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Fire Detection and Alarm System**

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Last Update: May 12, 2017

A. General:

1. Intelligent, addressable fire alarm systems at BSU are used in all buildings. Residence halls, high rise buildings and a few selected other buildings use voice annunciated fire alarm systems. Refer to guideline 283111 for information on those systems.
2. Test and Demonstration. BSU has very specific training, testing and demonstration requirements for fire alarm systems. Refer to the guide specification for details.
3. The consultant shall show all required flow and tamper switch, smoke damper, fire pump, security interlock, AHU shutdown, elevator recall etc. monitor and control modules on the drawings. Do not leave this up to the contractor to approximate during bidding.
4. All fire alarm wiring shall be in raceways. BSU may on a case by case basis consider allowing the use of plenum rated open cable but our standard is to have all fire alarm cabling installed in raceways.

B. Manufacturers:

1. Approved manufacturers are Simplex and Notifier.

C. Single Fire Alarm Control Panel

1. It is our preference to have a single main fire alarm control panel in each building in lieu of multiple network nodes and/or master/slave arrangements. A single main fire alarm control panel should be provided unless the system is too large to be accommodated by a single panel or there are other logistical issues preventing a single panel from being used.

D. Renovation Projects

1. In renovation projects the existing fire alarm control panel must be maintained by the contractor and restored to a "trouble free" state at the end of each work day. The contractor shall employ the services of a factory trained service technician to make programming changes as required throughout the project duration to keep the existing system functional and without trouble conditions present on the panel.

E. Guide Specification

1. A guide specification follows this guideline. This specification is intended to aid the consultant in preparing his fire detection and alarm system specification and is not intended to be used verbatim although it is allowable to copy the applicable portions of this specification if the consultant so chooses. The consultant shall take full responsibility for his specification, including any portions copied from the guide specification, and shall include in his spec the same requirements of the BSU guide specification as a minimum.



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SECTION 283100 - FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
  - 1. Fire alarm and detection operations
  - 2. Control and monitoring of elevators, smoke control equipment, door hold-open devices, fire suppression systems, emergency power systems, and other equipment as indicated in the drawings and specifications.

1.3 COORDINATION

- A. Coordinate with the fire protection, mechanical and the elevator equipment contractors and provide all interconnections, equipment, devices, etc. whether or not indicated in the bid documents required for complete and operational fire suppression, stairwell and elevator shaft pressurization (where applicable), and elevator systems in accordance with all codes and approved by the local authority having jurisdiction.

1.4 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: The equipment and service described in this specification are those supplied and supported by Simplex and represent the quality of the equipment.
  - 1. Subject to compliance with this specification, fire alarm systems by the following manufacturers are acceptable:



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- a. Simplex or Notifier
  2. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications. If alternate system is determined to be non-compliant to the system operation specified herein the electrical contractor shall modify and/or replace the system with the specified equipment at no additional cost.
  3. The following are the only acceptable manufacturers for Alarm Notification Appliances:
    - a. Gentex
    - b. Wheelock
    - c. System Sensor
    - d. Simplex addressable type
- B. The fire alarm system provider / distributor to be considered for this project shall submit to the engineer of reference a list of at least five (5) projects similar to this project that have been successfully installed and are operational. The distributor shall have a minimum of 5 years of experience in the fire protective signaling industry and a minimum of 10 years in business with a minimum of 5 years in business in Indiana. The distributor shall maintain a staff of qualified specialists for installation, maintenance and engineering assistance of the fire systems furnished under this contract and shall stock standard manufacturer's parts. Only these qualified technicians shall be assigned to commission and service the project. The distributor shall have a minimum of one NICET Level 4 (fire Alarm Technology) technician. Outsourcing of the NICET Level 4 technician or is not acceptable. The distributor shall have a sales office with a 4 hour service available that is located within 50 miles of the project.

