

PROJECT:
PROPOSED INCUBATION MODULES FOR
IITMRP, CHENNAI
IBMS-TENDER SPECIFICATION

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1.0 INTRODUCTION

1.1 Project Overview

Proposed Incubation Modules For IITMRP, Chennai , building consisting of 3 & 6th floor in Phase -2, i.e.

- Block -A - third and sixth floor
- Block -B - third and sixth floor
- Block -C - sixth floor
- Block -D - third floor

Refer the tender drawings for floor area details and understanding of project. The contractor suggested offering the tender after the site visit of proposed building.

1.2 Scope

The scope of work shall include Design, Supply, Installation, Testing and Commissioning & Handing over of the Integrated Building Management Systems.

The Fire safety and security systems of following have been covered in this tender as follows;

1. Automatic Sprinkler & Fire detection and alarm system - FAS
2. Public address system for general cum emergency announcement - PAS
3. IP based Closed circuit television system - IP CCTV
4. Automatic gate management system with Boom Barriers & Tripod
5. Back bone system for Data & voice

The Integrated Building Management Systems - IBMS shall incorporate the following equipment for integrate, monitor, maintain and control the equipment:

1. Air Handling Units
2. VFD & VAV Units
3. Ventilation and Exhaust System

The system should be able to provide the following integration and provide consumption report of fit out areas.

1. Energy Meter integration
2. BTU calculation via BMS logic

The system should have open integration in terms of monitoring the chiller parameters and generate necessary report via Modbus protocol.

Also the system should be able to provide the following integration and provide parameters in the IBMS system.

1. PA Integration
2. FAS Integration
3. CCTV Integration
4. Access integration

The Details scope of system shall be described under the relevant subsystems.

The work under this system shall consist of supply, installation, testing, training & handing over of all materials, equipment, hardware, software appliances and necessary labour to commission they said system, complete with all the required components strictly as per the enclosed design specifications, design details. The scope also include the supply, installation & commissioning of any material or equipment including civil works that are not specifically mentioned in the specifications and design details but are required for successful commissioning of the project.

1.3 Coordination of work with IIT

- Coordinate the work of this division with the work of all other supply items by IIT team and the incubator company and so arrange that there will be no delay in the proper installation and completion of any part or parts of each respective work wherein it may be interrelated with that of this Contract so that generally all construction work can proceed without delaying the completion of the project.
- Examine contract drawings and specifications for all other trades relating to this project, verify all governing conditions at the site, and become fully informed as to the extent and character of the work required and its relation to other work in the building. No consideration will be granted for any alleged misunderstanding of the materials to be furnished for work to be done.
- Scaled and figured dimensions with respect to the items are approximate only; sizes of equipment have been taken from typical equipment items of the class indicated. Before proceeding with work, carefully check all dimensions and sizes and assume full responsibility for the fitting-in of equipment and materials to the building and to meet architectural and structural conditions.
- Coordinate work with other disciplines. Confer with other contractors whose work might affect this installation and arrange all parts of this work and equipment in proper relation to the work and equipment of others, with the building construction and with architectural finish so that this work will harmonize in service, appearance, and function.
- Install exposed piping to provide the maximum amount of headroom coordinated with the Architectural drawings above the finished floor. Install piping concealed in areas where hung ceilings or other furred spaces are indicated.
- Refer to the Architectural Drawings for ceiling heights, locations and types of hung ceilings and furred spaces.

- Furnish to the OEM guidelines for general construction, detailed advance information regarding all requirements related to work under other Divisions and/or Sections. Furnish sizes, accurate data, and locations of any and all pads, pits, chases, sleeves, and slots through floor slabs, walls, foundations, ceilings, roof, and other special openings required for work under this Division.

2.0 STANDARDS & REGULATIONS:

| | | |
|-----------------|---|--|
| NBC | : | National Building Code of India 2005, Part - 4, Fire and Life Safety |
| NFPA-72 | : | National fire protection academy code for fire alarm & public address system |
| NFPA-72 | : | National fire protection academy code for fire alarm & public address system |
| IS-2189 | : | Selection, Installation & Maintenance of Fire Detection and Alarm System. |
| NFPA 70 | : | National Electric Code |
| UL | : | Underwriters Laboratories, Inc. (UL) Publication-2775 |
| IS-694 | : | Specification for PVC insulated cables for working voltages up to and including 1100V |
| IS-9968 (Pt-1) | : | Rubber Insulated Braided Wire |
| IS-1554 (Pt-1) | : | PVC Insulated Cables |
| EN 50130-4:1995 | : | To ensure the protection of people and, property in the form of an intruder alarm system, hold-up alarm system, CCTV systems, access control systems or social alarm systems. |
| | | In terms of electromagnetic compatibility is necessary to address issues of the conformity assessment of products, selection of suitable components and in particular method of installation in a specific area of deployment. |
| BS 5887:1980 | : | Code of practice for testing of computer based Systems |
| BS 4808 | : | Specification for low frequency cables and wire for Telecommunication |
| BS 6558 | : | Optical fibres and cables |
| IEC65-WG9 65A | : | Software for computers in the application of industrial safety related Functional safety of programmable electronic systems: |
| IEC65-WG10 | : | Generic aspects 65A (Secretariat) |
| IEEE802.3 | : | CSMA/CD Local Area Network Protocol |
| IEEE 802.4 | : | Token Bus Local Area Network Protocol |
| IEEE 802.5 | : | Token Ring Local Area Network Protocol |
| ISO 9001:1987 | : | Quality Systems: Production, Installation and Servicing Capability |
| ISO 9000-3 | : | Guidelines for the application of ISO 9001 to development, supply and maintenance of software. |
| ASTM B 3-90 | : | Soft or Annealed Copper Wire. |
| ASTM 4565 | : | Cold Bend Test. |
| ASTM D4566-94 | : | Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire & Cable. |

| | | |
|-----------------------|---|---|
| ASTM 4565 | : | Physical and Environmental Properties of Insulation and Jackets for Telecommunications Wire and Cable. |
| ANSI/ICEA S-90-661 | : | Individually Unshielded Twisted Pair Indoor Cables. |
| Category 3, 5, 5e & 6 | : | For Use in General Purpose and LAN Communications. |
| ANSI/NFPA 70 2005 | : | National Electrical Code (NEC). |
| NFPA 90A | : | Standard for the Installation of Air Conditioning and Ventilating Systems, 2002 Edition. |
| NFPA 75 | : | Standards for Protection of Information Technology Equipment 2003 Edition. |
| ANSI/TIA/EIA568B.2 | : | Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components Addendum 1 Category 6 |

3.0 FIRE FIGHTING & FIRE DETECTION & ALARM SYSTEM

The Fire Fighting & alarm system shall be designed and installed as per National Building Code (NBC) 2005 Part IV – India, Life Safety standards and detailed specifications as noted above in this document.

1. Classification of Occupancy:

As per NBC, proposed project has been classified under **Business building (E) with ordinary hazard occupancy. (REFER - TABLE 23 OF NBC- 2005, PART IV).**

2. Systems Proposed:

Following Fire protection systems are proposed for the development.

- 2.1 Automatic sprinkler system.
- 2.2 Fire detection and alarm system.
- 2.3 Fluorescent type Exit and other Emergency Signage
- 2.4 Fire extinguisher

3. Automatic Sprinkler System:

- 3.1 Sprinklers and sprinkler piping net work are designed and provided as per the NFPA-13 requirement.
- 3.2 Sprinkler coverage area shall be 9-12 sq.mts per sprinkler. Sprinklers are Pendent / Upright
- 3.3 All sprinklers used shall be Standard response, standard coverage Pendent & Upright type of K-factor K-80(5.6) with temperature rating of 68°C.
- 3.4 Flow switches are provided on the Sprinkler main tapings at each floor for supervising at Fire alarm Panel.

4. Intelligent Addressable Fire Alarm system:

Intelligent/Analogue Addressable type fire detection and alarm system is designed and installed as per National Building Code, NFPA-72, and IS 2189. Major Equipments are.

- 4.1 Analogue addressable fire alarm control panel with battery back-up for 24hrs normal operation & 30 minutes alarm operation. Loop capacity shall be as per the BOQ.
- 4.2 Intelligent Addressable Heat detectors, Multisensor Detectors
- 4.3 Field devices like Control / Relay / Monitor Modules.
- 4.4 Dual action type Manual call points, Hooter cum strobe, Response indicators for above ceiling detectors.

5. Public Address system:

The main objective of the Public Address System is to convey clear and audible instructions to all the people on all floors / buildings in case of occurrence of fire / other emergency to reach a place of safety in the open, outside the buildings.

The sound output should not be so loud that people nearest to the speakers feel uncomfortable, nor so weak that people away cannot discern what is being broadcast. This is achieved by working the system at 60 to 75% power output and distributing speakers uniformly all over floor area. The system will comprise of a microphone of suitable for voice communication / Announcements through speakers on various floors/buildings. The system shall consist of:

- 5.1 Booster cum Mixer Amplifiers to avoid the noise.
- 5.2 Wall mounted speakers in common areas & ceiling speakers in the fall ceiling areas.
- 5.3 Connecting cables & racks for mounting above.
- 5.4 Master Controller with Console.
- 5.5 Zone Controller with Zone selector

SECTION THREE - AUTOMATIC SPRINKLER SYSTEM.

1. General:

- 1.1 The sprinkler system shall be provided for floors, comprising system components and equipments like sprinkler main, branch and internal piping complete with valves, alarms and supporting arrangements. Sprinkler heads shall be fixed as per the requirement and also supply spare sprinklers.
- 1.2 All material shall be of the best quality conforming to specifications and subject to the approval of the engineer-in-charge.
- 1.3 Pipes and fittings shall be fixed truly vertical/horizontal or on slopes required in a neat manner. Pipes shall be fixed in such a manner so as to provide easy accessibility for repair and maintenance and shall not cause obstruction in shafts, passages etc., Pipes shall be securely fixed to walls and ceilings by suitable clamps at intervals specified. Only approved types of anchor fasteners shall be used for RCC ceilings and walls.
- 1.4 Valves and other equipment shall be so located that they are easily accessible for operation, repairs and maintenance.
- 1.5 At false ceiling spaces, where below ceiling sprinklers are required an extra tee to be provided with flexible hose.

2. Sprinkler Heads:

- 2.1 Sprinkler heads shall be of Quartzoid bulb type with standard bulb, valve assembly, yoke and the deflector. The sprinkler shall be of approved make and type.
- 2.2 Pendent pattern: These sprinklers shall be designed to produce a hemi spherical type of discharge below the plane of the deflector with little or no water being discharged upwards to wet the ceiling.
- 2.3 Spray patterns: The spray type sprinklers shall produce a hemispherical discharge below the plane of the deflector.
- 2.4 Ceiling (flush) patterns (concealed type): These shall be designed for use with concealed pipe work. These shall be installed pendant with the cover plate flush to the ceiling with pushover rosette ceiling tile adjustable escutcheon screw adjustment concealed solder type sprinkler cover plate of proper temperature rating etc., as per manufacturer's specification.
- 2.5 Upright pattern: These sprinklers shall be designed to produce a hemi spherical type of discharge below the plane of the deflector with little or no water being discharged upwards to wet the ceiling.
- 2.6 Construction bulb: Bulb shall be made of corrosion free material strong enough to withstand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a pre-determined level.

- 2.7 Valve assembly: Water passage of the sprinkler shall be closed by a valve assembly of flexible construction. The valve assembly shall be held in position by the Quartzoid bulb. The assembly shall be stable and shall withstand pressure surges or external vibration with displacement.
- 2.8 Yoke: The yoke shall be made of high quality gunmetal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector.
- 2.9 Deflector: The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.
- 2.10 Color code: The following color code shall be adopted for classification of sprinklers according to nominal temperature ratings: -

| S. No | Type of Sprinkler | K-Factor | Size of bulb | Color of bulb |
|-------|---|----------|--------------|---------------|
| 01 | Standard response, std. coverage Upright sprinkler | 80 (5.6) | 5 mm. | Red. |
| 02 | Standard response, std. coverage Pendent sprinkler | 80 (5.6) | 5 mm. | Red. |

- 2.11 Size of sprinkler orifices: The following sizes of sprinklers shall be selected for various classes of hazards: Ordinary hazard: 15mm nominal bore
- 2.12 Temperature ratings: For normal conditions and temperature climates, rating of 68° C shall be used. However, the temperature rating shall be as close as possible to, but not less than 30 0C above the highest anticipated temperature conditions.

3. Installation of pipe (above ground piping) for sprinkler system:

- 3.1 All pipes shall be G.I heavy grade ('C' class) pipes as per IS: 1239 part-I for sizes up to 150NB & M.S pipes as per IS: 3589 for sizes 200NB & above with a minimum thickness of 6.0mm.
- 3.2 Fittings shall be G.I confirming to IS: 1239 part-II. Fittings up to 50mm dia shall be of screwed/threaded joints & for sizes 65NB & above welded or flanged shall be used. Fittings shall be fabricated from parent pipe for sizes 200NB & above. Only electro galvanized nut/bolts shall be used.
- 3.3 Pipes shall be carefully laid to the alignment & levels shown on the plan & sections and great care shall be taken to prevent any sand or foreign particles entering into the pipes. Pipes shall be kept thoroughly clean during the course of laying. Ends of pipes shall be blocked with wooden plugs wedged home, at the end of each day's work to prevent dirt and rodents, insects etc., entering the pipe.

- 3.4 Flanged joints shall be made with 3 mm thick insertion rubber washer / Gaskets. All bolt holes in flanges shall be drilled & making hole by using gas cutting is not acceptable. The drilling of each flange shall be in accordance with relevant Bureau of Indian Standards. The Bolts /Nuts / Washers used in the system shall be Galvanized as per **IS 1367** and suitable length of not more than 25mm beyond the Nut.
- 3.5 Piping shall be so installed that the system can be thoroughly drained. All the pipes shall be arranged to drain to the installation drain valve.
- 3.6 Sprinklers should have range pipes 25 mm dia of 150 mm length forming part of the fitting. Balance piping from Branch/ sub header will be measured part of piping works..

4. Installation control valve:

Installation control valves shall comprise of the following: -

- 4.1 One main stop valve of full way pattern with gunmetal pointer to indicate whether open/shut.
One automatic alarm valve, fitted with handle and cover.
- 4.2 One hydraulic alarm motor and gong for sounding continuous alarm upon outbreak of fire.
- 4.3 One combined waste and testing valve including 5 meters of tubing and fittings.
- 4.4 Alarm stop valve.
- 4.5 Strainer.
- 4.6 Drain plug.
- 4.7 Padlock and Strap.
- 4.8 Wall box for housing all of above.

5. Pressure gauge:

Pressure gauges conforming to IS/BS specifications shall be provided at the following locations

- Just above alarm valve.
- Just below alarm valve, on the installation stop valve.

6. Pipe Supports:

- 6.1 All above ground piping shall be installed on suitable pipe hangers/supports as required. The hangers shall be made of MS angles, channels, etc., and painted to the required finish.
- 6.2 Hangers & supports selected shall be capable of carrying the sum total of all concurrently acting loads. They shall be designed to provide the required supporting effects and allow pipelines movements as necessary. All guides, anchors, braces, dampeners, expansion joints and structural steel to be attached to the building / structure etc shall be provided by the contractor. Hangers & components for all piping shall be as per the drawing.

