

**1.00 GENERAL**

1.01 Scope:

- A. This Standard outlines the requirements for an addressable fire detection and alarm system.
- B. This Standard consists of all materials, equipment and services necessary and required to complete and test the automatic fire detection and alarm system. Any material not specifically mentioned in this Standard or not shown on drawings but required for proper performance and operation shall be furnished and installed.
- C. The contractor shall design, furnish and install (complete and ready for operation) an up-to-date automatic fire detection and alarm system including control panel, software, schematics, detectors, manual pull stations, alarm devices, wiring, components, appurtenances and accessories, and all wiring and connections to devices furnished by others.
- D. All references to "Owner's Safety Department" in this document refer to the Oklahoma State University Risk Management Environmental Health & Safety Department, which inspects, monitors and certifies all fire detection systems for the OSU campus.

1.02 Codes, Ordinances, and Standards:

- A. This installation shall be made in accordance with the drawings, this Standard, and the following:
  - 1. NFPA 70, National Electric Code, Current edition.
  - 2. NFPA #72, "National Fire Alarm Code", Current edition.
  - 3. NFPA #101, "Life Safety Code", Current edition.
  - 4. ADA (American Disability Act)
  - 5. All applicable State and local codes.
- B. All equipment and component parts shall be Underwriters Laboratories Listed and/or Factory Mutual Approved for use as a fire protective signaling system.
- C. Architects' Fire Alarm Drawings shall be used to indicate the area of protection. All Symbols dictate the area of protection—not the location of devices. Contractor shall be responsible for proper location and coverage of all areas.
- D. The Contractor shall correct, at no added cost, all equipment that is installed outside the above-mentioned codes. Authority Having Jurisdiction has the authority to accept or reject any installed equipment outside of these codes.

1.03 Workmanship:

- A. All work shall be performed by trained and certified technicians licensed by the State of Oklahoma for Fire Alarm Installation.
- B. A fire alarm technician, certified by the manufacturer of the fire alarm system, shall be on-site during construction to approve the installation of all wiring and devices.

1.04 Contractor Qualifications:

- A. The Contractor shall provide on-call 24-hour, 7-days-a-week service. Service personnel shall be available at any time for emergency service.
- B. The Contractor shall be a stocking distributor for all equipment included in the system for immediate replacement of parts from inventory and shall have been actively engaged in this type of work for a period of not less than five (5) years and located within ninety (90) miles of the Owner.
- C. The Contractor shall be licensed by the State of Oklahoma to perform fire alarm work in the State of Oklahoma.

1.05 Submittals:

- A. The contractor shall submit three (3) complete sets of documentation within 30 calendar days after award of purchase order. Documentation shall indicate the type, size, rating, style, catalog number, manufacturers' names, photos, installation and catalog data sheets for all items to ensure compliance with these standards.

Documentation shall consist of the following:

- 1. List of Data on the addressable fire alarm control panel.
  - a. CPU (Central Processing Unit)
  - b. Serial/Parallel communication boards
  - c. Loop interface boards
  - d. Display interface board (LCD with Operator Keypad)
  - e. Monitor and Keyboard
  - f. Printer
  - g. Up-to-date Software Version
  - h. Power Supply
- 2. List of data on the Field Initiating and Notification Devices.
  - a. Monitor Modules
  - b. Control Modules
  - c. Addressable smoke detectors
  - d. Addressable heat detectors
  - e. Any other initiating devices (eg: Duct Detectors)
  - f. Manual pull stations shall be Fire Lite BG-8 or Notifier BNG-1R
  - g. Speaker/Strobes
  - h. Remote power supply

3. Voice Evac
  - a. Audio Voice Message System
  - b. Amplifiers

The above-mentioned items are the basic for a Fire Alarm System. Any other item that is required by code shall be added to the above list.

This equipment shall be subject to the approval of the Owner's Safety Department. and no equipment shall be ordered without this approval.

