

283100 FIRE ALARM AND DETECTION SYSTEMS

Cornell's Design and Construction Standards provide mandatory design constraints and acceptable or required products for all construction at Cornell University. These standards are provided to aid the design professional in the development of contract documents and are not intended to be used verbatim as a contract specification nor replace the work and best judgement of the design professional. Any deviation from the Design and Construction standards shall only be permitted with approval of the University Engineer.

PART 1: GENERAL

1.01 RELATED CORNELL DESIGN AND CONSTRUCTION STANDARDS

- A. Section 260500 – Basic Electrical Requirements

1.01 QUALITY ASSURANCE

- A. The integrated fire alarm system including all equipment, components, and accessories shall be UL listed for the purpose for which the equipment, components, and accessories are used. Factory Mutual (FM) systems are preferred.

1.02 FIRE ALARM SYSTEM DESIGNER REQUIREMENTS

- A. The design of **all** fire alarm system renovations and new fire alarm and detection systems shall be performed by a qualified individual certified as either a National Institute for Certification in Engineering Technologies (NICET) Fire Alarm Systems Level III (minimum), or as a Licensed Professional Engineer.
- B. Consultant shall provide credentials of the Designer of Record to Cornell University (CU) representative at System Design Planning meeting.

1.03 SYSTEM DESIGN

- A. For **all** fire alarm system renovations (such as fire alarm panel revision or replacement) and new system designs, consultant shall engage Cornell University’s Facilities Engineering (FE) and Environment, Health & Safety (EHS) to determine overall scope of the work before commencing design.
- B. Coordinate the following system design elements with representatives from CU FE and EHS:
 1. List applicable Codes and Standards with Editions used in the system design, including applicable versions of Building Code, Fire Code, NFPA 72, NFPA 70, and Elevator Code. Identify Building Occupancy Type.

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2. Type of fire alarm system (addressable; conventional hardwired zone); connection method and type to supervising station, i.e., Digitize.
 3. Wiring class for initiating notification and signaling line circuits.
 4. Notification methods (horns or speakers).
 5. Fire alarm control panel (FACP) and annunciator(s) location(s).
 6. Fire command center location (where required by Code).
 7. Special systems considerations (fire pumps, elevators, atrium smoke purge, large area detection schemes).
- C. Drawings and Specifications shall include all requirements for Submittals and for As-built information (see Section 1.08, Project Close Out).

1.04 SUBMITTALS

- A. To ensure compliance with the intent of this standard, all new fire alarm and detection system final designs shall be reviewed by CU Facilities Engineering (FE) and Environment, Health & Safety (EHS). All new fire alarm and detection system contractor submittals shall be reviewed by CU Environment, Health & Safety (EHS).
- B. One (1) copy of each new project fire alarm system submittal shall be sent to CU EHS for review and comment prior to releasing final consultant approved submittals to the Contractor. Submittals shall contain the following information:
1. Product information for all installed components.
 2. System riser diagram with typical equipment and device connection and labeling; NOTE that a detailed system/device wiring diagram is NOT required until the completion of the project (as a complete “As-built”).
 3. Wire color coding table and/or schedule.
 4. System battery stand-by calculations.
 5. Special system requirements (voice evacuation, interlocks with other systems such as air handler shutdown, smoke purge, fire pump, generator, etc.).
 6. System labeling materials and methods as described in this section.
 7. Refer to CU Design and Construction Standard 260500 – Basic Electrical Requirements for additional submittal requirements.

1.05 SYSTEM DESCRIPTION

- A. Supervising Station Connection
1. A Digitize Systems, Inc. Supervising Station monitors Cornell University’s Ithaca central campus fire alarm main control panels (FACPs). The system is listed for use as a supervising station per NFPA 72, Chapter 8.
 2. Existing zone style FACPs tie into the Supervising Station via a dedicated copper communication line in the building and a reverse polarity module in the FACP.

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- 3. New installations of addressable style FACP's shall be tied into the Supervising Station via a dedicated copper communication line in the building and a Digitize Systems, Inc. "Mux Pad." Where the length or condition of the phone line prevents the use of a mux pad then a Digital Dialer (DDI) shall be incorporated into the design.
- 4. Phone lines required for a mux pad or reverse polarity shall be one dedicated copper pair. Phone lines required for a DDI shall be two regular phone lines, one dedicated to the fire alarm and one general purpose line.
- 5. It is the responsibility of the installing contractor to pay the costs associated with providing and installing the "Mux Pad" or "DDI" station, including interconnecting cabling and conduit from the FACP as described in this standard. Contractor shall coordinate with Cornell Fire Alarm Techs for final connection and programming of mux pad/central console.

