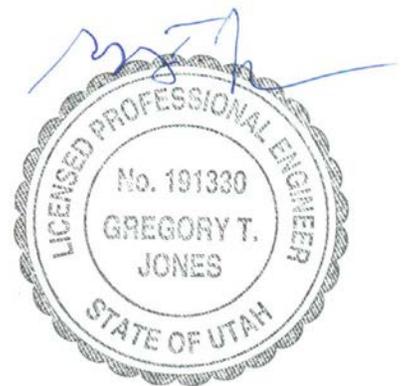
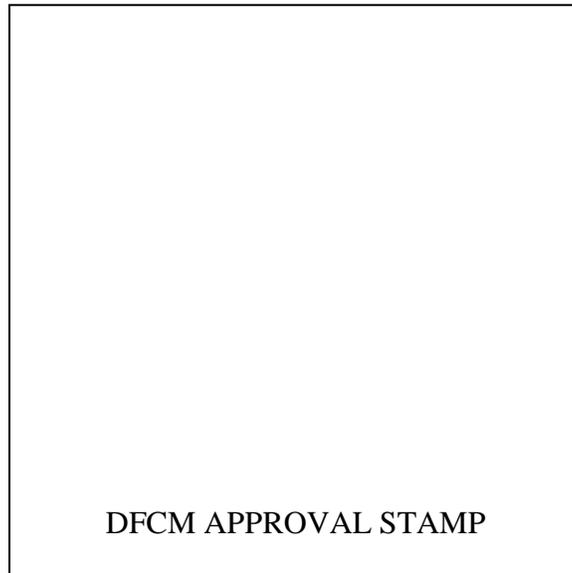




**FIRE/EMERGENCY VOICE ALARM SYSTEM
ADMINISTRATIVE OFFICE OF THE COURTS
MATHESON COURTHOUSE
450 SOUTH SATE TREET
SALT LAKE CITY, UT
DFCM # 13244150**

**SPECIFICATION SECTION 13851
FIRE/EMERGENCY VOICE ALARM SYSTEM**



10/8/13

SECTION 13851 - FIRE ALARM/EMERGENCY VOICE ALARM SYSTEM

PART I - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this section.

1.02 DESCRIPTION OF WORK:

- A. This section of the specifications includes the demolition of existing fire alarm system and furnishing, installation, connection and testing of new fire alarm/emergency voice alarm systems to protect ALL PORTIONS OF THE Matheson Courthouse in Salt Lake City, UT. Fire alarm/emergency voice alarm system shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), remote power supplies, amplifiers/transponders, auxiliary control devices and relays, local operating consoles/annunciators, conduit and wiring as shown on the drawings and specified herein. Fire alarm/emergency voice alarm system shall relay all signals received to an off-premise central monitoring station selected by Owner.

1.03 QUALITY ASSURANCE:

- A. The fire alarm/emergency voice alarm system shall comply with requirements of NFPA 72 (National Fire Alarm Code) 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.
- B. Major system components (control equipment, power supplies, amplifiers, network modules, network controllers/annunciators, etc.) for the fire alarm/emergency voice alarm systems shall be from a single manufacturer to ensure network inoperability. All products shall be furnished, installed, programmed and tested by a factory authorized/trained representative of the equipment Manufacturer. Fire alarm equipment installer shall have a local office located within 75 miles of the project location and shall be capable of providing emergency service (including parts/repairs) within 24 hours of notification by customer.
- C. All initiating devices shall be listed compatible with the control equipment used.
- D. Materials, devices and equipment shall be Underwriters Laboratories (UL) listed or Factory Mutual approved for use in fire alarm/emergency voice alarm systems and shall comply with all applicable requirements of the following UL standards:
 - 1. UL 38 Manually Actuated Signaling Boxes
 - 2. UL 50 Cabinets and Boxes
 - 3. UL 864 Control Units for Fire Protective Signaling Systems
 - 4. UL 268 Smoke Detectors for Fire Protective Signaling Systems
 - 5. UL 268A Smoke Detectors for Duct Applications
 - 6. UL 464 Audible Signaling Appliances
 - 7. UL 521 Heat Detectors for Fire Protective Signaling Systems
 - 8. UL 1971 Visual Notification Appliances.
- E. Shop drawings shall be prepared by an engineering technician or senior engineering technician (Level III or Level IV) NICET certified for fire alarm design. Include NICET certification

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number on the drawings. Drawings will be signed by the technician and submitted for approval under his name.

