

**Tender document for**  
**Design, Constructing, Testing, Commissioning of interior furnishing for office space**  
**of GSCL at Guwahati, Assam**  
**VOLUME II - TECHNICAL SPECIFICATIONS**

**PART: A2**  
**FIRE PROTECTION REQUIREMENT**

## 1. FIRE FIGHTING SYSTEM

### a. SCOPE OF WORK:

This document covers the work under the fire protection Services. The reports cover the design parameters of the fire protection system for 4<sup>th</sup> floor.

### b. DESIGN STANDARDS – FIRE PROTECTION

The following standards shall be followed for the planning and design of Fire protection system:

- i. NBC-2016- Fire and life safety (Part 4, Section 1).
- ii. Local by-laws.
- iii. Indian Standards.
  - IS:1239 (Part 1) : 2004. Steel Tubes, Tubular and Other Wrought. Steel Fittings
  - IS 1239 (Part 2) : 2011. Steel tubes, Tubular and other steel. Fittings
  - IS 3589: 2001 Steel Pipes for Water and Sewage (168.3 to 2 540 mm Outsides diameter
  - 780:1984 (R1995) Specification For Sluice Valves
  - IS 5312-(1) 2004 Swing Check Type Reflux (Non-Return]. Valves
  - IS:3624-1987 Specification for pressure and vacuum gauges. (second revision)
  - IS:1520 :1980. Horizontal Centrifugal Pumps
  - IS:325(1996): Three-phase induction motors
  - IS:12469(1988): Specification for Pumps for Fire Fighting
  - IS:15683 (2006): Portable fire extinguishers
  - IS 884 (1985): Specification for First-Aid Hose-Reel
  - IS 5290: 1993 Landing Valves--Specification (Third Revision)
  - IS 13039: 2014: External Hydrant Systems
  - IS 15105: 2002: Design and Installation of Fixed Automatic Sprinkler Fire Extinguishing System.
  - IS 908- 1975. Specification for fire hydrant, stand post type. (Second Revision).

- IS 10221: 2008: Coating And Wrapping Of Underground Mild Steel Pipelines External Hydrant Systems

**Note:-**

In event of revision in any of the applicable code standard etc; during execution of the system, then the changes/modification as necessity by the said revision shall be complied with.

**c. FIRE FIGHTING DESIGN GUIDELINES:**

Fire fighting systems, in India, are planned as per guidelines of National Building Code of India and /or local municipal rules which are statutory, most of the municipalities adopt the National Building Code of India guidelines in framing their requirements. The fire fighting measures as per NBC requirements are given in Annexure 1:

Municipal statutes are essential for compliance for any construction within a city. Also, interaction with municipal officials is required for ensuring compliance of proposed fire fighting scheme to the municipal statutes. The proposed fire fighting scheme will be required to be submitted to the insurance companies for approval and availing discount in insurance premium.

**d. FIRE FIGHTING MEASURES:**

Fire Fighting Measures that can be applied for Office building comprise as per Annexure 1;

- (a) Portable extinguishers, to fight fire in incipient stage.
- (b) Internal Hydrant system for fighting fires of higher intensity and as back-up to fire fighting operations with portable extinguishers.
- (c) Sprinkler system.

The proposed fire fighting measures for the Office Building would comprise of portable extinguishers and internal hydrant system and sprinkler system. The fire fighting system is designed as per the local municipal rules, National Building Code of India

recommendations. Reference is made to National Fire Protection Association (NFPA), USA, recommendations where necessary.

**e. PORTABLE EXTINGUISHERS**

Portable extinguishers of following types are recommended for the different class of fires:

- (a) 2 nos. of Portable extinguishers of 9 Litres Capacity Water Gas Pressure type for Class A fires.
- (b) 2 nos. of 2 kg and 2 nos. of 4.5 kg Portable extinguishers of carbon dioxide type for Class C fires.
- (c) 2 nos. of Portable extinguishers of dry chemical powder (DCP) in 4.5kg for Class A, B, C fires
- (d) The portable extinguishers would be so distributed that a person would not have to travel more than 15m to fetch an extinguisher. Also, every room/enclosure would be provided with minimum of one extinguisher.

**f. HYDRANT SYSTEM**

The hydrant system shall comprise of:

- (a) Internal hydrant valves with hoses in hose boxes
- (b) Hose reels at internal hydrant locations
- (c) Pumps comprising - one motor driven hydrant system pump, one common standby diesel engine driven hydrant system pump and a line pressurization jockey pump.

9.8.1 Internal hydrants shall be provided for fighting fire within the buildings. The internal hydrants shall be provided in sufficient quantities such that no portion of the floor is more than 30m from an internal hydrant. For each internal hydrant a hose box with two nos. hoses, each of 15m length, and a hose reel of 30m length will be provided. The hose reel enables fighting low intensity fire at lesser water discharge. All the internal hydrants are placed on wet risers which are connected to main hydrant line with isolation valve.