B. Fire Alarm System General Design

- 1. New systems shall be of the 24-VDC point-addressable, closed-circuit design type unless otherwise coordinated with CU FE and EHS.
- 2. For New Building construction, provide area smoke detectors that are connected to the fire alarm system in mechanical equipment rooms, electrical and transformer rooms, generator rooms, telephone/data equipment rooms, elevator machine rooms and elevator lobbies in all buildings. This would be bare minimum coverage for a fully sprinklered building unless more coverage is required by the NYS Bldg. Code.
- 3. For projects that are classified as an Alteration Level 3, Change of Occupancy or an Addition, the fire alarm and detection system devices shall be provided as required for new building construction. This would also be the bare minimum coverage for a fully sprinklered building unless more coverage is required by the NYS Bldg. Code.
- 4. It is preferred that all new fire alarm systems be provided with voice/alarm communications systems and shall be designed in accordance with NFPA 72. A discussion should be held with CU FE & EHS prior to or during the design development phase to determine if a voice evacuation system is warranted.
- 5. There shall be only one fire alarm control panel per building complex at the completion of a project. Multiple fire alarm panels are unacceptable. "Cross-tripping" of panels (the method of sending general trouble and alarm conditions from one FACP to another and receiving the conditions with fire alarm modules at the FACP that will report conditions to the supervising station) is

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unacceptable. The exception for cross tripping is when an existing panel is being replaced, and the fire alarm system must remain in operation while the devices and circuitry are being reconnected to a new fire alarm control panel (for continuity of service).

- 6. Where suppression release systems are required, the use of the main fire alarm control panel is preferred if listed for releasing. When a release panel is necessary, the release panel trouble and alarm conditions shall be monitored by the FACP. Conditions monitored (at minimum) shall include trouble, pre-alarm, and discharge.
- 7. Notification appliance circuits shall be of the Class A type or installed as Class ‘B’ on alternating circuits if approved by CU EHS (every other device connected to same cabling) such that the loss of one circuit shall not result in the area losing complete audible/visual notification.

Note: In BCNYS type ‘R’ occupancies, provide two (2) Class A notification appliance circuits (minimum) per building floor with circuiting connected to alternating devices to provide redundancy of coverage.

- 8. Initiating circuits and signaling line circuits shall be of the Class B type except in Class R2 occupancies (i.e., dormitories, sorority, and fraternity houses, etc.) that shall be of the Class A type. See further description in Section 2.07. B.
- 9. Provide generator status condition monitoring (“generator trouble”, “generator alarm”, “generator run” and “generator not in auto”). This shall be accomplished by providing individual fire alarm monitor modules for each condition at the generator main control panel; interface with generator relays as required.
- 10. Low-temperature condition monitoring shall be provided as a separate trouble at the FACP (to indicate if building’s ambient temperature drops below 40°F) in buildings that are equipped with fire sprinklers but are not provided with Cornell University steam.
- 11. Designs shall include provisions for the installation of temporary heat detection in construction areas as required by EHS and the authority having jurisdiction (AHJ). Design documents shall phase the installation and commissioning of new work to accommodate this requirement.
- 12. Where smoke detection is installed in a facility prior to final completion and occupancy, devices shall be tested and checked for listed sensitivity by fire alarm distributor and list provided to EHS for confirmation. The installing contractor shall clean or replace devices that do not meet said sensitivity at no cost. Design documents shall include language on the construction documents

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for this scope as required.

- 13. Refer to Building Code/Fire Code of New York State (BCNYS/FCNYS) for specific guidance on single or multi-station smoke alarm installations near cooking appliances and bathrooms in Class R2 occupancies.
- 14. All fire alarm system designs shall include floor plans with device layouts, a diagrammatic fire alarm system riser diagram, any applicable installation details and installation elevations/views.

C. Fire Alarm System Operation and Performance

- 1. System operation and performance shall include, but not be limited to, the following features conforming with the latest edition of NFPA 72 adopted by the Building Code of New York State (BCNYS):
 - a. Manual alarm initiation.
 - b. Automatic alarm initiation.
 - c. Activation of alarm notification appliances.
 - d. Activation of fire safety functions.
 - e. Activation of fire suppression systems.
 - f. Monitoring of abnormal conditions in fire suppression systems.
 - g. Monitoring generator status where the fire alarm panel or fire pump is powered by a generator.
 - h. Processing monitoring supervisory signals.
 - i. Enabling emergency voice/alarm communications.
 - j. Activation of off-premises signals via the “Mux Pad”, “DDI”, “Cellular” or “Reverse Polarity”.
 - k. Supervision of automatic fire pumps and special service pumps in accordance with NFPA 20, *Standard for the Installation of Centrifugal Fire Pump*, latest edition adopted by BCNYS.
- 2. Activation of manual or automatic alarm initiating devices shall cause, but not be limited to, the following action or effects:

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- a. Activation of alarm notification appliances.
- b. Activation of fire safety functions (i.e., elevator recall, operation of smoke/fire doors, smoke dampers, fan control, etc.)
- c. Activation of emergency voice/alarm communications.
- d. Transmission of alarm signal by reverse polarity, Cellular, Digitize, Inc. “Mux Pad” or “DDI” to the Supervising Station.
- e. Indication of alarm condition including the device, zone, or location from which the alarm condition was activated by alpha-numeric display at main fire alarm control panel, remote annunciators, and the Supervising Station.
- f. Activation of a duct smoke detector shall shut down its associated air handler and provide a supervisory trouble were permitted by the authority having jurisdiction.
- g. Control of the air system as the function of a fire alarm device shall be exclusively by the FACP. Building automation system control is NOT permitted unless it is UL 864 UUKL as referenced by BCNYS/FCNYS.

1.06 SYSTEM COMMISSIONING

- A. Fire Alarm program list to be provided to EHS for review and approval prior to release to the fire alarm vendor. This effort is to allow for the fire alarm device descriptors and room numbers to be coordinated prior to input into the fire alarm panel, as well as to verify the programming and operational sequence.
- B. Acceptance testing:
 - 1. Provide minimum (72) hours prior notice to EHS and AHJ.
 - 2. Complete and submit Program sheets to EHS.
 - 3. Ensure that the system is pre-tested.
 - 4. Contractor to provide all testing equipment.
 - 5. Smoke detectors shall be tested by smoke.
 - 6. Rate-of-rise heat detectors shall be tested by heat.
 - 7. Fixed temperature detectors shall be tested by shorting alarm contacts.
- C. Coordinate specified duration of fire alarm training based upon the final FACP selection. Note that CU Fire Alarm technicians are factory trained in most fire alarm systems and require minimum training unless a new panel technology / platform is being introduced by the manufacturer. Currently, Gamewell FCI E3 and Edwards

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EST-3 are the main addressable fire alarm control panels installed at Cornell University.

- D. Design documents shall include a requirement for two reprograms of the system by the Manufacturer’s Representative after the panel has been accepted by Cornell University’s Environment, Health & Safety at no additional cost, charge, or fee to Cornell University.

1.07 CONTRACTOR REQUIREMENTS

- A. The Contractor providing the fire alarm and detection system shall be licensed per Article 6 D of the New York State General Business Law.
- B. The Contractor is required to provide a complete set of As-builts within 15 days of final Acceptance Test.

1.08 PROJECT CLOSE OUT

- A. At completion of the project, the Project Manager shall be provided a complete set of fire alarm “As-built” drawings that includes but is not limited to the following information prior to the closeout of the project. “As-built” information shall comply with NFPA 72 requirements, the latest edition adopted by the NYSBC in effect at the time of the project. Project Manager will ensure these documents are delivered to Facilities Inventory Group for archiving.
 - 1. Fire alarm control panel and Annunciator(s) locations.
 - 2. Auxiliary panel (voice/speaker amplifiers; supplemental notification appliance circuit (SNAC) panels and power supplies) locations.
 - 3. Initiation and notification device, relay, and control module locations.
 - 4. Special systems interface locations.
 - 5. Complete fire alarm riser diagram that depicts wiring between FACP and all fire alarm system components. Such detail shall include all major equipment and their locations (approved room number designation), zone/loop wiring connections to initiating devices, SNAC wiring to notification appliances, and interconnections to other special systems as designed per this standard.
 - 6. Circuit breaker locations for all fire alarm panels and accessory panels that receive building power. Locations shall include room number in which the power panel is located, as well as the breaker number that serves the equipment. Circuit breakers to all fire alarm equipment shall be labeled in red and have a lock out installed on them to prevent accidental power shutoff.

