

MINNESOTA MULTI-PURPOSE STADIUM  
MINNEAPOLIS, MINNESOTA

SECTION 283100

ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary conditions and Division-1 specification sections, apply to work of this section.
- B. Division 26, Basic Electrical Materials & Methods apply to work specified in this section.
- C. Division 26 "Electrical Identification" apply to work in this section for labeling of conduit and equipment.
- D. Division 28 "Smoke Management" apply to work specified in this section.
- E. Related work specified in other divisions of these specifications.
  - 1. Installation of duct type smoke detectors.
  - 2. Control wiring from Fire Alarm Control equipment to mechanical fans, dampers, control equipment both low voltage and line voltage and all other control wiring associated with mechanical equipment.

1.2 SUMMARY

- A. Provide a complete and coordinated Class A wiring, fire alarm system in accordance with the contract documents. Audible intelligibility shall be provided throughout the building.
- B. Any fire alarm devices, wiring etc., not indicated on the drawings, but required by the local AHJ Plan Reviewer during plan review, shall be provided as part of this specification at contractor's expense. As a minimum, an additional 25 audio/visual alarms 25 smoke detectors and 25 addressable interface devices shall be included in price including labor. Any remaining devices shall be provided to the owner at project completion as attic stock.
- C. Refer to Life Safety Report for sequence of events (fire alarm matrix).

1.3 SUBMITTALS

- A. Procedure - prepare and make submittals listed in accordance with Division 1, "Submittals" as required by Local Authority Having Jurisdiction.
- B. Product Data - submit manufacturer's specifications, recommendations, and installation instruction for use intended. The data shall include but is not limited to the following:
  - 1. Control panels
  - 2. Cabinets
  - 3. Manual stations
  - 4. Batteries
  - 5. Battery charger
  - 6. Smoke sensors

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7. Installer's training history
8. Visual alarms
9. Audio/visual alarms
10. Addressable interface devices
11. Central processing unit
12. Wiring conductors
13. Wire connectors
14. Thermal sensors
15. Electromagnetic door hold-open devices
16. LED Point lit graphic annunciator.
17. Two-way voice communication system
18. Manufacturer's recommended calibrated test method for smoke sensors and smoke detectors.
19. Include Underwriters Laboratories or Factory Mutual listing cards for equipment provided.

C. Drawings

1. Detailed drawings for the fire alarm system shall consist of illustrations, schedules, performance charts, battery calculations, point lists, instructions, diagrams, and complete detailed drawings of the fire alarm system.
2. A descriptive index of drawings in the submittal with drawings listed in sequence by drawing number.
3. A legend sheet identifying device symbols, nomenclature, and conventions used in the package.
4. Floor plans drawn to a scale not less than 1/8-inch equals 1 foot which clearly show locations of devices, equipment, risers, panels, electrical power connections, approximate location of conduit runs, and other details required to clearly describe the proposed system.
5. A 1/4" scale plan view of the fire command center and security office with dimensioned layout of all equipment therein.
6. Location of control panels, detectors, supervisory switches, manual pull stations, visual/audible alarms and electrical devices. Clearly and completely indicate the function of the control panel and devices. Indicate conduit routing and sizes, or cable routing and sizes, and the number of conductors contained in each. Indicate points of connection and terminals used for electrical field connections in the system, with a wiring color code. Indicate termination points of devices and indicate the interconnection of modules required for proper operation of the system. Indicate interconnection between modules and devices. Control diagrams shall be supplemented with a narrative description of the system. Point-to-point wiring diagrams shall indicate control panel wiring and make and model of devices and equipment. Signal circuit diagrams shall show current draw and load by device and by circuit.

D. Design Data

1. Battery standby power requirements calculations.
2. Submit design calculations for the system substantiating battery standby power requirements, calculations showing battery capacity and supervisory and alarm power requirements.

E. Field Test Reports

1. Preliminary and acceptance tests.
2. Include the control panel and initiating and indicating devices, a unique identifier for each device with an indication of test results, and signature of the factory-trained technician of

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the control panel manufacturer and equipment installer. With reports on preliminary tests, include printer information.

F. Record Drawings

1. Upon completion, and before final acceptance of the work, submit a complete set of CADD generated as-built drawings for the fire alarm system, including components and any other associated appurtenances. Include as-built circuit diagrams complete with conductor color codes and a listing of initiating device locations and fixing voltage for each. Submit a minimum ten of 11 x 17 inch reproducible as-built drawings with title block similar to contractor drawings, and provide CAD diskettes of entire project. Submit as-built drawings in addition to the record drawings required by Division 1, "Operation and Maintenance Data".
2. List of FACP alphanumeric address names
3. Request for formal inspection and tests
4. When tests have been completed and corrections made, submit a signed, dated certificate with a request for formal inspection and tests.

G. Operation and Maintenance Manuals

1. Fire alarm control panel
2. Smoke and thermal sensors
3. Interface and control modules
4. Submit in accordance with Division 1, "Operation and Maintenance Data". Include current unit prices and source of supply for parts list, and a list of parts recommended by the manufacturer to be replaced after one year and three years of service. Include in the fire alarm control panel, full and comprehensive manufacturer's repair and service manuals.

1.4 QUALITY ASSURANCE

- A. Qualifications the manufacturer's authorized distributor must substantiate that within a 50 mile radius of the job site, there is an established agency which stocks a full complement of parts and offers full service during normal working hours on all equipment to be furnished and that the agency will supply parts without delay and at a reasonable cost.
- B. Qualifications of Installer: Prior to installation, submit data for approval showing that the Contractor has successfully installed addressable, analog intelligent interior fire alarm systems of the same type as specified herein, or that the Contractor has a firm contractual agreement with a subcontractor having such required experience. Include the names and locations of at least two installations where the Contractor or the subcontractor referred to above, has installed such systems. Indicate the type and design of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 18 months. Submit names and phone numbers of points of contact at each site. The Installer must be licenced in the State/Locality in which the project is located.
- C. Codes and Standards: Except as modified by governing codes and where more stringent standards are specified by the contract documents, comply with the latest applicable provisions and the latest recommendations of the following:
1. National Fire Protection Association (NFPA): NFPA 70, "2011 National Electrical Code": NFPA 72, "National Fire Alarm and Signaling Code": NFPA 241, "Standard for Safeguarding Construction, Alteration and Demolition Operations": NFPA 101, "Life Safety Code".

