

University of Rhode Island

Department of Public Safety

Design and Construction Standards
Division 28 – Electronic Safety and Security

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28 31 10 - Fire Alarm Systems

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SECTION 28 31 10 – FIRE ALARM SYSTEMS**1. GENERAL****1.1. Summary:** For all fire alarm system installations:

- 1.1.1. For all University of Rhode Island fire alarm projects, the Office of Fire & Life Safety (URI Fire & Life Safety) represents the Department of Public Safety with respect to plan review in accordance with these approved university Design and Construction Standards and the Office of Alarm Services (URI Alarm Services) supports installation and commissioning.
- 1.1.2. The fire alarm system shall be a municipally connected system, designed for emergency forces notification as defined by the Rhode Island Life Safety Code (RILSC) current edition.
- 1.1.3. All new and retrofit fire alarm systems shall be automatically transmitted.
- 1.1.4. The installation shall comply with all state and local laws and regulations applying to electrical and fire alarm installations in the State of Rhode Island with all applicable requirements of The National Electrical Code and revisions, Rhode Island Fire Code, appendixes, referenced publications, and revisions, and the standards described in this document, without exception.
- 1.1.5. The system shall include, but not be limited to, all control panels, power supplies, initiating devices, audible and visual alarm devices, conduit, conduit fittings, and outlet boxes and fittings, conduit hangers, clamps and supports, pull boxes, locked terminal boxes, wire and cables, disconnect switches and fuses, circuit breakers, pilot devices, connectors, identification name plates, tags, wireways and accessories, and all other equipment and accessories
- 1.1.6. All material shall be new, unless otherwise indicated, and shall conform to the standards of the Underwriters Laboratories (UL) or as accepted by URI Alarm Services. This fire alarm shall be supplied by an only source; accessory components as required should be catalogued by the manufacturer and UL and FM listed to operate with the manufacturer's control panel.

1.2. Submittals: URI Fire & Life Safety will approve all equipment submittals.

- 1.2.1. General requirements are as follows:
 - A riser diagram of the complete fire alarm system point-to-point. (Typical riser diagrams are not acceptable.)
 - A complete point-to-point installation diagram. (Typical diagrams are not acceptable.)
 - A complete list of current drain requirements during normal, supervisory, trouble, and alarm condition.
 - Battery standby calculations showing total standby power required meeting the specified system requirements.

- Manufacturer's original catalog data and description information shall be supplied for all major components of the equipment supplied.
 - Supplier's qualifications indicating years in business, service policies, warranty definitions, and a list of similar installations.
 - Contractor's qualifications indicating years in business, prior experience with installations that include the type of equipment that is to be installed, Rhode Island license number and type of license.
 - All pertinent information regarding the reliability and operation of the equipment to being installed.
 - Sufficient information shall be supplied, so that the exact function is known of each installed device.
 - Permit applicant will invite URI Fire & Life Safety to view and receive all notifications within the "Viewpoint" application system.
- 1.2.2. Submittal of shop drawings shall contain original manufacturer's specification sheets. All equipment and devices on the shop drawing furnished under this contract shall be marked clearly in the specification sheets. If any equipment and/or devices required in the systems are not so marked, the engineer shall mark the sheet and this equipment and/or devices shall be made part of the system and shall be provided.
- 1.2.3. If equipment of a listed equivalent Manufacturer is submitted for approval, the contractor shall state the amount that is to being deducted from his base bid for the substitution and shall state what, if any, specific points of system operation differ from the specified points of the system operation. This differentiation report must reference every paragraph of this specification. This submittal and detailed report shall be provided to URI Fire & Life Safety no less than five (5) days following award of contracts.
- 1.2.4. Drawings shall show the layout of the system and indicate the approximate locations of outlets, apparatus, and equipment. The runs of wiring as shown on the drawings are schematic only. The exact routing of conduit shall be determined by the structural conditions and other obstructions. This shall not be construed to mean that the design of the system may be changed but refers only to exact runs of conduit between given points.
- 1.2.5. All contract drawings shall be reviewed for conditions that may affect the location of any outlets/devices and equipment to avoid interference and permit full coordination of all work. The right to make any reasonable change in location of outlets/devices, apparatus, and equipment up to the time of roughing in, is reserved by URI Fire & Life Safety and such change shall be made without additional charge.
- 1.2.6. All junction and pull boxes, controls and such other apparatus as may require maintenance and operation from time to time shall be made easily accessible. Although the equipment may be shown on the drawings in certain locations, the construction may disclose the fact that such locations do not make its position

readily accessible. Any such cases shall be called to the attention of URI Alarm Services as work proceeds.

