

FIRE ALARM SYSTEMS

PART 1 GENERAL

1.1 GENERAL AND SPECIAL CONDITIONS

- A. General and Special Conditions shall apply to all work under this section.
- B. The Contractor shall furnish all equipment, materials, tools, labor, engineering, drawings, etc. necessary for a complete total coverage, addressable fire alarm system. The Contractor shall not delete any equipment or devices without the written directive of the Owner and Engineer.
- C. The purpose of the furnished specifications and drawings is to convey to the Contractor the scope of work required, all of which the Contractor is responsible to furnish, install, adjust, and make operable.
- D. The fire alarm system shall comply with all applicable codes including, but not limited to, the following: National Fire Code (NFPA72), California Building Code, California Fire Code, National Electric Code (NFPA70).
- E. The Contractor shall examine all existing physical conditions, which may be material to the performance of his work. No extra payments will be allowed to the Contractor as a result of extra work made necessary by his failure to do so. Omission, discrepancy or lack of clarity shall be promptly identified to the Owner and Engineer for clarification prior to the bid due date.
- F. Doors that lead to the Fire Alarm Panel shall have signage in RED that reads, "FIRE CONTROL PANEL INSIDE."

1.2 DEFINITIONS

- A. ADA -- Americans with Disabilities Act.
- B. AHJ -- Authority Having Jurisdiction (Division of State Architect).
- C. Approved -- Unless otherwise stated, materials, equipment, or submittals approved by the Owner, Architect or AHJ.
- D. Contractor -- The Company awarded the prime contract for this work and any of its subcontractors, vendors, suppliers or fabricators.
- E. CSFM -- California State Fire Marshal.
- F. District (The District) -- The San Diego Community College District
- G. Engineer -- Engineer or engineering company designated by the District.
- H. FACP -- Fire Alarm Control Panel.
- I. Fire Alarm System -- The entire fire alarm system including all panels, annunciators, devices, and peripheral equipment. The system shall monitor all devices and connected equipment and generate all appropriate responses and signals.

- J. Listed -- Materials or equipment included in a list published by a nationally recognized laboratory that maintains periodic inspection of production of listed equipment and material, and whose listing states either that the equipment or materials meets nationally recognized standards or has been tested and found suitable for use in a specified manner.
- K. NFPA -- National Fire Protection Association.
- L. Owner -- The San Diego Community College District

1.3 SCOPE OF WORK

- A. The Contractor shall furnish and install, unless otherwise indicated, items required for a complete fire alarm system as outlined in these specifications and shown on the drawings. The work includes, but is not necessarily limited to, the following:
 - 1. Provide a new state-of-the-art fully automatic addressable fire alarm system, including smoke detectors, manual pull stations, heat detectors, duct detectors, ADA compliant annunciation (strobes, horns, etc.), waterflow switches, valve supervisory devices, magnetic door holders and any other devices or equipment specified either elsewhere in these specifications or on the blueprints.
 - 2. Provide a point addressable control system, addressable initiating devices, signaling devices, indicating devices, sensors, annunciators, relays, software, accessories and other materials and equipment for a complete operating system.
 - 3. Provide monitoring of the fire sprinkler system via fire alarm monitor module devices.
 - 4. Provide duct-mounted smoke detectors in the main supply-air ducts(s) to effect shutdown of each air handler rated at supplying more than 2000 CFM. Provide control relays to actuate smoke/fire doors as shown on the drawings. Where the building is provided with full area smoke detection, area detectors shall be permitted to be used to control HVAC units and smoke/fire dampers as permitted by code.
 - 5. Connect to the existing HVAC control system to provide control functions, in accordance with the specifications.
 - 6. Provide a network connection from the new FACP to the existing fire alarm OnyxWorks or current District monitoring system including all necessary hardware components. Network drop to be furnished by others.
 - 7. Install all data into the OnyxWorks or current District monitoring software. This shall include all data necessary for the proper functioning of the system and shall include, but not necessarily be limited to, the building graphics (blueprints/floorplans for the project, device types, locations and addresses, etc.), panel information, network IP addresses, etc.
 - 8. Provide smoke detectors in each elevator machine room and in each interior elevator lobby. Provide relay modules to effect primary and alternate floor recall of each elevator. Connect the new fire alarm system to the elevator controls for elevator recall. Where required provide heat detectors to be mounted at the top of each elevator shaft. Heat detectors shall be fixed temperature. Where elevator landings are exterior, weatherproof heat detectors shall be installed in lieu of area smoke

detectors as permitted by NFPA72.

