

SECTION 13852  
ZONED FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 SCOPE & RELATED DOCUMENTS

- A. The work covered by this section of the specifications, includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the drawings and as herein specified.
- B. The work covered by this section of the specifications is to be coordinated with the related work as specified elsewhere under the project specifications.
- C. REFERENCES: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	1996 National Electrical Code
NFPA 72	1996 National Fire Alarm Code
NFPA 90A	1996 Installation of Air Conditioning and Ventilating Systems
NFPA 101	1997 Life Safety Code

UNDERWRITERS LABORATORIES INC. (UL)

UL-864	UL Standard for Safety Control Units for Fire Protective Signaling Systems Seventh Edition; May 11, 1994, Bulletin August 4, 1995
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1.2 QUALITY ASSURANCE

- A. Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label. All control equipment is to be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.
- B. The equipment and installation supervision furnished under this specification is to be provided by a manufacturer who has been engaged in production of this type of equipment for at least ten (10) years, and has a fully-equipped service organization within seventy five (75) miles of the installation. Contractor shall certify a maximum service call response time of eight (8) hours to this job site.
- C. Qualifications of Installer: Prior to issuing NOTICE TO PROCEED, the Contractor shall submit data for the approval of the Contracting Officer proving that he has successfully installed fire alarm systems of the same type and design as specified herein, or that he has a contractual agreement with a subcontractor having such required experience. Submit the names and locations of at least two installations where the Contractor or the subcontractor has installed such systems. The Contractor shall indicate the type and design of these systems and

certify that these systems have performed satisfactorily for at least 18 months. Installer shall be a level III minimum NICET certified.

- D. Manufacturer's Representative: The Contractor shall provide the services of a certified manufacturer's representative or technician, experienced in the installation and operation of the type of system being provided to supervise the testing, including final testing, adjustment of the system and instruction to Government personnel. Upon final testing, the manufacturer's representative shall certify the system is installed and operating correctly. Submit the name of the qualified manufacturer's representative and letter by the manufacturer of the FIRE ALARM CONTROL PANEL manufacturer that such representative is duly authorized to install, repair, and program such equipment. Approval is required before the NOTICE TO PROCEED is issued.
- E. Certifications
1. Contractor Qualification Statement: Submit as required by the paragraph, "Qualifications of Installer."
  2. Manufacturer's Representative: Submit letter or certificate of the fire alarm equipment manufacturer to certify the manufacturer's representative is authorized by the manufacturer to supervise testing of the installed system, and the manufacturer's representative is authorized to approve the system is installed and operating correctly.
- F. Submit Underwriters Laboratories (UL) listings of each fire alarm component.
- G. Submit Operation & Maintenance Manuals five (5) sets bound, including all catalog numbers, and address of nearest supplier of parts. The operations manual shall not be general in nature but specifically tailored for the work in this contract.
- H. Factory Certified Installer: Contractor shall submit and receive approval prior to issuing the NOTICE TO PROCEED.
- 1.3 GENERAL
- A. Furnish and install a complete operational Replacement Fire Alarm system as shown on the plans, to be wired, connected, and left in first class operating condition. The entire system shall be wired in metallic raceways per manufacturer's recommendations. Existing metal conduit system shall be re-used.
- B. General: Noncoded, zoned system with manual and automatic alarm initiation; and hard-wired for signal transmission, using separate individual circuits for each zone of alarm initiation and notification appliances.
- C. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.
- C. Furnish a minimum of two spare detectors of each type.
- D. DEFINITIONS
- FACP: Fire alarm control panel.
- LED: Light-emitting diode.

Definitions in NFPA 72 apply to fire alarm terms used in this Section.  
NFPA 72 National Fire Alarm Code 1996 Edition.

SYSTEM SPECIALIST: A factory trained and authorized installation and  
service technical representative.

#### 1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
  - 1. Fire alarm control panel.
  - 2. Smoke detectors.
  - 3. Heat detectors.
  - 4. Manual pull stations.
  - 5. Audible/visible notification appliances.
  - 6. Transient voltage surge suppressor.
- B. Shop Drawings:
  - 1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified.
  - 2. Battery: Sizing calculations.
  - 3. Floor Plans: Indicate final outlet locations and routings of raceway connections.
  - 4. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- C. Operating Instructions: For mounting at the FACP.
- D. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.
- E. Installer Qualification Certificate: Signed by manufacturer certifying that installers comply with requirements.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.
- G. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72.
- H. Certificate of Completion: Comply with NFPA 72.
- I. Manufacturer's Installation Instructions and Recommendations: Submit for all materials.
- J. Service Call Response Time Certificate.

