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PERFORMANCE SPECIFICATION  
INTELLIGENT REPORTING FIRE DETECTION SYSTEM

PART 1.0 - GENERAL

1.1. DESCRIPTION:

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system.

B. The fire alarm system shall comply with requirements of 1993 NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

C. Alarm and trouble signals from each transponder shall be digitally encoded by listed electronic devices onto the looped multiplex communication system.

D. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto the Signaling Line Circuits.

E. The system shall be an active/interrogative type system where each transponder is repetitively scanned, causing a signal to be transmitted to the local fire alarm control panel node indicating that the transponder and its associated initiating device and notification appliance circuit wiring is functional. Loss of this signal at the local FACP shall result in a trouble indication on both the FACP display and at the network display, as specified hereinafter for the particular input.

F. The system shall be arranged such that not less than 20 percent additional transponders may be inserted into any network communication loop.

G. The fire alarm manufacturer shall be of the highest caliber and insist on the highest quality. The system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

H. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).

I. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be in compliance with the UL listing.

J. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

## 1.2. SCOPE:

A. A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

### B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).

2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected to the by the SLC circuit.

3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC circuit or a panel circuit.

4. Alarm signals arriving at the main FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

5. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone, which ever is greater.

6. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.

7. Two-way telephone communication circuits shall be supervised for open and short circuit conditions.

### C. BASIC SYSTEM FUNCTIONAL OPERATION

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the FACP shall flash.

2. A local piezo electric signal in the control panel shall sound.

3. The display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location.

4. Printing on the FACP and history storage equipment shall log the information, along with time and date of occurrence.

5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs shall be activated.

## 1.3. SUBMITTALS

### A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.

2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.

B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.

2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.

3. Show annunciator layout, configurations, and terminations.

C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

1.4. GUARANTY:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.5. APPLICABLE STANDARDS AND SPECIFICATIONS:

The specifications and standards listed below form a part of this specification. The system shall comply with the latest standards.

A. National Fire Protection Association (NFPA) - USA:

No. 12	High Pressure CO2 Extinguishing Systems
No. 12B	Halon 1211 Extinguishing Systems
No. 13	Sprinkler Systems
No. 13A	Halon 1301 Extinguishing Systems
No. 15	Water Spray Systems
No. 16	Foam/Water Deluge and Spray Systems
No. 17	Dry Chemical Extinguishing Systems
No. 17A	Wet Chemical Extinguishing Systems
	Clean Agent Extinguishing Systems
No. 72-1993	National Fire Alarm Code
No. 101	Life Safety Code

- B. Underwriters Laboratories Inc. (UL) - USA:
  - No. 268 Smoke Detectors for Fire Protective Signaling Systems
  - No. 864 Control Units for Fire Protective Signaling Systems
  - No. 268A Smoke Detectors for Duct Applications
  - No. 521 Heat Detectors for Fire Protective
  - No. 464 Audible Signaling Appliances
  - No. 38 Manually Actuated Signaling Boxes
  - No. 346 Waterflow Indicators for Fire Protective Signaling Systems
  - No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling
- Systems
  - No. 1971 Visual Notification Appliances
- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ).
- E. The Video Display Terminal (VDT) shall comply with Swedish magnetic emission and X-radiation guidelines MPR 1990:10.

1.6. APPROVALS:

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:

- UL Underwriters Laboratories Inc
- FM Factory Mutual
- ULC Underwriters Laboratories Canada
- MEA Material Equipment Acceptance (NYC)
- CSFM California State Fire Marshal

- B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

- C. The system shall be listed by the national agencies as suitable for extinguishing release applications.

PART 2.0 PRODUCTS

2.1. EQUIPMENT AND MATERIAL, GENERAL:

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.

- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations.

2.2. CONDUIT AND WIRE:

A. Conduit:

1. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.

2. Where possible, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.

3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.

