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BuildingName
The Description of the Project
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SPECIFICATION DIVISION 28

NUMBER SECTION DESCRIPTION

DIVISION 28 ELECTRONIC SAFETY AND SECURITY
SECTION 283100 - FIRE DETECTION AND ALARM SYSTEM

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DIVISION 28 ELECTRONIC SAFETY AND SECURITY
SECTION 283100 - FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, Standard General and Supplementary General Conditions, Division 01 Specification Sections, and other applicable Specification Sections, in particular the Related Sections listed below, apply to this Section.

B. Related Sections:

1. Section 017823 - Operation and Maintenance Manual
2. Section 019100/019110 - Commissioning
3. Section 260513 - Medium, Low & Control Voltage Cables
4. Section 260526 - Grounding and Bonding for Electrical
5. Section 260533 - Electrical Materials and Methods
6. Section 260800 - Electrical Acceptance Tests

1.2 SUMMARY

A. Provide all equipment, devices, appliances, wiring, and materials necessary for a complete and expandable fire detection and alarm system which adheres to applicable codes, standards, and University of Michigan requirements.

B. Coordinate with and provide submittals to the Michigan Bureau of Fire Services, Ann Arbor Fire Department, U-M Fire Marshal, and FM Global as required.

C. Maintain the existing fire alarm system in service while the new work is installed, tested and made operational.

D. Provide a new fire alarm system with the following features:

1. A main fire alarm control panel (FACP).
2. Node and notification appliance circuit (NAC) panels.
3. Automatic and manual initiating devices.
4. Audible and visual notification appliances.
5. Control inputs and outputs to ventilation systems.
6. Control outputs to each elevator controller to initiate elevator recall.
7. Status monitoring of fire pump controllers, sprinkler flow switches, and sprinkler valve tamper switches.
8. Alarm, supervisory, trouble, fire pump running and maintenance alert outputs to the MOSCAD or MC-Edge RTU alarm transmitter.
9. Raceways, junction boxes, wiring and accessories as shown on the drawings and as required for a complete and operable system.
10. System programming in accordance with the system's sequence of operation.

E. Renovate the existing fire alarm system by providing the following as appropriate for the project's scope:

1. A pre-renovation test of the existing system to document the condition of the system before it is changed.
2. A main fire alarm control panel (FACP).

3. Node and notification appliance circuit (NAC) panels.
4. Automatic and manual initiating devices.
5. Audible and visual notification appliances.
6. Control inputs and outputs to ventilation systems.
7. Control outputs to each elevator controller to initiate elevator recall.
8. Status monitoring of fire pump controllers, sprinkler flow switches, and sprinkler valve tamper switches.
9. Alarm, supervisory, trouble, fire pump running and maintenance alert outputs to the MOSCAD or MC-Edge RTU alarm transmitter.
10. Raceways, junction boxes, wiring and accessories as shown on the drawings and as required for a complete and operable system.
11. System programming as required to incorporate changes to the system's sequence of operation.

F. Provide the following additional work where shown on the drawings:

1. Remote annunciators.
2. A smoke control system control panel.
3. Status monitoring of other building life safety systems.
4. Control outputs to automatically control smoke control system equipment.
5. Status lights indicating the current status of smoke control system equipment.
6. Control switches to manually override the automatic control outputs to smoke control system equipment.
7. Control outputs to interrupt power to electrically operated access control door hardware devices.
8. Non-battery backed power to door hold-open devices.
9. Emergency voice/alarm communications.
10. Building-wide mass notification system.
11. Remote microphone cabinets.
12. Fire Department telephone communications.

G. The following work is not included unless shown otherwise:

1. Smoke and heat detectors that actuate a fire suppression system.
2. Electrically operated door hardware devices.
3. Power to electrically operated door hardware devices.
4. Door hold-open devices.

1.3 RELATED SECTIONS

A. The drawings and the general provisions of the contract, including the current edition of the University of Michigan Standard General Conditions, apply to this section.

B. The applicable requirements of the other Division 28 specification sections, including the following, apply to this section.

1. Section 260533, "Basic Electrical Materials and Methods".
2. Section 260513, "Cables and Wires".
3. Section 262000, "Service and Secondary Distribution".
4. Section 260526, "Grounding".
5. Section 260800, "Electrical Acceptance Tests".

1.4 REFERENCES

A. Comply with the current versions of the following codes and standards as applicable:

1. ANSI/IEEE C2, "National Electrical Safety Code".
2. MBC, "Michigan Building Code".
3. MEC, "Michigan Electrical Code".
4. "Michigan Elevator Code"
5. MMC, "Michigan Mechanical Code".
6. "Michigan Rehabilitation Code".
7. "Michigan Residential Code".
8. NFPA 13, "Standard for the Installation of Sprinkler Systems".
9. NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps".
10. NFPA 72, "National Fire Alarm Code", clarified as follows:
    a. Smoke and heat detectors shall not be required above suspended ceilings.
    b. Horns or speakers shall not be installed in elevator machine rooms. Horns, speakers, or strobes shall not be installed in elevator cars.
    c. Fire alarm system shall not shut down power to the elevators upon sprinkler water flow.
    d. Optional smoke detectors in rooms with beam pockets shall be spaced as shown on the plan drawings.
11. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems".
12. UL 217, "Single and Multiple Station Smoke Detectors".
13. UL 268, "Smoke Detectors for Fire Protective Signaling Systems".
14. UL 268A, "Smoke Detectors for Duct Applications".
15. UL 464, "Audible Signal Appliances".
16. UL 521, "Heat Detectors for Fire Protective Signaling Systems".
17. UL 864, "Control Units for Fire Protective Signaling Systems"
18. UL 1480, "Speakers for Fire Protective Signaling Systems".
19. UL 1971, "Signaling Devices for the Hearing Impaired".

B. For classroom, in-patient medical, and Housing projects, comply with the applicable sections of NFPA 101, "Life Safety Code" as adopted and amended by the Michigan Bureau of Fire Services.

C. For systems that provide partial evacuation or relocation of occupants rather than full evacuation, comply with the NFPA 72 requirements related to survivability from attack by fire.

1. Designate each notification appliance circuit to serve no more than one notification zone.
2. Protect power supply and notification appliance circuits from fire until they enter the notification zone they serve.
3. Monitor the integrity of audible and visual notification appliance power supplies, audio generators, amplifiers and circuits.
4. Monitor the integrity of Fire Department telephone communications circuits.