9. Provide detailed terminal-to-terminal alarm system shop drawings, wiring diagrams, and battery calculations for all components and voltage drop calculations (voltage drop not to exceed 10% per notification appliance circuit), sequence of operation, and operating and maintenance instructions.
10. Provide an on-site, factory-trained technician acceptable to the Engineer and the Owner's Representative to supervise the installation.
11. Provide an on-site project manager.
12. Conduct weekly progress meetings and issue monthly written job progress reports to the Owner's Representative and the Engineer.
13. Submit shop drawings and product data submittals to the Engineer for approval by the Engineer and Owner.
14. Where required the Contractor shall provide x-ray of walls or slabs prior to any core drilling and any required fireproofing of the cores.
15. The Contractor shall submit a bar graph schedule at the pre-Construction meeting.
16. Conduct a complete test of the system upon completion of installation to assure the Owner's Representative, the Engineer, and the AHJ that the system is operational. This test shall take place prior to a final acceptance test and pre-testing by the Contractor.
17. Conduct the final acceptance test as required by CFC/NFPA 72. The Alarm Contractor shall furnish personnel who are familiar with the installation at a time convenient to the Owner's Representative, the Engineer and the AHJ. The two-year warranty shall begin upon approval by the Owner's Representative, the Engineer and the AHJ. The acceptance test shall take place as soon as convenient after the completion of the installation.
18. Provide training of the Owner's personnel in accordance with the specification.
19. Provide a two-year job site warranty of all materials and labor furnished under this section.
20. Provide software disable zones for audible/visual devices, elevator control, fire doors, HVAC control and sprinkler waterfowl devices on the ONYX workstation.

1.4 RELATED WORK

A. Materials and methods specified in other sections:

1. Automatic Sprinkler System.
2. Firestopping.
3. Basic Electrical Materials and Methods, Division 1600, except where modified in this section.
4. Mechanical (Fan and Smoke Control) Division 15.

B. Materials furnished and installed by others but wired by this Contractor:

1. Sprinkler waterflow switches, valve supervisory switches and other sprinkler supervisory switches shall be furnished and installed by others. The Fire Alarm Contractor shall wire these switches to the fire alarm system and adjust them for proper operation.

1.5 SYSTEM DESCRIPTION

- A. The fire alarm system shall be a Notifier UL listed; CSFM approved addressable system capable of individual annunciation of all devices as well as zoned alarm, common trouble, and supervisory signaling.
- B. The fire alarm system shall be capable of programming changes through the main CPU without the use of external devices such as laptop computers or proprietary programming tools.
- C. The fire alarm system shall be provided with a continuous sounding evacuation signaling system.
- D. Where indicated the fire alarm system shall be zoned in accordance with the specifications and drawings.
- E. System circuit wiring:
 1. All fire alarm and supervisory alarm initiating circuits shall be NFPA Class B Signaling Line Circuits (SLC) from the fire alarm control panel to the devices.
 2. Initiation Device Circuits (IDC) shall be wired NFPA Class B.
 3. Notification Appliance Circuits (NAC) shall be wired NFPA Class B.
 4. All notification appliance circuits shall be NFPA Class B.
 5. All point addressable Signaling Line Circuits shall be NFPA Class B.
 6. A dedicated, homerun ¾" conduit shall be installed from the Fire Alarm Control Panel to the remote annunciator. The conduit shall consist of the annunciator power and data circuits.

1.6 APPLICABLE STANDARDS

- A. The latest adopted issue of the following standards is hereby made a part of this Work by reference thereto:
 1. NFPA 13 – Sprinkler Systems
 2. NFPA 70 - *National Electrical Code*,
 3. NFPA 72 - *National Fire Alarm Code*,
 4. NFPA 90A - *Installation of Air Conditioning and Ventilating Systems*

5. UL Standard 268 - *Smoke Detectors for Fire Protective Signaling*
6. UL Standard 268A - *Smoke Detectors for Duct Application*
7. UL Standard 1971 - *Signaling Applications for the Hearing Impaired*
8. Americans with Disabilities Act (ADA)
9. American National Standards Institute (ANSI) A117.1
10. American National Standards Institute (ANSI) A17.1
11. California Building Code (CBC)
12. California Fire Code (CFC)

1.7 SYSTEM OPERATION

- A. The addressable fire alarm system shall perform the following functions:
 1. Continuous monitoring of all supervisory signal initiating devices.
 2. Continuous monitoring of all electrically supervised fire alarm initiating, supervisory and notification appliance circuits.
 3. Continuous monitoring of all panels, voice communication equipment, and data transmission lines.
 4. Continuous monitoring of all addressable modules.
 5. Operation of elevator controls as required.
 6. Operation of all audible and visual signals as indicated.
 7. Operation of all required HVAC controls as indicated.
 8. Operation of all magnetic door holders
- B. Upon change in status of any device on the system, the CPU shall:
 1. Activate audible and visual status change indicators and display the system point number, point description and message associated with the point at the FACP and all annunciators located at the site.
 2. Display the account information, point number, point description and point status as well as the floor plans and other graphics associated with the building and specific point via the OnyxWorks or current District monitoring system located in the District's Police Dispatch Center.
 3. Permanently record the change in status, time, date, point description, and message associated with the point on the onsite printer as specified elsewhere in these specifications.

C. Activation of any manual fire alarm station, waterflow switch, smoke detector, heat detector, duct smoke detector, sprinkler supervisory valve or other fire alarm initiating device shall cause the following functions to occur.

1. Manual Pull Station operation shall:

- a. Perform all operations as described in 1.7.B above.
- b. Activate the audible and visible notification appliances throughout the building.
- c. Release all doors normally held open by door-control devices.
- d. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

2. Sprinkler system waterflow switch operation shall:

- a. Perform all operations as described in 1.7.B above.
- b. Activate the audible and visible notification appliances throughout the building.
- c. Activate the HVAC system fans, dampers and other mechanical equipment.
- d. Release all doors normally held open by door-control devices.
- e. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

3. Area smoke detector or heat detector operation shall:

- a. Perform all operations as described in 1.7.B above.
- b. Activate the audible and visible notification appliances throughout the building.
- c. Activate the HVAC system fans, dampers and other mechanical equipment.
- d. Release all doors normally held open by door-control devices.
- e. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.