#### 1.5 ALARM SEQUENCE

- A. The system alarm operation subsequent to the alarm activation of any manual station, or automatic detection device, is to be as follows:
  - 1. All audible alarm notification appliances shall sound a continuous fire alarm signal at a three "S", or "March-Time" beat until silenced by the alarm silence switch at the control panel.

2. All visual alarm notification appliances Xenon Strobes shall display a continuous pattern until System is reset.
  3. A supervised signal to notify the local fire department or an approved central station is to be activated. To accommodate and facilitate job site changes, the type of "city connection circuit" is to be on-site configurable to provide either a "reverse polarity", "local energy", "shunt" or dry contact connection.
  4. The mechanical controls shall turn off the air handling systems per life safety specification, NFPA-90A and NFPA-101.
  5. An alarm is to be displayed on the panel display. The alarm LED shall flash on the control panel until the alarm has been acknowledged at the control panel. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone after acknowledged shall flash the alarm LED on the control panel and the panel display shall show the new alarm information.
  6. A pulsing alarm tone shall occur within the control panel until acknowledged.
- B. Alarm and trouble conditions shall be immediately displayed on the control panel front display.

#### 1.6 SUPERVISION

- A. IDC (Initiating Device Circuit) shall be Class B, Style A. (2 wire #16 TFFN solid copper).
- B. NAC (Notification Appliance Circuits) shall be Class B, Style X. (2# 14 THWN solid copper).
- C. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.
- D. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and remote supervisory alarm. A green "power on" LED shall be displayed continuously while incoming power is present.
- E. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote supervisory alarm.

#### 1.7 POWER REQUIREMENTS

- A. The control panel shall receive 120 VAC power (as noted on the plans) via the existing dedicated circuit to the control panel and shall have surge protection in accordance with UL 864.
- B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of forty-eight (48) hours with five minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

- C. All circuits requiring, system operating, power shall be 24VDC and shall be individually fused at the control panel.

PART 2 - PRODUCTS

2.1 FUNCTIONAL DESCRIPTION OF SYSTEM

- A. Control of System: By the FACP.
- B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
- C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.
- D. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.
- E. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.
- F. System Alarm Capability during Circuit Fault Conditions: System wiring and circuit arrangement prevent alarm capability reduction when a single ground occurs in an initiating device circuit, or notification-appliance circuit.
- G. Loss of primary power at the FACP initiates a trouble signal at the FACP. The FACP indicates when the fire alarm system is operating on the secondary power supply.
- H. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a smoke or flame or heat detector initiates the following:
  - 1. Notification-appliance operation.
  - 2. Identification at the FACP of the zone originating the alarm.
- I. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP.
  - 1. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
  - 2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
  - 3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.
- J. Removal of an alarm-initiating device or a notification appliance initiates the following:
  - 1. A "trouble" signal indication at the FACP for the zone involved.

2. Transmission of trouble signal to remote alarm receiving station.

## 2.2 MANUAL PULL STATIONS

- A. Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.
  1. Double-action mechanism requires two actions, such as a push and a pull, to initiate an alarm.
  2. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.

## 2.3 SMOKE DETECTORS

- A. General: Include the following features:
  1. Operating Voltage: 24-V dc, nominal.
  2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
  4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
  5. Sensitivity: Can be tested and adjusted in-place after installation.

- B. Photoelectric Detectors

Operate on the light scattering principle using an LED light source. Detectors shall respond to both flaming and smoldering fires.

## 2.4 HEAT DETECTORS

- A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) and a rate of rise of temperature that exceeds 15 deg F (8.3 deg C) per minute, unless otherwise indicated.
  1. Mounting: Plug-in base, interchangeable with smoke detector bases.

## 2.5 NOTIFICATION APPLIANCES

- A. Description: Equip for mounting as indicated and have screw terminals for system connections.
  1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
- B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 90 dB, measured 10 feet (3 m) from the horn.
- C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: 110 candela.
2. Strobe Leads: Factory connected to screw terminals.