1.5 SYSTEM DESIGN REQUIREMENTS

A. The system shall be device addressable and power limited.

B. Provide a fire alarm control panel with the following:

1. Digital display.
2. Multiple pushbutton keypad.
3. LED status indicating lights.
4. Audible status signals.
5. Output relays.
6. Battery charger and batteries.
7. RS-232 communications card.

C. Evaluate and document the appropriate signaling line circuit class designation.

1. In general, provide Class B signaling line circuits except where an applicable code requires a different circuit class.
2. Provide sufficient spare capacity on each signaling line circuit for an additional 25 percent of initiating and control devices.

D. Evaluate and document the appropriate notification appliance circuit class designation.

1. In general, provide Class B notification appliance circuits except where an applicable code requires a different circuit class.
2. Size the control panel power supplies, amplifiers, and batteries for 25 percent spare capacity calculated with 40 ma horn loads, 1 watt speaker loads, and 150 ma strobe light loads.
3. Provide sufficient spare capacity on each notification appliance circuit for an additional 25 percent of notification appliances.

E. The system shall supervise the following circuits and components:

1. Initiating device circuits.
2. Signaling line circuits.
3. Notification appliance circuits.
4. Addressable initiating and control devices.
5. Control output wiring.
6. Auxiliary control switches.
7. System node panels, NAC panels, remote annunciators, and remote microphone panels.
8. Primary power supply.
9. Secondary power supply.

F. The system shall be capable of being programmed by the Owner on site to accommodate expansion or sequence of operation changes.

G. Provide 120 volts AC primary power to the system from a dedicated emergency power branch circuit.

H. Provide a control panel battery charger capable of fully charging a 200 amp-hour battery within 24 hours.

I. Provide sufficient secondary power battery capacity to operate the entire system (except the door hold-open devices) upon the loss of primary power for a period of 24 hours in a normal supervisory mode followed by 5 minutes of evacuation alarm operation.

1. When emergency voice/alarm communications is provided, provide sufficient battery capacity for 24 hours of operation in a normal supervisory mode followed by 15 minutes of voice/alarm operation.
2. The system shall automatically transfer to and from the secondary power batteries upon an interruption of primary power without initiating a nuisance alarm.
3. The system shall delay initiating a trouble condition for two seconds upon a transfer to or from primary power to avoid nuisance trouble conditions during emergency generator testing.

J. Provide smoke and heat detectors as required by code and as shown, including the following.

1. Provide smoke detectors in each elevator lobby, in each elevator machine/control room, and at the top of each elevator shaft to initiate elevator recall.
2. Provide two heat detectors, one in front and one behind, each unit substation transformer.
3. Provide a smoke detector in each mechanical, electrical, telecommunications, trash collection, and recycling room.
4. Provide smoke detectors in residence hall corridors, each sleeping room, and immediately outside each sleeping room that is located within a suite or apartment.
5. Provide duct smoke detectors where required by code. When not in plain view or when more than 10 feet above the floor, provide duct detector remote alarm indicators and test switches mounted in plain view at 48 inches above the floor.

K. Provide sufficient audible notification appliances to achieve a sound level of 15 dBA above ambient sound level, but not less than 60 dBA nor more than 110 dBA in all occupiable spaces. The sound level in mechanical rooms shall be not less than 90 dBA, and in sleeping rooms shall be not less than 75 dBA measured at pillow level. The sound shall be a three-pulse temporal pattern evacuation tone.

1. In rodent rooms, the sound shall be a slow whoop or warble with a peak frequency below 500 Hz.
2. Do not provide horns or speakers in exit stair enclosures.
3. Do not provide horns or speakers in elevator machine rooms or in elevator cars.
4. Provide a speaker in each sleeping room and a sounder base in each sleeping room smoke detector. The speaker shall provide the general alarm and the sounder base shall alarm upon smoke within the room.

L. Provide visual notification appliances in accordance with the intensity and spacing requirements of NFPA 72.

1. Provide strobes in all public areas including multi-person offices.
2. Do not provide strobes in exit stair enclosures or in animal rooms.
3. Combine horns or speakers with strobes when both are required at the same location.
4. Synchronize strobes when more than two appliances are in any point of view and are less than 55 feet apart.

5. Provide strobes in elevator machine rooms. Do not provide strobes in elevator cars.
6. Provide strobes in accessible sleeping rooms and in living spaces of accessible suites or apartments.
7. Provide strobes in mechanical rooms and other areas that have an average ambient noise level exceeding 95 dBA.

M. Provide a waterproof horn/strobe or speaker/strobe with waterproof back box on the exterior of the building between 8 and 12 feet above each fire department connection. Audible sound shall be 90 dBA minimum at 10' and visual intensity shall be 110 candelas. Program this device to alarm upon sprinkler system water flow only, and to cease operation upon termination of water flow.

N. Provide individually addressable monitor modules to monitor non-addressable initiating devices and status contacts of other systems.

1. Monitor modules shall use Class B initiating device circuits to monitor the initiating devices and status contacts.
2. When interconnecting with an existing fire alarm system control panel, provide monitor modules as required.
   a. New and existing control panels shall function as a single system.
   b. All control panels shall be capable of being reset simultaneously from a single location.

O. Provide panel auxiliary relay contacts and individually addressable control module contacts, including the required panel control logic programming, to interface with control circuits of other systems and equipment.

1. Provide normally closed duct smoke detector contacts to shut down ventilation systems.
2. Provide three control module output contacts for each elevator to control elevator recall.
3. Provide normally closed auxiliary relay or control module contacts to release electrically held door locks and door hold-opens, and to disable electrically operated door proximity sensors.
4. When interconnecting with an existing fire alarm system control panel, provide control modules as required.
   a. New and existing control panels shall function as a single system.
   b. All control panels shall be capable of being reset simultaneously from a single location.

P. Provide a smoke control system panel.

1. Provide normally open auxiliary relay or control module contacts to automatically control smoke control system equipment.
2. Provide smoke control panel On/Off/Auto switches with "On" and "Off" or "Open" and "Closed" LED indicators for overriding the normally open contacts that control smoke control system equipment.
   a. In the Auto position, the contacts shall operate in accordance with the fire alarm system program. In the Off position, the contacts shall remain open. In the On position, the contacts shall close to test the controlled equipment.

b. The LED indicators shall indicate the status of the controlled equipment in accordance with the MMC.
c. Turning any switch out of the Auto position shall initiate a system trouble condition.

Q. Assign each initiating device and control module a unique device address. Label each device with its unique address using a clear adhesive backed nylon or Mylar tape with black text. Install the label on the base of any device with a removable or replaceable head.

R. Develop a custom location label for each initiating device and control module that describes the type, floor, room number and exact location of the device.

