

SECTION 13850 (28 31 00)

NETWORKED FIRE ALARM SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Expandable emergency evacuation fire alarm system. – OWNER PROVIDED GAMEWELL E3 SERIES FIRE ALARM SYSTEM EQUIPMENT
- B. Furnish all labor, materials, tools, equipment and services necessary for and reasonably incidental to complete the fire alarm installation work as specified.
- C. For the purpose of this contract, the terms Owner, District, Architect, and Engineer shall mean Madera Unified School District.

1.2 RELATED SECTIONS

- A. Related documents: general provisions of contract, including General and Supplementary Conditions apply to work of this section.

1.3 REFERENCES

- A. Electrical Industries Association (EIA):
 - 1. RS-232-D – Interface Between Data Terminal Equipment and Data Circuit-Terminating Equipment Employing Serial Binary Data Interchange
 - 2. RS-485 – standard defining the electrical characteristics of drivers and receivers for use in balanced digital multipoint systems
- B. National Fire Protection Association (NFPA):
 - 1. NFPA 12 – Standard on Carbon Dioxide Extinguishing Systems.
 - 2. NFPA 13 – Installation of Sprinkler Systems.
 - 3. NFPA 15 – Standard for Water Spray Fixed Systems for Fire Protection.
 - 4. NFPA 16 – Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems.
 - 5. NFPA 16A – Standard for the Installation of Closed Head Foam-Water Sprinkler Systems.
 - 6. NFPA 70 – National Electrical Code (NEC).
 - 7. NFPA 72 – National Fire Alarm Code.
 - 8. NFPA 90A – Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 9. NFPA 101 – Life Safety Code.
 - 10. NFPA 750 – Standard on Water Mist Fire Protection Systems.
 - 11. NFPA 5000 – Building Construction and Safety Code.
- C. Underwriters Laboratories (UL):
 - 1. UL 268 – Standard for Smoke Detectors for Fire Alarm Signaling Systems.
 - 2. UL 8649th – Standard for Control Units and Accessories for Fire Alarm Systems.
 - a. UOJZ, Control Units, System.
 - b. SYZV Control Units, Releasing Device.
 - c. UOXX, Control Unit Accessories, System.

3. UL 1971 – Standard for Signaling Devices for the Hearing Impaired.

1.4 SYSTEM DESCRIPTION

- A. A new intelligent reporting, Style 7 networked, fully peer-to-peer, microprocessor-controlled fire detection and notification system shall be installed in accordance with the specifications and as indicated on the Drawings.
- B. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.
- C. Basic Performance:
 1. Network Communications Circuit Serving Network Nodes: Wired using single twisted non-shielded 2-conductor cable or connected using approved fiber optic cable between nodes in Class A configuration.
 2. Signaling Line Circuits (SLC) Serving Addressable Devices: Wired Class A.
 3. Initiation Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class A
 4. Notification Appliance Circuits (NAC) Serving Strobes and Horns: Wired Class A.
 5. On Style 6 or 7 (Class A) Configurations: Single ground fault or open circuit on Signaling Line Circuit shall not cause system malfunction, loss of operating power, or ability to report alarm.
 6. Alarm Signals Arriving at Control Panel: Not lost following primary power failure until alarm signal is processed and recorded.
 7. Network Node Communications:
 - a. Communicated between panels on single pair of copper wires or fiber optic cables.
 - b. To enhance system survivability, ability to operate on loss of Command Center, short or open of entire riser at Command Center shall be demonstrated at time of system acceptance testing.
 - c. Systems that are not capable of providing true Style 7 riser performance shall not be acceptable.
 8. Signaling Line Circuits (SLC):
 - a. Reside in remote panels with associated audio zones.
 - b. SLC modules shall operate in peer-to-peer fashion with all other panels in system.
 - c. On loss of Command Center, each remaining panel shall continue to communicate with remainder of system, including all SLC and control functions. Systems that provide a "Degraded" mode of operation upon loss of Command Center or short in riser shall not be acceptable.
 9. NAC Circuits: Arranged such that there is a minimum of 1 audible device per fire alarm zone.
 10. Notification Appliance Circuits (NAC), and Control Equipment: Arranged such that loss of any 1 NAC circuit will not cause loss of any other NAC circuit in system.
 11. NAC Circuits:
 - a. Electrically supervised for open and short circuit conditions.
 - b. If short circuit exists on NAC circuit, it shall not be possible to activate that circuit.
- D. Basic System Functional Operation: When fire alarm condition is detected and reported by 1 of the system alarm initiating devices, the following functions shall immediately occur:
 1. System Alarm LEDs: Flash.

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2. Local Piezo-Electric Signal in Control Panel: Sound at a pulse rate.
3. 80-Character LCD Display: Indicate all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence.
5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
6. Strobes flash synchronized continuously.
7. Audible devices sound continuous Temporal pattern until system is reset.