9.8.2 The system shall be designed to operate automatically on operation of any of the hydrant valve(s). The system shall be always pressurized and will operate by a set of pumps and related instrumentation and controls. The operation of pumps shall be sequential. The jockey pump shall start and stop to maintain header pressure. In case of operation of hydrant(s), the jockey pump would be unable to maintain the pressure and the pressure drops further. At a lower predetermined pressure the motor driven hydrant system pump starts. In case motor driven pump fails to start, the pressure continues falling. At a further lower predetermined pressure, the diesel engine driven standby hydrant system pump shall operate. Stopping of hydrant system pumps shall be manual.

**g. SPRINKLER SYSTEM**

The Sprinkler System shall be designed as per as per NBC and Indian standards.

The entire sprinkler installation shall be designed to make it a hydraulically balanced system.

**5.0 ANNEXURE 1: PROVISIONS FOR FIRE-FIGHTING SYSTEM :**

As per provisions of National Building Code Part IV, Table 07. Following are the provisions for Fire Fighting: - {Group- E } Business Building (Greater than 10m and Less than 15 m in height.)

**Table - 07 Provisions for fire-fighting system**

Sr. No.	Type of Installation	Requirement As per NBC
1	Fire Extinguishers	R (As per IS:15683)
2	Hose Reel	R
3	Wet riser	R
4	Down Comer	NR
5	Yard Hydrant	NR

<b>6</b>	Automatic sprinkler system	R (If basement Area is more than 200 sq.m)
<b>7</b>	Manually operated electric fire alarm system	R
<b>8</b>	Automatic detection and alarm system	R
<b>9</b>	Underground static storage tank	As per NBC norms
<b>10</b>	Overhead tank	As per NBC norms
<b>11</b>	One electrical driven pump	R- 1620 LPM
<b>12</b>	One diesel engine driven pump	R- 1620 LPM
	One Jockey electrical driven pump	R- 180 LPM
<b>13</b>	Booster pumps (overhead pumps)	R

**Note:- Bidder/ Contractor/ Supplier to Obtain N.O.C for the entire installed FPS system from local fire authority and Government Regulatory Bodies up to hand over of final NOC to GSCL for records.**

## 1.0 General

This performance specification provides the minimum requirements for the Fire Alarm System (Life Safety System). The system shall include, but not limited to all equipment, materials, labor, documentation and services necessary to furnish and install a complete, operational system to include but not limited to the functions specified in the subsequent clauses:

Smoke and fire detection and Alarm System.

## 2.0 Materials & Equipment

All equipment and components shall be the approved manufacturer's current model. The materials, appliances, equipment and devices shall be listed by a nationally recognized approvals agency like UL864/FM/EN54 for use as part of a protected premises protective signaling (fire alarm) system and smoke control system. The authorized representative of the manufacturer, to be designated as the contractor, shall be responsible for the satisfactory installation of the complete system. The contractor shall provide, from the acceptable manufacturer's current product lines, equipment and components, which comply with the requirements of these specifications. Equipment or components, which do not provide the performance and features, required by these specifications are not acceptable, regardless of manufacturer. Strict conformance to this specification is required to ensure that the installed and programmed system will function as designed, and will accommodate the future requirements. All specified operational features must be met without exception. All equipment and components shall be the manufacturer's current model. The contractor shall be responsible for the satisfactory installation of the complete system. All control panel assemblies and connected field appliances shall be provided by the same system supplier, and shall be designed and tested to ensure that the system operates as specified. The system shall utilize electronically addressable, microprocessor-based detectors as described in this specification. The equipment to be supplied will be considered only if it meets all sections of the performance specification.

The supplier shall submit a point-by-point statement of compliance for all sections in this specification. The statement of compliance shall consist of a list of all paragraphs within these sections. Where the proposed system complies fully with the paragraph, as written, placing the word "comply" opposite the paragraph number shall indicate such. Where the proposed system does not comply with the paragraph as written and the supplier feels the proposed system will accomplish the intent of the paragraph, a full description of the function as well as a full narrative description of how its proposal will meet its intent shall be provided. Any submission that does not include a point-by-point statement of compliance as described herein shall be disqualified. Where a full description is not provided, it shall be assumed that the proposed system does not comply. The Contractor shall furnish all labor, services and materials necessary to furnish and install a complete, functional fire alarm system (System). The System shall comply in respects with all pertinent codes, rules, regulations and laws of the Authority, and local jurisdiction. The system shall comply in all respects with the requirements of

the specifications, manufacturer's recommendations and Underwriters Laboratories (UL) listings.

It is further intended that upon completion of this work, the Owner/Consultant be provided with:

- a. Complete information and drawings describing and depicting the entire system(s) as installed, including all information necessary for maintaining, troubleshooting, and/or expanding the system(s) at a future date.
- b. Complete documentation of system(s) testing.
- c. Certification, software licenses that the entire system(s).

