

SECTION 16721 - FIRE ALARM SYSTEMS, ADDRESSABLE

PART I - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes Fire Alarm Systems, including Manual Stations, Detectors, Signal Equipment, Controls and Devices.

1.3 SYSTEM DESCRIPTION

- A. General: Complete Addressable Fire Detection and Alarm System with Manual and Automatic Alarm Initiation.
- B. Signal Transmission: Hard-wired, using separate individual circuits for each zone of alarm initiation and alarm device operation.
- C. Audible Alarm Indication: By sounding of horns and bells.
- D. Functional Description: The following are required System Functions and Operating Features:
 - 1. Signal Initiation: The manual or automatic operation of an alarm-initiating or supervisory-operating device causes the FACP to transmit an appropriate signal including:
 - a. General Alarm
 - b. Fire-Suppression System Operation Alarm
 - c. Smoke Detector Alarm
 - d. Door Release
 - e. Elevator Recall
 - f. Elevator Shutdown
 - g. System Trouble
 - h. Air-Handling Fan Shut Down
 - i. Automatic Dial-Out
 - 2. Silencing at FACP: Switches provide capability for acknowledgment of alarm; supervisory, trouble, and other specified signals at the FACP; and capability to silence the local audible signal and light a light-emitting diode (LED). Subsequent zone alarms cause the audible signal to sound again until silenced in turn by switch operation. Restoration to normal of alarm, supervisory and trouble conditions extinguish the associated LED and cause the audible signal to sound again until the restoration is acknowledged by switch operation.
 - 3. Loss of primary power at the FACP sounds trouble signal at the FACP and indicates at the FACP when the system is operating on an alternate power supply.
 - 4. Loss of primary power at the FACP sounds trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on an alternate power supply.

5. Annunciation: Manual and automatic operation of alarm and supervisory initiating devices is annunciated both on the FACP and on the annunciator, indicating the location and type device.
6. General Alarm: A System General Alarm includes:
 - a. Indicating the general alarm condition at the FACP and the annunciator.
 - b. Identifying the device that is the source of the alarm (or its zone) at the FACP and the annunciator.
 - c. Initiating audible and visible alarm signals throughout the building.
 - d. Initiating elevators' automatic recall operation.
 - e. Closing fire and smoke doors normally held open by magnetic door holders.
 - f. Closing smoke dampers on system serving zone where alarm is initiated.
 - g. Initiating smoke control sequence through a signal to the building automatic temperature control system.
7. Manual station alarm operation initiates a general alarm.
8. Water-flow alarm switch operation:
 - a. Initiates a general alarm.
 - b. Causes flashing of the device location-indicating lamp of the device that has operated.
9. Sprinkler valve tamper switch operation causes or initiates the following:
 - a. A supervisory audible and visible "valve tamper" signal indication at FACP and annunciator.
 - b. The location-indicating light to flash for the device that has operated.

1.4 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product Data for System Components. Include dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and NRTL listing data.
- C. Wiring diagrams from manufacturer differentiating between factory and field installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Indicate components for both field and factory wiring.
- D. Shop Drawings showing details of [visual or graphic] annunciator.
- E. System operation description covering this specific project including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
- F. Operating instructions for mounting at the FACP.
- G. Operation and Maintenance Data for inclusion in Operating and Maintenance Manual specified in Division 1. Include data for each type product, including all features and operating sequences, both automatic and manual. Include recommendations for spare

parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

- H. Product Certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
- I. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of annotated Contract Drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, submit them for review. Make resubmissions if required to make clarifications or revisions to obtain approval.
- J. Record of field tests of system.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A factory-authorized Installer is to perform the work of this Section.
- B. Compliance With Local Requirements: Comply with the applicable building code, local ordinances and regulations and the requirements of the authority having jurisdiction.
- C. Comply with NFPA 70, "National Electrical Code".
- D. NFPA Compliance: Provide Fire Alarm and Detection Systems conforming to the requirements of NFPA 72, "Installation, Maintenance, and Use of Protective Signaling Systems".
- E. NRTL Listing: Provide systems and equipment that are listed and labeled.
 - 1. Terms "Listed" and "Labeled", as defined in the "National Electrical Code", Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.
- F. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility for system components.

