



## DESIGN & CONSTRUCTION GUIDELINES

### DIVISION 28 ELECTRONIC SAFETY & SECURITY

<b>DIVISION 28 ELECTRONIC SAFETY &amp; SECURITY</b>	
<b>SECTION 28 31 00 FIRE ALARM AND SMOKE DETECTION SYSTEMS .....</b>	<b>2</b>

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**SECTION 28 31 00 FIRE ALARM AND SMOKE DETECTION SYSTEMS****PART 1 - GENERAL****1.1 SECTION INCLUDES**

- A. An addressable fire alarm and smoke detection system.

**1.2 REFERENCES**

- A. Current code and statues adopted during time of permitting.

**1.3 REGULATORY REQUIREMENTS**

- A. System: Underwriters Laboratory (UL) listed.
- B. Conform to requirements of National Fire Protection Association (NFPA) 101 and the USF Fire Code Official (FCO).

**1.4 DESCRIPTION OF SYSTEM**

- A. The system shall be an addressable, microprocessor based fire alarm control system with transient protection on each circuit and walk-through test capability. The system shall have the capability to control and supervise all the addressable devices and non-addressable appliance and auxiliary control circuits. Each component of the system shall be UL listed for its use. The system shall have a Dynamic LCD display and be located in a constantly attended location while the building is being occupied. The system shall be designed with an addressable Emergency Voice Evacuation (EVAC) throughout, and shall be connected to the campus Mass Notification System (MNS), The system shall be connected to a Federal Signal panel.
- B. It is the general intent that the MNS must operate in conjunction with the separate building fire alarm voice EVAC system and must include all components necessary for that interconnection. MNS systems shall be installed to provide for individual building activation for message annunciation. At a minimum, the MNS system must be capable of capturing and making voice announcements with the fire alarm appliances (where provided) or with a dedicated speaker system throughout the facility at levels sufficient for comprehension but at no less than the higher of 15 dB above ambient noise or 50 dB in normally occupied areas. AV devices that are separate from building fire alarm systems must be installed in a like manner as outlined by the latest adopted edition of NFPA 72.
- C. The design must include a clear description of the capturing sequence and priority for fire alarm activation. The joint fire alarm and MNS must be verified by the engineer of record for compliance with the applicable codes with details stated on the design documents. Local fire alarm microphone must take precedence over all remote messaging systems.
- D. New system installed must be serviceable by multiple vendors. The system shall 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.

**1.5 QUALIFICATIONS**

- A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience.
- B. Installer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience with projects of equivalent scope of work and size and certified by the Florida State Licensing Board as fire alarm installing contractor. The actual installer shall be licensed to install fire alarm systems and shall be certified by the system manufacturer to install the system. Proof of certification and licensure shall be provided upon request.
- C. Qualified installers for the MNS must be a direct sales division, or a trained and authorized vendor of Federal Signal MNS System that has demonstrated design, installation, sales, and service maintenance of the system with a minimum of five (5) years' work experience on projects of similar size and scope. Installer must have a Fire Alarm Systems NICET Level IV qualified individual for project management, oversight, and final fire alarm connection. All installation personnel must have been trained and approved by the equipment manufacturer with proof of certificated manufacturer training provided upon request. Installer must show

proof of availability to provide replacement parts for key components within a 24 hour express order timeframe.

## 1.6 SUBMITTALS

- A. Submit digital files and one (1) set of shop drawings and product data.
- B. Provide complete point to point wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes. Indicate the location of surge protection devices.
- C. Submit manufacturer's installation instructions.
- D. Submit manufacturer's certificate that the system meets or exceeds specified requirements per NFPA 72.
- E. Submit copy of Contractor's license before work begins.
- F. Submit battery calculations indicating the required battery, including the specified spare capacity.
- G. Submit voltage drop calculations.
- H. Provide training for four (4) people on the operation, maintenance, and repair of the system at the Contractor's expense. Training shall be certified by the manufacturer and be at different times for each person. Include transportation, room and board where needed.
- I. For Mass Notification System (MNS), submit review with description of function, complete shop drawings, wiring diagrams, parts list, and component specifications with description of function, programming and sequence of operations. The drawings must indicate the exact location of all installed components, wiring paths and connections/interfaces with other systems.