E. Fire Alarm System Functionality: **Owner Provided**

1. Install a complete, electrically supervised distributed, Style 7 networked analog/addressable fire alarm and control system, with analog initiating devices.
2. Fire Alarm System:
 - a. Incorporate E3 Series multiprocessor-based control panels, with Intelligent Loop Interface ILI-MB-E3 and RPT-E3 repeater modules communicating over peer-to-peer token ring network with capacity of up to 64 nodes.
3. Each ILI-MB-E3 SLC module: Incorporate 2 Signaling Line Circuits (SLC), with capacity to support up to 159 analog addressable detectors and 159 addressable modules per SLC.
4. All data transmits over single pair of wires or fiber optic cable.
5. Each Network Node: Incorporate Boolean control-by-event programming, including as a minimum AND, OR, NOT, and Timer functions.
6. Control Panels: Capability to accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips.
7. Network:
 - a. Based on peer-to-peer token ring technology operating at 625 K baud, using Style 7 configuration.
 - b. Capability of using twisted-pair wiring, pair of fiber optic cable strands up to 200 microns, or both, to maximize flexibility in system configuration.
8. Each Network Node:
 - a. Capability of being programmed off-line using Windows-based software utilized by fire alarm system manufacturer. Capability of being downloaded by connecting laptop computer into any other node in system. Systems that require system software to be downloaded to each transponder at each transponder location shall not be acceptable.
 - b. Capability of being grouped with any number of additional nodes to produce a "Region", allowing that group of nodes to act as 1, while retaining peer-to-peer functionality. Systems utilizing "Master/Slave" configurations shall not be acceptable.
 - c. Capability of annunciating all events within its "Region" or annunciating all events from entire network, on front panel LCD without additional equipment.
9. Each SLC Network Node: Capability of having integral DACT (digital alarm communicator transmitter) that can report events in either its region, or entire network to single central station monitoring account.
10. Each Control Panel: Capability of storing its entire program and allow installer to activate only devices that are installed during construction, without further downloading of system.
12. Password Protection: Each system shall be provided with 4 levels of password protection with up to 16 passwords.

1.5 SUBMITTALS

- A. Comply with the following submittal procedures.
- B. Include sufficient information, clearly presented, to determine compliance with the specifications and the Drawings.
- C. Equipment Submittals:
 - 1. Cover Page: Indicate the following:
 - a. Project name and address.
 - b. Engineered systems distributor's name and other contact information.
 - c. Installing contractor's name and other contact information.
 - d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
 - 2. Table of Contents: Lists each section of equipment submittal.
 - 3. Scope of Work Narrative: Detail indented scope of work.
 - 4. Sequence of Operations: Use matrix or written text format, detailing activation of each type of device and associated resulting activation of the following:
 - a. Control panel.
 - b. Annunciator panels.
 - c. Notification appliances.
 - d. Building fire safety functions, including elevator recall, elevator power shutdown, door lock release, door holder release, HVAC unit shutdown, smoke evacuation system activation, and stair pressurization fan activation.
 - 5. Bill of Material: **OWNER PROVIDED**
 - a. Quantity.
 - b. Model number.
 - c. Description.
 - 6. SLC Circuit Schedule: Detail address and associated description of each addressable device. Clearly provide information that indicates number of both active and spare addresses.
 - 7. Battery Calculations: Show load of each of, and total of, components of system along with standby and alarm times that calculations are based on. Show calculated spare capacity and size of intended battery.
- D. Shop Drawings:
 - 1. Cover Page: Indicate the following:
 - a. Project name and address.
 - b. Engineered systems distributor's name and other contact information.
 - c. Installing contractor's name and other contact information.
 - d. Date of equipment submittals. Indicate on revised submittals the original submittal date and revised submittal date.
 - 2. Floor Plans:
 - a. Provide separate floor plan for each floor.
 - b. If a floor plan must be split using match lines to fit on the page, provide match lines and match line references that refer to sheet number that shows area on opposite side of match line.

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- c. Prepare using AutoCAD.
 - d. Prepare to scale 1/8 inch = 1'-0", unless otherwise required by the Architect or Engineer.
 - e. Show equipment and device locations.
 - f. Show wiring information in point-to-point format.
 - g. Show conduit routing, if required by the AHJ.
 3. Title Block: Provide on each sheet and include, at a minimum, the following:
 - a. Project name.
 - b. Project address.
 - c. Sheet name.
 - d. Sheet number.
 - e. Scale of drawing.
 - f. Date of drawing.
 - g. Revision dates, if applicable.
 4. Control Panel: Provide sheet that details exterior and interior views of control panel and clearly shows associated wiring information.
 5. Annunciator Panels: Provide sheet that details exterior and interior views of annunciator panels and clearly shows associated wiring information.
- E. Certification: Submit with equipment submittals and shop drawings, letter of certification from **Gamewell-FCI**, indicating proposed engineered system distributor is an authorized representative in good standing of the equipment supplied. Include a copy of at least two (2) certified technician E3 system training certificates.
- F. Project Record Drawings:
1. Submit complete project record drawings within 14 calendar days after acceptance test.
 2. Project record drawings shall be similar to shop drawings but revised to reflect changes made during construction.
- G. Operation and Maintenance Manuals:
1. Submit complete operation and maintenance manuals within 14 calendar days after acceptance test.
 2. Operation and maintenance manuals shall be similar to equipment submittals but revised to reflect changes made during construction.
 3. Include factory's standard installation and operating instructions.

1.6 QUALITY ASSURANCE

- A. Codes and Standards:
1. NFPA: System shall comply with the following NFPA codes and standards:
 - a. NFPA 12.
 - b. NFPA 13.
 - c. NFPA 15.
 - d. NFPA 16.
 - e. NFPA 16A.
 - f. NFPA 70.
 - g. NFPA 72.
 - h. NFPA 90A.
 - i. NFPA 90B When smoke control is required by code.

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- J. NFPA 101.
 - K. NFPA 750.
 - L. NFPA 5000.
 - 2. ADA: System shall conform to American with Disabilities Act (ADA).
- B. Equipment, Programming, and Installation Supervision:
- 1. Provide services of approved Engineered systems distributor of Gamewell-FCI for equipment, programming, and installation supervision.
 - 2. Provide proof of factory training within 14 calendar days of award of the Contract.
 - 3. Please contact Curtis Manganaan at 559-675-4534

E. Software Modifications:

- 1. Provide services of Gamewell-FCI factory-trained and authorized technician to perform system software modifications, upgrades, or changes.
- 2. Provide use of all hardware, software, programming tools, and documentation necessary to modify fire alarm system software on-site.
- 3. Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones.
- 4. System structure and software shall place no limit on type or extent of software modifications on-site.
- 5. Modification of software shall not require power-down of system or loss of system fire protection while modifications are being made.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: **Madera Unified** shall deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions, or as directed by the district.
- C. Handling: Protect materials from damage during handling and installation.