- 6.3 Additional supports shall be provide at bends etc., angles for pipe support should not be less than 40x40x6mm size. Cutting shall be by gas cutter. All cut edges and weld surfaces shall be grounded to a smooth finish.
- 6.4 Slotted angle/channel supports on walls shall be provided wherever shown on drawings or as required. Angles/channels shall be fixed to brick walls and bolts embedded in cement concrete blocks and to RCC walls with suitable anchor fasteners. Holes required in RCC walls shall be neatly drilled by electric drills and no manual chiseling will be allowed.
- 6.5 Anchor fasteners used for sprinkler piping supports shall be as follows:
- Pipes up to 50mm dia - M8 x 40 long drop in anchor with threaded rod.
 - 65 to 100mm dia - M10 x 40 long drop in anchor with threaded rod.
 - Pipes above 150mm dia shall use 75 x75 x 8mm angle.
- 6.6 However the contractor shall submit piping support detail drawing along with the shop drawings for consultant's approval.
- 6.7 The spacing of piping supports shall be as follows:
- 25mm to 32 mm dia. - 2.5 meters
 - 40 mm to 65 mm dia. - 3.0 meters
 - 65 mm and above - 3.6 meters

7. Pipe Protection:

- 7.1 All pipes above ground and in exposed locations shall be painted with two coat of Zinc chromate primer and two coats (each of 40 microns) of synthetic enamel paint of approved shade (RED- Shade no -536). The pipes should be initially brushed to remove all foreign matter before applying paint / primer.
- 7.2 Pipes passing through masonry walls, foundation, beams (if any) shall be taken through embedded pipe sleeve of same material. The pipe sleeve size to be at least one and a half times (1.5) diameter of the crossing pipeline. The pipeline running below floor shall be given anticorrosive treatment same as for underground piping.

8. Welding Process:

- 8.1 Welding shall be carried out by 3 phase rectifier type welding set. Welding shall be on high current low voltage basis. Conventional welding machine shall not be accepted.
- 8.2 Proper weld or filler rod to be selected to achieve a weld metal with the desired corrosion resistant & strength characteristics.
- 8.3 After completion of welding, brushing process need to be performed using a stainless steel manual wire brush. The goal of this process is cleaning all the imperfections left by the welding process, and

preventing rust from appearing. Brushing removes the burrs & other foreign particles that may be present on the welded portion.

8.4 All weld surfaces & cut edges should be grounded to smooth finish.

8.5 With the completion of above process welded portion need to be coated with paint/primer which are high in elemental zinc (Zinc chromate primer). This will effectively restore full corrosion protection to the weld areas.

9. Functional tests

9.1 Upon the completion of the installation, the contractor shall conduct functional tests with simulated fire conditions in the space to be decided by the owners. The contractor shall supply all materials, labor and personnel required for the functional tests. Rate quoted in the BOQ shall be deemed to include cost of the above.

10. Butterfly Valves:

1.1 Butterfly valves shall be provided for pipes 50mm dia and above. The valves shall conform to BS 5155 and shall be CI construction, including nuts, bolts, washers, 3mm thick insertion rubber gasket complete as per the specifications.

1.2 Butterfly valves up to 150NB shall be lever operated type. 200NB & above are gear operated.

1.3 The valves shall be tested to a pressure of 16 Kg/sq.cm. Butterfly Valves shall confirm the following specification:

- Body: High duty cast iron to IS 210 Gr. FG 220 and BS 1452 Gr. 220.
- Seating: Molded in-situ resilient lining of black nitride rubber.
- Disk: Nylon coated S.G. Iron to IS 1865/SG 400/12 and BS 2729 Gr.420/12.
- Shaft: The shafts are made of stainless steel AISI 431. Only flanged end valves to be used with flanges drilled to BS 10 Table F. Valves shall be capable of being locked in open position.

1.4 Hand wheel shall be with vertical gear unit for smooth opening and closing of the valve for gear operated valves. Key rods with M.S. coated extended spindles to be provided wherever the valves are not approachable from the ground surface.

1.5 Valves shall be provided with the supervisory switch for monitoring of open / closed position of the valves.

11. FIRE ALARM CONTROL PANEL (FACP):

The FACPs used in the Building shall confirm with the UL - 9th Editions.

1. The fire alarm control panel (FACP) shall be suitable for Class-A Style 5, 6 or 7 wiring and Class-B Style 4 type of wiring as per NFPA-72.

2. It shall have provision to accept the range of 110V - 230V \pm 10% single phase, 50 Hz SMPS supply.
3. The processor shall be of M3 32 bit, capability for Day & Night mode.
4. The panel shall maintain 2000 events, each with a time and date stamp.
5. The control panels shall exclusively maintain 1000 alarm event and 1000 other events (troubles supervisory pre alarm etc.).
6. The system shall support three password levels, (i.e. Advance / Admin/ user).
7. It shall have inbuilt USB 2.0 Interface for easy configuration facility via PC/Laptop.
8. The FACP shall have Minimum 160 Characters LCD in which the LCD clearly indicates the location of fire, Fault & Supervisory.
9. The FACP should have capacitive Touch Keypad, instead of mechanical snap dome switches for trouble free operation.
10. The panel shall have degraded operating mode. In case of main CPU failure the panel still gives audio and visual notification.
11. The FACP shall have maximum capacity of four loops and can be configurable as one, two, three and four loop.
12. It shall have inbuilt RS485 facility for networking. Peer to peer networking of at least eight panels should be possible in a system, comprising of not less than 8128 devices in any combination.
13. The panel shall have two circuits for remote monitoring with at least one for Initiating device circuit.
14. The FACP should have minimum two inbuilt Notification Appliances circuits.
15. The FACP shall have provision to interface Ethernet, GSM module and any BMS.
16. The FACP shall have the facility to connect the Printer by using Interface module directly to the panels.
17. The panel shall have minimum three programmable form C, potential free Relays, loop wise Auto-learn facility for easy installation and commissioning, capability to add or delete the devices without affecting the existing configurations, facility to program 192 groups with label, built in visual alarm indication for minimum 36 zones, programmable time delay facility.
18. The Panel should be capable of alerting duplication of address, mismatch on the device type. The panel shall have provision to restore factory default setting.
19. The FACP should give audio and visual indication for main and/or standby power supply failure.

20. The panel shall indicate degraded power supply in case both the mains and standby power supplies are below the rated level with inbuilt battery charging circuit to charge up to 40Ah SMF batteries.

21. The FACP shall be capable to integrate the voice evacuation system, shall have Programmable Trouble Reminder facility, AC loss Delay facility and also on site and off site programming.

The FACP shall have the following functions activated through the touch key pad:

- Acknowledge
- Silence
- Evacuate
- Reset
- Scroll
- Test

22. Zone should have built in intelligence with 32 bit controller with auto addressing facility in respect to the slot it is inserted, shall be swappable without any configuration changes and should have LED for loop status indication.

23. Each zone shall accommodate minimum 50 devices (detectors and modules) in any combination.

24. All the alarm initiating devices shall be addressed through 8 way DIP switch without any configuration utility/ programming kit. (Binary-addressing).

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

26. The sensitivity of smoke sensor shall be individually adjusted from the FACP to suit the conditions of each location.

27. Each detector shall have self-test facility, which is monitored in the FACP.

28. The FACP should be able to monitor each detector and raise maintenance alert once the drift compensation level is reached.

3.1 CONSTRUCTION DETAILS:

- The FACP shall be of 1.6 mm CRCA cabinet and shall have an ingress protection of at least IP-50. It shall be capable of being wall Mounted or flush mounted.
- The cabinet and front shall be corrosion protected, given a rust-resistant powder coat, and manufacturer's standard finish.
- It shall be of Red, White or Black finish as per requirement. The FACP's shall be provided with

earthing premises with cable entry from the top.

- The panel shall be completely factory wired, absolutely ready-in all respects for installation at site. The internal wiring of the panel shall be carried out with 650V grade, stranded copper wires of size rated for the current in the corresponding circuit.
- The minimum size of the wire shall be not less than 0.8 sq.mm for electronic-circuits and 1.5sq.mm for electrical circuits & 14AWG for grounding.
- The door shall be provided with a key lock and shall have the ability to be hinged.

Note: The DSP will be located in panel with respect to no of zones which will be supplied by IIT team. The DSP installation, wiring, interconnection & co ordination work for commissioning will be under the scope of contractor.

3.2 POWER SUPPLY:

- The System shall operate in the range of 110-240V AC, 50/60 Hz main supply (SMPS). The power supply shall have auto resettable fuses.
- The panel shall have protection against transient and surges.
- The Power Supply shall be provided with an earth detect circuit, capable of detecting earth faults.
- The power supply shall have Battery charging facility with thermal fuses to avoid reverse polarity damages.
- The SMPS power supply shall have LED indication to show the healthiness of the power supply in green color and in low voltage condition it shall have RED indication.

3.3 CENTRAL PROCESS UNIT (CPU):

- The FACP shall have a processor which shall be 32 bit ARM cortex M3 controller.
- The sophisticated software shall facilitate extensive memory for storing the logs of alarms, times and action taken report.
- The memory shall store data in a non-volatile format and retrievable for at least seven years.

3.4 REPEATER PANEL (Passive type):

- Repeater panel shall be UL Listed.
- The Repeater Panel shall have minimum 160 characters LCD display in which the LCD clearly indicates the location of fire, fault & supervisory status.
- The repeater panel should have capacitive touch keypad, instead of mechanical snap dome switches, for trouble free operation.

- Repeater panels shall be suitable for wall mounting or mounting on table which shall display all the parameters occurring on the fire alarm control panel.
- It shall connect to any of the fire panels in the network. It shall be provided with an external power supply.
- The repeater panel shall replicate the main panel indications and shall be accessed only by authorized users through password.
- The repeater panels shall be connected to the main panel and other repeater panels in such a way that failure in any of the panels shall not affect the performance of the other panels.

3.5 Conventional Optical Smoke Sensor Detector:

The Optical Detector shall conform to the relevant standards having the following features-

1. Detector shall be UL approved.
2. It shall have smoke sensitivity of 1.9 +/- 0.6 %/ft.
3. The Detector shall be loop powered and addressed by DIP switches.
4. All the detectors shall have a visible dual blinking LED to indicate the healthiness/ trouble/ alarm condition of the detector. The LED shall be located in such a way that it shall be visible from the 360°.
5. It shall possess False alarm immunity and a superior signal to noise ratio.
6. It shall be capable of supporting style 7 wiring.
7. It shall have inbuilt drift compensation facility.
8. In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming.
9. The detector shall change sensitivity settings based on day/night mode or with schedules based on the programming.
10. The detector shall have at least 3 levels of sensitivity settings.
11. The detector wiring shall be polarity free.
12. The detector shall have the connection details on the bottom.

3.6 Addressable Heat Detector:

The Heat Detector shall conform to the relevant standards having the following features:

1. Detector shall be UL approved.
2. The detector should have fixed temperature rating of 59°C and rate of rise of 11.1°C / min.
3. The Detector shall be loop powered and addressed by DIP switches.
4. All the detectors shall have a visible dual blinking LED to indicate the healthiness/ trouble / alarm condition of the detector. The LED shall be located in such a way that it shall be visible from the 360°.
5. It shall possess False alarm immunity and a superior signal to noise ratio.
6. It shall be capable of supporting style 7 wiring.
7. In case of a failure, panel shall allow to replace the detector with the same type without the need of additional programming.
8. The detector wiring shall be polarity free.
9. The detector shall have the connection details on the bottom.

3.7 Standard base:

1. It shall be UL Listed.
2. It shall be common for PHOTO, THERMAL AND MULTI SENSOR.
3. Premises of base shall be rust resistant.
4. It shall have separated in and out premises.
5. It shall have premises to connect remote indicator.

3.8 Addressable Control Module:

1. It shall be UL listed.
2. It shall have LED indication to show the status.
3. It shall activate notification devices and 24V DC operated devices.
4. It shall have a capability of handling at least 1A @ 30VDC to integrate with third party system.
5. It shall be capable of powering through the auxiliary source and shall supervise the auxiliary power. The CM shall communicate faults and troubles related to the NACs, power supply to the panel.
6. It shall be addressed by means of dip switches.
7. It shall be loop powered.

3.9 Addressable Monitor Module:

1. It shall be UL Listed.
2. It shall have LED indication to show the status.
3. It shall have supervised monitoring circuit.
4. It shall monitor any number of potential free NO contact.
5. It shall be addressed by means of dip switches.
6. It shall be loop powered.

3.10 Addressable Control Relay Module:

1. It shall be UL Listed.
2. It shall provide two dry potential free contacts for activating a variety of auxiliary devices and other fire fighting / ventilation equipment.
3. It shall have contact rating of 2A @30V DC, 0.5 @125 VAC
4. It shall be addressed by means of dip switches.
5. It shall have LED for status indication.
6. It shall be loop powered.

3.11 Addressable Isolator Module:

1. Isolator module/ base shall be part of the loop. These modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Style 6 (Class A) or Style 4 (Class B branch).
2. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit on the SLC loop segment or branch.
3. At least one isolator module shall be provided for each floor or protected zone of the building.
4. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is rectified, the isolator module shall automatically reconnect the isolated section.
5. The isolator module shall not require any address setting, and its operations shall be totally automatic.
6. It shall not be necessary to replace or reset an isolator module after its normal operation.

3.12 Addressable Zone Interface Module:

1. The zone Interface module (ZIM) will facilitate connection of conventional detectors in the same circuit /loop consisting of addressable detectors.
2. It shall be capable of powering the detectors through the auxiliary source and shall supervise the IDC power supply.
3. It shall communicate alarm and troubles related to detector and power supply to the Panel.
4. It shall allow resetting conventional detectors from the panel.
5. It shall have LED status indication
6. It shall be capable to connect at least 16 Initiating Devices.

3.13 Addressable Input/Output Module:

1. The input and Output Module shall have LED indication to show the status.
2. It shall have supervised monitoring and output circuit.
3. It shall monitor any number of potential free NO contact.
4. It shall be addressed by means of dip switches.

3.14 Manual Pull Stations:

The Manual Pull Stations shall conform to the relevant standards having the following features.

1. It shall easily replaceable break glass rod.
2. It shall be of single gang mounting.
3. It shall be connected thru the Monitor module for addressing facility.
4. It shall have 10 amp@120VAC rating SPDT contact.
5. It shall Made of High quality Nontoxic-die casting.
6. It shall be UL listed.

3.15 Sounder :

The Sounder shall confirm to the relevant standards having the following features.

1. It shall be a Conventional sounder. (Bidder shall consider external power supply, cable, conduits, modules required for activating externally powered sounders and include the costing as part of the item – Sounders)
2. It shall have audibility level of 85dB
3. It shall have the capability of being tested from the FACP.

3.16 TCP/IP MODULE:

1. It shall be compatible with **ravel make** fire alarm panel.
2. It shall be ready to use TCP/IP firmware for fast integration.
3. It shall be 10/100M auto sensing Ethernet Mini card for embedded device networking.
4. It shall supports TCP server, TCP Client, UDP, Real COM driver operation modes.
5. It shall consume power not more than 1.5 Watts.
6. It shall works on the power supply from the fire alarm control panel.
7. It shall have enclosure of MS with powder coated white in color.