4. Conduit shall be 3/4 inch (19.1 mm) minimum.

B. Wire:

1. All fire alarm system wiring shall be new.

2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system.

3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.

4. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).

5. All field wiring shall be completely supervised.

C. Terminal Boxes, Junction Boxes and Cabinets:

All boxes and cabinets shall be UL listed for their use and purpose.

D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes.

2.3. MAIN FIRE ALARM CONTROL PANEL:

A. The FACP shall be completely microprocessor based.

B. Basic System Operator Controls:

1. Acknowledge Switch: Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON.

2. Alarm Silence Switch: Activation of the alarm silence switch shall cause all programmed devices to return to the normal condition after an alarm.

3. System Reset Switch: Activation of the System Reset switch shall cause

all devices and circuits, to return to their normal condition.

4. Lamp Test: The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.

C. System Capacity and General Operation

1. The control panel shall provide, or be capable of expansion to

D. Intelligent/addressable devices and/or conventional circuits.

1. The system shall include Form-C alarm and trouble relays rated at a minimum of 3.0 amps @ 30 VDC.

2. The fire alarm control panel shall include a full featured operator interface and backlit 80 character Liquid Crystal Display (LCD).

3. The system shall be fully field programmable.

4. The FACP shall provide the minimum following features:

a. Drift compensation to extend detector accuracy over life.

b. Detector sensitivity test, per NFPA 72, Ch 7.

c. Maintenance alert, to warn of excessive smoke detector dirt or dust accumulation.

d. Multiple sensitivity levels for alarm, selected by detector.

e. System status reports to display or printer.

f. Alarm verification, with verification counters.

g. Cross zoning with the capability of counting two detectors in alarm.

h. Walk test.

i. UL-1076 security monitor points.

j. Control-by-time with holiday schedules.

k. Day/night automatic adjustment of detector sensitivity.

l. Device blink control for sleeping areas.

m. Releasing capability.

n. Pre-Alarm

o. Selectable sensitivity levels, three minimum.

p. History Storage, with a minimum of 400 events.

q. Point Enable/Disable.

r. Point Read (status and level of obscuration).

E. Central Microprocessor

1. The microprocessor shall be a state-of-the-art, high speed, and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.

2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system.

3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail.

F. Display:

1. The display shall include an 80-character back-lit Liquid Crystal Display (LCD). It shall also provide Light-Emitting-Diodes (LEDs) for standard fire alarm indications.

2. The display keypad shall be an easy to use type keypad. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Multiple password levels shall be provided.

G. Signaling Line Circuits (SLC)

1. The system shall include

SLC circuits. Each SLC interface shall provide power to and communicate with intelligent detectors (ionization, photoelectric or thermal) and intelligent modules (monitor or control).

Each SLC loop shall be wired NFPA 72 Style 4 (Class B).

H. Serial Interface

1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Electronic Data Processing (EDP) peripherals. One serial port shall support a printer, the other a CRT.

2. The system shall include an EIA-485 port for the serial connection of annunciators and remote LCD displays.

I. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.

2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.

J. Voice Command Center (VCC)

The Voice Command Center (VCC) shall contain equipment required for all audio control, telephone system control, signaling and supervisory functions. This shall include amplifiers, tone generators, digital voice units, a microphone and a main telephone handset.

K. Power Supply:

1. The main power supply for the fire alarm control panel shall provide available power for the control panel and peripheral devices.
2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies or field mounted power supplies.
3. Over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger.
4. The main power supply shall provide a battery charger for 24 hours of standby using dual-rate charging techniques for fast battery recharge.
5. All circuits shall be power-limited, per 1995 UL864 requirements and include earth fault detection.
6. The main power supply shall provide meters to indicate battery voltage and charging current.