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2. Factory Mutual (FM): FM 37825, "1952 Approved Guide".
  3. Underwriters Laboratories (UL): UL FPED, "Fire Protection Equipment Directory; UL 268, "Smoke Detectors for Fire Protective Signaling Systems;" UL 164, "Control Units for Fire Protective Signaling Systems, UL 197/ANSI, "Codes applicable to Americans with Disabilities Act Compliance".
  4. Americans with Disabilities Act
  5. Local and City Codes and Amendments.
  6. International Building Code, IBC-2006.
  7. International Fire Code, IFC-2006.
- D. Federal Specifications Compliance: Comply with FED-STD-595, "Colors used in Government Procurement".
- E. Guarantee - all components, parts and assemblies supplied by the manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months upon acceptance. Warranty service shall be provided by a trained specialist of the equipment manufacturer. The specialist shall be based in a fully-staffed branch office located within 50 miles from the job site.
- F. Testing - conduct a total system test for Architect/Engineer and Local Fire Department. Tests shall include as a minimum.
1. Verify operation of all manual pull stations and detectors.
  2. Verify line supervision of each initiating and indicating circuit.
  3. Verify the Class A operation of each initiating circuit.
  4. Verify operation of all indicating devices.
  5. Verify operation of all alarm initiated function.
  6. Perform smoke test(s) as directed by the Local Fire Department. Provide electricians, and factory representatives to perform as many tests as required to approve smoke management system. The Engineer, Owner and Architect shall be advised a minimum of five working days before each test.
- G. All equipment provided as part of this section shall be the product of a single fire alarm equipment manufacturer.
- H. Equipment and devices shall be from a manufacturer who has been manufacturing similar products for a minimum of 5 years. Furnish materials and equipment that are current products of one manufacturer regularly engaged in the production of such equipment.
- I. Regulatory Requirements
1. Devices and equipment for fire alarm service shall be listed by Underwriters Laboratories, Inc. and listed in UL FPKD or approved by Factory Mutual and listed in FM P7825. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.
- J. Requirements for Fire Protection Service
1. Equipment and material shall have been tested by Underwriters Laboratories, Inc. and listed in UL FPKD or approved by Factory Mutual and listed in FM P7825. The omission of these terms under the description of any item of equipment described shall not be construed as waiving this requirement.

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K. Standard Products

1. Materials and equipment shall be standard new products of a manufacturer regularly engaged in the manufacture of such products. Select material from one manufacturer, and not a combination of manufacturers, for any particular classification of materials.

L. Modification of References

1. In NFPA publications referred to herein, consider advisory provisions to be mandatory, as though the word "shall" had been substituted for "should" wherever it appears; interpret reference to "Authority Having Jurisdiction".

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect equipment delivered and placed in storage from the weather, humidity and temperature variation, dirt and dust, and other contaminants.

1.6 SPARE PARTS

- A. Spare parts shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, stamping or tagging. Furnish the following:
  1. Four keys or tools for resetting manual systems.
  2. Four keys for locks of control panels or cabinets.
  3. Three (bases and heads) of each type smoke (area and duct) and thermal sensors.
  4. Three of each type monitor module.
  5. Three of each type control module.
  6. Three fuses of each type provided. Spare fuses shall be mounted in the fuse holder located inside each control panel.
  7. One of each type audio/visual device.
  8. One of each type visual device.

PART 2 - PRODUCTS

2.1 SYSTEM DESIGN

- A. Acceptable Manufacturers: Refer to Section 26 05 05.
- B. Scope
  1. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performing all operations in connection with the installation of the addressable Fire Alarm System (Class A) as shown on the drawings, as hereinafter specified, and as directed by the architect/engineer.
  2. The Fire Alarm System shall consist of all necessary hardware and software equipment to perform the following functions:
    - a. Fire Alarm and Detection Operations.
    - b. Two-way Supervised Voice Communication Operations.
    - c. One-way Supervised Automatic Voice Alarm Operations.
    - d. Remote Manual and Automatic Control of elevators, all Smoke Control Related Fan Systems, remote monitoring of sprinkler, fire pump, and emergency power systems.

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- e. Interface to the public address speaker system for the seating bowl.
- f. Interface to Division 23 smoke control equipment with appropriate outputs, controls and graphics.
3. Each item of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by the Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. The Control Equipment for all Systems shall be listed under UL category UOJZ as a Single Control Unit.
4. The complete installation shall conform to the applicable sections of NFPA-72, NEC 76, Life Safety Code 101, and Local Authorities Having Jurisdiction.
5. Nodes as defined for this specification shall be intelligent, microprocessor based devices that connect to, and handle network communications.
6. By programmable selection at each node:
  - a. The specific detail information of any point connected to any node in the network may be made accessible (declared public) to the network.
  - b. Points within each node shall be able to be grouped by area, type of device, type of function, or any other user selectable category, and custom labeled as a point list. A point list shall be acted upon as though it was a point for purposes of interaction with the node custom control program. Detail information shall not burden the point list messages, only the quantity and type of status shall be broadcast into the network.
7. The fire alarm system shall be provided with the primary monitoring host computer system for alarms, trouble, and supervisory indication located as shown on the construction documents. This host shall be U.L. listed for use with the fire alarm system. The host system shall be connected to the fire alarm control panels utilizing an RS-485, BacNet Level II, or equivalent network protocol on a twisted pair communication bus network.
8. Survivability: When wiring connecting the FSCS to any remote mounted controlling device exceeds 100 feet; the wire shall be 2-hour rated in addition to being in conduit.

C. Alarm System

1. Furnish and install a fully field programmable/addressable analog fire detection system. The System shall determine the number and types of modules installed, the number of analog addressable loops, and all installed devices. It shall determine the type of device and the device number. The System shall use Style 4 (Class A) signaling line circuits and Style Z (Class A) indicating appliance circuits with individual device supervision and annunciation, primary and secondary supervision, and interfaces to the public address system (furnished by others). Include control panels, central processing unit, microphone, signal zone selectors, manual pull stations, smoke sensors, thermal sensors, addressable input interface devices, control and isolation devices, analog/addressable loop modules, audio/visual devices, visual devices, wiring, connections to devices, outlet boxes, junction boxes, and other necessary material for a complete operating system. System shall allow for loading or editing special instructions and operation sequences as required. System shall be site programmable to accommodate and facilitate expansion or changes. System shall be capable of generating the programming necessary to establish a fully functional general alarm system upon initialization. Software operations are to be stored in a non-volatile programmable memory. Loss of primary and secondary power shall not erase the instructions stored in memory. Selective input/output control functions based on ANDing, Oring, NOTing, timing and special coded operations shall be incorporated in the resident software programming of the system.

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D. Job Site Changes

1. To accommodate and facilitate job site changes, initiating and indicating circuits shall be individually configurable on site to provide either alarm/trouble operation, alarm only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit.

