

SECTION 28 31 00
FIRE ALARM AND DETECTION

PART 1 GENERAL

1.01 SUMMARY

- A. The contractor must provide a new, code compliant fire alarm system meeting the requirements of applicable local and national codes. This system will act as a monitoring and supervising system for the fire sprinkler system. Design of this fire alarm system is a delegated design to the fire alarm contractor using this performance specification and the design drawings.
- B. Provide a listed fire alarm control panel (FACP) to serve to serve the building.
 - 1. System is to supervise the installed fire sprinkler system and send fire, tamper, and supervisory signals at a minimum.
- C. Section Includes:
 - 1. Fire alarm control panel (FACP).
 - 2. Initiating devices.
 - 3. Notification devices.
 - 4. Miscellaneous devices.

1.02 QUALITY ASSURANCE

- A. Referenced standards as adopted by the authority having jurisdiction including local amendments.
 - 1. Architectural Barriers Act (ABA).
 - 2. National Electrical Manufacturers Association (NEMA).
 - 3. National Fire Protection Association (NFPA).
 - a. NFPA 70, National Electric Code.
 - 1) Article 760, fire alarm systems.
 - b. NFPA 72 National Fire Alarm and Signaling Code.
 - 4. National Institute for Certification of Engineering Technologies (NICET).
 - 5. International Building Code (IBC).
 - 1) 2021 edition.

B. Design Criteria:

1. Provide a complete fire alarm system as described in the contract documents and per the requirements of the authorities having jurisdiction and all applicable national and local codes.
 - a. Where system requirements exceed those of the authority having jurisdiction and/or NFPA, meet the requirements of both.
 - b. Coordinate with other trades materials and installation.
 - c. Contractor is responsible for providing a fully functional and code compliant fire alarm system at no additional costs to the Government.
 - d. Submit documents after fire alarm detailed design has been approved by the authorities having jurisdiction.
 - e. Design of fire alarm systems must be performed by one of the following:
 - 1) A licensed fire protection engineer.
 - 2) A NICET certified engineering technician at Level III or Level IV in the subfield of Fire Alarm Systems.
 - 3) As approved by the FCO.

C. Service Organization Qualifications:

1. Offer an annual maintenance contract to include complete service and equipment of the system.
2. Must have 10 years' experience of fire alarm system installation.
3. Provide 24-hour emergency service. Response time to the site must be 24 hours or less and a service office must be within 250 miles of the project site.
4. Installation of fire alarm systems must be performed by one of the following:
 - a. A state of municipal licensed fire alarm company.
 - b. A contractor qualified by a manufacturer.
 - c. As approved by the FCO.

D. Field Quality Control:

1. Provide service by factory-authorized and certified service representative to supervise field assembly and connection of components and pretesting, testing, and adjustment of systems.
2. Perform pretesting to ensure system meets requirements of plans, specification, and code requirements. Correct deficiencies and retest to verify proper operation before commissioning.

3. Inspection:
 - a. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
 - b. Verify units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

E. Authority Having Jurisdiction (AHJ) Review:

1. Before installation, submit shop drawings, product data, and calculations to the authority having jurisdiction for review and approval.
2. Installation of the fire alarm system must not begin without both authority having jurisdiction and Contracting Officer approval.
3. Upon receipt of comments from the authority having jurisdiction, make resubmissions, if required, for clarification or revisions to obtain approval.
4. The authority having jurisdiction will witness the final testing and inspection in order to obtain final approval for the system.

1.03 DEFINITIONS

A. For the purpose of providing materials and installing electrical work, the following definitions will be used:

1. Outdoor area: exterior locations where equipment is normally exposed to the weather and includes below grade structures such as vaults, manholes, and in-ground pump stations.
2. Architecturally Finished Area: offices, laboratories, conference rooms, restrooms, corridors, and other similarly occupied spaces.
3. Non-architecturally Finished Area: pump, chemical, mechanical, electrical rooms and other similar type rooms.
4. Hazardous areas: Class I, Class II, or Class III areas as defined in NFPA 70.
5. Shop fabricated: manufactured or assembled equipment for which a UL test procedure has not been established.
6. Service Organization: commercial entity comprised of professionals capable of providing the technical knowledge and a supply of replacement equipment required for the comprehensive maintenance of fire alarm systems.