1. If the device is in a corridor or similar large space, state device is by Room XXX.
2. If room numbers are not available, provide compass directions and references to unique building features.

S. Provide transient voltage surge suppression for the system.

1.6 SYSTEM PERFORMANCE REQUIREMENTS

A. Under normal conditions, the control panel digital display shall display a "SYSTEM NORMAL" message and the current time and date.

B. Should an abnormal condition be detected, the appropriate alarm, supervisory, or trouble panel LED shall flash and the appropriate panel audible signal shall sound.

C. The appropriate panel alarm, supervisory, trouble, or supervisory maintenance alert output relay contact shall close and send a signal through the MOSCAD or MC-Edge RTU alarm transmitter to the Division of Public Safety and Security (DPSS).

D. The fire alarm control panel shall manage all input and output signals through software programming and hardware configuration. In addition to managing and supervising the fire alarm devices, the control panel shall be configured to trigger a supervisory condition when the fire pump runs.

E. The panel shall display the following information relative to the abnormal condition:

1. Custom location label (40 characters minimum).
2. Type of initiating device.
3. Type of abnormal condition (alarm, supervisory or trouble).

F. If the abnormal condition is an alarm, the following actions shall occur:

1. Audible notification appliances shall sound throughout the building.
2. Visible notification appliances shall flash throughout the building.
3. Control outputs to mechanical systems and elevator controllers shall perform their programmed functions.
4. Control outputs shall interrupt power to electrically operated door hardware devices.
5. Power to door hold-open devices shall de-energize.

G. Pressing the appropriate Acknowledge pushbutton shall acknowledge the alarm, supervisory or trouble condition unless the system is in the silence inhibit mode. Once acknowledged, the appropriate LED shall latch on and the panel audible signal shall be silenced.

H. If the abnormal condition is an alarm, pressing the Silence pushbutton shall silence the audible notification appliances and stop the visual notification appliances from flashing.

I. Upon a subsequent abnormal condition from another device, the appropriate panel LED shall flash, the panel audible signal shall again pulse and the panel display shall show the new abnormal condition.

J. After all of the points have been acknowledged and silenced, the LED's shall glow steady and the panel audible signals shall be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated.

K. Pressing the System Reset pushbutton shall return the system to its normal state if the abnormal conditions have been remedied.

1. The display shall step the user through the reset process with simple English language messages. Messages including "IN PROCESS", "RESET COMPLETED", and "SYSTEM NORMAL" shall provide operator assurance of the sequential steps as they occur.
2. The ventilation system motors shall restart sequentially.
3. The outputs to control circuits of other systems and equipment shall return to normal.
4. When interconnecting with an existing fire alarm system control panel, resetting shall not require the simultaneous operation of reset pushbuttons or switches on multiple control panels, or the disconnection of wiring.

L. Should an abnormal condition continue to exist, the system shall remain in an abnormal state. The system control relays shall not reset. The panel LED’s shall remain on. The display shall indicate the total number of alarm, supervisory and trouble conditions present in the system along with a prompting to review the points. These points shall not require acknowledgment if they were previously acknowledged.

M. Should a trouble condition continue to exist, the trouble audible signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100 percent operational. Both the time interval and the trouble audible signal shall be programmable to suit the Owner's application.

N. Should the Alarm Silence Inhibit function be active, the System Reset pushbutton shall be ignored and a "RESET INHIBITED" message shall be displayed for a short time to indicate that action was not taken. For operator assurance, a "RESET NO LONGER INHIBITED" message shall be displayed when the inhibit function times out.

1.7 ITEMIZED QUOTATION

A. Submit with your bid an itemized cost breakdown listing all major component costs, labor costs (including subcontractor labor and material costs), and engineering costs, for base bid and for each alternate, for the entire fire alarm system scope of work. When requested, provide an itemized breakdown to the Owner post-bid for review and approval.

1.8 SUBMITTALS

A. Submit for approval copies of the following shop drawings and product literature. Shop drawings shall contain title blocks identifying the project name and number. Submittals shall be marked to indicate the specific models, sizes, types, and options being provided. Submittals not so marked and incomplete submittals will be rejected.

1. Plan drawings showing the locations (with room names and numbers) of the system components, including any adjustments in the quantities and locations of initiating devices and notification appliances to meet code requirements.
2. Riser diagram showing system components, interconnecting wiring and connections to other building systems and equipment.
3. Wiring diagrams showing manufacturer and field connections at component terminals, complete with conductor color codes and wire numbers.
4. System configuration list showing inputs, outputs, device addresses and custom location labels, device configurations and program logic.
5. Bill of materials.
6. Catalog pages showing system components.
7. System battery sizing calculations.
8. Power supply, amplifier and circuit sizing calculations.
9. Door hold-open power supply sizing calculations.

1.9 EXTRA MATERIALS

A. Provide to the Owner the following extra materials matching the products installed, packaged in protective coverings for storage, and identified with labels clearly describing the contents. Provide 1 percent of the installed amount of each with a minimum of one of each.

1. Fuses: Each size and type used in the system.
2. Manual Pull Stations.
3. Detector Bases.
4. Detector Heads: Each type used in the system.
5. Addressable Monitor and Control Modules: Each type used in the system.
6. Notification Appliances: Each size and type used in the system.
7. Output Relays.

B. Provide one data cable for connecting a lap top computer to the fire alarm control panel's RS-232 communications card so that the Owner can perform panel programming.

1.10 RECORD DOCUMENTS

A. Submit four copies of record drawings showing the locations of fire alarm panels, devices and appliances, the locations of end-of-line resistors and junction boxes, the addresses of addressable devices, the tap settings of audible notification appliances, the intensity ratings of visual notification appliances, the sizes of conduits and conductors, circuit numbers, and deviations from the design.

B. Submit four printed copies of the final system configuration list showing inputs, outputs, addresses, custom location labels, device configurations, and program logic.

C. Provide an electronic file storage device (USB drive, SD card, etc.) containing the following final system software:

1. The master program generic to the model of system being provided.
2. The building specific program containing the unique information for the system being provided.
3. A software license and the system passwords required by the Owner to perform programming changes.

1.11 OPERATIONS AND MAINTENANCE MANUALS

A. Submit for approval four copies of operations and maintenance manuals for the specified system and equipment prior to startup. The manuals shall be the same manuals used by the Manufacturer's field service technicians. The manuals shall be marked to indicate the specific models, sizes, types and options that were provided. Manuals not so marked will be rejected.