- 1.2.7. Incomplete submittals will be returned without action, unless prior approval is obtained from the University of Rhode Island for partial submittals.
- 1.2.8. Work shall not begin until approval is received from both the State Fire Marshal and URI Fire & Life Safety.

1.3. Project Closeout: In addition to any bid-related closeout documents required, the following shall be provided to URI Alarm Services:

- 1.3.1. An electronic (PDF) as well as hard copy fire alarm as-built drawing showing all system components, and wire routing point to point, as built and shall be no smaller than 1/8" = 1' scale. This drawing shall be provided to URI Alarm Services 48 hours prior to the final fire alarm acceptance test.
- 1.3.2. In addition to the above documents, the installing contractor shall provide full pretest documentation and points list a minimum of 48 hours prior to final acceptance testing.
- 1.3.3. Upon final acceptance of the system, a copy of the final fire alarm program, as accepted, a copy of the fire alarm points lists, and the current programming password.
- 1.3.4. A copy of all service manuals and as-built drawings, in addition to the closeout documents required by the project, shall be installed in a document cabinet at a location acceptable to URI Alarm Services.
- 1.3.5. All old work including, but not limited to, conduit, wiring, devices, and strobes shall be removed before acceptance. Exterior strobes are not required on systems with emergency forces notification.
- 1.3.6. URI Alarm Services will be notified and afforded the option to witness both termination of power and testing of residual system power of the 60- or 24-hour battery test.

1.4. Approvals: For the purposes of code compliance, the installation is to be compliant with requirements of the AHJ. Where there are conflicts between the AHJ and the referenced codes and standards, the more stringent standard shall apply. If there is a question of interpretation as to which is more stringent, URI Alarm Services shall decide.

2. EQUIPMENT

2.1. General: To provide uniformity and compatibility across university properties, the following equipment shall be specified for all fire alarm system installations unless otherwise approved by URI Alarm Services.

2.2. Wireways

- 2.2.1. Wireways shall be complete with all necessary fittings, accessories, covers and connectors and shall be hot dip galvanized.

- 2.2.2. The complete raceway system shall become metallically continuous throughout its entire length and the entire system shall be electrically continuous and shall be thoroughly grounded.
- 2.2.3. All conductors for fire alarm systems shall be installed in raceways as herein specified and as indicated. Raceways shall be of the sizes indicated or for maximum number of wires required by system design and as stated in the N.E.C. #70 and shall bear the label of Underwriters Laboratories. Raceways shall include rigid steel threaded conduit, electrical metallic conduit (EMT). M/C cable and steel connectors with bushings shall be allowed only with the prior approval of URI Alarm Services and usually only in locations that will remain accessible.
- 2.2.4. Couplings and connectors for electrical metallic tubing shall be steel setscrew type, raintight, or watertight as ambient conditions require. Only with approval of URI Alarm Services may PVC be allowed.

2.3. Boxes and Fittings

- 2.3.1. Junction boxes; pull boxes; outlets; and terminal boxes (as defined by the RILSC) and conduit fittings shall be provided as indicated herein and/or wherever they shall be necessary to facilitate the pulling or termination of wires and cables.
- 2.3.2. Junction boxes shall be constructed of code specified gauge sheet galvanized steel with lockable covers, keyed to the fire alarm panel, and painted red. Boxes shall be secured in position independently of conduits entering them. Boxes shall be installed so they are accessible. All terminations shall be made on screw terminals and labeled to the satisfaction of URI Alarm Services.
- 2.3.3. Outlet boxes for the fire alarm system shall be galvanized steel at least 1-1/2 inches deep and of sufficient size to accommodate the devices at the outlet location except for the notification appliance boxes which shall be 4" square x 2-1/8" deep or as required by the manufacture. All boxes shall have mounting lugs or ears for covers and knockouts for conduit terminations.
- 2.3.4. Where possible, outlet and junction boxes shall be installed in a manner to protect from or drain any accumulated water or condensation.

2.4. Wiring

- 2.4.1. Wire and cable work shall be in strict accordance with the requirements of the State of Rhode Island Fire Code, NFPA 72, National Electrical Code, and the latest revisions, both with respect to material and workmanship, except where insulation thickness and covering are required by these specifications above code requirements. Color-coding shall be in strict accordance with the Rhode Island State Fire Code and the latest edition of this university Design and Construction Standard. Any conductors not specifically addressed in the Rhode Island State Fire Code shall be as approved by URI Alarm Services.
- 2.4.2. Raceways containing conductors identified as "Fire Protective Alarm System" shall not contain any other conductors, and AC current carrying conductors will

not be allowed in the same raceway with the DC fire alarm detection and signaling conductors.