1.8 COORDINATION

- A. Not applicable.

1.9 WARRANTY

- A. Warranty Period for System Installation: one (1) year from date of final acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Gamewell-FCI, Honeywell Fire Systems, 12 Clintonville Road, Northford, Connecticut 06472. Phone (203) 484-7161. Fax (203) 484-7118. Website: www.gamewell-fci.com

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- B. References to manufacturer's model numbers and other information is intended to establish minimum standards of performance, function, and quality. Equivalent equipment from Gamewell may be substituted for the specified equipment, as long as minimum standards are met. No other installer of manufacturers, other than Gamewell-FCI, FCI, and Gamewell, in good current standing with Gamewell-FCI, will be considered for use on this project.
- B. Substitute equipment: None
- C. Madera Unified shall provide all Fire Alarm Equipment.

2.2 DISTRIBUTED NETWORKED FIRE ALARM SYSTEM

- A. Distributed Networked Fire Alarm System: Gamewell-FCI E3 Series Expandable Emergency Evacuation Fire Alarm System.

2.3 CONTROL PANEL HARDWARE For Installation Purpose

- A. Intelligent Control Panel: Supply user interface, including LCD or touch-screen 1/4 VGA display Intelligent Loop Interface Modules (ILI-MB-E3), manual switching, Control Panel shall consist of the following units and components:
 - 1. System Cabinet (B-, C-, or D-Size Cabinet) with associated inner door.
 - 2. Power Supply Module (PM-9) with batteries.
 - 3. 80-Character LCD Display (LCD-E3).
 - 4. Intelligent Loop Main Board Interface (ILI-MB-E3 or ILI95-MB-E3).
 - 5. Optional Intelligent Loop Supplemental Interface (ILI-S-E3 or ILI95-S-E3).
 - 6. Optional DACT (DACT-E3).
 - 7. Optional Network Repeater (RPT-E3) with fiber optic modules (FSL-E3 or FML-E3).
 - 9. Optional 1/4 VGA touch-screen display (NGA).
 - 10. Optional Auxiliary Switch Module (ASM-16).
 - 11. Optional LED Driver Module (ANU-48).
 - 12. Optional Addressable Node Expander (ANX-SR, ANX-MR-FO, ANX-MR-UTP).
- B. System Cabinet:
 - 1. Surface or semi-flush mounted with texture finish.
 - 2. Consist of back box, inner door, and door.
 - 3. Available in at least 3 sizes to best fit project configuration.
 - 4. Houses 1 or more PM-9 Power Supply Modules, 1 or more ILI-MB-E3 or ILI95-MB-E3, ILI-S-E3 or ILI95-S-E3 assemblies, and other optional modules as specified.
 - 5. Construction: Dead-front steel construction with inner door to conceal internal circuitry and wiring.
 - 6. Wiring: Terminated on removable terminal blocks to allow field servicing of modules without disrupting system wiring.
- C. Power Supply Module (PM-9): Use latest technologies to provide power to the Control Panel and incorporate the following features:
 - 1. Power-saving switching technology using no step-down transformers.
 - 2. 9-amp continuous-rated output to supply up to all power necessary under normal and emergency conditions.

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3. Integral battery charger with capacity to charge up to 55 amp-hour batteries while under full load.
- D. Batteries:
1. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 24 hours with 15 minutes of alarm signaling at end of this 24-hour period, as required by NFPA 72, Local Systems.
 2. Sufficient capacity to provide power for entire system upon loss of normal AC power for a period of 60 hours with 15 minutes of alarm signaling at end of this 60-hour period, as required by NFPA 72, Auxiliary Systems.
- E. LCD Display Module (LCD-E3):
1. LCD Display: 80-character RS-485 based textual annunciator with capability of being mounted locally or remotely. Provides audible and visual annunciation of all alarms and trouble signals. Provide dedicated LEDs for:
 - a. AC Power On: Green.
 - b. Alarm: Red.
 - c. Supervisory: Yellow.
 - d. System Trouble: Yellow.
 - e. Power Fault: Yellow.
 - f. Ground Fault: Yellow.
 - g. System Silenced: Yellow.
 2. 80-Character Alphanumeric Display: Provide status of all analog/addressable sensors, monitor and control modules. Display shall be liquid crystal type (LCD), clearly visible in dark and under all light conditions.
 3. Panel shall contain 4 functional keys:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. Signal Silence.
 - d. System Reset/Lamp Test.
 4. Panel shall contain 3 configuration buttons:
 - a. Menu/Back.
 - b. Back Space/Edit.
 - c. OK/Enter.
 5. Panel shall have 12-key telephone-style keypad to permit selection of functions.
- F. Intelligent Loop Interface (ILI-MB-E3): System shall be of multiprocessor design to allow maximum flexibility of capabilities and operation. Intelligent Loop Interface shall be capable of mounting in stand-alone enclosure as specified.
1. Field Programmable: System shall be capable of being programmed by Field Configuration Program (FCP), allowing programming to be downloaded via portable computer from any node on network.
 2. RS-232C Serial Output: Supervised RS-232C serial port shall be provided to operate remote printers and/or video terminals, accept downloaded program from portable computer, or provide 80-column readout of all alarms, troubles, location descriptions, time, and date. Communication shall be standard ASCII code operating from 1,200 to 115,200 baud rate.
 3. RS-485 Serial Output: Each ILI-MB-E3 shall incorporate RS-485 bus via ribbon harness for connection of modules inside same cabinet, and via 4-wire quick connector for