4. Elevator lobby or elevator machine room smoke detector or heat detector shall

- a. Perform all operations as described in 1.7.B above.
- b. Activate the audible and visible notification appliances throughout the building.
- c. Activate the HVAC system fans, dampers and other mechanical equipment.
- d. Release all doors normally held open by door-control devices.

- e. Recall the elevators to the first floor or alternate floor.
 - f. Where required transmit a zoned fire alarm signal to the College Police Remote Station via the digital communicator.
5. Duct smoke detector activation shall
- a. As required operate as a supervisory device and perform all operations as described in 1.7.C.5.
 - b. Activate the HVAC system fans, dampers and other mechanical equipment associated with the specific detector.
 - c. Shut down the supply air fan if the duct smoke detector is downstream of this fan.
 - d. Where required transmit a zoned fire supervisory signal to the College Police Remote Station via the digital communicator.
6. Supervisory device operation shall:
- a. Activate audible and visual status change indicators and display the system point number, point description and message associated with the point at the FACP and all annunciators located at the site.
 - b. Display the account information, point number, point description and point status as well as the floor plans and other graphics associated with the building and specific point via the OnyxWorks monitoring system located in the District's Police Dispatch Center.
 - c. Permanently record the change in status, time, date, point description, and message associated with the point on the onsite printer as specified elsewhere in these specifications.
 - d. Where required transmit a supervisory signal to the College Police Remote Station via the digital communicator
- D. Removal of any devices, wiring disarrangement, or system component failure shall:
- 1. Activate audible and visual status change indicators and display the system point number, point description and message associated with the point at the FACP and all annunciators located at the site.
 - 2. Display the account information, point number, point description and point status as well as the floor plans and other graphics associated with the building and specific point via the OnyxWorks monitoring system located in the District's Police Dispatch Center.
 - 3. Permanently record the change in status, time, date, point description, and message associated with the point on the onsite printer as specified elsewhere in these specifications
 - 4. Where required transmit a supervisory signal to the College Police Remote Station via the digital

communicator

- E. When any point in the system returns to normal, the CPU shall:
 - 1. Activate audible and visual indicators and display point identification, time, date and message.
 - 2. Acknowledgment of "system return to normal" will print the time, date, point identification and message. Acknowledgment will also silence all audible indicators associated with the point at the CPU.
- F. Where required zoned alarms shall be transmitted by the NFN Network Gateway. Each floor shall have a minimum of one zone. Automatic and manual devices shall not be combined on the same zone and, at a minimum, shall be separated by floor. Each of the following shall be on its own zone and shall not be combined onto zones with any other type of device: waterflow/pressure switches, supervisory devices, and duct detectors.

1.8 SUBMITTALS

- A. Provide complete product data (including manufacturer's descriptive and technical literature); and catalog cut sheets clearly marked to indicate model and catalog number, installation instructions, maintenance and testing procedures, dimensions, and wiring diagrams for the equipment provided. Where devices furnished by the Contractor involve work by another Contractor or Subcontractor, submit additional approved data sheets and shop drawing copies to the Contractor or Subcontractor.
- B. Provide shop drawings, including building floor, plans showing sequence of operations, device locations, complete wiring and schematic diagrams, including conduit size and wire routing, wiring size and counts, wire color codes, field terminations; control panel layout, including all modules, circuit terminals and interconnections, overall cabinet dimensions; complete riser diagrams indicating wiring sequence for all devices and control equipment. Drawings shall show proposed layout and anchorage of equipment and appurtenances and equipment relationship to other parts of the work, including clearances for maintenance and operation. All shop drawings are to be provided with the manufacturer's logo clearly printed on each drawing.
- C. Provide substantiating calculations, including calculations for determining secondary power supply requirements and voltage drop calculations. Battery calculations shall list the supervisory and alarm current requirements for each component. Battery recharging period shall be included with the calculations. The voltage drop calculations shall list the distance and current draw of each notification appliance and the formula used and shall not exceed 10 percent.
 - 1. Prior to purchase or fabrication of any material, approval shall be obtained from The District and Engineer. Make two (2) complete submittals of all shop drawings, wire diagrams, and literature for review and approval.
 - 2. Provide complete submittal within two (2) weeks of notice to proceed.
- 3. PARTIAL SUBMITTALS ARE NOT ACCEPTABLE AND WILL BE RETURNED TO THE CONTRACTOR UNREVIEWED.**
- D. Submittals rejected by the Owner's Representative and Engineer shall be corrected and resubmitted within seven (7) days of notification of rejection.

1.9 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

- A. Contractor will deliver all materials to area of project designated by The District. Vehicles shall not block fire lanes or fire doors during delivery of materials.
- B. Owner will not accept deliveries for the Contractor.
- C. The Owner's Representative will designate an area within the facility for storage of all materials. At the end of each working day, all materials shall be returned to the designated area. Material, equipment, tools, etc will not be left outside the storage area without the consent of the Owner's Representative.
- D. No material storage facilities are available on site. The Contractor is to include in his bid the cost of storage trailers or other suitable storage facilities. The Contractor's storage trailers will be parked in areas designated by the Owner.
- E. The cost of all material handling, delivery and freight is the Contractor's responsibility. The Owner or his representatives will not be responsible for material delivered to the site.
- F. Maintain premises free from accumulation of waste materials or rubbish caused by this work. At the end of each day, remove from the site all surplus materials, tools, and all waste. The Contractor shall leave the premises clean to the Owner's satisfaction.
- G. The Contractor shall arrange and pay for parking.