1.6 EXTRA MATERIALS

- A. General: Furnish extra materials, matching products installed (as described below), packaging with protective covering for storage and identifying with labels clearly describing contents.
- B. Lamps for Remote Indicating Lamp Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
- C. Lamps for Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
- D. Smoke Detectors and Heat Detectors: Furnish quantity equal to 10 percent of the number of units of each type installed, but not less than one (1) of each type.
- E. Detector Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

PART II - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
 - 1. Notifier
 - 2. Honeywood
 - 3. Simplex Time Recorder Co.

2.2 MANUAL PULL STATIONS [ADDRESSABLE]

- A. Description: Double-action type, fabricated of metal or plastic and finished in red with molded, raised letter operating instructions of contrasting color. Stations requiring the breaking of a glass panel are not acceptable.
- B. Station Reset: Key operated, double-pole, double-throw, switch-rated for the voltage and current at which it operates. Stations have screw terminals for connections.

2.3 SMOKE DETECTORS [ADDRESSABLE]

- A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems". Include the following features:
 - 1. Factory Nameplate: Serial number and type identification
 - 2. Operating Voltage: 24-V d.c. nominal.
 - 3. Self-Restoring: Detectors do not require re-setting or re-adjustment after actuation to restore them to normal operation.
 - 4. Plug-In Arrangement: Detector and associated encapsulated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. The plug connection requires no springs for secure mounting and contact maintenance. Terminals in the fixed base accept building wiring.
 - 5. Visual Indicator: Connected to indicate detector has operated.
- B. Photo Electric-Type Smoke Detector: Analog type adjustable sensitivity. Notifier 5DX-551/BX-501.
- C. Duct Smoke Detector: Notifier DXH502 Photo-Electric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Detector includes relay as required for fan shutdown.

2.4 OTHER DETECTORS [ADDRESSABLE]

- A. Thermal Heat Detector: Notifier FDX-551 Combination fixed-temperature and rate-of-rise unit with mounting plate arranged for outlet box mounting; 135 degrees F fixed temperature setting except as indicated.

2.5 ALARM-INDICATING DEVICES

- A. General: Equip alarm-indicating devices for mounting as indicated. Provide terminal blocks for system connections.
- B. Fire Alarm Bells: Electric vibrating, 24-V d.c., under-dome type, with provision for housing the operating mechanism behind the bell. When operating, bells provide a sound pressure level of 94 dB, measured 10 feet from the bell. 10 inch size except as indicated. Bells are weatherproof where indicated. Notifier MB-G10-24.
- C. Visual Alarm Devices: Dual-voltage (120-V a.c. or 24-V d.c.) strobe lights with clear polycarbonate lens and xenon flash tube. Mount lenses on an aluminum face-plate. The word "FIRE" is engraved in minimum 1-inch high letters on the lens. Notifier ST24-1575.
 - 1. Lamps have a minimum peak intensity of 8,000 candlepower. Strobe leads are factory-connected to screw terminals.
 - 2. Combination devices consist of factory-combined, audible and visual alarm units in a single mounting assembly. Notifier H524-1575.
- D. Control relay module Notifier CMX-2.

2.6 MAGNETIC DOOR HOLDERS

- A. Magnetic holder will be furnished by the General Contractor and installed by the Electrical Contractor to the F.A. System equipment as required.
- B. Material and Finish: Match door hardware.