3.17 Graphic Software: - It shall be integrate with BMS software via Modbus TCP IP

1. The Graphic Software shall provide both Alarm Management and System maintenance tool.
2. The Graphic Software shall have all the System information available on a single screen allowing quick assessment and full control over the fire alarm system.
3. The Graphic Software shall be able to access the individual device and Zones Status.
4. The Graphic Software shall be connected to a single panel or series of the networked panels.
5. The Graphic Software shall have a 3 access level for the software access security.
6. Building Evacuation, Alarm Silencing and Reset are available to any users with suitable security clearance.
7. The Graphics Software can be configured to provide a schematic overview of the overall site, individual floor plans and even individual rooms. Each plan is independently named and can be configured to show all devices as installed on the site.
8. The Graphics software shall have event log details with a complete history of the activity of the fire system. All major control actions are recorded with date, time used and an Optional comment field. Entries are color coded to help easy identification of specific types of events.

3.18 Batteries:

1. Battery shall have sufficient capacity to power the fire alarm system for not less half an hour in alarm condition and at least 24 hours in normal condition.
2. The batteries are to be completely maintenance free.
3. The batteries shall be of Lead acid type.

3.19 Cables/conduits:

All cables/conduits to be laid on wall, ceiling and on the hangers wherever necessary and as directed by the authority with required hardware. The cables shall be Armored PVC twisted 1.5 sq mm multi strand insulated, copper conductor, conforming to IS: 1554 and shall be of specified make. The cables shall be properly terminated and labeled.

4.0 SYSTEM DESCRIPTION - PUBLIC ADDRESS SYSTEM

4.1 General Requirements:

- A. The fully digital public address system shall interface with the Fire Alarm System in accordance with NFPA 72 and BS 5839 part 8.
- B. The system shall be capable of fulfilling the following requirements:
 - 1. Clear, un-distorted announcements to selected areas during public addressing;
 - 2. Clear, un-distorted paging to all zones; either individually or collectively. Selection of groups of zones shall be programmable from time to time; and
 - 3. In the event where controller fails; emergency announcement shall be able to broadcast to all areas.
- C. For general office and public areas, the system shall be capable of delivering a sound pressure level of 85 dB at the listening level or +5dB from environmental condition.
- D. Signal processing modules shall be provided for the Call Station inputs. It shall act as a compressor to supply uniform microphone output levels, compensating for variation in voice volume, irrespective of different voice strengths and speaking distances.
- E. The listening level shall be taken to be 1.5 m above floor level.
- F. The reinforced sound shall be distributed evenly throughout the listening area; the total variation in each area shall not exceed 4 dB.
- G. An articulation loss of consonants of less than 15% shall be maintained. (Generally, the reverberation time of the various locations shall be assumed to be not more than 1.9 seconds).
- H. Call station shall have three colour LEDs, one to monitor the status of the system that signal an announcement may be made or the selected zone is engaged (that is, with another announcement) and the second one to indicate the status of the call station and the third one to monitor the power to the call station.

- I. The microphone paging station shall have the flexibility of selecting any number of user keys (selection buttons) at any one time. It shall be able to program each user key for any function.
- J. The central network controller shall be an Ethernet-based controller. It shall be using integrated for the user interfaces and system interaction. It shall have a means of monitoring, to continuously monitor the system from the microphone of the call station onwards; any faults shall be displayed on the screen of the Alpha-Numeric Display as well as the Central Monitoring, Configuration and Diagnostic PC. It shall come with dual cabling connectivity for redundant cable connection.
- K. It shall be able to deliver high quality signals to the loudspeakers, all individual audio equipment shall have its own Digital Signal Processing modules.
- L. High quality signals shall be maintained at the output of the power amplifiers to compensate for losses in the audio distribution lines.
- M. Each power amplifier with 20% spare capacity shall be provided to drive all loudspeakers during an emergency without overloading.
- N. Each power amplifier shall have a built-in self-restoring protection circuit to guard against hazards of operation such as mis-loading at its input, short-circuiting of its output and connection mistakes. It shall come with dual cabling connectivity for redundant cable connection.
- O. The power amplifiers shall also have built-in line transformers for 100V loudspeaker matching, DC input of emergency operation, headphone monitor output, adjustable input sensitivity, and shall conform to the safety standard of IEC 65489. It shall have amplifier monitoring and auto-changeover over circuits & automatic volume control features built-in.
- P. The power amplifiers shall have control inputs and audio inputs for interfacing for fire alarm signals. This control inputs shall be supervised, freely programmable for any system actions and with priorities setting. Each power amplifier shall have digital audio processing to ensure good audio quality being delivered to the Loudspeakers.
- Q. A built-in amplifier monitoring circuits shall continuously monitor the functioning of the power amplifiers and shall automatically switch in a spare power amplifier in case of failure of any of the amplifiers. Upon detection, the status of the fault shall be indicated by the LCD display on the amplifier itself as well as in the Central Monitoring, Configuration and Diagnostic PC. The number of spare power amplifiers to be provided shall be ten percent of the total quantity of each range of power amplifiers.
- R. All speaker lines shall be supervised for open circuit fault, short circuit fault, and short to ground fault. Upon detection, the status of the fault shall be indicated by the LCD display on

the amplifier itself as well as in the Central Monitoring, Configuration and Diagnostic PC.

- S. The loudspeakers shall be located such that they meet the necessary requirements. Facilities shall be incorporated to override volume control units, including those in the "off" position to enable emergency announcements to be broadcast. Horn speakers shall be provided for all plant rooms, generator rooms and outdoor areas with high ambient noise.

4.2 SYSTEM REQUIREMENTS

- A. The Public Address System shall be network based and in digital domain and shall be flexible and easy to operate. Specific functions shall be easily programmed and changed by non-technical personnel through Internet Explorer to access the system configuration software
- B. The main equipment shall be housed in standard 19 inch equipment racks.
- C. Cabling between a call station and the central network Controller shall merely comprise a two-core fibre cable, while standard loudspeaker cables shall be used between the power amplifiers and the loudspeakers.
- D. Cabling within the main equipment shall be via fibre cable with purpose built connectors located at the back of each equipment.
- E. Each call station shall have a built-in converter that convert the Analog signal to digital signal for transmission to the network controller of the PA system. The audio input of the microphone shall consist of equalizer.
- F. Each user key on the call station shall be programmable via the Central Configuration PC. Each key shall be capable of being programmed with a priority hierarchy, signal tones, digitally stored messages and routing instructions prior to a call. Each user key when depressed shall activate a zone or group of zones of speakers according to type of announcement to be made.
- G. Supervised control inputs and audio inputs shall provide the interface between the inputs and the central PA/EVC system. Each input is supervised and freely programmable for any system actions with priorities setting.
- H. The central network controller shall manage the operation of the system; that is, detection of the user keys being depressed, routing of the microphone and attention signal tones, setting of the priority levels and switching of the loudspeaker volume control override circuits. It shall also act as the 'watchdog,' continuously checking the system hardware.
- I. A digital message module shall be stored in the central network controller for broadcasting of message in case of emergency. More than one message shall be able to be played simultaneously. The status of these messages shall be monitored.

- J. For evacuation and emergency procedures, signals shall be programmed to precede an announcement from a call station, or they shall be capable of being broadcast independently by a defined user-key.
- K. Signals shall be capable of being programmed to precede an announcement from a call station or may be used independently as alarms for evacuation or emergency procedures.
- L. Whatever signal is being transmitted, the emergency and alarm calls shall always have top priority. They shall be broadcast immediately and at full volume, even in those zones where loudspeaker are currently switched off or set at a low volume.
- M. The uniformity of sound pressure level distribution at 1.5 metres above the floor level shall not vary beyond ± 4 dB for frequency up to 4,000 Hz and not more than ± 8 dB for frequency up to 8,000 Hz.
- N. The ceiling loudspeakers so chosen shall have uniform frequency response ranging from 100 Hz to 16,000 Hz within 3 dB variation.
 - i. Each loudspeaker assembly shall incorporate a flush-mounted baffle, a 100V line matching transformer and a high efficiency loudspeaker in order to keep the operating power at a minimum.
 - ii. Each loudspeaker shall be capable of generating an on-axis sound pressure level of at least 91 dB at 1 metre distance, with 1W input.
- O. The remote volume control units shall be sufficiently rated to handle the total number of loudspeakers it has to serve and shall have a speech restoration circuit, which shall permit announcements always at full volume ir-regardless of the control setting.

4.3 CENTRAL NETWORK CONTROLLER

- A. It shall have the following functions:
 - The Basic System shall be based on a 19" rack frame and shall comprise at least the following:
 1. Central Digital Signal Processor module
 2. 2 x 16-character LCD Display
 3. 8 Supervised Control Inputs and 4 Audio Inputs
 4. Ethernet interface for Configuration and Diagnostic & Logging functions
 5. Digital message storage
 6. Stores up to last 200 faults messages
 7. Ethernet Interface for logging
- B. The control unit shall be the heart of the public address system. The unit shall be capable of

routing minimum 10 audio channels, delivering power to the system, fault reporting and controlling of the system. This unit can work either in stand-alone mode or with a PC connected to it.

- C. The network controller shall have 4 analog audio inputs.
- D. There shall be 8 control inputs, which are freely programmable. These can be programmed for any action to be done in the system and assigned priorities.
- E. The network controller shall have a redundant network wiring capability. Status/fault enquiries shall be made via the front panel display and rotary control of the network controller. The front panel shall have a 2 x 16-character LCD display and a rotary control to navigate through the menu. The network controller shall be provided with a storage facility for the last fault messages in the system
- F. The status of the digital audio storage and the messages shall be monitored. The audio messages can be downloaded from a computer via the Ethernet link.
- G. The network controller shall monitor the status of all equipment in the system and report any status change as well as the microphone capsule of a call station microphone and report any fault.
- H. Attention and alarm tone definitions shall be stored in the network controller. These tones can be accessed by any call stations or control inputs for announcement broadcast or alarm broadcast. The network controller shall have an internal real time clock and this clock can be synchronized via a control input.
- I. The network control unit shall have extensive audio processing possibilities for audio inputs and audio outputs. Parametric equalization, limiter, and gain can be adjusted with the configuration software.

4.4 POWER AMPLIFIERS

1. Amplifier shall be package type Class A and ABI, with push-pull or push-pull-parallel output and negative feedback to obtain low distortion and regulation with high stability.
2. Frequency response shall be 100-10,000 Hz (plus or minus 3 dB).
3. Power amplifier shall be complete with on-off switch, minimum 3 MIC and 2 Aux inputs, plus 1 Aux out, on DIN or XLR connector, general volume control, independent bass and treble adjustment, primary fuse, 220 volt AC 50/60 Hz power supply; capacity as shown on the drawings.

4.5 CONFIGURATION/DIAGNOSTIC & LOGGING SOFTWARE

A. Configuration software

- i. The configuration software shall be used for configuring the system and shall be user friendly. The configuration software shall be located in the network controller except for the file transfer facilities.
- ii. Any IBM PC with Internet Explorer latest version will be able to connect to the network controller to access the configuration and logging functions.

B. Fault enquiries can be made via the diagnostic section of the web interface. The configuration software shall be designed in such a way that even first-time users can navigate through the configuration easily.

C. Configuration of system shall be accessed at different authorization levels, namely Administrator, Installer and User

D. Diagnostic & logging software

1. The diagnostic & logging software shall have the main function of monitoring and recording the status of all the units in the PA system. It shall log all events such as calls and status changes of system units, and provide a current view of the system status. This software section shall be used for real-time logging by connecting a PC with web browser.
2. It shall be able to view historical log stored in the network controller including logged events of monitored external devices. It shall be able to acknowledge and reset the events and the acknowledgment and reset actions shall be logged. It shall be able to view the last 200 faults, which are stored on the network controller
3. The call station shall have a fixed microphone to transmit speech over the network and a press-to-talk key. It shall also have a headset socket with volume control for audio monitoring of pre-recorded message and chime signal.
4. It shall have a speech filter with a cut-off frequency at 300Hz to improve intelligibility and prevent clipping of the audio input on low-frequency signals.
5. It shall have an Analog-to-digital audio conversion circuit within the call station and a digital signal processor which can be used for audio processing. It can be used to adjust sensitivity, limiter and parametric equalizer.
6. It shall have three 2-color LEDs for power/error indication, system status and call station status.

4.6 CALL STATION KEYPAD

1. The call station keypad shall be used in combination with the call station basic unit for

making a manual or pre-recorded call to any pre-assigned zones or executing a predefined action. The call station keypad shall have 8 keys.

2. The call station keypad keys can be freely programmed for recall of selection, live speech call, cancel selection, BGM mute, BGM volume control and each key at the call station keypad shall have 2 colour LEDs.

4.7 CEILING /WALL SPEAKER (LOW WATTAGE - 6 WATTS)

| | | |
|--|---|-------------------|
| Rated voltage | : | 100 volts |
| Rated impedance | : | 8 ohms |
| Effective frequency range | : | 70 to 18,000 Hz |
| Opening angle (4 KHz) | : | 70 |
| Power handling capacity | : | 6 watts, 10 watts |
| Sound pressure level at 1 KHz, 1W, 1m | : | 91 dB |
| Maximum sound pressure level | : | 99 dB |
| Speaker diameter | : | 200mm |

4.8 LISTENING ARRAY 25 W COLUMN/WALL LOUDSPEAKER

| | | |
|---------------------------------------|---|------------------|
| Rated voltage | : | 100 volts |
| Rated impedance | : | 333 ohms |
| Effective frequency range | : | 190 to 18,000 Hz |
| Opening angle (4 KHz) | : | 140°/ 18° |
| Power handling capacity | : | 15 watts |
| Sound pressure level at 1 KHz, 1W, 1m | : | 93 dB |
| Maximum Sound pressure level | : | 108 dB |

4.9 35W HORN LOUDSPEAKER

| | | |
|---------------------------------------|---|-------------|
| Rated voltage | : | 100 volts |
| Rated impedance | : | 1000 ohms |
| Effective frequency range | : | 410-3900 Hz |
| Opening angle (4 KHz) | : | 70° |
| Power handling capacity | : | 35 watts |
| Sound pressure level at 1 KHz, 1W, 1m | : | 104 dB |
| Maximum sound pressure level | : | 114 dB |

4.10 CD PLAYER/TUNER

- A. CD Player: Shall be automatic multi-CD player and shall be provided with carousel disk changing system for automatic playing of five (5) CD's. It shall have following features:
- Optic digital output.
 - Advance editing for optimized recording.
 - Full repeat for continuous prolonged playing.
 - Random programming of 32 selections.
 - Frequency response : 50-20000Hz, 0.5dB.
 - Dynamic range : >96dB.
 - S./n ratio : >102dB.
 - Channel separation : >100dB.
 - THD + noise : 0.003%.
 - Phase linearity : 0.2 %.
 - Wow & flutter : Quartz precision.
- B. The digitally controlled FM/AM tuner shall use a frequency synthesizer for accurate tuning and features 15 presets for storing favourite radio stations simultaneous operation of CD player and tuner shall be possible via separate outputs. A mixed output shall provide the CD signal and switches to the tuner signal if the CD stops to prevent an interruption in BGM if the CD is not changed immediately. (optional)

4.11 Microphone:

A. Microphone shall be of the dynamic, low-impedance, uni-directional type with built-in compressor circuit and level indicator to prevent distortion, and suitable for announcement to each or all zones. Microphone shall be desk-top type complete with stand, gooseneck and holder.