- B. Equipment and devices are to be shown on the contract drawings. Provide the following shop drawings and lists.
  1. Complete one-line riser diagram showing all equipment and the size, type, and number of all conductors.
  2. Large-scale drawing of the Fire Command Center Room.
  3. Large-scale drawing of all field panels.
  4. Provide calculations to support the size of standby batteries submitted.
  5. A complete floor-by-floor fire alarm plan, showing devices, zone layout and wire interconnections.
  6. A complete flow chart or outline of the programming that is going to be used for the fire alarm panel.
    - a. Main subroutine: General Alarm, System disables
    - b. Subroutines: Zones, Buildings, wings, floors and large areas
    - c. Sub-subroutines: Auditoriums, large classrooms, and any rooms that have more than three initiating devices

## 2.00 SYSTEM DESCRIPTION AND FUNCTION:

- A. The automatic fire detection and alarm system shall consist of a main control panel, remote power supply panels, remote control panels, detection devices, manual stations, HVAC fan relay control modules, and magnetically-held fire door relay control modules that are wired in accordance with the schedule on the drawings and shall function as specified herein. The system shall be capable of being expanded at any time up to the predetermined capacity of the system.
- B. The system shall be capable of operating both addressable and non-addressable ionization, thermal and photoelectric detecting devices, manual stations, sprinkler supervisory switches and water-flow switches.
  1. Supervisory switches shall be set up for supervisory (trouble) causing only.
- C. The system shall function as follows when any smoke detector, heat detector, duct detector, manual pull station, alarm monitor modules or waterflow switch operates:
  1. Activate the Evacuation notification system devices as shown on the drawings.

2. Illuminate all visual notification devices as shown on the drawings.
3. Automatically notify the fire department via the Central Station located at the OSU Police department.
4. Display the device(s) and location of the device(s) in alarm and in trouble on the LCD Display, printer, annunciator, and interactive display system.
5. Conventional zones (monitor modules) are to display the area of protection.
6. Light an indicating lamp on the device initiating the alarm.
7. Shut down the HVAC system and operate smoke dampers as shown on the drawings.
8. Close all magnetically-held fire doors as shown on the drawings.
9. Operate Smoke Removal systems, if required, for those initiating devices.
10. Activate Emergency Elevator operation, if required, for that initiating device.
11. Activate natural gas shutoff (only if alarm exists in the area of natural gas).

NOTE: There shall be no limit, other than the maximum system capacity, as to the number of addressable devices that may be in alarm simultaneously.

D. The System shall function as follows when a Building, Zone, Floor, and/or Device is disabled:

1. When the Building is disabled:
  - a. All notification devices in that Building shall not be activated.
  - b. All AHU and fire doors in that Building shall not be activated.
  - c. Transmission of Fire alarm Signal shall not be activated.
2. When the Zone is disabled:
  - a. All notification devices within that zone shall not be activated.
  - b. All AHU and fire doors within that zone shall not be activated.
  - c. Transmission of Fire alarm Signal shall not be activated.
  - d. All other areas outside the disabled zone shall activate the fire alarm system and its programmed functions.
3. When the Floor is disabled:
  - a. All notification devices on that floor shall not be activated.
  - b. All AHU and fire doors on that floor shall not be activated.
  - c. Transmission of Fire alarm Signal shall not be activated.
  - d. All other areas outside the disabled floor shall activate the fire alarm system and its programmed functions.

4. When the Sprinkler System alarm circuit is disabled:
  - a. All notification devices shall not be activated
  - b. All AHU and Fire Doors shall not be activated.
  - c. Transmission of fire alarm signal shall not be activated.
  - d. All other parts of the Fire Alarm system shall activate the fire alarm system and its programmed function.

### 3.00 PRODUCTS

#### 3.01 General:

- A. All materials, equipment, accessories, devices and other facilities and appurtenances covered by these standards or noted on the contract drawings and on the contractor's approved working drawings and installations shall be up to date, new, best suited for its intended use and shall conform to applicable and recognized standards for their use. All equipment shall be standard cataloged products of a single manufacturer with the exception of the manual stations (Notifier Model BNG-1R or Fire Lite BG-8 -- NO SUBSTITUTES).
- B. Since this system is to be part of an overall existing campus fire alarm system, NO FIRE ALARM CONTROL PANEL OTHER THAN THAT MADE BY, FIRE-LITE, NOTIFIER, SIMPLEX, OR SEIMENS PYROTRONICS shall be accepted for the equipment specified in this section.