1.12 QUALITY ASSURANCE

A. The fire alarm system shall be the standard product of a single fire alarm system manufacturer who has been producing this type of equipment for at least 10 years, and has a fully equipped service organization within 150 miles of the Owner. Each component shall display the manufacturer's name.

B. Each fire alarm system component shall be listed under the appropriate standard of Underwriters Laboratories and shall bear a UL label.

C. The fire alarm system shall be UL labeled as a system and approved by FM Global.

D. For classroom, in-patient medical, and Housing projects, the fire alarm system shall also be approved by the State of Michigan Bureau of Fire Services.

1. Submit shop drawings to the Michigan Bureau of Fire Services for approval.
2. Arrange for a Michigan Bureau of Fire Services Inspector to inspect the system installation and testing.
3. Submit to the Owner a copy of the FS-12A Form submitted to the Michigan Bureau of Fire Services.

E. The fire alarm system shall comply with the requirements of the National Fire Alarm Code, the Owner’s Inspection Authorities and with the Manufacturer's instructions.

1.13 WARRANTY

A. Provide a complete parts and labor warranty for twelve months from the date of final acceptance of the system by the Owner.

B. Provide a telephone response to Owner's questions within 4 hours and on-site assistance within 24 hours.

C. Permit Owner's Fire Alarm Technicians to perform temporary bypasses and emergency repairs on the system without voiding the warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers and Models:

1. EST Model EST-3.
2. Honeywell Model XLS3000.
3. SimplexGrinnell Model 4100 Series.
4. National Time & Signal Model On-Point.
5. Notifier ONYX 3030 Series.
6. Siemens Model XLS.

2.2 SYSTEM COMMUNICATIONS

A. The fire alarm control panel shall communicate with each addressable initiating and control device individually via shielded twisted pair signaling line circuits. EST SIGA-Loop or SimplexGrinnell MAPNET II or IDNET.

B. Each signaling line circuit shall be capable of accessing up to 127/250 addressable devices.

C. Each signaling line circuit shall allow up to 10,000 feet of wire length to the furthest addressable device.

D. Communications shall use a broadcast polling protocol to allow t-tapping of the circuit except where Class A wiring is required. T-taps shall be limited to 64 per loop.

E. Communications shall be completely digital and shall include parity data bit error checking routines for address codes and check sum routines for the data transmission protocol.

F. Each device shall be uniquely identified by a device address.

G. There shall be no limit to the number of initiating devices which may be activated simultaneously.

H. Each device shall be individually annunciated at the panel. Annunciation shall include the following conditions for each device.

1. Alarm, supervisory or trouble condition.
2. Open, short or ground.
3. Device failure or incorrect device installed.

2.3 FIRE ALARM CONTROL PANEL

A. The fire alarm control panel shall be modular with solid state, microprocessor based electronics.

B. The panel shall display only those primary controls and displays essential to operation during a fire alarm condition.

C. The panel shall include a LCD digital display, with a minimum of 80 characters.

1. The display shall be backlit for enhanced readability. It shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
2. The display shall support both upper and lower case letters. Lower case letters shall be used for soft key titles and for prompting the user. Uppercase letters shall be used for system status information. A cursor shall be visible when entering information.

D. A panel audible signal shall sound during alarm, supervisory, or trouble conditions. This audible signal shall sound differently during each condition to distinguish one condition from another. The audible signal shall also sound differently during each key press to provide audible feedback (chirp) indicating that the key has been pressed properly.

E. The system program shall be stored in a non-volatile flash EPROM memory within the panel. Loss of primary and secondary power shall not erase the program stored in memory.

1. The program shall be capable of selective input/output control functions.
2. The program shall enable initiating devices to be individually configured on site to provide either alarm and trouble, supervisory and trouble, alarm only, supervisory only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit.
3. The program shall enable initiating devices to be disabled or enabled individually.

F. The panel or the field devices shall determine the alarm decision for each detector by comparing the detector value to stored values.

1. The panel shall automatically maintain a constant smoke obscuration sensitivity in percent of smoke obscuration format for each detector.
2. The panel shall maintain a moving average of each smoke detector's smoke chamber value to automatically compensate for dust and dirty conditions that could affect detection operation.
3. The smoke obscuration sensitivity shall be adjustable to within 0.3 percent of either limit of the UL window (0.5 percent to 4.0 percent) to compensate for any environment.
4. When a detector's average value reaches a predetermined value, a "MAINTENANCE ALERT" condition shall be audibly and visually indicated at the panel. The LED on the detector base shall glow steady giving a visible indication at the detector location. If a dirty detector is left unattended and its average value increases to a second predetermined value, a "TROUBLE" condition shall be indicated at the panel. To prevent nuisance alarms, these dirty conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.

5. The panel shall continuously perform an automatic self-test routine on each detector which shall functionally check detector electronics and ensure the accuracy of the obscuration values being transmitted to the panel. Any detector that fails this test shall indicate a "SELF TEST ABNORMAL" or "TROUBLE" condition at the panel.
6. Each detector shall be scanned by the panel for its type identification to prevent inadvertent substitution of another detector type. The panel shall operate with the installed device but shall initiate a "WRONG DEVICE" or "TROUBLE" condition until the proper type is installed or the programmed detector type is changed.
7. An operator at the panel, having a proper access level, shall have the ability to manually access the following information for each detector.
    a. Device type.
    b. Device status.
    c. Present average value.
    d. Peak detection values.
    e. Present sensitivity selected.
    f. Detector range (normal, dirty, etc.).
8. An operator at the panel, having a proper access level, shall have the ability to perform the following for each detector:
    a. Enable or disable the point.
    b. Clear peak detection values.
    c. Clear verification tally.
    d. Control a detector's relay driver output.
9. The panel shall be programmable to automatically change the sensitivity settings of each detector based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied periods and less sensitive during occupied periods). There shall be seven sensitivity settings available for each detector.
10. The panel shall be programmable for a pre-alarm or two-stage function. This function allows an indication to occur when, for example, a detector with a 3 percent set point reaches a threshold of 1.5 percent smoke obscuration.
11. Smoke detectors shall be provided with the ability for alarm verification. When in alarm verification mode, only a verified alarm shall initiate the alarm sequence operation.
    a. The activation of a smoke detector shall initiate an alarm verification operation whereby the panel resets the activated detector and waits for a second alarm activation. If, within an adjustable time delay, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm. If no second alarm occurs within the time delay, the system shall resume normal operation.
    b. The alarm verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation shall be selectable by device.
    c. The panel shall have the capability to display the number of times a device has gone into a verification mode.

d. Detectors in alarm verification mode shall have the ability of being divided into different groups whereby any two activations from a group shall cause the panel to follow its programmed alarm sequence.