L. Auxiliary Field Power Supply - Addressable

1. The auxiliary addressable power supply is a remote 24 VDC power supply used to power Notification Devices and field devices that require regulated 24VDC power. The power supply shall also include and charge backup batteries.
2. The addressable power supply for the fire alarm system shall provide up a minimum of 6.0 amps of 24 volt DC regulated power for Notification Appliance Circuit (NAC) power or 5 amps of 24 volt DC general power. The power supply shall have an additional .5 amp of 24 VDC auxiliary power for use within the same cabinet as the power supply. It shall include an integral charger designed to charge 7.0 - 25.0 amp hour batteries.
3. The addressable power supply shall provide four individually addressable Notification Appliance Circuits that may be configured as two Class "A" and two Class "B" or four Class "B" only circuits. All circuits shall be power-limited per UL 864 requirements.
4. The addressable power supply shall provide built-in synchronization for certain Notification Appliances on each circuit without the need for additional synchronization modules. The power supply's output circuits shall be individually selected for synchronization. A single addressable power supply shall be capable of supporting both synchronized and non-synchronized Notification Devices at the same time.
5. The addressable power supply shall operate on 120 or 240 VAC, 50/60 Hz.
6. The interface to the power supply from the Fire Alarm Control Panel (FACP) shall be via the Signaling Line Circuit (SLC) or other multiplexed means Power supplies that do not use an intelligent interface are not suitable substitutes. The required wiring from the FACP to the addressable power supply shall be a single unshielded twisted pair wire. Data on the SLC shall be transmitted between 24 VDC, 5 VDC and 0 VDC at approximately 3.33k baud.

7. The addressable power supply shall supervise for battery charging failure, AC power loss, power brownout, battery failure, NAC loss, and optional ground fault detection. In the event of a trouble condition, the addressable power supply shall report the incident and the applicable address to the FACP via the SLC.

8. The addressable power supply shall have an AC Power Loss Delay option. If this option is utilized and the addressable power supply experiences an AC power loss, reporting of the incident to the FACP will be delayed. A delay time of eight or sixteen hours shall be Dip-switch selected.

9. The addressable power supply shall have an option for Canadian Trouble Reporting and this option shall be Dip-switch selectable.

10. The addressable power supply mounts in either the FACP backbox or its own dedicated surface mounted backbox with cover.

11. Each of the power supply's four output circuits shall be DIP-switch selected for Notification Appliance Circuit or General Purpose 24 VDC power. Any output circuit shall be able to provide up to 2.5 amps of 24 VDC power.

12. The addressable power supply's output circuits shall be individually supervised when they are selected to be either a Notification Appliance Circuit when wired Class "A" or by the use of an end-of-line resistor. When the power supply's output circuit is selected as General 24VDC power, the circuit shall be individually supervised when an end-of-line relay is used.

13. When selected for Notification Appliance Circuits, the output circuits shall be individually DIP-switch selectable for Steady, March Time, Dual Stage or Temporal.

14. When selected as a Notification Appliance Circuit, the output circuits of the addressable power supply shall have the option to be coded by the use of a universal zone coder.

15. The addressable power supply shall interface and synchronize with other power supplies of the same type. The required wiring to interface multiple addressable power supplies shall be a single unshielded, twisted pair wire.

16. An individual or multiple interfaced addressable power supplies shall have the option to use an external charger for battery charging. Interfaced power supplies shall have the option to share backup battery power.

M. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24 volt power supply or used to power Notification Appliances.

1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24 volt power. It shall include an integral charger designed to charge 7.0 amp hour batteries and to support 60 hour standby.

2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.

3. The FCPS shall include an attractive surface mount backbox.

4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per 1993 NFPA requirements.

5. The FCPS include power limited circuitry, per 1995 UL standards.

N. Stand Alone Voice Evacuation Control Panel

1. A stand alone Voice Evacuation Control Panel shall be available from the same manufacturer of the main fire alarm system.

