Chilled Water Pump VFD Modulation			2		To Pump MCC
3.6	Differential Pressure Feedback	2				From DP Transmitter
		2	**6**	**2**	**2**	
4	**Air Handling Units 32 Nos (2 fan,HRW /HP)**					
4.1	AHU ON/OFF Command Supply fan With VFD				16	To AHU Panel
4.2	AHU ON/OFF Command Exhaust fan With star/delta				16	To AHU Panel
4.3	HRU ON/OFF Command With DOL				16	To AHU Panel
4.4	AHU supply & exhaust Air flow / Run Status		32			DP Switch across Air
4.5	AHU supply, exhaust & HRU Trip Status		48			From MCC Panel
4.6	AHU Auto/Manual Status		16			From MCC Panel
4.7	Strip heater status On/ OFF		16		16	To AHU Panel
4.8	Strip heater status Trip Status		16		16	To AHU Panel
4.	UVGI status On/ OFF		16			To AHU Panel

9						
4.10	Supply Air temperature + RH Feedback	32				Duct Temperature Sensor
4.11	Return Air temperature + RH Feedback	32				Duct Temperature Sensor
4.12	Room temperature + RH Feedback	16				Wall Mount Temperature Sensor
4.13	Motorized valve (Cooling)			32		Motorized Valve Modulation
4.14	Motorized supply & return Air Damper Control On/OFF				32	Damper actuator
		80	144	32	112	
	* Every zone has 2 AHUs, both AHUs shall be interlocked so that only one AHU is operational					
	* Operational AHUs damper should open, standby AHUs dampers should be closed					
7	**Panels - 1 nos**					
7.1	Incomer Breaker Status		1			Voltage free contact
7.2	Incomer Trip Status		1			Voltage free contact
7.3	Incoming energy analyser monitoring - 1 nos					Software integration with BMS
7.4	KWh meter monitoring - 1 nos					Software integration with BMS
			2			
	Grand Total	**96**	**317**	**34**	**200**	

Additional Conditions & Specifications

1. The entire job will be executed by a specialized HVAC Contractor on turnkey basis for:
   a) Detailed design to ensure maintenance of specified conditions.
   b) Preparation and Approval of detailed Drawings.
   c) Fabrication/ supply of required equipment/ fabricated items/ materials after factory testing.

d) Erection/ Testing/ Commissioning/ Coordination with other execution Agencies.
e) Ensuring proper workmanship by deploying skilled personnel/supervisor/ Engineer and use of proper erection tools and machinery.
f) After Completion of Job, subsequent comprehensive operation and maintenance backed by proper preventive maintenance as per Manufacturers recommendations and as per site requirements.

2. The entire work will be executed in conformity with the General Specification for HVAC Works 2004 of CPWD, with latest amendments (up to the stipulated date of submission of tender). These are printed publications available for purchase and the tenderer should procure these documents before tendering. Besides technical specifications, this lays down commercial and financial conditions also. The electrical work shall be executed as per CPWD electrical specifications, internal, external, substation in force with latest amendments.

3. Wherever an item is not covered by the CPWD Specifications, the same will be as per Manufacturers specifications/ specifications as approved by the Engineer-in-Charge.

4. Specifications as per BOQ/ Additional Specifications will supersede the CPWD Specifications.

5. **Technical Deviations allowed from CPWD Specifications**:

Refer to Design Parameters of Chilling Unit. With reference to Clause IV e, Va, Vb, Ve, the technical parameters will be as per BOQ and the Manufacturers Design.

Condenser/ Chiller Testing: The test Pressure shall be as per Manufacturers standard Pressure.

Condenser chiller water box: With reference to clause 5.5.3.2, vi, and 5.6.3.2 ix, water box shall be single/ multi pass flow.

AHUs: With reference to Chapter VI of CPWD HVAC specifications, the following improvements are required to ensure longer life, rust free operation and better efficiency. Refer Clause 6.2.3:

Cooling Coil:
Copper Headers with purge/ drain connections. AHRI certified coils.

Chilled water pipe insulation:

Refer clause 11.2 to 11.5 of CPWD HVAC specification. Since a huge quantity of chilled water pipe will be insulated, it is better to go for factory pre insulated pipe for seamless insulation, quality and speedier execution. Factory Pre insulated pipes will be used in place of the above specified CPWD specifications.

6. Specification for factory pre-insulation:
The pipe shall be MS ERW.
The pipe insulation shall be Polyurethane Foam with 36 Kg/cum minimum density, 90 % minimum closed cell content, minimum compressive strength of 40 psi and initial thermal conductivity not exceeding 0.14 BTU/hr.sft ^{0} F. The insulation shall completely fill the annular space between the service pipe and the jacket and shall be bonded to both the service pipe and jacket.
The insulation shall be provided with minimum thickness specified below:

Pipe size (mm)	Minimum insulation thickness(mm)
<150	30
150 and above	50

i. Fittings:
Fittings shall be fabricated at site over the pipe and correct quantity of PUF to be poured manually.

ii. Field Joint Insulation:
Field joint insulation shall be PUF Poured manually in a site fabricated GI cladding fixed around the joint.

Note:
Site fittings/ Joints insulation shall be done by the Manufacturer of the Pre-insulated Pipes.

7. Specification of Duct Insulation:
Chemically cross linked, closed cell polyethylene foam (XLPE)

Density	: 33 +/- 3 Kg/ M 3
Closed Cell	:> 90 %
Temperature Range	:-40 to 110 Deg C
Aging	: No effect.
Odour	: Neutral

Thermal conductivity: not exceeding 0.035 w/mk at average temp of 40 Deg C.

Fire Rating	: Class I as per BS-746 Part 7
UL	: Certified

Smoke Emission : AS 1530-3199: not exceeds 1
Flammability : Self extinguishing.
The insulation shall be cladded with factory laminated 30 micron Aluminum foil Single layer upto 15 mm thickness.
Fire Approval By : CBRI Roorkee.

8. DUCTWORK – Ducting work on each floor shall be GI as per CPWD specs chapter 9.

9. BMS Compatibility:
   The AC plant will have a BMS System for monitoring and Control of various equipment, BMS system shall. All the switch gear, equipment and valves etc will be BMS compatible.

10. Power Supply to AHUS:
    Electrical Power supply cable/ incoming isolator to AHU/ FCUs is in Electrical contractors scope.
    Wiring from isolator to AHU starter panels, termination etc is in the scope of tender work.

11. Variation of Quantities with reference to BOQ Quantities:
    The BOQ quantities are estimated quantities. The work will be executed as per approved drawings based on actual site requirements. The actual quantities may differ from BOQ quantities. The work will be executed as per actual quantities with plus/ minus deviation as permitted under conditions of the contract.

12. Foundations of equipment and connected Civil Works:
    The AC contractor will execute all these works within tendered rates.

13. This is a turnkey job.
    Even if certain items are not included in the BOQ, but are required for comprehensive completion of the job, the AC Contractor will do the same without any extra cost.

14. Operation and Maintenance:
    After completion of the main job, the Contractor will provide comprehensive operation and maintenance with the deployment of required skilled personnel, supervisor and Engineer as required on the basis of quoted rates and terms and conditions of the agreement for operation and maintenance part for which a supplementary agreement will be drawn. All cost to be included except cost of water and electricity. The staff will wear proper uniform, shoes and provided with mobile phones within tendered rates. The work will be executed as per Manufacturers recommendations and direction of the Engineer-in-

charge primarily guided by preventive maintenance considerations. All servicing, cleaning, painting, minor/ major repairs, replacement of parts etc. will be included. In case of any mishap or accident, the Department will not take any responsibility and the Contractor will bear all such financial or otherwise responsibility.

15. Quantum of staff for Maintenance:
    The contractor will employ following minimum staff for round the clock operation, 365 days a year. (This will include necessary leave reserve also)
    3 shifts, each shift
    one operator
    one helper

16. HVAC vendor shall offer the factory testing and inspection as given below. The cost testing and inspection shall be considered by HVAC Vendor accordingly. Boarding and lodging expenses shall be born by department.
    - One chiller shall be tested for performance at 100%, 75%, 50% and 25% at AHRI Conditions.
    - All other materials shall be supplied with test certificates.)

17. Axial flow fan rpm should not exceed 1450, irrespective of fan dia.

18. Civil work like making cutouts in wall for routing duct, chilled water pipe, cable, etc is also part of tender work, the scope also includes finishing the cutout with sand cement plaster and paint.

19. Client will not issue any form C, contractor will issue form“ C”

20. There must be an arrangement for the two connections along the each long wall for IVC AHU duct to the main exhaust ducting to connect 89 mm size of IVC exhaust pipe. This opening must have close and opening arrangement as per the requirements during operations.

21. Pressure zoning should be maintained as mentioned:

    Clean corridors 12 -15pa,

    Animal rooms 10-12pa

    and dirty/service corridor 0-5pa

    with min 12-15 air changes per hour in animal rooms strictly and may be decreased in other service areas.

22. DIFFERENTIAL PRESSURE: Provide individual Magnahelic Gauges across each zone.

23. There must be a mechanism of 100% fresh air and100% exhaust through proper exhaust system.

24. VALIDATION: Before the animal facility can be used, the HVAC system chillers system must be validated by checking all essential parameters for temperature, humidity, and leakage, noise control etc., by the turnkey contract before handover the system.

4.6. Scope of works – HVAC

The scope of the Contractor shall comprise design, engineering, manufacturing, inspection & testing at works, packing, forwarding, supply to site, unloading at site, storage at site, construction, installation, erection, testing, commissioning, performance testing at site, and other related items of work for the complete following Air Conditioning & Ventilation (HVAC) system:

- Water Cooled Screw Compressor Type Packaged Skid Mounted Water Chilling Machines each of required capacity as specified in the BOQ with R-134a Refrigerant complete with semi - hermetic compressor, motor, starter, water cooled condenser, insulated (insulation to be carried out at factory only) evaporator, vibration isolators, sole plates, integral refrigerant piping with insulation, necessary Valves & fittings, first charge of refrigerant and oil, wiring, automatic and safety controls & microprocessor based electrical control panel, all mounted on Mounting steel base frame. Chiller must have the efficiency, capacity controls and noise data as mentioned under the BOQ and specifications. Harmonic filters are provided to keep THD less than 5% for chillers. Chillers Shall be as per ECBC Plus, 0.60KW/TR, COP@ AHRI not less than 6.5)
- Horizontal Centrifugal Pumps for Primary Chilled Water & Condenser Water Circulation, of Capacities as specified in BOQ, complete with electrical motor, VFD with by-pass, factory fitted mechanical seal, common base frame for pump and motor, coupling & coupling guard, foundation bolts, vibration isolators, & insulation (for chilled water duty).
- Horizontal centrifugal pumps Variable Frequency Drive Driven Centrifugal Pumps for Secondary Chilled Water Circulation, of Capacities as specified in BOQ, complete with electrical motor, factory fitted
- mechanical seal, common base frame for pump and motor, coupling & coupling guard, foundation bolts, vibration isolators, & insulation.
- FRP Forced Draft cooling towers, of Capacities as specified in the BOQ, complete with FRP basin, casing, distribution system, fills, louvers, ladder, fan, electrical motor, supports for fan & motor, brass strainers & MS Base frame for the Cooling Towers. Cooling tower fans and motors shall be supplied and installed with VFD's. Cooling tower condenser water pumps as specified under the BOQ and
- specifications with VFD's.
- Air Handling Units, of Types / Construction / Capacities as specified in the BOQ, specifications and AHU schedule complete with Casing, Pre Filters, Fine Filters, Chilled Water-Cooling Coil with SS casings,
- Centrifugal Fans, Electrical Motor, Drain Pan, Access Doors, control panels, VFDs etc. All supply fans are provided with VFD with by-pass. Mixing boxes shall be provided for each AHU and the CSU as mentioned in BOQ and AHU schedule.
- Ceiling Suspended Air Handling Units, of Types / Construction / Capacities as specified in the BOQ and specifications complete with Casing, Pre Filters, Fine Filters, Chilled Water-Cooling Coil, Centrifugal Fans, Electrical Motor, Drain Pan, Access Doors, control panels, etc.
- Ceiling Suspended chilled water cassette units of Types / Construction / Capacities as specified in the BOQ and specifications complete with Casing, Filters, Chilled

Water-Cooling Coil, Fans, Electrical Motor, drain pump and Drain Pan, etc.