- 2.4.3. The wiring type shall be twisted pair wiring, as defined by the equipment manufacture, for all addressable loop wiring.
- 2.4.4. Class A Style 6 communications shall be provided. Wire shall be routed to maintain sufficient distance between the forward and return loop as called for by the RILSC. If additional NAC power supplies are required, they must be initiated Style 7 off the SLC or Style Z off the NAC circuit and wired class "A".
- 2.4.5. The minimum size wiring shall be #16 AWG THHN solid 600-volt.
- 2.4.6. All wires and cable shall, as far as practicable, be continuous from origin to termination without running splices. The installation of wires and cables shall include the provisions of all hangers, racks, cable cleats and supports necessary to make a neat and substantial installation. To avoid injury to sheathing, cable shall not be subject to bending less than 6 times its overall diameter.
- 2.4.7. Wiring types shall be approved by the Equipment Manufacturer, Engineer of Record, and URI Alarm Services.
- 2.4.8. All signal line circuits shall have a minimum of 3 isolation modules. Isolation modules shall be installed below drop ceilings where possible.
- 2.4.9. All system components, including tampers, flow switches, and modules shall be class A
- 2.4.10. Color code for wires shall be as per Rhode Island State Fire Code:
 - 2.4.10.1. *Detector Circuit and SLC* shall be red and black. Red shall be positive and black shall be negative. (NFPA IDC)
 - 2.4.10.2. *Horn/Strobe Circuit* shall be blue and white. Blue shall be positive and white shall be negative. When bells, chimes or other audible/visual devices are used in lieu of horns, this color shall be followed. (NFPA IAC) This includes sounder bases.
 - 2.4.10.3. *Flashing Strobe Circuit*, if separate feed is required, shall be blue and white. Blue shall be positive and white shall be negative.
 - 2.4.10.4. *Sprinkler/Standpipe Circuits* shall be red and black. Red shall be positive and black shall be negative.
 - 2.4.10.5. *Smoke Detector Circuits*, if a separate power feed is required, shall be brown and violet. Violet shall be positive, and brown shall be negative.
 - 2.4.10.6. *Electromagnetic Door Holders – Circuits* shall be gray and gray, or 120-volt door holders shall be black and white.
 - 2.4.10.7. *Municipal Master Box Tripping Circuits* shall be orange and orange. Conductors for this circuit shall be installed in a separate raceway.
 - 2.4.10.8. *Elevator Capture Circuits* shall be brown and yellow.

- 2.4.10.9. *Fan Shutdown Circuits* shall be orange and yellow.
- 2.4.10.10. *Remote Annunciator Circuits* shall be violet and numbered at each end or as required by the manufacture.
- 2.4.10.11. *Bond Wires* from the control panel to the master box ground rod, and all required bonding conductors shall be green.
- 2.4.10.12. *Municipal Fire Alarm Loop* from the master box to the municipal loop shall be black and white, if used.
- 2.4.10.13. *AC Supply Circuit* to the main fire alarm control panel shall be white, black and red. The black wire shall be one phase and the red shall be the opposite phase, if required. The white shall be the neutral.
- 2.4.10.14. *AC Supply Circuit* for the battery charger shall be black and white unless the main fire alarm panel requires only one AC feed. In that case, the conductors to the battery charger shall be red and white.
- 2.4.10.15. *Local Smoke Detector Interconnect* wire shall be violet.
- 2.4.10.16. *Ethernet and Data cables* shall be red or an alternative color approved by URI Alarm Services.

2.5. Nameplates and Identification

- 2.5.1. Engraved plastic nameplates with engraving through to white core shall be provided on the fire alarm equipment as specified by URI Alarm Services.
- 2.5.2. All duct smoke detector and isolation module locations will be identified in the nearest visible area.
- 2.5.3. Fire alarm disconnects shall be lockable and painted with red enamel and shall be provided with suitable nameplates.
- 2.5.4. Installer shall provide Brady, or approved equivalent, adhesive markers indicating the device address with minimum 12-point font lettering in the following locations:
 - 1. Outside of addressable smoke detector bases.
 - 2. Outside of addressable monitor modules.
 - 3. Outside of addressable relay output modules.
 - 4. Outside of addressable fault isolator modules.