PART 2: PRODUCTS

2.01 SUPERVISING STATION CONNECTION

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A. Digitize “Mux Pad”

1. The Project shall confirm the need for the installation of the Digitize “Mux Pad” with Cornell University EHS early in the design phase based upon the System Planning Meeting. Generally, if the system is located on the central campus and the FACP is addressable type, a Mux Pad will be required, allowing for point identification of a facility fire alarm condition.
2. The Digitize “Mux Pad” shall be furnished and installed by the Contractor. Equipment can be purchased through the local fire alarm representative; contact West Fire Systems, Rochester, NY.
3. A space clear of any other equipment, 24" square adjacent to the main fire alarm control panel is required for the “Mux Pad.” The “Mux Pad” will be mounted at 60" AFF to the center of the device in a dedicated enclosure, and within (5) feet of the fire alarm control panel.
4. Cornell University’s EHS and Fire Alarm Technicians shall perform the associated final connections to the fire alarm control panel and communication lines.
5. Digitize “Mux Pad” conduit system shall be included in the Contract Documents as part of the Electrical Contract as follows:
 - a. One 3/4" conduit with nylon dragline from each Mux Pad to designated Cornell University System 85 communication cabinet. Cabling will be installed and connected by Cornell University.
 - b. One 3/4" conduit and Digitize Mux Pad interconnecting cable (contractor to purchase from manufacturer) between FACP and the Mux Pad. Cable should be factory pinned for proper fire alarm panel to be connected.

B. Reverse Polarity Connection

1. Where reverse polarity is deemed adequate for reporting fire alarm conditions to the supervising station by EHS, design documents shall include the installation of (1) one 3/4" conduit with nylon dragline from fire alarm control panel to designated Cornell University System 85 communication cabinet. Cabling will be installed and connected by Cornell University.

C. Costs, charges, and fees associated with the installation and connection of any leased telephone lines shall be included in the Contractor’s invitation-for-bid proposal.

D. Contractor to provide a Digital Dialer (DDI), Model GFCI M/N 411UDAC UL. Final Connections will be made by the Cornell Electric Shop. Consult with Cornell

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Facilities Engineering for design direction.

- E. Cellular Communications to be reviewed with CU FE & EHS during design development phase to determine if this is warranted.
 - 1. Design basis - StarLink Fire SLE-LTEVI-FIRE Dual Path Communicator, Cellular &/or IP, connected, ABS. Low current draw, powered by control panel. UL and NFPA 72 Fire Code-Compliant, Wireless Commercial Fire Alarm Dual Path Communicator with universal support for any brand 12V to 24V fire alarm control panel, reporting in Contact ID and 4/2 (4-digit account number and sends a 2-digit alarm code).
 - 2. Design basis - StarLink Fire SLE-LTEVI-FIRE Dual Path Communicator, Cellular &/or IP, connected, ABS. Low current draw, powered by control panel. Design basis - StarLink Fire SLE-LTEVI-FIRE Dual Path Communicator, Cellular &/or IP, connected, ABS. Low current draw, powered by control panel.

2.02 FIRE ALARM SYSTEM CABLING

- A. Conductors for conventional hardwired system, initiating device circuits shall be #18 AWG (minimum) stranded THHN copper unless otherwise recommended by the manufacturer for the application. Conductors for signaling line circuits (i.e., multiplex systems) shall be as recommended (minimum) by the manufacturer.
- B. Conductors for notification appliance circuits shall be #14 AWG (minimum) stranded THHN copper. Size to accommodate voltage drop.
- C. Refer to the latest BCNYS adopted version of NFPA 70 (NEC) for further requirements related to fire alarm cabling, specifically Article 760 – Fire Alarm Systems. Code may require the use of specific cable in certain applications such as for circuit integrity.

2.03 FIRE ALARM SYSTEM PATHWAYS

- A. Initiating, notification, signaling, and other fire alarm system circuits and wiring shall be installed in a separate and independent conduit system from other system circuits. Notification Appliance Circuits (NAC) shall be installed in a separate and independent conduit system from Signal Line Circuits (SLC) to avoid any crosstalk.
- B. It is imperative that life safety cabling be protected from physical damage and from interference/cross communication with other system cabling (i.e. building automation system, telecommunications, and AC circuits).
- C. Label all pathways as described in this standard.

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2.04 FIRE ALARM CONTROL PANEL

A. Control Panel Enclosure

1. Enclosures shall be of the heavy-gauge, galvanized steel, dead-front construction with keyed, lockable panel cover type. All accessory panels (SNAC, amplifiers, etc. shall be keyed to match the FACP lock).
2. Enclosures, panel covers, and trim rings shall be of surface, semi-flush, or flush-mounted design type, and assembled with tamper-proof screws. Panel shall be surface-mounted when installed in nonpublic spaces such as mechanical rooms, electrical rooms, and closets. Panel shall be flush mounted when installed in public spaces such as lobbies and corridors. Colors of enclosures shall match where they are installed in the same area.
3. A Fire Alarm Document Box shall be installed to store a record of the installed software and firmware version numbers along with any fire alarm system documents as needed for the specific site. The Document Box shall be installed at the location of the FACP.