- F. Contractor (and/or subcontractor) shall be licensed as both an electrical and a fire alarm contractor in the State of Utah. License shall be active throughout the duration of the project.

1.04 SUBMITTALS:

- A. Descriptive Data: Descriptive data shall be submitted on the following items of material and/or equipment. Such data shall consist of manufacturer's or supplier's catalog information in sufficient detail to allow verification that the material and/or equipment meets the specification requirements, or is equal to that specified. Descriptive data shall be included with the shop drawings submittal described in paragraph B below.
1. Fire alarm control panel.
 2. Local Operating Consoles/Annunciator panels.
 3. Remote power supplies for notification appliance circuits.
 4. Amplifiers/Transponders
 5. Initiating devices (smoke detectors, heat detectors, manual pull stations, monitor modules, etc.)
 6. Relay modules to control protected premise fire safety functions.
 7. Notification appliances.
- B. Shop Drawings: Prior to ordering or installing any equipment, contractor shall prepare shop drawings for submittal to Owner/Engineer. Shop drawings shall include sufficient information, clearly presented, to determine compliance with drawings and specifications. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts. Indicate type and gauge of wire to be used for each different circuit type. Show annunciator layout, configurations, and terminations.
- C. Submit four sets of drawings, descriptive data, battery calculations and voltage drop calculations to the Owner/Engineer for review. After review and acceptance by the Owner/Engineer, submit to State Fire Marshal for review. Any review comments, and associated drawing revisions, from state or local approving authorities that affect the system design shall be approved by the Owner/Engineer prior to installation.
- D. Testing Documentations/Certificates: Upon completion of installation and prior to final acceptance testing, complete and submit fire alarm/emergency voice alarm system record of completion. Record of completion, along with all other material and test certificates shall be submitted to Project Engineer.
- E. As-Built Drawings: A complete set of "as-built" drawings showing installed wiring, color coding, and wire tag notations for exact locations of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of system. As built drawings shall be furnished in printed (reproducible) format as well as electronic format (DWG and PDF files on CD).
- F. O&M Manuals: Operating and instruction manuals shall be submitted prior to testing of the system. Three (3) complete sets of operating and instruction manuals shall be delivered to the owner upon completion. User operating instructions shall be provided prominently displayed on a separate sheet located next to the control unit in accordance with U.L. Standard 864.
- G. Warranty Letter: Provide letter stating that contractor will warrant all equipment and wiring to be free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance. Provide information regarding any equipment warranty provided by the equipment

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manufacturer that exceeds 365 days.

1.05 SYSTEM DESCRIPTION:

- A. Remove, modify or upgrade existing fire alarm/emergency voice alarm system in building as described on project drawings. A new intelligent, microprocessor-controlled fire detection and emergency voice alarm communication system shall be installed in accordance with the specifications and as indicated on the Drawings. Upgrade or replace all control equipment, enclosures, power supplies, initiating circuits and devices, notification appliance circuits and devices. Existing conduit and wiring may be reused where compatible with the new system. Add new conduit and wiring where existing conduit/wiring is not adequate or where no conduit/wiring exists. Existing junction boxes may remain where they comply with the provisions of the specification and will be used to mount new devices.
- B. Existing FACP in building shall be upgraded or replaced and shall include emergency voice alarm capabilities. FACP shall be addressable with integrated signaling line circuits (SLC) with sufficient capacity for all initiating devices and control modules required with an additional reserve of 20% unused addresses for future expansion.
- C. Furnish and install addressable initiating devices as indicated on the project drawings and as specified below:
 - 1. Smoke detectors: Install smoke detectors on ceiling/deck of all corridors, lobbies and all areas open to corridors/lobbies/concourses. Install additional detectors above all fire alarm system control equipment. Detectors shall be located in conformance with NFPA 72 with a maximum spacing of 30' between detectors.
 - 2. Heat detectors: Install heat detectors on ceiling/deck of elevator equipment areas, elevator shafts and other areas as indicated on plans. Heat detectors shall be fixed temperature type (135 deg-f). Detectors shall be located in conformance with NFPA 72 with a maximum spacing of 50' between detectors.
 - 3. Duct smoke detectors: Install duct smoke detectors where indicated on plans and in supply/ return ducts of all air movement systems with a capacity in excess of 2,000 cfm. Required number and location of duct smoke detectors shall conform to IMC (2009) and manufacturer's requirements.
 - 4. Projected beam smoke detectors: Install projected beam type smoke detectors where indicated on plans. Install in accordance with NFPA 72 and manufacturer's requirements. Detectors shall be single ended type with all power/controls contained at one end with a reflector unit only on the opposite end. Beam detectors shall include an integrated testing system utilizing opaque screens/filters. Test/reset switches shall be provided for each detector and shall be key operated or located within a secure room.
 - 5. Manual pull stations: Replace existing manual pull stations with new addressable pull stations compatible with new FACP.
 - 6. Monitor modules: Install monitor modules to facilitate connection of existing conventional initiating devices (water flow, valve supervisory, fire suppression systems, etc.) that remain to new fire alarm system. Provide a separate monitor module for each water flow switch. A single monitor module may be used for multiple valve supervisory switches where each of the valves connected to the module serves the same purpose/zone.
- D. Provide addressable relay modules as required to provide the following protected premise fire safety functions:
 - 1. Release fire/smoke dampers
 - 2. Fan shutdown
 - 3. Fire door release
 - 4. Activation of NAC Circuits

