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ENGINEERING SPECIFICATION
FIRE DETECTION AND ALARM SYSTEM

PART 1.0 - GENERAL

1.1. DESCRIPTION:

A. This section of the specification includes the furnishing, installation, and connection of the microprocessor-controlled fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panel, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein.

B. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for protected premises signaling systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.

C. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

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

E. 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 microprocessor controlled fire detection and alarm system shall be installed in accordance with the specifications and drawings.

B. Basic Performance:

1. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).

2. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).

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

C. Basic System Functional Operation

1. Alarm Detection: When an alarm condition is detected by one of the system initiating devices, the following functions shall immediately occur:
 - a. The System Alarm LED on the panel shall flash.
 - b. A local sounding device in the panel shall be activated.
 - c. The corresponding LED on the initiating zone(s) in alarm shall flash.
 - d. All automatic programs assigned to the alarm point shall be executed and the associated notification devices and relays activated. As each notification circuit or control relay is activated, its green LED shall be illuminated.
 - e. If used, the Remote Signaling or Municipal Tie connection shall be activated.

2. System Trouble Detection: When a trouble condition is detected by one of the system initiating or notification circuits, the following functions shall immediately occur:

- a. The System Trouble LED shall flash.
- b. A local sounding device in the panel shall be activated. This sound shall be distinct from the alarm sound from this device.
- c. The trouble LED for the corresponding initiating or notification circuit shall flash on its respective module. If the trouble condition is caused by a CPU or Power Supply Trouble, the corresponding LED on the CPU shall flash.

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 equipment (compatible UL Listed) from other manufacturers may be substituted for the specified equipment.

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, and complete wiring point-to-point diagrams.
3. Show annunciator layout and main control panel module layout, configurations and terminations.
4. Show device layout, riser diagram, and auxiliary functions.

C. Manuals:

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

sheets (with model numbers to be used indicated).

2. Wiring diagrams shall indicate terminals and the interconnections between the items of equipment.

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

D. Certifications:

Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

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.

1.5. POST CONTRACT MAINTENANCE:

A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.

B. As part of the submittal work, include a quote for a maintenance contract to provide all maintenance test and repair as required after the warranty period. Include also a quote of hourly rates, response time and technician travel costs. Submittals which do not include a complete statement of maintenance costs will not be accepted.

1.6. APPLICABLE PUBLICATIONS:

The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

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

No. 72-1993 National Fire Alarm Code
No. 101 Life Safety Code

B. Underwriters Laboratories Inc. (UL) - USA:

No. 50 Cabinets and Boxes
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 Signaling Systems.
No. 228 Door Closers-Holders for Fire Protective Signaling Systems.
No. 464 Audible Signaling Appliances.
No. 38 Manually Actuated Signaling Boxes.
No. 346 Waterflow Indicators for Fire Protective Signaling Systems.
No. 1481 Power supplies for Fire Protective Signaling Systems.
No. 1971 Visual Notification Appliances.

C. Local and State Building Codes.

D. All requirements of the Authority Having Jurisdiction (AHJ).

1.7. APPROVALS:

A. Each system must have proper listing and/or approval from the nationally recognized agency responsible for the particular area.

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 the modular listing requirements of Underwriters Laboratories Inc. Each subassembly of the FACP, including all printed circuit boards, shall include the appropriate UL modular label.

C. The basic FACP shall also be listed by UL and FM as suitable for releasing service.

PART 2.0 - PRODUCTS

2.1. EQUIPMENT AND MATERIAL, GENERAL:

A. All equipment and components shall be new, and the manufacturer's current model.

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

C. All Equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

2.2. CONDUIT AND WIRE:

A. Conduit:

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

2. 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, as per NEC Article 760-29.

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

5. Conduit shall not enter the Fire Alarm Control Panel, or any other remotely mounted Control Panel equipment or backboxes, except where specified by the factory.

B. Wire:

1. 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. Number and size of conductors shall be as recommended the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.63mm) for notification device circuits.

2. 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).