1.10 WARRANTY

- A. The Contractor shall provide a two (2)-year written warranty against defects in material and workmanship furnished under this Contract. The costs of such warranty shall be part of the purchase price. The warranty commences when the Owner's Representative and Engineer accept the system and installation.
- B. The warranty shall include all necessary material, travel, labor and parts to replace defective components or materials at the job site. The Contractor shall commence repair of any "in warranty" defects which may cause the fire alarm system to be impaired within 8 hours of notification of such defects.
- C. The Contractor shall make allowances in his warranty to cover diagnosis of system defects, which might ultimately be the responsibility of others to correct. When this occurs, the Owner's Representative and other affected trades shall be notified.
- D. The warranty shall include all necessary factory and field software required to perform the specified tasks.
- E. The Contractor shall include, as part of the two-year warranty, a test and inspection of the entire fire alarm system within one month prior to the end of the first year and another at within one month prior to the expiration of the two-year construction warranty. The Contractor shall provide a written report of any deficiencies and repair any of the deficiencies. The test and report shall conform to the certification as described in NFPA 72.

1.11 AS-BUILT DRAWINGS

- A. Maintain at the site an up-to-date, marked set of as-built drawings, which shall be corrected and delivered to The District upon completion of the work.
- B. Furnish the Owner with one (1) reproducible set of each approved shop drawing, revised to show "as-built" conditions.

1.12 CHANGES

- A. Make no changes in installation from layout as shown on drawings unless the Engineer and DSA specifically approve change. This does not include minor revisions for the purpose of coordination.

1.13 DAMAGE

- A. The Contractor shall be responsible during the installation and testing periods of the fire alarm system for any damage to the building, its contents, etc. caused by the Contractor's work.

1.14 QUALITY ASSURANCE

- A. The fire alarm system manufacturer shall maintain a fully staffed branch office including application engineers, drafters and technical service personnel within the San Diego metropolitan area.
- B. The Contractor shall employ NICET certified fire alarm system installers. Minimum certification for on-site supervisory personnel shall be Level III. Installers shall be minimum Level II.
- C. The electrical contractor shall perform installation of all electrical circuits for the fire alarm system, including wire installation and terminations. The fire alarm contractor shall install all fire alarm related devices and make all connections associated with them.

PART 2 PRODUCTS

2.1 EQUIPMENT

- A. New Fire Alarm Systems: Equipment Manufacturer shall be Honeywell Notifier. No substitutions shall be accepted.
- B. Renovated/extended Systems: Acceptable equipment for this project must be listed for use with the present fire alarm network operating system in use by the District.
 - 1. Product data information for other desired manufacturers shall be submitted to the Engineer and The District within Seven (7) days after the pre-bid meeting for product equivalency approval.
- C. Products for this project shall be of the latest design; obsolete or discontinued products will not be acceptable. All equipment supplied shall be UL and California State Fire Marshal (CSFM) listed for required function.

2.2 INSTALLATION MATERIALS

- A. All wire and cable shall be new and CSFM/UL listed and/or approved for use in fire alarm signal systems per CFC/NFPA 70, Article 760. All SLC (Signaling Line Circuit) wire shall be solid conductors of copper, minimum size of No. 18 AWG, and insulation rated at 600V. All wire used for NAC circuit wiring shall be

THHN 12 AWG or 14AWG stranded.

B. Manufacturer's recommended wire type and gauge shall be used. If the fire alarm manufacturer specifies wire from a specific manufacturer(s), this wire shall be used unless the fire alarm manufacturer indicates in writing that other wire manufacturers are considered equal.

C. All conduit, junction boxes, pull boxes and fittings shall conform to the following:

1. Conduit:

- a. Conduit shall be (3/4) -inch minimum electric metallic tubing (EMT) and flexible conduit (in wet areas use rigid steel conduit), in conformance with NFPA 70.
- b. Conduit exposed to weather shall comply with NFPA 70 and the requirements of the AHJ.
- c. Conduit exposed in finished areas shall be Wiremold 800 or 2300 series (plastic). In areas where the Wiremold does not closely match the surface on which it is mounted, it shall be painted to match the surface and/or the surrounding area.
- d. All fittings shall be listed and approved for the specific conduit.
- e. For threaded rigid steel conduit do not use threadless or compression-type fittings.
- f. All EMT conduit fittings shall be steel or malleable iron compression-type couplings and connectors. Do not use set screw or indentation type of fittings.
- g. Maximum conduit fill shall be 75 percent of that permitted by the California Electrical Code.
- h. Magnetic door holding circuits and other non-power limited circuits shall be in separate raceways.
- i. Provide conduit and wiring between the FACP and each elevator machine controller to effect elevator recall as specified herein. This conduit and wiring shall be independent of that required for any other function.
- j. All concealed system EMT conduit shall red in color.
- k. Exposed flexible conduit used for attachment to waterflow and valve tamper switches or similar applications shall be liquid-tight and shall be the minimum length required for neat and secure installation. Flexible conduit shall not be buried or located closer than 12 inches to grade.