- connection of modules up to 3,000 feet from cabinet. Each ILI-MB-E3's RS-485 bus shall support up to 16 ASM-16 auxiliary switch modules, 6 LCD-E3 main annunciators, and 5 LCD-7100 annunciators.
4. Peer-to-Peer Panel Configuration: All Loop Interface Modules shall incorporate own programming, log functions, Central Processor Unit, and control-by-event (CBE) programming. If any loop driver becomes disabled, each remaining loop driver shall continue to communicate with remainder of network and maintain normal operation.
 5. Control-by-Event (CBE) Program: ILI-MB-E3 shall be capable of programming using Boolean logic including AND, OR, NOT, and TIMING functions to provide complete programming flexibility.
 6. Alarm Verification: Smoke detector alarm verification shall be standard option while allowing other devices such as manual stations and sprinkler flow to create immediate alarm. This feature shall be selectable for smoke sensors that are installed in environments prone to nuisance or unwanted alarms.
 7. Alarm Signals: All alarm signals shall be automatically latched or "locked in" at control panel until operated device is returned to normal and control panel is manually reset. When used for sprinkler flow, "SIGNAL SILENCE" switch may be bypassed, if required by AHJ.
 8. Electrically Supervised:
 - a. Each SLC and NAC circuit shall be electrically supervised for opens, shorts, and ground faults. Occurrence of fault shall activate system trouble circuitry but shall not interfere with proper operation of other circuits.
 - b. Yellow "SYSTEM TROUBLE" LEDs shall light and system audible sounder shall steadily sound when trouble is detected in system. Failure of power, open or short circuits on SLC or NAC circuits, disarrangement in system wiring, failure of microprocessor or any identification module, or system ground faults shall activate this trouble circuit. Trouble signal shall be acknowledged by operating "TROUBLE ACKNOWLEDGE" switch. This shall silence sounder. If subsequent trouble conditions occur, trouble circuitry shall resound. During alarm, all trouble signals shall be suppressed with exception of lighting yellow "SYSTEM TROUBLE" LEDs.
 9. Drift Compensation – Analog Smoke Sensors: System software shall automatically adjust each analog smoke sensor approximately once each week for changes in sensitivity due to effects of component aging or environment, including dust. Each sensor shall maintain its actual sensitivity under adverse conditions to respond to alarm conditions while ignoring factors which generally contribute to nuisance alarms. System trouble circuitry shall activate, display units that requires maintenance.
 10. Analog Smoke Sensor Test: System software shall automatically test each analog smoke sensor a minimum of 3 times daily. Test shall be recognized functional test of each photocell (analog photoelectric sensors) and ionization chamber (analog ionization sensors) as required annually by NFPA 72. Failure of sensor shall activate system trouble circuitry, display "Test Failed" indication, and identify individual device that failed.
 11. Off-Premises Connection:
 - a. Fire Alarm System: Connect via Digital Alarm Communicator Transmitter (DACT) and telephone lines to central station or remote station. Panel shall contain disconnect switch to allow testing of system without notifying fire department.
 12. Remote Station Option: Fire department shall be consulted regarding authorized remote station serving municipality. Fire alarm system shall transmit alarm, supervisory, and trouble signals with alarm having priority over supervisory and trouble signals. Required phone lines shall be provided and installed between incoming telephone service and fire

- alarm system by Owner's telephone contractor under separate contract. Owner will be responsible for phone company costs.
13. Local Energy City Master Box Option: Fire alarm system shall be connected to local energy city master box. City master box shall be coded and timed in accordance with requirements of fire department. Box shall be surface or flush mounted and located as specified by building engineer and fire department.
 14. Central Station Option: Fire alarm control panel shall provide Digital Alarm Communicator Transmitter (DACT) for signaling to central station. DACT shall contain "Dialer-Runaway" feature preventing unnecessary transmissions as result of intermittent faults in system and shall be Carrier Access Code (CAC) compliant, accepting up to 20-digit central station telephone numbers. Fire department shall be consulted as to authorized central station companies serving municipality. Fire alarm system shall transmit both alarm and trouble signals, with alarm having priority over trouble signal. Contractor shall be responsible for all installation charges and Owner will be responsible for line lease charges.
 15. Network Annunciator Option: Each ILI-MB-E3 and associated display shall provide option of being configured as network annunciator. Options for annunciation shall default as regional annunciator with capability of selecting global annunciation to provide system-wide protection and Acknowledge, Silence, and Reset capabilities.
 16. Redundant History Log: Each ILI-MB-E3 shall contain full 4100 event history log supporting local and network functions. If a main processor or network node is lost the entire log shall be accessible at any other Loop Interface board. This shall be demonstrated by removing power from Command Center followed by extraction of history log from any loop driver location, including Command Center or Transponder.
 17. LEDs Indicator and Outputs: Each ILI-MB-E3 or ILI95-MB-E3 Loop Interface shall incorporate a minimum of the following diagnostic LED indicators:
 - a. Power: Green.
 - b. Alarm: Red.
 - c. Supervisory: Yellow.
 - d. General Trouble: Yellow.
 - e. Ground Fault: Yellow.
 - f. Transmit: Green.
 - g. Receive: Green.
 18. Auxiliary Power Outputs: Each ILI-MB-E3 Loop Interface shall provide the following supply outputs:
 - a. 24 VDC non-resettable, 1 amp. maximum, power limited.
 - b. 24 VDC resettable, 1 amp. maximum, power limited.
 19. Microprocessor: Loop interface shall incorporate 32-bit RISC processor. Isolated "watchdog" circuit shall monitor microprocessor and upon failure shall activate system trouble circuits on display. Microprocessor shall access system program for all control-by-event (CBE) functions. System program shall not be lost upon failure of both primary and secondary power. Programming shall support Boolean logic including AND, OR, NOT, TIME DELAY functions for maximum flexibility.
 20. Auto Programming: System shall provide for all SLC devices on any SLC loop to be pre-programmed into system. Upon activation of auto programming, only devices that are present shall activate. This allows for system to be commissioned in phases without need of additional downloads.
 21. Environmental Drift Compensation: System shall provide for setting Environmental Drift Compensation by device. When detector accumulates dust in chamber and reaches unacceptable level but yet still below allowed limit, control panel shall indicate