3. All field wiring shall be completely supervised.

C. Terminal Boxes, Junction Boxes and Cabinets:

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

D. The main fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the Main Power Distribution Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG (3.25 mm). The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

2.3. MAIN FIRE ALARM CONTROL PANEL

A. The main FACP shall be a Notifier System 5000 and shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control slave microprocessor controlled modules which provide the interface to initiating device circuits, notification appliance circuits and building control relays.

B. System Capacity and General Operation

1. The control panel shall be capable of expansion to 15 optional modules, of any mix, each with up to eight Initiating Device Circuits (IDC) or Notification Appliance Circuits (NAC) per module, for up to a maximum of 120 Class A or B (NFPA Style D/B) circuits.

2. Optionally, an analog, addressable interface shall be available for point identification. The system shall support up to 10 addressable interface modules (each addressable module is considered one "option module").

3. The CPU shall provide the following controls and indicators used by the system operator:

AC POWER	(Green LED)
SYSTEMS ALARM	(Red LED)
SUPERVISORY	(Yellow LED)
SYSTEM TROUBLE	(Yellow LED)
SIGNALS SILENCED	(Yellow LED)
ANNUNCIATOR/MODULE TROUBLE	(Yellow LED)
POWER TROUBLE	(Yellow LED)
ACKNOWLEDGE	(Momentary Switch)
SIGNAL SILENCE	(Momentary Switch)
SYSTEM RESET	(Momentary Switch)
DISABLE/ENABLE	(Momentary Switch)
NOTIFICATION CKT 1 ON	(Green LED)
NOTIFICATION CKT 1 TROUBLE	(Yellow LED)
NOTIFICATION CKT 1 ON/OFF	(Momentary Switch)
NOTIFICATION CKT 2 ON	(Green LED)
NOTIFICATION CKT 2 TROUBLE	(Yellow LED)
NAC CKT 2 ON/OFF or DRILL	(Momentary Switch)
ALARM RELAY ON	(Green LED)
ALARM RELAY TRBL/DISABLE	(Yellow LED)
ALARM RELAY ON/OFF	(Momentary Switch)

REMOTE SIG/CITY TIE ON	(Green LED)
REMOTE SIG/CITY TIE TRBL	(Yellow LED)
REMOTE SIG/CITY TIE ON-OFF	(Momentary Switch)

4. The system shall be fully programmable, configurable and expandable in the field without the need for special tools or PROM programmers and shall not require replacement of memory ICs.

5. All programming may be accomplished through the front control panel indicators and switches and programming shall be stored in non-volatile memory.

6. Entry into program mode shall require a special key and a special password.

7. The system shall allow programming any input to activate any output or group of outputs. Systems which have limited programming, such as general alarm, or have complicated programming, such as a diode matrix or require a laptop computer, are not considered suitable substitutes.

8. Any notification circuit or control relay may be programmed to activate on alarm of a single initiating zone or any combination of initiating zones.

9. The following functions shall be programmable:

- a. Signal Silence Inhibit Timer, 30 sec. to 5 minutes.
- b. Automatic Silence Select, 5 to 20 minutes.
- c. Presignal Delay Select, 1 to 3 minutes.
- d. Positive Alarm Sequence per NFPA 72.
- e. Alarm and Trouble reminder.

C. Central Processing Unit Module

1. The Central Processing Unit (CPU) module shall communicate with, monitor, and control all other modules in the panel. Removal, disconnection, failure, or change of type of any control panel module shall be detected and reported by the CPU as a module failure. The CPU shall contain and execute all custom programs for specific action to be taken if a fire situation is detected in the system. Programming shall be held in non-volatile memory, and shall not be lost even if system primary and secondary power failure occurs.

D. Initiating Zone Module

1. The Initiating Zone Module shall provide eight fully supervised Class A (NFPA Style D) Initiating Device Circuits (IDC).

2. The system shall be capable of programming each Initiating zone for the following operations: Standard Fire, Waterflow, Tamper/Supervisory, Alarm Verification, or a low priority Non-alarm. Systems which require unique modules for these functions are not considered suitable substitutes.

3. Each Initiating zone (regardless of zone type) shall have the ability to turn on any, all, or specific output circuits.