2. This Voice Control Panel shall work stand alone or as a slave to the Main Control Panel.

3. Shall have as minimum requirements:

a. Integral 25 Watt, 25 Vrms audio amplifier.

b. Speaker circuit that can be wired both Class A or B.

c. Integral Digital Message Generator with a capacity of up to 60 seconds. The Digital Message Generator shall be capable of primary and secondary messages (30 seconds each). These messages shall field programmable without the use of additional equipment.

d. Built in alert tone generators with steady, slow woop, high/low and chime tone field programmable.

e. Integral Diagnostic LEDs for Power, System Trouble, Message Generator Trouble, Tone Generator Trouble, and Alarm.

4. The Voice Control Panel shall be fully supervised including microphone, amplifier output, message generator, speaker wiring, and tone generators.

5. Speaker outputs shall be fully power-limited.

O. Audio Amplifiers:

1. The audio amplifiers will provide audio power (@ 25 Volts RMS) for distribution to the speaker circuits.

2. The amplifier shall include audio input and amplified output supervision, back-up input, and automatic switch-over to back up (if primary amplifier should fail).

3. Amplifiers shall be backed up in groups (one amplifier backs up several).

P. Prerecorded Voice - Audio Message Generator

1. The voice communication system shall be capable of transmitting a prerecorded voice message to all speakers in the building, or to any programmed group of speakers.

2. A built-in microphone shall be provided to allow paging through speaker circuits and shall have priority over the alarm message.

Q. Multi Channel Audio Transponder

1. Transponders shall be listed under UL -Listed as a critical component in a multiplex fire alarm system. Transponders shall be located where shown on the plans. The transponder shall serve as the interface between Intelligent Addressable initiating devices, controlled signaling devices, and the FACP. The supervised multiplex communication port shall be an integral part of the transponder. The transponder shall be designed exclusively for multi channel voice (simultaneous messaging) applications where four different voice/tone messages are played at the same time to different areas of the building. This design is required to facilitate an orderly facility evacuation.

2. The transponder shall include the ability to generate evacuation and alert tones, programmable from a list of 27 different selections.

3. Each Transponder shall be powered from a local Power Supply, and shall provide all power necessary for its own operation, including standby power.

4. Transponders shall communicate with, and be controlled by, the host Fire Alarm Control Panel via a 2-wire Signaling Line Circuit (SLC). This SLC Loop shall operate as a NFPA Style 6 Loop. Systems that require a non-multiplex type interface (relay matrix or other) are not considered suitable substitutes.

5. The SLC interface shall also include a local Signaling Line output. The local output shall be designed for failsafe operation. Should the SLC riser be destroyed prior to the transponder due to fire, bombing or other unforeseen conditions, the local SLC shall operate in a failsafe mode where the transponder reverts to a local general alarm mode.

6. Transponder cabinets shall be used to house and mount amplifiers, batteries and power supplies to allow a true distributed processing and amplification. Plug-in amplifiers shall be used to facilitate flexibility, ease of installation and service.

7. Each transponder shall have the following LED indicators and operator Controls:

- General Trouble - Yellow
- AC Fail - Yellow
- Battery Trouble - Yellow
- Charger Trouble- Yellow
- Telephone - Riser Trouble - Yellow
- Telephone Circuit Trouble (for Circuits 1 to 4) - Yellow
- Speaker Circuit Trouble (for circuits 1 to 4) - Yellow
- Earth Fault - Yellow
- AC Mains On Line - Green
- Boost On Battery Test - Green
- SLC On Line - Green
- Amplifier Trouble (one per amplifier) - Yellow
- Amplifier Primary or Backup - Green
- Audio Channel Trouble (up to four) - Yellow
- Earth Fault Detection - Enable / Disable
- Phone Circuits Class A / B
- Background Music Volume
- Rotary Switches for Addressing
- Download Enable - Disable
- 7-Segment LED SLC Address Display - Red

8. Each transponder shall include Four Class B (Style Y) speaker circuits with a Class A (Style Z) option. Each circuit shall support up to 25 watts of 25 Vrms audio.