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5. Elevator recall (primary and secondary)
 6. Actuation of smoke control systems
- E. Furnish and install notification appliances and remote power supplies/amplifiers for notification appliance circuits. Quantity and location of power supplies/amplifiers shall be sufficient to create three separate notification zones (South wing, West wing/atrium and North wing) for each floor level of each building.
- F. Each Signaling Line Circuit (SLC) and Notification Appliance Circuit (NAC): Limited to only 80 percent of its total capacity during initial installation.

1.06 SYSTEM DESIGN:

- A. Basic Performance:
1. Signaling Line Circuits (SLC) Serving Addressable Devices: Wired Style 6 (Class A).
 2. Initiating Device Circuits (IDC) Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class A (NFPA Style D).
 3. Notification Appliance Circuits (NAC) Serving Strobes and Speakers: Wired Class A (NFPA Style Z).
 4. 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.
 5. Transponders:
 - a. Operate in peer-to-peer fashion with other panels and transponders in system.
 - b. Each transponder shall store copy of audio evacuation messages and tones.
 - c. Systems that use centralized message storage and control at main fire alarm control panel shall not be acceptable.
 6. Signaling Line Circuits (SLC):
 - a. Reside in remote transponders with associated audio zones.
 - b. SLC modules shall operate in peer-to-peer fashion with all other panels and transponders in system.
 - c. On loss of INCC Command Center, each transponder shall continue to communicate with remainder of system, including all SLC functions and audio messages located in all transponders.
 - d. Systems that provide a “Degraded” mode of operation upon loss of INCC Command Center or short in riser shall not be acceptable.
 7. Audio Amplifiers and Tone-Generating Equipment: Electrically supervised for normal and abnormal conditions.
 8. Amplifiers: Located in transponder cabinets serving no more than 3 floors per transponder to enhance system survivability, reduce required riser wiring, simplify installation, and reduce power losses in length of speaker circuits.
 9. Speaker NAC Circuits: Arranged such that there is a minimum of 3 speaker circuits per floor level.
 10. Notification Appliance Circuits (NAC), Speaker Circuits, and Control Equipment: Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
 11. Speaker Circuits:
 - a. Electrically supervised for open and short circuit conditions.
 - b. If short circuit exists on speaker circuit, it shall not be possible to activate that circuit.
 - c. Arranged for 25 VRMS and shall be power limited in accordance with NEC
 - d. 20 percent spare capacity for future expansion or increased power output requirements.