4. Initiating Zone Circuits shall be capable of powering two-wire smoke detectors or monitor any N.O. dry contact initiating device.

5. The Initiating Zone Module shall provide red ALARM and yellow TROUBLE LED's for each Initiating Device Circuit.

6. The initiating zone module shall provide a momentary switch per zone that may be used to disable, test or program each circuit. Custom label inserts

shall be provided. Inserts shall be labeled using a standard typewriter.

7. The Initiating Zone Module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wiring.

8. By connecting a remotely located switch to an Initiating circuit, it may be programmed to operate as system ACKNOWLEDGE, SILENCE, OR RESET.

9. Initiating circuits may be programmed to operate as remote control to command a telephone page over the speaker circuits, either on an ALL-CALL basis or on a selected speaker circuit basis.

E. Addressable Intelligent Module (AIM)

1. The Addressable Intelligent Module (AIM) functions as an interface between the conventional fire alarm control panel and up to 198 addressable/intelligent devices.

2. The Addressable Intelligent Module shall have full internal control capability and can activate control modules on its loop according to an internally stored custom program.

3. The module shall communicate with up to 198 addressable devices, identifying exactly which device is in alarm or trouble.

4. The module shall be able to measure analog sensitivity and determine the type of devices, such as Ionization, Photoelectric, or thermal detector.

5. It shall be possible to adjust the sensitivity of each detector to best fit its particular environment from the control panel.

6. The module shall automatically test and verify operation of programmed and connected detectors every few hours. It shall also give a warning when a detector has become contaminated and needs cleaning (maintenance alert).

7. The module shall have a digital display for device address, and a zone display with alarm and trouble LEDs for each of eight zones. The 198 devices may be mapped into these software zones as desired.

8. The AIM shall include an automatic program function which shall determine the address and type of all devices which are connected to it, and store this information into memory.

9. All information about the device shall be stored in nonvolatile memory.

F. Notification Circuit Module

1. The Notification Circuit Module shall provide four fully supervised Class A or B (NFPA Style Z or Y) notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.

2. The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.

3. The module shall not affect other module circuits in any way during a short circuit condition.

4. The module shall provide eight green ON/OFF LED's and eight yellow TROUBLE LED's.

5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit ON/OFF or to disable the circuit.

6. Each notification circuit shall be capable of custom a label insert used to identify it's location. Messages shall be applied using standard typewriter.

7. The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG (3.25 mm) wiring.

8. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.

G. Control Relay Module

1. The Control Relay Module shall provide four Form-C auxiliary relay circuits rated at 5 amperes, 28 VDC. An expansion circuit board shall allow expansion to eight Form-C relays per module.

2. Relay circuits shall be programmed to activate on alarm from any initiating zone or from any combination of initiating zones.

3. The expansion module shall provide 8 green ON/OFF LEDs and 8 yellow LEDs (indicates disabled status of the relay).

4. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.

5. Custom label inserts shall be provided that may be used to identify the circuits using a standard typewriter.

6. The control relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wiring.

H. Timed Control Module

1. The timed control module shall be provided for Releasing Service with 2 or 4 fully supervised (Class A or B) releasing device Circuits.

2. An expansion printed circuit board may be provided for this module to extend its capability to 6 or 8 releasing circuits.

3. The module shall provide cross-zone capability, Agent Release Abort Circuit and Warning Indicating Circuit. It may be programmed for manual release from any alarm initiating circuit, and shall include an internal programmable timer and time display.

4. The module shall be programmable to meet IRI requirements. It may also be programmed to provide pre-signal functions with an internal programmable timer and display.

I. Enclosures:

1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. 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.

3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be selected for either right or left-hand hinging.

J. Power Supply:

1. The main power supply for the fire alarm control Panel shall provide all control panel and peripheral device power needs, as well as 3 amperes of 24 VDC power for audio-visual alarm notification 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. All Power Supplies shall meet 1995 UL and NFPA requirements for power-limited operation on all notification and initiating circuits.