B. Control Panel Features

1. System operating hardware including, but not limited to, the system control unit, power supply unit, keyboard display unit, addressable loop unit, annunciator boards, relay boards, dual signal units, zone coder units, remote annunciator units, and other system components shall be of the solid state, plug-in module design type.
2. System operating hardware shall be functionally expandable by installing additional solid state, plug-in modules (Note: the installation of additional plug-in modules shall not require the replacement of existing equipment, components or accessories).
3. System operating software, system configuration, and plug-in modules shall be programmable via front panel user switches or computer program.
4. Soft-key programming provided to disable the following: Activation of soft keys shall produce one trouble only per soft key on the FACP.
 - a. Audible circuits
 - b. Central station tie connection
 - c. Auxiliary functions such as door holders, gas valves, air handlers, pre- action sprinkler systems

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- d. Key/button to conduct monthly alarm test without impacting system functions only sends alarm condition to central console; does not perform any alarm functions
- 5. Front panel user switches including, but not limited to, alarm and trouble acknowledge, alarm and trouble silence, alarm and trouble reset, drill, bypass, municipal connection, walk-test, circuit disable, relay control, on-board trouble-shooting diagnostics, lamp test, and other switches as required by NFPA 72.
- 6. Annunciation lights (i.e., LED's) shall be supervised and of the push-to-test, lock-in, manually reset, tamper-proof type for system alarm, system trouble, and main system operating power (Note: one yellow LED to indicate individual zone trouble and one red LED to indicate individual zone alarm shall be provided per zone).
- 7. Programmable alarm verification shall be provided for automatic smoke detection devices.
- 8. Ground-fault indication shall be provided for both positive and negative lines in initiating, notification, and signaling line circuits.
- 9. Control panels shall be provided with alarm circuits and indicators to indicate sub-, main-, or multiple-processor failure.
- 10. Control panels shall include an emergency operating feature that operates the fire alarm system including, but not limited to, equipment, components, and accessories in a general alarm configuration in the event of sub-, main-, or multiple-processor failure.
- 11. Control panels shall include a full duplex RS-232 serial interface port to provide output to a Digitize "Mux Pad."
- 12. Filtered power source shall be provided for zones to operate smoke, heat, and duct detectors.

2.05 POWER SUPPLIES

A. General

- 1. The fire alarm control panel, auxiliary equipment and associated battery backup power supplies shall be provided and include the following features:
 - a. 110/220 or 120/220 VAC input (power source breaker shall be red in color to identify it as part of the fire alarm system with a breaker lock installed);

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- b. Sufficient power capacity to operate existing system and 25% expansion of system equipment, components, and accessories;
 - c. Transient suppression of input, output, and municipal connection circuits. This shall include input surge suppression on all equipment connected to 120 VAC standby power, which supplies 24 VDC for fire alarm functions. Equipment includes FACP, SNAC panels, and amplifiers. This requirement is generally due to the impact of routine testing of facility generator(s) and transfer switch(s). Typical model number is Di-Tech DTK-120HW.
- 2. Built-in solid state, dual-rate battery chargers shall be provided to maintain back-up batteries at peak power for supervisory and operating conditions during main power outages.
 - 3. Automatic transfer of system power supply to battery back-up power supply in the event of a primary power supply failure.

B. Battery Back-Up Power Supply

- 1. Batteries shall be of the sealed, lead-acid type.
- 2. Batteries shall be capable of providing operating and supervisory power to meet the requirements of NFPA 72, as required by the latest adopted version of the Building Code of New York State (BCNYS).
- 3. Batteries shall be capable of providing operating power to operate alarm signals after the above minimum required amount of time has elapsed to meet the requirements of NFPA 72, latest edition adopted by the Building Code of New York State (BCNYS).
- 4. Batteries shall be mounted in the main control panel enclosure or in a separate enclosure of similar type to the main control panel.
- 5. The Engineer of Record shall provide battery calculations to Cornell University’s FE Electrical Engineer and to EHS during the submittal process and at the completion of the project.

2.06 REMOTE ANNUNCIATOR PANEL

- A. Remote annunciator panel operation and features shall be similar to the main control panel operation and features.
- B. Remote annunciator panel enclosures shall be similar to the main control panel enclosures, panel covers, and trim rings. (Note: Keyed locks for remote annunciator

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panels shall be keyed the same as the main control panel.) However, this panel shall be flush-mounted unless approved for surface-mounting by the Architect of Record.

- C. Lettered identification plates for remote annunciator panels shall be similar to lettered identification plates for the main control panel.