- Fire Rated - Ceiling Suspended Air Handling Units without Cooling Coil (Fan Filter Units) - For Fresh Air Supply in chilled water plant room and Stair Pressurization System of Types / Construction / Capacities as specified in the BOQ, complete with Casing, Pre Filters, Fine Filters, Centrifugal Fans, Electrical Motor, Access Doors etc.
- Heat Recovery Units and Treated Fresh Air Units– Heat recovery units and treated fresh air units with supply fans, exhaust fans, chilled water-cooling coil and filtration shall be provided with the capacities as mentioned in BOQ and specifications.
- Direct Driven and Belt Driven Single Phase and Three Phase Floor Mounted Air Handling Units without Cooling Coil (Exhaust Air Units) - For Exhaust Air from Toilets - Units Installed on Roof - of Types / Construction
- / Capacities as specified in the BOQ, complete with Casing, Centrifugal Fans, Electrical Motor, Access Doors etc.
- Radiant Cooling- Hydronic radiant floor systems pump chilled water from a water-cooled chiller through tubing laid in a pattern under the floor. In some systems, controlling the flow of hot water through
- each tubing loop by using zoning valves or pumps and thermostats regulates room temperatures for Ramps.
- High Wall Split Air Conditioner Units with R-410a refrigerant having Zero Ozone Depletion Potential (ODP) and Low Global Warming Potential (GWP), of Capacities as specified in the BOQ, complete with Indoor Unit with filters; evaporator cooling coil; fan with motor & drive arrangement; power & control components with wiring, Air cooled condensing unit with compressor(s); multi row deep air cooled
- condenser coil; condenser fan with motor & drive; controls; power & control components with wiring, Stands for Outdoor Condensing Units, Initial charge of refrigerant and oil, Electronic remote control unit, Refrigerant Piping with fittings & insulation, Filter Dryer, Refrigerant Solenoid / Manual Valves, Expansion Valve etc.
- DX Split System with floor mounted air handling unit and outdoor roof mounted condensing unit with R-410a refrigerant having Zero Ozone Depletion Potential (ODP) and Low Global Warming Potential (GWP), of Capacities as specified in the BOQ, complete with Indoor Unit with pre filters, file filters and semi HEPA filters; evaporator cooling coil with SS casing; fan with motor & drive arrangement; power & control components with wiring, Air cooled condensing unit with compressor(s); multi row deep air cooled condenser coil; condenser fan with motor & drive; controls; power & control components with wiring, Stands for Outdoor Condensing Units, Initial charge of refrigerant and oil, Electronic remote control unit, Refrigerant Piping with fittings & insulation, Filter Dryer, Refrigerant Solenoid/Manual Valves, Expansion Valve etc.
- Propeller Fans of Capacities as specified in the BOQ, complete with mounting arrangement, speed regulator, gravity louvers & bird screen etc.
- Axial Flow Fans – AMCA certified, Fire Rated, of Capacities as specified in the BOQ, complete with fan, electrical motor, mounting accessories, vibration isolators, Welded Mesh Protective Screen / Grille for Inlet only of Exhaust Air

Fans & Outlet only for Fresh Air Fans, etc.

- Battery Room Exhaust Fan - Explosion Proof of Capacities as specified in the BOQ, complete with Explosion Proof Fan suitable for Battery Room Exhaust, certified according to ATEX 94/9/EC Directive, electrical motor, capacitor, etc.
- Precision Dual fluid air conditioning units shall be provided for both server rooms. Each system shall be 1+1 (working + stand-by) configuration and each unit shall be dual fluid type which can produce air conditioning through chilled water and also with a dx system. Dx system shall be on the emergency generator.
- Supply and installation of GI site fabricated oval/elliptical/circular exposed ducts with insulation inside, complete with RTV Sealant joints with necessary supports using threaded roads (as directed) and anchor bolts, supply air collars, vanes, splitters dampers duly painting of the ducts and as per specification for Air-Conditioned Areas. Fusible Link Type Fire Dampers, UL Listed Fusible Links, Manual Volume Control Duct Dampers, Grilles, Grille Collar Dampers, Air Transfer Grilles, Diffusers, Diffuser Collar Dampers, Louvers, Non-Return Dampers etc. – All complete with fittings, flanges, bracings & supports.
- Supply and installation of the UL approved motorized fire/smoke damper with required rating.
- Supply and installation of the motorized, modulating volume control dampers with required actuator as specified in BOQ and specifications.
- Condenser Water Piping (Supply & Return) complete with Supports, Valves, Fittings and all Related Accessories.
- Chilled Water Piping (Supply & Return) complete with Supports, Valves, Fittings Insulation and all Related Accessories.
- Chilled water & Condenser water make up Water Piping from the source complete with Supports, Valves, Fittings and all Related Accessories.
- Drain Water piping complete with Supports, Valves, Fittings Insulation and all Related Accessories.
- PRESSURISED CHILLED WATER EXPANSION TANK suitable for total volume of water in chilled water circuits along with necessary accessories such as centrifugal air separator, pumps etc.
- Thermal Insulation of Supply & Return Air Ducting complete with all accessories and finishes (including Protective Coating on the insulated ducts exposed to atmosphere) as per specifications and BOQ.
- Acoustic Insulation of Supply & Return Air Ducting complete with all accessories and finishes as per specifications and BOQ.

- Acoustic Insulation of Walls & Ceiling of AC Plant Room complete with all accessories and finishes as per specifications and BOQ.
- Jet Nozzles on the ducts complete with all accessories and finishes as per specifications and BOQ.

HVAC Electrical Control Panels.

- Local Electrical Isolators for Outdoor Condensing Units of Split AC Units & for Other HVAC Equipment located away from HVAC Electrical Control Panels, as described in the BOQ.
- Power Cabling / Wiring, Control Cabling / Wiring & Earthing of Various HVAC

Equipment / Motors complete with Cables / Wires, Bare GI strips/ wires, cable trays, supports, installation, saddles, cable ties, cable tags, ferrules, cable glands, lugs, nuts/ bolts/ hardware etc.

- Supply Erection, testing, calibration and commissioning of all field Instruments along with the accessories as required / specified. The scope shall also include the necessary erection hardware for installation of the field instruments.
- Base Frame with foundation bolts for equipment and vibration isolators, mounting frames for fans, cooling coils, filter banks, louvers & other HVAC equipment, as required.
- Grouting & Finishing of Foundations.
- Paint & Painting of Equipment, Supports, Piping, Flow Direction Indicators etc.
- One Set of Special Erection & Maintenance Tools & Tackles.

Start Up & Essential Spares.

- Supply of Counter Flanges with Gaskets, Nuts & Bolts at all Flanged Terminal Points.
- All accessories required for system completion and required for normal operation of equipment.

Shop Inspection & Testing.

- Packing, marking and forwarding.
- Completion erection of all equipment covered under this contract.
- Testing and trial run of equipment.
- Pre-commissioning checks and commissioning of all equipment.
- Carrying out field performance testing of equipment at site as per relevant standards, air and water balancing and demonstrating guaranteed performance parameters and handing over the systems.
- Associated minor civil works including but not limited to making & repairing of openings in brick works, etc. to be executed by the contractor

Electricals:

- Mechanically coupled motors
- Cable termination at Motor terminals including cable glands and lugs. CMA shall provide required power and control cables upto the equipment.
- Grounding of Motor’s body and other supplied items by using tinned stranded copper conductor from the nearest earthing conductor.

- Local instruments, controls and interlocks inclusive of electrically operated chilled water outlet valves for each of the chillers.
- Factory Acceptance Tests (FAT) and Site Acceptance Tests (SAT) including loop checking & commissioning, trial runs of all the above systems to meet the design specifications & functional requirements.
- Operation and comprehensive maintenance including all consumables is included in the scope of work after handing over for a period mentioned elsewhere in the Contract Document

4.7. Scope of work – general

- Engineering Responsibility of the System - The responsibility of system design, manufacturing, erection, working and safety will solely be the responsibility of the Contractor for the parameters as mentioned in the tender documents. The Contractor shall study design depicted in these documents thoroughly and point out reservations, if any, at tender stage only.
- Codes and Standards - A reference made to various codes and standards in these Contract document shall imply reference to the latest version of that standard, including such revisions/amendments as may be issued by the relevant Authority during the currency of the contract and the corresponding clause(s) therein shall hold valid in place of those referred to.
- Performance Tests- The contractor shall guarantee the satisfactory functioning of the system to maintain the specified design conditions. The contractor shall also give summer, monsoon and winter performance tests of the system after the same is completed and commissioned. These tests shall be carried out during the first summer, monsoon and winter following the completion and commissioning. Before taking over the installation, the system will be run by the contractor continuously for 72 hours to demonstrate the satisfactory functioning and performance of the system installed.
- Samples - Before undertaking fabrication and/or installation, the contractor shall manufacture, at his own cost, a sample of every type of item. The Authority/ DTA will approve these samples. The contractor shall proceed further only after the above referred approval.
- Noise and Vibration Levels-Noise level in conditioned spaces due to all refrigeration and air conditioning equipment (without operation of any other equipment) shall not exceed 45 dBA (unless specifically mentioned elsewhere) when measured at any point in occupied spaces at 1.5 meter above floor level and at 1.5 meter from any supply air register or 0.6 m from any return air grills. Necessary provisions of duct Sound Attenuators and/or acoustic insulation are to be included by the HVAC contractor whether forming part of the specifications and/or BOQ. The HVAC equipment shall be provided with proper vibration isolators to ensure vibration free operation of the plant.
- The tender drawings attached are preliminary. However, the Contractor will be required to submit the detailed shop drawings indicating P & I drawings, Ducting layouts, foundation details, Dimensional drawings of all AHU, Chillers, cooling towers, pumps, vessels and equipment, Chiller plant layout, piping and valves, electrical control panel with cable routing, level sensors and all other accessories as required. These detailed shop drawings shall be submitted to DTA / Authority for their comments & approval.

5. SCOPE OF WORKS PUMP HOUSE (PH) EQUIPMENT WORKS

5.1. Scope of work- General

- The scope shall cover the collection of data, evaluate them, design, manufacture, erection, operation, maintenance and adopting safety measures, repairs, replacement etc.
- The CMA shall refer to the latest norms, codes, manuals, Indian and Internationals for adopting parameters for design and O & M procedures. The system as suggested in tender is only indicative and CMA shall be responsible to review afresh design, specification, drawings, selection of materials,
- execution and testing strategy, O & M strategy etc. The items in the BOQ are suggestive and tentative and shall be reviewed holistically as per the building planning, routing, circulation etc. The necessary documents on review shall be generated for the study to be reviewed by the owner in regard through various inputs, modification, correction suggested by the CMA which shall be reviewed for final approval.
- The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the DTA prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- Contractor shall make his own arrangements for drawing and distribution of water and electricity.
- Contractor shall also make his own arrangements for other facilities like compressors, DG sets etc. for unhindered progress of work.
- List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor’s guidance only. The Authority shall not entertain any claim for compensation for the reasons that the details as shown on “Good for Construction” drawings are different from those shown on tender drawings.
- One permanent benchmark shall be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after
- completion of his work.
- “Good for Construction” drawings shall be furnished to the Contractor progressively during the execution of the work and as further data becomes available, to supplement the tender drawings. These drawings shall show all dimensions and clearances of the structures, loadings where necessary, material to be furnished and size of each member, definite location of openings, reinforcing steel details, embedded parts and piping. “Good for Construction” drawings shall be revised, and fresh revised copies
- issued to the Contractor from time to time by the DTA to adopt them in work to the final designs and to suit the physical conditions encountered during the progress of the works.
- “Good for Construction" drawings issued by the DTA shall form part of these specifications. Unless otherwise specified, the plans and specifications are

intended to include everything obviously requisite and necessary for proper and entire completion of the work and shall be read in conjunction with the relevant specifications and codes of practice. These specifications shall have precedence in case anything contrary to this is stated anywhere in the contract document except description of items given in the schedule of items. If there is a conflict between the specification and schedule of items, then the details provided in the schedule of items shall govern. The decision of DTA/Authority shall be final, on any issue arising out of such discrepancies.