### **3.0 CODES**

The equipment and installation shall comply with the current provisions of the following codes and standards:

NFPA 72 - 1999 National Fire Alarm Code®  
UL 9th Schedule certification

### **4.0 Panel Components & Functions**

The control panel(s) shall be a multi-processor based networked system designed specifically for fire, one-way and two-way emergency audio communications, and smoke control, extinguishing agent releasing system if necessitated, with integration modules for BMS or any third party control/annunciation. The control panel shall be UL/FM/EN 54 listed. The control panel shall include all required hardware, software and site specific system programming to provide a complete and operational system. The control panel(s) shall be designed such that interactions between any applications can be configured, and modified. The control panel(s) operational priority shall assure that life safety takes precedence among the activities coordinated by the control panel.

The control panel shall include the following capacities:

- Support up to minimum 125 detectors / 125 Devices per Loop.
- Support up to minimum 2500 analog/addressable points per panel
- Support network connections up to minimum 64 or other control panels and annunciator.
- Support multiple digital dialers and modems
- Support multiple communication ports and protocols
- Support up to a minimum of 840 chronological events.

The network of control panels shall include the following features:

- Ability to download all network applications and firmware from the configuration computer from a single location on the system.
- Provide electronic addressing of analog/addressable devices.
- Provide an operator interface control/display that shall annunciate command and control system functions.



- Provide an internal audible signal with different programmable patterns to distinguish between alarm, supervisory, trouble and monitor conditions.
- Provide a discreet system control switch provided for reset, alarm silence, panel silence, drill switch, previous message switch, next message switch and details switch.
- Provide system reports that provide detailed description of the status of system parameters for corrective action or for preventative maintenance programs. Reports shall be displayed by the operator interface or capable of being printed on a printer.
- Provide an authorized operator with the ability to operate or modify system functions like system time, date, passwords, holiday dates; restart the system and clear control panel event history file.
- Provide an authorized operator to perform test functions within the installed system.

The control panel shall contain a standby power supply that automatically supplies electrical energy to the system upon primary power supply failure. The system shall include a charging circuit to automatically maintain the electrical charge of the battery.

The control panel shall be provided with all hardware and software compatibility devices for integration with other third party systems on open platform required for safe functioning and ease operability for the infrastructure.

#### **4.1 Operator's Interface**

The system shall be designed and equipped to receive, monitor, and annunciate signals from devices and circuits installed throughout the GSCL Office. Standard LED annunciator may be combined in common enclosures provided that the groups of LED's comprising each of the required annunciator are separated from one another (Detection, Supervisory, Status, and Security) and clearly labeled. A minimum 640 - character LCD display shall be part of the main control panel for easy alarm reading and understanding. Receipt of alarm, trouble, and supervisory signals shall activate integral audible devices at the control panel(s) and at each remote annunciation device. The integral audible devices shall produce a sound output upon activation of not less than 85 DBA at 10 feet.

The annunciator shall contain the following system status indicators:

- LCD character Backlit Liquid Crystal Display
- System Normal Indicator
- System Common Alarm Indicator
- System Common Trouble Indicator
- System Common Supervisory Indicator
- System Ground Fault Indicator
- System Common Security Indicator
- System Disabled Point(s) Indicator
- System Reset Switch with Indicator
- System Alarm Silence Switch with Indicator
- System Trouble Silence Switch with Indicator
- System Message Queue Scroll Switches.
- Digital Keypad to Enable/Disable System and Functions.

## 4.2 Power Supply

System power supply(s) shall provide multiple powers limited 24 VDC output circuits as required by the panel. Upon failure of normal (AC) power, the affected portion(s) of the system shall automatically switch over to secondary power without losing any system functions. Each system power supply shall be individually supervised. Power supply trouble signals shall identify the specific supply and the nature of the trouble condition. All standby batteries shall be continuously monitored by the power supply. Low battery and disconnection of battery power supply conditions shall immediately annunciated as battery trouble and identify the specific power supply affected. All system power supplies shall be capable of recharging their associated batteries, from a fully discharged condition to a capacity sufficient to allow the system to perform consistent with the requirements of this section, in 48 hours maximum.

All AC power connections shall be to the building's designated emergency electrical power circuit and shall meet the requirements of NFPA 72 - The AC power circuit shall be installed in raceway. The power circuit disconnect means shall be clearly labeled FIRE ALARM CIRCUIT CONTROL and shall have a red marking. The location of the circuit disconnect shall be labeled permanently inside the each control panel the disconnect serves. Power supply for all input & output devices to be driven from main Fire Alarm Panel.

## 4.3 Reports

The system shall provide the operator with reports that give detailed description of the status of system parameters for corrective action, or for preventative maintenance programs. The system shall provide these reports via the main LCD (not part of this contract), and shall be capable of being printed on any printer.

The system shall provide a report that gives a sensitivity listing of all detectors that have less than 75% environmental compensation remaining. The system shall provide a report that provides a sensitivity (% Obscuration per foot) listing of any particular detector.

The system shall provide a report that gives a listing of the sensitivity of all of the detectors on any given panel in the system, or any given analog/addressable device loop within any given panel.