E. Operations

1. Display
  - a. Under normal condition, front panel shall display a "SYSTEM NORMAL" or equivalent message and the current time and date.
2. Sequence of Operation
  - a. Operation of manual stations or activation of area smoke sensors and thermal sensors including any manual or automatic initiating device shall cause the following unless noted otherwise:
    - 1) Annunciate device type, location by building, floor, circuit and time on FACP mounted alphanumeric annunciator and graphics panel.
    - 2) Trip communications dialer to alert monitoring agent/Fire Department. (Response will be required to reset FACP.)
    - 3) Building audio/visual devices to activate per FIRE ALARM MATRIX in this specification, except activation of a single smoke detector shall not sound devices until a second device of any type is activated, on devices programmed for Alarm Verification. Speakers and visual devices shall be activated in the area of alarm.
    - 4) Operate prioritized outputs to release magnetically held smoke doors throughout the building and as indicated on the contract drawings. Any designated normally locked doors shall be unlocked via a code compliant interface to the security and access control system.
    - 5) Operate prioritized outputs to signal the elevator recall functions.
    - 6) Operate prioritized outputs to signal Building Automation Control system for controlling operation of dampers and fans for smoke evacuation and control, and integration of signal/control to all other systems.
    - 7) Automatic Voice Evacuation Sequence shall perform as outlined below:

The audio alarm signal shall consist of a "Slow Whoop" alarm tone for a maximum of 15 seconds followed by automatic pre-selected voice evacuation messages. At the end of each voice evacuation message, the "Slow Whoop" alarm tone shall resume. The alarm tones shall sound alternately until the signal silence switch at the FACP has been operated.
    - 8) Manual Voice Paging Sequence (During Non Event times) shall perform as outlined below:

The system shall be configured to allow selective voice paging. Upon activation of any speaker manual control switch, the "Slow Whoop" alarm tone shall be sounded over all speakers in that group. If any speaker manual control switches are activated, the control panel operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers. When the microphone button is released, the alarm tone shall resume, until the selector button is de-selected. Facility for total building evacuation and paging shall be provided to allow for

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activation of all speakers. This shall be accomplished by the means of an "All Call" switch.

- 9) Manual Voice Paging Sequence (During Event) shall perform as outlined below:

The system shall be configured to allow paging over the Public Address speakers. Upon activation of the Public Address manual control switch, the "Slow Whoop" alarm tone shall be sounded over all Public Address speakers. The control switch shall allow the operator at the Fire Alarm audio control center to make announcements from his push-to-talk microphone over the entire Public Address sound system speakers. When the microphone button is released, the alarm tone shall resume. The System shall have the ability to delay for 2-3 minutes the "Slow Whoop" alarm to all public area speakers upon an alarm condition, subject to the approval of the Building and Fire Department.

- 10) ~~Two Way Voice Communication Sequence shall perform as outline below:is to be done over the DAS (distributed antenna system).~~

~~The system shall incorporate a Two-Way Firefighter Communication operation. All fire phone locations shall be connected to the Master phone, located at the fire alarm control panel. The operation shall be as follows:~~

~~The act of plugging a handset into an emergency jack or removal of any phone from its normal hook position shall cause the appropriate phone circuit LED to flash and a distinctive audible device to sound at the control panel. The subsequent selection of the indicated circuit, and picking up on the Master phone, shall silence the audible tone, and cause the flashing LED to turn steady. This action shall couple the remote phone to the Master phone to provide direct and private communication. Attempting to use a subsequent phone on the same circuit shall not activate the LED or tone for that circuit. Any new circuits activated shall, however, cause their discrete phone circuit LED and tone to activate.~~

~~The Two-Way Communications system shall provide the capacity to handle simultaneous use of multiple remote phones. The system shall be configured to allow for remote paging from any remote phones location via the system speakers, as manually selected at the fire alarm control panel.~~

- 11) Operate prioritized outputs to Public Address system.  
12) Refer to Appendix in this section for additional information on the Sequence of Operation.
3. Abnormal Conditions
- a. Panel shall display the following information relative to the abnormal condition of a point in the system:
- 1) Alphanumeric custom location label (minimum of 30 alphanumeric characters.)
  - 2) Type of device.
  - 3) Point status.
4. Alarm or Trouble Condition
- a. Pressing the appropriate FACP acknowledge button shall acknowledge the alarm or trouble condition. After the points have been acknowledge, the LEDs shall glow steady and the panel audible signal will be silenced. Total number of alarms,



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supervisory and trouble conditions shall be displayed along with a prompt to review each list chronologically. End of the list shall be indicated.

5. System Reset
  - a. "System Reset" button shall be used to return to its normal state after an alarm condition has been remedied. The display shall step the user through the reset process.
  - b. Should an alarm condition continue to exist, system will remain in an abnormal state. System control relays shall not reset. The panel audible signal and the alarm LED shall be on. The display will indicate the total number of alarms and troubles present in the system along with a prompting to review the points.
6. History Logging
  - a. The control panel shall have the ability to store multiple events in an event buffer. These events shall be stored in a battery-protected memory. Events shall also be printed to the alarm printer.
7. Access Levels
  - a. There shall be a minimum of four access levels provided for operators and supervisors via user-defined pass codes. Changes to pass codes shall be made only by authorized personnel.
  - b. Should an invalid code be entered the operator shall be notified with a message.
  - c. Access to a level will only allow the operator to perform actions within that level and actions of lower levels, not higher levels.
  - d. The following functions shall have access levels associated with them:
    - 1) System Reset
    - 2) Set Time/Date
    - 3) Manual Control
    - 4) On/Off/Auto Control
    - 5) Disable/Enable
    - 6) Clear Historical Log
    - 7) Change Alarm Verification
    - 8) Program Update
8. Detection Operation (Smoke Sensors)
  - a. Smoke sensors shall be smoke density measuring devices having no self-contained alarm set point (fixed threshold.) The alarm decision for each sensor shall be determined by the fire alarm control panel. The control panel shall determine the condition of each sensor by comparing the sensor value to the stored values.
  - b. Control panel shall maintain a moving average of the sensors' smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. System shall automatically maintain a constant smoke obscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors. Smoke obscuration sensitivity shall be adjustable at least twice a day and within UL 26B window (0.5 percent to 4.0 percent) to compensate for any environment.
  - c. System shall automatically indicate when an individual sensor needs cleaning. When a sensor's percentage of compensation reaches a predetermined value, a "DIRTY SENSOR" trouble condition or similar display shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.
  - d. Control panel shall perform an automatic self-test routine on each sensor which will functionally check sensor sensitivity electronics and ensure the accuracy of the values being transmitted to the control panel. Sensors that fail this test shall indicate a trouble condition with the sensor location at the control panel.

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- e. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device:
    - 1) Primary status
    - 2) Device type
    - 3) Present average value
    - 4) Present sensitivity selected
    - 5) Sensor range (normal, dirty, etc.)
  - f. An operator at the control panel, having a proper access level, shall have the capability to manually control the following for each sensor:
    - 1) Alarm detection sensitivity values.
    - 2) Enable or disable the point.
    - 3) Control a sensor's relay driver output.
  - g. It shall be possible to program the control panel to automatically change the sensitivity settings of each sensor based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied times and less sensitive during occupied periods.)
  - h. Control panel shall have the capability of being programmed for a pre-alarm or two-stage function. This function allows an indication to occur when, for example, a 3 percent sensor reaches a threshold of 2.5 percent smoke obscuration.
  - i. If allowed by the Local AHJ, for increased smoke detection assurance, individually addressed smoke sensors shall be provided with field adjustable alarm verification. Only a verified alarm shall initiate the alarm sequence operation. System shall be initially set up with a 30-second verification period.
9. Detection Operation (Thermal Sensors)
- a. Thermal sensors shall be combination rate-of-rise/fixed temperature sensing. The alarm decision for each sensor shall be determined by the fire alarm control panel. The control panel shall determine the condition of each sensor by comparing sensor value to stored values. Sensor shall have the ability from the control panel to adjust its temperature setting.
  - b. Control panel shall maintain a moving average of the sensors' heat sensing value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. System shall automatically maintain a constant heat sensing sensitivity for each sensor (via the floating threshold) by compensating for environmental factors.
  - c. System shall automatically indicate when an individual sensor needs cleaning. When a sensor's percentage of compensation reaches a predetermined value, a "DIRTY SENSOR" trouble condition or similar display shall be audibly and visually indicated at the control panel for the individual sensor. Additionally, the LED on the sensor base shall glow steady giving a visible indication at the sensor location. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of heat sensing necessary for system activation.
  - d. Control panel shall perform an automatic self-test routine on each sensor which will functionally check sensor sensitivity electronics and ensure the accuracy of the values being transmitted to the control panel. Any sensor that fails this test shall indicate a trouble condition with the sensor location at the control panel.
  - e. An operator at the control panel, having a proper access level, shall have the capability to manually access the following information for each initiating device:
    - 1) primary status
    - 2) Device type
    - 3) Present average value
    - 4) Present sensitivity selected
    - 5) Sensor range (normal, dirty, etc.)