2.07 INITIATING DEVICES

A. Manual Pull Stations

- 1. Manual pull stations shall be of the non-coded, double-action type.
- 2. Keyed, latching covers of the automatic reset type shall be provided. (Note: Keyed locks for manual pull stations shall be keyed the same as the main control panel.)
- 3. Manual pull station housings and doors shall be red in color unless otherwise approved by Cornell University EHS (Note: Manual station and wall shall be contrasting colors as required by NFPA 72).
- 4. Coordinate the installation of tamper-resistant (i.e., Lexan) covers with EHS. All covers will need to be listed for use with the specific device.

B. Smoke Detectors – Spot Type

- 1. Smoke detectors shall be of the low profile, solid state, photoelectric or ionization type and shall be compatible for use in addressable, zoned, and combination addressable and zoned systems.
- 2. Smoke detectors shall be compatible for use in Class A and Class B circuits. (Note: Special power supplies or compensating devices shall not be required for smoke detectors to properly operate in circuits containing other Class A or Class B initiating devices.)
- 3. Smoke detectors installed in type “R” occupancies shall meet the requirements of the appropriate NYSBC requirement. Installation beyond these requirements shall be as follows:
 - a. Smoke detectors serving sleeping rooms shall include a sounder base and shall be 24 volt DC. Where sprinkler coverage is not provided within the room the device shall have an integral thermal sensor connected to the fire alarm system.
 - b. Power to the detector shall come from the main fire alarm control panel (FACP) or supplemental power supply and shall be supervised to indicate a

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“trouble condition” if power is lost anywhere on the loop.

- c. Removal of the device shall create a trouble condition on the fire alarm panel.
- 4. Dedicated smoke detectors that control smoke hatches, smoke/fire doors, and other similar type emergency equipment shall be located within the immediate vicinity of the controlled equipment.
- 5. Smoke detectors shall not be installed in areas where false or nuisance alarms may occur.
- 6. Provide smoke detector above the FACP and other locations such as remote nodes, power supplies, nac panels, etc as required by NYSBC/NYSFC.

C. Smoke Detectors – Duct Type

- 1. Duct smoke detectors shall be provided with air duct detector housings and remote indication, test, and reset stations (Note: Duct detector housing shall be compatible for use with ionization type smoke detectors in Class A and Class B circuits).
- 2. Test/Reset indicator stations shall be mounted at 80" AFF in readily accessible areas, adjacent to or within sight of the duct detector. Stations shall be grouped together where possible and shall be labeled with each device served. All locations shall be verified with EHS.
- 3. Use of “no flow” style smoke detectors within duct work shall be allowed if UL and FM approved. Devices shall be monitored by the fire alarm for placement supervision and activation (supervisory condition). If power other than that being provided by the FACP is used, then the power must be supervised to ensure it is at the detector. These are not preferred and should only be a last choice if normal duct detection will not work. They shall only be used upon approval from CU FE and EHS.

D. Smoke Detectors – Other Types

- 1. The use of other type of smoke detection, including beam detection, air sampling (i.e. VESDA), and video imaging is allowed based upon building construction and installation conditions.
- 2. Engage CU FE and EHS to review specialty installations early in the system design process.

E. Heat Detectors

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1. Heat detectors shall be of the low profile, solid state, fixed temperature or dual-action combination fixed temperature/rate-of-rise type and shall be compatible for use in addressable, zoned, and combination addressable and zoned systems.
2. Heat detectors shall be compatible for use in Class A and Class B circuits.
3. Dual action heat detectors shall be provided with spring-contact type, fixed temperature, and self-restoring type rate-of-rise features.

F. Carbon Monoxide Detectors (CO)

1. Coordinate the design of code required carbon monoxide devices and the interface with the fire alarm system with Cornell University EHS.
2. Carbon Monoxide Detectors shall be installed in new buildings per NYSBC, and in existing buildings where required by local laws and the AHJ.
3. Where a fire alarm infrastructure is already in place, carbon monoxide (CO) devices shall be 24 VDC detectors powered by a dedicated, supervised circuit. Removal of the CO detector shall cause a trouble signal at the fire alarm control panel (FACP). Activation of device shall result in a supervisory signal at the FACP.
4. Where a fire alarm infrastructure is not available, CO detectors shall be provided using a 120VAC device (with battery backup) as the preferred option. A battery operated CO detector is acceptable when 120VAC is not feasible.