9. Transponders shall also include Four Class B (Style Y) or Two Class A

(Style Y) Notification Appliance Circuits (NAC) circuits. The NAC circuits shall support either 24 VDC Visual devices or Fire Fighters Telephones (selected per transponder - not per circuit).

10. Fire Fighters phone circuits shall include a ring tone. The fire fighters telephone riser shall support up to seven telephones communicating simultaneously before signal degradation.

11. If selected for NAC operation, visual circuits shall support up to 2 Amps per circuit and 6 Amps per transponder.

12. Back-up amplifiers shall be available in the unlikely event that a main amplifier fails.

13. The Voice Transponder shall support a remote microphone that shall be used for local paging.

14. A building music input circuit shall be located on the voice transponder. The music input shall be listed as such and a third party interface shall not be required. A means to adjust the music volume shall be available. The transponder software shall prioritize all messaging. In no event shall a non-alarm message (background music, etc.) take priority over an evacuation message.

15. For ease of installation and serviceability, the voice transponder shall include removable terminal blocks which accept up to 12 AWG wire and a Windows based programming utility. All matrix/control by event programming shall be internal to each transponder and downloaded through a serial connection from a PC compatible personal computer.

#### R. Specific System Operations

1. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.

2. Point Read: The system shall be able to display or print the point status diagnostic functions.

3. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.

4. Waterflow Operation: An alarm from a waterflow detection device shall activate the appropriate alarm message on the 80 character display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.

5. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the 80 character display.

6. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

#### 2.4. SYSTEM COMPONENTS:

##### A. Programmable Electronic Sounders:

1. Electronic sounders shall operate on 24 VDC nominal.
2. Electronic sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device.
3. Shall be flush or surface mounted as show on plans.

B. Speakers:

1. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts.
2. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).
3. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
4. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

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

1. The maximum pulse duration shall be 2/10 of one second.
2. Strobe intensity shall meet the requirements of UL 1971.
3. The flash rate shall meet the requirements of UL 1971.

D. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

E. Manual Fire Alarm Stations

1. Manual fire alarm stations shall be non-code, non-breakglass type, equipped with key lock so that they may be tested without operating the handle.
2. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset.
3. An operated station shall automatically condition itself so as to be visually detected, as operated, at a minimum distance of 100 feet (30.5 m) front or side.
4. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters one half inch (12.7 mm) in size or larger.

F. Conventional Photoelectric Area Smoke Detectors

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

2. Each detector shall contain a remote LED output and a built-in test switch.
3. Detector shall be provided on a twist-lock base.
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.
5. A visual indication of an alarm shall be provided by dual latching 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.
6. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.
7. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
8. All field wire connections shall be made to the base through the use of a clamping plate and screw.

G. Conventional Ionization Type Area Smoke Detectors

1. Ionization type smoke detectors shall be a two wire, 24 VDC type using a dual unipolar chamber.
2. Each detector shall contain a remote LED output and a built-in test switch.
3. Detector shall be provided on a twist-lock base.
4. It shall be possible to perform a calibration sensitivity and performance test on the detector without the need for the generation of smoke.
5. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs) over 360 degrees, on the detector, which may be seen from ground level. This LED shall flash every 10 seconds, indicating that power is applied to the detector.
6. The detector shall not alarm when exposed to air velocities of up to 1,200 feet (365.76 m) per minute. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
7. All field wire connections shall be made to the base through the use of a clamping plate and screw.

H. Duct Smoke Detectors

Duct smoke detectors shall be a 24 VDC type with visual alarm and power indicators, and a reset switch. Each detector shall be installed upon the composite supply/return air ducts(s), with properly sized air sampling tubes.