2.6. System Operation

- 2.6.1. The operation of a manual station or automatic activation of any smoke detector, heat detector, sprinkler flow device, or extinguishing system device shall cause:
 - All evacuation horns to sound and lamps to flash in a synchronized fashion.
 - Shut down all air handling units as specified later herein and shown on the plans.
 - Indicate the zone in alarm on the control panel.

- Indicate the zone in alarm on the remote annunciator.
- Automatically release all magnetically held doors.
- Perform any additional function as specified herein or as shown on the plans.
- Summon the fire department via master box activation.

2.6.2. These shall continue until:

- The operated device returns to normal, and the control panel is manually reset, except that the alarms may be silenced or acknowledged in accordance with RI State code.
- An alarm may be silenced by a switch on the zone card in the control panel. When silenced, this shall not prevent the resounding of subsequent alarms if another zone should alarm.
- When alarms are silenced, the zone indicating red LEDs on the control panel and the remote annunciator shall remain on until the operated device returns to normal, and the control panel is manually reset.

2.6.3. The operation of a Carbon Monoxide device shall cause:

- Local sounder base to activate.
- Indicate the device on the fire alarm control panel as a supervisory condition. The supervisory condition shall be non-latching and clear upon restoration of the device.
- Transmit via the radio box and/or the data relay device as a trouble/supervisory condition.
- Transmit a "clear" signal via the radio box and/or data relay device upon the device restoring.

2.6.4. Drill Switches

- 2.6.4.1. Drill Switches shall activate all Horn/strobe devices while bypassing accessory device shut down. The drill switch shall also bypass emergency forces notification.

2.6.5. Fume Hood bypass

- 2.6.5.1. Fume hood exhaust fans shall be configured for shutdown bypass at the FACU to facilitate testing.

2.7. Fire Alarm Control Panel

- 2.7.1. Control Panel shall be manufactured by FCI, Simplex, or Notifier and shall be a model acceptable to URI Alarm Services. Control Panel construction shall be modular with solid state, microprocessor-based electronics. It shall display only those primary controls and displays essential 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.

2.7.2. The following primary controls shall be available within the primary panel and remote annunciator. These controls shall not be password protected.

- Minimum forty (40) character liquid crystal display
- Individual red system alarm LED
- Individual yellow supervisory service LED
- Individual yellow trouble LED
- Green "power on" LED
- Alarm Acknowledge key.
- Supervisory Acknowledge key.
- Trouble Acknowledge key.
- Alarm Silence key.
- System Reset key.
- Alarm and trouble LEDs shall be provided for all corresponding zones.
- HOA Switches for all smoke control units controlled (maybe allowed within a separate panel at the FACP and annunciator location).

2.7.3. The following secondary control switches and LEDs shall be available within the primary enclosure and remote annunciator and functions shall be restorable: City disconnect/switch, Elevator bypass, Door holder release bypass, HVAC bypass, Signal Bypass, Future

2.7.4. The control panel shall provide the following password protected options: Setting of time and date, LED testing, Alarm, trouble, and abnormal condition listing log, Enabling and disabling of each monitor point separately, Activation and deactivation of each control point separately, changing operator access levels, Walk Test enable, Device bypass of each device point separately, displaying software revision level, Displaying historical logs.

2.7.5. *Primary Keys, LEDs, and LCD Display:* Addressable Control Panels shall have a minimum 2-line x 40-character liquid crystal display, which shall be backlit for enhanced readability or shall be acceptable to URI's Coordinator of Alarms. The LCD shall display the following information relative to the abnormal condition of a point in the system.

- 40-character custom location label, as approved by URI Alarm Services.
- Type of device (i.e., smoke, pull station, waterflow)