- Output: 0dBv, 600ohms, balanced.
- Microphone: gooseneck electric condenser mic with windscreen.
- Make-contact: Required NO. of individual calls + all-call.
- Output control: Required NO. of zones + all-call.
- Chime: 4-tone chime.

4.12 CABLES

- **Speaker Cable - Indoor**

- Multicore insulated, Armoured and sheathed cables with minimum cross section of 1.5 sq. mm for copper conductors. The conductor insulation and the sheath shall be polyvinyl chloride (PVC), and shall be rated for a minimum of 300/500 V, and shall comply with IEC 189.

- **Microphone Cable - Indoor**

- The conductors with a diameter of 0.5 mm shall be of stranded copper wires. Two conductors shall be twisted to a pair which is screened with tinned copper wires.
- The conductor insulation and the sheath shall be polyvinyl chloride (PVC). The insulation resistance shall be minimum of 100 Mega Ohm kW.
- The cables, with required number of pairs, shall be suitable for the installation in conduits, ducts or on cable trays.

5.0 IP BASED CLOSED CIRCUIT TELEVISION SYSTEM

5.1 CCTV system shall be provided for obtaining live view of the authorized / unauthorized entry, unauthorized intrusion, abnormal conditions in process areas and recording the events for future investigation.

- CCTV system shall be integrated into IBMS for escalation of violations in security protocols and unauthorized intrusion into the facility. The integration shall be carried out at higher level without use of dry contact/physical wired connections between the systems.
- The high level interfaces shall be **MODBUS interface** to facilitate higher number of alarms being passed between the systems using data interface. The data interfaces shall be based on industry standard open standard protocols. **Details of such protocols from all the manufacturers shall be declared to IIT for future development.**
- In addition the above systems shall also be integrated to Process Control Systems (PCS) using MODBUS protocol for exchange of data between the systems.

5.2 CCTVSYSYEM -Functional Requirements

5.2.1. The CCTV system shall be used to monitor the perimeter for unauthorized entry in to the premises and associated facilities by breaching the perimeter of the building and common areas.

- Monitor and record personnel and vehicles entering the facility with high resolution.
- Monitor common areas for safety of personnel and critical equipment like DG , UPS etc

5.2.2. The CCTV System shall be an integrated system for the building with IP based camera and centralized server with storage. The system shall be supplied and installed based on PAL standard.

5.2.3. CCTV system shall comprise of

- a. Outdoor Weather Proof PTZ Cameras
- b. Dome/Bullet IR Colour Camera
- c. Min 3MegapixelCameras
- d. Optical Transceivers
- e. Matrix Switcher
- f. Multiplexers (Video Quad)
- g. Keyboard
- h. IP Video Encoders
- i. Network Storage Unit
- j. Video Management System

- k. Server
- l. Ethernet Switches
- m. OPC/Gateway
- n. Monitors

- 5.2.4.** Looped Videos of selected security related cameras shall be extended to a video multiplexer (QUAD). Spot output of the Quad shall be connected to one of the matrix switcher inputs. Security personnel shall be able to view video from multiple cameras on a single screen or multiple screens in IBMS Room.
- 5.2.5.** All the IP Cameras shall be connected an Ethernet switch. Video compression shall be based on H.264.
- 5.2.6.** A separate local area network with dedicated Ethernet switches shall be implemented to create a new domain for CCTV, Access Control System and IBMS System. The new domain shall be termed as IBMS Domain.
Megapixel shall be connected to the IBMS domain Ethernet switches directly.
- 5.2.7.** Video Encoders shall send two streams of video in to the network. One of the streams shall be used for live view and the second stream is sent to the network video recorder for storage. Encoder's shall be intelligent type with motion detection feature for alerting in case of movement or change in the area being viewed.
- 5.2.8.** It shall be possible to configure at least three zones on the area being viewed by the camera. The size of the zones shall be configurable. Encoders shall also provide facility to initiate an alarm using motion detection in any single zone or a combination of any two or three zones.
- 5.2.9.** Network Video Storage unit shall be sized to retain 30 days of video from all the cameras. The archive video shall be stored with 12fps (frames per second) for normal conditions and 25fps for alarm conditions.
- 5.2.10.** Pre alarm and post alarm video shall also be stored at 25fps. The pre alarm and post alarm period shall be programmable in the CCTV System.
- 5.2.11.** Video Management Server shall manage all the IP encoders, Network storage units and the client workstations for remote management, authentication of clients, moving of cameras based on alarms from various systems according to the Preset positions. Video management server and Network Storage Unit Make and configuration shall be according to the CCTV system manufacturer recommendations.
- 5.2.12.** CCTV central equipment shall be installed at the IBMS Room at Block E. Contractor shall provide and install the servers and engineering workstations located in the CCTV central equipment

cabinets.

5.2.13. Remote viewing of archive video and live video from the IP cameras shall be possible at the following locations.

- IBMS Room
- Authorized personal at client side like FMS team

5.2.14. Building indoors shall be provided with Indoor IP bullet min 3 Megapixel cameras to monitor the common area's movement like lift lobby.

5.2.15. Min 3 Megapixel cameras shall be installed at the entry gates to monitor personnel and vehicles entering the facility. This is in order to clearly identify personnel and vehicle numbers, vehicle types in case of incident investigation. Two cameras shall be positioned at difference heights to view inside of Trucks and Cars driver's cabin.

5.2.16. All Outdoor cameras Maximum coverage shall be achieved by positioning of cameras in optimised locations. Position of cameras shall be closely coordinated with the operations team and security team during the execution stage of the project.

5.2.17. Megapixel cameras shall be connected via CAT6 cables to the IBMS Domain Ethernet Switch.

5.2.18. To ensure stability in the picture all outdoor cameras shall be installed on wall using with mounting bracket to a maximum possible extent or else mounting GI poles.

5.2.19. Perimeter Security cameras shall be mounted on the boundary wall. Boundary wall shall have reinforced concrete columns for installation of cameras.

5.2.20. The IP Based Video Management System shall provide an open standard interface for high level integration with Access Control and IBMS system for moving cameras to preset positions in case of an alarm or an event.

5.2.21. IBMS Room shall be provided with 36" High definition LED monitors mounted on wall for viewing of video and Client Workstation.

5.3 TECHNICAL REQUIREMENTS

5.3.1 PTZ OUTDOOR CAMERAS

- Camera shall be high resolution 1/3" CCD colour cameras. PTZ cameras shall be provided with facilities that include pan, tilt and motorized zoom lens.
- Contractor shall submit the calculation the lens and focal length requirements to meet the coverage required during the execution. However the motorized zoom lens shall offer a minimum 20:1 zoom ratio, continuously variable between 10mm (wide angle) and 200mm (telephoto) as minimum. The camera shall have auto focus and auto iris features.

- iii. Pan rotation shall be 360 Deg continuous endless panning and tilt rotation shall be at least +/- 90 Deg from Horizontal position. The camera shall support Variable high speed Pan and Tilt functions such that the target can be spotted and focused instantaneously when a preset function is triggered or when the operator is moving the camera.
- iv. Programmable pre-set positions for pan, tilt and zoom shall be available that allows the operation of a surveillance 'tour' of each similarly equipped camera. The camera shall support a minimum of 125 preset positions and 6 tours. The preset positions shall include Pan, Tilt, Zoom with Autofocus and Auto Iris. Clear picture shall be visible on the screen immediately after triggering a preset position.
- v. The cameras shall be installed in an environmental housing to meet the area certification and equipped with wind screen, demister, sun shield and wipe.
- vi. Cameras shall be of Day/Night Wide Dynamic Range type and shall operate satisfactorily at light levels above 0.05lux. In the event of light levels being lower than that able to support colour reproduction, the camera shall be capable of automatically switching from colour to monochrome operation that enables the camera to operate at light levels of 0.001lux. The cameras shall be fitted with an auto-iris function to compensate for vary in light level conditions.
- vii. Cameras shall be installed at suitable position in alignment with the lights such that a clear view is obtained on the monitor.

5.3.2 MEGAPIXELBULLETCAMERAS

- i. Megapixel fixed cameras shall be used at the security gates, Common areas and IBMS room for monitoring and high resolution recording of personnel and vehicles entering the facility. The cameras shall be positioned properly to identify personnel and vehicle number plates by zooming into the picture for investigation in future.
- ii. The cameras shall provide a minimum of 3 Megapixel resolutions with 25fps. The camera shall support various resolution settings in the configuration.
- iii. The cameras shall be powered from the IBMS domain Ethernet Switch using Power over Ethernet (POE). External Power supply shall not be used. The camera shall support H.264 standard. It shall provide a minimum of two video streams with one fixed high resolution for recording and second with configurable resolution for live viewing of video.
- iv. Manual Pan Rotation shall be +/- 180 Deg continuous and Manual tilt rotation shall be at least +/- 90Deg with camera looking down.
- v. Contractor shall submit their calculation the lens and focal length requirements to meet the

coverage required and determine the black spot.

- vi. Cameras shall be of IR LED type @ 30 mts and shall operate satisfactorily at light levels above 0.5lux. In the event of light levels being lower than that able to support colour reproduction, the camera shall be capable of automatically switching from colour to monochrome operation that enables the camera to operate at light levels of 0.03lux. The cameras shall be fitted with an auto-iris function to compensate for varying light level conditions.
- vii. Cameras shall be installed at suitable position in alignment with the lights such that a clear view is obtained on the monitor.

5.3.3 NETWORK STORAGE UNIT

- i. Network storage unit shall be connected to the IBMS domain Ethernet switch using 10/100/1000Base Ethernet interface.
- ii. The storage unit shall be sized to accommodate continuous video storage for 30 days as per the requirements be low or **52TB (Tera Bytes)** whichever is higher.
- iii. 12fps for normal video 25 fps for alarm video with configurable prealarm and post alarm video duration. The system shall record a minimum of 15 minutes pre alarm and 15minutes of post alarm video storage at 25fps.
- iv. Alarm duration shall be 1 hour per day per camera for storage sizing purposes. The storage unit shall be provided with RAID 6 storage data protection against hard disk failure. The hard disks shall be **hot swappable**.
- v. The system shall have built in automatic defragmentation routines to avoid data getting fragmented.
- vi. The system shall record H.264 Compressed video from Cameras.
- vii. The storage unit shall have redundant hot swappable power supply and fan units. The storage unit shall support tagging of video.
- viii. The network storage unit shall support a recording through put of 165Mbps to 330 Mbps of read through put at all times. There shall be no limitation on the number of cameras being used with the storage unit for recording or reading activity.
- ix. The network storage unit shall be fully manageable using the Ethernet interface.

5.3.4 VIDEO MANAGEMENT SYSTEM SERVER

- i. The Video Management System server shall be an integrated system that manages all the CCTV system components IP cameras, Network Storage Unit. It shall
 - Act as a Dynamic Host Configuration Protocol - DHCP server allocating IP address to all the CCTV Equipment

- Hold configuration data base of the systems.
- Provide authentication, control and facilitate interaction between all the devices with in the CCTV network.
- Act as an NTP server for service date and time to various system components. Shall be capable of synchronising with external high accuracy time source.
- Shall manage security for all devices, clients, login, passwords, user groups, user privileges,
- Maintain a data base of device related alarms and associated videos for easy access in future.
- Maintain fault logs for various faults within the system.
- Manage storage unit of the CCTV system.

5.3.5 CLIENT AND ENGINEERING WORK STATIONS

- i. The work station shall work as a HMI (Human Machine Interface) for the Video Management System. The system shall
 - Provide live and archive viewing of video from all the cameras.
 - Provide full access to all the IP cameras including PTZ Control, Iris and Focus control, Camera configuration, Preset configuration and Preset positioning etc.
 - Have facility to load MAPs of the sites in various file formats including GIF, TIF, BMP, JPEG and other Provided facility to have interleaved maps with embedded icons / hyperlinks to camera and alarm device icons with expanded view of a part of the facility.
 - Provide inter active configurable icons with facility to associate them with devices. The icons shall support controlling of devices, know device status including alarms.
 - Support dual monitors. In general one of the monitors shall be used for MAP and Icons view and the second monitor for viewing of video from various sources.
 - Facilitate writing of scripts and associating the scripts with alarms, icons and various devices.
 - Act as virtual matrix and support mapping of video from any source to any monitor.
 - Act as a virtual multiplexer (QUAD) and support viewing of up to 16 cameras in a single screen simultaneously.
 - Support time synchronised play of stored archive video of up to 16 cameras. Simultaneous viewing of standard resolution and megapixel cameras must be possible on the same display.
 - Support exporting of snap shots, video in various file formats including AVI, BMP and JPG. The exported video shall be stored in transportable storage devices like CD/

DVDROM, USB etc.

- Provide extensive alarm handling features including provision of help text for showing the handling procedure for the specific alarm, write notes and feedback while activating or acknowledging the alarms.
 - Provide the ability to control and program any camera equipped with PTZ.
- ii. The workstation shall be capable of the following operations
- Manually control the PTZ
 - Set the pan /tilt home positions form annual or alarm activation
 - Automatically control the cameras through an alarm trigger
 - Ability to set multiple preset positions
 - Ability to set multiple tours
 - Remotely set and clear the movement limits of the pan / tilt mechanism from the control room, through a telemetry unit at an outdoor camera site
 - Adjust the zoom lens graphics file formats.
 - Ability to control the camera menu and setup the camera through the IP video security system
- iii. The workstations shall be provided with two 21" High Definition LCD colour monitors with DVI interface for view of standard resolution and megapixel cameras. Client work station shall only have privileges to use the system. Engineering workstations shall be provided with privileges to modify configuration of the entire CCTV system and associated components.
- iv. It shall be possible to select any monitor to display live full screen single, sequential or multiple pictures from any combination of cameras selected from the operator work station keyboard.

5.3.6 ETHERNETSWITCHES

- i. Ethernet switches shall be minimum of 24 ports x 100 Base T and 4 x 1000 Base uplink interfaces.
- ii. Suitable optical interface modules shall be provided for interconnecting switches at various locations.
- iii. Connectivity to network storage unit and Client workstation shall be 1000 Base T.
- iv. Cameras and video encoders shall be connected to the switches using 100 Base T ports.

5.3.7 GATEWAY

- i. CCTV system shall be equipped with an Open Process Control or a Gateway device which can exchange data between CCTV system Access Control System and Perimeter Intrusion Detection system for meaningful integration of the three systems.
- ii. The integration shall facilitate automated response of various security systems to unauthorised intrusion alarms and escalation of alarms to Security personnel for further action.
- iii. Integration shall be at a higher level using data interfaces, various protocols and exchange of data between systems. Use of dry contacts for communicating alarms between systems is not acceptable.