#### 3.02 Control Equipment:

- A. Fire Alarm Control Panel (FACP):
  1. The FACP shall provide power, annunciation, supervision and control for the detection and alarm system. The FACP shall be modular in construction and contain all modules necessary to operate in accordance with this section and the applicable drawings.
  2. The system shall provide fail-safe operation, i.e. incoming alarms shall automatically override all other modes of operation, and the panel shall automatically return to normal operating mode from any operator-initiated mode.
  3. Dynamic supervision of system electronics, wiring, and detection devices shall be provided by the control system. Failure of system hardware or wiring shall be indicated by type and location on the alphanumeric annunciator. Ground fault detection shall be provided for all initiating and audible circuits. Lamp test capability shall be provided for all visual panel indicators.
  4. A service mode shall permit the arming and disarming of individual detection devices and a group of detection devices (Zones). Status of these devices shall be displayed upon command from the control panel. If any change in status degrades system operation as configured, a trouble condition shall be reported and remain until system operation again meets configured status.
  5. Owner shall be capable of entering the FACP programming software to make changes when needed.
  6. No audible signal shall be heard from the fire alarm control panel upon receiving a trouble signal.
  7. Fire Alarm Control Panel shall be installed in a secured room that has the dimension of 8ft. x 8ft. or 8ft. x 6ft.

B. Power Supply Panels:

Fire Alarm Control Panel Power

1. The primary power supply shall operate from 120 volts AC. (If an emergency generator is provided, obtain power from the emergency power panel.) The 120-volt power shall be converted to 24 volts DC and shall provide 110% of the required system amperage.
  - a. 120 Volt AC power shall be dedicated to the Fire alarm system panels only.
2. The secondary power supply shall consist of batteries and charger, enabling automatic switching to battery power in the event of loss of power from the primary supply and switching back to the primary power supply when it is restored. An automatic tapering charge battery charger capable of fully recharging the batteries in twelve (12) hours shall be supplied to maintain the batteries. Supervision of battery connections, battery fuse or breaker, and battery condition shall be provided and shall produce a trouble signal when any condition occurs that would prevent operation of the secondary power supply.

Remote Power Supply (Notification and Auxiliary)

1. There shall be at least four 24-volt outputs per Remote Power Supply. Each output shall be used for Audio, Visual, and Auxiliary (AHU or Fire Doors).
2. Shall be activated by the Fire Alarm Control Panel.
3. Shall operate from 120 volts AC. (Receive AC power from the same circuit as the FACP AC power). 120 volts power shall be converted to 24 volts DC.
4. There shall be a second source of power that consists of batteries and charger enabling automatic switching to battery power in the event of loss of power from the primary supply and switching back to the primary power supply when it is restored. An automatic tapering charge, battery charger capable of fully recharging the batteries in twelve (12) hours shall be supplied to maintain the batteries.
5. There shall be supervision of the following:
  - a. Main power source.
  - b. Battery and Charger.
  - c. All output circuits
  - d. Ground Faults.

Note: The supervisory signal shall be sent to the Fire Alarm Control Panel. There shall be proper Annunciation of the Remote Power Supply panels.

6. Remote Power Supply panels shall be installed six feet above the floor, measured from the top of the Remote Power Supply panel.
7. Remote Power Supplies shall be located on the floor or the area where it supplies power for fire alarm system devices.

