SECTION 28 31 10: FIRE ALARM & DETECTION SYSTEMS

1. GENERAL

A. This section applies to fire detection/alarm system and carbon monoxide system components and equipment installed during new construction or as part of any renovation and improvement project.

B. The fire alarm (FA) contractor must have a minimum of one National Institute for Certification in Engineering Technologies (NICET) certified Level III fire alarm technician as the lead technician for any project involving the installation of new or modification of existing fire alarm systems.

C. For renovations within existing facilities, and all new facilities verify that adequate 800 MHZ radio coverage is provided throughout the overall building via a survey performed by a licensed radio and communications system technician. Where coverage is found to be lacking and requires the installation of a booster antenna, the antenna and all associated power supplies shall be monitored and supervised by the fire alarm system per City of Providence ordinance.

D. Design of the FA systems requires submission of key information, at various design phase milestones, for review and approval by the project team. As the design progresses the information submitted shall be updated and revised to reflect the associated decision making process and design development. The information submitted shall include the following:

1. Basis of Design
2. Design Assumptions: Provide a list of the basic assumptions used when developing the fire protection systems design. Items to be included are the following:
    i. Types of fire protection systems in building, if any
    ii. Use and hazard classification for the building
    iii. New system, modification to existing system, replacement of existing system
    iv. For modifications to existing system, reuse of materials, verification of compliance and/or compatibility
    v. Reporting (municipally connected or local system)
    vi. Method used for reporting
3. Applicable Standards: Identify all applicable standards that will be used to identify the requirements for the FA project. This includes referenced design standards from the building and fire codes. Identify owner's insurance requirements.
4. Narrative Description of System Types: Provide a narrative description of the fire alarm, inclusive of the following:
    i. Design Responsibility: Who is responsible for the design of the system, and who is serving as the Engineer of Record
    ii. System Description:
        - System zoning
        - Equipment types, locations, and space requirements
        - Locations of protection: areas requiring special protection/detection and areas where protection will omitted
        - Notification type (horns vs. speakers)

- Location and types of exterior components (exterior beacons)

iii. Sequence of Operations Matrix showing system inputs and outputs
iv. System inputs and outputs
v. System Interfaces: Describe how the FA system interfaces with the other building systems (describe desired building system response from FA system interface).
vi. Preliminary list of equipment
vii. Safeguard During Construction: Identify if an existing system is to be impaired during construction and the applicable requirements. Identify who is responsible for documenting the impairment plan and presenting to the fire department.

5. Fire Alarm System Sketches: Provide schematic floorplans and one-line riser and interconnection diagram to graphically correspond to the information in the narrative report.

E. Manufacturers:
1. Fire alarm control units shall be Gamewell/FCI series E3; fire alarm system field devices as manufactured by, or listed as compatible with, by Gamewell/FCI; exceptions are only allowed for University properties where it is required to match existing installations from other system manufacturers to maintain UL system listings.
2. Fire alarm control units used for releasing services shall be Gamewell/FCI series E3, unless the E3 control unit is not listed or approved for that service.
3. Standalone-Type (Single Station and Interconnected Single Station Type) smoke detectors, carbon monoxide, combination smoke/carbon monoxide:
i. Manufacturer: Kiddie
ii. Provide with 10 year listed batteries
iii. Smoke Detectors Alarms shall be as manufactured by Kidde. Provide with 10 year listed batteries. Residential Halls to use photoelectric type smoke detector alarms

F. Power Supply: Provide all FACPs with twenty percent (20%) excess power supply, input circuit, and output circuit capacity at final acceptance to allow for future expansion

G. Occupancy classes (excluding 1,2,3 family residential structures): New fire alarm system to be addressable type. Modifications to existing systems to match existing system type and manufacturer. Any equipment that is installed or modified must be listed for the specific intended use by UL or another nationally recognized testing company.