5.3.8 NETWORK PoE SWITCH (10/100Mbps):

The network should have following features and specifications

FEATURES:

1. IEEE802.3af Power over Ethernet (PoE) standard compliant (DTE power via MDI)
2. Complies with IEEE802.3 and IEEE802.3u standards
3. 24 x RJ-45 10/100Mbps auto speed switch ports
4. Built-in 4 x PoE ports with maximum 15.4W per port
5. Supports PoE Power Device (PD) classification identify
6. Provides over current and circuit shorting protection
7. Supports N Way protocol for speed (10/100Mbps) and duplex mode (Half/Full) detection
8. All ports with auto MDI-X function for switch-to-station & switch-to-switch connection with non cross over cable
9. Supports full and half duplex operation on all ports
10. Operates at max. packet filtering and forwarding rate
11. Store and forward transmission method
12. Easy-to-read LEDs provide instant operating feedback
13. Supports 1K MAC address entries in whole system
14. 768K bits buffer memory
15. Desktop size with 19" rack mountable bracket
16. Convenient internal switching power, 100 ~ 240V AC

6.0 ACCESS CONTROL SYSTEM

6.1 ACCESS CONTROL SYSTEM (ACS):

The Access control system shall have been covered the IBMS Room and Security Main Entrance with Smart cards system for the commercial.

Areas to be covered:

- MAIN ENTRY FOR EACH ODU

6.2 ACCESS CONTROLLER-MODULAR TYPE

General Specification

- The Access Card Controller shall be of modular design with a download software built-in so that the application program can be easily changed and downloaded without the physically touching the controller itself.
- The connection from the Access Card Controller to the Access Card system server running the management software shall preferably by Ethernet 10/100/1000 Base T or RS-485.
- The Access Card Controller shall have a 16-characters liquid crystal display (LCD), and a button provided for selective display to show all its network parameters and actual status like:
 - a. IP address of the controller
 - b. MAC address of the controller
 - c. DHCP on/off
 - d. Status of all the inputs connected to it
 - e. Status of all the outputs connected to it
 - f. Online and Offline status of the controller
 - g. Firmware version
 - h. Date and Time - A real time clock (RTC) that will adjust itself to leap year computations automatically.
- The Access Card Controller shall support and include a standard Compact Flash (CF) memory card for storing cardholder data and access events. The CF memory card must be formatted with a standard FAT file system, to allow reading them using a standard card reader connected to a computer, if the Access Card Controller fails.
- The Access Card Controller memory shall under no circumstance lose a single, not even the last transaction when power fails.
- The Access Card Controller and all devices connected to it shall continue to operate and control access in off-line mode, even if the computer network fails.

- The Access Card Controller memory shall store database that has a capacity with a minimum of 80,000 cardholders (upgradeable to 400,000), each having a programmable 10 digits (personal Identification Number) PIN codes.
- The cardholder database shall be upgradeable by exchanging the CF card. The system shall automatically detect the size of the CF-card.
- The Access Card Controller provided shall support the connectivity of up to 4 standard Wiegand interface readers or up to serial interface readers operating on RS 485 bus technology.
- The Access Card Controller shall provide minimum eight programmable I/Os on board, and shall be expandable to 56 each, using I/O extensions.
- All inputs provided shall be configurable to provide 2- or 4- status selectable, via End-Of-line (EOL) resistors, namely:
 - a. Input Closed
 - b. Input Opened
 - c. Input Shorted (provided in 4- status mode)
 - d. Input Tamper (Cable cut, provided in 4- status mode)
- EOL resistor's values shall be flexible selectable in the Access Control System management software during configuration.
- UPS shall be provided to continually supply power to the Access Card Controller and readers for a minimum of 2-hours, in the event of power failure subject to retrieve the power.
- The Access Card Controller shall generate a transaction record and save them in the memory for every alarm, they include:
 1. Time/date of occurrence and restoration.
 2. Location of alarm sensors.
 3. Surveillance of Employees/Regular Visitors/Casual Visitors: All personnel visiting the buildings may be divided into three categories i.e. Employees, Regular Visitors (who are issued passes for specific period of not more than 03 months) and Casual Visitors (who are issued passes for the day). The system should be capable of the following :
 - a. Provision of unique Access Card having smart card technology.
 - b. Read facility.
 - c. Surveillance and recording of entry and exit of personnel through dedicated access doors.
 - d. Restricting access of visitors to specific office by creating electronic barriers.

- e. Detection of a visitor who doesn't meet designated officer or doesn't report back at reception/exit gate after meeting the officer in the given time frame.
- f. Signage System within the building for Zone indication and evacuation.
- g. A Central Video Display Unit and integrated public address system for parking areas and building under the control of IBMS room or designated person on a single platform.
- h. The Platform should provide for the flexibility of sending alert message/announcement to particular individual/zone/entire buildings.
- i. Power back up and inbuilt redundancy for each hardware. Provision for this feature may be in-built in the system.
- j. Integration of Pass Section – security cabin , Reception Offices and Main security officer : System Architecture should cater for integration of Pass Section, Reception Offices and the Central Control Unit for effective Pass and Vehicle management .
- k. The ACCESS CONTROL SYSTEM shall be so designed that any failure of any sub-system shall not affect the normal operation of another sub-system; they shall continue to operate normally in a non-degraded mode.
- l. The System Integrator/Firm submitting the Access control system Application Software proposed for the project shall show proven operational record of such nature in their bid documents.
- m. The Access control software with GUI shall be capable to integrate with Facility management software, visitors management system, Time and attendance software etc (which is inclusive in this package).
- n. The Software licensee will be multiuser package (N+2) with min capacity of 50000 card holders.

6.3 SMART CARD READER:

General Specification

- a. The Smart Card Reader shall be of ruggedized design, having weatherized polycarbonate enclosure or similar protection to withstand harsh environments for both indoor/outdoor used and provides a high degree of vandal resistance.
- b. The Smart Card Reader shall provide two-factor authentication with the combination of a proximity [contactless smart] Card

- c. The Smart Card Reader together with the contactless smart card shall support operation with 1:1 verification mode identification mode.
- d. The Smart Card Reader shall continue to operate to control access in off-line mode. When the network connection restored, the reader shall automatically upload and synchronize its database with the server.
- e. The Smart Card Reader provided shall have a read tolerance of at least ± 30 degree.
- f. The same Smart Card Reader provided shall be able to be used for both access control and as an enrolment station.
- g. The Contractor shall supply and install the software provided shall be integrated to the SACMS for access control and monitoring.
- h. The card reader shall be based on contactless smart card 13.56MHz technology for connection to the AMC with Wiegand interface.
- i. The card reader provided shall be capable of reading CSN number in 32-bit format in accordance with ISO standard 14443 Series.
- j. The data transfer between the contactless smart card reader and smart card shall be encrypted.
- k. Power requirement: 10 - 16Vdc.
- l. The card reader shall have a read range of at least 3".
- m. The response time to unlock the door after a card is presented to the card reader shall not exceed 1.0 second \pm 0.5 second.
- n. The card reader unit shall have an integral keypad with beeper, multi-colour LEDs.
- o. The keypad shall have back-light to allow easy viewing, in case of power blackout. It shall lights automatically upon pressing any key or when a card is presented to the reader.
- p. The overall thickness of the card reader unit shall not exceed 30mm.
- q. Certification: CE and UL Listed.

Scope of Works

1. The scope of work for this contract shall include design, procurement, installation, integration, testing, commissioning and associated services for a fully operational Access Control System as per manufacturer's guidelines, codes described within this document, that provide central security management, integrated control and remote monitoring of the intended site, including the interfacing of all existing facilities.
2. All necessary tools, equipment, hardware, software and software user licenses required as describe in this document for the complete installation of the Access control system shall be supplied and installed under this contract.

3. The entire Access control system and sub-systems including all its hardware, peripherals, software and software licenses as specified within this document shall be supplied and provided as part of this contract.
4. The extent of the contract works shall include necessary cabling to interconnect the various security systems, central equipment, hardware and devices and the like for it to provide the performance as specified in this contract document.
5. All cable enclosures including conduits, cable trays, wall boxes, termination panels and the like that are required to facilitate and complete the installation shall be supplied and installed as part of this contract.
6. All proposed security field devices installation shall not only to operate functionally, they have also to blend with the interior design of the building. The contractor shall liaise directly with the owner, architect, consultant and other services contractor at site in coordination of the installation work and ensure such requirements are harmonized.
7. All installations carried out by the contractor shall conform to the national standards and code of practices.
8. The contractor shall cooperate and work closely with site safety officer to ensure safe working environment at all times.
9. The Contractor shall upon completion of the installation provide complete training with documentations on the configuration, operation and maintenance of the systems to the required operators assigned by the Client.
10. All the hardware components under the system covered shall have 24 months of onsite warranty and the systems shall have antivirus software with facility of offline Updation.
11. The Contractor shall ensure that the Access control system must be expandable in the following areas:
12. The system shall be designated to allow foreseeable organizational changes and procedural changes beyond current plans.
13. Additional hardware units shall easily be added without any modification to the existing hardware, software and network configuration.

Functional Requirements

1. The Access control system shall be SQL based, PC-based system based on Professional Versions of the latest and viable Windows Operating Systems.
2. The Access control system shall comply to the strict regulation and adapting state-of-the-art security technologies, the highest level of reliability and integrate to networking

infrastructures such as the Intranet, Internet, LAN/WAN. All interfaces within the Access control system shall be based on TCP/IP network protocol connectivity over the corporate intranet/internet/LAN/WAN.

3. The main function of the Access control system shall be to control, monitor and raise alarm of all designated access to the selected doors, areas or buildings.
4. The Access control system provided shall support industry standards for database, networks, credential printers, video cameras and more, such as OPC, Auto CAD, HTML, ASPX, and MS-SQL.
5. The Access control system shall preferably be of web-server and browser application based on a truly open protocol and non-proprietary industrial standards.
6. The Access control system shall run using a standard Microsoft SQL Server database for configuration and central event logging. It must be modularly designed, providing an individual system for specific requirements.
7. The Access control system shall only require a single hardware license key on the central login/database server for system operation. The feature licensing is a single license file. The system's functionality can be extended by exchanging that file. Hardware or software keys are required at the client workstations.
8. The Access control system shall be of modular design providing the flexibility allowing user to add or remove any components and/or controlled functions, in the event when operating requirements changes as system expand.
9. The Access control system shall allow user to define operation of one or combination of Sub-System as on required basis and also set protocol for such operations.
10. Simple integration to other non-security based sub-systems adapting industry standards or open protocols, preferably OPC- compliant shall be supported. Examples of the systems are like Process Management, Building & Administration Management or telephony (PABX) system.
11. The Access control system shall allow the monitoring of vital IP network devices, such as servers, workstations, printers, routers, or more using standard SNMP traps and existing OPC-compliant drivers.
12. The proposed Access control system shall fulfill the functions and specifications described in this document. In particular, the proposed access controller shall be equipped with all common interfaces such as, Ethernet and RS-485 for connection to the Access Control System server running the management software.

13. The Access Control System shall allow the control of door entry access by Smartcard Reader and from the Access Control System workstation.
14. The Access control system shall support up to four different types of card formats simultaneously. The number of each format supported shall be unlimited.
15. A locally mounted door release push button shall be provided for purpose of exiting at selected doors as defined by the owner or as indicated on the drawings.
16. For highly secure areas as further specified or indicated on the drawings, exit card reader shall be provided to allow an exact tracking of people going in & out the predefined area.
17. In the event of emergency, card holder's access muster report shall be generated, to provide an overview of the location where each card holder is in. This allows the security manager to track the exact and count the number of people within the disaster areas so to assist in the evacuation.
18. All access doors shall have an emergency break-glass door release installed to unlock the door for exit in the event of emergency. In addition, all dedicated doors along the escape route shall automatically open during fire alarm activation.
19. The Access control system shall monitor and record in database all movements and activities at each control point.
20. The Access control system shall provide configuration and programming of access groups, where each access group contains a list of control points or access doors to which a card holder has authorized access.
21. The Access control system shall provide configurable time schedules to have the flexibility for programming automatic locking and unlocking of any access controlled doors, as well as activating and de-activating of card holder settings for restricting any access groups from entering certain areas with the pre-programmed time model.
22. The time schedule shall include holiday facilities to allow user programming for public holidays and user definable special holidays. All schedules shall be definable by day, hours and seconds.
23. All other available security subsystems if installed shall be integrated with the Access control system to form the complete integrated Security Access Control Management System shall be provided and installed by the Contractor under this contract.
24. The Contractor shall ensure that the system must be expandable and by adding new component to the existing system will not affect its normal operation.
25. The Access control system design shall allow the security access within the building compound to be monitored and controlled by the designated security control rooms.

26. There shall be provision for alarm generation whenever there is some attempt to tamper with the system or some unauthorized intrusion into the system.
27. Reports shall always be readily available and owner shall be able to request for the reports on exactly what information from the report is required with the use of event filters.
28. The system shall be a flexible and user-friendly workstation providing user(s) with a standard browser based text and Graphical User Interfaces (GUIs) for alarm monitoring and control. Such GUIs shall be the core of the entire Access control system that shall interface to all other available security sub-systems, such as CCTV Surveillance and Recording System, Intrusion Detection, Public Address System, Visitor Management System, Parking Lot Management, Explosive and NBC Detection and more as required by the user.
29. The system shall be provided to control access into designated security controlled doors only by personnel with a valid access card and within valid time schedule. All access cards shall be authenticated against the central and/or local database before granting access.
30. All door access activities shall be logged into the central database. Any unauthorized attempt or invalid card used shall be reported to the Access control system, including door held and forcible entry as priority alarm transactions.
31. With the interface to the CCTV Surveillance System, live images from the camera installed at the door location shall be displayed at Access control system GUI during door alarm activation. It shall also be possible to select live view of the camera to view the person's face before activating (manually unlocking the door via icon control on the GUI) and granting during door access request.
32. All equipment within the Access Control System shall continue to operate for at least 2 hours in the event of main AC power failure. The Contractor shall take in consideration the power consumption at each point of installation when determining the size of the Uninterrupted Power Supply (UPS) as backup power. Power backup will be provided by the owner to this extent.
33. The Access control system provided shall contain all the features and requirements specified, but not limited to, in this document. The Contractor shall highlight and update the owner of any new or special functionality that are useful and relevant to the user's application but not found in any part of this document.

7.0 COMMUNICATION SYSTEM

All category 6 information outlets designed for termination of 4-pair balanced twisted-pair category 6 copper cables must possess the following characteristics at the minimum:

7.1 CAT 6 INFORMATION OUTLET (WORK AREA COMPONENT) SPECIFICATIONS:

1. The CAT 6 information outlets should comply fully or exceed with category 6 connecting hardware specifications for all pair combinations up to 600 MHz.
2. The lead frame design used for information outlet should have advanced pair balancing design with linear crosstalk response. It should ensure full compliance with category 6 specifications.
3. The information outlets should use strain relief mechanism to simplify and reduce installation time protecting the quality of the termination simultaneously.
4. The termination cap shall provide strain relief on the cable jacket, ensure cable twists are maintained to within 1/2" (12.7. mm) and include a wiring scheme label.
5. The information outlet should be backward compatible and should comply with the standard IEC 60603-7 for backward compatibility.
6. All outlets should be compatible with both T568A and T568B wiring options.
7. The jack shall be able to be re-terminated a minimum of 10 times and be available in multiple colours or more for colour-coding purposes.
8. They shall be universal in design, accepting 2, 3, or 4 pair modular plugs without damage to the outer jack contacts.
9. The jacks shall terminate 4 pair 23 or better AWG 100 ohm solid unshielded twisted pair cable.