## 1.7 PROJECT RECORD DRAWINGS

- A. Contractor shall provide digital files and one (1) set of record drawings to the Owner upon completion of project.
- B. Record document shall include the location of end-of-line devices, surge protection devices and exact conduit and wire routing. Numbers and types of conductors shall be indicated for each circuit.

## 1.8 OPERATION AND MAINTENANCE DATA

- A. Provide digital file and one (1) set of operation and maintenance data prior to the completion of construction for all point devices CPUs, and all other equipment.
- B. Include operating instructions, and maintenance and repair procedures.
- C. Provide manufacturer representative's letter stating that the system is operational.
- D. Maintain system for a minimum of one (1) year, after complete acceptance by the Owner, in accordance with NFPA 72.
- E. Provide, at the end of the first year after construction completion, a yearly certification as outlined by the State Fire Marshal's Rule 4A-48.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Products shall be delivered to job site in manufacturer's original shipping packages.
- B. Provide storage and protection of products, as needed.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURER'S

- A. Fire Alarm System:
  1. Notifier System
- B. Mass Notification System (MNS):
  1. Federal Signal
  2. Acceptable devices supporting the MNS are manufactured by EDCO with indicator light or approved equivalent.

NOTE: Approval of manufacturer's equipment does not in any way relieve the Contractor from meeting the performance criteria as outlined in the Plans and Specifications.

## 2.2 FIRE ALARM CONTROL PANEL (FACP)

- A. Control panel construction shall be modular with solid state, microprocessor based electronics and shall conform to all requirements made necessary by the USF Fire Code Official (FCO). It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions. A local audible device shall sound during alarm, trouble or supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each keypress to provide an audible feedback to ensure that the key has been pressed properly. The panel shall be complete with all required cards for the points necessary for all the devices indicated, plus capability for expansion to 40% more points, minimum, without the requirement for additional cabinet. Each circuit shall not exceed 70% capacity. Horns must be zoned, not "T" tapped. Provide the necessary hard wired circuits for all the indicating appliance and auxiliary control devices. Provide a two spare indicating appliance circuit in addition to the required indicating appliance circuits to serve the appliances shown on the drawings. Indicating appliance circuits shall be sized for the addition of 30% more devices on each circuit without the requirement for a new circuit.
- B. The following primary controls shall be visible through a front access panel:
1. 80 character liquid crystal display.
  2. Individual red system alarm LED.
  3. Individual yellow supervisory service LED.
  4. Individual yellow trouble LED.
  5. Green "power on" LED.
  6. Alarm acknowledge key.
  7. Supervisory acknowledge key.
  8. Trouble acknowledge key.
  9. Alarm silence key.
  10. System reset key.
  11. Printer Board.
  12. Device Zones labeled on inside door of FACP.
- C. The control shall provide the following:
1. Setting of time and date.
  2. LED testing, alarm, trouble, and abnormal condition listing.
  3. Enabling and disabling of each monitor point separately.
  4. Changing operator access levels.
  5. Walk test enable.
  6. Running diagnostic functions.
  7. Displaying software revision level.
  8. Displaying historical logs.
  9. Displaying card status.
  10. Point listing.
  11. Speaker silence switch.
- D. For maintenance purposes, the following lists shall be available from the point lists menu:
1. All points listed by address.
  2. Monitor point list.
  3. Signal/speaker list.
  4. Auxiliary control list.
  5. Feedback point list.
  6. Pseudo point list.
  7. LED/switch status list.