1.5 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Fire alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.
  1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.6 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this section.
- B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications.
- C. The system and all associated operations shall be in accordance with the following:



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1. Guidelines of the following Building Code: International Fire Code
2. NFPA 72, National Fire Alarm Code
3. NFPA 70, National Electrical Code
4. Other applicable NFPA standards
5. Local Jurisdictional Adopted Codes and Standards
6. ADA Accessibility Guidelines

1.7 SYSTEM DESCRIPTION

- A. General: Provide new fire alarm control panel and related system components to provide a complete, non-coded, addressable, microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.
- B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.
- C. History Logs: The system shall provide a means to recall at least 1000 alarm and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.
- D. Recording of Events: Capable of recording all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout differentiates alarm signals from all other printed indications.
- E. Wiring/Signal Transmission:
  1. Transmission shall be addressable signal transmission, dedicated to fire alarm service only.
  2. System connections for initiating and notification appliance circuits shall be Class B, except for the main riser initiating loops which shall be wired class A.
  3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
- F. Functions:
  1. Required Functions: The following are required system functions and operating features:
  2. Priority of Signals: Alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower



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priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.

3. Noninterfering: The activation of an addressable device does not prevent the receipt of signals from subsequent activations.
4. Transmission to Remote Central Station: Provide the ability to automatically route alarm, supervisory, and trouble signals to a remote central station.
5. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.
6. General Alarm: A system general alarm shall include:
  - a. Indication of alarm condition at the FACP and the annunciators.
  - b. Identification of the device that is the source of the alarm at the FACP and the annunciators.
  - c. Selective Operation of audible and visible notification devices throughout the building until silenced at FACP.
  - d. Closing doors normally held open by magnetic door holders.
  - e. Unlocking designated electrically secured doors.
  - f. Shutting down supply and return fans serving zone where alarm is initiated. i.e. shutdown AHU upon the alarm of any duct detectors monitoring that AHU only.
  - g. Notifying the campus police through the Owner's Metasys building management system.
  - h. Initiation of elevator recall in accordance with Indiana Building Code (2008 Edition), when specified sensors are activated.
  - i. Other functions as specified elsewhere.
7. Supervisory Operations: Upon activation of a supervisory device the system shall operate as follows:
  - a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the annunciator.
  - b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
  - c. Record the event in the FACP historical log.
8. Transmission of supervisory signal to the campus police through the Owner's Metasys building management system.
9. Restoring the condition shall cause the Supervisory LED restore system to normal.
10. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visual alarm signals shall cease operation.
11. System Reset
  - a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the



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potential for re-alarmed the system. The display message shall indicate “ALARM PRESENT, SYSTEM RESET ABORTED.” Manufacturer’s standard messages are acceptable in lieu of the messages specified above.

- b. Should an alarm condition continue, the system will remain in an alarmed state.
12. Drill: A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
  13. WALKTEST: Include manufacturer’s standard WALKTEST function.
  14. \*\*\*\*Where applicable\*\*\*\*Existing FACP shall cross trip: alarm, trouble and supervisory signals with new FACP during the decommissioning of the existing system and installation of the new system.
- G. Analog Smoke Sensors:
1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
  2. Environmental Compensation: The FACP shall maintain a moving average of the sensor’s smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
  3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
  4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be printed for annual recording and logging of the calibration maintenance schedule.
  5. The FACP shall automatically indicate when an individual sensor needs cleaning via manufacturers standard messages similar to the following. The system shall provide a means to indicate that a sensor requires cleaning. When a sensor’s average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate that a sensor is close to a trouble reporting condition and will be indicated on the FACP as “ALMOST DIRTY.” This condition provides a means to alert maintenance staff of a dirty sensor without creating a trouble in the system. If this indicator is ignored, a second level “DIRTY SENSOR” condition shall be indicated at the FACP and subsequently a system trouble is reported to the Campus Police. The sensor base LED shall glow steady giving a visible indication at the sensor location. The “DIRTY SENSOR” condition shall not affect the sensitivity level required to alarm the sensor. If a “DIRTY SENSOR” is left unattended, and its average value increases to a third predetermined value, an “EXCESSIVELY DIRTY SENSOR” trouble condition shall be indicated at the control unit.
  6. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a “SELF TEST ABNORMAL” trouble condition.