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12. Speaker Circuits and Control Equipment:
 - a. Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
 - b. Systems utilizing “bulk” audio configurations shall not be acceptable.
- B. Basic System Functional Operation: When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 1. The system Alarm LED on the FACP shall flash.
 2. A local sounder with the control panel shall sound.
 3. LCD display on the FACP and all remote annunciators shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 4. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm.
 5. Alarm signal shall be transmitted off-premise via the DACT to the central monitoring station selected by the owner.
- C. All wiring shall be free of opens, shorts and grounds. All wiring shall be installed in rigid conduit or EMT. All penetrations through rated partitions shall be fire stopped with a suitable caulking compound. All wiring (except new power distribution circuits) shall be fire power limited (FPL) with minimum 300V insulation or equivalent complying with NFPA 70 Article 760.
- D. Provide a ground fault detection circuit, to detect positive and negative grounds on all field wiring. The ground fault detector shall operate the general trouble devices as specified but shall not cause an alarm to be sounded. Ground fault will not interfere with the normal operation, such as alarm, or other trouble conditions.
- E. All low voltage circuits will be protected by microprocessor controlled power limiting or have self restoring polyswitches for the following: smoke detector power, main power supply, indicating appliance circuits, battery standby power and auxiliary output.
- F. Notification circuits shall be designed to limit the voltage drop to a maximum of 20% from the power supply to the most remote device on any notification circuit.
- G. All visible alarms within a single field of view shall flash in synchronization.
- H. Secondary power supply (battery backup) shall be provided for each control panel, power supply and amplifier and shall be sufficient to provide a minimum of 24 hours of standby power with an additional reserve to operate the system for 15 minutes in alarm.

1.07 WARRANTY:

- A. The contractor shall warrant all equipment and wiring free from inherent mechanical and electrical defects for one year (365 days) from the date of final acceptance.

1.08 APPLICABLE CODES AND STANDARDS:

- A. The specifications and standards listed below form a part of this specification. The system shall fully comply with all applicable provisions of the latest issue of these standards.
 1. International Building Code – 2012 edition

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2. International Fire Code – 2012 edition
3. International Mechanical Code – 2012 edition
4. Utah State Fire Marshal Rule R710-4
5. NFPA 70 - National Electrical Code – 2011 edition
6. NFPA 72 - National Fire Alarm Code – 2010 edition
7. NFPA 101 Life Safety Code – 2009 edition
8. ASME A17.1 – current edition
9. DFCM standards/established procedures

PART II - PRODUCTS

2.01 GENERAL:

- A. All equipment and components shall be new, and the manufacturer's current model. The installer shall be an authorized representative of the manufacturer of the major equipment, such as control panels and shall be responsible for the satisfactory installation of the complete system. Major system components (control equipment, power supplies, amplifiers, network modules, network controllers/annunciators, etc.) for the fire alarm/emergency voice alarm systems shall be from a single manufacturer to ensure system inoperability. Fire alarm equipment installer shall have a local office located within 75 miles of the project location and shall be capable of providing emergency service (including parts/repairs) within 24 hours of notification by customer.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. Fasteners and supports shall be adequate to support the required load.
- D. Substitute equipment proposed as equal to equipment specified shall meet or exceed requirements of this section. For equipment other than that specified, provide proof that such substitute equipment equals or exceeds features, functions, performance, and quality of specified equipment. This proof shall be provided by submission of a copy of specification with each copy of the submittals that has had each paragraph marked as either compliant or non-compliant along with a letter from engineering manager or product manager at factory that certifies information presented as either compliant or non-compliant including a detailed explanation of each paragraph identified as non-compliant. In order to ensure that the Owner is provided with a system that incorporates required survivability features, this letter shall also specifically certify that the system is capable of complying with the test requirements of this section.

2.02 CONDUIT AND WIRE:

- A. Conduit:
 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and DFCM 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. Wiring for 24 volt control, alarm notification, emergency communication and similar

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power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the equipment manufacturer.
6. Conduit shall be 3/4 inch minimum.
7. Install conduit attached to structure by straps, staples, hangers or similar fittings designed and installed to support conduit. Installation shall conform to DFCM requirements, NFPA 70 Article 760 and 300.4.
8. Conduit shall be rigid or EMT. Flexible conduit may be used for a drop to a single device. Metal clad or armored cable may be used as an alternate to conduit where installed and supported in accordance with NFPA 70, DFCM requirements and NEMA RV1.
9. Conduit shall be concealed above ceilings or in walls where ceiling or walls are present. Conduit may be installed exposed in unfinished areas.
10. Conduit and junction boxes used for the fire alarm/emergency voice alarm system shall be marked and labeled to indicate that they are part of the building fire alarm/emergency voice alarm system. Conduits shall be periodically marked with red paint and labeled to indicate the circuit type and designation contained inside. Junction boxes shall be painted red.