## 2.3 DEVICES AND ACCESSORIES

- A. Manual Station: Semi-flush mounted, supervised, normally open single action manual station. Manual stations shall be single action and shall be constructed of cast metal or Lexan with raised white lettering and a smooth high gloss finish. The station shall have a hinged front with key lock. Stations which utilize screwdrivers, Allen wrenches, and other commonly available

- tools shall not be accepted. Stations shall be keyed alike with the fire alarm control panel. When the station is operated, the handle shall lock in a protruding manner to facilitate quick visual identification of the activated station. Stations shall be the addressable type.
- B. Heat Detector: Easy installation, low profile with wide base to cover mounting plate and box. Detectors shall be white and have a dangling disk to indicate element operation. Detectors will be fixed temperature with thermostats rated at 135 °F, except when the plans call for a 194 or 200 °F rating. The detector shall be the addressable type for use with an addressable system and shall be UL listed for this purpose.
  - C. Heat detectors installed in hazardous environments shall be the explosion proof type.
  - D. Smoke Detectors: NFPA 72: photoelectric type with plug-in base, supervised visual indication of detector actuation, suitable for mounting on 4 inch outlet box.
  - E. Detectors shall be listed to UL Standard 268 and shall be documented compatible with the control equipment to which it is connected. Detectors shall be listed for this purpose by Underwriters Laboratories, Inc. The detectors shall obtain their operating power from the fire alarm panel supervised detection loop. The operating voltage shall be 24 VDC (nominal). Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the control panel. Detectors shall be the addressable type for use on an addressable type system.
  - F. Each detector shall have a flashing status indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. The detector may be reset by actuating the control panel reset switch.
  - G. To minimize nuisance alarms, voltage and RF transient suppression techniques shall be employed as-well-as a smoke verification circuit and an insect screen. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). The detector head shall be easily disassembled to facilitate cleaning.
  - H. Smoke Detector Sensitivity Adjust (Simplex True Alarm or equal): Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the System keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window.
  - I. Alarm Verification: Each of the Intelligent/Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification Function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system, or any time after system turn-on. The Alarm Verification shall not require any additional hardware to be added to the Fire Alarm Control Panel (FACP). The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
  - J. Horns: Moisture repellent, fire retardant speaker or horn designed for smooth frequency response with minimal distortion. Horn/Speakers shall be listed and approved for use as a fire alarm indicating appliance. Horn/Speakers shall all sound the same general alarm sound. Outdoor speakers shall be weatherproof and listed for use as an outdoor fire alarm indicating appliance.
    - 1. Sound Level: 87 dB at 10 feet not to exceed 120 dB.
  - K. Visual Flashing Lamps (Xenon Strobe): Visual indicating appliances shall be comprised of xenon flashtube and be entirely solid state. These devices shall be UL listed and be capable of either ceiling or wall mounting. The Lexan lens shall be pyramidal in shape to allow better visibility. Separate alarm indicating circuits shall be provided for strobes. The maximum strobe pulse duration shall be 0.2 seconds with a maximum duty cycle of 40%. The intensity shall be a minimum 100 candela and the flash rate shall be at least 1 Hz but not to exceed 3 Hz. Strobe must meet current Americans with Disability Act (ADA) requirements.
  - L. Audio/Visual Alarm Indicating Appliance: Audio/Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices. The housing shall be designed to accommodate either horn, bells, chimes, or speakers. The unit shall be complete with a tamper resistant, pyramidal shaped Lexan lens with "Fire" letter visible from 180 degree field of view. The front panel or bezel which is constructed of cast metal may be inverted so that the lens is