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H. Alarm Notification: Provide audible, visible and audible/visible alarm signal devices in areas as indicated on drawings.

I. Power Requirements

1. The control unit shall receive 120 VAC power as indicated on the drawings.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously while incoming power is present.
5. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be indicated at the control unit.
6. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
7. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

J. Fire alarm disable keys or disable keyed switches

Provide password protected programmable keys or keyed switches at the main FACP to perform following disable functions. Turn over 5 sets of keys if keyed switches are used in lieu of programmed password protected keys on the FACP.

1. Disable alarm transmissions to Campus Police through the Metasys.
2. Disable AHU Shutdown and smoke damper closure.
3. Disable all Horn Strobes, Speaker Strobes and Strobe only devices.
4. Disable Elevator Recall functions.
5. Disable Door Hold Opens.
6. Disable Flow Switches and Tamper Switches.
7. Disable Fire Pump monitoring points.
8. Master Disable (perform all functions 1-7).

K. Provide the following alarm outputs to the BSU Campus System (Johnson Metasys):

1. All General alarms.
2. Trouble.
3. Supervisory Alarms.





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L. Renovation Projects

1. In renovation projects the existing fire alarm control panel must be maintained by the contractor and restored to a "trouble free" state at the end of each work day. The contractor shall employ the services of a factory trained service technician to make programming changes as required throughout the project duration to keep the existing system functional and without trouble conditions present on the panel.

1.8 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

1. Product data sheets for system components highlighted to indicate the specific products, features, or functions required to meet this specification. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.
2. Wiring diagrams from manufacturer.
3. Shop drawings showing system details including location of FACP, all devices, circuiting and details of annunciator.
4. System Power and battery charts with performance graphs and voltage drop calculations to assure that the system will operate per the prescribed backup time periods and under all voltage conditions per UL and NFPA standards.
5. System operation description including method of operation and supervision of each type of circuit and sequence of operations for all manually and automatically initiated system inputs and outputs. A list of all input and output points in the system shall be provided with a label indicating location or use of IDC, NAC, relay, Sensor, and auxiliary control circuits.
6. Operating instructions for FACP.
7. Operation and maintenance data for inclusion in Operating and Maintenance Manual. Include data for each type product, including all features and operating sequences, both automatic and manual. Provide the names, addresses, and telephone numbers of service organizations.
8. Product certification signed by the manufacturer of the fire alarm system components certifying that their products comply with indicated requirements.
9. Record of field tests of system.

B. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.





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1.9 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Field quality-control reports.

1.10 QUALITY ASSURANCE

- A. Manufacturers' Technician Qualifications: A factory trained and authorized technician is to perform the work of this section. The technician shall have a minimum NICET level 4 certification. A copy of the technicians NICET level 4 or above certification shall be included in the equipment submittals for review by the electrical engineer
- B. Manufacturers Designer Qualifications: The designer shall have or be supervised by an individual with a NICET level 4 certification or a Bachelor's degree in Electrical Engineering. A copy of the designer's certification shall be included in the equipment submittals for review by the electrical engineer.
- C. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.11 MAINTENANCE SERVICE

- A. Maintenance Service Contract: Provide maintenance of fire alarm systems and equipment for a period of 12 months, using factory-authorized service representatives.
- B. Basic Services: Respond to service calls within 24 hours of notification of system trouble. Adjust and replace defective parts and components with original manufacturer's replacement parts, components, and supplies.
- C. Additional Services: Perform services within the above 12-month period not classified as routine maintenance or as warranty work when authorized in writing. Compensation for additional services must be agreed upon in writing prior to performing services.