2.6 TRANSIENT SURGE SUPPRESSION PROTECTOR

Protector shall utilize a silicon avalanche transient voltage suppressor to clip excessive voltages in five nanoseconds or less. Power dissipation shall be 12,000 watts for 1 ms. Current rating shall be 15 amps. After each transient, the protector shall automatically reset to the ready position with no degradation in protective capability. In the event of suppressor failure, the protector shall de-energize the load, thereby preventing possible damage by subsequent transients. The protector shall be permanently wired into the power input circuit of the fire alarm control panel.

2.7 CENTRAL FACP

- A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. If more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels.
  1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1 inch (25 mm) high. Identify individual components and modules within cabinets with permanent labels.
  2. Mounting: Surface.
- B. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable. Provide the number of alarm initiating circuits as indicated on the drawings.
- C. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.
- D. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.
- E. Indicating Lights and System Controls: Individual LED devices identify zones transmitting signals. Zone lights distinguish between alarm and trouble signals, and indicate the type of device originating the signal. Manual switches and push-to-test buttons do not require a key to operate. Controls include the following:
  1. Alarm acknowledge switch.
  2. Alarm silence switch.
  3. System reset switch.
  4. LED test switch.
- F. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.
- G. Instructions: Printed or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays

and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.8 EMERGENCY POWER SUPPLY

- A. General: Components include valve-regulated, recombinant lead acid battery; charger.
  - 1. Battery Nominal Life Expectancy: 10 years, minimum.
- B. Battery Capacity: Power the fire alarm system for no less than forty-eight hours plus 5 minutes of alarm upon a normal AC power failure.
- C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.
- D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.9 WIRE

- A. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
  - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
  - 2. Line-Voltage Circuits: No. 12 AWG, minimum.
- B. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, TFFN, or FPLP, as recommended by manufacturer, all solid-copper, color coded insulation.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Connect the FACP to the existing 120 volt power supply.
- B. Manual Pull Stations: Mount semiflush in recessed back boxes in finished wall. Surface mount on unfinished walls.
- C. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.
- D. Smoke Detectors near Air Registers: Install no closer than 60 inches (1520 mm).
- E. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.
- F. Visible Alarm-Indicating Devices: Install adjacent to each alarm horn and at least 6 inches (150 mm) below the ceiling.

- G. FACP: Surface mount with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

### 3.2 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceway according to Division 16 Section 16400 "Wiring Systems." Conceal raceway except in unfinished spaces and as indicated. Flexible metal conduit shall be allowed in concealed wall spaces at new manual pull station locations of lengths no longer than six feet, where no conduit exists.
- B. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- C. Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- D. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

### 3.3 IDENTIFICATION

- A. Install instructions frame in a location visible from the FACP.

### 3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: The manufacturer's representative shall inspect field-assembled components and connections and shall supervise pretesting, testing, and adjustment of the system. Report results in writing.
- B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- C. Report of Pretesting: After pretesting is complete, the manufacturer's representative shall provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.
- D. Final Test Notice: Provide a minimum of 5 days' notice in writing when the system is ready for final acceptance testing.

- E. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:
1. Verify the absence of unwanted voltages between circuit conductors and ground.
  2. Test all conductors for short circuits using an insulation-testing device.
  3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
  4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
  5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
  6. Test each initiating and indicating device for alarm operation and proper response at the control unit.
  7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and remote supervisory alarm indications
  8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.
- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.
- H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

### 3.5 DEMONSTRATION

- A. The manufacturer's representative shall train the Government's maintenance personnel as specified below:
1. Train the Government's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.
  2. Schedule training with the Government, through the COTR, with at least seven days' advance notice.

### 3.6 TESTING

- A. The completed fire alarm system shall be fully tested in accordance with NFPA-72 by the factory certified installer in the presence of the fire alarm system manufacturer representative. Upon completion of a

successful test, the manufacturer representative shall so certify in writing to the owner per the requirements of NFPA 72 2-2 Documentation.

3.7 WARRANTY

- A. Provide manufacturer's standard Warranty for each item to be provided.