- Point status (i.e., alarm, trouble)
- 2.7.6. *NFPA 72 requirements:* Pressing the appropriate acknowledge button shall display the first unacknowledged condition in the appropriate list (either alarm, supervisory or trouble), and require another acknowledge button. Press to acknowledge only the displayed point.
- 2.7.7. *Alarm Silencing only after alarm acknowledged:* All auxiliary functions shall be restorable (silencable) and shall function again for any subsequence alarm at the direction of the Coordinator of Alarms, URI.
- 2.7.8. *Silent Walktest with History Logging:* The system shall be capable of being tested by one person. While in testing mode the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm. The momentary disconnection of an initiating or indicating device circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition. Should the walktest feature be on for an inappropriate amount of time it shall revert to the normal mode automatically.
- 2.7.9. *Access Levels:* There shall be a minimum of 3 access levels. An access level shall not be required to reset, acknowledge, or silence the alarm.
 - 2.7.9.1. To maintain security when entering a passcode, the digits entered will not be displayed but a cursor will move along filling the position with an X to indicate that the digit has been accepted. All key presses will be acknowledged by a local audible sound.
 - 2.7.9.2. Access to a level will only allow the operator to perform all actions within that level plus all actions of lower levels, not higher levels.
 - 2.7.9.3. The following switches/program shall have access levels associated with them: Set Time/Date, Manual Control, On/Off/Auto Control, Disable/Enable, Clear Historical Alarm Log, Clear Historical Trouble Log, Walk Test, Change Alarm Verification
- 2.7.10. The fire alarm system shall be protected by a DTK-120SRD surge suppressor. It can be installed next to the main fire alarm or at the electrical panel where the A/C voltage supply originates. The surge suppressor shall be monitored by the fire alarm.
- 2.7.11. All systems shall be equipped with a key operated drill switch located in a location acceptable to URI's Coordinator of Alarms.
- 2.7.12. All new or Upgraded systems shall be provided with an FACU capable of voice alert.
- 2.7.13. All 24-volt control power shall be supervised at the FACU.

2.8. Remote Annunciator(s)

- 2.8.1. Remote annunciator(s) shall be 40-character LCD serial annunciator that provides full function equivalent to the main FACU:

- 2.8.1.1. Control Push button switches for: alarm silence, trouble silence, system reset and all bypass buttons.
- 2.8.1.2. Tone Alert: Duplicates the control panel tone alert during alarm & trouble conditions.
- 2.8.1.3. System trouble, Power ON, Tamper Trouble, Smoke Detector, Heat Detector, Manual Station, and City Box Trouble Indications.
- 2.8.1.4. Manual Control Switches shall be provided for the following functions: System Reset, Alarm Silence, Trouble Silence, City Box bypass, Alarm Acknowledge, Trouble Acknowledge, Fan Bypass, Elevator Bypass, Signal Bypass

2.9. Addressable Devices

- 2.9.1. The system control panel must be capable of communicating with the types of addressable devices specified below. Addressable devices will be located as shown on the drawings. The location of addressable devices will be selected along with conventional devices to optimize the system layout to provide the level of protection, zone identification and control as shown on the drawings. Label all detectors with their address for easy recognition. Labels shall be professionally fabricated and attached to the base of the detector.
- 2.9.2. *Addressable Detector Bases:* All addressable smoke and heat detector heads as specified below will be pluggable into their bases.
 - 2.9.2.1. The base or head will contain electronics that communicate the detector status (normal, alarm, trouble) to the control panel over two wires and shall contain the address of that device. The same two wires shall also provide power to the base and detector.
 - 2.9.2.2. Different detector heads (smoke or heat) must be interchangeable on the same base. The devices must allow the owner to replace, and repair associated detector heads without the need to readdress or verify addresses. Addressable detector bases shall contain the address of the detector and shall be securely mounted to a standard electrical outlet box. Additional bases shall be available for local sound activation and/or auxiliary relay functions.
 - 2.9.2.3. Upon removal of the head, a trouble signal will be transmitted to the control panel.
 - 2.9.2.4. Local sounder bases installed in sleeping rooms shall be programmed for self-restoration without the use of full system reset functions.
 - 2.9.2.5. For systems installed in sleeping rooms be programed for self-restoration without the use of full system reset functions.
 - 2.9.2.6. Those listed systems that do not comply with this section shall not be considered equal.
- 2.9.3. *Photoelectric Detector Head:* The photoelectric type of detector shall be a plug-in unit that mounts to a twist-lock base and shall be UL and FM approved.