1.04 SYSTEM DESCRIPTION

A. Automatic and manual, addressable, general alarm, supervised, closed-circuit, 24V dc fire detection and alarm system.

- B. Provide components and features as required by applicable codes, authorities having jurisdiction, and contract documents but not limited to; the following:
1. Main FACP as shown on contract documents.
 2. Manual alarm box at fire alarm panel.
 3. Smoke detector above FACP.
 4. Sprinkler system interface:
 - a. Sprinkler flow switch.
 - b. Control valve tamper switch.
 - c. Notification device above fire department connection.
- C. Fire Alarm System Wire: All wiring must be in conduit.
- D. Digital Alarm Communicator Transmitter (DACT):
1. The IP DACT must communicate over the business network.
 2. DACT must automatically communicate all alarm, supervisory, and trouble signals to a listed Central Station.
 - a. For alarm signals, the Central Station must contact the local fire department to initiate Emergency Services Notification.
 - b. For supervisory or trouble signals, the Central Station must contact the appropriate parties to inform them the system requires maintenance.
- E. Basic Performance:
1. Signal Line Circuits (SLC) must be wired Class B.
 2. Notification Appliance Circuits (NAC) must be wired Class B.
 3. Each SLC and NAC must be limited to 80 percent of its total capacity at the time of initial installation.
 4. The fire alarm system and all associated equipment and devices must be suited to the environment in which it is installed.
 5. All fire alarm systems must report in Radionics Modem II, Radionics Modem IIIau2, or Modem 4 format.
 6. FACP must be capable of handling a Bosch Zonex expander or report to the central station in the same format of point identification as the Zonex expander and be compatible with remote programming system.
 7. All flow switches must report on Zone 2 or Point No. 2.
 8. All FACP must have four wires between powered sensing devices. If possible, zone or point identification must be used, using the best English possible (example: "SMOKE SE OFFICE" indicating a smoke detector in a southeast office).
 9. All tamper switches must have a tag or permanent marking matching the FACT point or zone description for that valve.
 10. Each building must have its own account number.

11. All telephone lines connected to a FACP must have an “RJ31” phone jack.
12. All programming in the panel must be submitted in hardcopy at time of acceptance.
13. No parts of the programming may be made invisible, locked out, or required keypad only programming.
14. All work must be done in a neat and professional manner.

1.05 SUBMITTALS

A. Shop Drawings:

1. Shop drawings must include the minimum required documentation as required by NFPA 72 including but not limited to the following:
 - a. Narrative describing design intent and system description.
 - b. Floor plan layout showing location of all devices and control equipment.
 - 1) Indicate salient features of each device (weatherproof, strobe candela rating, etc.)
 - 2) Designate where protective equipment is provided (pull station covers, guards, etc.)
 - 3) Wiring diagrams
 - 4) Include system details including location of FACP and all devices and circuits.
 - 5) System power and battery backup calculation with voltage drop calculations per NFPA 72.
 - 6) Equipment technical data submittals for all products provided.
 - 7) System operation description including method of operation and supervision of each circuit and sequence of operations for all manual and automatic inputs and outputs.
 - 8) Provide list of all input and output points in system with label indicating location or use of IDC, SLC, NAC.
 - 9) Operating instructions for FACP.
 - 10) Completed NFPA 72 record of inspection and testing.
 - 11) Copy of site specific software.
 - 12) Name of local service organization.
 - 13) Documentation of authorities having jurisdiction approval.

B. Contract Closeout Information:

1. Operation and Maintenance Data.
2. Field test reports.
3. Pro-rated warranty for batteries.

4. Spare Parts: provide extra materials with protective packaging for storage and identifiable with labels describing the contents.
 - a. Manual alarm boxes: no fewer than one.
 - b. Notification devices: no fewer than one of each type.
 - c. Initiation devices: no fewer than one of each type.
 - d. Detector bases: no fewer than two of each type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the contract documents, the following manufacturers are acceptable:
 1. Fire Alarm System:
 - a. Edwards System Technology (EST).
 - b. Gamewell FCI.
 - c. Notifier.
 - d. Monaco.
 - e. Siemens.
 - f. Silent Knight.
 - g. JCI.
 - h. Bosch.
 - i. Cooper Wheelock.
 2. Manufacturer must have a service organization local to the project site.
- B. Submit request for substitution per Section 01 26 01, Contract Modification Procedures.
- C. All Equipment:
 1. UL listed as a product of a single manufacturer.
 2. Equipment must not be modified or installed to altered or void UL listing.
 3. Approved by authorities having jurisdiction.