- Authority has carried out Soil investigations and the extract from the report is attached as part of the Schedule 3A Contract document as reference. However, the Contractor shall note that there is neither express nor implied guarantee, as to either the accuracy of the records or any interpretation of them. The information about the site of work and site conditions in the Tender Documents is given in good faith for guidance only but the Contractor shall satisfy himself regarding all aspects of site conditions. The Contractor must satisfy himself regarding the character and volume of all work under this tender and expected surface, sub-surface and/or sub-soil water to be encountered. The location of the works and the general site particulars are as generally shown on the Site plans shown in Schedule 3.
- The scope shall cover the collection of data, evaluate them, design, manufacture, erection, operation, maintenance and adopting safety measures, repairs, replacement etc.
- The CMA shall refer to the latest norms, codes, manuals, Indian and Internationals for adopting parameters for design and O & M procedures. The system as suggested in tender is only indicative and CMA shall be responsible to review afresh design, specification, drawings, selection of materials,
- execution and testing strategy, O & M strategy etc. The items in the BOQ are suggestive and tentative and shall be reviewed holistically as per the building planning, routing, circulation etc. The necessary documents on review shall be generated for the study to be reviewed by the owner in regard through various inputs, modification, correction suggested by the CMA which shall be reviewed for final approval.
- The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the DTA prior to purchase of the same. The work shall be executed in accordance with best modern practices,
- latest I.S. codes and other relevant codes.
- Contractor shall make his own arrangements for drawing and distribution of water and electricity. Contractor shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.
- List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor's guidance only. The Authority shall not entertain any claim for compensation because the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.
- One permanent benchmark shall be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect

and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.

- The main source of water is the Municipal Main Line of the Narmada system. The quality of supply is potable and must be obtained from existing sump as directed by DTA/Authority. A tapping shall be taken with a control system from the existing line. A supplementary source informing of existing tube wells is a part of the system. As can be seen from the water analysis result (attached), water is non-potable therefore R.O. is proposed, which shall be housed in the existing pump house. Bore well treatment plant is in the scope of CMA. Tube well water shall be pumped using existing machinery to RO and from RO water shall be transferred to existing sump. Using existing machinery water shall be pumped to the utility block fire tank.
- The scope of the Contractor shall comprise design, engineering, manufacturing, inspection & testing at works, packing, forwarding, supply to site, unloading at site, storage at site, construction, installation, erection, testing, commissioning, performance testing at site, and other related items of work for the
- complete water treatment plant comprises of Pumps, RO, with electrical, mechanical, piping and controls along with operation and maintenance period as mentioned elsewhere in the tender. The treated water should be fit for domestic water supply.
- Treated Water Quality - The treated water output should be under acceptable limits as per IS : 10500.

Design Criteria

- The equipment is designed on the basis of total water requirement per day and quality parameters. These values shall form the design criteria for designs. The "Manual on water supply and treatment" and other relevant BIS / PCB / Ministry of environment publications shall be followed.
- The tender drawings attached are preliminary. However, the Contractor shall be required to submit the detailed shop drawings indicating P & I drawings, foundation details, Dimensional drawings of all pumps, vessels and equipment, pump room layout, piping and valves, electrical control panel with cable routing, level sensors and all other accessories as required. These detailed shop drawings shall be submitted to DTA / Authority for their comments & approval.
- Contractor has to submit all the technical details for equipment along with sizing calculations and equipment selection to the DTA for approval. All the works shall be carried out as per final "good for construction drawings" only.

5.2. Scope of works – PH equipment

The scope of the Contractor shall comprise design, engineering, manufacturing, inspection & testing at works, packing, forwarding, supply to site, unloading at site, storage at site, construction, installation, erection, testing, commissioning, performance testing at site, and other related items of work for connection in the existing Pump House, pumping machinery and related Equipments. Along with operation and maintenance period as mentioned elsewhere in the tender.
Following items are within the scope of contract –

- Various types of pumps such as transfer pump, Hydro-pneumatic pump,

submersible pump, Dewatering Pumps.
- Related piping and manifold system
- Control systems such as different types of valves, their accessories, manholes etc.
- Power and control cables with terminations and cable trays
- Control Panel with all protection and accessories

Related instrumentations.

- Complete interconnecting piping between various units including supply of all materials like pipes, fittings, all valves, gaskets, flanges, nuts and bolts including all materials required for necessary pipe supports and associated civil works, etc., complete.
- Supply, erection and commissioning of all the equipment required for the Pump House Equipments specification and details given.
- All electrical works including all electrical motors for the various equipment, cabling, LT panel, starters, etc., shall be provided by the contractor. The scope of work includes coordinating all other related civil works. Commissioning of all the equipment after the electricity is supplied shall be within the scope of contract.
- All temporary sheds, office, godowns, etc. required for storage of materials and for contractor's supervisory personnel at site.
- Make of all items including but not limited to piping, Equipment, Motors, Cables and Pumps shall be as stated in the RFP and shall be approved by the Authority / DTA before Supply & Installation. The decision of DTA/Authority in this regard shall be final and binding on the Contractor.
- All equipment GA drawings shall be submitted to DTA for approval prior to fabrication/ ordering. The fabricated and brought-out equipment shall be inspected at Contractor / Manufacturers workplace by the Authority / DTA at the cost of contractor and shall be dispatched to site only after obtaining clear dispatch instructions in writing from Authority / DTA.
- It is obligatory on the part of the intending Contractor to visit the site of work prior to submitting the RFP and familiarize himself with local / site / soil conditions, availability of men, Materials and Machinery for successful and timely execution of the works. No extra shall be paid in case the Contractor fails to ascertain correct site conditions before submitting the RFP.
- Any other item not specifically / mentioned in this tender but is essential for proper and successful completion, commissioning and running of the Plant for its commercial utilization shall also to be included in the scope of contract.
- Test / Commissioning and Trial Running of Individual Component- the Contractor shall have to test each equipment used for the plant with designed load and to the full satisfaction of the Authority / DTA. Any defects found, has to be rectified by the contractor at his own cost immediately and within reasonable time to be decided by the Authority. Necessary Instruments, Gauges, Labor/Supervisory Staff, Laboratory analysis etc., are to be provided by the Contractor free of cost to Authority. Vendor has to specify the value-added services in his RFP.
- Commissioning And Trial Run of Plant area connections And Handing Over- After successful commissioning of the plant, the contractor shall trial run it for a period of one month. During trial runs as described above, the Contractor shall

satisfy the Authority / DTA in all respects regarding the satisfactory quality of effluent, quality of materials, equipment and workmanship used in the plant. Only after satisfying itself/ himself regarding the above points, Authority shall take over the plant and such date of taking over shall be deemed as date of completion for all purposes, like guarantees, and payment terms mentioned elsewhere in this tender. The guarantee period described elsewhere in the tender shall start from the date of commencement of operations.

- Operation and Maintenance–Operation and comprehensive Maintenance including all consumables is included in the scope of work after handing over for a period mentioned elsewhere in the contract document.
- Equipment shall be suggested for the final treatment.

6. SCOPE OF WORKS - PLUMBING WORKS

6.1. Scope of work – General

- The scope shall cover the collection of data, evaluate them, design, manufacture, erection, operation, maintenance and adopting safety measures, repairs, replacement etc.
- The CMA shall refer to the latest norms, codes, manuals, Indian and Internationals for adopting parameters for design and O & M procedures. The system as suggested in tender is only indicative and CMA shall be responsible to review afresh design, specification, drawings, selection of materials, execution and testing strategy, O & M strategy etc. The items in the BOQ are suggestive and tentative and shall be reviewed holistically as per the building planning, routing, circulation etc. The necessary documents on review shall be generated for the study to be reviewed by the owner in regard through
- various inputs, modification, correction suggested by the CMA which shall be reviewed for final approval. All these activities shall be done at tender stage.
- The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the DTA prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- Contractor shall make his own arrangements for drawing and distribution of water and electricity. Contractor shall also make his own arrangements for other facilities like compressors, DG sets etc. for unhindered progress of work.
- List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor's guidance only. The Authority shall not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.
- One permanent benchmark shall be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.
- "Good for Construction" drawings shall be furnished to the Contractor progressively during the execution of the work and as further data becomes available, to supplement the tender drawings. These drawings shall show all dimensions and clearances of the structures, loadings where necessary, material to be furnished and size of each member, definite location of openings, reinforcing steel details, embedded parts and piping. "Good for Construction" drawings shall be revised and fresh revised copies issued to the Contractor from time to time by the DTA to adopt them in work to the final designs and to suit the physical conditions encountered during the progress of the works.
- "Good for Construction" drawings issued by the DTA shall form part of these specifications. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for proper and entire completion of the work and shall be read in conjunction with the relevant specifications and codes of practice. These specifications shall have precedence in

case anything contrary to this is stated anywhere in the contract document except description of items given

- in the schedule of items. If there is a conflict between the specification and schedule of items, then the details provided in the schedule of items shall govern. The decision of DTA/Authority shall be final, on any issue arising out of such discrepancies.
- Authority has carried out Soil investigations and the extract from the report is attached as part of the Contract document as reference. However, the Contractor shall note that there is neither express nor implied guarantee, as to either the accuracy of the records or any interpretation of them. The information about the site of work and site conditions in the Tender Documents is given in good faith for guidance only but the Contractor shall satisfy himself regarding all aspects of site conditions. The Contractor must satisfy himself regarding the character and volume of all work under this tender and expected surface, sub- surface and/or sub-soil water to be encountered. The location of the works and the general site particulars are as generally shown on the Site plans part of the Tender Drawings.

6.2. Scope of Works- Plumbing

All the work shall be carried out in a workmanship like manner and as per the best practices of the trade.

The scope of work shall include supply of all material, labor and T&P, installation, testing in position and commissioning of followings –

- Sanitary fixtures and accessories.
- C.P. bathroom fittings and accessories
- Soil, waste and vent pipes with fittings
- Rainwater disposal pipes with fittings
- Water supply pipes with fittings
- Water misting system at terrace
- External sewerage system
- External Drainage system
- External water supply system
- All kinds of water supply and waste disposal pumps.
- Connection to and from municipal mains in case of water, sewer and drain connection including coordination with all other agencies.
- Storm water system with recharging well.
  Flushing Out And Sterilization Of Pipe Work And Tanks –
- It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into services and that drinking and domestic water services mains and tanks are sterilized in accordance with IS : 2065 :1965 – code of practice for water supply in buildings. The contractor shall be responsible for making any temporary pipework connection required.
  Testing And Commissioning –
- The Contractor shall be responsible for testing and commissioning the entire services installation described in the technical specifications and shall demonstrate the operation of the systems to the entire satisfaction of the DTA and to the

Authority approval.

- All water supply, sewerage and storm water drainage works comprising of internal and external installations, water lines, sanitary fixtures, bathroom fittings, soil/waste/vent/rainwater pipes, excavation, laying and jointing of pipes, refilling of trenches, construction of appurtenances like manholes, road gully chambers etc. shall be carried out in a workmanship like manner and as per the specifications mentioned in Schedule-3. The quality and makes of the materials shall be as specified in each specification, bill of quantities, approved list of makes and drawings. In case specifications of a material or work is not
- mentioned or not clear in the enclosed specifications, then the reference shall be made to the latest CPWD specifications and the relevant IS Codes amended up to date.

Structural Alterations To Buildings:-

- No structural member in the building shall be damaged/altered, without prior approval from the competent Authority through the DTA.
- Structural provisions like openings, cutouts if any, provided by the Authority for the work, shall be used. Where these require modifications, or where fresh provisions are required to be made, such contingent works shall be carried out by the contractor at his cost.
- All such openings in floors provided by the Authority shall be closed by the contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the DTA without any extra payment.
- All chase required in connection with the plumbing works shall be provided and filled by the contractor at his own cost to the original architectural finish of the buildings.
- Operation and comprehensive maintenance is included in the scope of work after handing over for a period mentioned elsewhere in the Contract Document.