C. Indicators:

1. The FACP shall provide an alphanumeric display, which shall provide a user definable message associated with each heat, smoke, control module, monitor module, remote power supply or zone.
2. Normal condition shall be indicated by a green light, trouble conditions by an amber light, and fire conditions by a red light. Trouble indicating lights shall automatically reset when trouble conditions are cleared. Fire indicating lights must remain lit at the control panel until manually reset.
3. Remote Annunciators shall display the alarm and trouble message on an LCD alphanumeric display. The annunciator shall also be capable of silencing the alarm signal. The annunciator shall be placed in a cabinet with a window door and locked. The lock shall be keyed to a cat-15 key.
4. Remote Annunciator(s) shall be located at a main entrance on the first floor of a building/wing. The Owner's Safety Department shall give the approval of the location.

D. Signal Initiation Circuits:

1. Individual input and output device addressability shall be performed on the same pair of wires. Wiring shall be Class B. No special wiring sequence shall be required on addressable device circuits. An unlimited number of wiring branches shall be permitted with no loss of supervision. Addressable detection devices shall be individually identified by the system using user-defined messages. The system shall be capable of reading the sensitivity of remote addressable ionization and photoelectric detection devices.
2. All smoke detectors shall provide alarm verification via the control panel.
3. All control function of the smoke detectors shall be provided via the control panel, and software control.
4. There shall be 20% of device space available for each Signal Initiation Circuit, for future expansion.

E. Notification Circuits:

1. Audible Notification Circuits:
  - a. At least two (2) march-time coded, Class "B" supervised, general alarm, audible notification output circuits shall be provided. It shall be possible to disarm these output circuits from the control panel without the disconnection of wiring. Disarming these output circuits shall cause a trouble signal to be generated and shall also indicate, by user-defined message on the alphanumeric display, the cause of the trouble signal.
  - b. The disarming of the Audible Notification devices shall be set for building disarm, floor disarm, and zone disarm.
  - c. These output circuits should be used to activate the remote power supply panels.

2. Voice Evacuation:

- a. Emergency voice/alarm communications service shall be provided by a system with automatic or manual voice capability that is installed to provide voice instructions to the building occupants.
- b. In response to an initiating signal indicating a fire emergency, the system shall automatically transmit a message (that has been recorded by the user) either immediately or after a delay acceptable to the authority having jurisdiction, consisting of a tone of a “whooping” sound of 3 seconds to 10 seconds duration followed by a message. The tone and message will repeat until silenced by the user.
  - An example of a message may be this: “MAY I HAVE YOUR ATTENTION PLEASE. THE FIRE ALARM SYSTEM HAS BEEN ACTIVATED. GO TO THE NEAREST EXIT AND LEAVE THE BUILDING. DO NOT USE THE ELEVATORS.”
- c. Failure of the message described by (b), where used, shall sound the evacuation signal (whooping sound) automatically. Provisions for manual initiation of voice instructions or evacuation signal generation shall be provided.
- d. Live voice instructions shall override all previously initiated signals on that channel and shall have priority over any subsequent automatically initiated signals on that channel.
- e. All other requirements by code shall comply with section 3-12 of NFPA 72.
- f. Speakers shall be set up for building, wing, floor, and zone notification. Emergency Responders shall be capable of activating or deactivating the speakers for each section and all sections.
- g. Emergency Responders shall be capable of selecting a group of speakers by building, wing, floor, and zone sections to alert occupants of certain emergency situations.

3. Visual Notification Circuits:

- a. At least One (1) non-coded, supervised general alarm visual output circuit shall be provided. It shall be possible to disarm this output circuit from the control panel without the disconnection of wiring. Disarming this output circuit shall cause a trouble signal to be generated and shall also indicate the cause of the trouble signal by a user-defined message on the alphanumeric display.
- b. The disarming of the Visual Notification devices shall be set for building disarm, floor disarm, and zone disarm.
- c. Do not overload the fire alarm control panel power supply. There shall be a separate power supply or output circuit from the remote power supply for the visual notification devices. This supply of power shall have supervision capabilities and shall be monitored by the fire alarm control panel.

4. CENTRAL STATION NOTIFICATION:

- a. Automatically notify the fire department via the Central Station located at the OSU Police Department. The contractor shall provide and install the appropriate modules for proper monitoring/control of the fire alarm control panel.