END OF SECTION 13852

**SECTION 16722**

**FIRE ALARM SYSTEM, ADDRESSABLE SMALL SYSTEM**

**PART 1 - GENERAL**

**1.1 SCOPE & RELATED DOCUMENTS**

- A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, and performance of all operations in connection with the installation of the Fire Alarm System as shown on the drawings and as herein specified. Also included is the disposal of existing ionization detectors as indicated under Section 01010 of the Specifications.
- B. The work covered by this section of the specifications is to be coordinated with the related work as specified elsewhere under the project specifications.
- C. **REFERENCES:** The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

**INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. (IEEE)**

IEEE C62.41 (1991) Surge Voltages in Low-Voltage AC Power Circuits

**NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)**

NFPA 70 1999 National Electrical Code  
NFPA 72 1999 National Fire Alarm Code  
NFPA 90A 1999 Installation of Air Conditioning and Ventilating Systems  
NFPA 101 1997 Life Safety Code

**UNDERWRITERS LABORATORIES INC. (UL)**

UL 497B (1999) Safety Protectors for Data Communications and Fire Alarm Circuits  
UL-864 UL Standard for Safety Control Units for Fire Protective Signaling Systems Seventh Edition; May 11, 1994, Bulletin August 4, 1995  
UL 1449 (1996; R 1998) Transient Voltage Surge Suppressors  
UL 1971 (1992) Standard for Safety Signaling Devices For the Hearing Impaired

**1.2 QUALITY ASSURANCE**

- A. UL Listing: Each and all items of the Fire Alarm System shall be listed as a product of a SINGLE fire alarm system manufacturer under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L" label. All control equipment is to be listed under UL category UOJZ as a single control unit. Partial listing shall NOT be acceptable.
- B. Qualifications of Manufacturer: The equipment and installation supervision furnished under this specification is to be provided by a manufacturer who has been engaged in production of this type (software driven) of equipment for at least ten (10) years, and has a fully-equipped service organization within one hundred(100) miles of the installation.
- C. Manufacturer's Representative: The Contractor shall provide the services of a certified manufacturer's representative or technician, experienced in the installation and operation of the type of system being provided to supervise the testing, including final testing, adjustment of the system and instruction to Government personnel. Upon final testing, the manufacturer's representative shall certify by letter that the system is installed and operating correctly in accordance with NFPA 72. The manufacturer's representative shall not be an employee of the contractor.

**1.3 SUBMITTALS:** Submittals shall be itemized as in this paragraph except for "Product Data" which will be itemized as in "Part 2" of this section.

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:
  - 1. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Include one-line riser diagrams.
  - 2. Battery: Sizing calculations.
  - 3. Floor Plans: Indicate locations of panels, devices and wiring.
  - 4. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- C. Certificate of Conformance: Signed by manufacturers of system components certifying that products furnished comply with requirements.
- D. Qualifications of Installer Certificates: The Contractor shall submit data signed by the Contractor for the approval of the Contracting Officer proving that a Manufacturer's Certified Installer will be present during the complete time of construction. Such "Certified Installer" shall be present every day of construction throughout duration of contract. Submit the name(s) and a copy of the manufacturer's certificate of the proposed "Certified Installer".  
**Work on the construction site will not be allowed without the "Certified Installer" present.**

- E. Manufacturer's Installation Instructions and Recommendations: For all equipment and devices.
- F. Wiring Recommendations: Submit the written recommendations of the fire alarm control panel manufacturer for all the different types of fire alarm wiring required for this system installation.
- G. Qualifications of Contractor Certificate: The Contractor shall submit data for the approval of the Contracting Officer proving that the Contractor has successfully installed fire alarm systems of the same type and design as specified herein, or that he has a contractual agreement with a subcontractor having such required experience. Submit the names and locations of at least three installations where the Contractor or the subcontractor has installed such systems within the last five (5) years. The Contractor shall indicate the type and design of these systems and certify that these systems have performed satisfactorily for at least 18 months. Prior to awarding the contract the Qualifications of Contractor must be "Approved". If the submittal is "Disapproved" contractor must resubmit within 5 days of "Disapproved Submittal". Failure of the Contractor to obtain an "Approved" Qualifications of Contractor Certificate submittal before the contract is awarded will be deemed cause for the government to disqualify the contractor.
- H. Manufacturer's Representative: Submit the name of the qualified manufacturer's representative and letter by the manufacturer of the FIRE ALARM CONTROL PANEL manufacturer that such representative is duly authorized and qualified to install, repair, and program such equipment. The manufacturer's representative shall not be the same as the qualified installer and shall not be an employee of the contractor or subcontractor installing the fire alarm system.
- I. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.
- J. Submit copies of Underwriters Laboratories (UL) certificates for each fire alarm component.
- K. Operation and Maintenance Manuals: For fire alarm systems to include in maintenance manuals specified in Division 1. Comply with NFPA 72. Submit five (5) sets bound, including all catalog numbers and address of nearest supplier of parts. The operation and maintenance manual shall not be general in nature but specifically tailored for the work in this contract. Submit operating instructions per section 01300.
- L. Certificate of Completion: Upon final testing, the manufacturer's representative shall certify by letter that the system is installed and operating correctly in accordance with NFPA 72.