2.02 FIRE ALARM CONTROL PANEL (FACP)

- A. FACP must perform operations as described in Fire Alarm System Operation:
- B. The fire alarm system must have 100-point minimum initiating device capacity with the capability to add additional minimum 100 initiating device control modules.

- C. Construction must be modular with solid-state electronics.
 - 1. An 80-character LCD display must display alarm, supervisory, and trouble signals.
- D. Keyboards or keypads must not be required to operation system during fire conditions.
- E. Provide required switches, relays, lamps, wiring terminals, etc. for complete operations supervising, control, and testing facilities for entire system.
- F. FACP must allow for loading or editing special instructions and operating sequences as required.
 - 1. System must be capable of on-site programming to accommodate and facilitate expansion, building parameter changes, or changes as required by local codes.
 - 2. All software operations must be stored in non-volatile memory inside the FACP.
- G. System must have provisions for disabling and enabling all circuits individually for maintenance and testing.
- H. System must be capable of logging and storing 300 events in history log.
 - 1. Events must be stored in battery-protected random access memory (RAM).
 - 2. Each recorded event must include time and date of occurrence.
 - 3. System must have capability of recalling alarms, supervisory conditions, trouble conditions, acknowledgements, silence, and reset activating in chronological order for recreating an event history.
- I. FACP must be listed under UL 864.
- J. FACP must be in enclosed metal panel.
 - 1. Mounting: surface.
 - 2. Finish: red enamel.
- K. Each addressable device must be represented individually in the FACP.
 - 1. Indicate trouble by discreet LCD readout for each supervised circuit.
 - 2. Indicate alarm by a discreet LCD readout for each alarm initiating device addressable device.
 - 3. Include individual supervisory and alarm relays in each circuit arranged so that ground or open conditions will not affect proper operation of other devices.

- L. FACP must include the capability to report alarm and trouble conditions via telephone lines to a third party alarm reporting service.
- M. FACP must include a system testing capability to help ensure zoning and supervision has been maintained.
 - 1. Actuation of enable walk must activate walk test mode causing the following to occur:
 - a. Third party reporting connection circuit must be disconnected or put in test mode with the central station.
 - b. Control relay functions must be bypassed.
 - c. FACP must display a trouble condition.
 - d. FACP must be capable of causing audible signals to activate for 2 seconds upon alarm activation of any initiating device.
 - e. FACP must automatically reset itself after code is complete.
 - f. Any momentary opening of alarm initiating or alarm indicating circuit wiring must cause audible signals to sound continuously for 4 seconds to indicate trouble condition.
 - g. Power supply:
 - 1) Power limited operation per NFPA 70 Article 760.
 - 2) 120V ac dedicated circuit from panel to integral 24V dc regulated power supply in FACP and battery charger.
 - a) The power supply must provide all panel and device power needs.
 - 3) Provide transient voltage surge suppression for the FACP for power and communication channels.
 - 4) Battery:
 - a) Low maintenance sealed type for fire alarm use with automatic battery charger.
 - b) The fire alarm system must have batteries capable of operating maximum normal loads of the system for 24 hours, and after 20 hours operate system under alarm condition.
 - c) Size batteries for the total maximum number of devices that can be connected to the FACP, not the number of installed devices.

2.03 INITIATING DEVICES

A. Addressable Manual Pull Stations:

- 1. Latching Pull Station:
 - a. Reset using key or special tool.
 - b. Non-coded.
 - c. Single action.

2. High impact red Lexan with operating directions in white letters.
 - a. Surface mount.
 3. Key stations to match FACP.
- B. Addressable detector base:
1. Detector and associated electronic components mounted in module that connects to a fixed base with twist locking plug connection.
 2. Plug connections must not require springs for secure mounting and contact maintenance.
 3. Terminals in the base must accept building wiring.
 4. Detector construction must have a mounting base with twist lock.
 5. Locking feature must be field removable when not required.
 6. Removal of detector head must cause a trouble signal at the FACP.
- C. LED with flash on FACP scan.
1. Steady LED on detector base indicating abnormal conditions.
- D. Each detector type must be verified on scan by FACP.
1. FACP must display “wrong device” or other message indicating the wrong type of device is installed.
- E. Addressable Smoke Detectors:
1. Photoelectric type.
 2. Self-restoring.
 3. Provide quantity and spacing per NFPA 72.
- F. Addressable monitor modules:
1. Provide addressability and supervision to initiating devices (tamper, flow switches).
 2. Wiring must be Class B.