7. SCOPE OF WORKS - FIRE FIGHTING WORKS

7.1. Scope of work – General

- The scope shall cover the collection of data, evaluate them, design, manufacture, erection, operation, maintenance and adopt safety measures, repairs, replacement etc.
- The CMA shall refer to the latest norms, codes, manuals, Indian and Internationals for adopting parameters for design and O & M procedures. The system as suggested in tender is only indicative and CMA shall be responsible to review afresh design, specification, drawings, selection of materials, execution and testing strategy, O & M strategy etc. The items in the BOQ are suggestive and tentative and shall be reviewed holistically as per the building planning, routing, circulation etc. The necessary documents on review shall be generated for the study to be reviewed by the owner in regard through various inputs, modification, correction suggested by the CMA which shall be reviewed for final approval. All these activities shall be done at tender stage.
- The materials shall strictly conform to relevant standards mentioned in detailed specifications. The testing and inspection plan for the materials shall be prepared by the Contractor and approved by the DAT prior to purchase of the same. The work shall be executed in accordance with best modern practices, latest I.S. codes and other relevant codes.
- Contractor shall make his own arrangements for drawing and distribution of water and electricity. Contractor shall also make his own arrangements for other facilities like compressors; DG sets etc. for unhindered progress of work.
- List of tender drawings issued at the time of calling of tenders for this work is given elsewhere in this Contract document. These drawings are meant for Contractor's guidance only. The Authority shall not entertain any claim for compensation for the reasons that the details as shown on "Good for Construction" drawings are different from those shown on tender drawings.
- One permanent benchmark shall be furnished and all other layout, fixing levels etc. shall be done by the Contractor at his own cost. The Contractor shall protect and maintain, during the course of execution of the work, the main center lines and benchmarks, so that they are left undisturbed even after completion of his work.
- "Good for Construction" drawings shall be furnished to the Contractor progressively during the execution of the work and as further data becomes available, to supplement the tender drawings. These drawings shall show all dimensions and clearances of the structures, loadings where necessary, material to be furnished and size of each member, definite location of openings, reinforcing steel details, embedded parts and piping. "Good for Construction" drawings shall be revised and fresh revised copies issued to the Contractor from time to time by the DTA to adopt them in work to the final designs and to suit the physical conditions encountered during the progress of the works.
- "Good for Construction" drawings issued by the DTA shall form part of these specifications. Unless otherwise specified, the plans and specifications are intended to include everything obviously requisite and necessary for proper and entire completion of the work and shall be read in conjunction with the relevant specifications and codes of practice. These specifications shall have precedence in

case anything contrary to this is stated anywhere in the contract document except description of items given in the schedule of items. If there is a conflict between the specification and schedule of items, then the details provided in the schedule of items shall govern. The decision of DTA/Authority shall be final, on any issue arising out of such discrepancies.

- Authority has carried out Soil investigations and the extract from the report is attached as part of the Schedule 3 Contract document as reference. However, the Contractor shall note that there is neither express nor implied guarantee, as to either the accuracy of the records or any interpretation of them. The information about the site of work and site conditions in the Tender Documents is given in good faith for guidance only but the Contractor shall satisfy himself regarding all aspects of site conditions. The Contractor must satisfy himself regarding the character and volume of all work under this tender and expected surface, sub-surface and/or sub-soil water to be encountered. The location of the works and the general site particulars are as generally shown on the Site plans shown in Schedule 3.
- The tender drawings attached are preliminary. However, the Contractor shall be required to submit the detailed shop drawings indicating P & I drawings, foundation details, Dimensional drawings of all pumps, vessels and equipment, pump room layout, piping and valves, electrical control panel with cable routing, level sensors and all other accessories as required. These detailed shop drawings shall be submitted to DTAs / Authority for their comments & approval.
- Contractor has to submit all the technical details for all equipment along with sizing calculations and equipment selection to the DTA and should get approval. All the works shall be carried out as per final "Good for construction drawings" only.
- Any other item not specifically / mentioned in this tender but is essential for proper and successful completion, commissioning and running of the Plant for its commercial utilization is also to be included in the scope of contract.

7.2. Scope of Work – Fire Fighting

The scope of the Contractor shall comprise design, engineering, manufacturing, inspection & testing at works, packing, forwarding, supply to site, unloading at site, storage at site, construction, installation, erection, testing, commissioning, performance testing at site, and other related items of work for the complete firefighting works comprising of the following major items:

- Internal hydrant system.
- External hydrant system.
- Related piping with all accessories.
- All types of valves, connections, headers.
- Hydrant valves, hose reel, hose pipes, Fire hose cabinets etc.
- Electrical and diesel operated Fire Fighting pumps with all accessories.
- Electrical works, Panels, cables and earthing.
- Automatic sprinkler system with accessories.
- Gas based suppression system for commend & server rooms.
  Fire extinguishers.

- All other allied and necessary equipment and accessories to complete the system up to the satisfaction of Authority and for proper functioning of the entire system.
- The complete installation of Fire Fighting System shall strictly confirm to the minimum specifications and guidelines given in NBC – 2016 (Part IV), IS : 15105 for sprinkler system, IS : 13030 for external hydrant system, other relevant IS code of practice and CPWD specifications (Part V) amended up to date.
- Unless otherwise mentioned in the tender documents, the following works shall be done by the contractor and therefore, their cost shall be deemed to be included in their tendered cost- whether specifically indicated in the schedule of work or not: -
- Foundations for equipments including foundation bolts and vibration isolation spring/pads,
- Suspenders, brackets and floor/ wall supports for suspending/supporting pipes.
- Suspenders and/or cable trays for laying the cables.
- Excavation and refilling of trenches in soil wherever the pipes are to be laid directly in ground, including necessary base treatment and supports.
- Sealing of all floor slab/wall openings for pipes and cables, from a fire safety point of view, after laying of the same.
- Painting of all exposed metal surfaces of equipment and components with appropriate colour.
- Making openings in the walls/ floors/ slabs or modification in the existing openings wherever provided for carrying pipeline, cables etc.
- All electrical works including cable/wires, earthing etc. beyond power supply made available by the contractor.
- Making good all damages caused to the structure during installation and restoring the same to their original finish.
- Approval from local fire authorities as may be required as per local byelaws. (The contractor's responsibility shall be limited to the work executed by him.)
- Preparation of Pressure Flow analysis for hydrant and sprinkler systems.
- Operation and comprehensive maintenance including all consumables is included in the scope of work after handing over for a period mentioned elsewhere in the Contract Document.

8. SCOPE OF WORKS - ELECTRICAL WORKS

8.1. Scope of works – Electrical

The scope of the Contractor shall comprise design, engineering, procurement, manufacture, installation, testing at manufacturer's works, packing, transportation, shipping, unloading at site, transportation to site, storage, insurance, transportation from stores to erection site, erection, site DRY testing, commissioning, demonstration of performance guarantee test of the Internal & External electrification power distribution system and handing over to Authority including submission of hard copy and soft copy of GFC cum Shop drawings based upon available data in tender drawing, and after successful installation contractor should submit all as-built drawings, O&M manuals etc. required for successful operation of entire project. Scope also include all works related to HT cable from HT panel, HT cable's termination, transformer, LT cable & cable tray from Utility room (which is away from building) to this building, LT cable's terminations, All electrical works for plumbing, fire and HVAC for utility room as per requirement, etc. (all require to complete the job).

Liaising with Distribution company/approval authority for 11 KV Power Distribution set up in project premises, starting from necessary documents and drawings required for necessary arrangement of power supply arrangement up to installation, testing and its support for charging of energy in project premise. Approval from the Chief electrical inspector before energizing the Transformer shall also be part of the contractor's scope of work, if required.

Installation, Testing and commissioning of outdoor type DP structure, Transformer, DG set with DG exhaust stake and main S/S with approval from chief electrical inspector and any other govt body for approval of the project set up. DG set is considered based on the emergency load of the building. At later stage due to the existing utility infrastructure or any other reason if the DG set or its synchronization panel (or both with necessary items) is not required, price of DG set and its panels – as mentioned in schedule III, should be deducted from total cost of the project and from the contractor's scope and passed back to the client.

415V Main LT panels, Sub LT panels, HVAC Panels/DBs, Lighting and Power DB, APFCR panels complete with ACBs, MCCBs, cable, relays, instruments, meters, indication lamps, etc.

Complete Distribution boards with MCCB & MCB
UPS, UPS input and output panel with battery backup arrangement, connection etc.

LT power, control cables and Pair cables with required numbers of glands, lugs, termination kits, jointing kits, etc as required for interconnection between various electrical equipment along with cable markers.

Complete cable carrier system –cable trays, supports, brackets, clamps etc as well as

GI/PVC conduits, Hume pipes and all other installation materials as required for laying of above power and control cables. HDPE/Hume pipes encased in concrete to be provided for crossing of cables below roads (wherever applicable).

Power to all equipment which require power including Lifts, Escalators, etc. The Control Panel of Lift and Escalators will be in part of the respective vendor.

Indoor & outdoor Lighting system for complete buildings, approach road and any other areas covered in this Contract. LDBs, lighting transformers (if any), Junction Boxes for raceways and for Outdoor lighting, Lighting Panels, light fixtures of various types, isolating and change over switches, switch boxes, switch socket outlets, cables, wires, GI/PVC conduits with all accessories, civil works required for installation of lighting poles, High mast, lightning, earthing, etc. It is the responsibility of the Contractor to submit the control layout along with circuit schedule, conduit layouts etc. for the approval of DTA/Authority, including details of wiring for lighting, sockets etc. as per Standard.

Lighting and power points for all Exhibits, Panels, Gallery, AV, IT, etc. all equipment. Necessary wiring or plugs to be provided as per requirement.

Point wiring with Conduits for all types of wiring including circuits, sub mains, light, fans, power and AC etc.

Switches and socket outlets for light, fans, plug, power, Tel, TV, computer network etc with suitable MS/GI boxes with all required accessories.

This scope shall also include conduits and wiring for Network Data and voice, network EPABX, TV system (if any), Public Address system for fire evacuation, CCTV and Computer networking, fire alarm, broad band etc. Contractor should ensure that all ELV systems shall be design built as per manufacturer’s recommendation and ensure that it shall be capable to cater all design requirements and scalability of future requirements.

Lighting Fixtures, fans and exhaust fans for building and external areas. The scope also includes Design, supply, installation, testing and commissioning of necessary accessories to install the Lighting fixture such as connectors supporting rods / frames, anchor fasteners, necessary hardware
etc. complete with all accessories required for installation.

System earthing as well as earthing fall non-current carrying metallic parts as per IS 3043 and lightning protection system as per codes and standards complete with deep bore earth pits, treated earth pits, earthing conductor, earth leads/strips etc. as required for Power Distribution System.

Electrical system related miscellaneous items like three phase welding receptacles, rubber mats, danger boards, first aid charts, first-aid boxes, insulated hand gloves, shock treatment chart, etc.

Fireproof sealing system comprising fire stops and fire breaks for the cable and cable trays, any wall/floor openings.

Underground and above ground LT cables and other allied works Feeder pillars with circuit breakers

Automatic protection of all electrical equipment through selective relaying systems. Electrical supply to equipment and machinery

Adequate provision for future expansion and modification. Maximum interchangeability of equipment.

Fail safe feature. Suitability for applicable environmental factors.

Civil work for earth pits, wall opening, minor core cutting in floors, minor chipping works for lighting inside building, cable burial including excavation, back filling and compression etc as detailed in technical specification. Foundation frames, bolts, bolts of special design, embedment, anchor fasteners and inserts.

Complete relay setting and coordination documentation with calculation for the Power Distribution System shall be submitted by the successful Contractor.

All safety equipment required in the electrical substation and other installations shall be as per the statutory requirement shall be provided by the contractor. Safety to personnel and equipment during operation and maintenance.

All the required approvals shall be in the scope of the contractor and all the required coordination charges, professional charges, etc. shall be in the scope of the contractor. However, statutory application fees shall be borne by the Authority. Contractor to coordinate with all agencies (AV, IT, PHE/FFTG, HVAC, Exhibit gallery, etc.) for power requirement and complete functioning.

All equipment supplied and all works executed under this contract including system design and
detailed engineering, shall comply with the statutory requirements and local regulations. The scope of work includes obtaining necessary statutory approvals/clearances from all the concerned authorities for various systems covered in this specification including preparation of Drawings & attending necessary meetings with statutory authorities.

It is not the intent to completely specify herein all details of design and construction of the equipment/systems. However, all equipment/systems shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing continuous operation up to the successful Contractor's guarantees in a manner acceptable to the Authority who will interpret the meaning of drawings and specifications and shall have the power to reject any work or material which in his

judgment are not in full accordance with the requirements. All the major equipment shall be installed, tested and commissioned under supervision of the representative of the original manufacturer of respective equipment.

All components included in Schedule 3 are not explicitly identified and/or listed herein, these shall be supplied under this contract to ensure completeness of the system and facilitate proper operation and easy maintenance of the electrical equipment.

All services necessary for the erection, testing and commissioning and all instruments/services required for carrying out performance testing of all items of the plant electrics covered under this specification shall be arranged by the Contractor.