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- f. An operator at the control panel, having a proper access level, shall have the capability to manually control the following for each sensor:
  - 1) Alarm detection sensitivity values.
  - 2) Enable or disable the point.
  - 3) Control a sensor's relay driver output.

F. Primary Power

- 1. Obtain primary power 208/120 VAC 50/60hz, at the emergency panel in the electrical room location as indicated. Primary power source shall be identified FIRE ALARM SYSTEM with a red and white engraved plastic sign permanently affixed to the face of the switch. Install lock clips on circuit breakers in the "ON" position.

G. Auxiliary Power (Secondary Power)

- 1. Provide for system operation in the event of primary power source failure. Transfer from normal to auxiliary (secondary) power or restoration from auxiliary to normal power shall be automatic and shall not cause transmission of a false alarm.
  - a. Batteries
    - 1) Provide rechargeable lead acid type with sufficient ampere-hour rating to operate the system under supervisory and trouble conditions, including audible trouble signal devices for 24 hours and audible and visual signal devices under alarm conditions for an additional 15 minutes if high rise or stadium minutes. House batteries either within the control panel or in a separate substantial steel cabinet, and finish on inside and outside with enamel paint; equip with a non corrosive base and cylinder lock keyed to match FACP. Separate cells to prevent contact between terminals of adjacent cells and between terminals and other metal parts. Locate cabinet to allow convenient viewing and servicing of the batteries. A separate cabinet shall have twice the volume of batteries it will contain. The battery cabinet, if provided, shall be identified FIRE ALARM SYSTEM BATTERY CABINET with a red and white engraved plastic sign permanently affixed to the face of the panel.
  - b. Battery Charger
    - 1) Provide solid state automatic float type, capable of recharging completely discharged batteries to fully charged condition in 24 hours or less. Locate charger within the control panel or within the battery cabinet. Provide voltmeter and ammeter to indicate battery voltage and charging current.

H. Wiring

- 1. Conductors
  - a. Provide in accordance with NFPA 70 and NFPA 72. Conductors shall be copper. Conductors for 120/208 volt circuits shall be No. 12 AWG minimum; single conductors for low-voltage dc circuits shall be a minimum No. 18 AWG twisted, shielded with drain wire minimum. Conductors shall be color-coded. Provide wiring in electrical metallic tubing conduit in dry locations not enclosed in concrete or where not subject to mechanical damage. Conceal conduit in finished areas. Identify conductors within each enclosure where a tap, splice, or termination is made. Identify conductors by plastic-coated, self-sticking, printed markers or by heat-shrink type sleeves. Wire the alarm initiating and notification signal devices so that removal will cause the system trouble device to sound. Each conductor used for the same specific function shall be distinctively color-coded. Use two different color codes for each interior alarm circuit; one for each loop. Each circuit

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color code wire shall remain uniform throughout circuit. Plenum rated cable can be used where approved by engineer and is concealed but accessible.

2. Terminations
  - a. Connections, junctions and conductor terminations shall be made with screw terminals at risers only. Terminate strips everywhere except in control panels. Terminations with operating voltage of 50 volts or more shall be provided with protective cover and shall be labeled with the voltage.

2.2 COMPONENT DESIGN

A. Colors

1. Provide finish colors under this section in accordance with FED-STD-595.

B. Fire Alarm Control Panel (FACP)

1. Requirements

- a. FACP shall comply with the applicable requirements of UL 864. Panel shall be modular, installed in a surface-mounted steel cabinet with cylinder lock. The door shall be hinged to allow access for service. Control panel shall be a neat, compact assembly containing components and equipment required to provide the specified operating and supervisory functions of the system. Control panel switches shall be within the locked cabinet. A suitable means shall be provided for testing the control panel visual indicating devices (meter or lamps.) Meter and lamps shall be plainly visible when the cabinet of the control unit is closed. Each initiating circuit shall be powered and supervised so that a signal on one zone does not prevent the receipt of signals from other zones. Loss of power, including any batteries, shall not require the reloading of a program from any source. Upon restoration of power, start-up shall be immediate, automatic and shall not require manual operation. Loss of primary power or the sequence of applying primary or emergency power shall not affect the transmission of alarm, supervisory or trouble signals. Enclosures shall be provided with ample gutter space to allow proper clearance between the enclosure and live parts of the panel equipment.
- b. Each FACP shall be intelligent, with its own microprocessor and memory. Each FACP shall be UL listed independently as a fire alarm control unit. Each FACP shall be capable of automatically updating the initial System Program to accommodate added or deleted devices on any analog circuit. Each FACP shall be capable of identifying and programming a General Alarm condition for all installed devices. The system shall be capable of identifying the number of analog addressable circuits, the number of devices on all circuits, the device type and location. The System shall be capable of incorporating all new devices into the System program. System shall display at the control panel, the sensitivity of remote addressable photoelectric or ionization smoke sensor devices and thermal heat sensor devices. The system shall be capable of displaying 160 characters of system and user text (4x40 alphanumeric display). Control panel shall automatically return the normal mode after a predetermined time (1 hour) after being in the service mode. Addressable devices shall be individually identified by the system, and any quantity of addressable devices shall be in alarm at any time up to the total number connected to the system. Control panel shall be capable of supporting non-addressable as well as addressable devices. The Control panel shall be capable of supporting conventional zones in addition to analog/addressable circuits. The Control Panel shall provide for addressable remote conventional zones that are hardwired to any device addressability as well as remote sensitivity measurement shall be performed on the same pair or wires.