B. Wire:

1. All fire alarm/emergency voice alarm system wiring must be new unless specified herein.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm/emergency voice alarm system. Number and size of conductors shall be as recommended by the fire alarm/emergency voice alarm system manufacturer, but not less than 18 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 12 or 14 AWG (1.63 mm) for notification appliance circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. All wiring shall be installed inside permanent conduit or raceway or contained inside approved junction boxes or enclosures.
5. The system shall permit the use of IDC and NAC wiring in the same conduit or raceway with the multiplex communication loop.
6. All field wiring shall be completely supervised. In the event of a primary power failure, disconnected standby battery, removal of any internal modules, or any open circuits in the field wiring; a trouble signal will be activated until the system and its associated field wiring are restored to normal condition.
7. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.
8. The fire alarm control panel and remote notification circuit power supplies shall be connected to dedicated branch circuits. Existing power circuit to FACP to be removed may be reused. Each circuit shall be labeled at the power distribution panel as FIRE ALARM. Primary power wiring shall be 12 AWG. Cabinets shall be grounded securely to either a cold water pipe or grounding rod.

2.4 FIRE ALARM CONTROL PANEL:

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- A. Install all required expansion modules to ensure adequate SLC loop capacity for all initiating devices and control relays shown on drawings with an additional reserve or at least 20% for future expansion.
- B. The FACP must have an integrated UL approved digital communicator. The communicator must allow local and remote up/downloading of system operating options, event history, and detector sensitivity data. The FACP must automatically test the smoke detectors in compliance with NFPA standards to ensure that they are within listed sensitivity parameters and be listed with Underwriters Laboratories for this purpose.
- C. The FACP must compensate for the accumulation of contaminants that affect detector sensitivity. Maintenance alert feature (differentiated from trouble condition), detector sensitivity selection, auto-programming mode (Jumpstart) and the ability to upgrade the core operating software on site or over the telephone.
- D. The main communication bus shall be capable of class A or class B configuration with a total Bus length of not less than 6,000 feet.
- E. The main control must have a built in annunciator with a minimum 80 character LCD display and feature LED's for General alarm, Supervisory, System trouble, System silence and Power. When in the normal condition the LCD shall display time and date which is capable of automatic daylight savings time adjustments. The annunciator must be able to silence and reset alarms through the use of a keypad-entered code, or by using a firefighter key. The annunciators must have twenty levels of user codes that will allow the limitation of operating system programming to authorized individuals.
- G. Provide all necessary system expansion modules required to provide a complete and functional fire alarm system as described on the project drawings and specified herein.
- H. Audio Amplifier: Include as a minimum, the following features:
 - 1. 50-watt switching audio amplifier, requiring no transformer when used in 25-watt mode.
 - 2. 2 individually addressable speaker circuits, each with capability of handling part or all of 50-watt supplied power.
 - 3. Power shall be 24 VDC supplied via terminal block from local power supply.
 - 4. Ability to select from 1 of 16 pre-programmed messages and paging from locally or from remote operating console.
 - 5. Status LEDs to indicate normal operation and trouble condition.

2.5 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.

2.6 NOTIFICATION APPLIANCE POWER SUPPLIES

- A. Notification appliance power supplies shall provide 8.0 amps of continuous, regulated 24-volt power. Power supplies shall include the following features:
 - 1. Integral Charger: Charge up to 18.0 amp-hour batteries and support 60-hour standby.

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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.

2.7 SYSTEM PERIPHERALS

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 9) 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 in INCC Command Center, 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. Form-C relay base rated 30 VDC, 2.0 A.
 - d. 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).
11. Each addressable device shall be permanently labeled to indicate programmed devices number/address. Address shall be of sufficient size and clarity to be read by an inspector from the floor level below the device.

B. Addressable Manual Stations:

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.

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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: 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 : 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 Duct Smoke Detectors:
1. In-Duct Smoke Detector Housing: Use on-board intelligent photoelectric 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 with remote alarm indicator.
 4. Each Detector: Install in either supply side or return side duct in accordance with local mechanical code.
- F. Addressable Dry Contact Monitor Modules:
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.
- G. Addressable Control Modules:
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.
- H. Addressable Relay Modules:
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.

