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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. 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. 1971 Visual 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.

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 system's 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. Initiating Device Circuits (IDC) shall be wired Class A (NFPA Style D).
2. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).

1.3. SUBMITTALS:

A. General:

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:

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:

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:

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

As part of the submittal work, include a quote for a maintenance contract to provide all maintenance tests 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. PERFORMANCE CRITERIA / APPLICABLE PUBLICATIONS:

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

- A. 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.

B. Local and State Building Codes.

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

1.7. PERFORMANCE CRITERIA / 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.

ULC Underwriters Laboratories Canada

MEA Material Equipment Acceptance (NYC)

CSFM California State Fire Marshal

1.8. BATTERIES

A. Shall be sealed, Gel-Cell acid type.

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.

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

1.9. SYSTEM COMPONENTS:

A. A built in Digital Alarm Communicator Transmitter (DACT) will be included in the panel. The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.

1. The DACT shall be fully integrated into the control panel.

2. The DACT 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 integrated DACT shall be programmed through the panels keypad along with all panel programming. The panel shall also have the ability with an optional programming kit, to upload and download programming from a PC.

4. The DACT 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)
- AC (Mains) Power Loss
- Low Battery and Earth Fault
- System Off Normal
- 12 and 24 Hour Test Signal
- Abnormal Test Signal (per UL requirements)

- Phone Line Failure

6. The DACT shall support independent zone/point reporting when used in the Contact ID format. This enables the central station to have exact details concerning the origin of the fire or response emergency.

B. 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.

C. Enclosure:

The control panel shall be housed cabinet suitable for surface mounting. An optional semi-flush trim ring shall be available for finished installations.

D. 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 3.0 amperes of 24 VDC power for each NAC.

2. The power supply shall provide an integral battery charger for use with batteries up to 17 AH.

E. 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.

F. 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 an IDC, all outputs normally activated by the tested zone shall activate for four seconds. Subsequent activation of devices on the same zone will activate outputs for one on second.

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

2. Alarm Verification Operation

When an alarm condition is detected on an Initiating Device Circuit which has been programmed for Alarm Verification shall cause the panel to remove power to that IDC to reset 2 wire detectors. After a short reset and retard time if that circuit returns within the confirmation time it will cause a verified alarm.

3. Waterflow Operation

a. All Initiating Device Circuits shall be programmable to provide Waterflow detection. If an alarm occurs on a Waterflow zone, all Notification Appliance Circuits which are programmed to activate for that zone will not be affected by the silence switch.

b. A programmable retard timer shall be available for waterflow circuits. This timer shall allow retards for 1-89 seconds.

4. Supervisory Operation

An alarm on a Supervisory circuit shall activate all programmed (mapped) outputs, activate a common Supervisory LED, and activate the zone which is in alarm.

5. Signal Silence Operation

All Notification Appliance Circuits of the system shall be capable of being programmed to deactivate with depression of the Signal Silence switch.

6. Pre-signal Operation

The control panel shall have the capability of operation in a pre-signal mode.

G. 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.

H. 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.

I. 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.

J. 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. 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.

4. A visual indication of an alarm shall be provided by latching Light Emitting Diodes (LEDs). These LEDs shall flash every 10 seconds, indicating that power is applied to the detector.

5. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute.

K. 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. It shall be possible to perform a calibration sensitivity and performance test on the detector without the need for the generation of smoke.

4. A visual indication of an alarm shall be provided latching Light

Emitting Diodes (LEDs). This LED shall flash every 10 seconds, indicating that power is applied to the detector.

5. 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.

L. 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.

M. 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.

N. 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).

O. 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.

P. 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.
8. The LED type annunciator shall provide the following operations:
 - a. The Annunciator shall provide alarm and trouble indications for each zone circuit using a red and yellow, long-life LED's. The annunciator shall also have an "ON-LINE" LED, common trouble LED, local piezo electric signal, local acknowledge/ lamp test switch and custom zone/function identification labels.
 - b. Wiring to the annunciator shall be supervised.
 - c. The annunciator shall be flush or surface mountable, as indicated on the drawings.
 - d. The annunciator shall provide alarm resound, with flashing of new conditions.

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

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. Manual pull stations shall be suitable for surface mounting on matching backbox, or 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 device circuits and verify response of trouble signals.

G. Check proper operation of 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.

3.3. FINAL INSPECTION:

At the final inspection a 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.