#### 1.4 GENERAL

- A. Furnish and install a complete operational Fire Alarm system as shown on the plans; to be wired, connected, and left in first class operating condition. The entire system shall be wired in metallic raceways per manufacturer's recommendations.
- B. The fire alarm control panel shall allow for loading or editing special instructions and operating sequences as required. The system is to be

capable of on-site programming to accommodate and facilitate expansion, building parameter changes, or changes as required by local codes. All software operations are to be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

- C. The ability for selective input/output control functions based on ANDing, ORing, NOTing, timing and special coded operations is to also be incorporated in the resident software programming of the system.
- D. All panels and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.
- E. Furnish a minimum of two spare detectors of each type. No duct detector spares.
- F. The Contractor shall provide installation shop drawings for each building and shall include the address of every addressable device installed in each building. The address numbers shall be determined by the Contractor and the room, area or equipment number where the device is located shall be as shown on drawings. The shop drawing shall also show the location of the monitor modules, control modules and the fault isolator modules.

#### 1.5 OPERATION

- A. Under normal condition, the front panel shall display a "All SYSTEM NORMAL" message and the current time and date.
- B. Should an abnormal condition be detected, the appropriate LED shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.
- C. The panel shall display the following information relative to the abnormal condition of a point in the system:
  - 1. Custom location label (40 characters minimum).
  - 2. Type of device (i.e. heat, smoke, pull station.)
  - 3. Point status (i.e. alarm, trouble).
  - 4. Room number.
- D. Pressing the appropriate acknowledge button shall acknowledge the alarm, supervisory, or trouble condition.
- E. Alarm Silencing
  - 1. Should the "Alarm Silence" button be pressed, all audible notification appliances shall be deactivated.
- F. Under an alarm condition, the system shall shut down all associated AHU's within building number 3.
- G. System Reset: The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied.

- H History Logging: The control panel shall have the ability to store a minimum of six hundred fifty (650) events.
- I. System Trouble Reminder: Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the owner's application.
- J. Smoke detector sensitivity shall be set through the Fire Alarm Control Panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
- K. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.

#### 1.6 ALARM SEQUENCE

- A. The system alarm operation subsequent to the alarm activation of any manual station, or automatic detection device, is to be as follows:
  - 1. All audible alarm notification appliances shall sound a temporal fire alarm signal until silenced by the alarm silence switch at the control panel.
  - 2. All visual alarm notification appliances Xenon Strobes shall display a continuous pattern until System is reset.
  - 3. A supervised signal to notify the local fire department or an approved central station is to be activated. To accommodate and facilitate job site changes, the type of "city connection circuit" is to be on-site configurable to provide either a "reverse polarity", "local energy", "shunt" or dry contact connection.
  - 4. The mechanical controls shall turn off the air handling systems per life safety specification, NFPA-90A and NFPA-101.
  - 5. An alarm is to be displayed on the panel display per 1.4.C of these specifications. The alarm LED shall flash on the control panel until the alarm has been acknowledged at the control panel. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone after acknowledged shall flash the alarm LED on the control panel and the panel display shall show the new alarm information.
  - 6. A pulsing alarm tone shall occur within the control panel until acknowledged.
- B. Alarm and trouble conditions shall be immediately displayed on the control panel front alphanumeric display. If more alarms or troubles are in the system, the operator may scroll to display new alarms.

**1.7 SUPERVISION**

- A. SLC shall be Class B, Style 4.
- B. NAC shall be Class B, Style X.
- C. Each independently supervised circuit shall include a discrete panel readout to indicate disarrangement conditions per circuit.
- D. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator. A green "power on" LED shall be displayed continuously while incoming power is present.
- E. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control panel and the remote annunciator.
- F. The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.

**1.8 POWER REQUIREMENTS**

- A. The control panel shall receive 120 VAC power (as noted on the plans) via a dedicated circuit and shall have surge protection in accordance with UL 864.
- B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of forty-eight (48) hours with five minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.
- C. All circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.