2.7 FIRE ALARM CONTROL PANEL (FACP) Notifier AFP-200

- A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems".
- B. Cabinet: Lockable Steel Enclosure. Arrange panel so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control panel, provide exactly matching modular unit enclosures. Accommodate all components and allow ample gutter space for interconnection of panels as well as field wiring. Identify each enclosure by an engraved, red-laminated, Phenolic resin nameplate. Lettering on the enclosure nameplate shall not be less than one (1) inch high. Identify individual components and modules within the cabinets with permanent labels.
- C. Systems: Alarm and Supervisory Systems shall be separate and independent in the "FACP." Each initiating device shall individually report to the "FACP." The System shall be microprocessor based, custom programmable.
- D. Alarm supervisory and trouble conditions are to have dedicated "Leeds" and tone-alert. Point status shall be by alphanumeric "LCD" for all alarms and troubles.
- E. Resetting: Provide the necessary controls to prevent the resetting of any alarm, supervisory, or trouble signal while the alarm or trouble condition still exists.
- F. The FACP shall be capability of being connected into the Telephone System equipment to automatically dial if an alarm is generated.
- G. Instructions: Printed or typewritten instruction card mounted behind a lexan plastic or

glass cover in a stainless steel or aluminum frame. Install the frame in a location observable from the FACP. Include interpretation and appropriate response for displays and signals and briefly describe the functional operation of the system under normal, alarm and trouble conditions.

2.8 REMOTE ANNUNCIATOR PANEL

- A. Remote unit shall be alphanumeric liquid crystal display with capability of indicating all alarm and trouble signals. Unit shall completely be compatible with the Master Fire Alarm Control Panel. Notifier LCD-80.
- B. Unit shall be "U.L." listed and labeled.
- C. Locate at Main Entry to building as shown on the Drawings or as directed by the local Inspector. Coordinate location shown before installing.

2.9 GRAPHIC ANNUNCIATOR

- A. The annunciator shall be similar and equal to "L.E.D." model number LD-1 Back-Lit recessed mounted with a brushed aluminum frame attached to the back box with vandal resistant hidden hinge. The cover shall be key lockable to prevent unauthorized access and terminal strips shall be screw connectors with wire captive protection to secure loosening.
- B. The electronic components shall be permanently installed on the circuit boards. Ribbon connectors shall be provided from the circuit to the terminal strip.
- C. The annunciator shall have two (2) sets of lights - one (1) for the Fire Alarm System annunciation. Lamps shall be "Red" in color. The other shall be for the Security System. The lamp shall be "Amber".
- D. The Normal System Operation shall be indicated by a "Green" LED indicator. A test lamp shall be provided to activate all system indicators to indicate that all internal circuit, wiring and LED's are 1.1.
 - 1. Standby Voltage - Nominal 24 Vdc: Min. 18 Vdc to 36 Vdc
 - 2. Standby Current - Typical Range 0 - 20 ma.
 - 3. Alarm Current - Standby Current is increased by approximately 20 ma. for each activated alarm indicator.
 - 4. Indicator - Super Bright LED's - Red, Green, Amber
 - 5. Activating Voltage - Positive or Negative, as specified.
 - 6. Operating Temp - 32 degrees. - 100 degrees. F. (0 degrees - 38 degrees C).
- E. All shall be protected by a non-glare plexiglass screen finished in a brushed aluminum trim. The annunciator shall be able to operate from a nominal 24-volt D.C. supplied system from the Fire Alarm Control Panel under the present contract. Upon activation of any alarm from the Fire Alarm or Security System shall utilize and operate on the Fire Alarm Control Panel standby batteries is upon any normal loss of power.
- F. The graphic layout of the annunciator shall be drawn by the annunciator manufacturer and submitted to the Engineer for final approval. The Graphic Drawing shall show the

building floor plan to proper scaled proportions. The LED's shall light in the area of the device(s) in the alarm. Provide Red LED's to light in the area in the alarm by Fire Alarm System. Provide green LED's to light in the area in alarm by the Security 80 character LCD display. The top line of 40 characters shall be the point label and the second line shall be the device type identifier. The System Alarm LED shall flash the remote until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another zone shall flash the system alarm LED. The LCD display shall show the new alarm information.