2. Junction and Pull Boxes:

- a. Shall be installed in accordance with the National Electrical Code, state or local codes.
- b. Provide galvanized sheet steel junction and pull boxes, with screw-on covers and of types, shapes, and sizes to suit each respective location and installation.

- c. Boxes exposed to weather, moisture, at or adjacent to water or steam connections, at sprinkler waterflow switches and supervisory switches shall be corrosion-resistant, cast-metal weatherproof outlet boxes of types, shapes, and sizes, including depth of boxes with threaded conduit ends, cast-metal face plates with spring-hinged waterproof caps suitable for each application, including face plate gaskets and corrosion-resistant fasteners.
 - d. Each box shall be large enough to accommodate required splices and conduit in accordance with the NEC.
 - e. Sectional boxes shall not be used.
 - f. Boxes shall be painted red or otherwise designated for identification as part of the fire alarm system.
3. Field Terminal Cabinets (FTC):
- a. Shall be UL listed for use in electrical wiring systems.
 - b. Minimum size shall be 12 inches by 12 inches by 4 inches deep with a hinged lockable cover or a plate cover attached by tamper-resistant screws.
 - c. Terminals cabinets shall be mounted no less that 48 inches nor more than 78 inches above the finished floor
 - d. Terminal strips shall be numbered and a list of all termination's shall be permanently affixed to the inside cover of all terminal cabinets.
 - e. Terminal cabinets shall be identified as part of the fire alarm system on the outward face of the cabinet.
4. Plenum Cable:
- a. Shall be installed per National Electrical Code, Articles 725 and 760.
 - b. The cable shall be marked with the wire model number, wire gauge, and number of conductors.
 - c. The cable shall be UL listed for fire alarm signaling applications.
- D. All wiring components shall be UL listed. Wiring methods shall conform to NFPA 70, Sections 760 and 780.

2.3 CONTROL EQUIPMENT

A. Fire Alarm Control Panel (FACP):

1. The FACP shall be fully compatible with OnyxWorks or the current District monitoring software. Compatibility shall include, but not necessarily be limited to, the ability to modify programming, operate control functions (silence alarms, troubles, reset the panel, etc.), monitor (the FACP, devices, etc.), display devices by point (point address, location, and description), and check the status of the panels remotely using OnyxWorks or the current District monitoring software.

2. The FACP shall be a Notifier NFS2 series (320, 640, or 3030) sized to allow a minimum of twenty-five percent (25%) expansion for future use. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.
3. The FACP shall be wall-mounted and installed in the location shown on the blueprints and approved by the Owner's Representative. The FACP shall be equipped with a locked enclosure having removable access panels for servicing of electronic components.
4. The FACP shall contain a microprocessor based Central Programming Unit (CPU) and power supply. The CPU shall communicate with, and control, the following types of equipment used to make up the system: intelligent addressable smoke and heat detectors, addressable modules, printer, annunciators, and other system controlled devices.
5. The CPU shall be equipped with a non-volatile main memory. This memory shall not be lost even if the system's primary and secondary power systems fail.
6. Normal operating power for the FACP shall be a dedicated 120 VAC, single-phase, 60 Hz circuit supplied from the building distribution power panel. The circuit breaker shall be clearly marked and equipped with a lock to prevent accidental shutting off of the breaker. Breaker shall be identified as "FIRE ALARM CIRCUIT", and equipped with a red lock.
7. The system-operating terminal shall be an LCD display with a QWERTY keyboard and other keys for programming, accessing, and operating the system. Functions shall include, but not necessarily be limited to, adding or eliminating devices, accessing history logs, checking status of points, acknowledging and resetting signals, etc.

2.4 ALARM INITIATING DEVICES

- A. Manual fire alarm pull stations shall be provided where required by code as indicated on DSA-stamped drawings. The manual fire alarm pull stations shall be cast metal type or Lexan red with raised or depressed lettering. The manual fire alarm pull station shall be dual-action type. Where pull station covers are used manual fire alarm pull stations are to be single action.

Surface-mounted stations shall mount on a red finished back box. Semi-recessed stations shall mount on a standard electrical box. Operation of a manual fire alarm station shall cause its contacts to lock-in until manually reset and visually indicate an actuation. The station shall be reset using the same key as the FACP.

Each station shall be individually addressed at the central control panel. Stations, which rely on wires from auxiliary contacts to the panel, do not meet this requirement.

- B. Sprinkler system waterflow switches are to be provided where indicated. The waterflow switches, which are wired under this section, shall contain a suitable, adjustable retard device; be of the vane type; and actuate upon flow from a single sprinkler. Waterflow switches shall be housed in a substantial metal housing with gasketed cover. The switch shall actuate in no less than 45 seconds nor more than 90 seconds after the inspectors test valve is opened. Pressure switches are not acceptable.
- C. Addressable point monitoring devices shall be provided to monitor waterflow switches. The wiring from the monitored device to the point-monitoring device shall be a (Style B) electrically supervised circuit. The point monitoring device shall send an individual address to the fire alarm control panel.

