

## FIRE ALARM SYSTEMS

### **General**

Provide a fire alarm system, or expand the existing system, as required by Code, the requirements in the Special Instructions to Designers (SID) of the Design Guidelines, and/or as noted in the Program Documents.

The Department of Public Safety (DPS) remotely monitors essentially all of the University buildings on the Ann Arbor campuses. DPS monitors all of these fire alarm systems, 24-hours a day. The connection from the building to DPS is by the University MOSCAD system. This system is UL approved for Central Station monitoring, and the DPS office is considered to be a constantly attended location.

In other locations and/or when noted in the program documents, the fire alarm system shall be connected by telephone to the fire department in that jurisdiction.

Provide shop drawings for approval, and final certification reports, to the State Office of Fire Safety, and/or University of Michigan Fire Marshall (Department of Public Safety), as required by Code, and the Design Guidelines

### **MOSCAD (Central Station Monitoring) Connection**

The fire alarm system shall have output contacts that will interconnect with the University of Michigan's MOSCAD (Motorola SCADA system) transmitting unit. Provide a minimum of three form "C" contacts in the fire alarm control panel, plus needed conduit and wiring to the MOSCAD panel, for use as Alarm, Trouble, and Supervisory inputs for the MOSCAD system. These contacts, in their normal state, shall be closed, and in the 'alarm' state they shall open. See Detail 16725012 for installation details

Note that the MOSCAD system is connected by radio to the University of Michigan's Department of Public Safety on Kipke Road on south campus. This MOSCAD system is often used to transmit other alarm messages to that central security office. These other alarms might include security, and/or monitoring points of critical systems

In new buildings and when defined in the program statement, install, wire, and connect a MOSCAD system. The MOSCAD 'RTU', and antenna equipment will be provided by the University. Installation shall comply with the above noted standard detail, and information included in the program statement.

All wiring in the RTU, between the Alarm Junction Box and the RTU, and the wiring to the antenna, as well as all of the programming and work needed at DPS will be by the University. *(Note to U of M Design Manager, include \$8000 in the project budget to pay for these U of M provided equipment and services.)*

### **Initiating devices**

Provide adequate smoke and heat detectors where required by Code to rapidly detect a fire in any area of the building. In buildings or areas without sprinklers, provide total coverage. In fully sprinklered buildings, Code only requires automatic detectors in elevator machine rooms, in elevator lobbies, and in most elevator hoistways of high rise buildings. In all buildings, Code requires one smoke detector above the fire alarm control panel. In addition, provide supplementary initiating devices as noted below in the 'Design Requirements' section

Provide manual pull stations in all buildings at exit doors and at other locations as defined by Code.

Pull stations in residence areas of residence halls, areas where children are present, and as noted in program statement shall have vandal covers with audible alarm (when cover is lifted). Smoke and heat detectors in resident areas of residence halls, and areas with ceilings of 8'-0" or less, and as noted in program statement shall have wire screen covers that are UL listed for the fire alarm system being installed.

### **Notification Appliances**

Provide audible notification appliances as required to meet the minimum sound levels of the applicable codes. Assume that all interior doors are closed. Take into consideration the average ambient sound level in each space, the distance from the nearest notification appliance to each space, and the sound attenuation of the intervening walls and doors. Note that many laboratories and mechanical rooms have high average ambient sound levels. Note also that alarm sound level measurements will be taken during fire alarm system testing, and audible appliances will have to be added if the alarm sound levels do not meet Code. High rise buildings, residence halls (in general), buildings having more than 1000 occupants and/or other buildings as noted in program statement, shall have emergency voice/alarm communication systems throughout the building (including speakers in elevator cars).

Provide visual notification appliances in all common and public spaces as required by the applicable codes. Common and public spaces are defined as corridors, toilet rooms, auditoriums, classrooms, multi-person offices, and conference rooms with an occupancy large enough that Code requires them to have two doors. In addition, provide supplementary visual notification appliances as noted below in the 'Design Requirements' section. To address UFAS (the University's ADA requirements), install a visual (or audible/visual) notification appliance adjacent to each exit sign.

Vivariums shall have special alarm audible and visual indicating appliances to accommodate the research animals. See SBA-A for the specific requirement in these areas.

### **Connections to Sprinkler Systems**

In a building with a sprinkler system, provide water flow switches to detect sprinkler activation; and valve tamper switches at all shut off valves (including elevator machine room sprinkler shut off valves). Fire panel descriptors shall specifically note coverage area of the water flows, and the locations of the tamper switches. In a building with a fire pump, provide surveillance of the pump and its power supply.

## **Design Requirements**

### General Items

All new fire alarm systems shall be addressable with one or more panels as required by the size of the project area. In addition, all new fire alarm systems shall be installed with 25%(additional) spare capacity in all initiating circuits, notification appliance circuits,, power supplies, amplifiers, and related components of the overall system.