H. Buildings requiring a municipal connection will be connected to the local fire department and Brown Public Safety via municipal connections as follows:
1. Each municipal alarm connection will be made using a Gamewell master box with a blank cover per Providence Fire Dept. requirements, mounted *inside* the building in close proximity to the fire alarm control panel. Master boxes use ¼ second timing.
2. For buildings equipped with a “Local Fire Alarm System” (not requiring a municipal connection) and for buildings with municipal connections which are not connected to the Brown Fire Alarm Loop, an IP-DACT (Ethernet-protocol Digital Alarm Communications Transmitter) and dedicated Ethernet jack shall be provided so that

fire alarm signals may be monitored at the Brown Public Safety Communications Center. Minimum conductor size is 12 AWG for power and lighting circuits

I. Provide manual override controls at the FACP (Fire Alarm Control Panel) for each of the following, where applicable, to allow for drills and testing of the fire alarm system:
   1. HVAC supply and exhaust fans
   2. Stairwell pressurization
   3. Smoke venting and smoke control systems
   4. Audio and visual alarm defeat for system testing purposes
   5. Elevator
   6. City master box
   7. Sprinkler flow sensors and tamper switches
   8. Security/door release service
   9. Fire shutter doors

J. Residential Room Smoke Detector Replacement:
   1. In all new residential buildings or residential buildings where comprehensive renovations are being performed, the individual room single station smoke alarms (or single station carbon monoxide alarms) will be replaced with system connected smoke detectors with sounder bases installed as described below.
   2. Review in Early Design Phase: Where system smoke detectors or system connected carbon monoxide detectors with sounder bases are used to meet the requirement for single station smoke alarms/carbon monoxide alarms in the individual rooms of a residential building, are to be connected to the building fire alarm control unit. If the system is connected to an IP DACT then the supervisory signal to be transmitted to the Brown Public Safety Communications Center.

K. For laboratory and research buildings, exhaust fans for fume hoods and lab spaces may need to be run at reduced capacity to maintain air quality inside the building per NFPA 45, while simultaneously avoiding excessive negative pressure concerns within the building.
   1. Fire alarm system designer to review ventilation system operation on fire alarm with the Office of Environmental Health and Safety (EH&S).

L. Linear Heat Detectors: Use of linear-style heat detectors to be limited to use in the following locations. For all locations, maximum circuit length per zone to be 200 ft:
   1. Within large, high-ceiling rooms or assembly spaces where wiring is not subject to damage from occupants or ongoing work within the space. Detection in these areas to be configured as an individual zone per space.
   2. For use as a temporary fire detection system within spaces undergoing renovation or construction.
   3. Within exterior, high ceiling locations where fire detection is required under roofs and other weather protection structures, where wiring is not subject to damage. Detection in these areas to be configured as an individual zone.
   4. Provide signage within all building mechanical, electrical and telecom rooms noting that linear heat detection wiring is installed within the building, and indicate the specific locations where it is installed.

M. Electromagnetic Door Holders: Supply circuits to be independent of fire alarm system power supply circuits; 120 VAC is preferred.

N. Detector Bases: Install on a standard 4" square or octagonal electrical outlet box.

O. Manual Pull Stations:
   1. "Double-action" type; provide pull stations that utilize the same key as FACP resetting.
   2. Surface or flush mount, installed with manufacturer's approved back box.
   3. Where directed by Brown vandal-resistant stations to include tamper-proof clear Lexan shield and frame and line-operated alert horn when activated.
   4. Tamper-proof Covers: Stopper II manufactured by STI, Safety Technology International, Inc.

P. Provide wall or ceiling mounting, flush or surface mounted, as required. Surface mount appliances to be installed on manufacturers approved factory-finished back boxes.

2. CARBON MONOXIDE ALARMS & DETECTION SYSTEMS

A. Only applies to residential buildings or spaces that have accessory sleeping containing fuel burning appliances)

B. All Other Facilities:
   1. In building with addressable fire alarm systems Carbon Monoxide detectors to be monitored by the building's fire alarm system
      i. CO alarms will generate a supervisory signal on the fire alarm control panel. A system trouble signal to sound on the local fire alarm panel in the event of tampering with any local detector. Detectors to receive their power from the building's fire alarm system.