G. The panel shall have four pass code controlled access levels. Pass codes shall be entered using the panel key pad.

1. To maintain security when entering a pass code, the digits entered shall not be displayed.
2. When a correct pass code is entered, an "ACCESS GRANTED" message shall be displayed. The access level shall be in effect until the keypad is inactive for 10 minutes or the operator logs out.
3. Should an invalid code be entered, the operator shall be notified with a message and shall be allowed up to two more chances to enter a valid code. After three unsuccessful tries, an "ACCESS DENIED" message shall be displayed.
4. Access to a level shall only allow the operator to perform actions within that level and actions of lower levels, not actions of higher levels.
5. Access levels shall be associated with the following functions:
   a. Alarm silence.
   b. System reset.
   c. Set time and date.
   d. On/Off/Auto control selection.
   e. Manual control.
   f. Disable and enable circuits and devices.
   g. Clear historical logs.
   h. Walk test.
   i. Change alarm verification.
   j. Change detector sensitivity.
   k. Function keys.
6. An access level shall also be associated with acknowledge keys. If the operator presses an Acknowledge key with insufficient access, an error message shall be displayed. The points on the log shall scroll with each key press, but the points shall not be acknowledged.

H. The panel shall have the ability to store a minimum of 300 events in an alarm log plus a minimum of 300 events in a separate trouble log. These events shall be stored in a battery protected random access memory. Real time and date shall accompany history event recordings.

I. The panel shall supervise subordinate module LED’s for burnout or disarrangement. Should a problem occur, the panel shall display the module and LED location numbers to facilitate location of that LED.

J. The panel shall have function keys programmed as follows for disabling and enabling circuits or groups of devices for maintenance or testing purposes. While circuits or devices are disabled, the panel shall indicate "TROUBLE".

1. F1: Disable smoke detectors by floor.
2. F2: Disable duct smoke detectors.
3. F3: Disable sprinkler system flow switches.
4. F4: Disable horns/strobes or speakers/strobes by floor.
5. F5: Disable beam detectors.
6. F6: Disable smoke detector sounder bases.
7. F7: Disable hood suppression systems.

8. F8: Disable elevator recall.

K. The system shall be capable of being walk tested by one person.

1. The activation of an initiating device under test shall be silently logged as an alarm or supervisory condition in the historical log. The panel shall automatically reset itself after logging the abnormal condition.
2. The momentary disconnection of an initiating device or notification appliance shall be silently logged as a trouble condition in the historical log. The panel shall automatically reset itself after logging the trouble condition.
3. The walk test sequence shall have the ability to activate the notification appliances for a maximum of 2 seconds upon the activation of an initiating device under test. If this option is selected, any momentary opening of the initiating device circuit or a notification appliance circuit shall cause the notification appliances to sound for 4 seconds to indicate the trouble condition.
4. Should the walk test mode be on for an inappropriate amount of time, the panel shall automatically revert to normal mode.
5. Should an abnormal condition occur from an active point not in walk test mode, the system shall perform its standard programmed alarm, supervisory or trouble sequences.

L. The panel enclosure shall be equipped with opaque door panels and locks providing security from tampering.

2.4 NODE AND NAC PANELS

A. Node and NAC panels shall be modular with solid state, microprocessor based electronics, operator interfaces, power supplies, audio generators, amplifiers, battery chargers and batteries as required. All components shall be supervised.

2.5 BATTERIES

A. Batteries shall be lead calcium and supervised so that a failure produces a "TROUBLE" signal.

2.6 REMOTE ANNUNCIATOR

A. The remote annunciator shall duplicate the backlit LCD display; the alarm acknowledge, supervisory acknowledge, trouble acknowledge, alarm silence, and system reset pushbuttons; the alarm, supervisory, and trouble audible signals; the alarm, supervisory, trouble, and power "on" LED's; and the programmable function keys of the fire alarm control panel. A key "enable" switch or door lock, keyed to match the fire alarm control panel door lock, shall permit activating or deactivating the controls.

B. A remote microphone shall be included when the fire alarm system includes emergency voice/alarm communications, along with the same pushbuttons as the fire alarm control panel for selecting pre-recorded voice messages, and the same controls to choose total building or selected areas communications.

2.7 ADDRESSABLE SPOT DETECTOR BASES

A. Spot detector mounting bases shall be individually addressable, suitable for two wire operation, with a twist-lock head locking feature a DIP switch or electronic addressing means, and an LED that provides power "on", alarm and trouble indications. The bases shall be listed for ceiling and wall mounting. Removal of the detector head shall cause a trouble condition at the panel.

B. Where shown, the bases shall include an auxiliary relay that is controlled from the panel.

C. In sleeping rooms, the base shall include a piezoelectric sounder that is controlled from the panel.

D. In corridors outside of sleeping rooms, the base with its head shall be protected by a vandal-resistant cage.

E. In corridors, locker rooms, and meeting rooms of athletic facilities, the base with its head shall be protected by a vandal-resistant cage.

F. When bases are not in plain view, bases shall be connected to remote alarm indicators mounted in plain view at 48 inches above the floor.

2.8 MULTISENSOR SMOKE DETECTOR HEADS

A. Multi-sensor type smoke detector heads shall include sampling and reference ionization chambers with a single radioactive source, a photoelectric sensor and a programmable heat detector. The detectors shall support at least four levels of sensitivity selectable at the panel and 360 degree smoke entry.

2.9 PHOTOELECTRIC SMOKE DETECTOR HEADS

A. Photoelectric type smoke detector heads shall include a pulsed LED light source and a silicon photodiode receiver, at least seven levels of sensitivity selectable at the panel, an integral insect screen and 360 degree smoke entry. This type of detector shall be installed in all duct detectors.

2.10 HEAT DETECTOR HEADS

A. Heat detector heads shall include combination rate-of-rise and rate compensated fixed temperature sensing, two levels of rate-of-rise sensitivity selectable at the panel, and an independent 135 degrees F fixed temperature set point. Heat detector heads shall be self-restoring.

B. Heat detector heads for steam tunnels, cage wash areas and dish machine areas shall have a 135 degrees F fixed temperature set point and shall be self-restoring.

2.11 DUCT DETECTORS

A. Duct detectors shall be individually addressable and consist of a housing, sampling tubes, a baffle and a detachable detector head. Duct detectors shall include an alarm LED, a local test switch, and an auxiliary SPDT relay for ventilation system control. Duct detectors shall be resettable by actuating the panel reset pushbutton. The sampling tubes shall be capable of being cleaned through the housing cover.