The system shall provide a report that gives a chronological listing of up to the last three months system events.

The system shall provide a listing of all of the firmware revision listings for all of the, installed network components in the system. The system shall also provide healthiness of the entire system and associated system, last updates, up gradations requirement and maintenance requirements.

## 5.0 Field Mounted System Components

### **5.1 INTELLENT SMOKE DETECTOR:**

Smoke detectors shall provided below & above false ceiling where space between the false ceiling and the slab is 800 mm and more as per IS code The multi-sensor or multi-tech smoke detector which will have both photoelectric as well as thermal detection elements shall have inbuilt microprocessor, and shall be capable of taking an independent alarm decision. The scattering of smoke particles shall activate the photo sensor. Each intelligent addressable multi-criteria detector's sensitivity shall be capable of being programmed electronically from Control Panel without any extra tools as: most sensitive, more sensitive, normal, and less sensitive or least sensitive. In addition to the five sensitivity levels the detector shall provide a pre-alarm sensitivity setting, which shall be settable in 5% increments of the detector's alarm sensitivity value. The detector should continue to give TRUE alarms even if the loop controller on the main panel fails. Alarm condition shall be based upon the combined input from the photoelectric and thermal detection elements. Each detector shall be capable of transmitting pre-alarm and alarm signals in addition to the normal, trouble and need cleaning information. It shall be possible to program control panel activity to each level. Each smoke detector may be individually programmed to operate at any one of five (5) sensitivity settings. Each detector microprocessor shall contain an environmental compensation algorithm that identifies and sets ambient "environmental thresholds approximately six times an hour. The microprocessor shall monitor the environmental compensation value and alert the system operator when the detector approaches 75% and 100% of the allowable environmental compensation value.

### **5.2 INTELLENT THERMAL (HEAT) DETECTOR:**

Heat detectors (rate of rise) shall be installed in pantry & kitchen for activation of alarm. The heat detector shall have a thermal sensing element /circuit. The detector shall have inbuilt microprocessor and shall be capable of taking an independent alarm decision. Detectors shall be rated at 15°F (9°C) per minute rate-of-rise and 135°F (57°C) fixed temperature The detector shall be capable of being addressed electronically from control panel without any extra tool.

### **5.3 Detector Bases:**

The bases shall be easy to install and mount and shall be of standard type. The base shall be used where local or group alarm signaling is required. The base shall, contain no electronics and support all series detector types.

### **5.4 Response indicators**

Response indicators shall be LED powered from signal initiating device and shall be provided wherever the detectors are hidden.

### **5.5 Manual Stations (Break Glass Unit)**

Break glass units shall be flush mounted tamper proof listed or approved addressable with built in microprocessor or operated through monitor module and making a positive alarm and fool-proof operation BGU should provide an address through a monitor module or otherwise. Each BGU shall have a built-in microphone for talk back to the control panel.

For detailed specifications refer Appendix F6

## **5.6 Sounders - Strobes:**

Electronic sounders shall operate on 24 VDC nominal. Electronic sounders shall field programmable without the use of special tools, at a sound level of at least 90 DBA measured at 10 feet from the device and shall be flush or surface mounted as shown on plans. They shall produce broad band directional sound to guide occupants to safe exists even in complete darkness. Strobe lights shall meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:

The maximum pulse duration shall be 2/10 of one second. Equivalent alternate type will be also acceptable.

## **5.7 Power Supply**

Standby power supply shall be an electrical battery with capacity to operate the system under maximum supervisory load for 24 hours and capable of operating the system for fifteen (15) minutes of evacuation alarm on all devices, operating at maximum load. The system shall include a charging circuit to automatically maintain the electrical charge of the battery. The system shall automatically adjust the charging of the battery to compensate for temperature.

## **6.0 Sequence of Operations**

### **6.1 General - Audio**

Upon alarm activation of any area smoke detector, heat detector, manual break glass unit, the following functions shall automatically occur:

The internal audible device shall sound at the control panel or command center. Display the alarm event on the graphical workstation. The LCD Display shall indicate all applicable information associated with the alarm condition including: zone, device type, device location and time/date. All system activity/events shall be documented on the system printer. Any remote or local annunciator LCD/LED's associated with the alarm zone shall be illuminated.

The following audio messages and actions shall occur simultaneously:

An evacuation message shall be sounded on fire floors (zones) / cable galleries, deck area immediately above and below (adjacent to) the fire floor (galleries), in fire condition. It is the intent of this message to advise occupants hearing this message that they are near danger and should leave the building via nearest exit (manhole etc.) immediately.

Activate visual strobes on the fire floors (zones), / cable galleries, deck area immediately above and below (adjacent to) the fire floor (zone). The visual strobe shall continue to flash until the system has been reset. The visual strobe shall not stop operating when the "Alarm Silence" is pressed. An alert message shall be sounded on the remainder of building. It is the intent of this message to advise occupants to prepare for evacuation if necessary. An instructional message shall be sounded in the stairwells or at the point of man-hole instructing occupants to move carefully and quickly to exit the building /gallery and to exit to a safe location if you encounter smoke in the galleries/sub-station.