- below the audible device. The lamp assembly shall incorporate a built-in reflector for more efficient light propagation and a special shock-mounting arrangement to resist Bulb failure due to vibration. Lamp shall be provided with a 4-wire connection to insure properly supervised in/out system connection. Unit shall be complete with all mounting hardware including blackbox. Audio/Visual unit shall be UL listed for its intended purpose. The visual flashing lamps shall meet the specification indicated above in Part E.
1. Minimum dB: 87 dB at 10 feet per UL 464.
- M. Duct Smoke Detectors: Duct smoke detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle. The detectors shall be designed to ignore invisible airborne particles or smoke densities that are below the factor set alarm point. No radioactive materials shall be used. Detectors shall be the addressable type for use on an addressable type system. Detectors shall be provided with the capability of performing automatic fan shutdown either directly from the detector or via the main control panel. All required wiring and supervision shall be provided for all required fan shutdown. Provide all relays and supervise relays as required. Duct Smoke Detector remote test switches shall be installed within 6 ft above finish floor.
- N. Provide all required auxiliary control circuits for door release, dampers, valve closure and other required control functions indicated on the drawing or otherwise specified. All auxiliary control circuits shall be indicated on the annunciator as a separate zone or shall be addressable so the device can be identified quickly and accurately.
- O. Provide wall mounted, magnetic door holder/automatic door release devices. Door holder shall have a minimum 25 pounds holding force.
- P. Monitor Module (Individual Addressable Module)
1. Addressable Monitor modules shall be provided to connect one supervised circuit of a conventional alarm initiating device (any N.O. dry contact device), such as tamper switches and water flow switches, to the Fire Alarm Control Panel (FACP).
  2. The Monitor Module shall mount in a 4 inch square, 2-1/8 inches deep electrical box.
  3. The conventional alarm initiating device may be wired for Style D or Style B operation. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. Modules that use binary jumpers or dip-switches that are subject to installation errors are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.
  4. For difficult to reach areas, the Monitor Module shall be available in a miniature package and shall be no larger than 2-3/4 inches by 1-1/4 inches by 1/2 inch. This version need not include Style D or an LED.
- Q. Water Flow Switches:
1. Flow switches shall be integral, mechanical, non-coded, non-accumulative retard type.
  2. Flow switches shall have an alarm transmission delay time that is conveniently adjustable from 0 to 60 seconds. Initial settings shall be 30 seconds.
  3. Flow switches shall be located a minimum of 1 foot from a fitting that changes the direction of the flow and a minimum of 3 feet from a valve.
  4. Water flow switches shall be rated for the location installed. Provide an individually addressable control module for each flow switch to provide an addressable device. The control module shall be installed in a dry location. Flow switches shall be rated for use outdoors where installed outside.
- R. Sprinkler and Standpipe Valve Supervisory Switches:
1. Each sprinkler system water supply control valve riser or zone control valve, and each standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.
  2. Each Post Indicator Valve (PIV) or main gate valve shall be equipped with a supervisory switch.

3. Mount switch so as not to interfere with the normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position.
4. The mechanism shall be contained in a weatherproof aluminum housing that shall provide a 3/4 inch tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.
4. Switch housing to be finished in red baked enamel.
6. The entire installed assemble shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or it the unit is removed from its mounting.
7. Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor.
8. Tamper switches shall be rated for the valve type installed. Provide an individually addressable control module for each tamper switch to provide an addressable device. The control module shall be installed in a dry location. Tamper switch shall be rated for use outdoors where installed outside.

## 2.4 BATTERY BACK-UP

- A. The system shall be battery back-up for 24 hours with 5 minutes of alarm capabilities (per NFPA 72) with all system indicating appliances operating, including strobes. Provide battery with 30% spare capacity for the potential addition of indicating appliances.
  1. Provide battery calculations clearly indicating 30% spare capacity. Calculations shall be submitted for approval.

## 2.5 LIGHTNING PROTECTION

- A. Provide Isolated Loop Circuit Protectors.
- B. Provide lightning protection at all points entering and leaving the building (including walkways) and at the FACP location shown on the drawings. The 120 volt power circuit shall be provided with lightning protection.
- C. Loop protection shall be manufactured and listed for use with the fire alarm system.

## 2.6 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

- A. Provide required monitoring and signaling capability for connection of the fire alarm control panel to the USF Police Department (UPD). Provide conduit and cabling from the fire alarm control panel to the Digital Alarm Communicator Transmitter (DACT).
- B. Telephone line capture requirements and external devices shall be the responsibility of the Contractor. Coordinate all telephone line work with the Owner. The Contractor shall provide and install 120 volt electrical power (via emergency panel if available), associated circuit breaker, appropriate electrical connections, both "Alarm" and "Trouble" signal wire between FACP and DACT, all conduit, four pair telephone wire (color coded eight (8) conductor cable), and connectors as needed to connect two (2) separate four pair phone lines per DACT to telephone terminal boards. The Contractor shall be responsible for all other requirements associated with DACT installation and integration into the Fire Alarm System.
- C. Provide Silent Knight 5104 Fire Communicator mounted in the telecommunications room and wire to FACP for monitoring from the USF Police Department.