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System shall be capable of having multiple addressable devices in alarm simultaneously. FACP shall have a service mode to permit the arming and disarming of individual detection or output devices as well as manually operating output devices. Status of these devices shall be displayed upon command from the FACP. Control panel shall automatically return to normal mode in the event the panel remains unattended in the service mode. Control panel shall be able to receive and process alarms even in the service mode. FACP shall be capable of:

- 1) Smart Start auto initialization.
  - 2) Smart Start Program Update.
  - 3) Program all functions from the FACP front panel.
  - 4) Counting the number of addressable devices within a "circuit" which are in alarm.
  - 5) Counting "circuits" which are in alarm.
  - 6) Counting number of addressable devices which are in alarm on system.
  - 7) Differentiating among types of addressable devices such as ionization smoke sensors, photoelectric smoke sensors, thermal heat sensors, control elements, collective zone interfaces, point identification devices, and manual stations.
  - 8) Assigning priorities to type of detectors, circuits or groups of detectors.
  - 9) Provide remote LED point lit graphic map for all remote annunciator locations.
  - 10) Indicate on FACP alphanumeric display, as a minimum, the following:  
Building Number, Floor, Type of Device, and Device Address.
  - 11) Supporting 1008 addressable devices.
  - 12) Provide Fireman's Override Control Panel as required by IBC, to override control of air handling equipment, dampers and smoke control devices as required. This panel shall interface directly to the BAS system and comply with the requirements of U.L. smoke control listing.
  - 13) Automatic evacuation voice message which operates as a two channel system, allowing evacuation tones and voice messages be transmitted simultaneously to different zones. Visual alarms shall operate in unison with voice alarm system.
2. Control Functions
    - a. Control functions shall be assigned on the basis of system initiation patterns of devices such as "ANDing" groups and "ANDing" types of devices.
  3. Supervision
    - a. FACP shall supervise each individual device on an initiating circuit such that trouble supervisory, normal, pre alarm and alarm thresholds are individually annunciated. Each device on an addressable initiating circuit shall be checked to include the following: Sensitivity, response, opens, shorts, ground faults, functionality and status.
  4. Reporting a Failure
    - a. FACP shall report the failure of a device's transmitting components, open or shorted, on an addressable initiating circuit. Device shall be recognized and identified by location within the circuit to the specific devices, and other devices on the circuit shall continue to function properly.
  5. Devices
    - a. FACP shall report by specific device and address, any device which has been removed from an addressable initiating circuit, and shall not disrupt the operation of the remaining devices to function. The system shall be capable of sounding a Trouble if the device replaced is a different device type than the device removed.
  6. Accessories
    - a. FACP shall be completely equipped and be provided with 25 percent spare initiating and indicating circuits, including modules, enclosure space, terminal

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strips, internal electronic memory and other necessary accessories complete and ready to accept future circuits. The FACP shall be capable of automatically updating the System Program to adjust for such changes.

7. Power
  - a. FACP shall provide power necessary for the devices connected to it, including relay and remote annunciators. Provide a green LED to indicate normal system power is functioning.
8. Hardware and Software
  - a. Hardware and software which define system configuration and operation shall be provided. Memory data and operating system software shall be contained in a non-volatile memory.
9. Smoke Sensors
  - a. Smoke sensors shall be provided with alarm verification with field-adjustable time from 0 to 60 seconds. System shall initially set up with a 30-second verification period.
10. Detector Sensitivity
  - a. FACP shall be capable of measuring and adjusting the sensitivity of sensors. Provide an alphanumeric display to display custom messages and give readings of sensor sensitivity, sensor by sensor. It shall not be possible to change the sensor sensitivity from the FACP within maximum and minimum values as defined by the UL listing of the sensors. System shall be capable of listing sensor sensitivity settings on the printer for permanent record.
11. Smoke Obscuration Sensitivity
  - a. Control panel shall maintain a moving average of the sensors' smoke chamber value to automatically compensate (move the threshold) for dust and dirty conditions that could affect detection operations. System shall automatically maintain a constant smoke obscuration sensitivity for each sensor (via the floating threshold) by compensating for environmental factors. The smoke obscuration sensitivity shall be adjustable within the UL 260 window (0.5 percent to 4.0 percent) to compensate for any environment.
12. Dirty Sensor Indication
  - a. System shall automatically indicate when an individual sensor needs cleaning. When a sensor's percentage of compensation reaches a predetermined value, a "DIRTY SENSOR" or equivalent trouble condition shall be audibly and visually indicated at the control panel for the individual sensor. To prevent false alarms, these "DIRTY" conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.
13. Self-Test Routine
  - a. Control panel shall continuously perform an automatic self-test routine on each sensor which will functionally check sensor sensitivity and ensure the accuracy of the values being transmitted to the control panel. Any sensor that fails this test shall indicate a trouble condition with the sensor location at the control panel.
14. Resetting and Testing the System
  - a. It shall be possible to test, reset and alarm silence from the FACP. New unacknowledged alarms and troubles shall be distinctively displayed on both the visual display and the printer and differentiated from previous alarm and troubles. System shall automatically indicate the total quantity of alarms and trouble which have occurred prior to reset at the control unit. No alarm or trouble indication shall be resettable until it has been acknowledged. It shall not be possible to reset the system until alarms have been acknowledged.

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15. FACP Switches
  - a. FACP switches shall allow authorized personnel to accomplish the following, independent of the main operating console:
    - 1) Trouble silencing switch which transfers trouble signals to an indicating lamp.
    - 2) Evacuation alarm silencing switch which, when activated during alarm, silences alarm devices and, upon clearing the alarm, causes operation of the system trouble signals until the switch is returned to the normal position. Upon activation of a second alarm while silenced, causes the evacuation alarm to re-sound. Operation of the switch when there is no evacuation alarm causes operation of the system trouble signals.
    - 3) Reset zones after initiating devices have been returned to normal.
    - 4) Perform a complete operation test of the microprocessor with a visual indication of satisfactory communications with each board.
    - 5) Test panel LEDs for proper operation without causing a change in the condition on any zone.
16. Field Programming Equipment
  - a. If label changes are not able to be made at the FACP, provide field programming equipment, software devices, software, computers and other equipment necessary, including interconnection cables to accommodate field software programming changes to be made by the owner to change device descriptions, sensitivity setting, control, device type and addition or deletion of devices.
  - b. Provide one High Speed LAN-based workstation for field programming of FACP. It shall consist of (at a minimum) a 2.0 GHz personal computer operating under a true multi-tasking operating system. The software shall be capable of communication to all FACP in the system, as well as to the other high speed LAN workstations provided under Division 17.
  - c. Provide a minimum of 2 serial communication ports for connection to modems or controllers. For connection to the high speed LAN, the appropriate network interface card shall be included using an expansion slot.
  - d. The computer shall contain a minimum of 16 MB of RAM memory and 1 GB of hard disk memory. The disk access time of the hard drive shall be less than 14 milliseconds.
  - e. Workstation shall be equipped with a SVGA color monitor, standard keyboard and a mouse.
  - f. The CPU and all subsystems shall be capable of operating in an environment of 60 to 90 degrees F with 20 to 80% noncondensing relative humidity.
  - g. Provide a UPS with minimum 1 hour full speed operating capacity (including any required Network repeaters) for each workstation.
  - h. Printers: Each workstation shall have one (1) printer, UL Listed with the Fire Alarm system, with tractor feed, and associated cables. Each printer shall be capable of a minimum 160 characters per second operation and be compatible with standard parallel or serial communications.
  - i. Printer shall be dedicated to FA System alarms and shall be provided with a minimum 1 hour UPS.
17. Lockable Equipment
  - a. Lockable equipment shall have a keyed lock. All devices and cabinets shall be keyed alike.