An instructional message shall be sounded in the elevator cabs (if any). It is the intent of this message to advise elevator occupants that an emergency exists, the elevator has been directed to the ground floor, and that occupants should quickly exit the building. An instructional message shall be sounded in the lobby. It is the intent of this message to advise lobby occupants to leave the lobby and clear the area for arriving firefighters. An instructional message shall be sounded in the concourses connected to the building's lobby / deck area. It is the intent of this message to prevent new entries into the lobby by advising occupants not to attempt to enter the lobby of the affected area.

Provide selective paging to each individual floor (zone). In addition to the message/channels detailed above, a dedicated page channel shall be capable of simultaneously providing live voice instructions without interrupting any of the messages listed above shall be provided.

Transmit signal to the building automation system (HVAC, Access Control etc.)

Transmit signal to the central station with point identification.

All automatic events programmed to the alarm point shall be executed and the associated outputs activated.

All man-holes exits /exit doors shall unlock throughout the building.

All self-closing fire/smoke doors held open shall be released.

## 6.2 Network Wiring

The system supplied under this specification (interconnection of FACP-1 & 2 with Global Fire Alarm Panel at UC-5 Sub-station) shall utilize node-to-node, direct-wired multi-priority peer-to-peer network operations. The backbone shall be multi-core wiring or commercial CAT5/6 cable depending on application. A Minimum of 64 ten loop panels shall be capable of being networked together and each panel shall have capability of addressing 2500 points .The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between nodes. When a network is wired in a Class B configuration, a single break or short on the network wiring isolates the system into two groups of panels. Each group continues to function as a peer-to-peer network working with their combined databases. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate

the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-networks and continues to respond to alarm events from every panel that can transmit and receive network messages. The remote control panel/network nodes shall meet the same requirements as described in control panel section and shall contain Common control switches with minimum 640 character LCD display, as required with Integral power supply(s) with secondary stand-by power. It shall also have signaling line circuits for communications with analog/addressable devices, as required, audio amplification, as required, Notification appliance circuits, as required and auxiliary function circuits and operations, as required.

The network communication shall be based on a Local Area Network (LAN). The network shall use a deterministic token-passing method. Collision detection and recovery type protocols are not acceptable substitutes due to life safety requirements. In addition, there shall be no master, polling computer, central file computer, display controller or other central element (weak link) in the network which, on failure, may cause complete loss of network communications or cause major degradation of network capability. There shall be no cascading of CPUs or master-slave relationships at the network level to facilitate network communications. Failure of any node shall not cause failure or communication degradation of any other node or change the network communication protocol among surviving nodes located within distance limitations

## 6.4 Shop Drawings

A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:

- Control panel wiring and interconnection schematics.
- Complete point to point wiring diagrams.
- Riser diagrams.

Complete floor plan drawing locating all system devices and 1/4" = 1'-0" scale plan and elevation of all equipment in the Fire Command Station. Including showing the placement of each individual item of fire alarm, security, and access control equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.

Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.

Complete system bill of material.

All drawings shall be reviewed and signed off by the consultant

The engineered systems distributor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.

Submit a copy of the system supplier's training certification issued by the manufacturer of the integrated life safety system, and a copy of the installing technician's NICET certification.

## 6.5 System Calculations

Complete calculations shall be provided which show the electrical load on the following system components:

- Each system power supply, including stand alone booster supplies.
- Each standby power supply (batteries).
- Each notification appliance circuit.
- Each auxiliary control circuit that draws power from any system power supply.

## 7.0 DOCUMENTS TO BE SUBMITTED BY THE CONTRACTOR:

It is the responsibility of the vendor to meet the entire intent and functional performance detailed in these specifications. Approved submittals shall only allow the vendor to proceed with the installation and shall not be construed to mean that the vendor has satisfied the requirements of these specifications. The vendor shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order. Each submittal shall include a cover letter providing a list of each variation that the submittal may have from the requirements of the contract documents. In addition the Vendor shall provide specific notation on each shop drawing, sample, catalogue cut, data sheet, installation manual, etc. submitted for review and approval, of each such variation. All drawings and diagrams shall include the vendor's title block, complete with drawing title, vendor's name, address, date including revisions, and preparer's and reviewer's initials.

Data sheets with the printed logo or trademark of the manufacturer for all equipment. Indicated in the documentation will be the type, size, rating, style, and catalog number for all items proposed to meet the system performance detailed in this specification. The proposed equipment shall be subject to the approval of the Architect/Engineer.

A complete set of shop drawings shall be supplied. The shop drawings shall be reproduced electronically in digital format. This package shall include but not be limited to:

- Control panel wiring and interconnection schematics.
- Complete point to point wiring diagrams.
- Riser diagrams.