3. Positive-temperature-coefficient thermistors, circuit breakers, and other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 60 AH, or may be used with external battery and charger systems. Battery arrangement may be configured in the field.

4. The main power supply shall continuously monitor all field wires for Earth Ground conditions and shall have the following LED indications:

Ground Fault
Battery Fail
AC Power Fail

5. The power supply shall include provisions to add a battery voltmeter and ammeter.

K. Field Charging Power Supply:

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

2. 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.

3. 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.

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

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

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

L. Specific System Operations

1. Walk Test Operation

a. Walk Test mode shall test initiating device circuits and notification device circuits from the field without returning to the panel to reset the system.

b. Upon activation of a first Initiating device on a zone, the controlled outputs shall operate for approximately four seconds. On initiation of a second input device, the outputs shall activate for approximately 1 second.

c. Inducing a trouble into the initiating circuit shall activate the controlled outputs and remain activated until the trouble is cleared.

d. Walk test shall be selectable on a per zone basis. Circuits which are not selected for walk test shall continue to provide fire protection, and if an alarm is detected, will exit walk test and activate all programmed alarm functions.

e. A red LED for alarm and a yellow LED for trouble shall flash upon completion of each circuit test.

2. Alarm Verification Operation

When an alarm condition is detected on an Initiating Device Circuit which has been programmed for Alarm Verification, the system will automatically enter the ALARM verification mode. If the alarm condition is still present after a preset time period of 13 seconds, the system will automatically enter the alarm mode. If a second alarm occurs during the verification period, the system will immediately enter alarm mode. If both smoke detectors and dry contact devices, such as pull boxes, are connected to the same verified circuit, the smoke detectors will be verified but not the dry contact devices.

3. Waterflow Operation

All initiating device circuits of the system shall be programmable to provide waterflow detection operation. If a waterflow detection circuit alarms, then all notification appliance circuits which are mapped to that point will automatically become non-silenceable.

4. Supervisory Operation

Each Initiating Device Circuits shall have the option to be selected as a sprinkler supervisory circuit. If an Initiating Device Circuit is programmed as a Supervisory circuit, then activation of that circuit will cause the associated LED to illuminate. It shall not cause the system to enter the trouble mode. Any system output circuit shall be capable of being "mapped" (activate) to any system Supervisory circuit.

5. Signal Silence Operation

All Notification Appliance Circuits shall have the option to turn off if the panel signal silence switch is manually activated.

6. Coded Circuit Operation

All Notification Appliance Circuits shall be programmable to provide coded circuit operation. The system shall also support a "zone" coder capable of initiating up to 255 distinct 24 vdc coded notification circuit signals.

7. Non-Alarm Input Operation

a. Any Initiating Device Circuit in the system may be used as a Non-Alarm input to monitor any Normally-Open contact type device. Non-alarm points will not activate the system alarm LED. Non-alarm points operate only when a non fire condition exists in the system.

b. Non-Alarm points shall operate as "tracking" type points, and the LED which annunciates the status shall be "ON" whenever the contact being monitored is closed, and "OFF" whenever the contact being monitored is open.

8. History Mode Operation

The system shall be able to store (in non-volatile memory) and display the last 255 system events which have occurred. Systems which store history information in volatile RAM are not acceptable.

M. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet (1828.8 m) from the fire alarm control panel. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.

2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.

3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.

4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.

5. Communication shall include vital system status such as:

- Independent Zone (Alarm, trouble, non-alarm, supervisory)
- Independent Addressable Device Status
- AC (Mains) Power Loss
- Low Battery and Earth Fault
- System Off Normal
- 12 and 24 Hour Test Signal
- Abnormal Test Signal (per UL requirements)
- EIA-485 Communications Failure
- Phone Line Failure

6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

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.

2.4. BATTERIES

A. Battery shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

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

C. If necessary to meet standby requirements, external battery and charger systems may be used.

2.5. 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. 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.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. 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.

I. 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).

J. Waterflow Switches:

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.