7.2 UTP Cabling System

| <u>Unshielded twisted pair cabling system, TIA / EIA 568-C.2 addendum Category 6 Cabling system</u> | | |
|---|--|-------------------------|
| Parameter | Technical Specification | Compliance with remarks |
| Networks Supported | 10 / 100/1000 Ethernet, 155 Mbps ATM, 1000 Mbps IEEE 802.3ab Ethernet, and Cat 6 Gigabit Ethernet | |
| Warranty | 25-year Performance warranty; Warranty to cover Bandwidth of the specified and installed cabling system. | |

| | | |
|---|---|--|
| Performance characteristics to be provided along with bid | Attenuation, Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR for 4-connector channel | |
| Site Certification | Site certification to be done by OEM certified installer for 25 years and certificate to be issued. | |
| Conductors | 23 AWG solid bare copper or better | |
| Insulation | Polyethylene | |
| Jacket | Sheath Fire retardant PVC Compound (FRPVC) Flame Rating : 60 deg. C As per UL 1685 CM | |
| Pair Separator | Cross-member fluted member | |
| Approvals | UL tested for TIA/EIA-568C.2 | |
| | ETL verified to Cat 6 for channel | |
| | Zero Bit Error verified by ETL. | |
| ISO certification | All Quoted product and Brand should have ISO certification for manufacturing | |
| Operating temperature | -20 Deg. C to +60 Deg. C | |
| Frequency tested up to | Minimum 600 MHz | |
| Packing | Box of 305 meters | |
| Delay Skew | 35ns MAX. | |
| Impedance | 100 Ohms + / - 6 ohms, 1 to 600 MHz | |
| Performance characteristics to be provided along with bid | Pair-to-pair and PS NEXT, ELFEXT and PSELFEXT, Return Loss, ACR and PS ACR | |
| Attenuation | 22.8dB/100m at 250MHz | |
| | 29.4dB/100m at 400MHz | |
| | 39dB/100m at 600MHz | |

7.3 Patch Chords:

CAT 6 Modular Chords Specifications

1. The modular cord should be compatible with both T568A and T568B wiring schemes
2. The modular cord should have strain relief boots with a latch guard or a one-piece, tangle-free latch design to protect plug latch from snagging when pulling cords through pathways or cable managers
3. All the modular cords should be factory assembled cords made out of stranded cable and should be 100% tested to 600 MHz
4. The modular cords should be made using excellent plug-to-cable strain relief without causing pair deformation.

5. The modular cord should provide strain and bend relief mechanism to improve the plug-to-cable retention and maximum performance by preventing pair deformation, as caused by mechanical strain.
6. The modular cord boots should be coloured for additional colour-coding.
7. The modular plugs should provide long-term resistance to corrosion from humidity, extreme temperatures, and airborne contaminants.
8. The modular cord plug geometry should meet FCC 68.500 and IEC 60603-7 specifications for modular plugs.
9. The cordage and boots should be available in a wide range of colours for easy identification.
10. The Category 6 Stranded cable used to manufacture the modular patch cords should meet the specifications set forth by both ANSI/TIA/EIA-568 C clause and ISO/IEC 11801:2002.
11. The modular patch cords should have compliance to both '568 and '11801 to ensure minimal cable impedance variation and superior return loss performance.
12. All CAT6 Patch Chords shall be 2m/ 5m standard length and have a standard as recommended by the client at the time of execution.

7.4 Workstation / Equipment patch Cords

| Type | Unshielded Twisted Pair, Category 6, TIA / EIA 568-C.2 | |
|-----------------|---|-------------------------|
| Parameter | Technical Specification | Compliance with remarks |
| Conductor | 24-26 AWG stranded copper with Cross-member fluted member for Pair Separator | |
| Length | 1 meter, 2 meter and 3 meter with RED colour | |
| Plug Protection | Matching coloured snag-less, boot to maintain bend radius | |
| Warranty | 25-year component warranty | |
| Category | Category 6 | |
| Plug | | |
| Housing | Clear polycarbonate | |
| Terminals | Phosphor Bronze with gold plating , 50 micron" gold over nickel | |
| Load bar | PBT polyester | |

| | | |
|---------------------|------------------------------|--|
| Jacket | PVC | |
| Insulation | Flame Retardant Polyethylene | |
| End point connector | Factory standard connector | |
| Approvals | UL, ETL certificates. | |
| Material | ROHS compliant | |

7.5 Patch Panel

All termination panels shall facilitate cross-connection and inter-connection using modular patch cords and shall conform to EIA standard, 19-inch relay rack mounting requirements.

7.6 CAT 6 JACK PANEL SPECIFICATIONS:

1. The jack panel specifications should meet or exceed EIA/TIA category 6 connecting hardware specifications for all pair combinations up to 600 MHz
2. The Jack Panel should be predominantly silver in colour and should be mountable directly to an EIA standard 19-inch relay rack or cabinet.
3. The Jack Panel should have Icon label holders and designation labels as part of the standard device.
4. The modular outlets should be FCC CFR 47 part 68 subpart F and IEC 60603-7 compliant and should have 50 micro inch gold plated contacts.
5. The Jack Panel should be backwards compatible – can be used with modular cords for category 6e compatibility.
6. The Jack Panel should support universal wiring for both T568A and T568B termination methods.
7. The Jack Panel should incorporate shuttered jacks for superior aesthetics and dust exclusion when not equipped with patch cords.
8. The Jack Panel should also have Metal rear cable manager to properly guide cables to point of termination and come with individual application and colour Icons for identification
9. The Jack Panel should support a strain relief mechanism to simplify and reduce installation time protecting the quality of the termination simultaneously. The Jack Panel should have individual jacks to allow for change-out in the event of damage to any jack- without disturbing the other jacks in the panel.

10. The jacks should have lead-frame design to ensure full compliance and consistency with category 6 specifications.

7.7 UTP JACK PANELS

| Type | 24-port, Unshielded Twisted Pair, Category 6, TIA / EIA 568-C.2 | Compliance with remarks |
|-------------------------------|---|-------------------------|
| Parameter | Technical Specification | |
| Ports | 24 / 12 / 8 | |
| Port arrangement | Keystone type. Ports must be individually replaceable with RED colour | |
| Category | Category 6 | |
| Circuit Identification Scheme | Icons on each of 24-ports | |
| | | |
| Port Identification | 9mm or 12mm Labels on each of 24-ports (to be included in supply) | |
| Height | 1 U (1.75 inches) | |
| Modular Jack | 750 mating cycles | |
| Wire terminal (110 block) | 200 termination cycles | |
| Accessories | Strain relief and bend limiting boot for cable | |
| Materials | ROHS compliant | |
| Housing | Polyphenylene oxide, 94V-0 rated | |
| Wiring blocks | Polycarbonate, 94V-0 rated, Spring Contact: Phosphor bronze 50m" gold | |
| Jack contacts | Phosphorous bronz | |
| Panel | Black, powder coated steel | |
| Approvals | UL , ETL and 3P | |
| Termination Pattern | TIA / EIA 568 A and B; | |

| | | |
|---|--|--|
| Performance Characteristics to be provided along with bid | Attenuation, NEXT, PS NEXT, FEXT and Return Loss | |
|---|--|--|

7.8 CONNECTING BLOCKS

- i. The connecting block shall facilitate cross-connection and/or inter-connection using jumper wire or patch cords. Voice Termination and Cross-connects
- ii. The network cabling system shall be comprised of modular connectors in support of high-speed networks and applications designed for implementation on copper cabling.
- iii. The voice patch panel shall utilize fully interchangeable and individual connector modules that mount side-by-side to facilitate quick and easy moves, adds, and changes.
- iv. The panel should be designed using a high-density patch panel saving the space in the Telco room and offering better manageability.

7.9 CABLE

7.9.1 CAT 6 CABLE SPECIFICATION

CAT 6 cable should provide significant headroom above all TIA/EIA and ISO/IEC category 6 transmission performance specifications. The cable should meet or exceed the proposed requirements of ANSI/EIA/TIA568-C Clause. Transmission Performance Specifications for 4-Pair Category 6 Cabling

Insulation: Conductor Insulation: Thermoplastic PE

Conductor: 23-24 AWG solid bare copper

Isolation Member: To maintain pair geometry before, during and after installation for optimal NEXT Loss performance

Rip Cord: Should be applied longitudinally under cable jacket

Highlights:

- It should be swept tested from 1 to 650 MHz
- Transmission performance should be verified
- It should have round jacket
- The jacket material should be lead free

PACKAGING

- 1000 ft. reel in a box or 3000 ft. reel
- Weight Thermoplastic PE Jacket – 29-lbs/1000 ft.

STANDARDS COMPLIANCE

- ISO/IEC 11801: 2002 (Category 6)
- ANSI/TIA/EIA-568 C Clause (Category 6)

ETHERNET APPLICATIONS SUPPORT

- 1000BASE-T • 100BASE-T • 10BASE-T

Should support any application designed for category 6 or lower cabling

JACKET

- Nominal Cable O.D : Thermoplastic PE Jacket – 0.222 in.
- Jacket Material: PVC

ELECTRICAL CHARACTERISTICS

| | | |
|--------------------------|---|--------------------------|
| DC Resistance | - | < 9.38 Ohms/328 ft. |
| DC Resistance Unbalance | - | 5% |
| Mutual Capacitance | - | 5.6nF/328 ft. |
| Capacitance Unbalance | - | <330 pF/328 ft. |
| Characteristic Impedance | - | 1 ≤ f ≤ 100: 100 ± 15% |
| | - | 100 ≤ f ≤ 160: 100 ± 20% |
| | - | 160 ≤ f ≤ 250: 100 ± 22% |
| | - | 250 ≤ f ≤ 350: 100 ± 25% |
| NVP | - | CMP – 70% CMR – 68% |
| LCL | - | 30-10Log(f/100)dB |

| PHYSICAL PROPERTIES | | CMP | CMR |
|---|---|---------------|---------------|
| <u>Pulling Tension 25 lbf(max) 25 lbf(max)</u> | | | |
| Bend Radius | - | 1 in. (min) | 1 in. (min) |
| Installation Temperature | - | -32 to 140 °F | -4 to 140 °F |
| Storage Temperature | - | -4 to 167 °F | -30 to 167 °F |
| Operating Temperature | - | -4 to 140 °F | -30 to 140 °F |

7.10 OPTICAL FIBRE PRODUCT SPECIFICATIONS

In addition to meeting the specifications outlined in ANSI/TIA/EIA-568-C 2 and ISO/IEC 11801:2000 Ed2.0, the requirements in this section must also be met for all applicable optical fibre products as listed below.

All optical fibre connectors shall meet the following characteristics:

7.11 FIBRE ST AND SC CONNECTORS

1. The ST and SC single mode connectors should support a variety of termination methods...epoxy, anaerobic adhesive etc.
2. The adhesive system should not have a longer cure time (preferably 30 – seconds or less).
3. All connectors should utilize precision zirconia ceramic ferrules and include protective dust caps.
4. The precision zirconia ceramic ferrules utilized in ST and SC multi mode connectors should enable a typical insertion loss performance of 0.10 dB and 30 dB, typical return loss, using a manual polishing method.
5. The Single mode connectors should typically achieve 0.20 dB insertion loss and 55 dB return loss using a simple manual polishing method.
6. The SC Duplex, SC Connector should be UL 94V-0 compliant and should allow each connector to be removed individually. The duplex connector should give access to user so that an individual connector can be removed and re-terminated without disturbing the adjacent connector
7. The ST coupling nut should be metallic to assure optimum durability and engagement. The ramps should be radial to facilitate mating/de-mating
8. The SC outer housing and connector body should be colour coded in accordance with ANSI/TIA/EIA-568-C.Clause and ISO/IEC 11801:2002.
9. The strain and bend relief boots should be provide to improve plug-to-cable retention and to maximize performance by preventing fibre deformation caused by mechanical strain.

10. The SC simplex connectors should employ an outer housing that is colour-coded in accordance with TIA/EIA-568-C clause and ISO/IEC 11801: Edition 2000 requirements (beige for multimode and blue for single mode).

6.12 Single Mode Fibre Optic Cable

| Parameter | Technical Specification | Compliance with remarks |
|----------------------------|---|-------------------------|
| Make and Model | | |
| Cable Type | 24 core, Single mode, Tight Buffer cable is constructed for outdoor application with tight buffer tubes on each Fibre fibre and Fire retardant orange PVC jacket protects the cable from mechanical stress | |
| Fibre type | 8.2 / 125, Laser Grade, Fibres are strengthened by extruding plastic upto 1310 micron around them | |
| No. of cores | 24 core | |
| @1310 nm | 0.33 dB/Km | |
| @1550nm | 0.19 dB/Km | |
| Coating / Cladding offset | <= 0.5 microns | |
| Zero Dispersion Slope | <= 0.092ps / sqmm-km | |
| Zero Dispersion Wavelength | 1310nm< 1324nm | |
| Fibre core | Should be UL Listed | |
| Tensile rating | 400N | |
| Maximum Crush resistance | 22 N /mm | |
| Operating Temperature | -40 Degree C to +70 Degree C | |
| Min Bend | 20 X Outer Diameter | |
| Marking | Identification marking at regular intervals of 1 meter | |
| Fibre Core | Raw fibre should be from world renowned sources and raw fibre marking should be visible on the OFC cable | |
| Approval | UL Listed | |
| ISO certification | All quoted product and Brand should have ISO certification for manufacturing | |

6.13 Patch Cords/Pigtails

Fiber equipment cords shall possess the following characteristics:

6.14 FIBRE CABLE ASSEMBLIES & PIGTAILS

1. The fibre used for cable assemblies should meet the IEEE 802.3 10 Gigabit Ethernet Standard as well as IEC-60793-2-10 and TIA-492AAAC specifications for laser bandwidth Differential Mode Delay (DMD) specifications.
2. The assemblies should meet or exceeds all ANSI/TIA/EIA and ISO/IEC insertion loss and return loss requirements.
3. When used in a system these precision cable assemblies should be warranted for 20 years or above.
4. The fibre optic cable assemblies should meet all Telcordia and ISO/IEC specifications for ferrule end face geometry - including radius of curvature, apex offset, and spherical undercut. The compliance to these is important to ensures minimum Return Loss, thereby reducing back reflection of laser energy which could degrade transmission performance or damage transceivers
5. The fibre optic cable assemblies should be available in 1, 3, and 5 meter standard lengths. Dust caps should be included as part of the standard shipment to protect polish from dirt and damage.
6. In a duplex jumper cord the duplex coupling mechanism should offer a polarity correction mechanism, which is independent of the connectors in the coupling.
7. The connectors used in the patch cord should be colour coded as per ANSI/TIA/EIA-568-C 2.
8. It should exceed ANSI/TIA/EIA and ISO/IEC requirements for aging, exposure to humidity, temperature extremes, impact, vibration, coupling strength, and cable resistance to stress and strain Supports