Complete floor plan drawing locating all system devices and 1/4" = 1'-0" scale plan and elevation of all equipment in the Fire Command Station. Including showing the placement of each individual item of fire alarm, security, and access control equipment as well as raceway size and routing, junction boxes, and conductor size, quantity, and color in each raceway.

Detailed system operational description. Any Specification differences and deviations shall be clearly noted and marked.

Complete system bill of material.

All drawings shall be reviewed and signed off by the Engineer

The engineered systems distributor must be licensed in the state of project location and have been incorporated in the business in that state for a minimum of 5 years.

Submit a copy of the system supplier's training certification issued by the manufacturer of the integrated life safety system, and a copy of the installing technician's NICET certification.

Complete calculations shall be provided which show the electrical load on the following system components:

- Each system power supply, including stand alone booster supplies.
- Each standby power supply (batteries).
- Each notification appliance circuit.
- Each auxiliary control circuit that draws power from any system power supply.

The vendor shall have successfully installed similar system fire detection, evacuation voice and visual signaling control components on a previous project of comparable size and complexity. The employer reserves the right to reject any control components for which evidence of a successful prior installation performed by the vendor cannot be provided.

The vendor shall have in-house engineering and project management capability consistent with the requirements of this project. Qualified and approved representatives of the system manufacturer shall perform the detailed engineering design of central and remote control equipment. Qualified and approved representatives of the system manufacturer shall produce all panel and equipment drawings and submittals, operating manuals. The vendor is responsible for retaining qualified and approved representative(s) of those system manufacturers specified for detailed system design and documentation, coordination of system installation requirements, and final system testing and commissioning in accordance with these specifications.

## **8.0 SYSTEM OPERATION – FUNCTIONAL SPECIFICATIONS AND PRODUCTS:**

### **8.1 General**

The system shall be integrated into a comprehensive system, to provide the functional performance described as follows:

#### **8.1.1 Fire Detection and Alarm System**

- 8.1.1.1** The fire detection and alarm system shall monitor and display the activation of each device in the system, such as heat detector, smoke detector, manual break-glass unit, or any other input device which may be required.
- 8.1.1.2** The system shall initiate output functions such as automatic alarm annunciation via speakers, fans shutdown, automatic notification to the Fire main control PC and activation of audible hooters/directional sounders/strobes.
- 8.1.1.3** The system shall be of the addressable intelligent type, completely supervised, such that a break in any wire (loop) shall not prevent any device from operating. The system shall be of the type such that each device connected to the system shall be provided with unique address and separately identified



at the Main control panel (MCP).

- 8.1.1.4** The wiring shall be monitored against faults such as opens, shorts, earth's or data transmission failure. Detection addressable loops, capable of handling minimum of 250 addressable points shall return to the control panel.

## **8.2 Scope**

- 8.2.1** The Fire Alarm System for Smart City Office shall comprise of 1 no. of Fire Alarm control panels & associated fire devices & other hardware.
- 8.2.2** Photoelectric type smoke detector shall be with integral microprocessor and shall be capable of taking an independent alarm decision. In case of the failure of the main loop controller the detector shall be capable of operating in standalone mode or degrade mode and continue to take decisions
- 8.2.5** Heat detectors of the fixed temperature (58 deg.C) type or rate of rise of temperature type shall be used in areas environmentally unsuited for smoke detectors such Kitchens, Valet Laundries, Emergency Generator rooms,
- 8.2.6** Break-glass stations (manual fire alarm stations) shall be located on the occupied side of the door to each exit, at man-holes and at intermediate locations as required (Maximum distance between pull stations shall not exceed 60 m). .
- 8.2.7** Magnetic hold open devices shall be provided where required for the automatic release of smoke / fire doors.

## **9.0 Fire Alarm Control Panels – OPERATIONAL SPECS**

- 9.1** Each network FIRE ALARM CONTROL PANLEL shall contain a microprocessor-based central processing unit (CPU). The FACP shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, local and remote operator terminals, printers, annunciators, emergency voice communication systems, public address system, building management system, and other system controlled devices. The Fire Alarm System shall include all required hardware and system programming to provide a complete and operational system, capable of providing the protected premises with the following functions.
- 9.2** Modular systems manufacture with a layered application concept, including an “operational layer” and a “human interface layer”, to allow maximum flexibility at the system with a minimum physical size requirement.
- 9.3** All system operational software is to be stored in FLASH memory with power backup.
- 9.4** System response to any alarm condition must occur within 3 seconds, regardless of

the size and the complexity of the installed system.