C. Duct Smoke Detectors:
   1. Label duct work and direction of air flow and identify the proper locations for duct detectors
   2. Duct –mounted smoke detectors to be located upstream or sufficiently downstream to prevent nuisance alarms from any humidification grids mounted within the air handlers and associated ductwork. Refer to the manufacturer's installation instructions for guidelines for the location of duct detectors.
   3. Mount Duct smoke detector Remote alarm indicator and Test/Reset stations at 80" AFF in readily accessible areas, adjacent to or within sight of the duct detector. Group stations together where possible. Each station shall be labeled with each device

3. FIRE ALARM ACCESSORIES

A. Provide a lockable documentation storage cabinet at or adjacent to (within five ft. of) the FACP, for storing and securing all documents required for fire alarm system maintenance and response, building floor plans, emergency response materials, MSDS sheets, etc. Storage shall be separated from all active electrical, electronic, or electromechanical parts and components. If adequate, storage may contain unconnected spare/repair parts.
   1. Storage cabinet to be keyed to match fire alarm system

B. Knox Box®:
   1. Provide in an agreed upon location for each building
   2. Use Knox-Box® 3200 Series Lift-Off Door Models

C. Identification/Labeling
   1. Provide engraved nameplates for FACP, remote annunciators and power supplies. The plate shall contain:
      i. Equipment identification, the building or area served, as well as power circuit source and breaker number.
      ii. Provide type-written directories for all equipment controls and indicators.
   2. Provide computer-generated adhesive labels to indicate the device address/ notification appliance circuit and install on the bases of all initiating device and notification appliances, as well as any remote test and monitoring stations. The labels must be legible from a standing position below.

4. WIRING

A. All wiring to be run in minimum ¾" metal raceway with steel, not cast-type, couplings and box connectors.

B. "Red-MC" cable, rated as FPLP and 2-hour fire rated for penetrations by UL is allowed for use above accessible hung ceilings, and in walls accessible via adjacent hung ceilings only. Where type "Red-MC" Cable is utilized, UL listed type MC. Cable connectors with insulated bushings and screw type cable attachments shall be used.

C. Interconnection cable for wiring of municipal master box circuits shall be IMSA-rated, 4/C # 14 AWG solid copper wire. Wiring to be installed in dedicated fire alarm conduit within buildings, or in a dedicated telecommunications duct when run underground.

5. SUBMITTALS & DOCUMENTATION/TURNOVER MATERIALS

A. Submittals: Submit the following documents for reference and/or approval:
   1. Product Data:
      i. Full equipment list including model numbers and quantities.
      ii. Compliance data indicating that all proposed field devices are FM approved or UL listed with the proposed fire alarm panels.
      iii. Highlighted Data Sheets on Devices & Products:
         - Fire Alarm Control Panel
         - Batteries
         - Automatic Detectors
         - Manual Stations
         - Audible Signaling Devices
         - Visual Signaling Devices
         - Control Devices
         - Wiring
   2. Shop Drawings: Submit project –specific shop drawings (for all engineered fire alarm and CO detection systems) including but not limited to:
      i. Fire Alarm Panel Schematics: Include detailed fire alarm and remote annunciator (where applicable) front panel elevations showing all major control devices, zone assignments (where applicable) and identification labels, as well as general locations of all interior modules and components.

ii. Diagrams indicating the interconnection of the various panels, modules, field devices, and major junction boxes. Include relevant information detailing the number of circuits, type of devices, number of devices, number of conductors, conduit sizes, and system zone information.

iii. Wiring diagrams for all fire alarm system device connections and interfaces to other building systems such as: HVAC motor starters, magnetic door holders, sprinkler system supervisory valves, lighting and public address system interfaces, door security system interfaces, elevator capture, etc.

iv. Scaled floor plans, detailing the layout of all fire alarm devices, including initiating and notification devices, Linear Heat Detection circuit routing, other building systems interfacing with the fire alarm system. For zone-type systems, clearly identify zoning on plans.

v. For speaker devices, include wattage setting for each speaker labeled adjacent to the speaker.

vi. For visual devices, include Candela rating for each strobe adjacent to the strobe.

3. Installation and operating instructions for all equipment.

B. Documentation/ Package including the following:

1. Complete, updated "As-Built" Submittal and As-Built Drawing information denoting all of the completed and installed system information.
2. Copies of all completed systems acceptance test reports including operation confirmation of all interfaced systems (elevators, etc.)
   Refer to 01_17_71 Project Turnover Requirements
3. Final fire alarm system program and database (where applicable) information, including description of system logic strings, control by event programming, and point identification labels, provided both on CD and in printed form. Include programming manual suitable to allow for the ready understanding, operation and program editing of the fire alarm panel program.
4. State of Rhode Island or NFPA 72 certification form