I. Projected Beam Detectors

1. The projected beam type shall be a 4-wire 24 VDC device.

2. The detector shall be listed to UL 268 and shall consist of a separate transmitter and receiver capable of being powered separately or together
3. The detector shall operate in either a short range (30' - 100') or long range (100' - 330') mode.
4. The temperature range of the device shall be -22 degrees F to 131 degrees F.
5. The detector shall feature a bank of four alignment LEDs on both the receiver and the transmitter that are used to ensure proper alignment of unit without special tools.
6. Beam detector shall feature automatic gain control which will compensate for gradual signal deterioration from dirt accumulation on lenses.
7. The unit shall be both ceiling and wall mountable.
8. The detector shall have the ability to be tested using calibrated test filters or magnet activated remote test station.

J. Automatic Conventional Heat Detectors

1. Automatic heat detectors shall have a combination rate of rise and fixed temperature rated at 135 degrees Fahrenheit (57.2 Celsius) for areas where ambient temperatures do not exceed 100 degrees (37.7 Celsius), and 200 degrees (93.33 Celsius) for areas where the temperature does not exceed 150 degrees (65.5 Celsius).
2. Automatic heat detectors shall be a low profile, ceiling mount type with positive indication of activation.
3. The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.
4. The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.
5. Automatic heat detectors shall have a smooth ceiling rating of 2500 square feet (762 square meters).

K. Waterflow Indicator:

1. Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type.
2. Waterflow Switches shall have an alarm transmission delay time which is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.
3. All waterflow switches shall come from a single manufacturer and series.
4. Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor.
5. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

L. Sprinkler and Standpipe Valve Supervisory Switches:

1. Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
2. PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch.
3. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves.
5. The switch housing shall be finished in red baked enamel.
6. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.

M. Serially Connected Annunciator

1. The annunciator shall communicate with the fire alarm control panel via a two wire EIA 485 (multi-drop) communications loop.
2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits. The following operations shall also be provided:
  - a. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions.
  - b. The annunciator shall include a single electrical keyswitch to disable all switch functions.

N. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

1. The system shall offer an interface to a graphic style annunciator and provide each of the features listed above.

O. LCD Alphanumeric Display Annunciator:

1. The alphanumeric display annunciator shall be a supervised, back-lit

LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.

2. The LCD annunciator shall display all alarm and trouble conditions from either the network node or complete network, via the INA.

3. Up to 32 LCD annunciators may be connected to a specific (terminal mode) EIA 485 interface. LCD annunciators shall not reduce the annunciation capacity of the system. Each LCD shall include vital system wide functions such as, system acknowledge, silence and reset.

4. LCD display annunciators shall mimic the local control panel 80-character display or network annunciator and shall not require special programming.

P. Portable Emergency Telephone Handset Jack

1. Portable emergency telephone handset jacks shall be flush mounted on stainless steel plates as indicated on the plans.

2. Insertion of a portable handset plug into a jack shall send a signal to the fire command center which shall audibly and visually indicate the on-line condition, and shall sound a "ring" indication in the handset.

3. The two-way emergency telephone system shall support a minimum of seven (7) handsets on line without degradation of the signal.

Q. Fixed Emergency Telephone Handset

1. The telephone cabinet shall be painted red and clearly labeled as "Emergency Telephone." The cabinets shall be located where shown on drawings.

2. The handset cradle shall have a switch connection so that lifting the handset off of the cradle shall send a signal to the fire command center which shall audibly and visually indicate its on-line (off-hook) condition.

3. On activating the remote phone, the phone earpiece shall sound a telephone ring signal until the master handset is lifted.

4. The two-way emergency telephone system shall support a minimum of seven (7) handsets on line without degradation of the signal.

R. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

S. An optional module shall be provided for NFPA 72, Chapter 4 transmitters as well as a Digital Alarm Communicator Transmitter (DACT). The DACT shall be an optional plug-in module which supports up to 9 different transmission methods. The UDACT shall have the ability to annunciate each and every addressable point at the central station receiver.