2.04 NOTIFICATION DEVICES

- A. Horn Strobes:
1. Red tamper resistant weatherproof lens with 24V dc xenon strobe.
 2. Housing: Red with white “FIRE” lettering.
 - a. Surface mount.

2.05 WIRING

- A. Conduit: 1/2 inch minimum, metal tubing.
- B. Conductors:
 - 1. All wiring must be in conduit.
 - 2. Insulation type per NFPA 70, Article 760.
 - 3. 120 VAC and power supply, 12 GA minimum.
 - 4. Low Voltage General Alarm Circuits: 14 GA minimum.
 - 5. Low Voltage Initiating Circuits: 18 GA minimum.

2.06 SYSTEM OPERATION

- A. Activation of any alarm causing initiating device must cause the following:
 - 1. Horn strobe at exterior fire department connection.
 - 2. Alarm information displayed at FACP.
 - 3. Indicate device sending alarm signal.
 - 4. DACT must automatically sent alarm signal to central station.
- B. Lock alarm information display at panel until signaling device has returned to normal and FACP is reset.
- C. Activation of any trouble signal must cause the following:
 - 1. Trouble signal display at FACP.
 - 2. Indicate device sending trouble signal.
 - 3. DACT must automatically sent trouble signal to central station.
- D. Activation of any supervisory signal must cause the following:
 - 1. Supervisory signal display at FACP.
 - 2. Indicate device sending supervisory signal.
 - 3. DACT must automatically sent supervisory signal to central station.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install all fire alarm equipment and wiring in accordance with NFPA 72, local, and national codes.
- B. Install all wiring in raceways and all devices in boxes.
 - 1. Install raceways and boxes per Section 26 05 33, Raceway and Boxes.
 - 2. Fire alarm conduit must be red.
 - 3. All boxes must be red.

- C. Install all components as indicated and per manufacturer's wiring diagrams, instructions, and recommendations.
- D. Make all fire alarm wiring continuous from terminal to terminal or from terminal to device pigtail lead.
 - 1. Circuit splices not permitted.
 - 2. Wiring joints, only when required at device pigtail leads shall use insulated conical spring connector.
- E. Color coding is required for all fire alarm wiring.
- F. Detection devices must be protected during construction. Damaged devices must be replaced with new at no cost.
- G. Device mounting schedule:
 - 1. Manual pull stations: 48 inches above finished floor to operating handle.
 - 2. Notification devices: lens not less than 80 inches and not more than 96 inches.
 - 3. FACP: 72 inches to top of panel.

3.02 TESTING

- A. Provide services of factory-trained representatives of system manufacturers to supervise the installation and its progress, supervise final connections to equipment, and provide testing to assure system is in proper operating condition and conforms to applicable codes and standards.
- B. Entire system must test free of opens, grounds, and short circuits.
- C. Test system and provide documentation of acceptance by authorities having jurisdiction.
- D. Acceptance operational tests:
 - 1. Perform operation tests to verify system operation.
 - a. Each alarm initiating device must be tested.
 - b. Each device must be tested for alarm and trouble conditions.
 - c. Contractor must provide certification the system installation is complete, and all punch list items have been corrected.
 - d. Test operation of fire alarm system battery backup for durations per NFPA 72.
 - e. Test supervising station transmitter. Confirm receipt of signals at monitoring firm.
 - f. Test each notification device.
 - g. Test FACP.

2. Provide a minimum of 5 days' notice of acceptance testing performance schedule.
- E. Retesting: correct deficiencies found by testing and retest work until operation is confirmed code compliant and meets design specifications.
- F. Provide final test report and record of completion.
- G. Test system as required by authorities having jurisdiction to obtain certificate of occupancy.

3.03 CLEANING AND ADJUSTING

- A. Cleaning: remove paint splatters and other spots, dirt, and debris from all devices and panels. Clean only 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 pressure levels and control sensitivities. Provide up to three visits to the site for this purpose.

3.04 TRAINING

- A. Provide services of factory authorized technicians to demonstrate system and train personnel in operation.
 1. Train personnel in procedures and schedules involved in operating, troubleshooting, servicing, and preventative maintenance.
 2. Provide a minimum of eight hours of training.
 3. Schedule training a minimum of two weeks in advance.
 4. Provide documentation of training.

END OF SECTION