- 2.9.3.1. The detectors shall be of the solid-state photoelectric type and shall contain no radioactive material. They will use a refracted infrared LED light source and be sealed against rear airflow entry.
- 2.9.3.2. The detector shall fit into a base that is common with both the heat detector and ionization type detector; and shall be compatible with other addressable detectors, addressable manual stations, and addressable Zone Adapter Modules on the same circuit.
- 2.9.4. *Addressable Thermal Detector Heads:* Thermal detector heads must be UL and FM listed. Shall be a combination rate-of Rise and fixed temperature (135 F) type, 135 fixed, or 190 Fixed, as approved by the AHJ. These devices shall provide an integral alarm LED that shall illuminate on activation.
- 2.9.5. *Addressable Pull Stations:* Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires, which also provide power to the pull station. The address will be set on the station.
 - 2.9.5.1. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common to the fire alarm control panel. Pull stations will be double action. Stations that use allen wrenches or special tools to reset will not be accepted.
 - 2.9.5.2. The addressable manual station shall be capable of field programming of its "address" location on an addressable initiating circuit. The address shall be permanently attached to the exterior of the device. The manual station shall be fitted with screw terminals for field wire attachment.
- 2.9.6. *Addressable Photoelectric Duct Detector:* The detector shall be a non-polarized 24VDC type that is compatible with the Fire Alarm Panel.
 - 2.9.6.1. Detectors shall be of the solid-state photoelectric type and shall operate on the light scattering, photodiode principle. No radioactive material shall be used.
 - 2.9.6.2. To minimize false alarms, voltage and RF transient suppression techniques shall be employed as well-as smoke signal verification circuit and an insect screen.
 - 2.9.6.3. The detector head shall be directly interchangeable with an ionization detector type. The 24VDC detector must be reset by actuating the control panel reset switch.
 - 2.9.6.4. Detector construction shall have a mounting base with a twist-lock detecting head that is lockable. The locking feature must be field removable when not required.
 - 2.9.6.5. Detector shall be configured to alarm the duct housing by using a test switch (installed at a location approved by URI Alarm Services). For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housings front cover.

2.9.7. *Zone Adapter Module:* Zone Adapter Modules shall be used for monitoring of waterflow, valve tamper, Releasing Control Panels, all Heat and Smoke detectors shall be individually addressed. Modules must be class "A."

2.9.8. Carbon Monoxide Detectors

2.9.8.1. Carbon monoxide detectors shall be a single criteria device compatible with the FACU, installed according to manufacturer specifications.

2.9.8.2. Carbon monoxide detectors shall be installed with a sounder base.

2.9.9. *Smoke Alarms:* Smoke alarms installed per residential requirements shall be monitored by the alarm system within the structure.

2.10. **Addressable Device Supervision**

2.10.1. Each addressable device must be uniquely identified by an address code entered on each device at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable.

2.10.2. All devices shall be supervised for trouble conditions. The system control panel will be capable of displaying the type of trouble condition (open, short, device missing/failed). Should a device fail, it will not hinder the operation of other system devices.

2.11. **Alarm Signals**

2.11.1. *Audible/Visual Unit (Xenon Strobe):* Horn/strobe unit to be comprised of a 24 VDC horn and xenon flash tube entirely solid state. Unit must conform to ADA requirements. The unit shall be red unless mounted against a red background, and then the color shall be as determined by the Coordinator of Alarms.

2.11.2. *Visual Flashing Lamps (Xenon Strobe):* Visual indicating appliances shall be and comprised of a xenon flash tube and be entirely solid state. The unit shall conform to ADA requirements and sized accordingly.

2.11.3. *Mini-Horns:* 24 VDC, red

2.11.4. Approved live voice evacuation or relocation shall be installed in accordance with NFPA 72, National Fire Alarm and Signaling Code.

2.12. **Municipal Connection**

2.12.1. Emergency forces notification shall be provided for all new or upgraded system by an AES Intellinet Mesh Radio Subscriber – Model 7707P, Sigcom DTX Radio box, or King Fisher Radio box consistent with the local AHJ's requirements.

2.12.2. The Radio Alarm Transmitters shall have a minimum of eight programmable input zones.

2.12.3. The Radio Alarm Transmitters shall have a trouble supervision output.

- 2.12.4. The radio box shall be programmed and certified by a factory trained representative, compliant with local AHJ requirements.
- 2.12.5. Current ratings shall be no more than 175 mA in standby and 800 mA in transmit. The operating temperature shall be zero (0) degrees to fifty (50) degrees C at a minimum. The back-up batteries shall be capable of powering the transmitter for at least 60 hours. The transmitter shall report low battery and AC status. All input zones will be individually programmable for FIRE, normally open, normally closed, end of line and restoral.
- 2.12.6. Programmable parameters shall include but not limited to identification number, network code, automatic check-in time, zone input definition and restoral reporting suppression.
- 2.12.7. The Radio Alarm Transmitters shall be installed in an appropriate physical and environmentally protected location within each building.
- 2.12.8. Where an external antenna may be required (not preferred), the location of the radio alarm transmitter shall take into consideration the physical distance between the transmitter and proposed antenna location.
- 2.12.9. Antenna cabling length shall be in accordance with the manufacturer's instructions.