F. Auxiliary Output Circuits and Devices:

1. General:

- a. Individual input and output device addressability shall be performed on the same pair of wires. Addressable relay control devices shall be individually and collectively (group) controlled within the programming. It shall be possible to deactivate/activate these addressable relay control devices from the control panel by the user. Deactivating/Activating any of these addressable relay control devices shall cause a trouble signal to be generated and shall also indicate by user-defined message on the alphanumeric display the group deactivated/activated.
- b. All auxiliary devices shall be 24 volts DC. A 24-volt output from the remote power supply can also be used.

2. Air Handling Unit Shutdown:

- a. HVAC fan shutdown shall be achieved by the use of addressable relay control modules.
- b. The addressable relay control module shall be designated for HVAC control only. No other equipment shall be controlled by this device.
- c. A single command or switch shall be programmed to shut down AHU's by the user (Emergency Personnel)

3. Smoke/Fire Door Release and Access Control Doors:

- a. Magnetically-held fire door release shall be achieved by the use of addressable relay control modules.
- b. Access Control doors shall unlock by addressable relay control modules.
- c. The addressable relay control module shall be designated for fire door control only. No other equipment shall be controlled by this device.
- d. A single command or switch shall be programmed to activate Smoke/Fire Door Releases and deactivate and bypass Access Control Devices by the user (Emergency Personnel).

4. Smoke Removal System Control:

- a. Smoke Removal System actuation (if required) shall be achieved by the use of addressable relay control modules. The initiating devices controlling this addressable relay control module shall be as indicated on the drawings.
- b. The addressable relay control module shall be designated for smoke removal control only. No other equipment shall be controlled by this device.
- c. A single command or switch shall be programmed to activate/deactivate the smoke removal system devices by the user (Emergency Personnel).

5. Emergency Elevator Control:

- a. Emergency Elevator Control shall be achieved by the use of addressable relay control modules. The initiating devices controlling this addressable relay control module shall be as indicated on the drawings.

- b. The addressable relay control module shall be designated for elevator control only. No other equipment shall be controlled by this device.
  - c. A single command or switch shall be programmed to activate/deactivate elevator recall by the user (Emergency Personnel).
6. Natural Gas Shut Off:
- a. The natural gas shut-off, if required, shall shut the gas off in an area where natural gas is used. (eg. Kitchen: It shall be achieved by the use of addressable relay control modules.
  - b. The addressable relay control module shall be designated for natural gas shut-off control only. No other equipment shall be controlled by this device.
  - c. A single command or switch shall be programmed to activate/deactivate gas shut-off devices by the user (Emergency Personnel).
- G. Cabinet(s):
- 1. The FACP cabinet shall be of the semi-flush or flush mount type and shall compactly house all solid state cards, indicating lamps, switches, power supply panels, batteries, etc. for the system. If the power supply panels and/or batteries cannot be mounted in the FACP cabinet, then supply and install a separate cabinet with blanked hinged cover matching the FACP cabinet and mount where directed by the Architect. All lamps and controls shall be behind a hinged locked door ("dead front") with glass or plastic vision panel(s) and CAT-15 lock. The front of the cabinet shall not project more than one-half inch (1/2") from the wall.

3.03 Devices:

A. AC Power Disconnect:

1. FACP

Dedicated branch circuit with separate fuse box and disconnect with provision to padlock the box cover and switch in the "on" or "off" position. The fuse shall be a ten-(10) amp, cartridge-type fuse. The connection of the AC power for the fire alarm shall be ahead of the main disconnects or breakers. THE FIRE ALARM AC POWER SHALL NOT BE CONNECTED TO A BREAKER. Locate the box and switch in an easily accessible location (preferably next to the FACP) and mount within five (5) feet of the floor. The box shall be labeled with an engraved red plastic sign that reads, "FIRE ALARM DISCONNECT SWITCH" printed in one-half inch (1/2") white letters. Locks will be provided by Owner.

2. Remote Power Supply

Dedicated branch circuit shall be used for the remote power supply panels. There shall be a surge protector and disconnect switch. The surge protector and disconnect switch shall be within the Remote Power Supply Panel.

