

SECTION 28 31 00  
FIRE ALARM AND DETECTION SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDES

- A. Providing and installing an intelligent, fully-addressable fire alarm and detection system.
- B. Documentation and maintenance of equipment.

1.2 DRAWINGS

- A. The locations and spacing of alarm initiating devices indicated on the Drawings are approximate. The equipment supplier shall verify device requirements and spacing, and shall add devices as required to satisfy governing authorities.

1.3 RELATED WORK

- A. Section [\_\_\_\_\_] - Door Hardware.
- B. Section [\_\_\_\_\_] - Overhead Coiling Doors.
- C. Section [\_\_\_\_\_] - Elevators.
- D. Section [\_\_\_\_\_] - Fire Suppression System.
- E. Section [\_\_\_\_\_] - Smoke Dampers.
- F. Section [\_\_\_\_\_] - Sprinkler Systems.
- G. Section [\_\_\_\_\_] - Direct Digital Control System.
- H. Division 16 - Electrical.

1.4 REFERENCES

- A. Americans With Disabilities Act (ADA).
- B. ANSI/NFPA 13 - Installation of Sprinkler System.
- C. ANSI/NFPA 72 - National Fire Alarm Code.
- D. ANSI/NFPA 80 - Fire Doors and Fire Windows.
- E. ANSI/NFPA 90A - Air Conditioning and Ventilating Systems.
- F. Iowa Administrative Code.

G. Uniform Building Code (UBC).

#### 1.5 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in alarm and detection systems with five years' experience in security alarms.
- B. Installer: Company specializing in alarm and detection systems with five years' documented experience in the installation and maintenance of security alarm systems.

#### 1.6 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Shop Drawings: Shall consist of the following:
  - 1. Floor plans indicating the location of all fire alarm equipment and interconnection between devices. Fire alarm zone and device addresses shall be clearly labeled on the drawings.
    - a. Quantities, types and locations of all devices shown on the drawings shall be verified by the supplier and adjusted accordingly to meet NFPA, ADA and manufacturer's requirements.
  - 2. Field wiring diagrams
  - 3. Terminal connection diagram of the fire alarm control panel showing all wiring connection points.
  - 4. Line diagrams.
- C. Product Data: Provide data sheets for the following:
  - 1. Control panel.
  - 2. Initiating devices.
  - 3. Signaling devices.
  - 4. Control devices.
  - 5. Wire.
  - 6. Voice and tone communication system.
- D. Manufacturer's Installation Instructions: Indicate installation instructions.
- E. Manufacturer's Certificate: Certify that system meets or exceeds specified requirements.
- F. Submittals shall also include quantities of equipment, catalog cuts indicating technical data necessary to fully describe the equipment proposed.
- G. Submittals shall be approved by the Design Professional and the Owner's FM-Fire Safety Department.

#### 1.7 RECORD DRAWINGS

- A. Submit under the provisions of Section 01787.
- B. Record drawings shall be provided to the FM-Fire Safety Department a minimum of 48 hours in advance of the partial or final inspection. Indicate the following:
  - 1. Alarm initiation devices with addresses.
  - 2. Alarm signal devices w/module location/address and circuit number.
  - 3. Door holder and smoke dampers with module location/address.
  - 4. Air handling units with module location/address.
  - 5. Junction and pull boxes.
  - 6. Layout of conduit.
  - 7. 120 VAC power source for control panel, door holders, and fire/smoke dampers.
  - 8. Location of all field device modules and "end of line resistors."
  - 9. Calculations for voltage drop on circuits, battery and audio amplifier sizing.
- C. Record drawings shall be updated and re-submitted after all testing and check-out has been completed and accepted, and shall include any corrections and/or changes made during final inspection.

#### 1.8 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Section 01730.
- B. Operation Data: Include operational instructions including programmed data and sequence of operation.
- C. Maintenance Data: Include maintenance and repair procedures, instructions and data from installation.
- D. Program Data: All data including factory and on-site programming.

#### 1.9 WARRANTY

- A. Partial Occupancy by Owner: Contractor will be compensated to warrant the installation between partial occupancy and Final Acceptance (100% completion) of system.
- B. All system components shall be warranted by the system manufacturer for a period of one year beginning at the time of Final Acceptance. During the warranty period, all defective components shall be replaced at no cost to the Owner.