Contractor to submit filled up data sheets to the Authority/ Authority's representative before procuring any material at site.

All quantities, rating indicated in the datasheet, SLD is indicative only. The responsibility lies with the Contractor to arrive at the exact requirement, quantity and ratings of the entire equipment. Items which are not indicated in specification or datasheet, but however required for completeness of the system are deemed necessary to be considered by the contractor.

Contractor has to prepare and submit all detailed design drawings/detailed calculations and vendor drawings for approval to the Authority/DTA. In case of any contradiction between various referred standards specification/datasheets statutory regulations more stringent shall govern.

The contractor has to submit the detailed design calculations, GFC cum shop drawings and all required documents for construction to Authority/DTA for approval before proceeding with the construction.

Preparation of as-built drawings for all electrical systems is in the scope of contractor In case of any deviation in the ratings indicated (in layouts, drawings, specification, datasheet) and sizing arrived by the Contractor at the time of detailed Engineering, it remains the responsibility of the Contractor to proceed as per actual sizing arrived and approved by the Authority without any time & cost implication.

Type test certificates for electrical equipment not less than 5 years shall be submitted for Authority's approval.

8.2. System description

- All equipment shall be suitable for smooth, efficient and trouble-free operation for power supply variations as mentioned herein below. The equipment shall be designed to give efficient and reliable performance even during various extreme atmospheres.
- Ambient air temperature shall be taken as 50 deg. C for the purpose of designing of electrical equipment.

- This specification shall be read and constructed in conjunction with the drawings and annexure to determine the scope of work.
- All equipment shall be capable of continuous operation satisfactorily under the following conditions:
  i. voltage variation: ± 10%
  ii. Frequency variation: ± 5%
  iii. combined voltage & frequency variation: ± 10%

- Nominal system supply available shall be as follows:
  i. Incoming: 11 kV, 3 Ph., 50 Hz, with fault level of 350 MVA.
  ii. Distribution: 415V, 3 Ph., 4 wire, 50 Hz with fault level of 20 kA.

8.3. Power distribution

- The Design Basis criteria for the Electrical equipment are elaborated in the following section. The below defined aspects form the basis of this design concept. For better understanding of power distribution refer to the Single line diagram provided in Schedule-3.
  Distribution
- Outdoor DP structure shall receive power from Distribution company's DP yard which shall further feed to Distribution Transformer and Main Electrical S/S. Client's DP structure, HT cable, Transformer, 415 Volt Main LT panel and DG set shall be provided by contractor which shall further feed power to various LT feeders as per enclosed single line diagram. Further routing of cables and
- Power Distribution shall be as per Single Line Diagram and drawings.

8.4. Operation and control philosophy

- All the breakers (ACB/MCCB/MCB) status, alarms and metering signals shall be monitored from BMS though the add-on Metering module or from the breaker itself. All the breakers/Meters shall be connected to the Ethernet switch via smart link/MIC (Modbus to Ethernet Converter). Smart link shall be with either Modbus or Profibus. All required interface modules/components to interface the electrical system including cables (Power cable, Control cable, Paired cable, Data cable and Fiber Optic cable) and terminal connectors with BMS system are in the scope of contractor. Contractor shall also be present for the testing & commissioning of the BMS System. Communication from smart link mod bus to Ethernet switch shall be with TCP/IP.
- Ethernet switches shall be provided with contact to alarm the failure and shall have dual power supply inputs, three spare ports. All components, communication links shall have diagnostic facility and any failure shall be enunciated in OWS.

8.5. Tests

- Charging (Pre-commissioning tests) - On completion of erection of the equipment and before charging, each item of the equipment shall be thoroughly cleaned and

then inspected jointly by the Authority/DTA and the Contractor for correctness and completeness of installation and acceptability for charging, leading to initial pre-commissioning tests at Site. The pre-commissioning tests to be performed as per relevant I.S. /vendor Contractor submitted and as shall be included in the Contractor's quality assurance plan.

- Commissioning Tests - The available instrumentation and control equipment will be used during such tests and the Contractor will calibrate all such measuring equipment and devices as far as practicable. However, unmeasurable parameters shall be taken into account in a reasonable manner by the Contractor for the requirement of these tests. The tests will be conducted at the specified load points and as near the specified cycle condition as practicable. The Contractor will apply proper corrections in calculation, to take into account conditions which do not correspond to the specified conditions. All instruments, tools and tackles required for the successful completion of the Commissioning Tests shall be provided by the Contractor, free of cost. Pre-commissioning test shall be carried out as per relevant I.E.C. and/or as specified in the relevant clause. The Contractor shall be responsible for obtaining statutory clearances from the concerned authorities for commissioning of the equipment.

9. SCOPE OF WORKS - INSTRUMENTATION WORKS (ELV WORKS)

9.1. Scope of Works – Instrumentation

The scope covers the design, engineering, documentation, inspection and testing at Contractor's / his SUB-Contractor's works, packing, supply, transportation from place of manufacture to site, unloading, storage and handling at site, site fabrication & erection, testing, pre-commissioning checks & commissioning, field performance testing and performance guarantee of LV System.

The scope of work shall include Design, supply, installation, testing and commissioning of following systems in the building.

- IP CCTV System
- Addressable Fire Detection & Alarm with evacuation PA system
- IT/LAN System with Audio Visual system
- Access Control System
- IP DATA and voice Network system
- Vesda system for fire detection
- Novec based gas detection system for all server room for fire suppression

The scope shall also cover incoming lease lines from the CMA starting from necessary documents and drawings required for necessary arrangement up to installation, testing and its support.

All cabling required for interconnecting the various components of the System shall be in the scope of Contractor.

The LV System shall be designed as per description given in this specification subject to satisfying the system needs after commissioning of the system.

It is not the intent to specify completely herein all the details of design and manufacture of the system/components. However, the system/ component shall conform in all respects to high standards of engineering, design and workmanship and be capable of performing in a manner acceptable to the Authority, who will interpret the meaning of drawings and specifications and shall be entitled to reject any material or work, which in his judgment is not in full accordance with the requirements. Whether called for specifically or not, all accessories required for operation of the system are deemed to be considered as part of the Contractor's scope of supply.

Supply and services shall be rendered in conformity with proven design principles, taking into account the current technology. The requirements of the contract must be fulfilled in totality.

The supply & services shall be rendered inclusive of all components, software and interconnecting arrangements with other supplies needed for proper and reliable continuous operation and for satisfactory maintenance and repair. In addition to

components described, any other component including any system and software required to make the system complete shall form part of this contract and shall be deemed to be included in the Contractor's scope.

If data on the execution of supplies and services are contained in drawings, but none in specification and vice versa, such data shall be deemed to be contained in both. Contradictions in the specification, if any, shall be brought to the attention of the Authority and DTA by the Contractor and the correct requirement shall be obtained.

Contractor shall undertake repair/replace any defective or inappropriate component/ system supplied within the warranty period and shall make good such deficiency within one day from the date the same is brought to his notice by the Authority.

Apart from the above visit during the warranty period, trouble-call visits shall be made as & when required by the Authority.

The various items of work shall be as per the schedule of items given in the Schedule of quantities of the specification.

It is not the intent to specify completely herein all details of design and Construction of the works covered under this enquiry. Scope of work may also include such other related works as indicated in the approved drawings and / or schedule of quantities/rates although they may not be specifically mentioned in the above paragraphs and all such incidental items of works not specified but reasonably implied and necessary for completion of the job as a whole, all as directed by Authority. All works shall conform in all respects to high standards of engineering, design and workmanship and shall fulfill the anticipated performance during the Contractor's guarantee period in a manner acceptable to the Authority who shall have the power to reject any works or materials which in his judgment are not in full accordance with the specification requirements.

Testing And Commissioning: The Contractor, at no extra cost, shall provide all instruments and accessories required for testing and commissioning of the items specified for the required duration of test.

Any modification/revisions in the equipment, installation of equipment as required by the statutory Authority shall be carried out by the Contractor. All tools and tackles along with necessary measuring and testing equipment required right from supply to final commissioning shall be in the scope of the Contractor. Contractor shall submit a commissioning Checklist along with commissioning tests for Authority / DTA approval. It is the responsibility of the Contractor to arrange for required test equipment for carrying out these tests. All pre-commissioning and commissioning tests shall be carried out in the presence of Authority's representative and approval for it shall be obtained before commissioning the installations.

9.2. Code of Standards

All equipment, system and services covered under this specification shall comply with all currently applicable statutes, regulations and safety codes. Nothing in this specification shall be construed to relieve the Contractor of this responsibility.

The standards not indicated in the specification are also acceptable, if they are established to be equal or superior to the standards indicated in the specification which shall be pre-approved by the Authority.

The metric units/SI units shall be used in all data/drawings submitted against this package.

The Contractor shall furnish the English translations of all standards to which the equipment and systems offered are conforming to, as and when required by the Authority.

The work shall be performed in conformity with these specifications standards and Codes of Practice specified or referred in the tender. In case of any conflict the stipulations under these specifications shall govern.
In addition, work shall also confirm to the requirements of latest editions/ amendments of the following:

- CEA Rules framed there under
- Fire Insurance Regulations
- Regulations laid down by the Factory Inspectorate
- Regulations laid down by the Chief Electrical Inspectorate of Government, PCB
- Applicable Codes of Practice of the Bureau of Indian Standards
- Any other regulations laid down by the Central, State or Local Authorities from time to time and during the execution of this contract and during the execution of this contract.

9.3. Scope of works – General

Unless otherwise mentioned in the tender documents, the following works shall be done by the contractor and therefore, whether specifically indicated in the schedule of work or not:-

Suspenders and/or cable trays for laying the cables,

Sealing of all floor slab/wall openings made by the contractor for cables, from fire safety point of view, after laying of the same.

Painting of all exposed metal surfaces of equipment and components with appropriate colour.

Making openings in the walls / floors / slabs or modification in the existing openings wherever provided for carrying conduits, cables etc.

Making good all damages caused to the structure during installation and restoring the

same to their original finish.

Approval from local fire authorities as may be required as per local byelaws. (The contractor's responsibility shall be limited to the work executed by him.)

10. SCOPE OF WORK – ACOUSTICAL WORKS

- The scope of service for the Acoustical Contractor is to engineer and execute acoustical work for Residential and allied Facilities as per the design given in the Tender drawings, Bill of Quantities, specifications and Design brief report.
- It includes the furnishing of all materials, Labor, tools and equipment and management necessary for Construction and completion of Work.
- The CMA to check the Ducting and other services layout before leveling the false Ceiling heights.
- All Materials used to be of fire retardant and recommended STC, NRC, and Color to be followed as approved by DTA/Authority.
- The Contractor shall follow the Manufacturer installation instructions to avoid any further confusion.
- The CMA to submit the descriptive technical literature of the materials, test certificates for the recommended materials to the DTA/Authority for approval.
- The CMA to submit the samples and installation images, Mockup along with technical bids to the DTA/Authority for approval.
- CMA should verify the quantities with respect to actual site measurements before confirming order to manufacturer and no claims are entertained in the later stage.
- Manufacturer /CMA should submit all valid test certificates of the materials before starting the work.
- Any clarifications regarding installation to be clarified with DTA/Authority / Manufacturer before starting the work.
- Change of materials is not recommended without valid reason. Change is accepted only on approval of DTA/Authority.
- Color to be approved by DTA/Authority.
- All work during its progress and upon Completion shall confirm the Specifications and layout drawings. Should any detail essential for completion of work when omitted from the drawings and specifications it shall be responsible for Contractor to inform the Client or DTA so that upon completion of work will be acceptable
- If required to support and execute the Acoustics Interior systems the CMA shall have to deploy supervisors, civil masons, laborers, carpenters, Tile masons, painters, electricians, etc. on his own cost to carry out the work effectively.
- CMA thereby certifies that it is qualified in all areas pertaining to, either directly or indirectly, the Work. In the event the CMA becomes unable to complete the Work in accordance with the Contract Documents, or the satisfaction of the DTA/Authority or its representatives, due to a lack of understanding of design or services required by the Contract Documents, it shall be the responsibility of the CMA to retain the services of the applicable manufacturers' representatives to expeditiously complete the Work in accordance with the construction schedule with no additional cost to the DTA/Authority.
- The CMA shall execute the Work as per DTA/Authority Instructions and as per the Specifications and no work should be executed which is not mentioned in the contract documents.
- The CMA is responsible to submit the Shop drawings with Junction details for the proper Execution of Work. The work will be executed after the approval from DTA/Authority. Immediately after the award of Contract the contractor shall develop the detailed progress Project schedule and send it to clients or Consultants

for approval which will indicate the start and finish date of the project.