- G. All graphic information shall be white photo-emulsion factory applied to ¼-inch smoke Plexi-glass face at the time of manufacture. The annunciator face shall be protected by 1/10th inch clear plexiglass enclosed by the architectural gray extruded aluminum frame.
- H. The annunciator shall be point back-lighted and use socket mounted LED's to facilitate any future changes. LED's for fire alarm annunciation shall be "Red". Incandescent lights are not acceptable.
- I. The annunciator shall be graphically and electronically expandable. Field updates of graphic information shall be possible through the use of factory supplied photo emulsion change kits. More extensive changes (major modification of graphic elements, adding or deleting LED's, etc.) shall be possible without requiring full replacement of the original panel.
- J. Back boxes shall be factory painted with a black two-part textured epoxy and shall be recess mounted. Backbones shall be available for shipment to the job site at the earliest date required by the Contractor. Front panels shall be designed for quick bolt-on attachments to the back box following completion of final on-site electric connections.
- K. The annunciator shall operate on 24 volts DC and be capable of annunciating more than one system. The annunciator shall have switches to perform auxiliary functions as follows:
 - 1. System Reset
 - 2. Alarm Silence
 - 3. Trouble Silence
 - 4. Alarm Acknowledge
 - 5. Trouble Acknowledge
 - 6. Supervisory Services Acknowledge
- L. All electronics shall be factory mounted to a metal back plane that shall be mounted to the back-box at the time of final annunciator installation. All field connections to the back plate shall be made through System Standard Terminal Strips. All front panel LED's shall be connected to the back plane by a quick disconnecting of ribbon cables. All front panel switches shall utilize quick plug-in circuit board connectors. The annunciator shall have a piezoelectric alarm (Model PC-900). Upon any input to the annunciator, the audio alert shall sound continuously until silenced by a momentary key or push button switch. Subsequent inputs shall re-sound the audio alert.
- M. The annunciator shall be UL listed and labeled.
- N. The graphic annunciator shall be provided by a manufacturer with not less than five (5) years of experience. Samples may be required.

2.10 EMERGENCY POWER SUPPLY

- A. General: Components include lead-acid type gel-cell battery, charger, and an automatic transfer switch.
- B. Battery capacity is adequate to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. At the end of this period, the battery has sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode for a period of 15 minutes.
 - 1. Magnetic door holders are not served by emergency power. Magnetic door holders are released when normal power fails.
- C. Battery Charger: Solid state, fully automatic, variable charging rate type. Provide capacity for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger recharges them fully within four hours. Charger output is supervised as part of system power supply supervision.
- D. Automatic Transfer Switch transfers the load to the battery without loss of signals or status indications when normal power fails.

2.11 WIRE

- A. Line-Voltage and Low-Voltage Circuits: Solid copper conductors with 600 V-rated insulation. All conductors in conduit shall be sized by manufacturer.

2.12 TAGS

- A. Tags For Identifying Tested Components: Comply with NFPA 72H.

PART III – EXECUTION

3.1 INSTALLATION - GENERAL

- A. Install system according to NFPA Standards referenced in Parts 1 and 2 of this Section.

3.2 EQUIPMENT INSTALLATION

- A. Manual Pull Stations: Mount semi-flush in recessed back boxes install 48 inches above finished floor to the top of device.
- B. Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.
- C. Smoke Detectors: Install ceiling-mounted detectors not less than 4 inches from a side wall to the near edge. Install detectors located on the wall at least 4 inches but not more than 12 inches below the ceiling. For exposed solid joist construction, mount detectors on the bottoms of the joists. On smooth ceilings, install detectors not over 30 feet apart in any direction and 15' from the end of corridors. Install detectors no closer than 3 feet from air registers. Field coordinate location before installation.
- D. Return air smoke detectors shall be furnished by the Electrical Contractor and installed by the Division 15 Contractor. All wiring and connections to the Fire Alarm System

Controller will be by the Electrical Contractor. All control wiring and shut down of the Division 15 equipment will be by the Division 15 Contractor.

