Fire Alarm Systems 28.31.00

Description:

The purpose of the section is to provide the UMD Design Standards for the design and implementation of approved Fire Alarm Systems on campus.

Related Sections:

- TBD

Effective Date:

January 1, 2023

Applicable Standards:

- The latest editions to the following codes and standards shall apply as a minimum but not be all inclusive to the design and installation of fire alarm systems:
  - Maryland State Fire Prevention Code (COMAR 12.03.01 and 12.03.02)
  - National Fire Protection Association (NFPA) 101 - Life Safety Code
  - Building Officials and Code Administrators International, INC. (BOCA) National Building Code
  - NFPA 1 National Fire Prevention Code
  - NFPA 70 - National Electrical Code
  - NFPA 72 - National Fire Alarm Code
  - NFPA 80 - Fire Doors and Windows
  - NFPA 90A - Standard for Air Conditioning and Ventilating Systems
  - NFPA 101 - Life Safety Code
  - NFPA 170 - Fire Safety Symbols
  - ANSI/ASME A17.1 -- Safety Code for Elevators and Escalators as adopted by the State of Maryland.
  - Americans with Disabilities Act (ADA)

General Requirements

System Description

- All new fire alarm and detection systems shall be addressable systems.
- The system and components shall be the product of a single manufacturer.
- **Quality Assurance**
  - The system and all components shall be listed by Underwriters Laboratory (UL) for fire protective signaling service (local and remote station, emergency communication and relocation equipment, and protective signaling systems) under UL 864.
- **Sequence of Operation**
  - **Manual Pull Station**
    - Activation of any manual pull station shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and the remote annunciators.
    - All manual pull station signals shall be automatically transmitted to UMD Department of Facilities Management, Work Control via the “University Fire Alarm Monitoring System” (UFAMS) as an "Alarm" signal.
  - **Smoke Detector**
    - When the smoke detector latches into the alarm mode the fire alarm system shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and at the remote annunciators.
    - All smoke detector alarm signals shall be automatically transmitted to UMD Work Control via (UFAMS) as an "Alarm" signal.

- Smoke detectors installed in residential dormitories, sleeping areas shall be programmed as non-latching (self-restoring) supervisory alarms. This direction does not apply to smoke alarms which are not part of the building fire alarm system.

- **Elevator Recall**
  - Smoke detectors at elevator landings, in elevator machine rooms, and in elevator shafts shall also recall the elevator(s) to the designated floor or to the designated alternate floor as required by the elevator safety code.

- **Door Release**
  - Smoke detectors used to shut smoke or fire doors shall release the detector's associated door.
  - Smoke detectors used to shut a door in a fire-rated stair enclosure shall release all of the doors in the stair enclosure.
  - Each smoke detector used for door release shall be provided with an alarm verification feature and shall indicate a supervisory signal only.

- **Suppression System Activation**
  - Smoke detectors used to activate a fire suppression system (Pre-action sprinkler system, deluge system, or special extinguishing system) shall be crossed-zoned.
  - Cross-zoning of detectors reduces the allowable spacing for the smoke detectors by ½.

- **Heat Detector**
  - Activation of any heat detector shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and at the remote annunciators.
  - All heat detector alarm signals shall be automatically transmitted to UMCP Work Control via UFAMS as an "Alarm" signal.
    - Elevator Shunt-trip - Heat detectors in elevator shafts and in elevator machine rooms shall also operate the shunt trip circuit breaker for the elevator main line in accordance with the elevator safety code.
    - Suppression System Activation - Heat detectors may be used in conjunction with smoke detectors to activate a fire suppression system (Pre-action sprinkler system, deluge system, or special extinguishing system).

- **Water Flow Alarms**
  - Activation of a water flow alarm shall automatically operate all audible and visual appliances and produce an alarm signal at the control unit and at the remote annunciators.
  - Each individual water flow switch shall have a distinct address.
  - All water flow alarm signals shall be automatically transmitted to UMCP Work Control via UFAMS as a "Water Flow" signal.

- **Valve Tamper Switch**
  - Activation of a valve tamper switch shall initiate a supervisory alarm at the system control panel and at the remote annunciators.
  - Each individual tamper switch shall have a distinct address. All valve tamper alarms shall be transmitted to UMCP Work Control via UFAMS as a "Valve Tamper" signal.