Whenever possible, expand and/or extend the existing system unless otherwise directed by the University. The expanded system shall also meet the 25% spare capacity requirement as noted above, limited only by the constraints of the model and vintage of that existing system.

All addressable devices shall have a unique address, this address shall be noted on the as-built drawings, and will be noted on a label for the device. Whenever possible number the heat and smoke detectors in each zone in a numerical order beginning with the detector closest to the control panel, and progressing away from the control panel.

### Initiating Devices and Notification Appliances

All initiating, monitoring, and control devices shall have the addressability function built into the associated device. Non-intelligent devices with separate addressable circuit boards are not acceptable.

Monitored components such as flow switches, tamper switches, etc. shall be connected (and monitored) by addressable 'monitor module' device. Monitor modules shall be connected to the monitored device, and shall be in close proximity to that device.

Pull stations, duct smoke detectors, audible and visual notification appliances, etc. shall all be installed and spaced as required by Code, and manufacturer's requirements.

### Design Issues

#### Initiating Devices

Buildings owned by the University without a sprinkler system shall have smoke and/ or heat detectors installed throughout the building.

In buildings with a sprinkler system, install smoke and heat detectors only in areas required by Code, as otherwise required by these guidelines, and good practice. If a building is partially sprinkled, follow the above noted guidelines in the appropriate areas.

Elevators are required by Code to be provided with smoke detectors in the elevator machine rooms, in the elevator lobbies, and in most elevator hoistways to initiate an elevator recall. These smoke detectors will be provided with the elevator, and they shall not be connected to the fire alarm system. When fire alarm system smoke detectors are required in elevator machine rooms and elevator lobbies, provide independent fire alarm system smoke detectors adjacent to the elevators' detectors. If the elevator hoistways are sprinklered, provide an independent fire alarm system smoke detector at the top of each elevator hoistway.

Install heat detectors, rather than smoke detectors, in high humidity locations such as bathrooms with showers and laundry areas, and/or in areas with occasional smoke present such as kitchens.

In areas where the room will be occasionally hosed down (cleaned) use devices specifically listed for such duty. For outdoor locations, use devices listed for the environment in which they will be located.

Locate all initiating devices (detectors) so that they are accessible for maintenance by the use of a ladder only. No lifts or scaffolding shall be required for maintenance. Those devices in restricted areas such as elevator shafts shall be easily accessible, from a non-restricted area, via an access doors. Avoid locating detectors above sloped auditorium floors.

Do not locate detectors at the top of atriums or skylights. In these applications use beam type where applicable. Avoid locating detectors where direct sunlight, high humidity, stagnant air, or turbulent air will cause maintenance problems.

When the need for door holders (and associated door release service devices) is defined during schematic design, the associated devices shall be connected to the fire alarm system. The needed smoke detectors shall report the fire alarm system, and the door holders are then released by the fire alarm system. Carefully coordinate associated fire system components and door hardware specified in the architectural section.

#### Duct Smoke Detectors

1. Locate duct smoke detectors at locations defined by manufacturer and/or by the mechanical contractor to have a laminar flow across the detector. Do not locate duct type smoke detectors downstream of humidity injection points or in outside air intake plenums. Duct smoke detectors shall 'report' to the fire alarm panel, and the fire alarm panel shall operate a 'control module' to stop the associated fan.
2. All duct smoke detector installations shall include a 'duct detector interface box' as shown in standard details 16720006, 16720007, or 16720008. The University will provide the interface box, unless noted otherwise during schematic design.
3. Locate the duct detector and the interface box so that a ladder is not needed to access them. Typically the boxes are located near the associated temperature control panel.. If the duct detector must be located where it is inaccessible or a ladder is required to access it, provide a remote indicator light and test pushbutton in a nearby accessible but non-public location.
4. If the fire alarm system is connected to a MOSCAD panel for transmission of alarm, supervisory, and trouble signals to the Department of Public Safety, program the duct detectors as supervisory rather than alarm devices. Duct detectors shall only alarm the building if the fire alarm system is not connected to MOSCAD.

#### Notification Appliances

1. Audible notification appliances shall produce a slow whoop alarm tone. If an emergency voice/alarm communication system is provided, the audible evacuation alarm signal shall produce three slow whoop alarm tones followed by a pre-selected voice evacuation message. The alarm tones and voice evacuation messages shall alternate until they are silenced.
2. Size and locate visible notification appliances in strict accordance with the "Visible Characteristics, Public Mode" Section of NFPA 72. Select the strobe candela outputs in accordance with the spacing tables, and indicate their outputs on the plan drawings for all strobes greater than 15 candela. Locate strobes at the halfway distance on the longest walls as shown in the NFPA 72 figures and appendices. Do not install strobes near room corners without increasing their candela ratings appropriately.