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- maintenance alert warning. When detector accumulates dust in chamber above allowed limit, control panel shall indicate maintenance urgent warning.
22. NON-FIRE Alarm Module Reporting: Non-reporting type ID shall be available for use for energy management or other non-fire situations. NON-FIRE point operation shall not affect control panel operation, nor shall it display message at panel LDC. Activation of NON-FIRE point shall activate control by event logic but shall not cause indication on control panel.
 23. 1-Man Walk Test:
 - a. System shall provide both basic and advanced walk test for testing entire fire alarm system. Basic walk test shall allow single operator to run audible tests on panel. All logic equation automation shall be suspended during test and while annunciators can be enabled for test, all shall default to disabled state. During advanced walk test, field-supplied output point programming shall react to input stimuli, such as CBE and logic equations. When points are activated in advanced test mode, each initiating event shall latch input. Advanced test shall be audible and shall be used for pull station verification, magnet activated tests on input devices, input and output device, and wiring operation/verification.
 - b. Shall Automatically generate professionally formatted NFPA 72, NFPA 10, or Joint Commission Reports such as (GW-eVance Inspection Manager) A second technician will not be required at the fire panel during testing.
 - c. Test feature is intended to provide for certain random spot testing of system and is not intended to comply with requirements of testing fire alarm systems in accordance with NFPA 72, as it is impossible to test all functions and verify items such as annunciation with only 1 person.
 24. Signaling Line Circuits: Each ILI-MB-E3 module shall provide communication with analog/addressable (initiation/control) devices via 2 signaling line circuits. Each signaling line circuit shall be capable of being wired Class B, Style 4 or Class A, Style 6. Circuits shall be capable of operating in NFPA Style 7 configuration when equipped with isolator modules between each module type device and isolator sensor bases. Each circuit shall communicate with a maximum of 159 analog sensors and 159 addressable monitor/control devices. Unique 40-character identifier shall be available for each device. Devices shall be of the Velocity series with capability to poll 10 devices at a time with a maximum polling time of 2 seconds when both SLCs are fully loaded.
 25. Notification Appliance Circuits: 2 independent NAC circuits shall be provided on ILI-MB, polarized and rated at 2 amperes DC per circuit, individually over current protected and supervised for opens, grounds, and short circuits. They shall be capable of being wired Class B, Style Y or Class A, Style Z.
 26. Alarm Dry Contacts: Provide alarm dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system alarm occurs.
 27. Supervisory Dry Contacts: Provide supervisory dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system supervisory condition occurs.
 28. Trouble Dry Contacts: Provide trouble dry contacts (Form C) rated 2 amps at 30 VDC (resistive) and transfer whenever system trouble occurs.
- G. Auxiliary Switch Module (ASM-16):
1. Each ASM-16 has 16 programmable push-button switches.
 2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
 3. Flexible switch configurations to allow auxiliary functions.

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4. An insertable label to identify function of each switch and LEDs combination.
 5. Provide capability to communicate with up to 16 ASM-16 modules locally, or up to 3,000 feet from the Control Panel
- H. Graphic Annunciator (NGA): Optional 1/4 VGA, touch-screen annunciator with the following characteristics:
1. Custom Graphics: Panel shall permit uploading of custom bit-mapped graphic to display screen. Graphic shall display when all systems are normal.
 2. Intuitive Functions: In alarm or trouble condition, annunciator shall display only information pertaining to event, including control switches.
 - a. Trouble Condition: Display shall indicate cause of trouble. Only controls available to operator shall be Acknowledge and Reset functions.
 - b. Alarm Condition: Display shall indicate cause of alarm. Only controls available to operator shall be Acknowledge, Silence, and Reset functions.
- I. Addressable Node Expander (ANX):
1. Addressable Node Expander shall provide interconnection between the Fire Alarm Control Panel networks.
 2. ANX-MR-FO (Addressable Node Expander Multi-Ring with Fiber Optic connectors) and ANX-MR-UTP (Addressable Node Expander Multi-Ring with Fiber Optic and Twisted Pair connectors) shall expand the E3 Series network from 64 nodes to 122 nodes. ANX-SR (Addressable Node Expander Single Ring) will function in single 64 node systems.
 3. ANX shall provide a Ethernet Port for use in Systems Integration and for use with Emergency Communication System (ECS) functions. The Ethernet port may also be used to communicate with a graphic interface software.
- J. Network Repeater Module (RPT-E3):
1. Intelligent Network Interface shall provide interconnection and protection of remote INCC Command Centers and Transponders. Repeater shall regenerate and condition token passing, 625 K baud signal between units. Repeater shall be available in wire, or wire/fiber configurations as determined by field conditions.
 2. Interface shall have jumper to allow selection of ground detection of wiring when used in wire mode. Interface shall have integral LEDs to display current status of board.
 3. Fiber configurations shall use:
 - a. Multi-Mode ST-type connectors with a maximum attenuation of 8db with 62.5/125-micron cable.
 - b. Single-Mode LC-style connector with a maximum attenuation of 30db with 9/125-micron cable.

2.4 PRINTERS

- A. Printers: Automatic type, printing code, time, date, location, category, and condition.
1. Provide hard-copy printout of all changes in status of system and time-stamp such printouts with current time-of-day and date.
 2. Standard carriage with 80 characters per line.
 3. Use standard pin-feed paper.
 4. Enclose in separate enclosure suitable for placement on desktop or table.
 5. Communicate with control using interface complying with EIA-232-D.
 6. Power: 120 VAC at 60 Hz.