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- D. Renewal of Maintenance Service Contract: No later than 60 days prior to the expiration of the maintenance services contract, deliver to the Owner a proposal to provide contract maintenance and repair services for an additional one-year term. Owner will be under no obligation to accept maintenance service contract renewal proposal.

1.12 EXTRA MATERIALS

- A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
1. Photoelectric smoke sensors and low profile bases: Quantity 10.
  2. Strobe Units: Quantity 6.
  3. Wall mounted Horn/Strobe Units: Quantity 6.
  5. Heat Sensors: Quantity 3

PART 2 - PRODUCTS

- 2.1 All products listed in this section are required on this project unless otherwise noted.
- 2.2 FIRE ALARM CONTROL PANEL (FACP) shall be Simplex 4100ES with accessories as required to meet project requirements. Subject to compliance with specifications, Notifier NFS2-3030 Series fire alarm system is an approved equivalent system.
- A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."
- B. The following FACP hardware shall be provided:
1. Non-Power Limited base panel with manufacturer's standard cabinet and door, 120 VAC input power.
  2. Minimum 2000 Initiating Device point capability.
  3. 2000 points of annunciation where one (1) point of annunciation equals:
    - a. LED or 1 switch on an LED/switch module.
    - b. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
  4. Two, four or six Notification Appliance Circuit Class B modules for system expansion.
  5. Provide battery voltage and ammeter readouts from the LCD Display.
  6. Municipal City Circuit Connection, 24VDC Remote Station reverse polarity, local energy, shunt master box, or a form "C" contact output.
  7. The FACP shall support at least one (1) RS-232-C port.



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8. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators, transponders, and I/O panels.
    - a. Network communication modules for intercommunication on style 7 peer to peer voice/data network.
  9. Serial (Point Annunciation) Event DACT.
  10. Unsupervised port for 24 pin Dot Matrix Printer (Main FACP only)
  11. Annunciator
  12. Internet connection including required software for transmission of alarm, trouble and system reports to email, with capability to forward such to selected individuals via text messaging. Simplex 4100-6079 SafeLink or equal by Notifier.
  13. Ethernet connection for off-site monitoring by the owner and/or a central station monitoring service, and automatic notification of system trouble conditions to manufacturers local service department. Provide any required software to the Owner for this function and demonstrate its use.
- C. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.
- D. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.
- E. Distributed Module Operation: FACP shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel:
1. Addressable Signaling Line Circuits
  2. Initiating Device Circuits
  3. Notification Appliance Circuits
  4. Auxiliary Control Circuits
- F. \*\*\*\*Network Node Operation (where applicable) It is the preference of BSU to use a single main FACP when possible. Do not specify networked panels without prior approval from BSU Engineering\*\*\*\*:
1. Network Node Operation shall be connected to a Style 7 token ring network with outgoing and returning feeds spaced a minimum of 50 feet apart.
  2. Each Network Node shall be a NFPA 72 stand alone control panel complete with master controller, display, IDNet/NAC/SLC modules, power supply and batteries. Provide network modules to communicate to the host control panel via a peer to peer, token ring, style 7 voice and data network.
  3. Data communications between network nodes shall be style 7 (class A).



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4. In the event of a communication loss of a node, the remaining nodes will regroup and establish a smaller sub-network that will maintain communications among the active nodes.
5. Loss of communication with the main control panel shall not limit operation of the system.