**PART 2 - PRODUCTS**

**2.1 FIRE ALARM CONTROL PANELS**

- A. The fire alarm control panels shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, annunciators, and other system controlled devices. The panel shall be U.L. listed for Fire Signaling per Standard 864 and NFPA 72.
- B. System Capacity and General Operation
  - 1. The control panel shall accommodate all addressable/intelligent devices and provide at least a 25% spare capacity.
  - 2. The system shall include Form-C alarm and trouble relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (NFPA Style X) programmable Notification Appliance Circuits.

3. The system shall support all programmable EIA-485 driven relays.
4. The Fire Alarm Control Panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display, individual, color coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
5. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring function of the Fire Alarm Control Panel.
6. The FACP shall provide the following features:
  - a. Drift Compensation to extend detector accuracy over life.
  - b. Sensitivity Test, meeting requirements of NFPA 72.
  - c. Maintenance Alert to warn of excessive smoke detector dirt or dust accumulation.
  - d. System Status Reports to display or print.
  - e. Alarm Verification, with verification counters.
  - f. Positive Alarm Sequence (PAS) feature, meeting NFPA 72-3.8.3 requirements.
  - g. Rapid manual station reporting (under 2 seconds).
  - h. Non-Alarm points for general (non-fire) control.
  - i. Periodic Detector Test, conducted automatically by software.
  - j. Pre-alarm for advanced fire warning.
  - k. Cross Zoning with the capability of; counting two detectors in alarm, two software zones in alarm, or one smoke detector and one thermals detector.
  - l. March time and temporal coding options.
  - m. Walk Test, with check for two detectors set to same address.
  - n. UL 1076 Security Monitor Points.
  - o. Control by-Time for non-fire operations, with holiday schedules.
  - p. Day/Night automatic adjustment of detector sensitivity.
  - q. Device Blink Control for sleeping areas
7. The FACP shall be capable of coding Notification circuits in March Time (120 PPM), Temporal code (NFPA 72 A-2-2.2.2).

C. Central Microprocessor:

1. The Microprocessor unit shall communicate with, monitor, and control all external interfaces with the control panel. It shall include EPROM for system program storage; non-volatile memory for building-specific program storage; and a "watch dog" timer circuit to detect and report microprocessor failure.
2. The Microprocessor Unit shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Such control-by-event programs shall be held in non-volatile programmable memory, shall not be lost even if system primary and secondary power failure occurs.
3. The microprocessor Unit shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

D. Display:

1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, and software zones.
3. The display shall provide a backlit alphanumeric Liquid Crystal Display (LCD). It shall also provide 5 Light-Emitting-Diodes (LEDS), that will indicate the status of the following system parameters: AC POWER, SYSTEM ALARM, SYSTEM TROUBLE, SIGNAL SILENCED, SUPERVISORY, and PRE-ALARM.
4. The Display shall provide a touch key pad with control capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. The Display shall include the following operator functions: SIGNAL SILENCE, RESET, DRILL, and ACKNOWLEDGE.

E. Signaling Line Circuit (SLC):

1. The SLC Interface shall provide power to and communicate with all intelligent detectors (Photoelectric, or Thermal) and all intelligent modules (monitor or control). Provide at least 25% system spare capacity. This shall be accomplished over a single SLC loop and shall be capable of NFPA 72 Style 4 wiring.
2. The loop Interface Board shall receive analog information from all intelligent detectors that shall be processed to determine whether normal, alarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired

sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

3. The detector software shall meet NFPA 72, chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
4. The detector software shall allow manual or automatic sensitivity adjustment.

F. Enclosures:

1. The control panel shall be housed in a UL listed cabinet suitable for surface mounting. Cabinet and front shall be corrosion protected given a rust-resistant prime coat, and manufacturer's standard finish.
2. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. All locks shall be keyed alike.

G. All interfaces and associated equipment is to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

H. Power Supply:

1. The power supply shall operate on 120 VAC, 60HZ, and shall provide all necessary power for the FACP.
2. It shall provide 5.0 amps of usable Notification appliance power, using a switching 24VDC regulator. A 3.0 amp Notification expansion power supply shall be provided, where required, for total system capacity of 8 amps.
3. It shall provide a battery charger for 48 hours of standby using dual-rate-charging techniques for fast battery recharge.
4. It shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.
5. Provide meters to indicate battery voltage and charging current.

I. Field Wiring Terminal Blocks:

For ease of service all panel I/O wiring, terminal blocks shall be of the removable, plug-in type and have sufficient capacity for 18 to 12 AWG wire. Terminal blocks which are permanently fixed are not acceptable.