- D. Point addressable smoke detectors shall be provided where indicated.
1. Photoelectric smoke detectors shall be provided with integral LED's to indicate detectors in alarm. The detectors shall operate from the 2-wire alarm initiating circuit and be listed under UL Standard 268, latest edition. Line transient and RFI protection shall be built into the detector. Mounted concealed detectors shall have a remote indicator light or LED. There shall be provisions for mounting a control relay in the base of the detector.
 2. Duct-mounted smoke detectors shall be provided, where indicated, with approved duct housings mounted on the exterior of the duct, and shall have perforated sampling tubes extended across the width of the duct. Each mounted concealed detector shall have a remote indicator light and a remote test and reset switch, which shall be clearly visible, clearly labeled and readily accessible. Provide an auxiliary D.P.D.T. load relay for fan shutdown control.

Duct detectors shall either be addressable or provided with an addressable point monitoring module.

3. HARSH type detectors shall be provided where indicated.
- E. Point addressable heat detectors shall be provided where indicated. The heat detectors shall be combination fixed temperature (135°) and rate-of-rise unless otherwise indicated. The heat detectors shall be self-restoring and contain an integral LED to indicate detectors in alarm.

F. General

1. Each device shall be field set and assigned a unique address. Devices that take their address from their position in the circuit are unacceptable because if devices are later added or removed, existing addresses, descriptors and commands must be reprogrammed.
2. Additional devices must be capable of being added to the circuit from any point in the circuit and without affecting any existing device's address or function.
3. All means of addressing detectors and modules must be by manually adjustable rotary type switches. Bar coded devices are not acceptable.
4. Each addressable device shall be provided with a clearly visible, printed label with the address of the device. This label shall be clearly readable from a distance of ten feet.

2.5 NOTIFICATION APPLIANCES

- A. Alarm horn units shall be provided as required to provide a sound level 15 dBA above ambient noise levels. The units shall be surface mounted in unfinished areas and semi-flush in finished areas. The units shall operate on 24 volts DC (VDC) polarized power to allow for supervision.
- B. Visual alarm units shall be provided where indicated. The visual alarm units shall contain strobe light source and sturdy transparent lens. Standard finish shall be red with the word "FIRE" imprinted on the body. All visual units shall operate on 24 VDC polarized power to allow for supervision. Visual units shall be in accordance with the ADA and UL Standard 1971.
- C. Fire alarm bells shall be provided where indicated. The bells shall be six-inch diameter, vibrating units with a minimum sound output of 90 dBA at 10 feet. All bells shall operate on 24 VDC polarized power to allow for supervision unless otherwise indicated.

2.6 SUPERVISORY DEVICES

- A. Valve supervisory devices shall be provided for all indicated sprinkler control valves. The valves including butterfly-type, O.S.& Y, or a combination of both. The valve supervisory devices shall be installed to transmit a supervisory signal to the panel within the first two turns of the control valve handle or when the stem of the valve has moved a distance of 1/5 of the length of the stem, whichever is less.
- B. Post indicator Valve (PIV) supervisory switches shall be provided for all indicated control valves. All switches shall be SPDT with gasketed rain-tight enclosures. The PIV supervisory switch shall be installed to transmit a supervisory signal within the first two turns, but no less than one-half turn, of the valve handle or when the stem of the valve has moved a distance of 1 /5 of the length of the stem, whichever is less.

2.7 CONTROL DEVICES

- A. Provide control relays/contacts for elevator recall, fan shut down, and smoke control sequence. The control relays/contacts shall be 24 VDC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.
- B. Magnetic door holders shall be provided where shown. The door holders shall be powered by 24 VDC circuits and shall be of the fail-safe design and shall have a minimum holding force of 25 pounds.
- C. Provide addressable control devices where shown to control fan units. The addressable control device shall be individually controlled from the FACP. Power to these devices shall be provided and supervised from the FACP.

2.8 REMOTE STATION TRANSMITTING EQUIPMENT

- A. Where required central station transmitters (NFN Network Gateway device) shall be provided as indicated at the FACP to transmit alarm and trouble signals for fire alarm system to SDCCD Police Remote Station. Transmission methods shall satisfy requirements of the station and NFPA 72.
- B. Where required, the NFN Network Gateway device shall be as specified by the District and shall be compatible with the District's programming and monitoring software. A Universal DACT (UDACT) shall not be used.