2.5 SUPPLEMENTAL NOTIFICATION APPLIANCE CIRCUIT (HPFF8)

- A. Supplemental Notification Appliance Circuit (HPFF) shall be Model HPFF8 offering up to 8.0 amps (8.0 amps continuous) of regulated 24-volt power. HPFF shall include the following features:
1. Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.
 2. 2 Input Triggers. Input trigger shall be Notification Appliance Circuit (from fire alarm control panel) or relay.
 3. Surface-mount back box.
 4. Ability to delay AC fail delay in accordance with applicable NFPA requirements.
 5. Power limited circuitry in accordance with applicable UL standards.
 6. Operates as sync follower or a sync generator.

2.6 SYSTEM PERIPHERALS - SYSTEM SENSOR Velocity

- A. Addressable Devices – General:
1. Provide address-setting means using rotary-decimal switches.
 2. Use simple to install and maintain decade-type (numbered 0 to 15) address switches by using standard screwdriver to rotate 2 dials on device to set address. Devices which use binary address set via dipswitch packages, handheld device programmer, or other special tools for setting device address shall not be acceptable.
 3. Detectors: Analog and addressable. Connect to fire alarm control panel's Signaling Line Circuits.
 4. Addressable Thermal and Smoke Detectors: Provide 2 status LEDs. Both LEDs shall flash under normal conditions, indicating detector is operational and in regular communication with control panel, and both LEDs shall be placed into steady illumination by control panel, indicating alarm condition has been detected. If required, flashing mode operation of detector LEDs can be programmed off via fire control panel program.
 5. Fire Alarm Control Panel: Permit detector sensitivity adjustment through field programming of system. Sensitivity can be automatically adjusted by panel on time-of-day basis.
 6. Using software, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. Detectors shall be listed by UL as meeting calibrated sensitivity test requirements of NFPA 72, Chapter 7.
 7. Detectors shall be ceiling-mounted and shall include separate twist-lock base with tamper-proof feature.
 8. Following bases and auxiliary functions shall be available:
 - a. Standard base with remote LED output.
 - b. Sounder base rated at 85 dBA minimum.
 - c. Intelligent Addressable Sounder base rated at 75 dBA minimum.
 - d. Form-C relay base rated 30 VDC, 2.0 A.
 - e. Isolator base.
 9. Detectors shall provide test means whereby they will simulate alarm condition and report that condition to control panel. Such test shall be initiated at detector itself by activating magnetic switch or initiated remotely on command from control panel.
 10. Detectors shall store internal identifying type code that control panel shall use to identify type of device (ION, PHOTO, THERMAL).

Scope of Work/Materials

- B. Addressable Manual Stations (MS-7AF):
 - 1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
 - 2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet (30.5 m) from front or side.
 - 3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
 - 4. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letters, 1.75 inches (44 mm) or larger.
 - 5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.
- C. Intelligent Thermal Detectors (ATD-RL2F): Intelligent addressable devices rated at 135 degrees F (58 degrees C) and have rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. Connect via 2 wires to fire alarm control panel signaling line circuit.
- D. Intelligent Photoelectric Smoke Detectors (ASD-PL2F): Use photoelectric (light-scattering) principal to measure smoke density and shall, on command from control panel, send data to panel representing analog level of smoke density.
- E. Intelligent Ionization Smoke Detectors (ASD-IL2F): Use dual-chamber ionization principal to measure products of combustion and shall, on command from control panel, send data to panel representing analog level of products of combustion.
- F. Intelligent Multi-Criteria Acclimating Detectors (MCS-ACCLIMATE2F):
 - 1. Addressable device designed to monitor a minimum of photoelectric and thermal technologies in single-sensing device. Include ability to adapt to its environment by utilizing built-in microprocessor to determine its environment and choose appropriate sensing settings. Allow wide sensitivity window, with no less than 1 to 4 percent per foot obscuration. Utilize advanced electronics that react to slow smoldering fires and thermal properties within single sensing device.
 - 2. Microprocessor: Capable of selecting appropriate sensitivity levels based on environment type it is in, such as office, manufacturing, or kitchen, and then have ability to automatically change setting as environment changes, as when walls are moved or as occupancy changes.
 - 3. Intelligent multi-criteria detection device shall include ability to combine signal of thermal sensor with signal of photoelectric signal to react hastily in event of fire situation. Include inherent ability to distinguish between fire condition and false alarm condition by examining characteristics of thermal and smoke sensing chambers and comparing them to database of actual fire and deceptive phenomena.
- G. Intelligent Laser Detectors (ASD-LS): Sensor device designed to use laser diode similar to way photoelectric sensor uses LEDs inside of sensing chamber. Detector design shall allow wide sensitivity window, with no less than 0.2 to 4 percent per foot obscuration. Detector shall be used as indicated in special application clean-room-type environments only.
- H. Intelligent 4 Element Multi-Criteria Detectors (MCS-4-WARN):

Scope of Work/Materials

1. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical carbon monoxide (CO) sensor, a daylight-filtered infrared sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
 2. The intelligent multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in an effort to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The product design shall be capable of selecting the appropriate sensitivity levels based on the environment type chosen by user in which it is installed (office, manufacturing, kitchen etc.) and then have the ability to automatically change the setting as the environment changes.
 3. The detector shall indicate CO trouble conditions including 6 months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self-test failure, IR self-test failure, and freeze warning.
 4. 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 switch) or initiated remotely on command from the control panel. There are three test methods: functional magnet, smoke entry aerosol, or direct heat method.
- I. Intelligent Fire/Carbon Monoxide Detectors (MCS-COF):
1. The detector shall be comprised of four sensing elements, including a photoelectric (light-scattering) particulate sensor, an electrochemical CO sensor, a daylight-filtered infrared (IR) sensor and solid state thermal sensor(s) rated at 135°F (57.2°C). The device shall be able to indicate distinct smoke and heat alarms.
 2. The advanced multi-criteria detection device shall include the ability to combine the signal of the photoelectric signal with other sensing elements in order to react quickly in the event of a fire situation. It shall also include the inherent ability to distinguish between a fire condition and a nuisance alarm condition. The detector shall be capable of selecting the appropriate sensitivity levels based on the environment type (office, manufacturing, kitchen, etc.) in which it is installed, and then have the ability to automatically change the setting as the environment changes.
 3. The CO detector component shall be capable of a functional gas test using a canned test agent to test the functionality of the CO sensing cell.
 4. The detector shall indicate CO trouble conditions, including six months of sensor life remaining and sensor life has expired. The detector shall indicate a combined signal for any of the following: low chamber trouble, thermistor trouble, CO self-test failure, IR self-test failure, and freeze warning
 5. The MCS-COF Photo/CO Detector shall be used with the B200S Intelligent Sounder Base.
- J. Intelligent Sounder Base (B200S):
1. The B200S sounder base “listens in” to the SLC communication between the attached sensor head and the fire alarm control panel (FACP) to adopt the same address as the detector, but as a unique device type on the loop. The FACP can then be programmed to use that address to command an individual sounder or a group of sounders to activate. The command set from the panel can be programmed to the specific event, allowing selection of volume, tone, and group. In addition, the FACP will enable custom tone patterns.