B. Batteries:

- 1. Approved gel cell-type batteries shall be provided as an emergency power source to power the system (FACP and Remote Power Supply panels) in the event of power failure. Batteries shall be of sufficient capacity to power the system under trouble and standby conditions for twenty-four (24) hours and to operate all notification appliances for at least five (5) minutes to the end of this period. Batteries shall be nine-(9) Amp Hours capacity as a minimum.

C. Locks and Keys:

1. All locks shall be keyed to CAT-15 key. Any lock that does not operate with the Owner's Safety Department's CAT-15 key shall be replaced with a lock that does work.
2. Close security of all keys to the alarm system is a requirement of this standard. The Equipment Supplier shall have the responsibility of retaining all except two (2) keys that are to be checked out to the Contractor for construction and tests. (Additional keys may be obtained by the contractor from the OSU Key Department if needed.) The Equipment Supplier shall transfer all keys to the OSU Key Department when the equipment is delivered to the contractor. The contractor shall return all keys to the OSU Key Department at the completion of the job.

D. Manual Fire Alarm Stations:

1. To maintain uniformity on the campus, THERE SHALL BE NO SUBSTITUTES for Notifier Model BNG-1R or Fire Lite BG-8. The lock shall be CAT-15 key lock for test purposes. Manual fire alarm stations shall be provided with addressable monitor modules.

E. Notification Appliances:

1. Speaker/Strobes combination, Speaker-only, and Strobe-only.
  - a. Audio/visual notification appliances shall be speaker/strobe designed for flush-mounting. All necessary adapters to achieve the mounting style specified shall be furnished. All appliances shall be red in color, with red grilles and white strobe lamp with "FIRE" in red letters on lens.
  - b. The ambient sound level of the audio shall be a minimum of 75 dBA @ 10 ft., or more than 120 dBA at a minimum hearing distance from the audio part of the device.
  - c. In a place of assembly the audible device shall be 15 dBA above the average ambient sound level or 5 dBA above the maximum sound level with a duration of at least 60 seconds, whichever is greater, measured 5 ft. (1.5m) above the floor in the occupiable area. (NFPA 4-3.3.2)
  - d. In sleeping areas the audible device shall be 75 dBA or 15 dBA above the ambient sound level or 5 dBA above the maximum sound level with a duration of 60 seconds.
  - e. Visual devices shall be of 75 cd. They shall be spaced 15 ft. from the end of the corridors and 100 ft between each other. For other installation requirements, refer to NFPA 72 Chapter 4.
  - f. The tops of the audio shall be located no less than 90 inches above the finished floor. If the required height cannot be achieved, they shall be located no less than 6 inches below the finished ceiling.
  - g. The location of the audio/visual and visual devices shall have their bottoms at heights above the finished floor of not less than 80 inches and no greater than 96 inches.
  - h. The audio sound shall be of a whooping sound or march-time sound.
  - i. Speakers and their enclosures shall be listed for voice/alarm signaling service and installed in accordance with (1) of this section and NFPA 72 chapter 4.

F. Smoke Detectors:

1. Smoke Detectors shall be addressable ionization or photoelectric smoke detectors as indicated on the drawings. It shall be possible to electronically measure and/or adjust the sensitivity of each individual addressable detector from the control panel.
2. A 2-wire smoke detector monitor module and conventional 2-wire smoke detectors shall be used in all Corridors/Hallways that are indicated on the approved contract shop drawings with three (3) or more smoke detectors. The 2-wire smoke detector module shall be properly labeled. Example: 2nd floor N. corridor smoke detectors.
3. A remote LED shall be installed in the hallway or corridor outside any room or office section in which smoke detectors are located. The location of each smoke detector shall be clearly labeled on the alphanumeric annunciator.
4. All smoke detectors shall be installed three (3) feet from the air supply diffusers. Any smoke detector that is within three (3) feet shall be moved to meet this requirement.

G. Thermal Detectors:

1. Thermal detectors shall be addressable devices. Each addressable thermal detector shall be individually annunciated on the control panel. Thermal detectors shall have an integral alarm LED.
2. The use of a monitor module and conventional heat detector is acceptable.