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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.
- I. Isolator Modules:
1. Provide to automatically isolate wire-to-wire short circuits on SLC Class A or Class B branch. Isolator module shall limit number of modules or detectors that may be rendered inoperative by short-circuit fault on SLC loop segment or branch. At least 1 isolator module shall be provided for each floor or protected zone of building. No more than 25 devices shall be connected to 1 isolator module.
 2. If wire-to-wire short occurs, isolator module shall automatically open-circuit (disconnect) SLC. When short-circuit condition is corrected, isolator module shall automatically reconnect isolated section.
 3. Does not require address-setting, and its operations shall be totally automatic. Not necessary to replace or reset isolator module after normal operation.
 4. Mount in standard 4-inch (101.6-mm) deep electrical box or in surface-mounted back box.
 5. Single LED: Flash to indicate isolator is operational and illuminate steadily to indicate short-circuit condition has been detected and isolated.
- J. Addressable Projected Beam Detectors:
1. Single-ended, reflective design.
 2. Six user-selectable sensitivity levels.
 3. Operates in range from 16 feet to 328 feet.
 4. Temperature Range of Device: Minus 22 degrees F to 131 degrees F.
 5. Beam Detector: Automatic gain control to compensate for gradual signal deterioration from dirt accumulation on lenses.
 7. UL Listed.
 8. Ability to be tested using built-in calibrated test filters actuated from remote test station.
- K. LCD Display Annunciator:
1. Furnish and install as indicated on the Drawings a remote serial annunciator. Annunciator shall provide 80-character display, which shall duplicate all information on basic system display, including any network nodes its host panel is annunciating, with exception of menus. Contain the following function keys:
 - a. Alarm Acknowledge.
 - b. Trouble Acknowledge.
 - c. Signal Silence.
 - d. System Reset/Lamp Test.
 - e. System Drill Test.
 2. Key Lock: Enable switches only when placed in “ON” position, with exception of Trouble Acknowledge, which is used to silence local trouble audible sounder. Annunciator shall contain the following LEDs:
 - a. Alarm.
 - b. Supervisory.
 - c. System Trouble.
 - d. Power Fault.
 - e. System Silenced.
 3. Mount on standard 3-gang surface or flush electrical box.
- O. Speakers:
1. Operate on 25 VRMS or with field-selectable output taps from 0.25 to 2.0 watts.
 2. Speakers in Corridors and Public Spaces: Produce nominal sound output of 84 dBA at 10 feet (3 m).

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3. Frequency Response: Minimum of 400 Hz to 4,000 Hz.
4. Back of Each Speaker: Sealed to protect speaker cone from damage and dust.

P. 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.

Q. Speaker/Strobes:

1. Operate on 25 VRMS or with field-selectable output taps from 0.5 to 2.0 watt
2. Speakers in Corridors and Public Spaces: Produce nominal sound output of 84 dBA at 10 feet (3 m).
3. Frequency Response: Minimum of 400 Hz to 4,000 Hz.
4. Back of Each Speaker: Sealed to protect speaker cone from damage and dust.
5. Audibility: NFPA 72.
6. Maximum Pulse Duration: 0.2 second.
7. Strobe Intensity: UL 1971.
8. Flash Rate: UL 1971.
9. Strobe Candela Rating: Determine by positioning selector switch on back of device.

2.8 SPARE DEVICES:

- A. Furnish the owner with a stock of spare initiating devices and notification appliances to allow for future addition/relocation of devices or replacement of equipment that fails after expiration of the warranty period. Manufacturer and model number of spare devices shall match those of devices used for the system installation. Minimum number and type of devices per building shall be as indicated below:

1. Two addressable heat detectors.
2. Five addressable smoke detectors.
3. Two addressable manual pull stations.
4. Five addressable contact monitor module.
5. Three addressable control modules.
6. Ten notification appliances corresponding to the type and proportion of notification appliances installed.
7. Two addressable duct mounted smoke detector (duct mounting kit and sampling tube).