2.9 REMOTE ANNUNCIATOR

- A. Provide LCD remote annunciators where indicated. The annunciator shall provide a backlit, super twist, 80 or 160 character liquid crystal display (LCD) for display of all system information. The annunciator shall also provide keys programmed for system control functions, such as acknowledge, silence, reset, as well as other custom-control functions as required. The annunciator shall be mounted with a clear, hinged, locking cover, using the same key as the fire panel.
- B. Provide graphic remote annunciators where indicated. The graphic annunciator shall be LED spot luminous for each zone in the system and shall have supervised wiring from the control panel. The complete graphic display shall be submitted to the Engineer for review prior to fabrication of the panel.
- C. Provide LED remote annunciator where indicated. The annunciator shall provide RED alarm and YELLOW trouble LEDs for each zone in the system and shall have supervised wiring from the control panel. The annunciator labeling shall be submitted to the Engineer for review prior to fabrication of the panel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The contractor shall provide factory trained and authorized personnel for on-the-job supervision of the proper installation of devices in cooperation with, or as may be required by, other trades. This shall include the following:
1. Provide specific on-site instructions to others on mounting and installation of each type of device by physically observing the mounting of one or more of each type of device, as required, to ensure that the installer is properly instructed in the work.
 2. Provide supervision as required by others to properly perform alarm installation work.
 3. Perform a complete test of the system, certifying that all devices have been activated and that the devices and systems have performed in accordance with the requirements of this specification.
 4. Install, test, trouble-shoot and correct all system software provided under this specification. This includes, but is not limited to, actual keyboard entry, reprogramming required to meet this specification, and any other tasks associated with the system software.
 5. Participate in other related testing, including smoke control, fire pump, fire sprinkler system, etc. which involves the operation of the fire alarm control panel and to verify the proper functioning of the fire alarm related equipment.
 6. Provide layout drawings and detailed wiring diagrams to the Division of the State Architect (DSA) as required by the Submittal section of these specifications and the AHJ.
- B. All work shall be installed as shown and in accordance with the manufacturer's specifications, unless otherwise specified

1. Control Panel

The control panel and its components shall be securely mounted on a $\frac{3}{4}$ inch plywood backboard painted white so that no part of the cabinet is less than 12 inches or more than 78 inches above the finished floor. All manually operable controls shall be at least three feet and less than five feet above the finished floor. Panel shall be installed to comply with the requirements of UL 864.

Unless a separate battery cabinet is mounted directly below the control panel, no conduit is to penetrate the bottom of the control panel cabinet.

2. Detectors

- a. Detectors shall be mounted on the ceiling not less than 4 inches (100 mm) from the side wall to the near edge, or if side wall, between 4 inches (100 mm) and 12 inches (300 mm) down from the ceiling

to the top of the detector.

- b. Detectors shall be located at least three feet from supply and return diffusers of air handling systems.

3. Manual Fire Alarm Stations

Manual fire alarm stations shall be mounted at 48 inches (145 mm) at the pull handle above the finished floor. Where the manual pull station and notification device are located in the same area, they shall be center vertically with each other in the same location.

4. Visual Signal Appliances

Visual signal appliances shall be wall mounted such that the entire lens is no less than 80 inches (2030 mm) nor more than 96 inches (2435 mm) above the finished floor or 6 inches (152 mm) below the ceiling, whichever is lower. .

5. Audible Signal Appliances

Where ceiling heights permit, wall-mounted appliances shall have their tops at 90 inches (2300 mm) above the finished floor or 6 inches (152 mm) below the ceiling, whichever is lower.

6. Combination Audible and Visual Signal Appliances

The location of audible/visual signal appliances shall comply with visual signal appliance mounting requirements.

7. Annunciators

Annunciators shall be mounted so that all controls shall be no less than 54 inches or more than 60 inches above the finished floor. Where the annunciator, manual pull station and notification device are located in the same area, they shall be centered vertically with each other in the same location.

8. Peripheral Equipment

Where located remotely from the control panel all peripheral equipment (relay modules, monitoring modules, control modules, etc.) not located in terminal cabinets or device mounting boxes shall be mounted no less than 72 inches AFF.

Where located in exposed locations (lobbies, halls, offices, etc.), peripheral equipment shall be in a recessed cabinet with a hinged lockable door using the same key as the FACP, 48 to 72 inches AFF, and painted to match the surrounding wall.

- C. Contractor shall furnish all material and labor to provide a complete and functional system, which operates in accordance with the requirements of this specification. This shall include the following:

- 1. Unless otherwise indicated, all wiring is to be in conduit.
- 2. Conduit, raceway and wiring systems as indicated herein, and throughout the specifications, and shown on the drawings.
 - a. All wiring shall be appropriately color-coded, and permanent wire markers shall be used to identify the terminations for each circuit at the control panel.

- b. Strap or bundle all cables and wires inside equipment enclosures and terminal cabinets, parallel to the enclosure sides.
- c. Splices shall be kept to a minimum. Splices shall be made in device mounting boxes and terminal cabinets only. Pull boxes and terminal cabinets must be clearly marked and readily accessible. More than four (4) splices in one location must be in a terminal cabinet.

Exception: Devices available only with “pig-tail” connections shall be connected to the circuit wiring using approved insulated wire nuts and wrapped with electrical tape.

- 3. Repair all surface areas where existing fire alarm equipment has been removed. All holes and walls shall be filled with UL fire-stopping material capable of maintaining the fire-resistance of the fire barriers.
 - 4. Replace all damaged ceiling tiles.
 - 5. Paint all exposed conduit, raceway, access panels, etc., and repair or patch surfaces to match existing finish.
 - 6. All coring and sleeving required. Core drilling shall be performed by qualified personnel to minimize damage. All rebar shall be located before drilling. The Contractor shall repair any damage that occurs because of core drilling.
 - 7. For existing facilities, all underground trenching and conduit shall be the responsibility of the contractor.
- D. Pay for and obtain all permits, approvals, fees and charges required for this work.