H. Wire shall be insulated, solid, copper conductors meeting the requirements of the current edition of the National Electric Code (NFPA #70), current edition.

1. Signaling Line Circuit: (SLC)
  - a. A minimum of 18-gauge, 2-conductor, solid-copper, shielded, fire-rated plenum wire.
2. General Alarm Circuits:
  - a. A minimum of 14-gauge, 2-conductor, solid-copper, fire-rated plenum wire.
  - b. If for speakers it shall be a minimum of 14-gauge, 2-conductor, solid-copper, shielded, fire-rated plenum wire.
  - c. Shall be of different color than the signal initiating wire.
3. Accessory Circuits:
  - a. A minimum of 14-gauge, solid-copper, fire-rated plenum wire.
  - b. Shall be of different color than the signal initiating wire and General alarm wire.
4. AC Power:
  - a. As recommended by Equipment Manufacturer.

## 4.00 EXECUTION

### 4.01 Installation:

No installation shall be done without drawings approved by the University Architect and the Owner's Safety Department.

- A. The Architect and Contractor will be responsible for the proper location of all detectors in relation to air conditioning outlets, walls, windows, doors, equipment, etc., and for spacing, location and testing of detectors in accordance with NFPA #72. Any improperly located detectors will be relocated at no added expense of the owner. (NOTE: Locations shown on plans are approximate and are intended as a guide only.)
- B. The Contractor shall be responsible for the integrity and testing of all field wiring prior to connection and procure the services of the manufacturer or authorized factory representative to make all final connections at the control panel. After final connections are made, all devices and controls shall be adjusted and tested by the representative.
- C. All wiring shall be in EMT thin-wall conduit or raceway. All system junction box covers shall be painted red and provided with labels to be furnished by the Owner's Safety Department. No wiring other than that directly associated with fire alarm detection, alarm or auxiliary fire protection functions shall be permitted in fire alarm conduits.
- D. All wires shall be connected to Terminal (barrier) strips and labeled with the proper circuit name in the junction boxes. Conductors shall be carefully formed and harnessed so that each drops off directly opposite to its terminal.
- E. A Junction (Terminal) box shall be installed on every floor and every Zone.
- F. All Fire Alarm Circuits shall enter from the hallway into the room. Do not jump from room to room.
- G. Transposing or changing color-coding of wires shall not be permitted. All conductors in conduit containing more than one wire shall be labeled on each end with "3M write-on tape SWD." Cabinet terminals shall be numbered and labeled. All controls, function switches, etc. shall be clearly labeled on all equipment panels.
- H. Signaling Line Circuits (addressable circuits) shall be placed in separate grounded metallic conduits from all other types of circuits.
- I. Audible-visual notification appliances shall be installed as recommended by NFPA #72 Chapter 6. Provide separate wiring to all strobe lamps.
- J. Manual fire alarm stations shall be installed with the tops of the boxes four (4) feet above floor level.
- K. A one-half inch conduit with one four-pair cable (22-gauge conductors) shall be run from the fire alarm control panel Dialer (4/2 format or Contact ID) to the main telephone service entrance box to facilitate connection of the leased telephone lines. This line shall be tagged "FIRE" at the telephone cabinet. This tag shall be removed by the Safety Department prior to completion of installation.
- L. All notifications, initiating devices, and fire alarm junction boxes shall be readily accessible for maintenance. This is a requirement.

4.02 Testing and Certification:

- A. A certificate of compliance (NFPA 72, current edition, Figure 1-7.2.1) shall be prepared. Parts 1, 2 and 4 through 10 shall be completed after the system is installed and the installation wiring has been checked. Part 3 shall be completed after the operational acceptance test has been completed. A preliminary copy of the certificate shall be given to the Owner after completion of the installation wiring tests and a final copy after completion of the operational acceptance tests.

THE OPERATIONAL ACCEPTANCE TESTS WILL NOT BE MADE WITHOUT THIS ITEM!