**9.5** Each FACP on the network shall perform the following functions:

- 9.5.1** Supervise and monitor all intelligent/addressable detectors and monitor modules connected to the system for normal, trouble and alarm conditions.
- 9.5.2** Supervise all initiating signaling and notification circuits throughout the facility. Voice evacuation speakers to be monitored by the public address system.
- 9.5.3** Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
- 9.5.4** Visually and audibly annunciate any trouble, supervisory or alarm, condition on operator's terminal, panel display, and annunciators.
- 9.5.5** Visually display status of emergency power.
- 9.5.6** Shall have controls for unlocking stairway doors.
- 9.5.7** Graphically display all zones.
- 9.5.8** Trouble alarm for public address system.
- 9.5.9** Trouble Alarm for Building Management System.
- 9.5.10** System status LEDs for Test status, CPU Fail status, Ground Fault status, Disable status
- 9.5.11** Common control switches for reset, Alarm silence, panel silence, drill silence.
- 9.5.12** Other operator control switches such as previous message switch. Next message switch and more details switch.
- 9.5.13** Each FACP node shall include a full featured operator interface control and annunciation panel which shall include individual, colour coded system status LEDs, and an alpha-numeric keypad for field programming and control of the node.
- 9.5.14** All programming or editing of the existing programming in the system shall be achieved without special equipment or interrupting the alarm monitoring functions of the fire alarm control panel.
- 9.5.15** Block Acknowledge for Trouble Conditions
- 9.5.16** Rate Charger Control

- 9.5.17** Control-By-Time (Delay, Pulse, time of day, etc.)
- 9.5.18** Automatic Day/Night Sensitivity Adjust (high/low)
- 9.5.19** Environmental Drift Compensation (selectable ON or OFF)
- 9.5.20** Smoke Detector Pre-alarm Indication at Control Panel
- 9.5.21** NFPA 72 Smoke Detector Sensitivity Test
- 9.5.22** System Status Reports
- 9.5.23** Alarm Verification, by device, with tally
- 9.5.24** Multiple CRT Display Interface
- 9.5.25** Non-Fire Alarm Module Reporting
- 9.5.26** Automatic NFPA 72 Detector Test
- 9.5.27** Programmable Trouble Reminder
- 9.5.28** Upload/Download System Database to PC Computer
- 9.5.29** Interface with security system, Building Management System public address system.
- 9.5.30** Ground fault detection.

## **10.0 Fire Alarm Central Processing Unit & Networking**

- 10.1** "The proposed Fire Alarm System shall be from a single UL listed manufacturer for complete compatibility of the proposed large peer-to-peer networked system. Master-Slave network will not be acceptable. Each area shall have its own Fire Alarm Control Panel as a Node in the Network complete with its own Network Control Annunciator for integration with Global Fire Alarm System at UC-5 Sub-station.

## **11. System Components & Practices**

### **11.1 Enclosures**

Control panels shall be housed in FM/UL-listed or BS/IEC Standards cabinets suitable for surface or semi-flush mounting. Cabinets shall be corrosion protected, given a rust-resistant prime coat, and the manufacturer's standard finish. The back box and door shall be constructed of 1.5mm steel with provisions for electrical cable connections into the sides and bottom. The door shall provide a key lock and

include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.

## **11.2 Field Programming**

The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.

All local FACP node programming shall be accomplished through the FACP keyboard or through a portable laptop.

All field defined programs shall be stored in non-volatile memory.

The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Multi-levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.

## **11.3 Specific System Operations**

Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all intelligent detectors in the FACP node from each system keypad or from the keyboard of the video terminal. Sensitivity range shall be within allowed UL limits.

Alarm Verification: Each of the intelligent addressable detectors in the system may be independently selected and enabled for alarm verification. Each FACP shall keep a count of the number of times each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

## **11.4 System Point Operations**

All devices in the FACP node may be enabled or disabled through the local keypad or video terminal.

Any FACP node output point may be turned on or off from the local system keypad or the video terminal.

Point Read: The FACP node shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point shall be annunciated for the parameters listed:

Automatic Detector Maintenance Alert: Each FACP node shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system shall enter the trouble mode, and the particular intelligent detector shall be annunciated on the system display, network display and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

## **12.0 System Components – Conventional**

### **12.1 Horns**

**12.1.1** All horns shall operate on 24 VDC or with field selectable output taps from 0.5 to 2.0 Watts.

**12.1.2** Horns in mechanical rooms shall produce a sound output of 110 dBA at 3m. All other horns shall produce a sound output of 100DBA at 3m.

**12.1.3** Frequency response shall be a minimum of 400 HZ to 4000 HZ.

**12.1.4** The back of each horn shall be sealed to protect the speaker cone from damage and dust.

**12.1.5** Weatherproof horns shall have weatherproof construction and shall be rated for 110 dBA.

**12.2** Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:

**12.2.1** The maximum pulse duration shall be 2/10 of one second.

**12.2.2** Strobe intensity shall meet the requirements of UL 1971.

**12.2.3** The flash rate shall meet the requirements of UL 1971.

**12.2.4** All strobe lights shall be synchronized.

**12.2.5** Weatherproof strobe lights shall have weatherproof construction and a temperature range of -35°C to 65°C.

### **12.3. Intelligent Photoelectric Area Smoke Detectors**

**12.3.1** Photoelectric smoke detectors shall be a 24 VDC, two wire, ceiling-mounted, light scattering type using an LED light source.