C. Manual Stations

1. Provide an addressable noncoded double action type with mechanical reset features. Locate stations as indicated. Stations shall be die cast aluminum semi-flush or surface-mounted. Surface-mounted boxes shall be painted the same color as alarm station.

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Mount stations per NFPA 72 height requirements and no more than 5 feet from any door. Provide each station with screw-type terminals of proper number and type to perform functions required. Break-glass-front stations will not be permitted; however, a pull-lever, break-glass-rod type is acceptable. The manual alarm station shall require a key to reset or test.

D. Smoke Sensors

1. Provide analog addressable smoke sensors of the photoelectric type which shall communicate actual smoke chamber values to the system fire alarm control panel. Detectors shall be uniquely identifiable to FACP.
2. Sensors shall be listed to UL 268 and shall be documented compatible with the control equipment to which they are connected. Sensors shall be listed for both ceiling and wall-mount applications.
3. Each sensor base shall contain a LED that, when the control panel determines that a sensor is in the alarm or trouble condition, the control panel shall command the LED on that sensor's base to turn on steady, indicating the abnormal condition.
4. Sensor's electronics shall be immune from false alarms caused by electromagnetic interference and radio frequency interference.
5. All sensor addressing information shall be stored in the fixed base. Addressing information that is stored in the removable sensor is not acceptable.

E. Duct Smoke Detectors

1. Detectors in duct shall be analog addressable photoelectric type and listed by UL or FM for duct installation. Duct detectors shall be provided with approved duct housing, mounted exterior to the duct, and shall be provided with perforated sampling tubes extending across the width of the duct. Activation of duct detectors shall cause actuation of the fire alarm control panel in the same manner as other alarm initiating devices and in addition, cause all air handling units to be deactivated. Detector head shall contain amplifier switching circuitry. The amplifier switching circuit shall be entirely solid-state and operate with a nominal detector line voltage of 24 volts dc. Detectors to be equipped with screw terminals. Detector to be provided with indicating lamp and test switch and in test position bypass fan shutdown feature.

F. Thermal Sensors

1. Provide analog addressable thermal sensors of the combination rate-of-rise and fixed temperature type which shall communicate actual heat values to the system fire alarm control panel. Detector temperature setting shall be accomplished via the FACP. Detectors shall be uniquely identifiable to FACP.
2. Sensors shall be listed to UL 521 and shall be documented compatible with the control equipment to which they are connected. Sensors shall be listed for ceiling applications.
3. Each sensor base shall contain an LED that, when the control panel determines that a sensor is in the alarm or trouble condition, the control panel shall command the LED on that sensor's base to turn on steady, indicating the abnormal condition.
4. Sensor's electronics shall be immune from false alarms caused by electromagnetic interference and radio frequency interference.
5. Detectors shall be nominal 24 Vdc powered by initiating circuit.

G. Beam Smoke Detector

1. Beam type smoke detector shall be supplied at the locations shown on the drawings. The beam smoke detector shall consist of a separate transmitter and receiver capable of



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being powered separately or together. The detector shall operate in either a short range of 30 to 100 ft. or a long range of 100 to 300 ft as a minimum. The detector shall feature a bank of alignment LEDs on both the transmitter and receiver to ensure proper alignment without the use of special tools. The detector shall utilize an automatic gain control to compensate for gradual signal deterioration from dirt accumulation on the lenses. The detectors shall be powered from the system control panel.

H. Addressable Point Identification Device

1. The Point Identification Device shall be provided to connect single supervised conventional initiating contact type device such as water flow switches, tamper switches, single detectors, and other such devices to any of the two-wire intelligent analog loop cards. The Point Identification Device shall mount in a 4 inch square, 2 1/8 inch deep electrical box and shall be capable of (Class "A") supervised wiring to the initiating device. The Point Identification Device shall contain an integral LED that annunciates module activation. The Point Identification Device shall provide address setting means switches and store an internal identifying code which the control panel shall use to identify the type of device.

I. Addressable Collective Zone Interface

1. The Collective Zone Interface shall be provided to connect supervised conventional initiating device or zone of supervised conventional initiating devices such as water flow switches, tamper switches, detectors, and other such devices to any of the three -wire intelligent analog loop cards. The Collective Zone Interface shall mount in a 4 11/16 inch square, 3 inch deep electrical box and shall be capable of (Class "A") supervised wiring to the initiating device(s). The Collective Zone Interface shall contain an integral LED that annunciates module activation. The Collective Zone Interface shall provide address setting means switches and store an internal identifying code which the control panel shall use to identify the type of device.

J. Addressable Control Element

1. The Addressable Control Element shall be provided to connect and supervise, conventional indicating device or zone of indicating devices that required an external power supply, such as horns, strobes to any of the (2) wire intelligent analog loop cards. The Control Element shall be capable of operating as a relay (dry contact form C,) to control door holders, and other such devices. Control Elements shall mount in a 4 11/16 inch square, 3 inch deep electrical box and shall be capable of (Class "A") supervised wiring to the indicating or control device. Control Element shall contain an integral LED that annunciates module activation. Control Element shall provide address setting means switches and store an internal identifying code which control panel shall use to identify the type of device. The addressable Control element shall be capable of providing feedback to the FACP for positive confirmation of the controlled devices activity.

K. Audio/Visual Alarms

1. Provide recessed and surface-mounted approved combination audio/visual alarm devices consisting of an electronic horn for use in an electrically-supervised circuit and a top-mounted integral flashing strobe light. The alarm horn shall have a sound rating of at least 96 decibels at 10 feet. Provide lamps of the flashing stroboscopic type, powered from the control panel alarm circuit. Lamps shall produce a minimum of 75 candela and be designed for A.D.A. compliance. Lamps shall be protected by a polycarbonate lens

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and shall be labeled FIRE, and are to be mounted at 80 inches above the floor, unless noted otherwise on the drawings.

2. Visual alarms shall operate in unison with audio alarm system.

L. Visual Alarms

1. Provide flush and surface-mounted lamp assembly suitable for use in an electrically-supervised circuit. Provide lamps of the flashing stroboscopic type, powered from the control panel alarm circuit. Lamps shall produce a minimum of 75 candela and be designed for A.D.A. compliance. Lamps shall be protected by a polycarbonate lens and shall be labeled FIRE, and are to be mounted at 80 inches above the floor, unless noted otherwise on the drawings.
2. Visual alarms shall operate in unison with voice alarm system.

M. Electromagnetic Door Hold-Open Devices

1. Attach to the outlet boxes indicated. Device shall operate on power from the fire alarm control panel. Attach compatible magnetic component to the door. Under normal conditions, the magnets shall attract and hold the door open. Upon activation of the building fire alarm system, the devices shall be de-energized, thus releasing the doors on the circuit. Devices shall be designed for wall or floor mounting as required by location shown on drawings, complete with matching door plate, material and finish to match door hardware. Electromagnet operates from a 24 DC source, and requires no more than 0.070 watts to develop 25 lbs. holding force.

