

SECTION 13851 - FIRE ALARM

PART 1 - GENERAL

SUMMARY

This Section includes fire alarm systems with manual stations, detectors, signal equipment, controls, and devices.

System Description: Noncoded, zoned system with manual and automatic alarm initiation; hard-wired for signal transmission, using individual circuits for each zone of alarm initiation and notification appliances.

DEFINITIONS

FACP: Fire alarm control panel.

LED: Light-emitting diode.

Definitions in NFPA 72 apply to fire alarm terms used in this Section.

SUBMITTALS

Product Data: For each type of fire alarm system component.

Shop Drawings:

Wiring diagrams. Detail wiring for power, signal, and control systems.

Identify terminals, wire designations, and wiring color-codes to facilitate installation, operation, and maintenance.

Indicate recommended types and sizes for field-installed system wiring.

Battery sizing calculations.

System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

Operating Instructions: For mounting at the FACP.

Field quality-control test reports.

Operation and maintenance data.

Certificate of completion.

QUALITY ASSURANCE

Installer Qualifications: A qualified installer and service technician, approved by the manufacturer.

Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

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Compliance with Local Requirements: Comply with applicable building code, local ordinances and regulations, and requirements of authorities having jurisdiction.

Comply with NFPA 72.

PART 2 - PRODUCTS

MANUFACTURERS

Manufacturers: Subject to compliance with requirements, provide products by the following:

Cerberus Pyrotronics.
Edwards Systems Technology; Unit of General Signal.
Faraday, Inc.
Federal Signal Corp.; Commercial Products Group.
Fire Control Instruments, Inc.
Fire Lite Alarms, Inc.
Gamewell Co. (The).
Grinnell Fire Protection Systems.
Harrington Signal, Inc; Fire Alarm.
Honeywell, Inc.
Notifier; Div. of Pittway Corp.
Protectowire Co., Inc. (The).
Silent Knight.
Simplex Time Recorder Co.

FUNCTIONAL DESCRIPTION OF SYSTEM

System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. Annunciate and display alarm, supervisory, and trouble signals regardless of priority or order received.

Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.

System Reset: Zones are manually resettable from the FACP after initiating devices are restored to normal.

Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and telephone lines.

System Alarm Capability during Circuit Fault Conditions: Comply with requirements of authorities having jurisdiction.

Loss of primary power at the FACP initiates a trouble signal at the FACP. The FACP indicate when the fire alarm system is operating on the secondary power supply.

Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a flame or heat detector, operation of a sprinkler flow device, or automatic alarm operation of a smoke, flame, or heat detector, or operation of a sprinkler flow device initiates the following:

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Notification-appliance operation.
Identification at the FACP of the zone originating the alarm.
Identification at the FACP of the device originating the alarm.
Transmission of an alarm signal to the remote alarm receiving station.

Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP.

Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

Water-flow alarm switch operation initiates the following:

Notification-appliance operation.
Flashing of the device location-indicating light for the device that has operated.

Sprinkler valve-tamper switch operation initiates the following:

A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
Flashing of the device location-indicating light for the device that has operated.
Transmission of supervisory signal to remote alarm receiving station.

MANUAL PULL STATIONS

Description: Fabricated of metal or plastic, and finished in red with molded, raised-letter operating instructions of contrasting color.

Single-action mechanism initiates an alarm.
Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.

SMOKE DETECTORS

General features include the following:

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

Ionization detector include the following features:

Responsive to both visible and invisible products of combustion.
Self-compensating for changes in environmental conditions.

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OTHER DETECTORS

Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate of rise of temperature that exceeds 15 deg F (8.3 deg C) per minute, unless otherwise indicated.

Mounting Provision for Heat Detectors: Adapter plate for outlet box mounting.

NOTIFICATION APPLIANCES

Description: Equip for mounting as indicated and have screw terminals for system connections.

Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 90 dB, measured 10 feet (3 m) from the horn.

Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

Rated Light Output: 75 candela, 15 candela in restrooms.

Strobe Leads: Factory connected to screw terminals.

CENTRAL FACP

Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure.

Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1 inch (25 mm) high. Identify individual components and modules within cabinets with permanent labels.

Mounting: Flush.

Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

Control Modules: Include types and capacities required to perform required functions of fire alarm systems.

Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

Indicating Lights and System Controls: Individual LED devices identify zones transmitting signals. Zone lights distinguish between alarm and trouble signals, and indicate the type of device originating the signal. Manual switches and push-to-test buttons do not require a key to operate. Controls include the following:

Alarm acknowledge switch.

Alarm silence switch.

System reset switch.

LED test switch.

Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

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EMERGENCY POWER SUPPLY

Battery Type: nickel-cadmium battery with a 20-year minimum life expectancy, charger, and an automatic transfer switch.

Battery Capacity: Comply with NFPA 72.

Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger recharges them completely within four hours. Charger output is supervised as part of system power supply supervision.

Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

DIGITAL ALARM COMMUNICATOR TRANSMITTER

Listed and labeled under UL 864 and NFPA 72.

Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

Self Test: Conducted automatically every 24 hours with report transmitted to central station.

WIRE

Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

Low-Voltage Circuits: No. 16 AWG, minimum.

Line-Voltage Circuits: No. 12 AWG, minimum.

Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

PART 3 - EXECUTION

EQUIPMENT INSTALLATION

Connect power to the FACP through a disconnect switch with lockable handle or cover.

Manual Pull Stations: Mount semiflush in recessed back boxes.

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Water-Flow Detectors and Valve Supervisory Switches: Connect for each sprinkler valve station required to be supervised.

Ceiling-Mounted Smoke Detectors: Not less than **4 inches (100 mm)** from a side wall to the near edge. For exposed solid-joint construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than **30 feet (9 m)** apart in any direction.

Audible Alarm-Indicating Devices: Install not less than **6 inches (150 mm)** below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

Visible Alarm-Indicating Devices: Install at each alarm bell or alarm horn and elsewhere as indicated. Mount at least **6 inches (150 mm)** below the ceiling.

Device Location-Indicating Lights: Locate in public space near the device they monitor.

FACP: Mount with tops of cabinets not more than **72 inches (1830 mm)** above the finished floor.

WIRING INSTALLATION

Wiring Method: Install wiring in metal raceway according to Division 16 Section "Raceways and Boxes." Conceal raceway except in unfinished spaces and as indicated.

Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by the manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

Cable Taps: Use numbered terminal strips in junction, pull and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

Wiring to Remote Alarm Transmitting Device: **1-inch (25-mm)** conduit between the FACP and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

IDENTIFICATION

Identify system components, wiring, cabling, and terminals.

Install instructions frame in a location visible from the FACP.

Paint power-supply disconnect switch red and label "FIRE ALARM."

GROUNDING

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Ground cable shields and equipment according to system manufacturer's written instructions to minimize ground loops, common-mode returns, noise pickup, cross talk, false alarm signals, and other impairments.

Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Division 16 Section "Grounding and Bonding."

FIELD QUALITY CONTROL

Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections, to supervise pretesting, and adjustment of the system and to assist in final system tests and demonstration.

Pretesting: Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Retest until satisfactory performance and conditions are achieved.

Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Minimum required tests are as follows:

Verify the absence of unwanted voltages between circuit conductors and ground.

Test conductors for short circuits using an insulation-testing device.

With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.

Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.

Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices.

Observe proper signal transmission according to class of wiring used.

Test each initiating and indicating device for alarm operation and proper response at the control unit.

Test smoke detectors with actual products of combustion.

Test the system for specified functions according to the approved operation and maintenance manual.

Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences.

Observe indicating lights, displays, and signal tones.

Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

Tag equipment, stations, and other components at which tests have been satisfactorily completed.

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DEMONSTRATION

Train Owner's maintenance personnel as specified below:

Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment.

Training Aid: Use the approved final version of the operation and maintenance manual as a training aid. Refer to requirements specified for maintenance manuals in Division 1.

ON-SITE ASSISTANCE

Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels, controls, and sensitivities to suit actual occupied conditions. Provide up to three requested visits to Project site for this purpose.

END OF SECTION13851