2.08 NOTIFICATION APPLIANCES

- A. Notification appliances shall be of the solid state, audible, visible, or audible/visible type and shall be compatible for use in addressable, zoned, and combination addressable and zoned systems.
- B. Notification appliances shall be compatible for use in Class A and Class B circuits.
- C. Notification appliance housings shall be red or white in color unless approved by CU EHS (Note: The device and wall shall be contrasting colors as required by NFPA 72).
- D. Coordinate mounting heights of notification devices in all areas with NFPA 72. Note that strobe locations vary by manufacturer; pay close attention to this detail during design phase to accommodate all types and avoid rough-in problems and non-compliant devices.
- E. Visible notification appliances

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1. Visible notification appliances shall be of the high-intensity, strobe type and output as required by Code.
2. Visible devices shall be synchronized to flash at the same time.
3. Visible notification devices shall contain multi-candela, field selectable setting. Design shall include device candela ratings on the bid documents.
4. Provide exterior (waterproof) 110 candela strobe at facility to indicate a fire alarm condition. Coordinate location and height with EHS and authority having jurisdiction.
5. Where visual notification devices are used for sleeping areas the strobe intensity shall meet the requirements of the applicable NFPA 72 standard as referenced by NYSBC.

F. Audible Notification Appliances

1. Horn type Appliances:
 - a. Horn type audible notification appliances shall be programmed for temporal three tone output.
 - b. Provide device with field-adjustable sound control and output per NFPA 72, latest edition adopted by BCNYS. (Note: Field sound level testing to be performed only by Cornell University’s Environment, Health & Safety Department. Sound level adjustments to be performed by installing contractor.)
 - c. In addition, conform to NFPA 72 (latest edition adopted by BCNYS) requirements for sleeping room notification sound levels at each sleeping room pillow. Consider the installation of supplemental notification devices in these areas to ensure that sound levels are achieved.
2. Speaker Type Appliances:
 - a. If a voice/speaker system is required or part of the design, Cornell University FE Electrical Engineer and EHS shall be notified during the schematic design phase of the project. In addition, consideration for installations other than where voice systems are code required (i.e. high-rises, assembly space) shall be discussed at the System Planning Meeting. Voice systems should be considered on new installations.
 - b. Designer shall review the audibility of speaker systems to ensure that

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voice messages can be distinctly heard by building occupants. Audibility shall be considered as the acceptable volume and clarity of a voice message within a facility.

- c. Design shall assume that the default speaker tap setting is set at 1 watt. Include language that the final tap settings (from ¼ to 2 watts) will be field set during final commissioning, based upon message audibility.
- d. Criteria for adding a Remote Microphone to allow building occupants to use the amplifiers, speakers and wiring of the emergency voice system for general announcements shall be as follows. Review of such work/system shall be approved by Cornell EHS Fire Protection Service Manager before work is allowed.
 - 1) The system must be engineered by a licensed electrical or fire protection engineer to ensure there is no disruption to the fire alarm or emergency voice system when in use. Any UL listings must be maintained.
 - 2) The microphone used for general announcements must be in a separate control panel and no switches that may affect the operation or supervision of the emergency voice or fire alarm system may be included in this control panel. This paging panel enclosure shall be keyed differently than the fire alarm system.
 - 3) Use of the fire alarm speakers for general announcements may only be used on those systems that will not generate trouble signals at the FACP when the remote microphone is used for this purpose.
 - 4) The general use microphone must be designed to be rendered inoperative upon receipt of an alarm at the Fire Alarm Control Panel (FACP). At that point the only microphone that will work for voice announcements during the fire emergency will be the one in the emergency voice cabinet as designed for fire alarm notification.
 - 5) No modifications shall be made to any components of the emergency voice system that will hinder or reduce the supervision or operation of those components as required by NFPA 72.
 - 6) Speakers or amplifiers that are used for fire alarm notification shall not be re-tapped, rewired, or replaced to produce a lower or different sound volume for general announcements. (Note: reduced volume for general announcements will require signal reduction from the general announcement equipment to the FACP.)

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- e. The use of 70 VDC for building voice evacuation systems must be approved by Cornell EHS.

2.09 ELECTROMAGNETIC DOOR HOLDERS

- A. Electromagnetic door holder shall be of the wall-mounted type and provided with a horizontal-adjustment feature that permits a horizontal adjustment of 25° (minimum). Integral holder/closer is not recommended.
- B. Electromagnetic door holders shall normally be energized and immediately operated (i.e., de-energized) upon any local or system alarm condition.
- C. Electromagnetic door holder operating voltages in new installations shall be 24 VDC (Note: Electromagnetic door holder power supply circuits shall be independent of fire alarm system power supply circuits.) unless reviewed and approved by Cornell EHS.
- D. Electromagnetic Door Holders with Card Access. Rated doors that are held open and using card access need to latch in the closed position whenever they are closed.