N. Fire Alarm Speakers - High Output

1. Speaker shall be a high efficiency, re-entrant type speaker suitable for voice and tone signals. Speaker shall be able to operate continuously without loss of signal for one hour in any ambient temperature environment from 150°F to -30°F. Speaker shall have a die cast housing and be resistant to water, corrosion, vibration and vermin and shall be impervious to damage from pointed objects. Speaker shall produce a sound pressure level of 87 dB measured at rated power (1 watt) ten (10) feet on axis at 1 Khz.
2. Speakers shall be suitable for semi-flush mounting or recessed as shown on plans. All speakers shall be mounted in the ceiling in office areas and in the wall in concourse areas.

O. Fire Alarm Speakers - Medium Output

1. Speaker shall be a high efficiency, re-entrant type speaker suitable for voice and tone signals. Speaker shall be able to operate continuously without loss of signal for one hour in any ambient temperature environment from 150°F to -30°F. Speaker shall have a die cast housing and be resistant to water, corrosion, vibration and vermin and shall be impervious to damage from pointed objects. Speaker shall produce a sound pressure level of 87 dB measured at rated power (1 watt) ten (10) feet on axis at 1 Khz. Speakers shall have transformer taps of 2, 1, ½ and ¼ watts RMS audio power rating. Speaker shall be provided with pigtail leads for wiring terminations. Speaker shall be semi-flush mounted on a standard 4 x 4 electrical box with extension ring, or fully recessed as noted on the plans. All speakers in general space shall be medium output.
2. Where speakers are indicated to be installed flush mounted, provide with a white circular metal baffle with perforated holes meeting the Architect's approval.

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- P. Outdoor Fire Light And Horn
1. Outdoor fire lights and horn suitable for wet locations complete with high intensity flashing light and alarm horn as integral unit.
  2. The electrical light source shall be sealed in silicone and protected by a Lexan lens. The word "fire" shall appear on the lens.
  3. The minimum sound level shall be 95 dB at ten (10) feet.
- Q. Firefighters' Telephone Jacks – Telephone jack stations are not required. Fire department confirmed the use of the DAS is acceptable. Refer to DAS specification for required frequency.
- ~~1. Provide stainless steel firefighter's telephone jack stations at the locations shown on the drawings. The jack station shall be clearly identified with the words "FIRE FIGHTER'S TELEPHONE" for use with portable fire fighters telephone handsets.~~
- R. Portable Telephone Handsets
1. Portable telephone handsets shall consist of a red telephone handset with a 5 ft coiled cord on a telephone plug. Telephone handsets shall be constructed of a heavy duty ABS plastic. A quantity of six (6) handsets shall be provided in a locked cabinet located adjacent to the FACP.
- S. Remote Indicator Lights
1. Remote indicator lights shall be lighted red when the associated device is in alarm. Light shall be mounted in a stainless steel coverplate with the appropriate legend engraved thereon. Indicators shall be a highly visible red LED.
- T. Floor Graphic Annunciator Panel
1. A hard graphic annunciator shall be provided on each level depicting all fire alarm devices on that entire level and the status condition of each device via a led.
- U. Nameplates
1. Major components of equipment shall have the manufacturer's name, address, type or style, model or serial number, catalog number, date of installations, installing Contractor's name and address, and the contract number provided on a new plate permanently affixed to the item or equipment. Major components include, but are not limited to, the following:
    - a. Fire Alarm Control Panels
      - 1) Furnish to obtain approval by the Engineer/Fire Department before installation. Nameplates shall be etched metal or plastic, permanently attached by screws to panels or adjacent walls.
- V. Pager Interface
1. The system shall provide a module capable of transmitting alphanumeric system activity, by event, to a commercial paging system using TAP pager protocol. The system module shall be equipped with high speed modem.
- W. Wiring
1. Provide Wiring materials under this section as specified in division 26, "Wires and Cables", with the addition and modifications specified herein.

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PART 3 - EXECUTION

3.1 INSTALLATION

- A. The work includes providing a new fully field programmable/addressable analog interior fire alarm and smoke detection system including associated equipment and appurtenances. Provide each system complete and ready for operation. Equipment, materials, installation, workmanship, inspection, and testing shall be in strict accordance with the required and advisory provisions of NFPA 70, NFPA 72 and NFPA 241, except as modified herein.
- B. Provide intelligent, analog addressable type manual pull stations, smoke sensors, thermal sensors, and audio/visual devices, including a stand-alone fire alarm control panel as located on the drawings and required by the fire department.
- C. Sound levels must meet NFPA requirements. Provide additional voice alarm speakers where sound level is not above 15dB above ambient noise level.
- D. Pre-inspection - examine areas and conditions under which work of this section is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION CRITERIA

- A. All fire alarm wiring shall be in conduit. All alarm and signal wiring shall be in accordance with the manufacturer's recommendations and installed in an approved raceway specified in Section 26 05 33.
- B. The contractors shall fully coordinate with all other trades for the proper wiring and control of all systems.
- C. Wiring in the Fire Command Center may utilize surface mounted wireways. Sizes and locations of such wireway shall be indicated on the shop drawings.
- D. All wiring shall be identified at the Fire Command Center and at each terminal and junction box.
- E. VCS speakers shall be wired in parallel.
- F. Control panel, annunciators, standby power module must be mounted with sufficient clearance for observation and testing. Final arrangement and location must be approved by the Architect/Engineer and Fire Department
- G. Flexible connectors are to be used for all devices mounted in suspended lay-in ceiling panels. All conduit, mounting boxes, junction boxes and panels are to be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary functions will be permitted in fire alarm raceways.
- H. Conductors in cabinets must be carefully formed and harnessed so that each drops off directly opposite to its terminal. Cabinet terminals must be numbered and coded.
- I. Wiring splices are to be avoided to the extent possible, and, if need, they must be made only in junction boxes which are to be painted fire-alarm red.

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- J. Color codes must be used throughout. Transposing or changing color coding of wire will not be permitted. Wire nut-type connections are not acceptable. All conductors in conduit pull boxes or cabinets containing more than one wire, must be labeled on each end with "E-Z Markers" or equivalent.
- K. Provide all necessary emergency power to the complete Fire Alarm System in accordance with the manufacturer's requirements.

3.3 PAINTING

- A. Paint exposed electrical, fire alarm conduit and surface metal raceway to match adjacent finishes in exposed areas. Paint conduit and surface metal raceways red in unfinished areas and above finished ceilings.