**2.3 SYSTEMS OPERATIONAL DESCRIPTION**

- A. General fire alarm signal initiation shall be by one or more of the following devices:
  1. Manual stations.
  2. Smoke detectors.
  3. Duct smoke detectors.
  4. Automatic sprinkler system water flow.
  5. Dry pipe or pre-action system water flow.
  6. Heat detectors.
- B. General fire alarm signal shall initiate the following actions:
  1. Continuously operate alarm notification appliances.
  2. Identify alarm at fire alarm control panel and remote annunciators.
  3. Transmit an alarm signal to the remote alarm receiving station.
  4. Release smoke doors held open by magnetic door holders and electrically secured doors.
  5. Activate voice/alarm communication system.
  6. Activate stairwell and elevator-shaft pressurization systems.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
  1. Valve supervisory switch.
  2. Low-air-pressure switch supervisory of a dry-pipe or pre-action sprinkler system.
  3. Elevator shunt-trip supervision.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
  1. Open circuits, shorts, and grounds in designated circuits.
  2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
  3. Loss of primary power at fire-alarm control unit.
  4. Ground or a single break in fire-alarm control unit internal circuits.
  5. Abnormal ac voltage at fire-alarm control unit.
  6. Break in standby battery circuitry.
  7. Failure of battery charging.
  8. Fire-pump power failure, including a dead-phase or phase-reversal condition.
  9. Low-air-pressure switch alarm operation on a dry-pipe or pre-action sprinkler system.



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- E. \*\*\*\*Stairwell Pressurization (where applicable)\*\*\*\*: Provide an output signal using an addressable relay to start the stairwell pressurization system. Signal shall remain on until alarm conditions are cleared and fire-alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands.
1. Pressurization starts when any general alarm is received at fire-alarm control panel.
- F. Primary Elevator Recall:
1. Initiating devices at the following locations shall initiate automatic primary elevator recall.
    - a. Elevator lobby smoke detectors except the lobby detector on the primary recall floor.
    - b. Smoke detector in elevator machine room.
    - c. Heat detectors integral to the pre-action systems (where applicable) in the elevator shafts and machine room.
- G. Alternate Elevator Recall
1. Elevator lobby smoke detectors located on the primary recall floor, when initiated, shall be programmed to move the cars to the alternate recall floor.
- H. Fireman's Hat
1. Smoke detectors in elevator machine room, when initiated, shall activate the fireman's hat in the elevator cars.
  2. Elevator shaft or machine room pre-action system heat detector (where applicable), when initiated, shall activate the fireman's hat in the elevator cars.
- I. Elevator shunt trip
1. Where applicable, heat detectors connected to the pre-action sprinkler system in the elevator shaft, when initiated, shall shut down elevator power with time delay to allow car to recall to primary recall floor.
- J. Door Controls: Magnetic Door hold-open devices throughout the building shall be released on any general alarm received at the fire alarm control panel.
- K. Fire Suppression Monitoring:
1. Monitor fire pump controller for pump running, pump fail and pump reversal. FIRE PUMP RUN shall report as a fire alarm, not just a supervisory trouble.
  2. Monitor jockey pump controller for pump fail.
  3. Water flow: Activation of a water flow switch shall initiate general alarm operations.
  4. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.



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5. WSO: Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.
  6. Suppression Releasing: FACP shall be capable of integration into an FM Approved Suppression Releasing System. System shall include the following:
    - a. FACP FM Approved for Suppression Releasing.
    - b. Regulated power supply with dedicated power TAP(s) for suppression releasing circuits.
    - c. Approved supervised connection to automatic solenoid releasing valves. Class B, wired hardwired supervised notification appliance circuit and coil supervision modules.
    - d. Specific FM Approved and/or electrically compatible automatic solenoid releasing valves.
    - e. Required FM Secondary standby power; 24 hours of standby with 5 minutes of alarm. Provide battery charts with showing performance of such standby and alarm power.
    - f. Service disconnect switch(es), system abort switch(es), manual release station(s) and all other accessories, as required.
- 2.4 ADDRESSABLE MANUAL PULL STATIONS – Simplex 4099-9006 or Notifier equal.
- A. Description: Addressable Double-action type, red LEXAN or metal, and finished in red with molded, raised-letter operating instructions of contrasting color. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.
- 2.5 SMOKE SENSORS – Simplex 4098-9714 w/ 4098-9792 base or Notifier Equal
- A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
    1. Factory Nameplate: Serial number and type identification.
    2. Operating Voltage: 24 VDC, nominal.
    3. Self-Restoring: Sensors do not require resetting or readjustment after actuation to restore normal operation.
    4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.