## 2.7 PRINTER

- A. Provide for the connection of a printer. The printer shall communicate with the control panel using an interface complying with Electrical industries Association Standard EIA-232D. Provide a minimum 300 dpi printer internal to the FACP or an external printer. External printers shall be provided with all required interconnections and cabling.

## 2.8 NETWORK COMMUNICATIONS

- A. Provide the capability to add a network communications card for communications via the University's network system. The card shall be capable for communications and connectivity via Category 5 UTP or fiber optic cable.

## 2.9 MASS NOTIFICATION SYSTEM (MNS) INTERFACE

- A. Provide Federal Signal unit UVRI-U Mass Notification System (MNS) fully compatible and completely integrated with the existing campus-wide Federal Signal System and shall include all building-based equipment, wiring, audio visual (AV) devices, transmitters, receivers, network connections, conduit, power supplies, battery back-up, surge suppression, etc. to provide a fully-functional and operational system without manual operation or activation.
- B. For new buildings located adjacent to an outdoor area subject to frequent assembly, additional devices shall be installed to broadcast verbal messages to the outdoor area and vicinity.
- C. For buildings where the fire alarm system is used for voice notification of the MNS, the fire alarm system must be installed with all necessary listed components for proper annunciation of the externally transmitted MNS signals. To ensure compatibility, all components, modules, interfaces, digital message repeaters, and amplifiers used in the MNS must be manufactured by Federal Signal or an approved equivalent. Substitutions are not permitted.
- D. Equipment must substantially come from one manufacturer of established reputation and experience. They must show proof of availability to provide replacement parts for key components within a 24 hour express order timeframe.
- E. Power supplies must be dedicated and provided with breaker clips.

## PART 3 - EXECUTION

### 3.1 SEQUENCE OF OPERATION

- A. ENTIRE BUILDING
  1. All pull stations, heat detectors, and smoke detectors shall, when placed in an alarm mode, sound the building general alarm, flash strobe lights, shut down AHUs, release door holders, and annunciate the address of the initiating device to the FACP.
  2. Activate all programmed indicating circuits until silenced.
  3. Actuate all programmed strobe units until the panel is reset.
  4. Annunciate the active initiating devices.
- B. All pull stations, heat detectors, smoke detectors, and duct smoke detectors shall, when placed in a trouble mode, indicate the address of the device experiencing trouble to the FACP and the remote monitoring stations.
- C. All tamper switches, water flow switches, smoke detectors, and duct smoke detectors shall, when placed in a trouble mode, indicate the address of the device experiencing trouble to the FACP, FAA and UPD via the DACT.
- D. Duct smoke detectors shall shut down their respective units on alarm or detection of smoke via a separate, supervised relay circuit to the AHU motor controller. The relay shall be located not more than 3 feet from the controller. Duct smoke detectors shall sound a supervisory signal to the FACP and shall not sound the general alarm.
- E. All required elevator recall and power shut down function shall be provided in accordance with NFPA-72, paragraphs 3-8.15 and 3-8.16. Provide required control circuit for elevator power shutdown. The elevator pit and elevator equipment room smoke detectors and heat detectors shall not sound the general alarm, but shall annunciate at the FACP and the remote monitoring station.