3.4 FIELD QUALITY CONTROL

A. Preliminary Tests

1. Conduct the following tests during installation of wiring and system components. Correct any deficiencies pertaining to these requirements prior to formal functional and operational tests of the system.
2. Ground Resistance
  - a. Measure the resistance of each connection to ground. Ground resistance shall not exceed 10 ohms.
3. Dielectric Strength and Insulation Resistance
  - a. Test dielectric strength and the insulation resistance of system interconnecting wiring by means of an instrument capable of generating 500 volts dc and equipped to indicate leakage current in 1000 mega-ohms. For the purpose of this test, instrument shall be connected between each conductor on the line and between each conductor and ground at control panel and of line, with the other extremity open circuited and series-connected devices shunted or in place. System shall withstand test without breakdown and indicate a resistance of not less than 500,000 ohms, the measurement being taken after an electrification of not more than 1.0 minute with a dc potential of not less than 100 volts nor more than 550 volts. Dielectric tests shall be witnessed by Engineer or his designee.
4. Smoke and Thermal Sensor Tests
  - a. Prior to formal inspection and tests, clean and perform sensitivity tests on each smoke and thermal sensor. Clean the smoke and thermal sensors in accordance with the manufacturer's recommended procedures. Perform voltage activation sensitivity test on each sensor and record the results. Remove sensors with a sensitivity level above or below the UL accepted sensitivity range for that sensor and replace with new sensors. Present recorded data at the formal inspection for verification. Approved copies shall become part of the operations and maintenance manual for the fire alarm system.
5. Field Inspection and Test
  - a. Before final acceptance of the work, test each system to demonstrate compliance with the contract requirement. Each system shall be subjected, at minimum, to complete functional and operational tests including tests in place of each smoke sensor and detector, each thermal sensor, each manual station and visual and audio/visual device, tests of wiring supervision and tests of control panel functions. Test the interface to the Public Address system and coordinate the P.A. alarm signal generation with the public address system subcontractor. Preliminary tests shall be performed in accordance with manufacturer's published testing instructions and in accordance with NFPA 72. Furnish one extra

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Operations and Maintenance Manual with the formal request for final acceptance testing. The system shall be operational, with no trouble or alarm conditions, a minimum of 14 consecutive days prior to formal tests. Printer shall be operational during the preliminary tests and break-in period. Provide printer records with the request for formal inspection as evidence of completion of required preliminary test.

6. Formal Inspection and Test
  - a. The Authority Having Jurisdiction will witness formal tests after receipt of written certification that preliminary tests have been completed and that the system is ready for final inspection. The system manufacturer's technical representative shall be present for the inspection and test. At minimum, preliminary tests shall be repeated and functional and operation tests conducted, as requested by the Architect/Engineer. Correct defects and conduct additional tests to demonstrate that the system conforms to contract specifications. Contractor shall provide two-way radios, personnel and test equipment required for conducting tests. Smoke detectors shall be tested using the manufacturer's calibrated test method. In addition, formal testing will require real smoke to be used to test smoke detectors. Canned smoke will not be permitted. Test equipment shall be turned over to the Authority Having Jurisdiction following test completion.
7. Manufacturer's Field Service
  - a. Manufacturer's Representative
    - 1) Furnish the services of a factory-trained fire alarm system manufacturer's representative or technician, experienced in the installation and operation of the type of system being provided, to supervise the installation, testing, including formal testing, adjustment of the system, and instruction to the facility personnel. Furnish names and phone numbers of the factory-trained fire alarm system representatives or technicians.

B. Training

1. Equipment manufacturer shall provide 40 hours on site technical training to the owner or its representative (for two persons designated by Owner). Training shall allow for individual hands on programming, trouble-shooting and diagnostics exercises. Training shall occur within 2 months of system acceptance.
2. Also provide a minimum of 40 classroom hours of factory training in programming and use of the system for each of two people (designated by Owner). Provide room and board for trainees' during this period if training facility is located more than 30 miles from the project. Provide this training no less than six months and no more than eighteen months after building acceptance, as scheduled by Owner.

C. Adjustments

1. Equipment manufacturer shall provide necessary subsequent custom reprogramming to modify and adjust operations and individual identification nomenclature to the owner satisfaction four months after final system acceptance and twelve months after system acceptance. Reprogramming is to be done at the job site and witnessed by the Authority Having Jurisdiction representative. Revision of as-built and record drawings shall be by the installing Contractor.

END OF SECTION

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3.5 FIRE ALARM MATRIX

FIRE ALARM MATRIX														
SYSTEM INPUTS	SYSTEM OUTPUTS													
	ACTIVATES FIRE ALARM SPEAKERS AND STROBES FOR ALL FLOORS.	ACTIVATES ELEVATOR SHAFT RELIEF DAMPER. (VERIFY IF REQUIRED)	RELEASE ELECTRIC LOCKS ON EXIT DOORS.	SHUT DOWN AFFECTED HVAC UNIT.	ACTIVATES EXTERIOR HORN/STROBE AT FIRE DEPARTMENT CONNECTION.	RELEASE MAGNETIC DOOR HOLDER CLOSING FIRE DOORS ON AFFECTED FLOOR.	ACTIVATES STAIR PRESSURIZATION SYSTEM FOR AFFECTED STAIRS. (IF REQUIRED)	RETURNS ELEVATORS TO PRIMARY RECALL (GROUND) LEVEL.	DISCONNECTS POWER TO AFFECTED ELEVATOR BANK.	RETURNS ELEVATORS TO ALTERNATE RECALL LEVEL (LEVEL 2).	ANNUNCIATES AT FIRE ALARM CONTROL PANEL.	SENDS ALARM TO FIRE DEPARTMENT VIA MONITORING STATION CONNECTION	CLOSES LOCAL FIRE/SMOKE DAMPER	ACTIVATES SUPERVISORY ALARM AT FACP AND MONITOR STATION
<b>FIRE PROTECTION</b>														
-AUTOMATIC SPRINKLER WATERFLOW OTHER THAN GROUND FLOOR	X		X		X	X	X	X			X	X		
-AUTOMATIC SPRINKLER WATERFLOW GROUND FLOOR	X		X		X	X	X				X	X		
-MAIN FLOW SWITCH	X		X		X	X					X	X		
-SPRINKLER TAMPER SWITCH													X	
<b>SMOKE DETECTION</b>				X									X	
-HVAC (AT UNIT)				X									X	
-RETURN FAN													X	
-ELEVATOR HOISTWAYS, MACHINE ROOMS	X	X	X			X	X	X			X	X		
-SMOKE DAMPER DUCT DETECTORS			X			X	X	X			X	X		
-ALL FLOOR AREA DETECTORS OTHER THAN 1 <sup>ST</sup> FLOOR	X		X		X	X	X	X			X	X		
-ALL FLOOR AREA DETECTORS 1 <sup>ST</sup> FLOOR	X		X		X	X	X	X			X	X		
<b>HEAT DETECTION</b>														
-ELEVATOR HOISTWAY AND MACHINE ROOM	X		X			X	X	X			X	X		
-MECHANICAL ROOM AND FLOOR AREA HEAT DETECTORS	X		X			X	X	X			X	X		
<b>MANUAL DEVICES</b>														
-MANUAL PULL STATIONS 1 <sup>ST</sup> FLOOR	X		X		X	X	X	X			X	X		
-MANUAL PULL STATION OTHER THAN 1 <sup>ST</sup> FLOOR	X		X		X	X	X	X			X	X		
<b>SYSTEM</b>														
-OPEN CIRCUIT, GROUND FAULT, SHORT														X
-FIRE ALARM LOW BATTERY														X
-FIRE ALARM AC POWER FAILURE														X
-FIRE PUMP POWER FAILURE/PHASE REVERSAL														X
-FIRE PUMP RUNNING				X										X

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END OF SECTION

ME ENGINEERS, INC. DV12119  
ADDRESSABLE FIRE ALARM SYSTEM  
2014-05-02

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