

Section 28 31 00: Fire Alarm Detection Systems (formally Section 16720)

Definitions

EPROM – Electrically Programmable Read Only Memory

EVAC – Emergency Visual Audio Control

FACP – Fire Alarm Control Panel

HVAC – Heating Ventilation & Air Conditioning

IDC – Initiating Device Circuit

NAC – Notification Appliance Circuit

NEMA – National Electrical Manufacturers Association

NFPA – National Fire Protection Association

NICET – National Institute for Certification in Engineering Technologies

NRTL – Nationally Recognized Testing Laboratory Listing

PAS – Positive Alarm Sequence

SLC – Signaling Line Circuit

General

Installation of any system in no way implies continued maintenance service contracts by the installing Contractor. The installed system must have replacement parts which are readily obtainable and can be serviced by a third party licensed vendor which is Owner-selected by separate bid process. Such service must not have an effect on warranties.

Any materials not specifically mentioned, but required for proper performance and operation, must be furnished and installed. Coordination with infrastructure items such as telecommunications must be planned for and itemized as needed.

Design

The system in its entirety must be all new, from a single manufacturer with a current NRTL, comprehensive of all components for the fire protective signaling purpose for which they are used. Alarm panels must be listed at a minimum to the most recent UL 864 edition standards.

The system must be a recent model for which replacement parts and local service are guaranteed to be readily available for a minimum of ten (10) years from the date of installation.

Systems must be designed and installed as one (1) unified system per building. Each building must operate independently. Where part of an existing building is being renovated or added to, the existing Fire Alarm System must be upgraded to accommodate the new addition in a unified, single system method, with full annunciation (including microphone speaker) and controls throughout. If the old panel is expanded beyond its capability or listed connecting parts are no longer available, the entire system must be replaced. If more than 50% of an existing fire alarm system is affected or it is more than ten (10) years old, it must be upgraded to the current standard.

If Silent Knight/Farenhyt systems are used, they shall utilize the Hochiki© protocol for all peripheral initiation devices.

Each fire alarm system on the main campus must be connected to the UCF Campus Receiving Station for fire alarm monitoring at the Police Building. Building monitoring methods for sites not on the main campus will be determined by the Owner on an individual basis. Main Campus monitoring methods will be NRTL listed for NFPA 72 Proprietary Supervising Service. Currently this is an Ethernet connection to a Digitize model 3505 receiver. The installing contractor shall include the utilization of the UCF Digitize-certified contractor to provide the hardware and program it into the existing UCF system, unless another proprietary-listed method is accepted by the Owner and AHJ. A backup method of communications, where mandated by code or the Owner, may be required.

A dedicated ethernet connection must be provided for fire alarm system monitoring, fed from a main switch, and must not be subject to general building occupant access. Monitoring signal transmission devices must be located with similar fire alarm equipment in an area with smoke detection. The Ethernet line must be identified at all ports as "Fire Alarm Service Only."

The fire alarm control panel must be located in a main lobby or common corridor near a fire department-accessible exit. Additional remote annunciators must be provided as indicated by the Owner. All buildings where hazardous materials are handled must be provided with an external annunciator.

No system components requiring access for testing, maintenance, and inspection may be located in office, storage, or instructional spaces used by building occupants. Maintenance-intensive items, such as batteries and sprinkler testing controls, must be located for easy access at finished floor level.

Gas utility service must have an automatic closing fire alarm solenoid and testing bypass. Building sound systems must be provided with a relay for automatic shut-off upon activation of the fire alarm.

In addition to where required by Code, all buildings meeting the following criteria must be designed with a fire alarm, including EVAC throughout, and must be connected to the campus Mass Notification System (MNS):

- Any facility with 300 or more occupants or capable of being expanded to 300 or more;
- Any facility with 50 or more occupants above or below the level of exit discharge;
- Any facility with hazardous processes, materials, or laboratories;
- Any facility deemed so in need by the UCF Emergency Manager due to special circumstances.

Where a fire alarm system is not required but a Mass Notification System is deemed essential, a separate voice notification system must be provided. See the Mass Notification System section for further details.

Installer Qualifications

The installing Contractor for the fire alarm system must at a minimum be a Certified Alarm System Contractor I and a direct sales division of, or the authorized and designated distributor for, the fire alarm system manufacturer, with at least five (5) years of manufacturer-certified work experience. Device installation, connection, terminations, final programming, testing, and certification must be performed by a NICET Level III or higher manufacturer-certified, trained technician.

Materials and Installation

The FACP must be in a unified enclosure, microprocessor-based, intelligent loop- interfaced, modular in construction, and in a complete, new cabinet. Each system must be capable of being expanded at any time for up to the predetermined capacity for known building additions or for a minimum of two (2) additional modules.