#### Fire Alarm Main Panels, and Annunciators

1. Locate the fire alarm system control panel in a clean, dry, heated, and ventilated closet or electrical room near a building entrance. The panel shall not be located in a building corridor, loading dock area or other high traffic area.
2. Provide at the fire department's normal entrance a fully functional annunciator panel.
3. In areas that are not continuously occupied, automatic smoke detection shall be provided at each control unit(s) location to provide notification of fire at that location.
4. The fire alarm system annunciation shall enable responding personnel to quickly and accurately identify the location of a fire, and to indicate the status of emergency equipment or fire safety functions that might affect the safety of occupants in a fire situation. All required annunciation means shall be readily accessible to responding personnel and shall be located as required by the authority having jurisdiction to facilitate an efficient response to the fire situation.

On all buildings on the Ann Arbor Campuses, install a NEMA 3R rated, 90 to 100 candela, strobe, outside, and above the location of the 'siamese' (hose) connection devices. This is a requirement of the Ann Arbor Fire Department

#### Supplementary Devices and Appliances

Provide supplementary initiating devices, of the type noted, for the following applications. Provide these devices so that a small fire can be detected and extinguished before the sprinkler system actuates and destroys the energized electrical equipment. Since these are not NFPA 72 requirements, place a note on the plan by each such device noting the reason for its placement. The note is to clarify the reason for the device, and to insure that the device is being and installed and placed to 'cover' the noted equipment or space. Unless otherwise required by Code, or these guidelines, there is no need to provide 'complete room coverage' in these situations - in all other respects the installation shall meet NFPA 72 requirements

1. In substation rooms provide two heat detectors per transformer. Center them on the transverse centerline of the substation transformer, and place approximately above the front, and rear surfaces, of the transformer.
2. In BDF (BE) and LDF (TR) communication rooms, provide at least one smoke detector above the relay racks.
3. In electrical power rooms, provide at least one smoke detector.
4. In recycling and trash rooms, install one smoke detector.
5. In elevator machine rooms and elevator lobbies of low rise buildings, provide one smoke detector.

Provide supplementary notification appliances, of the type noted, for the following applications. Provide these devices to notify people in areas with a high ambient sound level of a fire. Since these are not NFPA 72 requirements, place a note on the plan drawing by each such appliance noting the reason for its placement. Unless otherwise required by Code, or these guidelines, there is no need to provide 'complete room coverage' in these situations - in all other respects the installation shall meet NFPA 72 requirements.

1. In large mechanical rooms, elevator machine rooms, and electrical substation rooms, provide visual notification appliances if it is unlikely that the audible notification appliances will produce a sound level at least 15 dBA above the average ambient sound level.
2. In laboratories containing mechanical equipment, provide visual notification appliances if it is unlikely that the audible notification appliances will produce a sound level at least 15 dBA above the average ambient sound level.

### **Products**

The fire alarm system shall be resistant to damage from power system surges, spikes and voltage dips. The system shall be emergency battery backed, and size in accordance with Code requirements.

To reduce the possibility of damage by induced transients, circuits and equipment shall be properly protected in accordance with requirements set forth in NFPA 70, National Electrical Code, Article 800.

The fire alarm system shall be field programmable. When a special device is required to perform field programming, 1 programmer, software, and training shall be provided as part of the system unless the University already owns an appropriate programmer.

All wiring for the fire alarm system shall be installed in conduit or surface raceways. Use concealed conduit whenever possible and practical. When concealed conduit cannot be used in finished areas, provide surface raceways.

Route fire alarm system wiring in separate conduits (or surface raceways) from that of other building wiring. In addition, power, alarm, and detector wiring shall be segregated from each other as required by the system manufacturer and the applicable codes.

**Execution**

Instruct the Contractor to wire the detectors in each zone in numerical order beginning with the detector closest to the control panel, and progressing away from the control panel.

Instruct the Contractor to provide a typed list identifying all zones and detectors including the detector types and locations.

Inform the Contractor that the fire alarm system control panels, alarm devices, detectors, and switches shall not be painted. Junction boxes and covers, however, shall be painted red.

Detectors shall not be installed until after the construction clean up of all trades is complete and final. Detectors that have been installed prior to final clean up by all trades shall be cleaned or replaced.

Duct type detectors shall not be installed in the ducts until after the ducts have been cleaned and the duct filters have been changed.

Inform the Contractor that ceiling mounted detectors shall either not be installed prior to completion of other construction work in the area, or plastic bags shall cover the detectors until the other construction work is completed

Fire alarm system shall be connected, programmed, tested, and certified, by NICET certified fire alarm persons. Raceway, wiring, and installation shall be by licensed electricians. The fire alarm contractor shall provide the University, on floppy disk, or CD, a complete 'Windows System' compatible copy of the operational and application programs. This electronic documentation will reflect the system as configured after the certification testing is completed, and accepted.

Instruct the Contractor to perform testing in accordance with Section 16950, and to provide the University Project Coordinator with test reports.

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