B. The detector heads shall be photoelectric as specified above, but shall be capable of accepting ionization detector heads.

C. When not in plain view, duct detectors shall include remote alarm indicators and test switches mounted in plain view at 48 inches above the floor.

2.12 BEAM DETECTORS

A. Photoelectric projected beam detectors shall be individually addressable and consist of separate transmitter and receiver units capable of long range coverage of up to 350 feet. Beam detectors shall include alarm and trouble dry auxiliary contacts, and normal, alarm and trouble LED status indicators. Beam detectors shall include internal bore sights, automatic calibration, six sensitivity settings, automatic compensation for temperature and lens contamination, and a trouble indication upon either a total obscuration or an obscuration of 50 percent of the alarm set point. Beam detectors shall be suitable for four wire operation utilizing 24 volt DC power from the panel, and resettable by actuating the panel reset pushbutton.

2.13 MANUAL PULL STATIONS

A. Manual pull stations shall be individually addressable, suitable for two wire operation, with a high impact red Lexan body and raised white lettering. Stations shall include an ADA compliant single action operating mechanism with a mechanical latch to hold an operated station open until reset.

B. Reset shall be accomplished through use of a key common to the panel or a small flat-blade screwdriver. Stations which use allen wrenches or special tools to reset are not acceptable. The point of reset shall be front accessible so stations with tamper-resistant covers can be reset easily.

2.14 MONITOR MODULES

A. Monitor modules for individual two wire contact monitoring shall be individually addressable, suitable for two wire operation, with a DIP switch or electronic addressing means, and a programmable latch feature for monitoring momentary contacts. Monitor modules shall monitor a single normally open dry contact using a Class B, Style B, initiating device circuit.

B. Monitor modules for zone or four wire device monitoring shall be individually addressable, suitable for four wire operation utilizing 24 volt DC power from the panel, and with a DIP switch or electronic addressing means. Zone monitor modules shall monitor multiple normally open dry contacts using a Class B, Style B, two wire initiating device circuit, or monitor a four wire device using a Class B, Style D, four wire initiating device circuit.

2.15 CONTROL MODULES

A. Control modules shall be individually addressable with DIP switches or electronic addressing means. Control modules shall provide either one normally open and one normally closed contact or a Form C contact per digital output. Control modules may have more than one digital output per module if each output has a unique address. Contacts shall be rated 0.5 amps at 120 volts AC or 2 amps at 28 volts DC resistive and shall be controlled by the panel.

2.16 HORNS

A. Horns shall be electronic, rated 24 volts DC, with a piezoelectric driver set to produce a three-pulse temporal pattern evacuation tone with a sound level of 101 dBA at 10 feet, a red, semi-flush body capable of wall or ceiling mounting.

B. Horns in rodent rooms shall be set to generate a slow whoop or warble sound with a peak frequency below 500 Hz. Horns shall be of heavy-duty industrial construction and shall be UL listed for indoor and outdoor applications. EST Model 5530MD-24AW only.

2.17 SPEAKERS

A. Speakers shall be rated 125 to 12,000 Hertz, include four taps rated at from 1/4 to 2 watts, produce a sound level of 82 dBA at 10 feet when set at the 1/2 watt tap, and with a semi-flush body capable of wall or ceiling mounting..

B. Speakers for locations with high ambient noise may be high efficiency horns rated 500 to 6,000 Hertz minimum, 10 watts minimum, include four or more taps, produce a sound level of 106 dBA minimum at 1 meter when set at the 1 watt tap, and be capable of wall or ceiling mounting.

2.18 STROBES

A. Strobes shall be rated 15, 30, 60, 75, 110, or 177 candela as shown for proper illuminance, with a 1 Hertz flash rate, Xenon flash tube, white body, clear Lexan lens with red "FIRE" or international fire symbol lettering, capable of being synchronized, and capable of wall or ceiling mounting.

2.19 COMBINATION HORN/STROBES AND SPEAKER/STROBES

A. Combination horn/strobes and speaker/strobes shall consist of the horns, speakers and strobes specified above, but combined on a single mounting plate. Combination units used outdoors and in wet areas shall be waterproof and mounted to waterproof back boxes.

2.20 DOOR HOLD-OPEN POWER SUPPLY

A. The door hold-open power supply shall produce 24 volts DC of sufficient amperage to provide 0.4 amps of current to every door hold-open device being controlled. The power supply shall be supervised and capable of withstanding the inrush current that will occur when the door hold-open devices are energized.

B. The output of the power supply shall be distributed by individually fused circuits. Fuse each circuit at 5 amps.

C. The power supply shall release the held open doors upon a fire alarm or an AC power failure.

2.21 EMERGENCY VOICE/ALARM COMMUNICATIONS

A. Emergency voice/alarm communications shall include audio control modules for evacuation tone and voice message generation, controls to choose total building or selected areas communications, audio amplifiers, a local microphone, and a remote microphone at each remote annunciator. All of the components except for the remote microphones shall be located in or adjacent to the fire alarm control panel.

B. The audio control module default mode shall provide for automatic total building fire alarm evacuation. The evacuation tone shall consist of a three-pulse temporal pattern followed by a pre-recorded fire alarm voice message. At the end of each voice message, the evacuation tone shall resume. The evacuation tone and voice message shall sound alternately until the alarm silence pushbutton at the fire alarm control panel or remote annunciator has been pressed. Audio tones and voice messages shall be digitally transmitted between nodes.

C. The audio control modules shall provide for manual total building or selected area live voice communications. Upon keying of the local or a remote microphone, a three second continuous alert tone shall sound over the speakers indicating a live voice message will occur.

D. The evacuation and alert tones shall be digitally generated by programmable software so that changes can be made without component rewiring. The pre-recorded voice messages shall be stored digitally in non-volatile EPROM memory.

E. The evacuation tone for rodent rooms only shall be produced by a separate audio control module and amplifier that generate a slow whoop or warble sound with a peak frequency below the hearing range of rodents (i.e. 500 Hz).

F. Audio amplifiers shall have a frequency response of 125 Hz to 12,000 Hz minimum.

G. Microphones shall be of a hand-held, push-to-talk, noise-canceling type with a frequency range of 200 Hz to 4000 Hz and a self-winding five foot coiled cable. An LED shall indicate the microphone push-to-talk pushbutton has been pressed and the speaker circuits are ready for transmission.

H. Remote microphones shall be enclosed in remote annunciator cabinets with lockable doors.

1. Remote microphones shall duplicate the manual voice transmission capability of the local microphone at the fire alarm control panel. The fire alarm control panel microphone shall have priority over any remote microphones.
2. The remote microphone cabinets shall include controls for total building or selected areas communications.