The FACP must, at a minimum, include: Walk Test, PAS, Alarm Verification, Voice EVAC where required, multi-level alarm processing, trouble reminder, dry contacts (zone, trouble, alarm, & supervisory), and smoke detector sensitivity testing, and must be 24 VDC non-coded, power-limited.

The FACP must have a minimum eighty (80)-character alpha-numeric LCD display with user defined character capacity. The display must indicate all system conditions and device locations with description, room number, and relative compass location within the building. The panel must have a steady "Power On" light and separate "Alarm" (red color) and "Trouble" (amber color) LED indicators.

The fire alarm control panel must contain a history buffer capable of storing up to 1000 system events. Each of these events will be stored, with time and date stamp. The history buffer must use non-volatile programmable memory, and must not be lost with system primary and secondary power failure.

The CPU must be capable of being programmed on site without requiring the use of any external programming equipment and must accept firmware upgrades via connection with laptop computer, without requirement of replacing microchips, EPROMS, or similar.

The system must have the capability of networking with other control panels on single pair of copper wires, Ethernet, or fiber optic cables. The EVAC functions must include a microphone, control switches, and zoning as determined by the Owner (typical zone-by-floor minimum).

Additional microphone and control modules must be placed at remote annunciators as determined by the Owner. The local microphone must take priority over all messaging systems. EVAC messaging must be appropriate for the facility served, and a sample of the factory-recorded message must be provided to the Owner for review and approval.

Every IDC, NAC, and SLC must be Class A (NFPA Style Z), with no T-Tapping or spider-webbed type circuitry. A single ground fault or open circuit on the SLC must not cause system malfunction, loss of operating power, or ability to report alarm. Loss of any one (1) NAC circuit must not cause loss of any other NAC circuit in the system.

Each SLC and NAC must be limited to only seventy-five (75) percent of its total capacity during initial installation.

Dedicated HVAC control detectors must not sound the general alarm unless required by Code. Deviations for special circumstances must be discussed during design and outlined in the sequence of operations.

HVAC systems will shut down on general alarm in office and classroom type buildings in addition to their respective duct detector activation.

HVAC in buildings with hazardous materials and associated exhaust will only shut down on duct detector controls or as required for emergency exhaust operations to prevent areas from becoming excessively negative. For buildings with hazardous materials, a separate control button(s) for remote individual area HVAC shutdown must be provided at the panel as one of the pre-programmed buttons outlined below.

Where a Smoke Evacuation system is provided, the FACP must have means for manual operation. Separate control panels are not preferred when the main panel is capable of listed controls. A "Manual Off" and "Manual On" switch or button position for the Smoke Evacuation System must be monitored as a Supervisory indication. Activation of the switch must include, by program, all associated functions required for proper operation such as damper closure, door opening, etc. Additional buttons must be provided for individual functions and as needed to facilitate routine testing.

Hold-open devices for fire doors must be a sturdy, fixed, magnet-type mount.

The FACP must have the capability to be field-programmed for selective operations customary to the system as required by unique job conditions and must be capable of being programmed by keypad access by the Owner, secured via standard key and code without external computer interface.

Programmable function keys shall be provided for each of the following actions:

- Alarm signals bypass
- HVAC shutdown bypass
- Door hold-open device bypass
- Elevator Recall bypass
- Any other actions as determined by the Owner.

Codes and addresses must be supplied to the Owner. The Owner must have programming capability for individual points and manual control. An "Alarm Silence" switch must be included. Each system must be capable of at least four (4) levels of password protection. The contractor shall provide the owner with all passwords associated with the system, including any programming passwords.

The FACP must perform continuous testing of analog sensors, including sensitivity tests with compensation for age and environmental conditions. Problems must be indicated for each device, with "Failed Test, Self-Test Abnormal, Dirty, or Very Dirty" or similar, and must be recorded in the event log. Additionally, the LED on the sensor base must glow steadily, giving a visible indication at the sensor location.

Initiating control modules must be dedicated to the type of component served for individual programming control. HVAC shutdown and other control functions must be accomplished from the FACP, rather than by individual smoke detector relays.

The system must have a primary (main) power supply connected to dedicated branch circuit(s) and must also be connected to the building generator emergency system where provided. The circuit(s) disconnecting means must be provided with a breaker lock clearly marked "FIRE ALARM," labeled in red on both the legend and circuit breaker. Circuits serving individual panels must be clearly indicated with indelible ink inside the panel access cover.

There must be a secondary (standby) 24 VDC battery power supply to the complete system. Batteries must be placed at finished, floor-level-working-height and not above ceilings or in hard-to-reach spaces.