T. Printer: The printer shall provide hard-copy printout of all changes in status of the system and shall time-stamp such printouts with the current time-of-day and date. The printer shall be standard carriage with 80-characters per line and shall use standard pin-feed paper. Power to the printer shall be 120 VAC @ 60 Hz.

The system shall have a strip printer capable of being mounted directly in one of the system enclosures. Alarms shall be printed in easy-to-read RED, other messages, such as a

trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed.

U. Video Display Terminal (VDT):

1. The video display terminal shall provide a visual display and an audible alert of all changes in status of the system and shall annotate such displays with the current time-of-day and date.

2. A detachable keyboard shall be provided with the VDT which may be used for programming, testing, and control of the system.

3. The video display terminal shall include a count of all alarms and troubles in the system as well as a count of all alarms and troubles requiring acknowledgment.

2.5. SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. Addressable Devices - General

1. Addressable devices shall use simple to install and maintain type address switches.

2. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel signaling line circuits.

3. Addressable smoke and thermal detectors shall provide alarm and power/polling LEDs. LED(s) shall flash under normal conditions and LED(s) shall be placed into steady illumination by the control panel, indicating an alarm condition.

4. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system.

5. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.

6. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.

7. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

8. LEDs shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.

B. Addressable Pull Box (manual station)

1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.

2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.

3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.

C. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

D. Intelligent Ionization Smoke Detector

1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.

E. Intelligent Thermal Detectors

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

F. Intelligent Duct Smoke Detector

1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.

2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

G. Addressable Dry Contact Monitor Module

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.

2. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.

3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.

H. Two Wire Detector Monitor Module

1. Addressable monitor modules shall be provided to connect one

supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).

2. The two-wire monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or with an optional surface backbox.

3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

#### I. Addressable Control Module

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 contract relay.

2. The control module shall mount in a standard 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box, or to a surface mounted backbox.

3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, 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.

4. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised, UL listed remote power supply.

5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

#### J. Addressable Relay Module

1. Addressable Relay Modules shall be available for HVAC control and other building functions. The relay shall be form C and rated for a minimum of 2.0 Amps resistive or 1.0 Amps inductive. 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.

#### K. Radio Frequency Wireless Detector Interface

1. The Wireless Smoke Detector System shall allow Wireless Photoelectric Smoke Detectors to be used and interfaced with the fire alarm system Signaling Line Circuit. In this fashion, wireless devices are considered addressable devices and report independently for alarm and trouble conditions. In the event of a detector's alarm activation, the Wireless Smoke Detector will transmit an alarm signal to a receiver and the alarm information is provided to the Fire Alarm Control Panel via the Wireless Interface Unit. The Wireless Smoke Detector System consists of an Interface Unit, Receiver, Wireless Smoke Photoelectric Detectors and optional Remote Communications Interface.

2. The Wireless Interface Unit shall contain all necessary connections to operate and interface with the Fire Alarm Control Panel (FACP). The Wireless Interface Unit shall also be 100% field programmable by built in keys and equipped with a 16-digit LCD display that will provide diagnostic, status and test information. The LCD display's scrolling feature shall allow for multiple messages to be viewed at one time.

3. The Wireless Interface Unit shall also be connected with a Wireless Receiver that will accept communication from the wireless devices at 345 MHz and transfer the information to the Wireless Interface unit.

4. Information from the Wireless Interface Unit shall be communicated to the FACP via the Signaling Line Circuit (SLC). One to four receiver units may be interfaced with Remote Communication Interfaces and may be wired up to 7,275 feet away from the Wireless Interface Unit. Wiring to and between the Wireless Interface Unit and Remote Interface Units will consist of two twisted pair of wires 12 to 22 AWG (wire gauge requirements vary with distance). The Wireless Interface Unit shall consume one SLC address and shall only use addresses for devices used. Each wireless device shall report to the FACP in the same manner as wired devices. The Wireless Interface/Receiver unit shall communicate with up to 80 wireless devices.