#### 1.10 COORDINATION

- A. Coordinate the installation of equipment and devices that pertain to the work of other trades with the appropriate contractors.
- B. **Fire alarm systems are very sensitive to strong chemicals, smoke, dust, heat and moisture. Contractor shall notify FM-Fire Safety Department**

**(phone 319-335-6131) prior to any construction in areas where the fire alarm system is active.**

- C. Any proposed changes affecting the fire alarm system must have the approval of FM-Fire Safety Department and Owner's Representative.
- D. Software: Coordinate system programming with FM-Fire Safety Department. FM-Fire Safety Department shall have final approval of all walk test groups, fire zones and address names.
- E. Provide interim programming as required to accommodate partial building occupancy.
- F. Contractor shall notify Owner's Representative and FM-Fire Safety Department maintenance personnel when programming and pre-testing new systems. Contractor shall disable all newly programmed alarm-causing devices at the end of the day while programming and pre-testing is in progress. The loading and unloading of programming modifications may be required during this period. Contractor shall document all active and inactive devices in the fire alarm panel for use by FM-Fire Safety Department maintenance personnel, Department of Public Safety and the Iowa City Fire Department.
- G. When a fire alarm system becomes operational, but prior to Final Acceptance, FM-Fire Safety will respond to fire alarms after-hours and weekends. They will acknowledge and silence the alarm, but will not reset the system. Contractor will be responsible for clearing the fault and reimbursing the Owner for costs associated with silencing the alarm. FM-Fire Safety will notify the Owner's Representative (DCS Project Manager) of the alarm(s) during the first work day after the alarm problem occurred.
- H. When a fire alarm system becomes operational, the Contractor shall provide accurate and legible floor plans of the building with all alarm-causing devices (with addresses) shown on the Drawings, including room numbers. The floor plans shall be current and maintained in the fire alarm panel to allow responding emergency personnel information to investigate the fire alarm call. The loading and unloading of programming modifications may be required during this period.
- I. When a fire alarm system becomes operational, but prior to Final Acceptance by the Owner, the Contractor shall be responsible for disabling and enabling alarm-causing devices for Contractor personnel. The Contractor shall maintain current disable history documentation in the fire alarm panel.
- J. Contractor shall notify the Owner's Department of Public Safety prior to any installation and testing that may cause the fire alarm communicator to notify Public Safety receiving systems.

#### 1.11 FIELD SERVICES

- A. Equipment supplier shall provide the services of a factory-trained representative

who lives within a 125-mile radius of the University. Factory representative shall supervise the system installation and final connections to the equipment and provide testing to assure that the system is in proper operating condition.

1.12 ACCEPTANCE TESTING

- A. Partial Occupancy and Final Inspection: Alarm Contractor shall conduct his own 100% device check-out prior to Owner's inspection. All fire alarm equipment shall be in-place and operational prior to scheduling Owner's inspection. All fire alarm equipment shall be tested during Owner's inspection.
- B. Alarm Contractor shall provide an up-to-date and complete printout of software at the time of any inspection (partial occupancy or final) and after any and all corrections or changes.
- C. Alarm contractor shall provide sufficient personnel to conduct the acceptance test.
- D. Owner's "Certification of the Completion of the Fire Alarm" form (last page of this section) must be completed and signed by both the Electrical Contractor and the Alarm Equipment Provider before final checkout of the system can be scheduled. The FM-Fire Safety Department requires 48 hours notice for scheduling the final checkout.
- E. The manufacturer's authorized representative shall perform a 100% quality inspection of the final installation and, in the presence of the Contractor, Design Professional, Owner's Representative and local code and fire authorities, shall perform a complete finished test of all aspects of the system. A system certification verifying the proper system operation shall be required prior to acceptance.
- F. Audible sound level measurements shall be conducted though out the entire building, and all spaces with the evacuation system off and sounding. Measurements shall be recorded in the following format for each space:

Room/Area	Ambient Sound Level, db	Ambient and Evacuation Sound Level, db

- G. Contractor shall schedule a re-inspection of the fire alarm system with FM-Fire Safety within 30 calendar days of the original inspection.

1.13 SPARE PARTS

- A. Submit under the provisions of Section 01730.
- B. Provide 10 percent inventory of all field devices (a minimum of one device per

type) to the Owner.