- **Duct Smoke Detector**:
  - Activation of a duct smoke detector shall initiate a supervisory alarm at the system control panel and at the remote annunciators.
  - A duct smoke detector activation shall also initiate an air handling unit shut down as required by NFPA 90A. All duct detector alarms shall be transmitted to UMD Work Control via UFAMS as a "Trouble" signal.

- **Fire Pump Supervisory Signals**:
  - In buildings with fire pumps, individual supervisory signals shall be provided for the following conditions:
    - Fire pump running
    - Fire pump loss of power in any phase
    - Fire pump phase reversal
  - Activation of a fire pump supervisory signal shall initiate a supervisory alarm at the system control panel and at the remote annunciators.
  - Each set of contacts in the fire pump controller shall have a distinct address.

- **High/Low Air Pressure Signals:**
  - Buildings with dry-pipe or pre-action sprinkler systems shall provide a supervisory signal for system high and low air pressure.
  - Activation of a high/low air signal shall initiate a supervisory alarm at the system control panel and at the remote annunciators. Each pressure switch shall have a distinct address.
  - All high/low air supervisory signals shall be transmitted to UMCP Work Control via UFAMS as a "Trouble" signal.

- **Trouble Signals:**
  - Audible trouble signals shall sound until silenced. Silenced trouble signals shall be continuously indicated by a textual message and a trouble LED until restored to normal operation. The trouble LED shall remain illuminated until all abnormal conditions are cleared.
  - Upon a return to normal operation, the audible trouble signal shall resound until restored to normal position. Subsequent trouble events shall re-sound audible trouble signals until silenced. All trouble events shall automatically be transmitted to UMD Work Control via UFAMS as a "Trouble" signal.

- **Smoke Control Systems:**
  - Stair Pressurization System -- Stair pressurization systems shall be activated for any alarm signal in the building. Stair pressurization systems shall also be manually activated at the annunciator panel with a key operated switch.
  - Atrium Smoke Removal Systems -- Atrium smoke removal systems shall be activated by any atrium water flow switch or atrium smoke detector. Atrium smoke removal systems may also be manually activated at the atrium smoke removal control panel with a key operated switch.

- **Special Door Locking Arrangements**:
  - Delayed Egress Locks -- Doors with delayed egress locks installed in accordance with NFPA 101 shall unlock upon actuation of the fire alarm system.
  - Stair Enclosure Doors -- Stair doors that do not permit re-entry in accordance with NFPA 101 shall unlock upon actuation of the fire alarm system.

Components

- **Control Panel**
  - The fire alarm and detection system shall be a voice notification system, microprocessor based, power-limited, supervised, 24 VDC, non-coded system. The system shall be capable of providing the following functions:
    - Integral clock/calendar
    - Alarm verification (assigned by detector address)
    - Three-pulse temporal pattern evacuation signal
    - Functional walk-test of all initiating and signaling devices.

    The following manufacturers and systems shall be acceptable:
    - Simplex Time Recorder - Model 4100 or 4120
    - Notifier - Model AM2020

- **Fire Alarm Annunciator**:
  - Textual annunciation shall be provided at the control unit and remotely in a location as approved by UMD Fire Marshall. The textual display shall consist of an 80 character supertwist alphanumeric display, which shall include a 32 character user defined message for each device or function. The device addresses on the alphanumeric display must be approved by UMD Fire Marshall.
  - All events displayed on the textual display shall also be recorded on an integral, 40-column, thermal strip printer. The connection between the remote annunciator and the system control panel shall be electrically supervised. A building graphic shall be provided above each remote annunciator.
  - Each building graphic shall include the building outline, all stairs, all exterior doors, all elevators, the location of the fire department connection, the location of the fire alarm control panel, the location of the main sprinkler valve, a North arrow, a "You Are Here" indicator, and the four sides of the building (Side Alpha, Side Baker, Side Charlie & Side Delta) as directed by UMD Fire Marshall.
  - In buildings with a fire pump an LCD annunciator is required to be located in the fire pump room.

- **Supervision:**
  - Style 4 (Class B) supervision of all initiation devices is required. Notification appliance wiring shall also be Style Y (Class B).