Scope of Work/Materials

2. The sounder can be programmed to be silenced whenever a live page or active message is being played over the system.
- K. Intelligent Aspiration Smoke Detector (AAD-8100):
1. The AAD-8100 shall offer Very Early Warning Smoke Detection, Early Warning Smoke Detection and Standard Smoke Detection settings.
 2. It shall be tested and approved for coverage up to 8,000 sq. ft.
 3. The ASD shall have dual source (blue LED and infra-red laser) optical smoke detection for a wide range of fire detection with enhanced immunity to nuisance particulates.
 4. The ASD shall operate in air flows from 0-4000 ft/min (0-1,219 m/min).
 5. PipeIQ software shall provide pipe design, FFAST system configuration, and FFAST system monitoring in a single software program.
 6. The ASD shall allow 5 programmable alarm levels with time delays, including Alert, Action 1, Action 2, Fire 1, and Fire 2.
- L. Intelligent Duct Smoke Detector Base (DNR, DNRW):
1. In-Duct Smoke Detector Housing: Use ASD-PL2F intelligent photoelectric detector, ASD-PL2FR intelligent remote test photoelectric detector or ASD-IL2F intelligent ionization detector, which provides continuous analog monitoring and alarm verification from panel.
 2. When sufficient smoke is sensed, alarm signal is initiated, and appropriate action taken to shut down or change over air handling systems to help prevent rapid distribution of toxic smoke and fire gases throughout areas served by duct system.
 3. Duct Smoke Detectors Mounted Above Ceiling or Otherwise Obstructed from Normal View: Provide an (RTS151KEY) Remote test station accessory, designed to test a remotely located Intelligent Duct Smoke detector with remote alarm indicator.
 4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
 5. DST Sampling Tube
 - a. No tools needed for installation or removal
 - b. Installs/removes from front or back of detector
 - c. Available in 1 ft, 1.5ft, 3 ft, 5 ft, and 10 ft lengths
- M. Addressable Dry Contact Monitor Modules (AMM-2F):
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in standard deep electrical box.
 3. IDC Zone: Suitable for Style B operation.
- N. Addressable Dry Contact Monitor Modules (AMM-4F):
1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
 2. Mount in 4-inch (102-mm) square, 2-1/8-inch (54-mm) deep electrical box.
 3. IDC Zone: Suitable for Style D or Style B operation.
 4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.
- O. Addressable Dry Contact Monitor Modules (AMM-2IF):
1. Provide to connect 2 supervised IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.

Scope of Work/Materials

2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zones: Suitable for Style B operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

P. Addressable Two Input and Two Output Modules (AMM-2RIF):

1. Provide two isolated sets of Form-C contacts, which operate as a single pole double throw switch. The module shall allow the control panel to switch these contacts on command. The module shall not provide supervision for the notification appliance circuit (NAC). Module shall have both normally open and normally closed connections available for field wiring. Two input modules shall connect two supervised initiating device circuit (IDC) or zone of conventional alarm initiating devices (any normally open dry contact device) to the fire alarm control panel signaling line circuit (SLC) Loop.
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box.
3. IDC Zones: Suitable for Style B operation.
4. LEDs: Four LEDs that are controlled by the panel to indicate status of each input and output. Coded signals, transmitted from the panel, can cause the LED to blink, latch on, or latch off. Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

P. Addressable Dry Contact Monitor Modules (MMI-10F):

1. Provide to connect 10 supervised Style B IDC zones or 5 supervised Style D IDC zones of conventional alarm initiating devices (any N.O. dry contact device) to 1 of the fire alarm control panel SLCs.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

M. 2-Wire Detector Monitor Modules (AMM-4SF):

1. Provided to connect 1 supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. Mount in 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to optional surface-mounted back box.
3. IDC Zone: Wired for Class A or B (Style D or Style B) operation.
4. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

N. 2-Wire Detector Monitor Modules (MMI-6SF):

1. Provided to connect 6 supervised Class B IDC zones of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

O. Addressable Control Modules (AOM-2SF):

Scope of Work/Materials

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.
3. Control Module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

P. Addressable Control Modules (MMO-6SF):

1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.
4. Control module NAC: Wire for Style Z or Style Y (Class A/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
5. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.

Q. Addressable Relay Modules (AOM-2RF):

1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in standard 4-inch (101.6-mm) square, 2-1/8-inch (54-mm) deep electrical box or to surface-mounted back box.

R. Addressable Relay Modules (MMO-6RF):

1. Available for HVAC control and other building functions. Relay shall be Form C and rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
2. Mount in factory-supplied MBB-2 or MBB-6 enclosure.
3. LEDs: Flash under normal conditions, indicating monitor module is operational and in regular communication with control panel.