2.10 FIRE SPRINKLER SYSTEM DEVICES

- A. Vane-type water flow switches with adjustable surge protection delay (to prevent false or nuisance alarms) shall be installed on wet-type sprinkler system piping.
- B. In-line type low-air pressure switches shall be installed on dry-type sprinkler system piping. (Note: Low-air pressure switches shall be provided with an independent fire alarm zone in new installations.)
- C. Supervisory-type switches shall be installed on each sprinkler valve (to indicate trouble condition if the valve is closed). (Note: Supervisory switches shall be provided with an independent fire alarm zone in new installations.)
- D. Zone check valve assemblies shall be provided at each fire protection standpipe test assembly to allow for water flow testing without impact to the fire protection system. Assembly shall include a Potter VSR-AT Vane type AUTO-TEST flow switch and associated fittings installed by fire protection contract. Electrical contract shall provide a momentary pushbutton, LED keyed test switch at 60” AFF adjacent to the test assembly to initiate testing of the flow switch.
- E. Provide 24 VDC electric bell at exterior location in proximity of the FDC to indicate a facility water flow condition. Coordinate location with EHS and authority having jurisdiction, generally locate adjacent to the building fire department connection.

2.11 SYSTEM IDENTIFICATION/LABELING

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- A. Provide lettered plates for the following equipment, components, and accessories. The plate shall contain the equipment identification (custom panel number, area served), as well as power circuit source and breaker number. Label shall be plastic lamicoid engraved plated or approved equal. (Note: ALL Lettered plates shall be reviewed and approved by Cornell University’s Environment, Health and Safety prior to installation.)
 - 1. Fire Alarm Control Panels
 - 2. Supplementary Notification Appliance Circuit [SNAC] Panels
 - 3. Remote power supplies

- B. Provide type-written directories on the following equipment, components, and accessories:
 - 1. Fire Alarm Control Panels (non-addressable systems)
 - 2. Remote annunciators (non-addressable systems)

- C. Provide computer-generated adhesive labels and install on the bases of all initiating device and notification appliances, as well as any remote test and monitoring station. The label shall indicate the address and must be legible from a standing position below.
 - 1. Labeling guideline for signaling line circuit (SLC):
FACP/Board – Loop/cct # - Device #
 - 2. Labeling guideline for notification appliance circuit (NAC):
FACP/Board – Loop/cct # - Device # (where addressable)
 - 3. Labeling guideline for initiating device circuit (IDC):
Loop/cct #

- D. Initiating, notification, signaling, and other fire alarm system wiring, circuits, and conductors shall be color coded and identified by number at termination points (i.e., control panels, remote annunciators, etc.) and splice points (i.e., junction boxes, splice boxes, etc.). Wiring shall be consistent throughout the system with no color changes on individual loops from the FACP.

- E. Junction and splice boxes containing fire alarm system wiring, circuits, and conductors shall have red covers and be marked “FIRE ALARM” in 3/4" (three-quarter inch) white letters.

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- F. Fire alarm equipment supplied with 120 VAC power shall be labeled with the panel source information, including panel name, room number and source breaker number.
- G. End-of-line resistors in Class B initiating device and Class B notification appliance circuits shall be located at the fire alarm control panel, if feasible; otherwise, end-of-line resistors shall be installed in designated junction boxes with red covers and marked in accordance with the specifications of this section (see Paragraphs D. and E. above).

2.12 ACCEPTABLE MANUFACTURERS

- A. The fire alarm system shall be a complete operating system of one manufacturer.
- B. The equipment, components, and accessories shall be as specified by Cornell University’s Facilities Engineering Electrical Section. Requests for authorization to substitute, vary, or change the specified equipment, components, or accessories of the approved manufacturer may be submitted to FE Electrical Engineer prior to the Contractor’s submission of the invitation-for-bid proposal.
- C. Acceptable fire alarm system manufacturers are:
 - 1. Gamewell/Fire Control Instruments (FCI)
 - 2. Honeywell/Notifier
 - 3. Edwards System Technologies (EST)Other manufacturers are unacceptable.

2.13 EMERGENCY ACCESS LOCK BOXES (KNOX BOXES)

- A. Cornell University requires the provision of exterior lock boxes for emergency rapid entry as required by NYS Fire Code (2010 edition) Section 506, and in compliance with the AHJ. This requirement applies to all new and existing buildings that have fire alarm and/or fire detection systems which interconnect with the local fire department. Knox Box forms and information can be obtained by contacting the Cornell University Fire Marshal.

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