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5. Each sensor head shall contain an LED that will flash each time it is scanned by the Control Unit (once every approximately 4 seconds). In alarm condition, the detector head LED shall be on steady.
  6. Each sensor base or head shall contain a magnetically actuated test switch to provide for easy alarm testing at the detector location.
  7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a “wrong device”, the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a “Wrong Device” trouble condition.
  8. The sensor's electronics shall be resistant to false alarms caused by EMI and RFI.
  9. Addressability: Sensors include a communication transmitter and receiver having a unique identification and capability for status reporting to the FACP.
  10. Removal of the sensor head for cleaning shall not require the setting of addresses. Removal of the sensor head shall initiate a trouble signal at the FACP.
- B. Duct Smoke Sensor: Simplex 4098-9756 or Notifier Equal. Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay output as required for fan shutdown.
1. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single “Form C” contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable.
  2. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
  3. Duct Housing shall provide a magnetic test area and Red sensor status LED.
  4. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
  5. Each duct sensor shall have a Remote Indicator Station with an alarm LED and test switch. Simplex 2098-9806 or Notifier Equal.
- 2.6 ALARM-NOTIFICATION APPLIANCES: Simplex 49 series addressable type or non-addressable by Gentex, Wheelock or System Sensor.
- A. Notification Appliances: The Contractor shall furnish and install Notification Appliances and accessories as shown and as required.
1. Notification appliance operation shall provide audio and 24vdc power, separate control, and supervision of speakers and strobes over two pair of wires.
- B. Visible (Strobe) Only: Simplex 49VO-WRF addressable type or Gentex Commander 3 series GES3-24WW, or Wheelock or System Sensor equal. Red with white letters. Strobe shall be listed to UL 1971. The strobe shall consist of a xenon flash tube and associated lens/reflector system. The strobe enclosure shall mount directly to standard single gang, double gang or 4”





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square electrical box, without the use of special adapters or trim rings. Visible only appliances shall be provided with adjustable flash intensities of 15, 30, 60, 75 and 110cd. . In general building visible only units shall be set at 75cd unless otherwise noted on the drawings.

- C. Audible/Visible: Simplex 49AV-WRF addressable type or Gentex Commander 3 series GEC3-24WW or Wheelock or System Sensor equal.
  - 1. Visible portion compliant with part B above.
  - 2. Horn shall have continuous, synchable temporal 3 in 2400hz or mechanical tone, chime and slow whoop settings that are field selectabl along with high and low dB settings. Set to mechanical temporal 3 and high dB initially and adjust per Owner's direction.
- D. Synchronization Control Module (SCM) Notification Appliance Circuit Power Extender provides synchronization of strobes at a rate of 1Hz. The capability to synchronize multiple notification appliance circuits shall be provided.
- E. Accessories: The contractor shall furnish all necessary accessories.

2.7 ADDRESSABLE CIRCUIT INTERFACE MODULES. Simplex 4090 Series or Notifier equal

- A. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
- B. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.
- C. There shall be four types of modules. Dual monitor modules are not permitted:
  - 1. Type 1: Monitor Circuit Interface Module: Simplex or Notifier
    - 1. For conventional 2 or 4 wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
  - 2. Type 2: Line Powered Monitor Circuit Interface Module Simplex or Notifier
    - a. This module has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module is required for monitoring waterflow and tamper switches.



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3. Type 3: Line Power Control Circuit Interface Module Simplex or Notifier
  - a. This module is an individually addressable module. The system shall be capable of energizing 100% of the relays connected to the signaling line circuit.
  - b. The output control circuit will provide a non-supervised form C relay switching with a single “Form C” contact rated at 2 A @ 30 VDC resistive, power limited and at 1/2 A @ 120 VAC resistive, non-power limited.
  