- C. Provide 1 spare amplifier.

## PART 2 - PRODUCTS

### 2.1 FIRE ALARM CONTROL PANEL

- A. Fire alarm panel shall be an intelligent analog system with voice.
  - 1. Approved Manufacturers/Models:
    - a. Basis of Design: Notifier AM2020 or Simplex 4100U
    - b. No other substitutions will be allowed.
- B. Provide all hardware devices and software for off-line programming, complete with manuals and software files, to the Owner.
- C. Battery Back-up: Capable of supplying a minimum of 24 hours of operation in normal condition followed by no less than 15 minutes of alarm.

### 2.2 PHOTO-ELECTRIC SMOKE DETECTORS

- A. Photo-electric detectors shall provide a red LED on the detector or base when the device is in the alarm condition.
- B. Smoke detectors shall be analog, low profile.
- C. Cover all smoke detection devices immediately after installation to maintain cleanliness. All smoke detectors shall remain covered until the time of final checkout. (Covers shall be given to the Owner at the time of final checkout.)
- D. Provide a black indicator marking on the test point of each smoke head.
- E. All small detectors shall be placed so that they are readily accessible.

### 2.3 HEAT DETECTORS

- A. Heat detectors shall be restorable and provide a red LED on the detector or base when the device is in the alarm condition.
- B. Heat detectors shall be analog addressable unless they are high temperature devices.
- C. All detectors shall be on a specific address.
- D. All detectors shall be magnet testable.
- E. Provide a black indicator marking on the test point of each detector head.

F. All heat detectors shall be placed so that they are readily accessible.

2.4 BEAM DETECTORS:

- A. All beam detectors shall be "System Sensor" brand, with only a transmitter and a mirror (no receiver).
- B. All beam detectors shall be placed so that they are readily accessible.
- C. All beam detectors shall have a key or magnet test station.
- D. All beam detector locations shall be approved by the FM-Fire Safety Department.

2.5 ELECTRONIC DOOR HOLD-OPENS

- A. Electronic door hold-opens shall be 24 volt DC.
- B. No electronic door hold-opens with built-in smoke detectors will be accepted.

2.6 TELEPHONE COMMUNICATOR

- A. All new fire alarm control panel installations shall include a Silent Knight 5104 with programmer telephone communicator.

2.7 REMOTE HAND SETS (IF APPLICABLE)

- A. Provide five (5) phone hand sets to be located within a locked, labeled storage cabinet adjacent to the main fire alarm control panel.

2.8 PULL STATIONS

- A. All pull stations shall be addressable.
- B. When surface mounting pull stations, provide supply back boxes to match pull stations.

2.9 ELECTRICAL REQUIREMENTS

- A. Provide locking breaker on 120 VAC power source and label "Fire Alarm."
- B. Minimum Wiring Size and Color Standard:

	Minimum Wire Size	Wire Color (+)	Wire Color (-)
Loop/Mapnet** *Special cable approved by equipment supplier			Black
Speakers* *Special cable approved by equipment supplier			Black

Module Power*	#14AWG	Violet	Blue
Re-settable Module Power**	#14AWG	Yellow	Gray
Strobe Circuits* *Special cable approved by equipment supplier	Maximum Size #14AWG		Black
Door Holder/Smoke Dampers	#14AWG	Brown	White

\*\*Must be supervised for power loss at each device

- C. When conventional wiring is used, it shall be solid THHN.
- D. Line voltage (120VAC) shall be run in separate conduit.
  - 1. All line voltage devices shall be attached to a relay rather than direct connection to control modules. Relays must have a LED that activates when the relay is in the powered state.
- E. No spare conductors shall be in conduit or junction boxes.
- F. 3M #130C rubber tape shall be used to insulate all grounding shields.
- G. Fire alarm control panel power shall be supplied dedicated circuit(s).
- H. An SOU shall be installed within the fire alarm control panel to disconnect 120 volt power. An SOU(s) shall be installed within the fire alarm control panel to disconnect all battery power.
- I. A duplex receptacle, on a circuit separate from the fire alarm panel, shall be installed under the main fire alarm panel.
- J. If surface wire mold is specified, it shall be no smaller than 700 size.
- K. All junction and pull boxes shall be a minimum size of 4-11/16" square by 2-1/8" deep.
- L. No box extensions shall be permitted on new work.
- M. All fire alarm devices, junction and pull boxes shall be installed so they are readily accessible without removing light fixtures, equipment, conduits, junction boxes or other items.
- N. No splicing will be allowed in device mounting boxes.
- O. "End of Line Resistors" shall be located at the device that is farthest away from the panel or module.
- P. All devices being controlled by the fire alarm control panel (i.e., dampers, doors, etc.) shall be operated by the use of control modules and not by relay type devices in detector bases or relay cards. No auxiliary equipment shall be directly connected to an addressable control module. 24 vdc power must be supervised at each device. Each control module shall activate a 24 vdc relay with red LED when