**12.3.2** Each detector shall contain a remote LED output and a built-in test switch.

**12.3.3** Detector shall be provided on a twist-lock base.

**12.3.4** It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.

- 12.3.5** A visual indication of an alarm shall be provided by Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash every 10 seconds, indicating that power is applied to the detector when the detector is not in alarm.
- 12.3.6** The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
- 12.3.7** All field wire connections shall be made to the base through the use of a clamping plate and screw.
- 12.3.8** Each detector shall contain an optical sensing chamber with a nominal sensitivity of 2.3 percent/foot obscuration.

## **12.7 Addressable Control Module**

- 12.7.1.** Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
- 12.7.2.** The control module shall mount in a standard 100mm square, 100mm deep electrical box, or to a surface mounted backbox.
- 12.7.3.** The control module NAC may be wired for Style Z (Class A), or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
- 12.7.4.** The control module shall be suitable for pilot duty applications.

## **12.9. Isolator Module**

- 12.9.1.** Isolator module shall be built-in in the base of addressable detector. If proposed make of detector do not have this feature then contractor have to provide an isolator module after each twenty detector. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each zone.
- 12.9.2.** If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

**12.9.3.** The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.

**12.9.4.** The isolator module shall mount in a standard 100mm deep electrical box or in a surface mounted back box. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

## **12.10 Batteries and External Charger**

### **12.10 Battery**

**12.10.1.** Batteries shall be 12 volt, Cd type or better and shall not be hazardous to humans or environment

**12.10.2.** The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills and leakage shall not be required.

**12.10.4.** Battery shall be heavy duty type of life span of minimum 5 years.

## **13.0 Installation**

Installation shall be in accordance with the IFC, NEC, NFPA 72, local codes, as shown on the drawings, and as recommended by the major equipment manufacturer.

All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.

Manual Pull Stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed not less than 1 m nor more than 1.2 m above the finished floor.

## **14.0 Typical Operation**

Actuation of any manual station, smoke detector, heat detector or water flow switch shall cause the following operations to occur unless otherwise specified:

Activate all programmed speaker circuits in a zone or throughout.

Actuate strobe units until the panel is reset in a zone or throughout.

Light the associated indicators corresponding to active speaker circuits.

Release all magnetic door holders to doors to adjacent zones on the floor from which the alarm was initiated.

Where required, return all elevators to the primary or alternate floor of egress.

Duct type smoke detectors shall, in addition to the above functions, shut down the ventilation system or close associated control dampers as appropriate.

Activation of any sprinkler system low pressure switch, on valve tamper switch, shall cause a system supervisory alarm indication.

## **15.0 Commissioning**

Commissioning shall include pre-testing, troubleshooting, acceptance testing, and punch list.

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. The Contractor shall pre-test the system before the final acceptance testing and shall submit a pretest report to the Engineer:

Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.

Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

Verify activation of all flow switches.

Open initiating device circuits and verify that the trouble signal actuates.

Open signaling line circuits and verify that the trouble signal actuates.

Open and short notification appliance circuits and verify that trouble signal actuates.

Open and short (wire only) network communications and verify that trouble signals are received at network annunciators or reporting terminals.

Ground initiating device circuits and verify response of trouble signals.

Ground signaling line circuits and verify response of trouble signals.

Ground notification appliance circuits and verify response of trouble signals.



Check alert tone and prerecorded voice message to all alarm notification devices.

Check installation, supervision, and operation of all intelligent smoke detectors using smoke test.

Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.

When the system is equipped with optional features, the manufacturer's manual should be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

Check each zone smoke control sequence under “automatic,” “on” and “off” operation.

Perform the following tests for the public address/fire alarm system:

Simulate a fire condition using each of the following initiating devices in each zone:

- manual pull station - waterflow switch
- area smoke detector - projected beam smoke
- heat detector - detector
- duct smoke detector

After alarm verification time has exceeded ensure that proper voice institution messages are transmitted to the proper zone.

Simulate live voice announcements in all zones using All Call, All Call Minus, Page to Evac., and Page to Alert functions to ensure that proper voice instruction messages are transmitted to the proper zones. Stairways shall be on an independent zone separate from all other zones.

## **16.0 Test & Inspection**

All intelligent analog addressable devices shall be tested for current address, sensitivity, and user defined message. All wiring shall be tested for continuity, shorts, and grounds before the system is activated. All test equipment, the installing contractor, shall make instruments, tools and labor required to conduct the tests available.

The system including all its sequence of operations shall be demonstrated to the Owner, his representative, and the local fire inspector. In the event the system does not operate properly, the test shall be terminated. Corrections shall be made and the testing procedure shall be repeated until it is acceptable to the Owner, his representatives and the fire inspector.

At the final test and inspection, a factory-trained representative of the system manufacturer shall demonstrate that the system functions properly in accordance with these specifications. The representative shall provide technical supervision, and participate during all of the testing for the system.

A letter from the Contractor certifying that the system is installed entirely in accordance with the system manufacturer's recommendations and that the system is in proper working order.