6.15 Fibre Optic Pigtail

| | | |
|-----------------------|--|--|
| Pigtails Type | SC-Style, Simplex SM Pigtails | |
| Make and Model | | |
| Operating temperature | -20 Degree C to +70 Degree C | |
| Durability & colour | | |
| SM connectors | 220 cycles, Blue | |
| Ferrules | Pre-radius Ceramic Zirconia Ferrule. | |
| Attenuation | Not more than 0.75 dB per mated pair | |
| Insertion Loss | MM:< 0.5 dB | |
| Standard | Meets and exceeds ITU specifications ,UL listed and 3rd Party RoHS compliant. Fully in compliance with JIS C5973 F04 Type. | |
| Bayonet Coupling | 2.5 mm Zirconia Ferrule | |

6.16 PERFORMANCE SPECIFICATIONS

| | 50/125µm Multimode | | | Single mode |
|--------------------------------------|--------------------|---------|---------|-------------|
| | 850 nm | 1300 nm | 1300nm* | N/A |
| | | | | |
| Min. Cable Bandwidth (MHz km) | 500 | 500 | 2000 | N/A |

| | | |
|---------------------------------|---------------------|---------------------|
| Max. Insertion Loss (dB) | 0.50 (0.10 Typical) | 0.40 (0.10 Typical) |
| Min. Return Loss (Db) | 30 (35 Typical) | 55 (60 Typical) |

- Laser Bandwidth

6.17 Fibre Optic Patch panels

| | | |
|---------------------------------------|---|--|
| <u>Fibre optic patch panel</u> | <u>19-inch, Rack mounted Fibre optic patch panel</u> | |
| Make and Model | | |
| Height | 1 U, 1.75 inches | |
| No. of fibres | 24 port | |
| Dimensions | 44 * 410 * 280 mm (H*W*D) | |
| Material | Complete Aluminium Alloy housing, fully powder coated | |
| | Splice tray, adapter plate and cable spools to be included | |
| | Fully cushioned splice holder containing grooves for fixing splice protective sleeves | |
| No. of OSP Cables for termination | Minimum 24 | |
| Grounding | 2 Nos. of earthing lugs, pre-loaded | |
| Cable Management rings | Front and rear cable management rings, pre-loaded | |
| No. of 6-port adapter plates | 4 max | |

| | | |
|---------|--|--|
| Sliding | Panel cover is of slide out for easy maintenance | |
|---------|--|--|

6.18 Fibre Optic Adapter

| | | |
|----------------------------------|---|--|
| <u>Fibre Optic adapter plate</u> | <u>SC-Style, SM</u> | |
| Make and Model | | |
| Standard | Meets and exceed ITU specifications, UL listed and 3rd Party RoHS compliant. Fully in compliance with JIS C5973 F04 Type. | |
| Attenuation | Max of 0.75 Db per mated pair | |

6.19 Fibre Optic Patch Cord LC-SC TYPE.

| | | |
|--------------------------------|---|--|
| <u>Fibre Optic Patch Cords</u> | <u>SM patch cord LC-SC TYPE</u> | |
| Make and Model | | |
| Type | 1.6mm or 3mm simplex or Duplex Zipcord. | |

| | | |
|----------------------------------|---|--|
| Outside Diameter | (Simplex): 1.6mm x 3.0mm (Duplex): 1.6mm x 3.3mm | |
| Minimum Cable Retention Strength | 1.6mm: 11.24 lbs (50 N) | |
| Insertion Loss | Less than 0.5 dB for MM | |

6.20 Enclosures

All interconnect centres, panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fibre cables/jumpers. All the enclosures

1. Should not be bigger than one rack mount space and accommodate up to 24 ports for SC, or 24 ports for ST or FC adapters plates.
2. Should take in duplex adapter
3. Should have preloaded adapter plates with ST and SC fibre adapters in 6 and 8-port version, as well as a 24 port version for the SC, MT-RJ and LC adapters.
4. Should have blank adapter plates for future growth of the fibre infrastructure.
5. Should have six and eight port fibre adapter plates, which allow for color coding connectors.
6. Should have fibre adapter plates with snap-in installation and one-finger removal.
7. Should accommodate hybrid adapter plates for ST-to-SC or SC-to-ST connections.
8. Be modular in design with internal fibre managers that provide slack storage to comply with fibre bend radius and the recommended slack storage length.
9. Should have a snap-on front shield to be used as a labelling surface and to protect jumpers. This shield should also be relocating able to another position during termination to maintain circuit identification.
10. Should accommodate a splice tray for mechanical or fusion splices.
11. Should be available with a drawer mechanism, which allows the panel to slide forward or to the rear, and has defeat able latches to allow removal from the rack or cabinet.

6.21 Cable

In addition to meeting the applicable performance specifications, all optical fibre cable shall be appropriate for the environment in which it is installed.

6.22 Multimode Optical Fibre Cable

All horizontal multimode optical fiber cable must be a minimum of six strands of 62.5/125 or 50/125µm multimode.

Multimode fibre optical fibre cables shall meet all of the requirements delineated within the Industry Requirements except the limits for attenuation and bandwidth for cables containing 50/125 or 62.5/125 fibre shall be as noted below:

| Minimum Performance Parameters for MM Qualified Cables | | | | | | |
|--|-----------------------------|------------|----------------------------|------------|--------------------------------------|--------|
| Fibre | Maximum Attenuation (dB/km) | | Minimum Bandwidth (MHz•km) | | Guaranteed Transmission Distance (m) | |
| | 850n m | 1300 nm | 850n m | 1300n m | 850n m | 1300nm |
| 50/125 | 3.5 | 1.5 | 500 | 500 | 550 | 550 |
| 62.5/125 | 3.5 | 1.5 | 200 | 500 | 275 | 550 |

Attenuation: Cables shall perform in accordance with the attenuation limits as noted above when tested per ANSI/EIA/TIA-455-46, -53, -61 or -78 (as applicable).

Bandwidth: Cables shall perform in accordance with the bandwidth limits as noted above when tested per ANSI/EIA/TIA-455-51 or IEC/ISO 793-1-C2A.

Transmission Distance: The protocol pertinent to the transmission distances noted above for cables is Gigabit Ethernet per IEEE 802.3:2002.

6.23 Single mode Optical Fibre Cable

Single mode optical fiber cable shall be used for 1st and 2nd Level Backbone applications only. Single mode optical fiber cables shall meet all of the requirements delineated within the specified Industry Requirements. Attenuation and Zero Dispersion limits are noted below for convenience:

| Minimum Performance Parameters for SM Cables | | | | | |
|--|---------------|-----------------------------|--------|---------------------------------|---|
| Fibre | Cable Type | Maximum Attenuation (dB/km) | | Zero Dispersion Wavelength (nm) | Zero Dispersion Slope (nm ² •km) |
| | | 1310nm | 1550nm | | |
| Single mode | Inside Plant | 1.0 | 1.0 | 1300-1324 | < 0.093 |
| | Outside Plant | 0.5 | 0.5 | | |

Attenuation: Cables shall perform in accordance with the attenuation limits as noted above when tested per ANSI/EIA/TIA-455-46, -53, -61 or -78 (as applicable).

Zero Dispersion Wavelength and Slope: Cables shall perform in accordance with the Zero Dispersion wavelength and slope limits as noted above when tested per ANSI/EIA/TIA-455-168, -169, or -175 (as applicable).

6.24 MOUNTING OPTIONS

FACE PLATE SPECIFICATION (WORK AREA COMPONENT)

1. The work area, faceplates should offer a sleek, clean appearance for mounting Outlets. The designation labels cover the mounting screws (should be included as part of the standard equipment) and provide ample circuit identification.
2. The faceplates should offer write-on circuit designation labels (as part of the standard equipment) protected by clear plastic cover concealing the mounting screws.
3. The faceplates should be available in white versions,
4. The faceplates should be UV resistant, should be made using high impact plastic to prevent color fading and to provide added durability.
5. The faceplates should include quick pressure-release designation label covers for quick, tool-less removal.
6. The information outlets should be easily snapped out from the back of faceplates making moves, adds, and changes quick and easy.
7. Faceplate should be available in 1,2,3,4,5 and six Gang

8.0 BUILDING MANAGEMENT SYSTEM - TECHNICAL SPECIFICATION

SCOPE

The scope of this section includes design, supply, installation, testing, commissioning, and performance testing of integrated Building Management System (IBMS) as per the technical specification according with other services like HVAC, Electrical, Lifts, DG, UPS, water management etc

| SL.NO | DESCRIPTION | SUPPLY SCOPE | ERECTION & COORDINATION FOR TESTING & COMMISSIONING | TESTING & COMMISSIONING |
|-------|----------------------|--------------|---|-------------------------|
| 1 | BMS SOFTWARE | IIT | CONTRACTOR | IIT |
| 2 | DDC CONTROLLER | IIT | CONTRACTOR | IIT |
| 3 | BTU | IIT | CONTRACTOR | IIT |
| 4 | FIELD EQUIPMENT& HMI | CONTRACTOR | CONTRACTOR | CONTRACTOR |
| 5 | ALL CABLES | CONTRACTOR | CONTRACTOR | CONTRACTOR |
| 6 | MODBUS INTERFACE | IIT | CONTRACTOR | IIT |

SERVER & HUMAN MAN INTERFACE- HMI(AVAIABLE AT SITE)

One PC-based microcomputer (Dell) with minimum configuration as follows: The vendor shall check the minimum hardware & software requirement of Computer. If any of the technical parameters given below is less than the minimum required for the proposed system, the vendor is responsible to propose higher version as required.

Server specifications

- The minimum hardware configuration of the servers shall be:
- 3.0 GHZ each processor (in case the offered server is RISC & EPIC based processor speed shall be at least 1.2GHz)
- Minimum 2 Processors - Quad Core Intel Xeon E5640

- 12GB Main memory (RAM).
- 80 GB SATA II hard drive
- 216 GB Auxiliary memory (Hard disk drive).
- CD R/W drive,
- 21" HD colour monitor
- Graphic adaptor cards
- Keyboard & Mouse
- Dual 10/100/1000Mbps Ethernet ports & 1 No HDMI port minimum
- One hot pluggable port for external Cartridge magnetic tape drive
- TPC/ Spec mark performance compliance
- Redundant power supply
- Redundant fan

HMI specifications

- The minimum hardware configuration of Human Machine Interface (HMI) shall be:
- 2.1 GHz processor (in case RISC & EPIC it shall be at least 1.2GHz)
- 8GB Main memory (RAM)
- 216 GB Auxiliary memory (Hard disk drive)
- 48x24x48 CD-R/W drive
- 21" TFT/LED colour monitors
- Graphic adaptor cards
- Two speakers for audible alarms with configurable tones
- Keyboard & Mouse
- Dual 10/100/1000Mbps Ethernet ports
- One hot pluggable for external Cartridge magnetic tape drive
- Parallel, serial and USB (2.0) ports to accommodate printers, mouse and other peripherals etc

FIELD EQUIPMENTS: - OPTIONAL

TEMPERATURE SENSOR

Temperature sensors for space, pipes and ducts, shall be of the Resistance Temperature detector (RTD) type or thermistors. These shall be two wire type and shall conform to the following specifications :

- 1) Immersion sensors shall be high accuracy type with a high resistance versus temperature change. The accuracy shall be at least ± 0.33 degrees F and sensitivity of at least 2 ohm/F.
- 2) Immersion sensors shall be provided with separate stainless steel thermo well. These shall be manufactured from bar stock with hydrostatic pressure rating of at least 10 kgf/cm².
- 3) The connection to the pipe shall be screwed $\frac{3}{4}$ inch NPT (M). An aluminum sleeve shall be provided to ensure proper heat transfer from the well to the sensor. Terminations to be provided on the head. Flying leads shall not be acceptable.
- 4) The sensor housing shall plug into the base so that the same can be easily removed without disturbing the wiring connections.
- 5) Duct temperature sensors shall be with rigid stem and of averaging type. These shall be suitable for duct installation.
- 6) Outdoor air temperature sensor shall be provided with a sun shield.
- 7) The sensors shall not be mounted near any heat source such as windows, electrical appliances etc.

The temperature sensors may be of any of the following types :

- 1) PT 100, PT 1000, PT 3000
- 2) NI 100, NI 1000
- 3) Balco 500.
- 4) Thermistor

TEMPERATURE AND HUMIDITY SENSOR

Space and duct humidity sensors shall be of capacitance type with an effective sensing range of 10% to 90% RH. Accuracy shall be + 3% or better. Duct mounted humidity sensors shall be provided with a sampling chamber. Wall mounted sensors shall be provided with a housing. The sensor housing shall plug into the base so that the same can be easily removed without disturbing the wiring connections. The sensors shall not be mounted near any heat source such as windows, electrical appliances etc.

FLOW METER

Water flow meters shall be Ultrasonic type. The housing shall have IP 55 protection. Vendors shall have to get their design/ selection approved by the Consultant, prior to the supply.

The exact ranges to be set shall be determined by the contractor at the time of commissioning. It should be possible to 'zero' the flow meter without any external instruments, with the overall accuracy of at least $\pm 1\%$ full scale.

PRESSURE TRANSMITTER FOR WATER

Pressure transmitters shall be piezo-electric type or diaphragm type. (Bourdon Tube type shall not be acceptable). Output shall be 4-20mA or 0-10V DC and the range as specified in the data sheet depending on the line pressure. Power supply shall be either 24 V AC, 24 V DC or 230 V AC. Connection shall be as per manufacturer's standards. The pressure detector shall be capable of withstanding a hydraulic test pressure of twice the working pressure. The set point shall fall within 40%-70% of the sensing range and detector shall have sensitivity such that change of 1.5% from the stabilized condition shall cause modulation of the corrective element. The sensor must be pressure compensated for a medium temperature of -10°C to 60°C with ambient ranging between 0°C to 55°C .

DIFFERENTIAL PRESSURE SWITCH FOR PIPE WORK

These shall be used to measure pressure differential across suction and discharge of pumps. The range shall be as specified in the data sheet. Switch shall be ON with increase in differential. Housing for these shall be weather proof with IP 55 protection. The pressure switch shall be capable of withstanding a hydraulic test pressure of 1.5 times the working pressure. The set point shall fall in 40-70% of the scale range and shall have differentials adjustable over 10%-30% of the scale range. The switches shall be provided with site adjustable scale and with 2 NO/NC contacts.

DIFFERENTIAL PRESSURE SWITCH FOR AIR SYSTEMS

These shall be diaphragm operated. Switches shall be supplied with air connections permitting their use as static or differential pressure switches.

The switch shall be of differential pressure type complete with connecting tube and metal bends for connections to the duct. The housing shall be IP 54 rated. The pressure switches shall be available in minimum of 3 ranges suitable for applications like Air flow proving, dirty filter, etc. The set point shall be concealed type. The contact shall be SPDT type with 230 VAC, 1 A rating.

The switch shall be supplied suitable for wall mounting on ducts in any plane. It should be mounted in such a way that the condensation flow out of the sensing tips. Proper adaptor shall be provided for the cables.

The set point shall fall within 40%-70% of the scale range and I have differentials adjustable over 10%-30% of the scale range.

The switches shall be provided with site adjustable scale and with 2 NO/NC contacts.