- **Power Supply**:
  - Primary power shall consist of a two-wire 120 VAC branch circuit from the emergency power distribution panel. The branch circuit disconnect shall be arranged and protected to prevent inadvertent disconnection and ensure optimum reliability.
  - Standby power consisting of rechargeable batteries shall be provided. Batteries shall be capable of powering the system in the normal (standby) mode for 24 hours followed by 5 minutes of operation in the alarm mode (15 minutes for a voice system).

- **Passwords and Security:**
  - Access to control unit and remote annunciator switches wiring and power supplies shall be restricted by keyed-alike locks. Passwords shall be the same as the assigned University Building Number.

- **Voice/Alarm Systems**
  - Each voice/alarm system shall be capable of providing the following functions:
    - User defined automatic voice evacuation message. Message shall be in a female voice.
    - Public address at control unit and at remote location(s) as required by UMCP/FM.

- **Public Address**
  - During some events and emergencies it may be desirable to disable the voice alarm system and direct occupants over the fire alarm speakers.
  - In the public address mode, the voice alarm signals will be used to transmit instructions. The public address function shall be capable of manually overriding all other signals and users.
  - A hand-held push-to-talk microphone shall be provided at the control panel and each remote panel. Microphone shall be supervised from disconnection. An audio control switch module shall be furnished to provide manual control of audio functions.
  - These switches and associated LED indicators shall be supervised from disarrangement or failure. Audio power amplifiers shall be furnished with self-contained filtered 24VDC power supply, transformer, and amplifier monitor circuits.
  - Amplifiers shall provide an output with a frequency response of 120 Hz to 12000 Hz. A sufficient quantity of amplifier capacity to operate all system speakers simultaneously plus 20 percent spare capacity shall be provided.

- **Alarm Initiating Devices**
  - Alarm initiating devices consist of conventional and analog detectors and manual stations connected to the system control unit via Style D or Style 6 (Class A) circuits.

- **Duct Smoke Detector Assemblies:**
  - Each duct smoke detector shall be provided with a remote alarm lamp and keyed test switch located in a visible and accessible location.

- **Addressable Manual Station:**
  - Manual stations shall be red in color, non-coded, double-action, nonbreak-glass type mounted in a semi-flush backbox. Manual station covers shall be hinged and secured with a lockset. Lockset shall be keyed the same as the control unit lockset. Manual pull stations installed in areas subject to damage, vandalism, and/or false alarms shall be protected by a STI Stopper II as manufactured by Safety Technology International, Inc.

- **Addressable Heat Detectors:**
  - Addressable heat detectors shall be plug-in type with base. The detector base shall be of the twist lock type with screw terminals for field wiring. Heat detectors shall be of the rate compensated type.

- **Notification Appliances**
  - Alarm notification appliances shall consist of audible and visual signals for public signaling of fire. All notification appliances subject to damage and/or vandalism shall be protected by an STI Fire Alarm Signal Damage Stopper as manufactured by Safety Technology International, Inc. LED visual notification appliances should be used when possible in place of strobes.
  - Where approved by UMD Fire Marshal's Office and the College or Department, alternative notification appliances may be considered for use in Animal Holding/Testing/Use areas of a building. Provisions must be made for the use of standard audio/visual devices should of such areas changes.

- **Area of Refuge Communications**
  - Two-way communications (such as in high rise structures) shall be monitored by UMPD.

Qualifications

- System design and installation shall be supervised by an experienced fire alarm technician or fire protection engineer with not less than five years experience with fire alarm systems.
- Shop drawings shall be prepared and signed by a NICET Level III or IV certified engineering technician or a registered fire protection engineer.
- The signature of the technician or engineer constitutes an affidavit that the statements, representations, and information presented in the submittal constitute a complete operational system conforming with applicable state codes and recognized engineering practices.
- All field installation work shall be continuously supervised by a NICET Level II or III fire alarm system technician.

- **Fire Alarm Control Panel (FACP)**
  - **Location**: The FACP shall be located in:
    - Buildings with automatic sprinkler system: In the same room as the sprinkler system alarm check valve.
    - Buildings without sprinkler system: In the main electrical room.
  - **Lockset:** The lockset for the FACP shall be keyed for a "B" key, CAT15, or a "T45" key.
  - **Battery Box:** Auxiliary batteries shall be stored in a battery box located adjacent to the FACP. The lockset for the battery box shall be keyed the same as the FACP.

