

PROJECT:

IIT MADRAS RESEARCH PARK-CHENNAI ,
TECHNICAL SPECIFICATION FOR FIRE
ALARM SYSTEM TENDER

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1.0 INTRODUCTION

1.1 Project Overview

Indian Institute of technical (IIT) Research Park at Chennai proposed building consisting of 5 blocks in Phase -2, i.e.

- Block -A GF +10 Floors
- Block -B GF +10 Floors
- Block -C GF +08 Floors
- Block -D Basement, GF +10 Floors
- Block -E GF +5 Floors for multilevel car parking

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 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. Chiller plant integration
2. Air Handling Units
3. VFD & VAV Units
4. 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. LIFT integration
3. DG Integration
4. FAS Integration
5. Water management System
6. CCTV Integration for proposed & existing building
7. 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 DETECTION SYSTEM SCOPE

The scope of this section includes design, supply, installation, testing, commissioning, and performance testing of Fire alarm & detection System (FAS) as per the technical specification.

| SL.NO | DESCRIPTION | SUPPLY SCOPE | ERECTION & COORDINATION | TESTING, COMMISSIONING & PROGRAMMING | CO ORDINATION FOR TESTING & COMMISSIONING |
|-------|------------------------------------|--------------|-------------------------|--------------------------------------|---|
| 1 | CONVENTIONAL DETECTORS | CONTRACTOR | CONTRACTOR | CONTRACTOR | CONTRACTOR |
| 2 | DEVICES | CONTRACTOR | CONTRACTOR | CONTRACTOR | CONTRACTOR |
| 3 | CONVENTIONAL FAS PANEL WITH MODBUS | CONTRACTOR | CONTRACTOR | CONTRACTOR | CONTRACTOR |

| | | | | | |
|---|------------------|------------|------------|------------|------------|
| 4 | ADDRESSABLE CHIP | IIT | CONTRACTOR | IIT | CONTRACTOR |
| 5 | DSP | IIT | CONTRACTOR | IIT | CONTRACTOR |
| 6 | ALL CABLES | CONTRACTOR | CONTRACTOR | CONTRACTOR | CONTRACTOR |

3.1 Conventional Fire alarm control panel

- The main **Conventional FACP** shall contain a Microprocessor based Central Processing Unit (CPU). The Panel Shall communicate with and control various field devices used to make up the system, such as smoke, Thermal (heat) and modules, including initiating circuits and notification appliance circuits, local and remote operator premises, printers, annunciation, and other system controlled devices.
- The FACP shall be capable of disabling an individual detector, Facility shall be provided on the FACP for simulating the fire condition to enable testing of the various alarm circuits.
- The FACP shall have the facility to silence/ acknowledge/ reset the alarm. Apart from the FACP, Repeater panel present in the IBMS room shall have the facility to silence/ acknowledge the alarm of all FACP's in the Network.
- In case of a Fire alarm initiation by an alarm initiating device, the audio alarm shall be generated at the respective fire alarm control and the Repeater Panel located in the IBMS room, various locations and also initiate signal to operate Sounders located in the various locations.
- The FACP shall be programmed for the events to happen in case of fire like closing of fire dampers, shutting down supply fans for HVAC, deactivating the access control system and activating the sounder through **BMS software**.
- The FACPs shall have in built buzzer to alert the personnel in case of maintenance requirement.
- The electronic circuit shall be of solid state and of fail-safe design Vermin proof, protected from humidity, corrosion and dust to ensure uninterrupted operation.
- The circuit shall be protected against usual electrical transients, electromagnetic and electrostatic interference present in that vicinity.

- Spares and shall be made available for a minimum period of 5 years from the date of commissioning of the system.
- SLC cable should be placed at-least minimum of one meter away from any High Voltage cable.
- And the routing shall not permit multiple T joints.
- The FACP shall have facility to alter access or reset the stored program through a password to avoid unauthorized use.
- The system shall have reverse polarity protection, sensitivity adjustment, alert for drift compensation and shall be capable of networking minimum of 8 panels in a system
 - 1) The system shall be capable of diagnosing the cabling for open and short circuits, unauthorized removal of detector head and AC failure.
 - 2) In case of multiple alarms, the indication shall display in chronological order.

3.2 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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.

3.7 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.

Note: The Addressable chip (which makes address to the detector) will be located in detector as per guidance of IIT team the same will be supplied by IIT team. The Addressable chip installation, wiring , interconnection & co ordination work for commissioning will be under the scope of contractor.

3.8 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.

Note: The Addressable chip (which makes address to the detector) will be located in detector as per guidance of IIT team the same will be supplied by IIT team. The Addressable chip installation, wiring, interconnection & co ordination work for commissioning will be under the scope of contractor.

3.9 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.

3.10 Addressable Control Module:

1. It shall be UL listed.
2. It shall have LED indication to show the status.
3. It shall activating 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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.

3.15 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.

3.16 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.

3.17 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.

3.18 TCP/IP MODULE:

1. It shall be compatible with **ravel make conventional** 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.

3.19 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.

3.20 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.

Note: The contractor to consider the Addressable chip & DSP power consumption also in this battery selection. i.e. DSP ----- & Chip -----

3.21 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.