I. Should a Fire Department telephone communication system be provided, the telephones system shall be capable of being patched to the emergency voice/alarm communications system and controlled at the fire command center.

2.22 FIRE DEPARTMENT TELEPHONE COMMUNICATIONS

A. Fire Department telephone communications shall consist of a minimum of eight dedicated communications circuits between a fire command center communications panel and remotely located emergency telephone jacks, a master telephone handset and five pluggable telephone handsets.

B. The communications panel shall include a master telephone controller for processing of two-way communications. This module shall include a circuit selector switch and "Call" and "Trouble" LED indicators for each circuit, an audible device for call and trouble signaling, a trouble silence switch with ring-back, and an LED trouble indicator. Circuit supervision modules shall be included to electrically supervise for shorts, opens, and grounds of circuit wiring.

C. The system shall be capable of handling single or simultaneous conversations with all telephones connected into the system. The circuits shall be so designed to prevent static, hum, or other interferences to clear, intelligible two-way conversations. The communications shall be transported digitally between devices.

D. The act of plugging a handset into an emergency telephone jack shall cause the appropriate circuit indicator LED to flash and a distinctive audible device to sound at the communications panel. The subsequent picking up of the master telephone and selection of the proper circuit shall silence the pulsing sound, cause the circuit indicator LED to latch on, and couple the remote telephone to the master telephone. Two or more telephones shall be capable of being connected into an active conversation at the discretion of the operator.

E. Attempting to use a subsequent telephone on the same circuit shall not cause the pulsing sound to activate if any two-way communications are already established. Any new circuits activated shall, however, cause their circuit indicator LED’s to flash until acknowledged.

F. Unplugging the handsets in use and returning the related circuit selector switches to the normal position shall cause the restoration of normal supervisory functions. If any remote telephone remains plugged in, the appropriate circuit indicator LED shall flash and the pulsing sound shall resume at the communications panel.

G. The master telephone handset shall be recessed within a protective enclosure at the communications panel.

H. A single line circuit shall be provided to a jack in each stairwell at each floor, in each elevator car, in each elevator lobby, at each area of refuge, at the emergency generator location and at the fire pump location. Emergency telephone jacks shall be mounted on a stainless steel single gang plate engraved with the words "Fire Emergency Telephone".

I. Furnish an emergency telephone jack for installation in each elevator car. Wiring from the elevator controls to each elevator car and installation of the jacks will be provided by the elevator contractor.

J. Provide five pluggable emergency telephone handsets with self-winding five foot cords within a storage cabinet mounted at the fire command center. Key the cabinet to match the fire alarm control panel.

2.23 ADD ALTERNATE FOR BUILDING-WIDE MASS NOTIFICATION

A. If the Add Alternate is accepted, add any necessary equipment, initiating devices, notification appliances, conduit, wiring, programming, and appurtenances to the base fire alarm system scope of work to incorporate building-wide mass notification into the fire alarm system.

1. Comply fully with National Fire Alarm Code NFPA 72 emergency communications systems requirements including Annex and Supplement requirements.
2. The system and its components shall be UL listed.
3. Provide speakers for audible notification appliances in lieu of horns if the base fire alarm system scope of work specifies horns. Provide sufficient speakers to meet NFPA 72 voice intelligibility requirements.
4. Provide clear lens strobe lights with the lettering “ALERT” on the housing for visual notification appliances in lieu of providing the base bid clear lens strobe lights with the lettering “FIRE” on the housing.
5. Provide the following additional features in the main fire alarm control panel and in each remote fire alarm annunciator panel.
    a. Emergency voice/alarm communications and a microphone for DPSS and OSEH Fire Marshal use if not required by the base bid scope of work.
    b. The ability to generate a building-wide three second continuous alert tone. This alert tone shall be significantly different from the fire alarm system's three-pulse temporal pattern evacuation tone.
    c. A minimum of 8 pushbuttons to initiate the strobe lights and the building-wide evacuation or alert tone followed by a unique pre-recorded voice message.
        1) Actuation of any pushbutton shall override any fire alarm notification and instead initiate the strobe lights and the building-wide evacuation or alert tone over the fire alarm system speakers. The associated pre-recorded voice message shall alternate with the tone.
        2) Alarm and supervisory signals shall be sent through MOSCAD or MC-Edge RTU to DPSS.

3) At any time during the alert, actuation of any microphone shall permit building-wide live voice announcements to be made. If at any time a remote annunciator panel microphone is keyed simultaneously with the main fire alarm control panel microphone, the main fire alarm control panel microphone shall have priority.
4) The strobe lights shall continue to flash and the tone and pre-recorded voice message shall continue to sound until the fire alarm system is reset.

d. The tone and pre-recorded voice message shall be as follows for each pushbutton:
1) Alert tone alternating with "Your attention please - A tornado warning has been issued. Take shelter in this building now. Remain calm and do no run. Take shelter now."
2) Alert tone alternating with "Your attention please - An armed intruder has been reported in this area. Lockdown now."
3) Alert tone alternating with "Your attention please - An active shooter has been reported in this area. Lockdown now."
4) Evacuation tone alternating with "Your attention please - An emergency has occurred. Evacuate the building now. Remain calm and do not run. Evacuate now."
5) Alert tone alternating with "Your attention please - An emergency has occurred. Please remain in place until further notice. Please remain where you are."
6) Alert tone alternating with "Your attention please - This is an all clear. The emergency has been resolved. Resume normal operations."
7) Alert tone alternating with "Your attention please - This is a test of the building mass notification system. This is only a test."
8) (Spare for project-specific use.)

6. Provide a remote microphone cabinet with microphone for Facility Manager use at the location shown on the drawings. The cabinet shall include the following features:
a. Provide a minimum of 8 pushbuttons. These pushbuttons shall be identical to those in the main fire alarm panel and in each remote fire alarm annunciator panel. Each pushbutton shall be capable of initiating the building-wide evacuation or alert tone followed by the same unique pre-recorded voice message.
1) Actuation of any pushbutton shall override any fire alarm notification and instead initiate the strobe lights and the building-wide tone over the fire alarm system speakers. The associated pre-recorded voice message shall alternate with the tone.
2) Alarm and supervisory signals shall be sent through MOSCAD or MC-Edge RTU to DPSS.