### 3.2 PROGRAMMING

- A. The system shall be fully programmed and completely operational prior to acceptance. The FACP and CPU shall have the capability to be fully programmable by Owner's personnel.
- B. The Manufacturer shall provide the necessary documentation and training to allow the Owner's personnel to maintain the changed software.
- C. Program data shall be stored in non-volatile memory with battery back-up. Program data shall not be lost due to temporary outages, surges, dips, etc.
- D. Program bypasses
  1. All bypasses must be "log in by password" only. No active bypass buttons
  2. Log in password should be changed to: 11111
  3. Programming password should be changed to: 00000
  4. Our bypasses are as follows:



- a. Zone 99 Horn Strobes
  - b. Zone 98 Speakers
  - c. Zone 97 AHU
  - d. Zone 96 Elevators
  - e. Zone 95 Fire Doors
  - f. Zone 94 Flow, and Tamper
- E. The "On Board" fire alarm dialers are not used at USF. A Silent Knight 5104B is required to be installed next to the new panel.
1. Active duct detector test switches to be installed, and mounted no higher than eye level.
  2. All installed modules to be marked with device address, and mounted below the ceilings. Devices such as smoke detectors, etc. are also marked with device address.
  3. Horn Strobes need to be marked, circuit, and power supply panel number. EOL marked on all devices that have the EOL resistor. Use two (2) different fire approved wire colors for each circuit. If more than one (1) circuit, please use varying colors. If multiple colors are not available, please label each junction box.
- F. After install is complete installer should provide the following:
1. A thumb drive with the fire alarm program.
  2. Alarm panel points list, including addresses.
  3. Device counts including horn strobes, and speakers.
- G. The MNS shall be programmed to use the following frequencies, Tx: 465.5875 tpl: 206.5 Rx: 460.5875 tpl: 206.5

### 3.3 EXECUTION

#### A. INSTALLATION OF FIRE ALARM AND DETECTION SYSTEMS

1. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of National Electrical Code (NEC) and National Electrical Contractors Association (NECA) "Standard of Installation" and NFPA-72.
2. Wiring Systems and Materials
  - a. Wiring shall be in accordance with requirements of the NEC and NFPA 72. The fire alarm system, including components, conduit, boxes and wiring shall be completely installed and wiring and conduit shall be properly tagged and color coded. The Electrical Contractor shall make final connections as shown and required by the equipment manufacturer's wiring instructions.
  - b. Color Code - The color codes of the fire alarm cabling shall conform to the following:
    - i. Initiation Device Addressable Loop: Red.
    - ii. Indicating Appliance - Audible: Red (+) and Black (-).
    - iii. Indicating Appliance - Visual: Purple (+) and Orange (-).
    - iv. AHU Fan Shut-Down: Gray - White.
    - v. Remote Indicator/Test: Black, Red, Blue, Purple.
    - vi. Auxiliary Control Circuit: White - White + I.D. Tag.
    - vii. Duct Smoke Detector Power: Black - Blue + I.D. Tag.
    - viii. Spare Wires: Any different color, must be same throughout the building.
    - ix. Color codes must be adhered to, no deviations will be accepted.
3. All wiring to be installed in conduit with continuous ground.
4. All junction box covers shall be painted red. All lengths of conduit shall have at least one red stripe.
5. AHU shutdown relays and equipment control relays shall be mounted within 3 feet of controlled device. AHU shutdown relays shall be wired on a separate circuit.
6. Visual flashing lamps and speakers shall be wired on alternate circuits to provide coverage in the event of the failure of one circuit. Provide the required number of circuits for the indicated number of alarm indicating devices.
7. Provide conduit, wire and circuit breaker to connect fire alarm control panels to emergency circuit. The fire alarm circuit breaker shall be accessible to authorized personnel only and shall be marked FIRE ALARM CIRCUIT CONTROL. Provide handle lock for circuit breaker handle.