- **Annunciator Panel**
  - Annunciator panels shall be located at the main entrance to the building, in a public area such as a lobby, in plain view unobstructed by the opening of doors or other parts of the building as approved by UMD Fire Marshall.
  - All final locations must be reviewed approved by the UMD Fire Marshall.
  - The lockset to gain access to the annunciator panel shall be keyed the same as for the FACP.
  - Annunciator panels with reset functions that are not keyed activated shall be provided in a tamper proof locked cover to prevent unauthorized tampering.

- **Initiating Devices**
  - Manual Pull Stations: Manual pull stations shall be provided at the following locations:
  - At the exit from each floor at the stair enclosure exits on the corridor or room side located not more than 5 feet from the stair door.
  - At each door opening to the exterior of the building.
  - At the exit from each High-Hazard Occupancy (High-Hazard as defined by NFPA 101).
  - Manual pull stations shall be located so that the travel distance to any station from any point in the building does not exceed 200 feet.
  - At each exit from an Assembly Occupancy (Assembly Occupancy as defined by NFPA 101).
  - Telephone and electrical rooms in high-rise buildings.
  - Where required by NFPA 72.

  Manual pull stations shall be installed 42 to 54 in. above the finished floor. All manual pull stations shall be located to be readily accessible, unobstructed, and visible.

- **Smoke Detectors:** Analog smoke detectors shall be installed in accordance with NFPA 72 at the following locations:
  - In all fire pump rooms and diesel fire pump rooms, or fire pump rooms that directly open to the exterior, smoke detectors may be deleted or heat detectors may be substituted per UMD Fire Marshal's approval.
  - At each FACP.

  <u>All smoke detectors shall be programmed for a 30 second alarm verification cycle.</u>

- **Duct Smoke Detectors:**
  - Duct smoke detectors shall be provided for mechanical unit shut down as required by NFPA 90A.
- **Heat Detectors:**
  Heat detectors shall be provided in accordance with NFPA 72 at the following locations:
  - In all sprinklered elevator machine rooms as required by the elevator safety code.
  - At the top of each sprinklered elevator shaft and bottom of each sprinklered elevator shaft as required by the elevator safety code.
  - In any non-sprinklered storage room, mechanical room and electrical room.
  - As required for activation of a pre-action sprinkler system and other special fire extinguishing systems.
- **Interface Modules (Monitor):**
  Addressable interface modules shall be provided to monitor any conventional (non-addressable) alarm notification appliance. Such as:
  - Non-addressable heat detectors.
  - Non-addressable smoke detectors.
  - Valve tamper switches, and sprinkler system butterfly valves.
  - Water flow switches.
  - Pressure switches.
  - Fire pump supervisory alarms.
  - Kitchen Suppression System Activation.
- **Interface Modules (Control):**
  - Addressable interface modules shall be provided within three feet of the device being controlled for the control of the following auxiliary functions:
    - HVAC Shutdown: of respective air handler upon activation of associated duct smoke detector.
    - Door Holders: release doors automatically upon activation of associated smoke detector.
    - Door Lock Release: unlock all doors with special locking arrangements as required by NFPA 101.
    - Elevator recall: recall elevators as required by the elevator safety code.
    - Elevator Shunt Trip: operate the shunt trip circuit breaker for the elevator main line in accordance with the requirements of the elevator safety code.
- **Water Flow Detectors:** Water flow detectors shall be provided to monitor sprinkler systems for waterflow
  - Water flow detectors shall be provided for the following:
    - At each alarm check valve (Pressure switch).
    - At each dry-pipe valve (Pressure switch).
    - At each pre-action system valve (Pressure switch).
    - At each sprinkler or standpipe system riser.
    - One flow switch per sprinkler system zone on each floor.
    - See the UMCP design guidelines for sprinkler and standpipe system for more specific information on water flow detectors.
- **Sprinkler/Standpipe Valves:** Provide supervision for each sprinkler/standpipe system control valve.
- **Fire Pump Supervision**: For each fire pump provide individual supervision of the following fire pump alarms:
  - Fire pump running.
  - Fire pump loss of power in any phase.
  - Fire pump phase reversal.