Surge protection must be provided and dedicated to the fire alarm control panel circuit feeds, in addition to any general building protective systems. The device must be mounted at the main FACP or at the electrical panel with the FAS circuit breaker(s) and must be labeled. Additional devices must be provided to protect alarm circuits that extend to the exterior of the building (such as BFP, tamper, antennae). The device must incorporate a replaceable fuse design and failure indicator. Acceptable devices are manufactured by EDCO model number HSP121BT-1RU or Facilities Operations-approved equivalent.

All system panels, controls, pull stations, and cabinets must be made tamper-resistant, with lock keyed-alike to a standard key typical of the chosen manufacturer. A minimum of ten (10) keys of each type must be provided to the Owner, plus one (1) spare set for the fire department access box.

The Annunciator Panel must be modular in design, reflecting all status audible and visual indicators the same as the main FACP, with a minimum eighty (80)-character, alpha-numeric LCD display. It must have review function capability and alarm reset/silence secured by key switch. The annunciator must be housed within a NEMA rated enclosure, where appropriate.

Manual Stations must be non-coded, double action, flush mounted, and on the manufacturer's specified box. Break-rods are not permitted. System standard key is required for reset. All Housing and Residence Life manual stations must have an alarmed, tamper-resistant cover. Acceptable devices are manufactured by Safety Technology International (STI), model number STI-1100, or equivalent

Detectors and sensors must use point addressable bases, allowing detectors to be interchangeable via twist-lock mounting. Each detector or detector base must incorporate a steady-state light to indicate if it is in alarm. The unplugged detector must be capable of normal handling without damage.

Smoke detectors must be primarily the photoelectric, plug-in type. Ionization smoke detectors must be used as specified in special applications, such as computer rooms or electrical rooms. Ionization smoke detectors must have two levels of sensitivity which can be easily set.

Thermal detectors must be a bimetallic, restorable-type device.

Air duct, plenum, and under floor detectors must be installed in a manner that provides easy access for periodic cleaning and calibration. Where provided, the remote alarm indicator light and test switch must be located in the nearest corridor or a public area and adequately labeled with the location and type of device monitored. The Contractor must measure air velocity (CFM) across each duct to verify design and indicate CFM readings on the duct detector housing. All duct penetrations must be properly sealed.

Beam Smoke Detectors shall be single-ended, reflective-beam smoke detectors. The detector(s) shall consist of a transmitter/receiver, both within the detector unit. The detectors shall have an integral sensitivity test filter attached to a servo motor inside the detector optics, or other acceptable integral test method. The detectors shall include reflectors. The detectors shall allow for beam alignment between the detector and the reflector to be performed at the detector. Remote alarm indicator lights and test switches must be provided and located in the nearest corridor or a public area and adequately labeled with the location and type of device monitored.

Notification appliances must have both audible (A) and visible (V) alarm signals. Visible signals must be the white strobe (flash discharge) type, with a minimum intensity of seventy-five (75) candela. When installed in corridors, visible signals must be equipped with a side viewing lens. Devices must be combined AV, where possible, to reduce fixture counts.

Fire alarm devices must be red in color, where the option is available.

Audible indicating devices must produce area sound level signals 15 dB above ambient noise and not more than 100 dB where ambient conditions do not require it. The tone must be distinctive, but moderate in nature; "shrill" sounding horn-type appliances are not permitted. Low frequency sounders shall be utilized where required by Code

All sprinkler, standpipe, and similar fire suppression control valves must be provided with monitored tamper switches (including pumps, PIV, and BFP). Water flow switch-monitoring must be provided at a minimum to identify flow by floor with an integral fifteen (15)-second time-delay device to prevent nuisance alarms.

All systems must include tamper-monitored fire department access boxes with locations determined by the Owner.

Fire pumps must be monitored by the FACP at a minimum for general trouble and "Fire Pump Running," in addition to local fire pump annunciation.

A fire fighter's two-way telephone service communications, as required by Code or to match existing, must be provided.

All panels must be mounted with sufficient clearance for observation and testing. Conduit (joints, through penetrations, and minimum 10' interval) and junction boxes must be identified as "Fire Alarm," utilizing red conduit. All raceways, mounting boxes, junction boxes, and panels must be securely hung and fastened with appropriate fittings to insure positive grounding throughout the entire system. Conduit model shall be Allied "True Color" Red or equivalent

System wiring must be in red raceways, (Allied "True Color" or equivalent) minimum ¾" EMT. All conduit fittings must be steel compression-type (die cast-type prohibited), marked for fire alarm use only. Flexible

connectors, minimum ½", are only permitted for end sections less than six (6) feet in length between a box and a suspended or moveable device. No wiring other than directly associated fire alarm detection, alarm, or auxiliary fire protection functions will be permitted in fire alarm raceways. Wiring splices must be avoided other than in alarm devices and terminal strip junction boxes, and will use crimp connection or other approved method. Power-limited, non-power-limited, and AC power conductors must be run in separate conduit paths.

