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ENGINEERING SPECIFICATION
4 ZONE FIRE ALARM SYSTEM

PART 1.0 - GENERAL

1.1. DESCRIPTION:

A. These specifications include the furnishing, installation, and connection of the 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 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 installed in compliance with the UL listing.

F. 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 alarm shall be installed in accordance with specifications and drawings.

B. Basic Performance:

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

2. A single ground or open on any initiating device circuit or Notification Appliance Circuit (NAC) shall not cause system malfunction, loss of operating power or the ability to report an alarm.

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. Indicate the zone in alarm.
2. Activate audible and visual alarm notification appliances.
3. Activate the central station interface.

1.3. SUBMITTALS

A. Manufacturer's Equipment: All references to manufacturer's or supplier'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 as long as the minimum standards are met.

B. Shop Drawings:

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

C. Manuals:

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).

D. Certifications:

1. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation is an authorized representative of the major equipment manufacturer.

1.4. GUARANTY:

A. 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:

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.

1.6. APPLICABLE PUBLICATIONS:

The publications listed below form a part of this specification.

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

- No. 70 National Electric Code (NEC)
- 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 Signaling Systems
- No. 464 Audible Signaling Appliances
- No. 1971 Visual Signaling Appliances
- No. 38 Manually Actuated Signaling Boxes
- No. 346 Waterflow Indicators for Fire Protective Signaling Systems

C. Local and State Building Codes.

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

1.7. APPROVALS:

The control panel and all peripherals 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

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 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 (19.1 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). Number and size of conductors shall be as recommended by 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 (1.63 mm) for Notification device circuits.

3. All field wiring shall be completely supervised.

C. Terminal Boxes, Junction Boxes and Cabinets:

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

D. The 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. FIRE ALARM CONTROL PANEL:

A. The FACP shall be a Notifier Model No. SFP-400 and shall communicate with and control the following types of equipment used to make up the system: smoke detectors, manual pull stations, alarm notification appliances, and other system controlled devices.

1. Function: The FACP shall perform the following functions:

a. Supervise and monitor all initiating device circuits and alarm notification circuits for trouble and alarm conditions.

b. Detect the operation of any initiating device circuit and operate all notification appliances and auxiliary devices.

c. Visually and audibly annunciate any trouble, supervisory or alarm condition at the panel display.

2. The FACP shall be Microprocessor-controlled, and shall be field programmable to perform the following options: Alarm Verification, Waterflow, Supervisory, Silence Inhibit, Disable Circuits, and Walk Test.

B. The Control Panel shall include four notification circuits, alarm contacts, trouble contacts, supervisory contacts, and four Initiating Device Circuits.

C. System Display

The System Display shall indicate the status of the following system parameters:

AC POWER	Green LED
SYSTEM ALARM	Red LED
ALARM TEST	Red LED
SUPERVISORY	Yellow LED
SYSTEM TROUBLE	Yellow LED
CIRCUIT TROUBLE	Yellow LED
ALARM SILENCED	Yellow LED
POWER TROUBLE	Yellow LED
ZONE ALARM	Red LEDs

D. System Control Switch Operation.

1. Tone Silence Switch: Activation of the control panel tone silence switch in response to alarms troubles and supervisory conditions shall silence the local panel piezo electric signal and change the LEDs from flashing mode to steady-ON mode. Occurrence of any new condition in the system shall cause the control panel to resound the local piezo sounder and repeat the alarm, trouble, or supervisory sequences.

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

3. System Reset Switch: Activation of the system reset switch shall cause all electronically-latched initiating devices, as well as all associated output devices and circuits, to return to their normal condition. Holding system reset down shall perform a LAMP TEST function and will activate the piezo sounder.

4. Alarm Activate Switch: The alarm activate switch shall activate the Notification circuits and alarm relays in the system. Alarm Activate shall be a latching function.

E. System Functions

1. Zone Status LEDs: The alarm, supervisory, or trouble LEDs shall flash until events have been acknowledged. Any subsequent new alarm, supervisory, or trouble will flash new conditions only.

2. Zone Disable: Disable/Enable shall be accomplished using a special sequences of operation of the 4 control switches. If a zone has been disabled, an alarm shall activate the red zone LED, but not the piezo or any output circuit.

3. Last Event Recall: Last event recall shall allow the user to display the previous panel status. Last Event Recall may be used to diagnose intermittent trouble conditions.

F. The system shall support the following option modules:

1. Zone Relay Module. This module includes four Form-C relays which activate on a by-zone basis.

2. Volt/amp meter module.

G. 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.

H. 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.

6. Municipal Box or Reverse Polarity remote station interface.

I. 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.

J. Power Supply

1. The Power Supply for the Fire Alarm Control Panel shall be integral to the Fire Alarm Control Panel itself, and shall provide all control panel and peripheral device power needs.

2. Input power shall be 120 VAC, 60 HZ. The power supply shall provide an integral battery charger for use with a minimum of 12 AH batteries.

3. It shall provide 2.25 amperes of regulated 24 VDC power for Audio-Visual alarm notification devices, 200 mA of 4-wire smoke detector power, and 200 mA of Non-Resettable power.

4. The power supply shall be designed to meet 1995 UL and NFPA requirements for power-limited operation on all initiating and notification circuits.

5. Positive-temperature-coefficient thermistors, circuit breakers, fuses, or other over-current protection shall be provided on all power outputs.

K. Mechanical Design: The control panel shall be housed in a cabinet designed for mounting directly to a wall or vertical surface. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. The cabinet shall be approximately 5 inches (127 mm) deep and 14.5 inches (368.3 mm) wide. Height shall be approximately 16 inches (406.4 mm). An optional trim ring shall be used for flush mounting of cabinet.

L. System Circuit Supervision:

1. The FACP shall supervise all circuits to annunciators and peripheral equipment, and annunciate loss of communications with these devices.

2. Each initiating device circuit shall have individual LED alarm and trouble indication.

M. Annunciator

A remote annunciator shall be provided as shown on the plans. The annunciator shall mount in a single gang box. It shall provide four alarm LEDs, system trouble LED, piezo sounder and silence switch. It shall accept customized zone labels using a paper label insert.

2.4. BATTERIES

A. Shall be 12 volt, sealed Gell-Cell type (2 required).

B. 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.

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

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. 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.

D. 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.

E. 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.

F. 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.

G. 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.

H. 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).

I. 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.

J. 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.

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 ongoing 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. At the final inspection a factory trained representative of the manufacturer of the major equipment shall perform the tests in Section 3.2 TEST.

E. Manual pull stations shall be suitable for semi-flush mounting on standard single gang box, and shall be installed not less than 42 inches (107 mm) or more than 48 inches (122 mm) above the finished floor. Manual Stations shall be UL listed.

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 flow 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 trouble signal actuates.

F. Ground circuits and verify response of trouble signals.

G. Check presence and audibility of tone at all alarm notification devices.

H. Check installation, supervision, and operation.

I. Verify that each initiating device alarm is properly received and processed by the FACP (Walk Test).

J. Conduct tests from the FACP to verify trouble indications for common mode failures, such as alternating current power failure.

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. "Hands-on" demonstrations of the operation of all system components and the entire system shall be provided.