4. Type 4: Line Power Signal Circuit Interface Module
  - a. This module is an individually addressable module that has both its power and communications supplies by the two wire multiplexing signaling line circuit. The signal module shall be capable of being programmed to operate with any combination of individual initiating device alarm or general building alarm.
  - b. NAC output shall be rated for 0.5 A for special application or regulated 24VDC appliances, or audio operation (12.5 W @ 25 VRMS, and can be wired class A or Class B.

2.8 REMOTE CRTS AND PRINTERS

- A. Fire Alarm Control Unit shall be capable of operating remote CRT's and/or printers; output shall be ASCII from an RS-232-C connection with an adjustable baud rate.
- B. Each RS-232-C port shall be capable of supporting and supervising a remote Printer; the FACP shall support as many as two (2) remote CRT displays or four (4) printers. The Fire Alarm Control Panel shall have one unsupervised (1) RS-232-C port for printer connection.

2.9 REMOTE LCD ANNUNCIATOR Simplex 4603-9101 or Equal by Notifier

- A. Provide Remote LCD Annunciator with the same “look and feel” as the FACP operator interface. The annunciator shall be equipped with a microphone for the paging feature. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP. Provide quantity of remote annunciators shown on the drawings. If there are no remote annunciators shown on the drawings provide one located where directed by the Owner.
- B. Annunciator shall have super-twist LCD display with minimum two lines of 40 characters each.
- C. Under normal conditions the LCD shall display a “SYSTEM IS NORMAL” message and the current time and date.
- D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.



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- E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
  - 1. 32 minimum character custom location label.
  - 2. Type of device (e.g., smoke, pull station, waterflow).
  - 3. Point status (e.g., alarm, trouble).
  
- F. Operator keys shall be key switch enabled to prevent unauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.10 FIRE PROTECTION SYSTEM ALARM BELL

- A. Provide a 10" red 24VDC alarm bell: Cooper Model MB-G10-24-R or approved equal. Bell shall sound upon any sprinkler flow alarm.

2.11 EMERGENCY POWER SUPPLY

- A. General: Components include battery, charger, and an automatic transfer switch.
  
- B. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 15 minutes.

2.12 MAGNETIC DOOR HOLDERS

- A. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall operate from a 24VDC source, and develops a minimum of 25 lbs. holding force. Connect to and control existing magnetic hold open devices as indicated on the drawings. Simplex DH series or Notifier equal.
  
- B. Material and Finish: Match door hardware



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PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Prior to beginning installation of the fire alarm system the Contractor shall conduct a pre-installation conference with the Engineer and the Owner to reinforce the requirements of these specifications.
- B. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- C. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems.
- D. Refer to Part 2 PRODUCTS for additional information and requirements.

3.2 EQUIPMENT INSTALLATION

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
- B. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.
- C. Monitor fire pump for Pump Run, Power Loss, Fail to Start and Phase Reversal plus any additional points required by applicable codes. FIRE PUMP RUN shall report as a fire alarm not just a supervisory signal.
- D. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.
- E. All addressed devices shall have addresses, including loop and device number printed on the inside back of detector or base or pull station or on the front of an addressable module with indelible marker. Addresses for duct detectors shall be visible without removing the duct detector cover.
- F. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
  - 1. Comply with requirements for seismic-restraint devices specified in Section 260548 "Vibration and Seismic Controls for Electrical Systems."



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3.3 WIRING INSTALLATION

- A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC). All fire alarm wiring shall be installed in raceways. No open cable is permitted unless otherwise noted on the drawings.
- B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
- C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
- D. Risers: Install at least 2 vertical cable risers to serve the fire alarm system. Separate risers from each other, in accordance with NFPA 72, with a minimum 2-hour rated cable assembly, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones. (i.e. Class A configuration on risers only).