- **High/Low Air Pressure Supervision**: Provide supervision of low and high air pressure for each dry-pipe system and each pre-action system.

- **Off-Site Supervision**
  - Provide in or adjacent to the control panel all equipment necessary to connect the fire alarm system to the University Fire Alarm Monitoring System (UFAMS).
  - UFAMS uses a Keltron Active Radio Network System to transmit data from the fire alarm control panel to receivers at the University Security Operations Center and the Work Control Center. Keltron Transceivers require verification of newer version.
  - Each fire alarm control panel shall have a Keltron RF750F8 Transceiver installed.
  - The dry contact outputs in the fire alarm control panel shall activate dry contacts in the transceiver to transmit the following signals:
    - Fire Alarm System in Alarm.
    - Valve Tamper.
    - System Trouble.
    - Waterflow.
    - Fire Alarm System Power Off.
    - Hi & Low Air Pressure on Dry pipe & pre-action sprinkler systems.
    - Fire Pump Run
    - Fire Pump Fault

    Note: DES Code Services or FM Life Safety Systems may direct that other signals be transmitted.
  - All addressable fire alarm systems shall have, in addition to the RF750F8 transceiver, a Keltron "Datatap" card, configured for the specific model of fire alarm system.
  - The Datatap transmits point specific information from the fire alarm system via the fire alarm system printer port.
  - Operations & Maintenance Life Safety Systems maintains configuration information for all fire alarm systems that meet the requirements of the DCFS.

- **Spare Parts**

  The fire alarm system contractor shall supply the University with a minimum of one replacement for each six devices (or fraction thereof) installed of the following devices:
  - Analog Smoke Detectors.
  - Addressable Manual Stations.
  - Interface Modules (monitor).
  - Interface Modules (control).
  - Horn/Strobe Signals.
  - Speaker/Strobe Signals.
  - Strobe Signals.
  - Duct Smoke Detectors.
  - Door Hold Open Devices.
  - Addressable Heat Detectors.

- **Signs**
  - Provide and install 5 inch by 7 inch engraved red plastic signs with white lettering (Helvetica or sans serif type) above each manual pull station.
  - Secure signs to surface with pan head screws and suitable anchors.
  - Emergency pull Station placard standard language:

  For Non-Residential Buildings:

  IN CASE OF FIRE EMERGENCY
  PULL FIRE ALARM
  LEAVE BUILDING
  DIAL 9-1-1

  Notify (301) 405-2222 immediately for service repair

  For Residential Buildings (excluding areas not accessible to public):

  IN CASE OF FIRE EMERGENCY
  PULL FIRE ALARM
  LEAVE BUILDING
  DIAL 9-1-1

  Call (301) 314 9675 immediately for service repair

  on right side of placard with a white background
  WARNING
  FALSE FIRE ALARMS ARE A CRIME PUNISHABLE BY:
  -5 YEARS IN PERSON
  -$5,000 FINE
  -TERMINATION FROM CAMPUS HOUSING
  -EXPLUSION FROM THE UNIVERSITY
  -PERMANANT CRIMAL RECORD

- **Wiring**
  - All field wiring shall be installed in conduit. Conduit and boxes shall be sized according to National Electrical Code(R) requirements based on the number of conductors.
  - Initiating device circuit wiring shall be two-conductor, twisted with integral shield and ground. Notification appliance circuits shall be minimum 14 AWG. Primary power (AC) branch circuit conductors shall be minimum 12 AWG.
  - All conductors which are terminated, spliced, or otherwise interrupted shall be connected to terminal blocks. Make all connections with pressure type terminal blocks, which are securely mounted. The use of wire nuts or similar devices shall be prohibited.
    - Identification: Fire alarm circuits shall be identified by red junction box covers stenciled in white letters "FIRE ALARM."

- **System Testing**
  - All initiating and notification appliances, control equipment, accessories, and auxiliary functions shall be tested in accordance with NFPA 72 acceptance test procedures.

- **Training**
  - Provide complete certified factory technical training for a minimum of two of the University's select representatives.
  - The University's select representatives shall, upon completion of the above training, be factory qualified to perform complete maintenance and repair of the fire alarm system.
  - The contractor shall assume the responsibility to coordinate with the University the location and time required for the above certified factory technical training.