AIR FLOW SWITCHES

Air flow switches shall be selected for the correct air velocity, duct size and mounting attitude. If any special atmospheric conditions are detailed in the Schedule of Quantity the parts of the switches shall be suitably coated or made to withstand such conditions. These shall be suitable for mounting in any plane. Output shall be 2 NO/NC potential free. Site adjustable scale shall also be provided

AIR PRESSURE SENSOR

The pressure sensor shall be differential type. The construction shall be spring loaded diaphragm type. The movement of the membrane in relation to the pressure should be converted by an inductive electromagnet coupling which would give an output suitable for the controller. The pressure sensor shall be in a housing having IP 54 ratings in accordance with IEC 529. Suitable mounting arrangement shall be available on the sensor. The sensor shall come complete with the PVC tubes & probes.

WATER FLOW SWITCH

These shall be paddle type and suitable for the type of liquid flowing in the line. Output shall be 2NO/2NC potential free.

TRANSDUCERS FOR ELECTRICAL SERVICES

Electrical transducers shall be integrated electronic type and rack mounted on the field. These shall work on 230 V supply with the output being standard type i.e. 4-20 mA, 0- 10 Volts etc.

Power factor, Voltage, Current, Frequency and Kilowatt transducers shall have standard output signal for measurement for the specified variable.

Kilowatt-Hour metering(if any) shall be poly-phase, three- element with current transformer (CT) operated type. The metering shall feature high accuracy with no more than +/- 1% error over the expected load range. The coils shall be totally encapsulated against high impulse levels.

LEVEL SWITCH

The level switches shall have to meet the following requirement :

| | | |
|------------------|---|---|
| Type | : | Float Type/Capacitance /Conductivity type |
| Mounting | : | To suit application. |
| Connection | : | Flanged ANSI 150 lbs RF Carbon steel |
| Float material | : | 316 SS |
| Stem Material | : | 316 SS |
| Output | : | 2 NO, 2 NC potential free |
| Switch Enclosure | : | IP 55 |

INSTALLATION:

- A. All equipment shall be installed in a neat and professional manner.
- B. Cabling shall be neatly routed and bundled along the equipment cabinet sides. Cabling shall not hang or cross in the racks. Cabling shall be run at right angles to the rack.
- C. Cable connectors shall be the mating connector to the premises on the equipment. Adapters will not be accepted to interface a cable connector to the equipment jack.
- D. Installer shall follow factory installation guidelines for pulling tension and bending radii for all cables.
- E. Cables shall be one continuous piece between each system device.
- F. Dress cables routed to equipment with sufficient slack to allow for service of equipment and avoid strain on connections or cable.
- G. Use wire ties for supporting low voltage cable runs concealed above ceilings. Do not run cables loose on ceiling tiles. Cables shall be grouped in bundles and support from structure above.
- H. All equipment power and signal wiring shall conform to the National Electrical Code and to applicable local codes.
- I. All equipment and devices shall be securely mounted to a permanent cabinet or panel. No device shall be supported by it's wires or cables.
- J. Terminate each cable to premises blocks in sequence, including grounding drain wires.
- K. Premises locations and cables shall be labelled, legibly, with permanent embossed labels or by labelling pen. Identification shall be labelled on As-built Drawings.

TESTING

- A. All system functions shall be tested for proper performance. All test results shall be documented for inclusion in the as-built manuals.
- B. Complete system programming shall be done by a person who has received factory training in the programming of the installed system.
- C. The system shall be tested for intelligibility in every room after all installation and testing is finalized. The intelligibility tests shall follow NFPA 70 and IEC 60849 or BS 5839 Part 8.

TRAINING

- Provide a minimum of four hours of on-site in-service training in the operation of the Public Address/Voice Evacuation System. The training shall be provided by a training specialist specifically trained in the operation, programming and features of the installed system.

Note: BMS - IO controllers, Software & Modbus interface will be given by IIT.

TECHNICAL DATA SUBMITTAL

A. CENTRAL CONTROL STATION EQUIPMENT

1. CENTRAL PROCESSING UNIT

- a. Manufacturer :

- b. Country of Origin :

- c. Local Agent :

- d. Model :

- e. Processor :

- f. Minimum ROM (K Bytes) :

- g. Clock Frequency :

- h. RAM Capacity Installed :

- i. Ram Capacity Expandable :
- j. Cache Memory (K Bytes) :
- k. Hard Disk Capacity (M Bytes) :
- l. Floppy Disk Drive Capacity (M Bytes) :
- m. Floppy Disk Drive Size :
- n. Split Screen Capacity :
- o. Dimension Overall (mm) :
- p. Ambient Operating Temperature (deg.C) :
- q. Ambient Operating R.H (%) :
- r. Power Supply :
- s. Power Consumption (Watts) :
- t. UL Listing :

2. COLOUR GRAPHIC MONITOR

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Screen Size :

g. Resolution :

h. Input Signal Level :

i. Colours :

j. Dimension (mm) :

- k. Power Supply :
- l. Power Consumption (Watts) :
- m. Ambient Operating Temperature (deg,C) :
- n. Ambient Operating R.H (%) :
- o. RAM Capacity :

3. **KEYBOARD**

- a. Manufacturer :
- b. Country of Origin :
- c. Local Agent :
- d. Type :
- e. Model :
- f. No. of Keys :

g. Type of Keys :

h. Make of Keys :

4. **MOUSE**

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

5. **REPORT PRINTER**

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Print Speed :

g. Number of Columns :

h. Number of Pins :

i. Paper Feed :

j. Dimension (mm) :

k. Power Supply :

l. Power Consumption (watts) :

6. **ALARM PRINTER**

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Print Speed :

g. Number of Columns :

h. Number of Pins :

i. Paper Feed :

j. Dimension (mm) :

k. Power Supply :

l. Power Consumption (Watts) :

B. SENSORS CONTROLLERS, SENSORS & TRANSDUCERS

1. DDC CONTROLLER

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Model :

e. Micro Processor Model :

f. No. of Bits :

g. Clock Frequency :

h. RAM Memory :

i. RAM Backup Battery :

j. Battery Backup (Hrs) :

k. Transmission Rate :

l. Peer Communication :

m. Alphanumeric LCD Display :

n. Radio Interference Standards :

o. Enclosure Dimensions (mm) :

q. Power Supply :

r. Power Consumption (watts) :

s. Ambient Operating Temperature (deg.C) :

t. Ambient Operating R.H (%) :

u. Degree of protection (IP) :

2. SYSTEM INTEGRATION UNITS

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Model :

e. Micro Processor Model :

f. No. of Bits :

g. Clock Frequency :

h. RAM Memory :

i. RAM Backup Battery :

j. Battery Backup (Hrs) :

k. Transmission Rate :

l. Peer Communication :

m. Alphanumeric LCD Display :

n. Radio Interference Standards :

o. Enclosure Dimensions :

p. Weight (Kg) :

q. Power Supply :

r. Power Consumption (Watts) :

s. Ambient Operating Temperature (deg.C) :

t. Ambient Operating R.H (%) :

u. Degree of protection (IP) :

3. IMMERSION TEMPERATURE SENSOR

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Accuracy :

g. Sensor Material :

h. Temperature Coefficient :

i. Resistance Tolerance :

j. Resistance :

k. Sensing Range :

l. Length of Sensing Element :

m. Ambient Operating Environment :

n. Accessories :

o. Degree of protection (IP) :

4. DUCT TEMPERATURE & HUMIDITY SENSOR

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Accuracy :

g. Sensor Material :

h. Temperature Coefficient :

i. Resistance Tolerance :

j. Resistance :

k. Sensing Range :

l. Length of Sensing Element :

m. Ambient Operating Environment :

n. Accessories :

o. Degree of protection (IP) :

5. OUTSIDE TEMPERATURE SENSOR

- a. Manufacturer :
- b. Country of Origin :
- c. Local Agent :
- d. Type :
- e. Model :
- f. Accuracy :
- g. Sensor Material :
- h. Temperature Coefficient :
- i. Resistance Tolerance :
- j. Resistance :

- k. Sensing Range :
- l. Length of Sensing Element :
- m. Ambient Operating Environment :
- n. Accessories :
- o. Degree of protection (IP)

6. OUTSIDE TEMPERATURE & RELATIVE HUMIDITY SENSOR

- a. Manufacturer :
- b. Country of Origin :
- c. Local Agent :
- d. Type :
- e. Model :
- f. Sensing Range :

g. Output Signal :

h. Mounting :

i. Accuracy :

j. Time Constant :

k. Power Supply :

l. Power Consumption (Watts) :

m. Maximum Wiring :

n. Operating Ambient limits :

o. Dimensions (mm) :

p. Weight (Kg) :

q. Length Sensor (mm) :

r. Degree of Protection (IP) :

7. PRESSURE TRANSMITTER

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Model :

e. Pressure Sensing Element :

f. Range :

g. Temperature Compensation :

h. Repeatability :

- i. Hysterisis :
- j. Shock Resistance Compliance :
- k. Monitoring :
- l. Enclosure :
- m. Supply Voltage :
- n. Output Signal :
- o. Degree of Protection (IP) :

8. WATER FLOW SWITCHES

- a. Manufacturer :
- b. Country of Origin :
- c. Local Agent :

d. Type :

e. Model :

f. Body Construction Material :

g. Stem Construction Material :

h. Flapper Construction Material :

i. No. of Contacts :

j. Type of Contacts :

k. Connections :

l. Power Supply :

m. Switch Rating :

n. Degree of Protection (IP) :

9. DIFFERENTIAL PRESSURE SWITCHES FOR PUMPS

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Construction Material :

g. Dimensions (mm) :

h. Mounting :

i. Switch Rating :

j. Body Construction Material :

k. Sensing Element Material :

l. Fill Material :

m. Sensing Range :

n. Over Range Protection :

o. Maxm. Static Pressure on one side :

p. No. of Contacts :

q. Type of Contacts :

r. Power Supply :

s. Degree of Protection (IP) :

10. DIFFERENTIAL PRESSURE SWITCHES FOR FILTERS

a. Manufacturer :

b. Country of origin :

c. Local Agent :

d. Type :

e. Model :

f. Construction material :

g. Dimensions (mm) :

h. Mounting :

i. Switch Rating :

j. Body construction material :

k. Sensing element material :

l. Fill material :

m. Sensing Range :

n. Over range protection :

o. Maxm. static pressure on one side :

p. No. of Contacts :

q. Type of Contacts :

r. Power Supply :

s. Degree of protection (IP) :

11. **DIFFERENTIAL PRESSURE SWITCHES FOR BLOWERS**

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Construction Material :

g. Dimensions (mm) :

h. Mounting :

i. Switch Rating :

j. Body Construction Material :

k. Sensing Element Material :

l. Fill Material :

m. Sensing Range :

n. Over Range Protection :

o. Maxm. Static Pressure on one side :

p. No. of Contacts :

q. Type of Contacts :

r. Power Supply :

s. Degree of Protection (IP) :

12. FLOW METERS

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Construction :

g. Liner Material :

h. Sensor Material :

i. Impulse Piping Material :

j. Manifold Material :

k. Dimensions (mm) :

l. Output Signal :

m. Accuracy :

n. Mounting Arrangement :

o. Connection Type :

p. Type of Flow Measuring Element :

q. Operating Voltage :

r. Degree of Protection (IP) :

13. LEVEL SWITCHES

a. Manufacturer :

b. Country of Origin :

c. Local Agent :

d. Type :

e. Model :

f. Float Construction Material :

g. Shaft Construction Material :

h. Flange Construction Material :

d. Type :

e. Model :

f. Flange Construction Material :

g. Dimensions (mm) :

h. Mounting :

i. Power Supply :

j. Degree of Protection (IP) :

C. CABLES

1. SIGNAL CABLES

a. Manufacturer :

b. Country of origin :

c. Local agent :

d. Type :

e. Characteristics :

2. COMMUNICATION CABLES

a. Manufacturer :

b. Country of origin :

c. Local agent :

d. Type :

e. Characteristics :

3. LOCAL AREA NETWORK CABLE

a. Manufacturer :

b. Country of origin :

c. Local agent :

d. Type :

e. Characteristics

LIST OF RECOMMENDED MAKES.

| | | | |
|----|------------------------------|---|---|
| 1 | G. I. PIPES | : | JINDAL / TATA. |
| 2 | PIPE FITTINGS | : | BHARAT FORGE / SANJAY FORGE / VS ENGG. |
| 3 | SPRINKLERS | : | TYCO / VIKING |
| 4 | ROSSETTE PLATES | : | TYCO / VIKING. |
| 5 | FLEXIBLE DROPS | : | EASYFLEX / TYCO / VIKING. |
| 6 | ANTICORROSIVE MATERIAL | : | IWL / RUSTECH. |
| 7 | INSTALLATION CONTROL VALVE | : | TYCO / VIKING. |
| 8 | BUTTERFLY VALVE | : | AUDCO / BDK / FOURESS. |
| 9 | PAINT | : | ASIAN / BERGER. |
| 10 | ANCHOR FASTENERS | : | HILTI / FISCHER. |
| 11 | SUPPORTS | : | HI TECH / HILTI. |
| 12 | GATE VALVE | : | LEADER / KIRLOSKAR / ZOLOTO. |
| 13 | BALL VALVE (Screwed end) | : | LEADER / ZOLOTO / ITAP. |
| 14 | STRAINERS | : | GUJRAT OTO FILT / PROCYDENE / TELEFLOW. |
| 15 | NON RETURN VALVE | : | LEADER/AUDCO/ INTERVALVE. |
| 16 | PRESSURE SWITCH | : | INDFOS / SWITZER / DANFOSx. |
| 17 | PRESSURE GAUGE | : | H. GURU / FIEBIG / GENERAL INSTRUMENTS. |
| 18 | HOSE REEL DRUM | : | NEW AGE / WINCO / MINIMAX. |
| 19 | HOSE BOX / FIRE DUCT SHUTTER | : | NEW AGE / WINCO /EQUIVALENT. |
| 20 | AIR RELEASE VALVE | : | HD FIRE / LEADER. |
| 21 | FIRE SEALANT | : | HILTI/3M /PROMAT. |
| 22 | FIRE ALARM CONTROL PANEL | : | RAVEL |
| 23 | DETECTORS & DEVICES | : | RAVEL |
| 24 | CONTROL / POWER CABLES | : | VARSHA /POLYCAB/RR KABLE/ORBIT |

| | | | |
|----|---------------------------|---|----------------------------------|
| 25 | CONTROL MCB | : | L&T / SCHNEIDER / ABB /SIEMENS. |
| 26 | HOOTER / STROBE | : | RAVEL |
| 27 | BATTERY | : | EXIDE / AMRON / HITACHI. |
| 28 | PVC CONDUITS | : | VIP / PRECISION / EQUILAVANT ISI |
| 29 | P.A.SPEAKERS | : | BOSCH / BOSE / TOA / AUDIO TRACK |
| 30 | P.A.CONSOLE | : | BOSCH / BOSE / TOA / AUDIO TRACK |
| 31 | P.A POWER/MIXER AMPLIFIER | : | BOSCH / BOSE / TOA / AUDIO TRACK |
| 32 | CCTV SYSTEM | : | ADHUA, PELCO, SAMSUNG, HONEYWELL |
| 33 | ACCESS CONTROL SYSTEM | : | HONEYWELL, SOLUS, SPECTRA, HID |
| 34 | SIGNAGES | : | IS MAKE MATERIAL |
| 35 | NETWORKING SYSTEM | : | BELTON, D LINK, CISCO, SCHINDER |