2.13. IP data Gathering Module

- 2.13.1. All systems shall include point ID transmission via IP protocol connected to URI's network. The currently approved device is the Digitize, Inc. Supplemental IP Data Gathering Module – Muxpad II
- 2.13.2. The Muxpad shall be programmed and certified by a factory trained representative, as determined by URI Alarm Services.
- 2.13.3. The IP data gathering module shall have a minimum of eight programmable input zones.
- 2.13.4. All Radio Alarm Transmitters shall be housed in a locking red steel enclosure measuring 9.25" H X 13.25" W X 3.5" D. Input power shall be 24 VDC at 200 mA max. Battery backup shall be provided via a separate auxiliary power supply cabinet with two (2) 12 VDC batteries.
- 2.13.5. The operating temperature shall be zero (0) degrees to fifty (50) degrees C at a minimum. The back-up batteries shall be capable of powering the data gathering module for at least 60 hours. The data gathering module shall report low battery and AC status. All input zones will be individually programmable for FIRE, normally open, normally closed, end of line and restoral.
- 2.13.6. The IP data gathering module shall be capable of being programmed on location or remotely from the central monitoring system receiver over internet protocol.
- 2.13.7. The IP data gathering modules shall be installed in an appropriate physical and environmentally protected location within each building.

- 2.13.8. The IP data gathering modules shall be located within 25 ft. of the fire alarm control unit within each building specified on the drawings. Final location shall be coordinated with the engineer and the owner. The final location for the IP data gathering module shall take into consideration the location of ethernet jacks for connection to the URI network.
- 2.13.9. IP data gathering modules shall be interfaced to existing conventional fire alarm control units via on-board relay contacts for general alarm and trouble.
- 2.13.10. Where compatible, as shown on the drawings and specified herein, the IP data gathering modules shall be interfaced to existing addressable fire alarm control units via the RS-232 serial output from the fire alarm control unit. The contractor shall verify the compatibility of each existing FACU with the RS-232 serial interface.
- 2.13.11. The RS-232 output shall provide the ability to send point-specific, event identification data from an addressable and intelligent FACU through the supplemental IP data gathering module to the supplemental central monitoring system receiver as identified by URI Alarm Services.
- 2.13.12. The RS-232 serial interface shall provide supervision of outgoing data transmission from the FACU to the IP data gathering module, where permitted by the FACU.
- 2.13.13. All compatible existing fire alarm control units shall report by individual initiating device and shall annunciate the event type, address, and device type.

2.14. Lightning Suppressor

- 2.14.1. Lightning suppressors shall be provided at any buildings where an exterior antenna is required to boost mesh radio signal strength.
- 2.14.2. Lightning suppressors shall be installed on all coaxial cable before it penetrates to the exterior of a building.
- 2.14.3. Lightning suppressors shall be grounded per the manufacturer's instructions.

2.15. Sprinkler System Interconnect

- 2.15.1. The contractor shall supply and interconnect to the fire alarm system all the necessary water flow switches with retard, pressure switch and gate valve supervisory switches.
- 2.15.2. All hot boxes providing water to a sprinkler system will have "low temperature" monitored by the associated FACU.

2.16. Spare Parts

- 2.16.1. Spare Parts shall be provided at 5% of devices or a minimum of: (2) Manual Pull Stations, (5) Smoke Detectors, (2) Heat Detectors, (2) Smoke/Heat Bases, (5) Monitor Modules, (2) Horn Strobes, (3) Smoke Sounder Bases (if applicable), (3) Carbon Monoxide Detector Sounder Bases (if applicable), (3) Carbon Monoxide Detectors (if applicable).

2.17. Magnetic Door Holders

- 2.17.1. For all new or upgraded systems, magnetic door holders (controlled by the FACU) shall be installed for all required fire doors and doors within smoke barriers that are part of the egress separation.

2.18. Voice/Mass Notification system

- 2.18.1.1. For all new/upgraded systems with residential occupancy (greater than 100 persons) there shall be a voice announce feature that is compatible with the university's Mass Notification System.
- 2.18.1.2. For all new/upgraded systems in other occupancies (greater than 500) there shall be a voice announce feature that is compatible with the university's Mass Notification System.

2.19. Surge Protection

- 2.19.1. Surge protection shall be provided by Ditek 120 V protector for all line voltage feeds for main panels, data relay devices, and radio boxes.

2.20. Bi-directional amplification will be evaluated with results submitted to both the local fire department and URI Fire & Life Safety.

3. EXECUTION

3.1. **General:** All installation work shall be performed in accordance with specifications, applicable codes, the Manufacturer's recommendations, and as required by the AHJ.

- 3.1.1. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with URI Alarm Services.
- 3.1.2. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.
- 3.1.3. The Manufacturer's authorized representative shall provide onsite supervision of installation.