3.4 SYSTEM PROGRAMMING

- A. **\*\*\*Where Applicable\*\*\*Existing System:** The manufacturer shall provide the services of a NICET 4 technician, trained and certified on the existing fire alarm system equipment, to provide programming throughout the installation. Initiating and notification device points shall be removed from the operating program as they are removed from the existing system.
- B. **New System:** Uninstalled initiating, control and notification devices shall be stored in an uninstalled device buffer within the fire alarm control panel operating program, which shall prevent multiple trouble conditions from existing on the new fire alarm control panel during installation.
- C. No system troubles or alarm conditions shall exist on the system at the end of the work shift or left overnight.
- D. **\*\*\*\*Where applicable and the use of a single main FACP is not possible or practical\*\*\*\*New System:** The system shall be arranged so the FACP located in the Command Center is the "Master" and the remote nodes are 'Slaves'. At the end of construction and at the time the system is turned over to the Owner, all system functions, controls, etc. shall be operated from the master FACP and no interaction will be required at the nodes.



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- E. \*\*\*\*\*Where applicable\*\*\*\*\*Alternate manufacturers, other than that of the existing system, shall include the cost to provide the services of a technician certified on the existing system.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
1. Factory trained and certified.
  2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
  3. International Municipal Signal Association (IMSA) fire alarm certified.
  4. Certified by a state or local authority.
  5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- C. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
- D. Final Test Notice: Provide a 7-day minimum notice in writing when the system is ready for final acceptance testing.
- E. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
- F. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- G. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
- H. Final Test, Certificate of Completion, and Certificate of Occupancy:
1. Perform a 100% functional test of the system per NFPA 72 requirements and as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy prior to the Owner witnessed 100% test and demonstration.
  2. Test and demonstrate 100% of system initiating devices and control functions and perform an entire building sound test including all fire alarm, tornado alert, armed



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assailant alert and manual voice messaging in the presence of the Owner. Failure of any portion of this test and demonstration will result in immediate termination of the test and rescheduling at contractors expense (\$500 charge to contractor for rescheduling of each failed test). The contractor shall pre-test 100% of devices to ensure system functionality prior to scheduling the 100% test and demonstration for the Owner. This 100% test and demonstration for the Owner may occur on second shift. Contractor shall include any costs associated with second shift testing including any costs for premium time, overtime, shift differential etc. in his bid.

3. For clarification, testing required under this section equates to 100% of the system devices will be tested at least twice. 100% for the contractor's test prior to Owner's demonstration (not witnessed by Owner) and a 100% test and demonstration for the Owner, witnessed by Owner.
4. Certificate of Substantial Completion will not be issued until the Contractors 100% test and the Owner witnessed 100% have been successfully completed and all test reports have been submitted to the Owner and the AHJ and have been approved.
5. Test smoke detectors with canned smoke, heat detectors with an approved heat producing device, flow switches by flowing water, tamper switches by turning valves etc. Simulated tests and the use of magnets are not acceptable for the Owner witnessed test. Coordinate testing with the sprinkler installer as required and engage his services to assist with the test.
6. Schedule the 100% Owners Witnessed Test with BSU Project Engineer (765)285-5081 at least One (1) week in advance.

3.6 CLEANING AND ADJUSTING

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.7 TRAINING

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
- B. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 4 hours of training.
  1. Schedule training with the Owner at least seven days in advance. This training shall occur after and be independent of the Owner witnessed 100% test and demonstration of the system.





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2. Training shall include basic operation of the fire alarm control panel and remote annunciators. Explain and demonstrate how to acknowledge, silence and reset alarms. And how to read the display and respond accordingly. Explain any control functions such as AHU shutdown, elevator recall or smoke control systems. Demonstrate how to operate the disable buttons or switches. Conduct a walkthrough of main system components including the FACP, any annunciators, any amplifiers, NAC panels or remote or transponder panels. On voice annunciated systems, demonstrate the paging system and emergency buttons and fireman's phones if present. Demonstrate internet connectivity.
3. At the conclusion of training, provide the BSU Electronics Shop a copy of the FACP program for safekeeping.

END OF SECTION 283111