- B. The Contractor shall furnish two (2) copies [one (1) sepia and one (1) print] of a complete set of "As-built" plans before the acceptance test is made. These plans shall show the location of all equipment, conduit runs, wiring color codes, location, size and number of conductors, location of all junction boxes, etc., as installed. Two (2) copies of a separate drawing showing and identifying all connections made inside control equipment as installed shall also be furnished. These plans shall be permanent in nature and shall be neat and legible.

THE OPERATIONAL ACCEPTANCE TESTS WILL NOT BE MADE WITHOUT THESE ITEMS!

- C. The authorized factory representative shall measure and adjust each of the detectors to the required stable sensitivity setting. This must be performed at the operational location of the unit and under normal operational environmental conditions in the area. Bench settings are not acceptable. All tests and report costs shall be included in the contract price. A checkout report shall be prepared by the technician and submitted in triplicate, one copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to, the following:

1. Name of property.
2. Address.
3. Installer company name, address, and representative.
4. A complete list of equipment installed and wired.
5. Indication that all equipment is properly installed and that it functions according to the specifications of the manufacturer and conforms to these standards.
6. Serial number, location by zone and model number for each installed detector.
7. Voltage (sensitivity) setting for each smoke detector measured in place with HVAC operating.
8. Response time on thermostats and flame detectors (if used).
9. Technician's name, certificate number and date.

THE OPERATIONAL ACCEPTANCE TESTS WILL NOT BE MADE WITHOUT THIS ITEM!

- D. Before final acceptance of work, the contractor shall deliver five copies of complete "Operating, Installation and Maintenance Manuals." Each manual shall contain, but not be limited to, individual factory issued manuals containing all technical and programming information on each piece of equipment installed. In the event such manuals are not obtainable from the factory, it shall be the responsibility of the contractor to compile and include them. Advertising brochures or operational instructions shall not be used in lieu of the required technical manuals.

THE OPERATIONAL ACCEPTANCE TESTS WILL NOT BE MADE WITHOUT THIS ITEM!

- E. Following installation, the entire system, including all signal-initiating devices, supervisory devices, alarm notification appliances, and controls shall be given a thorough operating test by the Contractor. The acceptance test shall be as recommended in NFPA 72. Smoke detectors shall be tested with smoke. A twenty-four (24) hour test of the system to verify system standby battery capacity as herein specified will also be made by the Contractor. These tests shall be witnessed by representatives of the University Architect, OSU Safety Department, and others they may wish to have present. At this time, these representatives will also make a thorough check of device and wiring installation, location, and accessibility. Any faults or discrepancies found shall be corrected immediately and re-checked and/or re-tested, as deemed necessary by the Owner, to assure proper operation and ease of maintenance.
- F. Acceptance of the system shall also require a demonstration of the stability of the system. This shall be adequately demonstrated if the system operates for a ninety-(90) day test period without any trouble signals or unwarranted alarms. If a trouble signal and/or unwarranted alarm(s) occur, the contractor shall readjust or replace the detector(s), module(s), wire(s), and any other device(s), and begin another ninety-(90) day test period. This test shall not start until after the satisfactory operational acceptance test. The Owner will not make final acceptance of the alarm system until successful completion of this test.

4.03 Training and Maintenance:

- A. The Contractor shall provide a qualified representative for up to one (1) day to instruct assigned representatives of the Owner in the operation of the system. The Contractor shall also provide the instruction on programming of the system; this includes the programming manual of the software for the fire alarm panel.
- B. The Instruction manual for programming, Owner Manual, Operations Manual, Installation Manual, Schematics, Software and Lap-top Computer Communication port cable connectors shall be sent to the Owner's Safety Department.

4.04 Warranty:

- A. Warranty all control equipment, analog sensors and addressable I/O modules for three (3) years from date of acceptance. All other materials, peripherals, installation, and workmanship shall be under warranty for one (1) year from date of acceptance. Any defects appearing within these times shall be remedied at no added cost to the Owner, within a reasonable time after notice.

**END OF SECTION**