In new construction, all raceways serving the fire alarm system must be run above slab, enclosed within building construction in all finished areas. In renovations and remodeling, raceways must be enclosed where possible. Any exposed raceways in finished areas must be approved by the Owner prior to installation.

Extra Materials

Spare parts must be provided as requested by the Owner during design and keys must be provided as noted above.

Identification

Transposing or changing color-coding of wires is not permitted. All conductors in conduit containing more than one wire must be labeled on each end with "E-Z markers" or equivalent. Color codes of wires must be consistent throughout the system and depicted in a legend on the inside of the respective control panel or terminal cabinet, as well as on the system as-built drawings. Wherever possible, colors must remain consistent with similar systems already installed on the campus. All conductors in cabinets must be carefully formed and harnessed so that each conductor drops off directly opposite to its terminal. Cabinet terminals must be numbered and coded. All controls, function switches, etc., must be clearly labeled on all equipment panels. All wiring must be checked and tested to insure that there are no grounds, opens, or shorts.

A unique identification number, reflected on the shop drawings, must be assigned to each initiating device and be professionally marked on the unit base and readily visible from grade.

All controls and specific sequences of operations required achieving reset, fan control, etc., must be permanently labeled in a professional manner.

Training

A training session must be presented by a fully qualified and trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation for personnel selected by the Owner. Training, consisting of a minimum of two (2) sessions at three (3) hours each, must be scheduled with the Owner to accommodate a day and evening shift attendance and must be video recorded by the Contractor. Training is to cover, at a minimum, how the operator is to perform the basic duties, such as resetting, activating, troubleshooting, bypassing, and testing. Presentations must include instructional handouts as needed and viewer participation and demonstration. The training is to utilize the Owner-provided *UCF Minor Fire Alarm Service Personnel Training Overview Form* and must cover all items outlined therein and others as deemed necessary for the specific installation.

Approval, Testing, Documentation, and Warranty

Shop drawings, battery calculations, voltage drop calculations, wiring diagrams, sequence of operations for all programmed conditions, listings, complete cut sheets, installation, and program manuals must be provided for permit and Owner approval prior to installation. The fire alarm system must be successfully inspected, demonstrated, and approved by the Engineer of Record prior to requesting inspection by the State Fire Marshal.

In addition to standard test papers, local sensitivity test readings of the installed devices must be provided for all smoke sensing devices. Certification papers must be prepared in advance and provided to the inspector for approval at the final test. Final tests must include full performance of smoke evacuation, pre-action, and similar systems. All components, door operation, air flow, shut down, etc., must be verified on normal and standby

power conditions. The design must include the UPS power back-up system for proper operation of required equipment under emergency power transfer conditions.

Initial and re-acceptance testing of newly installed or relocated notification appliances shall include sound pressure levels measured as specified in NFPA 72. "Throughout," as noted by the Code shall be defined as readings taken separately from within each new or newly divided occupied space. System pretesting and all record readings shall be completed and hardcopy provided to the owner for review prior to final acceptance testing. Additional copies must be included in turnover documents as required by other sections of this standard.

Prior to final acceptance, a hardback system log book with a copy of the final State Fire Marshal-approved test papers, sensitivity reports, and two (2) copies of a simplified map of the building, showing device locations and numeric address of each device, must be provided. Additional framed copies of the system device map must be mounted professionally beside each FACP and annunciator.

All proposed systems are subject to Owner review and approval prior to contract award. The specific system details with manufacturer and model number for the main control panel shall be provided during the bidding process for verification of acceptance accordance with these standards. Substitutions after award are not accepted.

The "As-Built" package will be provided as defined in Division 1.

Prior to final acceptance, the Owner must be provided with a reproducible, accurate system "As-Built" package in electronic and hardcopy form. Drawings must be compatible with AutoCAD and contain conduit layout and wiring diagrams, including wire color code and tag number. The "As-Built" package must include a minimum of two (2) hard and two (2) digital media copies of comprehensive "Operation and Shop Maintenance Manual" and include a digital media (USB drive) copy of the site-specific software for each system and facility, including all passwords.

Contractor to update Fire Alarm maps in draft form for Building Code Office review. Once approved, contractor to provide final framed maps at specified locations. Contractor to provide CAD files and PDF for used for producing maps as part of closeout documentation.

The contractor shall provide the means for the owner to make simple program changes, such as label changes. This shall include any programming software, security devices to access the software, and training to accomplish the task.

The Contractor must warranty all equipment and systems for a minimum period of one (1) year following the date of final acceptance or the manufacturer's warranty period whichever is greater. The warranty must include repair parts, labor, and prompt field service, pick-up, and delivery, as coordinated with the Owner for access. The Contractor must provide the first year of testing outlined by NFPA, including a sensitivity test within one (1) year of installation. Such tests must be documented by the Contractor and included in the system log that is kept by the Owner.