J. Operators Controls

1. Acknowledge Switch:

- a. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and Trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance LCD display to the next Alarm or Trouble condition.
  - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
2. Signal Silence Switch: Activation of the Signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
  3. System Reset Switch: Activation of the system reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition. Holding the system reset switch shall perform a lamp test function.
  4. Drill (Evacuate) Switch.  
  
The Drill switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

K. Field Programming

1. The system shall be programmable, configurable and expandable in the field and shall not require field replacement of electronic integrated circuits.
2. All programming and reprogramming may be accomplished through the standard FACP keypad by a fire alarm technician qualified on the installed system and without the assistance of factory personnel.
3. All field-defined programs shall be stored in non-volatile memory.
4. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information. Both passwords shall be included with the operation and maintenance manual.
5. Program edit shall not interfere with normal operation and fire protection. If a fire condition is detected during programming, operation the system shall exit programming and perform fire protection functions as programmed.

6. A special program check function shall be provided to detect common operator errors.
7. An Auto-Program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
8. For flexibility, an off-line programming function, with batch upload/download, shall also be available.

L. Specific System Operations

1. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the System keypad. Sensitivity range shall be within the allowed UL window.
2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. Those counters may be displayed and reset by the proper operator commands.
3. Point Disable: Any Device in the system may be enabled or Disabled through the system keypad.
4. Point Read: The system shall be able to display the following point status diagnostic functions:
  - a. Device Status
  - b. Device Type
  - c. Custom Device Label
  - d. View analog detector values
  - e. Device zone assignments
  - f. All program parameters
5. System Status Reports: Upon command from an operator of the system, a status report will be generated, listing all system status.
6. System History Recording and Reporting: The Fire Alarm Control Panel shall contain a history Buffer that will be capable of storing up to 650 system alarm/troubles/operator actions. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the History Buffer may be manually reviewed, one event at a time, in its entirety. Although the foreground history buffer may be cleared for user convenience, a background, non-erasable buffer shall be maintained which provides the last 650 system events.

The History Buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable.
7. Automatic Detector Maintenance Alert: The Fire Alarm Control Panel shall automatically interrogate each intelligent smoke

detector and shall analyze the detector responses over a period of time.

If any intelligent smoke detector in the system responds with a reading that is below or above normal limits, then the system will enter the Trouble Mode, and the particular detector will be annunciated on the system display. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

8. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The systems shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.

## 2.2 PERIPHERAL DEVICES

### A. Programmable Electronic Sounders

1. Electronic sounders shall operate on 24 VDC nominal.
2. Electronic Sounders shall be field programmable without the use of special tools, to provide slow whoop, continuous, or interrupted tones with an output sound level of at least 90 dBA measured at 10 feet from the device. This project shall use the temporal tone.
3. Shall be flush or surface mounted as shown on plans.

### B. Strobe Lights:

1. Shall operate on 24 VDC nominal.
2. Shall meet the requirements of the ADA as defined in UL standard 1971 and shall meet the following criteria.
  - a. The maximum pulse duration shall be 2/10ths of one second.
  - b. The strobe intensity shall meet the requirements of UL 1971.
  - c. The flash rate shall meet the requirements of UL 1971.
  - d. The appliance shall be placed to be in accordance with ADA requirements. Where ADA does not apply (shop areas, etc.) appliances shall be 80 in (2,030mm) above the highest floor level within the space, or 6 in (152 mm) below the ceiling, whichever is the lower.

### C. Audible/Visual Combination Devices:

1. Shall meet the applicable requirements of Section A listed above for audibility.
2. Shall meet the requirements of Section B listed above for visibility.

### D. Addressable Device - General

1. Addressable devices shall provide an address-setting means using switches or fleethonic keypad.
  2. Addressable smoke and thermal detectors shall have an LED indicator. The LED shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel. The LED shall be placed into steady illumination, indicating that an alarm condition has been detected. If required, the flashing mode operation of the detector LED shall be optional through the system field program. An output connection shall also be provided in the base to connect an external remote alarm LED.
  3. Smoke detector sensitivity shall be set through the Fire Alarm Control Panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
  4. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
  5. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Smoke detectors in all sleeping rooms shall be provided with a built-in (local) sounder rated at 75 dBA minimum.
  6. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated locally at the detector itself or initiated remotely on command from the control panel.
  7. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).
- E. Addressable Pull Stations (manual station)
1. Addressable Pull Station shall, on command from the control panel, send data to the panel representing the state of the manual switch. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
  2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
  3. Manual Stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
  4. Stations shall be suitable for surface mounting or semiflush mounting as shown on the plans, and shall be installed per plans.