3) At any time during the alert, actuation of the facility manager's microphone shall permit building-wide live voice announcements to be made. If at any time the facility manager's microphone is keyed simultaneously with the main fire alarm control panel or any remote fire alarm annunciator panel microphone, the fire alarm panel microphone(s) shall have priority.
4) The strobe lights shall continue to flash and the tone and pre-recorded voice message shall continue to sound until the fire alarm system is reset.

b. Provide a uniquely keyed cabinet door lock and special facility manager keys so a fire alarm panel key or a special facility manager key can access this cabinet, but a facility manager's key cannot access the other fire alarm panels.

7. Provide the capability inside the main fire alarm control panel to add a future interface module or circuit card. This interface shall permit DPSS to actuate the strobe lights, actuate the building-wide evacuation or alert tone, actuate any of the pre-recorded voice messages, and make live voice announcements from a head end device located at one or more DPSS remote locations. This capability shall include:
   a. Physical space inside the fire alarm control panel.
   b. Power supply capacity.
   c. Battery capacity.
   d. Means to plug the interface into the fire alarm control panel circuitry.
8. Provide system interconnecting raceways, wiring and routing in compliance with the system "survivability" requirements contained in NFPA 72.

PART 3 - EXECUTION

3.1 SYSTEM INTERRUPTIONS

A. Coordinate with the U-M Fire Protection Shop (734-647-2046) before performing any work affecting an existing fire alarm system. Operating, programming, modifying, or impairing an existing system without approval of the U-M Fire Protection Shop is strictly prohibited.

B. When renovating a fire alarm system, test the system to document its condition before changes are made. Maintain operation of fire alarm system devices outside of the work area.

C. When replacing a fire alarm system, maintain operation of the existing system until acceptance of the new system. If operation of the existing system cannot be maintained and the building is occupied, provide a 24 hour/day fire watch until the new system is accepted.

1. Notify the U-M Fire Protection Shop (734-647-2046), the U-M DPSS (734-763-1131), the U-M Fire Marshal (734-647-1143), and the Michigan Bureau of Fire Services (if applicable) when a fire watch is being performed.

2. Perform the fire watch in accordance with U-M Fire Marshal and Michigan Bureau of Fire Services requirements.

D. Coordinate with the U-M Key Office (734-764-3481) before performing any work affecting existing electrically controlled doors.

3.2 INSTALLATION

A. Provide wiring in conduit in accordance with Sections 260533 and 260513, and Manufacturer's instructions.

B. Provide wiring in conduit or provide fire alarm-rated MC cables in accordance with Sections 260533 and 260513, and Manufacturer's instructions.

C. Provide wiring and raceways as follows and in accordance with Sections 260533 and 260513 and Manufacturer's instructions.

1. Concealed in walls, exposed on walls up to 8' AFF, and above non-accessible ceilings - provide wiring in conduit.
2. Above accessible ceilings and above 8' AFF in unfinished spaces - provide open wiring in J-hooks. Provide conduit sleeves where open wiring penetrates walls and floors.

D. For systems that provide partial evacuation or relocation of occupants rather than full evacuation, protect power supply and notification appliance circuits from attack by fire until they enter the notification zone they serve. Provide 2-hour rated cable assemblies or protect circuits in 2-hour rated shafts, enclosures or sprinklered stairwells in accordance with Sections 260533 and 260513.

E. Circuits may be T-tapped only where shown on the manufacturer's wiring diagrams.

F. Provide waterproof back boxes with gaskets for devices and appliances installed outdoors or in wet or wash-down areas.

G. Paint fire alarm junction boxes, covers and fittings red or provide red conduit throughout, except fire alarm raceways exposed in finished areas may be painted to match wall color.

H. Modifications to fire alarm control panels, node panels, NAC panels and remote annunciator panels shall be made by a Manufacturer's Representative.

I. Final connections to the fire alarm system components and system programming shall be performed by Fire Alarm Technicians with NICET Level II or higher certification.

J. Label fire alarm panels with the room numbers, electrical panel numbers, and circuit breaker numbers feeding them.

K. Paint the handles of circuit breakers feeding fire alarm panels red, and install handle locks.

L. Smoke and heat detectors shall not be installed until after construction clean-up is completed.

1. When renovating an existing system, remove and store existing detectors during construction activities.
2. Detectors installed prior to construction clean-up shall be cleaned by the manufacturer or replaced.

3.3 TESTING

A. Demonstrate complete operation of the fire alarm system in accordance with NFPA 72, NFPA 101 (classroom, in-patient medical, and Housing projects only), the Michigan Building Code, and Manufacturer's instructions. Notify the Owner’s Representative 3 working days in advance of the test.

1. The test shall be witnessed by a U-M Fire Marshal, a U-M Electrical Inspector, and the U-M Fire Protection Shop.
2. Especially on fire alarm renovation projects, the U-M Fire Protection Shop may participate in or direct the testing activities.
3. On classroom, in-patient medical, and Housing projects, also include an Inspector from the Michigan Bureau of Fire Services.

B. Submit a signed and dated NFPA 72 test report to the Electrical Inspector prior to acceptance of the fire alarm system by the Owner.

C. On classroom, in-patient medical, and Housing projects, also submit a signed and dated FS-12A Form to the Michigan Bureau of Fire Services.

3.4 COMMISSIONING

A. Perform Commissioning activities per Related Sections above.

3.5 TRAINING

A. Provide the Owner’s Fire Alarm Technicians with classroom training on the operation and maintenance of this model of system. This training shall be by the Manufacturer and shall be the same training as given to the Manufacturer's field service technicians. The University will pay the travel costs to the Manufacturer's training site. If the Owner's Technicians have already received operations and maintenance training from the manufacturer on this model of system, this training requirement will be waived.

B. Provide the Owner’s Fire Alarm Technicians with classroom training on the programming of this model of system. This training shall be by the Manufacturer and shall be the same training given to the Manufacturer's field service technicians. The University will pay the travel costs to the Manufacturer's training site. If the Owner's Technicians have already received programming training on this model of system, this training requirement will be waived.

C. Train the Owner’s Fire Alarm Technicians on unfamiliar components installed in this system.

D. Walk the Owner's Fire Alarm Technicians through the building and identify the locations of fire alarm devices hidden from plain view.

E. Train DPSS, Housing Security if applicable, and the U-M Fire Marshal on the basic operation of the system, including how to acknowledge audible notification appliances after an alarm.

F. Train DPSS, Housing Security if applicable, and the U-M Fire Marshal on how to override the smoke control systems, on how to use the emergency voice/alarm communications, and on how to use the Fire Department telephone communications systems. Invite representatives from the Ann Arbor Fire Department to this training.

G. Train the Facility Manager on how to use the emergency voice/alarm communications system, and how to use the mass notification system if provided.

END OF SECTION 283100