in the "alarm" state.

- Q. Back boxes shall be provided by equipment supplier for any surface-mounted pull stations or signaling devices.

## PART 3 - EXECUTION

### 3.1 TRAINING

- A. Owner Training: The Owner shall be given four (4) hours of training, if so requested.
- B. Contractor Training: Prior to fire alarm installation, FM-Fire Safety maintenance personnel will provide one (1) hour of training on device installation and cable terminations to all Contractor personnel directly involved with supervision and/or installation of the fire alarm system.

### 3.2 FIRE CONTROL PANELS

- A. Install system in accordance with manufacturer's instructions.
- B. Fire alarm control panel cabinets shall be mounted at 6'-0" to the top of the cabinet. There shall be a 6-inch spacing between cabinets.
- C. Panel door locks shall be front mounted.

### 3.3 TELEPHONE COMMUNICATORS

- A. Electrical contractor shall provide a 3/4" conduit with pull string from the fire alarm control panel to designated telephone switch room.

**[SPECIFIER NOTE: When including Item 3.4 - Smoke Dampers (below) in a project, the information provided in Paragraphs A, B and C below cannot be altered or deleted per University of Iowa Fire Safety requirements. This information has been cross-referenced in Section 15910 – Ductwork Accessories. If you have questions regarding this, contact Julie Colony in DCS at (319) 335-5687.]**

### 3.4 SMOKE DAMPERS

- A. Where a damper is installed within a duct, a duct smoke detector shall be installed within 5'-0" of the damper. Where a damper is installed within an un-ducted opening in a wall, a smoke detector shall be installed within 5'-0" of the damper.
- B. The Electrical Contractor is required to coordinate the purchase and installation of indicator lights and dampers with the Mechanical Contractor. End switches and damper motors shall be wired with separate sources of power. Provide Owner approved indicator light "Select-A-Switch" model SL53413-6-BG (light-

powered when damper closes; exception being elevator hoistway damper).

- C. Refer to Section 15910 – Ductwork Accessories of the mechanical specifications for smoke/fire dampers.

### 3.5 ELECTRONIC DOOR HOLD-OPENS

- A. Doors shall close on power loss or on general alarm, except as noted.

### 3.6 AIR HANDLERS

- A. Air handlers must shut down through an addressable control module which provides a signal to the DDC controller.
- B. Location of duct smoke detectors shall be marked if not obviously visible. Detectors must be accessible without removing light fixtures, equipment, conduits, junction boxes or other items.
- C. Duct smoke detectors shall not be located closer than six (6) duct widths from the air handler, or no closer than six (6) duct widths from a bend in the air duct. Coordinate exact mounting location with Project Mechanical Engineer.
- D. Install a labeled test switch with LED for each duct smoke detector. Mount switch 48" to 72" above the floor. Coordinate location with Project Mechanical Engineer.

### 3.7 SMOKE OR HEAT DETECTORS

- A. Location of devices shall not be closer than 36" from the edge of air shafts or air supply or return vent.

### 3.8 ELEVATOR CONTROLS

- A. Owner's FM-Fire Safety Department shall be provided with the proposed elevator control sequencing (sprinkling of hoistways, elevator shunt trips, smoke dampers, etc.).
- B. Manual control of elevator hoistway damper shall be controlled by a switch located on the front of the fire alarm control panel.
- C. Verify requirement with local codes, authorities and installers prior to programming.
- D. Elevator electrical shunt trip shall not be controlled by a water flow switch in the sprinkler system.
- E. Prior to elevator inspection, fire alarm system must be operational.