3.2 TEST/FIELD QUALITY CONTROL

- A. The final alarm acceptance test shall be coordinated with the Owner and the Engineer. A letter certifying that the installation is complete and fully operational shall be forwarded to the Owner and Engineer.
- B. The final alarm acceptance test shall be done in compliance with CFC/NFPA72. All required documentation shall be completed and provided to the Owner upon acceptance of the system.
- C. The Fire Alarm Contractor and the Owner’s Representative shall be in attendance at the final acceptance test to make necessary adjustments. The final test shall be conducted after final clean-up of the area. Per NFPA 72 (latest adopted edition) [Smoke] Detectors shall not be installed until after the construction cleanup of all trades is complete and final.’ The final acceptance test shall include, but not be limited to:
 - 1. A test of the complete system for grounded, open and shorted circuits.
 - 2. A test of each alarm-initiating and supervisory device for functions specified and for the required alarm actions.
 - 3. All communications equipment shall be tested to ensure that all signals are received to the SDCCD Police Dispatch Center. This includes, but is not limited to, all network communications, types and accuracy of signals, etc.
 - 4. A test of the system for electrical supervision.

5. A test to verify that the emergency power source is capable of operating the system for specified periods.
 6. A test to verify that alarm signals will operate under specified trouble conditions.
 7. A test to verify that the system will operate under specified trouble conditions.
 8. A test to verify that the system will perform all specified tasks.
 9. A test to verify that sound uniformity of voice alarm system has been achieved and voice messages are intelligible in all areas of coverage.
 10. A test to verify that a hard copy of all required system actions will be properly provided.
- D. A minimum of 3 day(s) will be required for these tests.
- E. If the system requires a retest by the Engineer, all costs for the retest shall be the responsibility of the Contractor.
- F. The Contractor shall pay all overtime pay required by the AHJ for witnessing the acceptance test.
- G. Provide a separate test message to facilitate testing of the required voice message unit.
- H. Contractor shall be present at other related tests, including but not limited to, emergency generator, fire pump, and smoke control.

3.3 TRAINING

- A. Provide training of Owner's personnel in the proper operation procedures. The training program for the Owner's personnel shall include the following:
1. Operations and Maintenance Manuals containing complete operating instructions, outline step-by-step procedures required for system start up, operation, and shut down, including the manufacturer's name, model number, service manual, parts lists, and brief description of all equipment and their basic operation features. Complete maintenance instructions listing routine maintenance procedures, possible breakdowns and repairs, trouble-shooting guide, and as-built drawings of the complete system, including conduit layout, equipment layout, device labels, and simplified wiring and control diagrams of system. Operations and Maintenance Manuals shall be submitted and approved prior to conducting the training course.
 2. Three separate 2-hour training sessions for operating personnel. The sessions are to cover proper operating and response procedures. These instructions shall be sufficient to enable an untrained person to properly operate the system.

3.4 AS-BUILTS

- A. Provide three (3) complete sets of prints, at least one of which is reproducible, and a set of disks in AutoCAD of "as-built" drawings and wiring diagrams
- B. Provide a complete set of "as-built" data sheets for all equipment connected to the system.
- C. Provide complete "as-built" software for all relevant components including, but not limited to, FACP programming and OnyxWorks (or current monitoring software) data files.

- D. Provide NFPA 72 completion certificate, signed by the AHJ.
- E. Provide a completed test form which complies with NFPA 72, signed and dated by the fire alarm system manufacturer or his agent.
- F. All items of this section shall be provided prior to final payment request.

3.5 SPARE PARTS

- A. All spare parts shall be directly interchangeable with the corresponding components of the installed systems.
- B. Spares of each of the following which have been used on this project shall be furnished to the Owner. Quantities shall be a minimum of five (5) percent of the number of each device used
 - 1. Manual fire alarm stations.
 - 2. Smoke detectors, including bases.
 - 3. Duct type detectors
 - 4. Heat detectors.
 - 5. Control relays/devices
 - 6. Addressable monitoring modules.
 - 7. Strobe units.
 - 8. Horn/strobe units (of each candela rating)

3.5 SERVICE CONTRACT

- A. If a separate test and inspection type service is requested, the service contract must include the following:
 - 1. Performance of a test and inspection of the fire alarm system quarterly during which the Contractor shall:
 - a. Test the operation of each waterflow alarm device in the alarm system by opening the inspector's test valve, test alarm and trouble transmitters, and visually inspect each device as it is tested.
 - b. Test the operation of each supervisory valve switch by opening the valve and verifying the receipt of a signal within the first two revolutions of the hand wheel or within one-fifth of the travel distance, and visually inspect each device as it is tested.
 - c. Remove any dirt or dust and make any minor adjustments or calibrations, which are apparent from inspection or testing of the device.
 - 2. Perform a semi-annual test of the entire smoke detection system and manual fire alarm system as per NFPA 72 testing method requirements.
- B. Emergency service, including all parts and labor, during the warranty period is to be included in the system purchase price

C. Service definitions:

1. Emergency Services: Emergency service is a special request for assistance from the Owner that necessitates a special trip or labor. A request to advance a regularly scheduled test and inspection trip is not emergency service.
2. Quoted Rates: Quoted rates refer to the labor rates quoted on the bid form or to adjusted rates which shall be supplied to the Owner at the beginning of each new contract term. In absence of this contract, the rates shall be Contractor's currently published billing rates.

- D. A written test and inspection report is to be submitted to The District at completion of every periodic system test and inspection visit.

END OF SECTION