- E. Remote return air detector annunciators, ceiling typed, shall be provided by the Electrical Contractor and connected to the respective return air smoke detector. Locate in a visible area. Label annunciator as to the unit controlled.
- F. All sprinkler flow and tamper switches will be furnished and installed by the Division 15 Contractor. The Electrical Contractor shall provide all wiring and conduit to connect into the Fire Alarm System Controller.
- G. Audible Alarm-Indicating Devices: Install not more than eighty (80) inches above the finished floor nor less than six (6) inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device operating mechanism concealed behind a grille or as indicated. Combine audible and visual alarms at the same location into a single unit.
- H. Visual Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn not more than eighty (80) inches above the finished floor and at least six (6) inches below the ceiling.
- I. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.
- J. Fire Alarm Control Panel (FACP): Surface mount with tops of cabinets not more than six (6) feet above the finished floor.
- K. Remote Annunciator: Arrange as indicated, with the top of the panel no more than six (6) feet above the finished floor.

3.3 SURGE PROTECTION

- A. Surge Protection: Provide surge protectors similar to "Ditek" DTK-120/240 CM for the Control Panel.
- B. Provide surge protection for all signal and initiating circuits which exit and enter the building to remote locations. Provide protection at each end.

3.4 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways". Conceal raceway except in unfinished spaces and as indicated.
- B. Wiring Within Enclosures: Install conductors parallel with or at right angles to the sides and back of the enclosure. Bundle, lace and train the 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 wiring diagrams of the system. 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 or outlet boxes, cabinets, or equipment enclosures where any circuit tap is made.
- D. System Wiring: All addressable control circuits shall be Class "A". Wire sizes shall be as required by the manufacturer.

- E. Color Coding: Color code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm circuits wiring and a different color code for supervisory circuits. Color code audible alarm indicating circuits differently from alarm initiating circuits. Use different colors for visual alarm indicating devices. Paint Fire Alarm System Junction Boxes and Covers 'Red'.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre-testing, testing and adjustment of the system.
- B. Pre-testing: Upon completing installation of the system, align, adjust and balance the system and perform complete pre-testing. Determine, through pre-testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
- C. Report of Pre-testing: After pre-testing is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of the witnesses to the preliminary tests.
- D. Final Test Notice: Provide a 10 day minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72, Chapter 14. Minimum required tests are as follows:
 - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
 - 2. Megger test all conductors other than those intentionally and permanently grounded with electronic components disconnected. Test for resistance to ground. Report readings less than 1 megohm for evaluation.
 - 3. Test all conductors for short circuits utilizing an insulation testing device.
 - 4. 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 the Record Drawings.
 - 5. Verify the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 - 6. 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 the initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
 - 7. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
 - 8. Test both primary power and secondary power. Verify, by test, the secondary power system is capable of operating the system for the period and in the manner specified.

- F. Re-Testing: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the 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 upon the satisfactory completion of tests.
- H. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.
- I. The owner shall be provided computer software upgrades at no additional cost for the entire life of the system.

3.6 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and mars of finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.7 DEMONSTRATION

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
 - 1. Train Owner's Maintenance Personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of two (2) hours training.
 - 2. Schedule training with the Owner at least seven (7) days in advance.

3.8 WARRANTY

- A. The Contractor shall warrant the workmanship to be free of defects for a period of (5) five years from the date of final acceptance. Should the Owner uncover defective workmanship during the warranty period, the Contractor of Record shall remedy the defect and certify that the correction has been made not less than seven (7) calendar days or reimburse reasonable direct or indirect costs to the Owner should the Contractor fail to correct the defect within the time allowed.

3.9 ALTERNATE

- A. An alternate price shall be submitted for Simplex Time Recorder Company for the Fire Alarm System specified.

END OF SECTION 16721