PART III - EXECUTION

3.01 INSPECTION:

- A. Contractor shall be responsible to attend a mandatory pre-bid walk through of building. If required, additional pre-bid inspections can be arranged. The contractor shall be responsible to examine all areas and conditions under which fire alarm/emergency voice alarm systems are to be installed and identify conditions detrimental to proper completion of the work. All unsatisfactory conditions shall be specifically identified in the bid.
- B. Extent and location of existing fire alarm equipment shown on bid drawings is based on informal field surveys of each building and should be considered to be approximate. Contractor shall be responsible to conduct a detailed inspection to verify conditions prior to preparing shop drawings and/or installing the new fire alarm/emergency voice alarm system.

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3.02 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.
- C. All fire detection and alarm system devices, control panels and remote annunciators (unless otherwise noted on drawings) shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
- D. Contractor is responsible for making his own job check and any necessary adjustments in the design prior to installation. Make final coordination with existing building elements and adjust design as necessary. Major conflicts shall be brought to the attention of the Project Engineer for resolution.
- E. Work shall be performed in a manner to minimize interruptions in service of the existing fire alarm/emergency voice alarm system. Contractor shall be responsible to provide a fire watch throughout all times that the automatic fire alarm and detection service is interrupted. Off-premise monitoring of the fire sprinkler control valves and water flow switches shall be provided at all times.
- F. Existing conduit and junction boxes not used for the new fire alarm/emergency voice alarm system may remain. Contractor shall remove all existing wiring from abandoned conduits and junction boxes. Abandoned junction boxes in finished areas shall be covered with a decorative plate (to be approved by the owner).
- G. Work only in one area of the building at a time. Complete all required work in that area before proceeding to the next area.
- H. Contractor shall prepare a schedule of work to be performed and submit the schedule to the building coordinator for review/approval.
- J. A tool/equipment storage area will be provided in a secure area to be designated by the Building Coordinator. All pipe threading/fabrication operations shall be performed in the provided tool/equipment storage area. Contractor is responsible for the security of all materials and equipment placed in the tool/equipment storage area. Prior to the end of each work shift, the Contractor shall remove all tools, equipment and materials awaiting installation from the work area and place in tool/equipment storage area
- K. Operations involving the creation of dust, debris or distracting noise shall be scheduled in advance with the building coordinator and shall be performed early in the morning or near the end of the work day.
- L. Work shall be performed Monday through Friday between the hours of 7:00 AM and 5:00 PM. Weekend, holiday and afterhours work will be allowed but is subject to availability of building security and will require prior approval from the building coordinator

3.03 FIELD QUALITY CONTROL:

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- A. Obtain permits and post bonds as required by state and local AHJ's (Authorities Having Jurisdiction).
- B. Inform AHJ's of job progress. Request presence of AHJ's, perform tests, and document results using Contractor's Material and Test Certificates.

3.04 TESTING/TRAINING:

- A. Make and pay for all tests required by applicable codes during and after completion of the work and correct and defects in the systems indicated by the tests.
- B. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system.
- C. Testing shall include but not be limited to the following:
 - 1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
 - 2. Open initiating device circuits and verify that the trouble signal actuates.
 - 3. Open signaling line circuits and verify that the 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 alert tone and prerecorded voice message to all alarm notification devices.
 - 9. Check installation, supervision, and operation of all intelligent smoke detectors using walk test.
 - 10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
 - 11. Test system batteries to verify that secondary power supply is sufficient to provide specified standby and alarm power.
- D. Train the Owner's maintenance personnel in the proper operation, testing and maintenance of all installed equipment. Training shall be sufficient to enable owner to service equipment, add or remove devices and make programming changes.

3.05 FINAL INSPECTION:

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

3.06 INSTRUCTION:

- A. Instruction shall be required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- B. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation

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3.07 CLEANING:

- A. Remove dust, scale, debris, and foreign substances from interior and exterior of devices, equipment, and materials prior to installation.
- B. Upon job completion, remove tools, surplus materials and equipment, leaving all areas broom clean.

3.07 AUTHORITIES HAVING JURISDICTION:

- A. Acceptance of installation is subject to final inspection and approval by:
 - 1. State of Utah Fire Marshal's Office
 - 2. State of Utah Division of Facilities and Construction Management
 - 3. Administrative Office of the Courts
 - 4. Project Engineer

END OF SECTION 13851