- CMA to visit the Site and make himself thoroughly understand the Site condition, nature and requirement of work, Facilities for the transportation of materials, Storage of materials and removal of rubbish and wastes. Hence the bidder to include the cost and charges for the additional difficulties. The CMA should not claim any extra compensation if they face any difficult conditions from DTA/Authority after the Commencement of the Work.
- The CMA should maintain his cost for Work tools and tackles Machines, Transportation, Scaffolding, timbering, shuttering, lighting, Storage.
- The CMA is responsible for any damages to the Property, Injury to the workers due to his / their carelessness or negligence. The CMA should rectify the damages without any claim or compensation from the DTA/Authority.
- The entire work must be completed within the stipulated time mentioned in the formal work order.
- The work will not be considered as completed unless otherwise the Authority has certified in writing.

11. SCOPE OF WORK – ICT SYSTEM

- Detailed Design Basis Report with ICT Schematics, Logical Connectivity Diagram and Single Line Diagram. The schematics should include Rack connectivity from Server room along with copper connectivity to end user from Hub Rooms should be shown as well.
- Site Plan Drawings containing fiber Layout for complete infrastructure along with the containment details
- Rack Elevation for all the Racks in the Facility along with mounting details. Sections and Elevations to show all wall mounted equipment and coordination of services demonstrating how the required ceiling heights are maintained.
- Node Matrix for all the Area fully Coordinated with all other services requirement from ICT
- Shop drawings which includes all the ICT requirements from All the services i.e., ICT, AV, Security, Fire, BMS etc. Shop drawings should have all the I/O ports marked in the drawing along with power requirements by each port on the drawings. Shop Drawings should be submitted in ISO
- A1 Size as well as soft copy is to be submitted.
- Faceplate needs to be coordinated with Floor box make so that the Passive Cabling OEM's faceplate can be mounted on Floor box.
- Methodology on ICT equipment installation, proactive measures for successful installation of ICT system
- Heat Map Survey Report for Wi-Fi Coverage and attaining the signal strength of RSSI -60dBm. Accordingly, the number of access points in the facility is to be calculated by CMA. The calculation sheet along with the Heat Map survey is to be submitted by CMA.
- Detailed BOQ with Specific make, Model & calculation sheet along with Specification sheets for all the products being deployed.
- Conduit and Raceway Details for complete Low Voltage Services. The international standards for Raceway and conduits should be followed along with fill ratio as well. Proper distance with power cables as per international standards ANSI/EIA/TIA is to be maintained. These Details are to be provided by CMA.
- Server Room, to Rack Connectivity along with Layouts & Elevation of these rooms is to be submitted by CMA.
- Proper Labeling, Ferruling and numbering details of each port, patch panel and cable (includes copper and fiber) is to be done and details are to be submitted by CMA.
- All the IT Hub Rooms Layout & Elevation is to be submitted by CMA.
- The CMA would need to define & illustrate, Rack wise, device wise, Port wise VLANs. The details are to be submitted.
- The details of all the active equipment along with numbering and port usage details are to be submitted also, all the switches should be properly marked.
- Submission of samples for cable, connectors and any Integrator custom equipment which are supplied for this package
- Testing Report for all the UTP Cables and Fibers should be submitted.
- Telephone numbering scheme is to be submitted along with details of all IP phone equipment and their locations.

- Installation report for complete active equipment is to be submitted.
- CMA to provide the server as required. The specification of the server needs to meet the requirement to run the facility and is to be discussed and finalized with DTA / Authority.

The Following are the documents required from the CMA (Some of the details asked above may overlap with below required documents) -

Structured Cabling –

- The successful Designer should provide the document with following details after successfully implementing the proposed Structured Cabling System:
- Detailed Connectivity Diagram
- Raceway/pathway Diagram
- Cable routing Diagram
- Copper and Fiber patching Details
- Naming and Labeling Details
- Cable scanning and Test results
- Documentation shall be provided in both hard copy and Compact Disk to the point of contact

Switching & Wireless –

- Detailed Connectivity Diagram
- IP addressing schema
- VLAN configuration details
- High available & QoS configuration details
- Wi-Fi Guest user access configuration
- Implementation Document (Switching and Wireless)
- System Configuration Details
- Acceptance Test Result Document
- Documentation shall be provided in both hard copy and Compact Disk to the point of contact.

Network Security (Firewall) –

- Detailed Connectivity Diagram
- System Configuration Details
- Acceptance Test Result Document
- Documentation shall be provided in both hard copy and CD to the point of contact.

Telephony

- Detailed Connectivity Diagram
- Dial Plan Schema
- Implementation Document
- System Configuration Details (Client Specific)
- Acceptance Test Result Document
  Documentation shall be provided in both hard copy and Compact Disk to the point of contact.

12. SCOPE OF WORK – LIGHTING AND LMS

12.1. Lighting:

- Brief Document of design basis report on understanding on the project and Implementation on the lighting concept to be prepared and approved.
- Design Intent / Presentation with the rendered night views and lighting element details for all critical areas to be prepared and approved.
- Shop drawings of complete area lighting drawings with legend and drawing list are to be prepared, submitted and approved and this would be done on a staggered basis.
- Shop drawings of Fixture Mounting details / Method which includes Elevation/sections drawings
- Shop drawings of complete area Lighting Controls drawings and its Load schedule
- Area Wise Dialux simulation & Lux level report for all major public areas or as directed by the client's consultant.
- Detailed Technical Specifications of each light fixture, - fixture mockup and sampling as decided in conjunction with the client's consultants.
- Factory visits shall be undertaken at the cost of the CMA for review of any specific customized fixtures as per requirement and as directed by the DTA/Authority.

12.2. LMS: (Lighting monitoring system)

- Brief Document of design basis report DB on understanding on the project and Implementation on the LMS concept.
- Lighting schematics drawing with equipment make and model information. Connectivity diagram with Cable schedule including starting and termination end point identification along with cable type information included.
- Hookup / Controls Schedule
- Detailed Technical Specifications of each light fixtures
- Detailed BOQ with Specific make and Model
- Dimming DB detail drawing and Keypad / Touch panel drawing

12.3. Server

- CMA needs to obtain approval of Authority/DTA regarding detail requirements of the Server. And incorporate functional and policy based operational requirements as directed by Authority/DTA.

13. SCOPE OF WORKS- Inspection

13.1. Quality assurance Plan

To ensure that the equipment and services under the scope of this Contract whether manufactured or performed within the Contractor's works or at his sub-contractor's premises or at the Authority's site or at any other place of work are in accordance with the specifications, the Contractor shall adopt suitable quality assurance plan to control such activities at all points necessary. Such a program shall be outlined by the Contractor and shall be finally accepted by the Authority after discussions before the award of Contract. A quality assurance plan of the contractor shall generally cover the following:

- His organization structure for the management and implementation of the proposed quality assurance plan.
- Documentation control system.
- Qualification data for Contractor's key personnel.
- The procedure for purchases of materials, parts components and selection of sub-contractor's services including vendor analysis, source inspection, incoming raw material inspection, verification of material purchases etc.
- System for shop manufacturing and site erection controls including process controls and fabrication and assembly control.
- Control of non-conforming items and system for corrective actions.
- Inspection and test procedure both for manufacture and field activities.
- Control of calibration and testing of measuring instruments and field activities.
- System for indication and appraisal of inspection status.
- System for quality audits.
- System for authorizing release of manufactured products to the Authority.
- System for maintenance of records.
- System for handling storage and delivery
- A quality plan detailing out the specific quality control measures and procedures adopted for controlling the quality characteristics relevant to each item of equipment furnished and/or services rendered.
- The Authority or his duly authorized representative reserves the right to carry out quality audit and quality surveillance of the system and procedure of the Contractor/his Vendor's quality management and control activities.

13.2. Quality assurance documents

The Contractor shall be required to submit the following Quality Assurance Documents within three weeks after dispatch of the equipment.

- All Non-Destructive Examination procedures, stress relief and weld repair procedure actually used during fabrication and reports including radiography interpretation reports.
- Welder and welding operator qualification certificates.
- Welder's identification list, listing welders and welding operator's qualification procedure and welding identification symbols.

- Raw material test reports on components as specified by the specification and/or agreed to in the quality plan.
- Stress relief time temperature charts/oil impregnation time temperature charts.
- Factory test results for testing required as per applicable codes/mutually agreed quality
- The quality plan with verification of various customer inspection points (CIP) as mutually and methods used to verify the inspection and testing points in the quality plan were performed satisfactorily.

13.3. Inspection and Testing

- The Contractor needs to submit all the relevant drawings, quality assurance plans for all the supply items under Contractor scope. Based on the approval from Authority/DTA, the Contractor needs to submit the inspection call, the same shall be inspected by Authority/DTA at vendor / sub vendor works, based on the clearance the same needs to be dispatched to site.
- Inspection of materials and equipment at manufacturer's works shall be done by the DTA. For item/ equipment requiring inspection at manufacturer's works, the contractor will intimate the date of testing of equipment at the manufacturer's works before dispatch. The contractor shall give sufficient advance notice regarding the dates proposed for such tests to the Authority's representative(s) to facilitate his presence during testing. The Authority at his discretion may witness such testing. Material / Equipment will be inspected at the manufacturer/ authorized dealer's premises, before dispatch to the site by the contractor.
- The Authority also reserves the right to inspect the fabrication job at the factory and the CMA has to make arrangements for the same.
- The materials duly inspected by DTA or his authorized representative shall be dispatched to site by the contractor.
- No additional payment shall be made to the contractor for inspection/testing at the manufacturer's works by the representative of the DTA. Also, the contractor will bear the cost of Authority’s representative deputed for carrying out inspection/testing.
- The Authority and the DTA or duly authorized representative shall have at all reasonable times free access to the Contractor’s premises or works and shall have the power at all reasonable times to inspect and examine the materials and workmanship of the works during its manufacture or
- erection, if part of the works is being manufactured or assembled at other premises or works, the Contractor shall obtain permission to inspect as if the works were manufactured or assembled on the Contractor’s own premises or works. Inspection may be made at any stage of manufacture, dispatch or at site at the option of the Authority and the equipment if found unsatisfactory due to bad workmanship or quality, material is liable to be rejected.
- All equipment being supplied shall conform to type tests and shall be subject to routine tests
- Accordance with requirements stipulated under respective sections. Contractor shall submit the type tests reports for approval. The Contractor shall intimate the

Authority/DTA the detailed program about the tests at least three (3) weeks in advance in case of domestic supplies. If for any item type test is pending payment would be made on successful completion of type/routine test(s) actually carried out as per DTA/Authority instructions.

- The Contractor shall give the DTA/Authority thirty (30) days written notice of any material being ready for testing. Such tests shall be to the Contractor's account. The DTA/Authority unless witnessing of the tests is virtually waived will attend such tests within thirty (30) days of the date of
- which the equipment is notified as being ready for test/inspection, failing which the Contractor may proceed with the test which shall be deemed to have been made in the presence of Authority/DTA and he shall forthwith forward to the DTA duly certified copies of tests in triplicate.
- The DTA/Authority shall within fifteen (15) days from the date of inspection as defined shall inform in writing to the Contractor of any objection to any drawings and all or any equipment and workmanship which in his opinion is not in accordance with the Contract. The Contractor shall give
- due consideration to such objections and make the necessary modifications accordingly.
- When the factory tests have been completed at the Contractor's or Sub-contractor's works, the DTA/Authority shall issue a certificate to this effect within fifteen (15) days after completion of tests but if the tests are not witnessed by the DTA/Authority, the certificate shall be issued within fifteen (15) days of receipt of the Contractor's Test certificate by the DTA/Authority. Failure of the issue such a certificate shall not prevent the Contractor from proceeding with the works. The
- completion of these tests or the issue of the certificate shall not bind the Authority to accept the equipment should, on further tests after erection, be found not to comply with the Specification. The equipment shall be dispatched to site only after approval of test reports and issuance of MICC (Material Inspection Clearance Certificate) by the Authority.