2.8 SYSTEM PERIPHERALS – E3 SERIES

Scope of Work/Materials

- A. Graphic Annunciator (Uses ANU-48 Serial Driver Board):
 - 1. Communicate to fire alarm control panel via EIA-485 (multi-drop) 2-wire communications loop. Up to 16 annunciator drivers, each configured up to 48 points, shall be connected per ILI-MB-E3.
 - 3. ANU-48: Provide interface to approved UL-listed graphic-style annunciator and provide each of the features specified.
- B. Auxiliary Switch Module (ASM-16):
 - 1. Each ASM-16 has 16 programmable push-button switches.
 - 2. Each push-button switch has 3 associated status LEDs (red, yellow, and green), configurable to indicate any combination of functions.
 - 3. Flexible switch configurations to allow auxiliary functions.
 - 4. Insert label to identify function of each switch and LEDs combination.
 - 5. Provide capability to communicate with up to 16 ASM-16 modules locally, or up to 3,000 feet from the Control Panel.
- D. NGA Network Graphic Annunciator
 - 1 Main Menu
 - a. Configure allows Auto-configuration of ILI-MB-S and NGA or ANX.
 - b. Walk/Drill enables Walk Test and Fire Drill function.
 - c. I/O Allows enable/disable input and output devices.
 - d. Clock system real-time clock.
 - e. View system configuration information
 - f. NGA log displays, stores, prints and clears the 4100 event history log.
 - g. Service provides Network Query functions.
 - h. (More spec items – Text messaging, custom logo, custom screensaver, max amount of text on screen at one time)
- E. Horns:
 - 1. Operate on 24 VDC or with field-selectable outputs.
 - 2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
 - 3. Have at least 2 audibility options
- F. Strobes:
 - 1. Compliance: ADA and UL 1971.
 - 2. Maximum Pulse Duration: 0.2 second.
 - 3. Strobe Intensity: UL 1971.
 - 4. Flash Rate: UL 1971.
 - 5. Strobe Candela Rating: Determine by positioning selector switch on back of device.
- G. Horn/Strobes:
 - 1. Operate on 24 VDC
 - 2. Have two selectable tone options of temporal 3 and non-temporal continuous pattern.
 - 3. Have at least 2 audibility options
 - 4. Maximum Pulse Duration: 0.2 second.
 - 5. Strobe Intensity: UL 1971.
 - 6. Flash Rate: UL 1971.

7. Strobe Candela Rating: Determine by positioning selector switch on back of device.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine areas and surfaces to receive fire alarm system.
 1. Notify Architect of conditions that would adversely affect installation or subsequent use.
 2. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

- A. Install fire alarm system in accordance with NFPA 72, NFPA 70, state and local codes, manufacturer's instructions, and as indicated on the Drawings. Device boxes shall be stubbed into an accessible ceiling and supported on j-hooks at 4'-0" maximum on center. Electrical conduit shall be ¾" minimum.
- B. Conceal conduit, junction boxes, and conduit supports and hangers in finished areas. Conceal or expose conduit, junction boxes, and conduit supports and hangers in unfinished areas.
- C. Do not install smoke detectors before system programming and test period. If construction is ongoing during this period, take measures to protect smoke detectors from contamination and physical damage.
- D. Flush-mount fire detection and alarm system devices, control panels, and remote annunciators in finished areas. Flush-mount or surface-mount fire detection and alarm system devices, control panels, and remote annunciators in unfinished areas.
- D. Ensure manual stations are suitable for surface mounting or semi-flush mounting as indicated on the Drawings. Install not less than 42 inches, nor more than 48 inches, above finished floor measured to operating handle.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide service of competent, factory-trained technician authorized by manufacturer to technically supervise and participate during pre-testing and acceptance testing of system.
- B. Testing:
 1. Conduct complete visual inspection of control panel connections and test wiring for short circuits, ground faults, continuity, and insulation before energizing cables and wires.
 2. Open initiating device circuits and verify that trouble signal actuates.
 3. Open signaling line circuits and verify that trouble signal actuates.
 4. Open and short notification appliance circuits and verify that trouble signal actuates.
 5. Ground initiating device circuits and verify response of trouble signals.
 6. Ground signaling line circuits and verify response of trouble signals.
 7. Ground notification appliance circuits and verify response of trouble signals.
 8. Check installation, supervision, and operation of intelligent smoke detectors.

Scope of Work/Materials

9. Introduce on system each of the alarm conditions that system is required to detect. Verify proper receipt and proper processing of signal at Control Panel and correct activation of control points.
10. Consult manufacturer's manual to determine proper testing procedures when system is equipped with optional features. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality, and similar.

C. Acceptance Testing:

1. Before installation shall be considered completed and acceptable by AHJ, a complete test using as a minimum, the following scenarios shall be performed and witnessed by representative approved by Engineer. Monitoring company and/or fire department shall be notified before final test in accordance with local requirements.
2. Contractor's job foreman, in presence of representative of manufacturer, representative of Owner, and fire department shall operate every installed device to verify proper operation and correct annunciation at control panel.
3. Open signaling line circuits and notification appliance circuits in at least 2 locations to verify presence of supervision.
4. Completely disconnect main Control Panel from rest of network. Activate initiating device. All control outputs supported by transponder SLC circuits shall operate under project programming mode. Default or degrade mode programming shall not be acceptable.
5. When testing has been completed to satisfaction of both Contractor's job foreman and representatives of manufacturer and Owner, a notarized letter co-signed by each attesting to satisfactory completion of said testing shall be forwarded to Owner and fire department.
6. Leave fire alarm system in proper working order and, without additional expense to Owner, replace defective materials and equipment provided within one (1) year from date of final acceptance by the AHJ or owner.

3.4 DEMONSTRATION

- A. Provide instruction to staff as required for operating fire alarm system.
- B. Provide hands-on demonstrations of operation of fire alarm system components and functions.

END OF SECTION