K. 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.

L. Serially Connected Remote Annunciator

1. The FACP shall support LED or graphic type remote annunciators via an EIA 485 (multi-drop) communications loop.

2. Connection to the remote annunciator shall be via a twisted, shielded EIA-485 pair. Distance to the remote annunciator shall be up to 6,000 ft. A UL 864 listed repeater shall be available to increase this distance in 3,000 ft. increments. An optional UL 864 listed repeater shall be available to transmit the EIA-485 data via fiber optics.

3. The annunciator shall require no more than four wires for operation. Annunciation shall include: all system alarm 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 LED's and control switches for the control of Fire Alarm Control Panel functions. The annunciator will also have an "ON-LINE" LED,

local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.

b. Up to (32) annunciators, each with up to 64 points, may be installed with the system. The manual on/off control switches shall be operational from a minimum of four annunciators.

c. The annunciator shall include a single electrical keyswitch to disable all switch functions.

d. The annunciator shall provide alarm and trouble resound, with flash of new conditions.

e. Switches shall be included used for global parameter control such as control of output points in the system, system acknowledge, global signal silence, and global system reset within the constraints of all applicable standards.

f. Wiring to the annunciator shall be supervised.

g. The annunciator shall be flush or surface mountable, as indicated on the drawings.

4. An optional graphic interface shall be available for custom display of alarm or trouble indications. The graphic annunciator shall have the ability to perform system functions such as, Reset, Signal Silence or Acknowledge.

M. Alphanumeric LCD Type Annunciator:

1. Shall be a supervised, local or remotely located back-lit LCD display containing a minimum 80 characters for alarm annunciations in clear text.

2. The alphanumeric labels may be programmed into the unit on site, using a PC compatible computer or terminal. Labels shall be up to 40 characters in length.

3. Connection to the LCD remote annunciator shall be via a twisted, shielded EIA-485 pair. Distance to the remote annunciator shall be up to 6,000 ft. A UL 864 listed repeater shall be available to increase this distance in 3,000 ft. increments. An optional UL 864 listed repeater shall be available to transmit the EIA-485 data via fiber optics.

4. An audible indication of alarm shall be integral to the alphanumeric display.

5. The display shall be UL listed for fire alarm application.

6. The display shall be capable of annunciating up to 128 zones or points of information.

7. Each LCD annunciator shall support an EIA-232 port for a remote printer.

N. Addressable Devices - General

1. Addressable devices shall provide an address-setting means using rotary decimal switches.

2. Addressable devices shall use simple to install and maintain decade (numbered 0 to 9) type address switches. Devices which use a binary address setting method, such as a dip switch are not an allowable substitute.

3. Detectors shall be Intelligent and Addressable, and shall connect with two wires to the fire alarm control panel Signaling Line Circuits.

4. Addressable smoke and thermal detectors shall provide dual (2) alarm and power LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LEDs shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.

5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.

6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

7. The detectors shall be ceiling-mount and shall include a separate twist-lock base which includes a tamper proof feature. An optional base shall be available with a built-in (local) sounder rated at 85 DBA minimum.

8. 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.

9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).

O. 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.

P. 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.

Q. 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.

R. 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.

S. 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.

T. 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.

U. 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.

V. 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.

W. 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.

X. 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 it's 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 and 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.

Y. 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.

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. Smoke detectors shall not be installed prior to the system programming and test period. If construction is on going during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.

C. 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.

D. 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:

Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system.

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

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

C. Verify activation of all flow switches.

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

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

F. Ground initiating device circuits and verify response of trouble signals.

G. Check all alarm notification devices.

H. Check installation, supervision, and operation of smoke detectors.

I. Verify that each initiating device alarm signal is properly received and processed by the fire alarm control panel (Walk Test).

J. Conduct tests to verify trouble indications for common mode failures, such as alternating current power failure. Consult the manufacturer's manual for other common mode failures and conduct the described testing procedures.

3.3. FINAL INSPECTION:

At the final inspection a factory trained representative of the manufacturer of the major equipment shall demonstrate that the systems function properly in every respect.

3.4. INSTRUCTION:

Provide instruction as required to the building personnel and fire and safety personnel. "Hands-on" demonstrations of the operation of the system shall be provided.