For tests whether at the premises or at the works of the Contractor or of any Sub Contractor, the:

- Contractor except where otherwise specified shall provide free of charge such items as labor, materials, electricity, fuel, water, stores, apparatus and instruments as may be required by Authority/DTA to carry out effectively such tests of the equipment in accordance with the Specification.
- The inspection by Authority/DTA and issue of Inspection Certificate thereon shall in no way limit the liabilities and responsibilities of the Contractor in respect of the agreed quality assurance plan forming a part of the Contract.
- The DTA/Authority will have the right of having at his own expense any other tests(s) of reasonable nature carried out at Contractor's premises or at site or in any other place in addition to aforesaid type and routine tests to satisfy that the material complies with the specifications.
- The Authority/DTA reserves the right for getting any field tests not specified in respective sections of the technical specification conducted on the completely assembled equipment at site. The testing equipment for these tests shall be provided by the Contractor.
- Any other tests or reasonable nature as required by the DTA/Authority not listed

above shall be carried out by the CMA at his own expense.

13.4. Final Inspection and testing

- Final Inspection and testing will be done by the DTA or his representative. The necessary test certificates shall be submitted before dispatch of material.
- The installation will be offered for inspection by local bodies (Chief Fire Officer). The contractor or his representative shall attend such inspection of the Chief Fire Officer, extend all test facilities as are considered necessary, rectify and comply with all observations of the Chief Fire Officer which are part of the agreement and arrange for obtaining necessary clearance certificate in
- favor of the Authority. In case the contractor fails to attend the inspection and make desired facilities available during inspection, the Authority reserves the right to provide the same at the risk
- and cost of the contractor and impose penalty for the same. The installation will be accepted by the Authority only after receiving clearance from the Chief Fire Officer for the work executed by the contractor under the agreement.

13.5. Mock-ups

Related Documents:

- Drawings and general provisions of the Contract apply to this Section.
- Review these documents for coordination with additional requirements and information that apply to work under this Section.
- After award by the CMA of all subcontracts for separate components and materials of the exterior wall systems and other mockups wherever required by Authority/DTA), and on basis of preliminary approval of materials and variations to proposed design exterior wall systems and other required mockups, construct full-scale mock-ups for review of design and construction.
- List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include source of
- stone, metal dry stack anchorage system, mix proportions for mortar and grout and source of aggregates. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Authority/DTA and approved in writing.
- Mock-ups shall be complete in all respects. For eg. In case of wall cladding, the mockup shall represent the final complete wall assembly, including all components of wall assembly including stone, back-up masonry wall, components of framing and anchoring of dry stack system, waterproofing and sealants.
- Construct mock-ups in location and orientation at Project site approved by DTA’s Project Manager. Mockup shall face South unless otherwise specified by DTA.
- Do not place orders for wall components or materials and do no fabrication until

mock-ups are approved.

- Where review of mock-ups may require revisions of designs or construction techniques, DTA will provide such revisions in writing to CMA.
- Do not install mock-up components or materials in the completed Project.
- Mock-ups shall remain in place until work on Project is complete, unless otherwise directed by Architect or specified. At project completion, remove and dispose of mock- ups.
- Design and provide structural framework assemblies necessary to support and display mock- ups.

Mock-ups shall be approved by Authority/DTA may include first review by DTA to be followed by subsequent review (or reviews) by both DTA and Authority. Approval of mock- ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless DTA and Authority specifically approves such deviations in writing.

14. SCOPE OF MAINTENANCE & SERVICES

Note :-

The below mentioned scope of maintenance in this section shall be applicable to all the aforementioned categories of works.
The Contract shall maintain the gallery as per the Good Industry practice.
The maintenance lists and equipment are indicative, it shall be further updated during the submission of Maintenance Manual which shall become an integral part of the contract.

After completion of the main job, the Contractor will provide comprehensive operation and maintenance with the deployment of required skilled personnel, supervisor and Engineer as required on the basis of quoted rates and terms and conditions of the agreement for operation and maintenance.
Any other work related to uninterrupted working of the Animal Facility and Containment Green House facility shall be treated as a part of scope of the bidder. The entire facility shall be validated in coordination with authorized members of GBU as per the WHO, DBT-RCGM, CPSCEA, CCSEA, Department of Animal Husbandary Govt. of India guidelines and necessary documentation and validation report duly stamped and signed by the external 3rd party validator ISO-17025 certified, authorized member of GBU and contractor as well should be submitted at the time of completion and handing over. Round the clock On-site Operation and Comprehensive Maintenance for 60 months after successful validation and handing over the new Animal Facility and Containment Green House Facility to GBU authority:
All cost to be included except cost of water and electricity. The staff will wear proper uniform, shoes and provided with mobile phones within tendered rates. The work will be executed as per Manufacturers recommendations and direction of the Engineer-in-charge primarily guided by preventive maintenance considerations. All servicing, cleaning, painting, minor/ major repairs, replacement of parts etc. will be included. In case of any mishap or accident, the Department will not take any responsibility and the Contractor will bear all such financial or otherwise responsibility.
The animal house should never be stopped mainly the stipulated HVAC , BMS access control, Fire and safety system.

14.1. Quantum of staff for Maintenance:

Operation and Comprehensive Maintenance of the Animal Facility & Containment Green House facility including providing of skilled operator cum technicians in each shift (round the clock) with one supervisor and one operator in general shift

including reliever, for operation and maintenance of the facility round the clock (7 days x 24hrs, 365 days/year) to operate, maintain and run the facility without any break down. Periodical Operation and Maintenance test report duly signed by authorized user scientist of GBU should be submitted in the pre-approved format at the end of every third month. Yearly facility validation should be conducted by the contractor in coordination with user scientists.

Operation and CMC activities include:

- High Side comprising of Chiller, Compressors, with all accessories
- Low Side comprising of AHUs, EXUs, Air distribution system (ducting with insulation), Air control devices like VCD, Registers, Grilles, Louvers, Terminals with filters, coils, heaters etc.
- Refrigerant piping system including control devices, flow balancing and Insulation
- Total Electrical System comprising of MCC and connected components, Cabling with all associates and Protection devices
- Static Pass Box in complete SS construction size: 600x600 complete with double door interlocking, UV light with hour meter, both side view glass and emergency egress button.
- Building management system including DDC Panel, controllers, field devices and sensors for checking and monitoring including calibration, replacement if needed
- Emergency doors and evacuation system as per the recommendations should be in place
- 3 sets of dedicated on-line 3 phases IN and 3 phases OUT, UPS system including battery bank and rack etc suitable for minimum 45 to 60 mins.
- Observations & readings to be recorded – Reporting arrangement in place
- CCTV footages for each 2-3 weeks should be kept in additional hard disk drive and should be submitted to the IISc recommended authority along with the quarterly testing, documentation.
- Periodic Lab Fumigation & Performance qualification/validation in coordination with USERS
- Operation & comprehensive maintenance of complete security and surveillance system including access control and door interlock arrangement, Fire and CCTV.
- Animal Facility and Containment Green House Facility rooms shall be tested in "AS BUILT" condition for the following parameters. All tests shall be carried out in coordination and presence of nominated GBU, executive and 3rd, party invigilator.
    a. Particle count for Biological laboratory cleanliness (class-100,000)
    b. HEPA filter installation integrity leak DOP test
    c. Differential Pressure check in coordination with air flow direction

d. Room Temperature 22±1˚C
e. Room Humidity 60±5%
f. ACPH as per actual flow rate
g. Room Illumination test
h. Lab Room differential pressure cascade check
i. Door interlock system check
j. BMS Interlocks / Alarm

14.2. Complaints :

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

14.3. Repairs :

All equipment that requires repairing shall be immediately serviced and repaired. Since the period of mechanical maintenance runs as per operation and mainatance period, all replacement parts and labor shall be supplied promptly free of charge to the owner.

14.4. Uptime Guarantee :

The contractor shall guarantee for the installed system an uptime of 98%. In case of shortfall in any month during the operation and mainatance period, the defects liability period gets extended by a month for every month having shortfall. In case of shortfall beyond the defects liability period the contract shall get extended by a month for every month having the shortfall and no reimbursement shall be done for the extended period.

The contractor shall provide log in the form of diskettes and bound printed comprehensive log book containing tables for daily record of all temperature. Pressure, humidity, power consumption starting and stopping times for various equipment, daily service rendered for the system alarms, maintenance records of unusual observations etc.

Contractor shall also submit preventive maintenance schedule.

Each tenderer shall submit along with the tender, a detailed operation assistance proposal for the owners site representative / consultant's review. This should include the type of service planned to be offered during the defects liability period and beyond. The operation assistance proposal shall give the details of the proposed monthly reports to the management.

14.5. Service & maintenance requirements

- CMA shall be responsible for full operation and maintenance of all MEPF systems, which shall include but not limited to piping systems, storages, machinery, W.T.P. and other related structures for defect liability period as mentioned in the contract.
- The Contractor shall, always, operate and maintain the Project in accordance with the provisions of the Contract, Applicable Laws and permits. In particular, the Contractor shall, always during the Maintenance Period, conform to the service and maintenance requirements set forth in this Schedule
- The Contractor shall repair or rectify any defect or deficiency set forth in this Schedule within the time limit specified therein and any failure in this behalf shall constitute a breach of the Contract. Upon occurrence of any breach hereunder, the Authority shall be entitled to recover as per contract.

14.6. Other Maintenance Requirements

S. No.	Activity	Description

a)	Electric Meter	The Contractor shall check all meters once in a month time to ensure that they are functioning and are showing correct readings.
b)	Standby Power Supply	The Contractor shall have arrangement of standby power supply by DG sets which shall be available 24 hours.
c)	Safety	Any fault in the electrical equipment like switches, receptacles, wiring etc. shall be identified, tested and repaired within 24 hours of detection to prevent accidents.
d)	Fire Fighting Facilities	The Contractor shall provide the required firefighting equipment and facilities including fire exits, fireproof doors, etc conforming to relevant standards and the applicable rules and regulations.
e)	Facilities for Physically Challenged Persons	The Contractor shall provide all the necessary facilities to the entry/exit seating and movement of physically challenged persons including wheelchairs, ramps etc.
f)	Equipment	The Contractor shall ensure the equipment and component parts conform to the relevant standards by Bureau of Indian Standards (BIS) wherever available.

14.7. Repair / rectification of defects and deficiencies

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the defects and deficiencies specified in CMC within the time limit set forth therein.

14.8. Other defects and deficiencies

- In respect of any defect or deficiency not specified in contract, the Contractor shall undertake repair or rectification in accordance with Good Industry Practice and within the time limit specified by the DTA/Authority.

- In respect of any defect or deficiency not specified in contract, the Authority/DTA may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor in accordance with Good Industry Practice and within the time limit specified by the Authority

14.9. Extension of time limit

Notwithstanding anything to the contrary specified in this Schedule, if the nature and extent of any defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Authority and conveyed to the Contractor and the Authority with reasons thereof.

14.10. Emergency repairs / restoration

Notwithstanding anything to the contrary contained in this Schedule, if any defect, deficiency or deterioration in the Project poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

14.11. Daily Inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project and maintain a record thereof in a register to be kept in such form and manner as the Authority/DTA may specify. Such records shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority/DTA.

14.12. Scope of maintenance-general

- The general scope of work includes operations, monitoring team and maintenance related works. The manpower deployments considered are to carry out equipment operations & maintenance works and attend to breakdowns as and when required. Also, the maintenance schedules shall be prepared by the Contractor and the site-based team shall carry out the equipment related works as per schedules & instructions.
- The basic tools required for maintenance, access ladders including special tools & tackles, measuring instruments, access ladders beyond 6 feet, scissor lift / boom lift for high access, etc and PPE's are included in the scope of Contractor and this is included as part of operation cost.
- All necessary logbooks, computers, office space, tables, chairs, registers & stationeries for report generation shall be arranged and provided by Contractor
- High access ladders (above 10 feet), scaffolding, boom lift / scissor lift etc shall be provided by Contractor as and when required.
- Storage space / Cupboards shall be provided by the Contractor for keeping the tools and tackles and other instruments.
- All equipment spares shall be provided by Contractor and has to monitor the

spares & if stock of spares is less, the same should be arranged and provided by the contractor.