F. Intelligent Photoelectric Smoke Detector

1. The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

G. Thermal Detector:

1. Thermal Detectors for the general areas shall be intelligent addressable devices rated at 135 or 190 degrees Fahrenheit as shown on plans and have a rate-of-rise element rated at 15 degrees F. per minute. Addressable detectors shall connect via two wires to the Fire Alarm Control Panel Signaling Line Circuit. Up to 99 intelligent heat detectors may connect to one SLC Loop.

H. Addressable Control Module:

1. Addressable Control Modules shall be provided to supervise and control the operation of one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
2. The Control Module shall mount in a standard 4-inch square, 2-1/8" deep electrical box or to a surface mounted backbox.
3. The control module NAC circuit may be wired for or Style X (Class B) with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall provide address-setting means and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.
6. A magnetic test switch shall be provided to test the module without opening or shorting its NAC wiring.
7. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

I. Fault Isolator Module:

1. Fault isolator modules shall be provided to automatically isolate wire-to-wire short circuits on a SLC loop. The Isolator Module

shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each of 15 initiating devices. Location of the isolator modules shall be indicated on the shop drawings.

2. If a wire -to-wire short occurs, the Isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section.
3. The isolator Module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
4. The Isolator Module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

J. Surge Suppression:

All control equipment and hardwired data lines shall have transient protection devices complying with UL 864. Protector shall utilize a silicon avalanche transient voltage suppressor to clip excessive voltages in five nanoseconds or less. Power dissipation shall be 12,000 watts for 1 ms. Current rating shall be 15 amps. After each transient, the protector shall automatically reset to the ready position with no degradation in protective capability. In the event of suppressor failure, the protector shall de-energize the load, thereby preventing possible damage by subsequent transients. The protector shall be permanently wired into the power input circuit of the fire alarm control panel. Line Surge Suppressor shall be **UL 1449** listed with a maximum 330 volt clamping level and a maximum response time of 5 nanoseconds. Suppressor shall also meet **IEEE C62.41** category B tests for surge capacity. Suppressor shall be a multi-stage construction which includes inductors and silicon avalanche zener diodes. Suppressor shall have a long-life indicating lamp (light emitting diode or neon lamp) which extinguishes upon failure of protection components. Fuses shall be externally accessible. Wire in series with the incoming power source to the protected equipment using screw terminations. Provide for all data line circuits which leave the building shell. When circuits interconnect two or more buildings, provide an arrester at the circuit entrance to each building. Suppressor shall be **UL 497B** listed with a maximum 30-volt clamping level and a maximum response time of 5 nanoseconds. Suppressor shall have multi-stage construction and both differential/common mode protection. Show on shop drawings.

**2.3 BATTERIES AND CHARGER**

- A. Shall be 12 volt, sealed lead-acid type (two required).

- B. Battery shall have sufficient capacity to power the fire alarm system for not less than forty-eight hours plus 5 minutes of alarm upon a normal AC power failure.
- C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks refilling, spills and leakage shall not be required.
- D. The battery charger shall have the capability of recharging batteries within 12 hours or less.

#### **2.4 FIRE ALARM WIRING**

- A. All required fire alarm wiring shall be provided as recommended by the manufacturer of the addressable fire alarm control panel. All wiring for exterior use shall be rated for wet locations.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Install the system in accordance with the plans, specifications, approved shop drawings and manufacturer's installation instructions and recommendations. All concealed junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the installation.
- B. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the fire alarm installation.

#### **3.2 TESTING**

- A. The completed fire alarm system shall be fully tested in accordance with NFPA-72 by the manufacturer's certified installer in the presence of the fire alarm system manufacturer representative. Fill out, sign and submit the Inspection and Testing Form in chapter seven of NFPA 72. Have COTR sign the form before submitting. Upon completion of a successful test, the manufacturer representative shall so certify in writing to the Government per the requirements of NFPA 72 by completing and signing a fire alarm system record of completion (certificate of completion).

#### **3.3 WARRANTY**

- A. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test or from the date of first beneficial use.
- B. The contractor shall make available to the Government a maintenance contract proposal to provide a minimum of two (2) inspections and tests per year in compliance with NFPA-72 guidelines.

--END OF SECTION 16722--