8. Provide a disable switch for system speakers at the Fire Alarm Control Panel. Label switch "ALARM SILENCE SWITCH". (If the switch is left in the disable position during normal system operation, a trouble signal shall sound at the control panel.)
- B. INSTALLATION OF MASS NOTIFICATION SYSTEMS
1. The MNS shall be compliant with the applicable sections of the current Florida Fire Prevention Code, the current Florida Building Code, the National Fire Protection Association NFPA 72, the Americans with Disabilities Act (ADA), the Common Alerting Protocol (CAP), and the Safety Act Certification from DHS.
  2. The installation is subject to review by the USF Building Code Official, the Florida State Fire Marshal (SFM), USF Emergency Manager, and designated representatives of the USF Offices of Facilities and Safety. Installations must meet all University Standards as outlined in other divisions of this document, including aesthetic considerations reviewed by facilities managers and representatives of Facilities Operations.
  3. Locate the MNS system in the Telecommunications Room, adjacent to the FACP whenever possible. When installation in the Telecommunications Room is not possible, equipment shall be located in common corridors, facilities mechanical or electrical type spaces, or similar type common spaces. Departmental server rooms, private offices, and other similar user secured spaces must not be used.
  4. Wire pathways must be concealed in all finished areas where at all possible. Exposed items and the manner of finish must be approved by the Owner prior to installation.
  5. Where visible components will have potentially undesirable effects in finished areas, it is the responsibility of the installer to ensure an aesthetically pleasing installation. Exposed conduit in finished areas is not acceptable.
  6. Stairwells shall not be penetrated or used as pathways.
  7. All MNS wiring shall be run in minimum conduit size of 3/4 inch EMT.
  8. All conduit fittings shall be steel, compression type. Die cast type is not permitted.
  9. "MNS" label must be applied intermittently along conduit in unfinished areas and inside box covers.
  10. Each system shall be powered by a dedicated circuit and attached to the backup emergency generator, where provided.
  11. All system components for AV messaging and the common area displays shall be installed on an emergency power source. Such source must supply power in quiescent mode for not less than 24 hours and then must be capable of operating the system in active and emergency mode for not less than 15 minutes at a maximum connected load.
  12. Each system shall be provided with surge suppression devices to the fire alarm, on all power supplies, and connections that extend beyond the building envelope (like antennae).
  13. When installed MNS component cabinets are equipped with locks, the Contractor shall provide the Owner with four (4) keys. When possible, the Contractor will install MNS component cabinets keyed the same as existing MNS component cabinets on campus.

### 3.4 QUALITY ASSURANCE

- A. NEC Compliance - Comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories.
- B. UL Compliance and Labeling - Provide fire alarm and detection system components which are UL listed and labeled. Installation is to be by a UL listed installer.
- C. Miscellaneous Compliance - The fire alarm system is to be installed in accordance with the equipment manufacturer's written instructions and comply with all applicable portions of the NECA's "Standard Installation" and all local codes and ordinances.

### 3.5 FIELD QUALITY CONTROL

- A. All components, parts, and assemblies supplied by the Manufacturer shall be guaranteed against defects in materials and workmanship for a period of 12 months commencing with the date of substantial completion. Warranty service shall be provided by a qualified factory trained representative of the equipment manufacturer. Service response time shall be a maximum of 4 hours before arrival to site.