- Contractor has to ensure the Tools & PPE's quantity as much as sufficient for the trouble-free service.
- In case of any defect in materials, workmanship or structural defects (strength and serviceability) of any element or the building, the Contractor shall make good, rectify or replace the element/structure.
- Maintenance technicians should be qualified (B.E / Diploma / ITI) and experienced in the related field. Persons deployed should be approved / confirmed by Authority, if persons deployed are found unsatisfied by Authority after necessary communication to Contractor, they have to replace the person immediately.
- Any increase in the manpower employed shall be communicated by Authority in writing.
- Helper person should be having 2-3 years of relevant experience in the field (Persons deployed should be approved / confirmed by Authority, if persons deployed are found unsatisfied by Authority after necessary communication to Contractor, they have to replace the person immediately.
- Contractor has to prepare / follow the standard operating sheet / operation control procedure for all Maintenance work – should get approval from the Authority.
- All people should undergo regular training for the operation and maintenance of the plant & safety measures. The same shall be arranged and ensured by the Contractor.
- Contractor has to submit the manpower detail and shift wise details & get approval from the Authority.
- Contractor has to supply sufficient manpower after considering weekly offs and statutory leaves in a month.
- Electrical supervisor should have a valid license –C license & electrical technician should have a valid B license.
- Housekeeping in a good manner at maintenance work spot and in the event of waste Generated from maintenance activity, same shall be collected properly and sent to storage location by Contractor employees as per hazardous & nonhazardous waste segregation process and as instructed by the Authority.
- In case of any safety deviation Authority can enforce % of penalty or Contractor has to replace the person who may have violated safety standards.
- Contractor should maintain all necessary documentation and records such as logbook / sheets, inventory registers, daily report, weekly report, monthly report, performance reports and all such other related documentation as per Authority requirement.
- Contractor should maintain accounts for receipts, consumption and inventory of all consumables & spares as per the consumption pattern.
- Contractor should prepare / adhere to the Authority maintenance schedule for mechanical, electrical & instrumentation should be approved by the Authority.
- Carrying out routine, preventive and break down maintenance in mechanical, electrical and instruments category and record to be maintained and submitted to Authority periodically.
- Before taking up major maintenance, the Contractor should inform and obtain

permission from the Authority and proper approval shall be obtained and further approvals in the form of Electrical clearance / LOTO procedures shall be adopted.

- Spares shall be procured and supplied by the Contractor as per requirement.
- The damaged / repaired equipment (Mechanical / Electrical / Instrument equipment/exhibit/) which are coming under warranty & guarantee the Contractor has to co– ordinate with supplier and get it replaced / serviced at free of cost from the equipment manufacture / supplier.
- Contractor should periodically check equipment, lubrication, adjustments etc. to ensure proper performance as per Project Manager Check sheet.
- Contractor has to follow getting a safety & security permit from Authority safety for the necessary job.
- Contractor should ensure that the Maintenance activities are conducted without affecting the production. However, it is the responsibility of the Authority to ensure availability of the equipment requested for maintenance by the Contractor.
- Environmental best practices to be followed as required by the Authority. Best environmental practice like Energy conservation, advance methodology in Pollution prevention etc., will be given appreciation to the Contractor.
- For Internal Transportation Contractor has to arrange vehicles and Maintain in Good condition (Petrol & other consumables is in Contractor scope) along with valid driving license and insurance.
- All Engineering spares, consumables like bulbs, fuses, contactors, chemicals, other materials etc, shall be provided by CMA.
- Costs of food for persons deployed by Contractor has to be arranged and provided by the Contractor. Providing drinking water and tea for Contractor employees shall be in the account of Contractor.
- The rate includes the cost of services like cost of communication, transportation, tools etc. in our pricing.
- All costs related to testing of equipment as per statutory requirements and obtaining statutory clearances etc. shall be in the scope Contractor.

14.13. Manpower estimation

S.No.	Designation (Principal Technical/ Technical Representative)	Minimum Qualification of Technical Representative	Discipline	Minimum Experience (in years)	Nos.
1	Team Leader/ Project Manager	Graduate Engineer	Civil	20	1
2	Subject Expert (Biotech background on intermittent basis to support in design and supervision for development of	Postgraduation + min 7 years experience in biotechnology and allied discipline OR PhD + min 5 years experience in	Post Graduate in Biotechnology	7	1

	labs)	biotechnology and allied discipline			
2	Deputy Project Manager	Graduate Engineer	2 Civil+ 1 Electrical / Mechanical	12	3
3	Project / Site Engineer	Graduate Engineer or Diploma Engineer	4 Civil+ 2 Electrical / Mechanical	5 (for Degree) OR 10 (for Diploma)	6
4	Quality Engineer	Graduate Engineer	1 Civil+ 1 Electrical / Mechanical	5 (for Degree) OR 8 (for Diploma)	1
5	Surveyor	Diploma Engineer	Civil	8	1
6	Project planning / billing	Graduate Engineer	1 Civil+ 1 Electrical / Mechanical	6	2

S.No.	**Designation (Maintenance Staff)**	**Minimum Qualification of Maintenanace Staff**	**Discipline**	**Minimum Experience (in years)**	**Nos.**
1	Supervisor/Engineer	Graduate Engineer	Electrical/Mecahnical	5	1
2	HVAC Plant Operator	Diploma ITI	HVAC	5	3
3	Plumber	Diploma ITI	Plumbing	5	3
4	Electrician/Wireman	Diploma ITI	Electrical	5	6
5	Technician	Diploma 3 year in IT/Electronics	ELV	5	2
6	Helper			5	6

Note:

- The above given manpower estimates during the O & M phase are minimum. CMA shall estimate and deploy additional personnel if required to ensure smooth operations of the facility.

- Before the deployment of manpower at site, the CMA will have to submit the CVs of all the proposed manpower to the Authority for approval. Based on the submitted CV or interview, the Authority shall provide the approval on the deployment or ask the CMA to provide alternate CVs.
- During the term of deployment, if the conduct of the deployed manpower is not as per standards, the Authority may ask the CMA to change the manpower.
- The contractor, at their own cost, must provide the biometric machine specified by GBU officials for regular attendance of manpower deputed for work on a daily basis. The contractor shall maintain a personnel file in respect of all the staff that is deployed in GBU campus.
- The manpower deployed should wear color coded uniforms with Gujarat Biotechnology University Logo. The uniforms need to be pre-approved by the Authority. Further, the agency will provide 2 pairs of uniforms to their male and female staff including shoes. For Monsoon adequate clothing like Raincoat will be provided by Contractor. In addition to that, CMA shall provide microphones to all the visitor guides.
- Annual training plan must be drawn by the CMA and implemented for the team deployed at Gujarat Biotechnology University. The trainer deployed by the CMA must follow and conduct based on the points mentioned below:
  - Review and update Human Resources Training, Structured Training, Mentorship Training to address current organizational requirements and ensure compliance with GBU.
  - Provide support and guidance to provide a series of (trainer) instructor-led training on formal mentorship to all manpower on their responsibilities and job profile.
  - Minimum training hours for staff = 24 Hours/year.
  - Staff training register should be maintained, and all training should be registered in the book.
  - Feedback form should also be maintained by the CMA.

15. PROJECT TIMELINE

Ref. No. 202210-AF_CGH-TL-01												**Date** 06.06.2024
GUJARAT BIOTECHNOLOGY UNIVERSITY												
PROJECT EXECUTION TIMELINE												
ACTIVITY	**TIME PERIOD (IN MONTHS)**											
	01	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**12**
Animal Facility												
Containment Green House												
External Development Works (Civil)												
External Development Works (MEP)												

16. PERSPECTIVE VIEWS

PART SITE PLAN

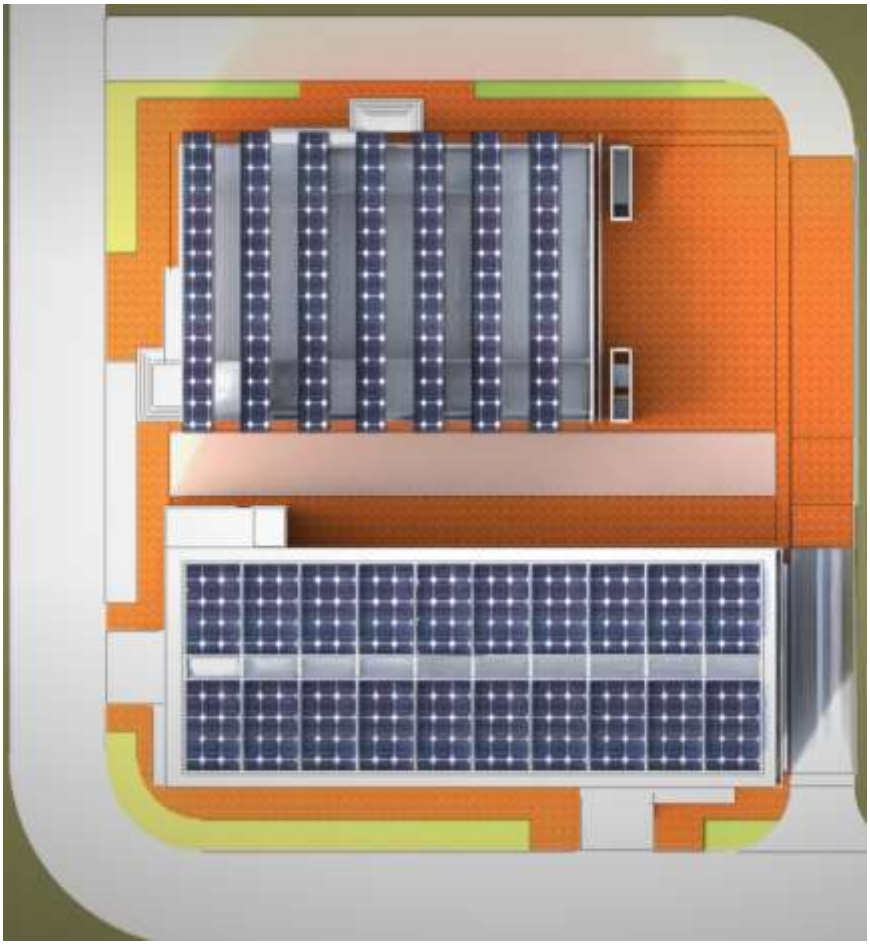

Image 1 *Proposed Site Plan*

Image 2*Proposed View*

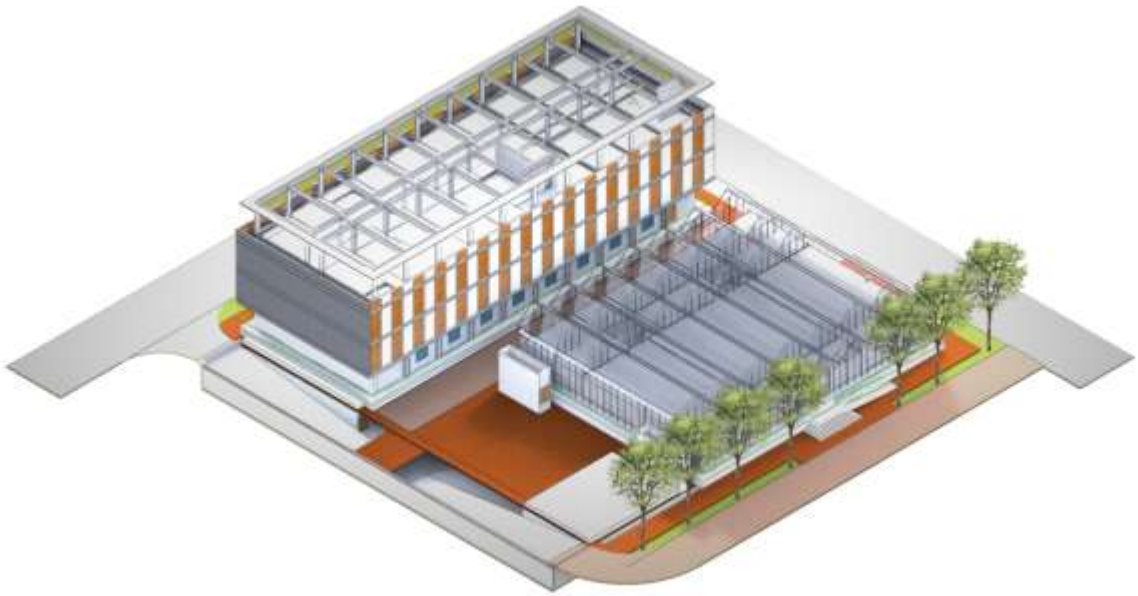

Image 3*Proposed Bird's Eye View*

***Image** 4 Proposed Eye level perspective view*

***Image** 5 Proposed Eye level perspective view*

***Image** 6 Proposed Eye level perspective view*

***Image** 7 Proposed Eye level perspective view*