3.2. **Shutdown of Existing Systems:** When it is necessary to shut down existing fire alarm systems that leaves the building unprotected overnight, a continuous approved fire watch shall be provided in accordance with URI's fire watch policy.

- 3.2.1. A Fire Protection Impairment Form shall be submitted to URI Alarm Services at least 48 hours in advance of any fire alarm or fire sprinkler impairment.

4. INSPECTIONS

- 4.1. Inspections will be made of routine work before any wiring is pulled, after wiring is pulled and before any devices are installed and before any connections to the control panel. URI Alarm Services will make these inspections and it is the contractor's responsibility to contact URI Alarm Services to arrange these inspections.

- 4.2. If work proceeds without these inspections, it will be the contractor's risk and expense to have construction removed to perform the inspections.

5. TESTING

- 5.1. **Pretest:** A pretest will be held with the installer and the manufacturer's technical representative present. In addition to the requirements listed below, the pretest shall demonstrate that each device is operative and produces the intended response. Each device is tested in accordance with the manufacturer's recommendations to initiate an alarm at its installed location.
 - 5.1.1. After certification of a complete pretest, the installing contractor shall provide the authority having jurisdiction with written documentation, from the manufacturer's authorized representative of the outcome of the test and will re-inspect in the presence of the authority having jurisdiction and the manufacturer's authorized technical representative.
 - 5.1.2. A complete test shall be conducted as follows: The installing contractor, in the presence of a representative of the authority having jurisdiction and URI Alarm Services, shall manually operate every manual fire alarm station, every rate of rise type thermo detector with heat, manually operate or electrically short out every fixed temperature thermo detector, open and short all zones, as instructed actuate every smoke detector with smoke in accordance with the manufacturer's recommendations to demonstrate that smoke can enter the chamber and initiate an alarm, activate all automatic extinguishing system switches and activate every water sprinkler/standpipe flow switch by a flow of water. Carbon Monoxide detectors shall be tested according to manufacturer's standards.
- 5.2. **Final Test:** All communications shall be tested completely. The fire alarm system shall be in one hundred percent (100%) operation prior to acceptance and/or issuance of a certificate of occupancy.
 - 5.2.1. Prior to the final test, URI Alarm Services must be notified within a reasonable time to witness the test (at least 48 hours). The Contractor shall provide the necessary personnel and equipment to conduct the test.
 - 5.2.2. The contractor shall prepare and submit a single line diagram of each installation indicating wiring between equipment and locations of panels, manual pull stations, detectors, and other devices to URI Alarm Services and the authority having jurisdiction. Each manual fire alarm station, thermo detector, smoke detector, extinguishing system switching circuits, each carbon monoxide detector, flow switch circuit and each alarm horn/strobe circuit shall be opened in at least two locations to test for the correctness of the supervisory circuitry.
 - 5.2.3. If any problems are found in the system, a date and time will have to be rescheduled with URI Alarm Services to retest the system after the problems are corrected.

6. WARRANTY

- 6.1. The contractor shall warrant the completed fire alarm system wiring and equipment to be free from inherent mechanical and electrical defects for a period of one (1) year from the date of the completed and certified test.

7. TRAINING

- 7.1. The Electrical Contractor and Manufacturer shall provide a minimum of two (2) on-site training sessions for the owner's representatives. Each session shall be a minimum of 4 hours or as otherwise determined by URI Alarm Services.
- 7.2. Due to the critical nature of proper system operation, training must be conducted by personnel in the direct employ of the manufacturer of the fire alarm control panel. A third-party instructor is not acceptable.
- 7.3. A complete set of reproducible "as built" drawings showing installed wiring, color coding, and wire tag notations for exact location of all installed equipment, specific interconnections between all equipment, and internal wiring of the equipment shall be delivered to the owner upon completion of the system.
- 7.4. Operating and instruction manuals shall be submitted prior to the testing of the system. A complete sets of the operating and instruction manuals shall be delivered to the owner upon completion, including one full paper copy and an electronic copy.
- 7.5. Instructions complete and accurate, step by step testing instructions giving recommended and required testing frequency of all equipment, and a complete trouble-shooting manual explaining how to test the primary parts of each piece of equipment shall be delivered to the owner upon completion of the system. Also, any passwords, site specific software, and other proprietary information that the owner deems necessary for him to maintain and repair the equipment.
 - Instructions for replacing any components of the system, including internal parts.
 - Instructions for cleaning and adjustments of equipment with a schedule of these functions
 - A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item
 - User operating instructions shall be provided and displayed on a separate sheet located next to the control unit in accordance with UL Standard 864.