5. The Wireless Interface/Receiver Unit shall require 45 mA from the SLC or 100 mA from a 24 VDC power supply that is UL listed for fire protective signaling. Power to the Wireless Interface Unit and Remote Interface Units shall be supervised by the use of an 120 ohm end-of-line resistor.

6. The Wireless Interface Unit may be mounted in its own cabinet or may be mounted in other locations near the FACP. The cabinet for the Wireless Interface Unit may also contain the Wireless Receiver.

7. Wireless Photoelectric Smoke Detectors shall operate on lithium battery power and will report low battery and tamper conditions. Removal of a smoke detector from its base will cause a trouble condition at the FACP. Removal of a Wireless Smoke Detector from reception range of the Wireless Receiver shall be detected and reported as a trouble condition within the UL required timeframe. Wireless detectors shall operate up to 60 feet from the location of the Wireless Receiver (contingent upon building structure). Mounting rings and internal sounders will be standard on the wireless photoelectric smoke detectors.

8. Each Wireless Smoke Detector shall be factory programmed with a unique identification number. During an alarm, trouble or tamper condition, the smoke detector shall transmit status and identification information to the wireless receiver. The Wireless Interface Unit will then forward the information and the detector's address to the FACP.

9. The Wireless Smoke Detector System shall be Underwriter Laboratories approved.

#### L. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. 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 segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.

2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.

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.

4. The isolator module shall mount in a standard 4-inch (101.6 mm) deep

electrical box or in a surface mounted backbox. 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.

M. HVAC/Smoke Control System Operation:

1. On/Auto/Off switches and status indicators (LEDS) shall be provided for monitoring and manual control of each fan, damper, HVAC control unit, stairwell pressurization fan, and smoke exhaust fan. To ensure compliance the units supplied shall meet the following UL categories : UUKL, PAZX, UDTZ, QVAX as well as the requirements of NFPA 90A, HVAC, and NFPA 92A & 92B, Smoke Control. The control System shall be field programmable for either 90A operation or 92A/B operation to allow for future use and system expansion.

2. The OFF LED shall be Yellow, the ON LED shall be green, the Trouble/Fault LED shall be Amber/Orange for each switch. The Trouble/Fault indicator shall indicate a trouble in the control and/or monitor points associated with that switch. In addition, each group of eight switches shall have two LEDS and one momentary switch which allow the following functions: An Amber LED to indicate an OFF-NORMAL switch position, in the ON or OFF position; A Green LED to indicate ALL AUTO switch position; A Local Acknowledge/Lamp Test momentary switch.

3. Each switch shall have the capability to monitor and control two addressable inputs and two addressable outputs. In all modes, the ON and OFF indicators shall continuously follow the device status not the switch position. Positive feedback shall be employed to verify correct operation of the device being controlled. Systems that indicate on/off/auto by physical switch position only are not acceptable.

4. All HVAC switches (i.e., limit switches, vane switches, etc.) shall be provided and installed by the HVAC contractor.

5. It shall be possible to meet the requirements mentioned above utilizing wall mounted custom graphic annunciators if the project requires such.

2.6. BATTERIES:

A. The batteries shall be sealed Gel Cell type, 12 volt nominal (two required).

B. The battery shall have sufficient capacity to power the fire alarm system for not less than 24 hours plus 5 minutes of alarm upon a normal AC power failure.

PART 3.0 - EXECUTION

3.1. INSTALLATION:

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

B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.

C. Manual pull stations shall be suitable for semiflush mounting on standard single gang box, and shall be installed not less than 42 inches or more than 48 inches above the finished floor.

3.2. TEST:

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. All testing shall be in accordance with NFPA 72, Chapter 7.

3.3. FINAL INSPECTION:

A. At the final inspection, a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect.

3.4. INSTRUCTION:

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components shall be provided.

B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."