- B. Testing: The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's form and NFPA 72. All test and report cost shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one (1) copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:
1. A complete list of equipment installed and wired.
  2. Indication that all equipment is properly installed and functions, and conforms to these specifications.
  3. Test result of individual initiating devices and indicating appliances.
  4. Serial numbers, locations by zone and model number for each installed detector.
  5. Response time on thermostats and flame detectors (if used).
  6. Technician's name, certificate number and date.
  7. Upon completion of the MNS installation and after satisfactory testing of the Fire Alarm system, the Contractor shall complete performance testing (pre-testing) of the MNS for compliance with the manufacturers' guidelines and codes above. Performance results, including the required sound pressure levels and intelligibility values, must be documented with notation of any deficiencies and corrective actions submitted to the Owner. Upon successful completion of performance testing, the Contractor must complete a witnessed acceptance test with the AHJ to include the SFM, Building Official, and or designated University Representatives.
- C. Documentation: After completion of the tests and adjustments listed above, the Contractor shall submit the following information to the Owner.
- A copy of the test report described in this specification and a Certificate of Compliance prepared as per NFPA 72, and State Fire Marshal's Rule 4A-48 to be complete at final test. Affix to FACP a standard service tag, as described in Rule 4A-48 for fire alarm contractors by the Office of the State Fire Marshal. Final tests and inspection shall be held in presence of the Owner's representatives and the USF Fire Code Official (FCO), to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost to the Owner. To assure that wire size, power supply, number of devices on a circuit, etc. are suitable to support 100% of devices being in alarm or operated simultaneously, this test shall include the following:
1. Place all sensors and monitor modules in alarm. Each shall display its address and alarm condition. At least the first 10 devices on each circuit shall also have their alarm LED's lighted.
  2. Operate all control modules for the alarm or operated condition. Each module shall display its address and condition.
  3. Reset all alarmed and operated devices. The panel shall display the address or zone of any off-normal devices.
  4. Test all sensors for alarm verification by momentarily testing for alarm. The sensor shall not initiate an alarm. Then, test by placing the sensor in alarm such that it remains in alarm for the selected verification time. The sensor shall initiate an alarm.
  5. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a 90 days test period without any unwarranted alarms. Should unwarranted alarm(s) occur, the Contractor shall readjust or replace the detector(s) and begin another 90 days test period. As required by the Engineer, the Contractor shall recheck the detectors using the fire test after each readjustment or replacement of detectors. This test shall not start until the Owner has obtained beneficial use of the building under tests.
  6. If the requirements provided in the paragraph above are not completed within 30 days after beginning the tests described therein, the Contractor shall replace the system with another acceptable manufacturer and the process repeated until acceptance of the equipment by the Owner.
  7. Before final acceptance of work, the Contractor shall deliver digital file and one (1) set of a composite "Operating and Shop Maintenance Manual." Each manual shall contain, but not be limited to:

- a. A statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.
  - b. Individual factory issued manuals containing all technical information on each piece of equipment installed. In the event that such manuals are not obtainable from the manufacturer, it shall be the responsibility of the Contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.
  - c. One (1) copy of all approved shop drawings, instruction sheets, operating instructions, and spare parts bulletins.
8. A training session, for personnel selected by the Owner, shall be presented by a fully qualified, trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation.
  9. Provide a written description of standard control panel functions and user instructions at each FACP. These instructions shall be written in standard laymen's English so that an unfamiliar operator can accomplish basic functions such as reset.
  10. A training session for the MNS must be presented by a fully qualified and trained representative of the equipment manufacturer who is thoroughly knowledgeable of the specific installation. Training, consisting of a minimum of two (2) sessions at one (1) hour each, must be scheduled with the Owner to accommodate a day and evening shift attendance and must be video recorded by the Contractor. Prior to final acceptance of the MNS, the Owner must be provided a reproducible accurate system "Record Documents" package in electronic and hardcopy form. Drawings shall be compatible with AutoCAD, meeting the USF CAD Guidelines and shall contain conduit layout and wiring diagrams, including wire color code and tag number. Submittals must include a minimum of two (2) hard copies of composite "Operation and Shop Maintenance Manual," including a digital media (USB drive) copy of the program for each system and facility.
- D. Warranty: All equipment and systems related to the Fire Alarm shall be warranted by the Contractor for a period of one 1 year following the state of final acceptance. The warranty shall include parts, labor, prompt field service, pick-up, and delivery.
1. Provide 1 year of testing as per NFPA 72, which shall consist of:
    - a. At the end of the one-year warranty period, provide a Test and Written report which certify that all initiating devices have been tested and which indicate the result of the inspection as required by the Owner. Provide the required certification tag. Problems discovered during this testing and inspection shall be covered under the warranty. It is the Contractor's responsibility to perform this testing prior to the end of the year warranty or provide an extended warranty if the test is performed after the warranty period was scheduled to expire.
  2. For the MNS, the Contractor shall warranty all equipment and systems for a period of not less than two (2) years following the date of final acceptance. The warranty shall include parts, labor, and prompt field service, pickup, and delivery. A procedure and checklist for no less than two annual re-certifications of the system shall be provided.

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END OF SECTION 28 31 00