### 3.9 SPRINKLER SYSTEMS

- A. Every sprinkler monitoring device shall have a specific address.
- B. Coordinate with sprinkler contractor concerning exact quantities of sprinkler monitoring devices. For bidding purposes, estimated quantity is \_\_\_\_\_, including items listed below:
  - 1. Fire pumps shall be monitored for pump running, power loss and phase reversal.
  - 2. Jockey pumps shall be monitored for power loss.
  - 3. Post Indicator Valve

### 3.10 LABELING OF EQUIPMENT AND CABLES

- A. All cables in the fire alarm control panel, and in all junction boxes and pull boxes, shall be clearly marked with a written description (e.g., SLC-1, 3<sup>rd</sup> Flr. Spk, 3<sup>rd</sup> East Strobe etc.).
- B. All control and monitor modules shall be labeled on the cover, identifying address and function. (e.g.: L1M16 Supply Fan #1 Shutdown)
- C. All components within the fire alarm control panel shall be labeled and a drawing shall be provided showing each component's purpose.
- D. Junction and pull boxes shall be clearly marked by painting the covers "red."

### 3.11 CLEANING

- A. Provide cleaning under provisions of Section 01710.
- B. Clean all dirt and debris from the inside and outside of fire alarm equipment at time of completion of the installation.

END OF SECTION

*Revised 08/20/2007*

NAME OF PROJECT LINE 1  
NAME OF PROJECT LINE 2

#0000001

**Certification of the Completion of the Fire Alarm:**

*(This form, along with accurate "as-built" drawings must be complete prior to the scheduling of the final check out of the system with the University Of Iowa Owners Representatives.)*

Your Name: \_\_\_\_\_ Date of test: \_\_\_\_\_

Company: \_\_\_\_\_ Project Title: \_\_\_\_\_

**"As-Built Drawings"**

Location of FACP 120VAC Power: \_\_\_\_\_ Breaker #: \_\_\_\_\_

All devices w/address's are shown: \_\_\_\_\_ All junction boxes and conduit runs are shown: \_\_\_\_\_

All control modules and monitor modules are shown w/address's: \_\_\_\_\_

All items being controlled by the FACP are shown: \_\_\_\_\_ (i.e. smoke dampers, fire doors, etc.)

Up to date printout of software: \_\_\_\_\_ Written sequence of operation: \_\_\_\_\_

"End of line resistors" are shown for all signal circuits and monitor modules: \_\_\_\_\_ - \_\_\_\_\_

**Main FACP:**

All control switches are installed: \_\_\_\_\_ (i.e. Audio by-pass, visual by-pass, damper by-pass, etc.)

Panel has been cleaned inside and out: \_\_\_\_\_ Batteries are installed: \_\_\_\_\_

Panel has been labeled: \_\_\_\_\_ (i.e. device type, control buttons, etc.)

**Field Devices:**

Computer printout or a written list showing test results of all initiating devices installed: \_\_\_\_\_

Provide a written list showing device type and location of each signaling device tested: \_\_\_\_\_

Provide a written list of all auxiliary devices that were tested: \_\_\_\_\_ (i.e. fan shutdowns, smoke dampers, elevator recall, etc.)

All control and monitor modules are labeled: \_\_\_\_\_

Conduit penetrations through walls and floors are fire caulked: \_\_\_\_\_

Conduits and junction boxes are properly secured & marked: \_\_\_\_\_

Cables marked at every junction box and in main FACP: \_\_\_\_\_ (i.e. SLC #2, Sig. 5, etc.)

All splices are properly insulated: \_\_\_\_\_

All shields on cables are tested for continuity at farthest device from panel: \_\_\_\_\_

*I have reviewed all items in the fire alarm and smoke damper specifications and I have met all of the requirements listed. My signature on this form certifies that 100% of all equipment controlling or being controlled by the fire alarm system has been tested as is operational.*

\_\_\_\_\_  
Signature of Electrical Contractor's Representative

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Alarm Equipment Provider's Representative

\_\_\_\_\_  
Date

UI Facilities Management, Fire Safety Department, 120 Court Street West, Iowa City, IA 52242  
Phone: (319) 335-6131 or (319) 335-5125; FAX: (319) 335-6013

DESIGN &  
CONSTRUCTION SERVICES  
AUGUST 2007 EDITION

FIRE ALARM AND DETECTION SYSTEMS  
28 31 00-12