

SECTION 16720
FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Fire alarm and smoke detection systems.

1.2 REFERENCES

- 1.3 NFPA 72
- 1.4 NFPA 101

1.5 REGULATORY REQUIREMENTS

- A. System: UL listed.
- B. Conform to requirements of NFPA 101.
- C. Conform to requirements of NFPA 72.

1.6 SYSTEM DESCRIPTION

- A. Fire Alarm System: Non-coded, supervised, electrically impulse, manually operated fire alarm system.
- B. Additions to a system: U.L. listed for use with the existing system manufacturer's control panel.
- C. System Supervision: Provide electrically supervised system, with supervised alarm initiating and alarm signaling circuits. Occurrence of single ground or open condition in initiating or signaling circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode. Occurrence of single ground or open condition on alarm initiating circuit does not disable that circuit from transmitting in ALARM. Occurrence of single ground or open condition on signaling circuit does not disable that circuit from transmitting in ALARM.
- D. Alarm Sequence of Operation: Actuation of manual fire alarm station or automatic initiating device causes system to enter ALARM, which includes the following operations:
 - 1. Sound and display local fire alarm signaling devices with non-coded march time signal.
 - 2. Transmit non-coded signal to remote security monitoring equipment.
 - 3. Indicate location of device that is in alarm on fire alarm control panel and the alarm zone on remote annunciator panel.
 - 4. Transmit signals to building elevator control panel to initiate return to main floor or alternate floor.
 - 5. Transmit signal to building mechanical systems to initiate shutdown of fans and damper operation.
 - 6. Transmit signal to release door hold-open devices.
 - 7. Transmit signal to all gas valve shutoff devices, and other auxiliary equipment.
 - 8. Accomplish all incidental functions required by NFPA 72 and NFPA 101.
- E. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm-initiating circuits have cleared.
- F. Trouble Sequence of Operation: System trouble, including grounding or open circuit of supervised circuits, or power or system failure causes system to enter TROUBLE mode, including the following:
 - 1. Visual and audible trouble alarm by specific device at control panel.
 - 2. Visual common trouble signal at annunciator panel.
 - 3. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
 - 4. Transmit common trouble signal to remote security monitor control.
- G. Lamp Test: Manual LAMP TEST function causes alarm indication at each zone at fire alarm control

panel and at annunciator panel.

- H. A connection to the chemical fire extinguisher system of the kitchen so that the auxiliary alarm contacts of the extinguisher control initiates the fire alarm system.
- I. Future circuit wiring a compliment of all the conductors needed for all types of initiation, signal and auxiliary functions from the control panel to designated future portable locations. Terminated in the closest building terminal boxes to the future site.
 - 1. Provide one extra initiation point or address for future feeds in the program.
 - 2. Provide one extra notification circuit for future feeds in the program.

1.7 QUALIFICATIONS

- A. Manufacturer: Allowable fire alarm systems are: "Simplex Model 4100U", "Notifier Models: AFP-200, AFP-300, AFP-400, AFP-1010, AM2020, and Onyx 3030", "Edwards Systems Technology EST3" or "Cerberus Pyrotronics Model MXL". Vendor must be capable of providing local training and service support to University fire alarm personnel. The fire alarm control panel shall be of a type previously installed at the University and operating satisfactorily for at least three-years, unless F.I.T grants in writing an exception.
- B. Installer: Company specializing in smoke detection and fire alarm systems with five years experience, certified by the State of Florida's Licensing Board as fire alarm installing contractor in Brevard County. Proof of appropriate certification and registration is required.

1.8 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Section 01300.
- B. Provide wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes.
- C. Submit manufacturer's installation instructions under provisions of Section 01300.
- D. Submit manufacturer's certificate under provisions of Section 01400 that system meets or exceeds specified requirements.

1.9 PROJECT RECORD DRAWINGS

- A. Submit documents under the provisions of Section 01730.
- B. Provide accurately indicated locations of terminal boxes, junction boxes and all peripheral devices as well as the conduit run and point to point connection diagrams on disk in "AutoCAD" file format, with layers as specified by the University.

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit data under provision of Sections 01700 and 01730.
- B. Include operating instructions, and maintenance and repair procedures.
- C. Include manufacturer representative's letter stating that system has been inspected, tested and is certified as fully operational as specified by NFPA 72.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01600.
- B. Store and protect products under provisions of Section 01600.

1.12 EXTRA MATERIALS

- A. Provide spare parts under provisions of Section 01700.
- B. Provide twelve keys of each type.
- C. Provide five smoke detectors.

PART 2 PRODUCTS

2.1 ADDITIONS TO EXISTING SYSTEMS NOT REQUIRING A NEW CONTROL PANEL

- A. All products except smoke and duct detectors shall match the existing system exactly.
- B. In lieu of an exact match, products compatible to the existing system will be accepted only with documentation from the control system manufacturer's authorized representative, stating compatibility as well as UL cross listing.

2.2 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

- A. Control Panel: The control panel shall provide power, annunciation, supervision and control for the detection and alarm system. The control panel shall be modular in construction, and contain all modules necessary to operate according with this section.
 - 1. The detection system shall remain 100% operational and capable of responding to an alarm condition while in the routine maintenance mode. The system shall be capable of having the entire total number of detection devices in alarm at the same time, without any loss of function. The control panel shall be capable of supporting non-addressable as well as addressable detection devices. The panel annunciator shall be at a minimum, 32 character alphanumeric display, which shall provide an optional user definable message associated with each detection device or zone.
 - 2. Supervision of system electronics, wiring, devices and software shall be provided by the control system. Failure of system hardware or wiring shall be monitored by an independent hardware watchdog, which will indicate their failure. The system shall provide failsafe 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. Ground fault detection shall be provided for all initiating and audible circuits.
 - 3. Lamp test capability shall be provided to test all visual panel indicators and associated software. Provisions shall be made for remote trouble and remote alarm silencing switches. The control panel shall be equipped with a silence before reset feature, designed to prevent accidental system reset during an alarm condition.
 - 4. The system alarm lamp shall flash upon receipt of any alarm condition. Acknowledgement of the alarm by operation of the silence switch shall silence the audible alarm and cause the alarm lamp to light steadily. Receipt of subsequent alarms shall cause the audible devices to resound and the alarm lamp to flash.
 - 5. The system trouble lamp shall flash and an integral trouble buzzer shall sound upon the occurrence of any trouble condition. Acknowledgement of the trouble condition by operation of the silence switch shall silence the audible alarm and cause the trouble lamp to light steadily. Receipt of subsequent troubles shall cause the trouble buzzer to resound and the trouble lamp to flash.
 - 6. Individual input and output device addressability shall all be performed on the same pair of wires. The system shall be capable of having all addressable devices in alarm simultaneously.
 - 7. The service mode shall permit the arming and disarming of individual input or output devices as well as manually operating output devices. One step function switches will be provided to allow the disarming & arming of groups of inputs or outputs, according to the grouping requirements of the University. The status of these devices shall be displayed upon command from the control panel. The panel shall automatically return to normal mode in the event the panel remains unattended in the service mode for more than four hours. The panel shall be capable of receiving and processing alarms even when in the service mode.
 - 8. The control shall operate from a three-wire 120 VA supply and internal 24V back-up battery. All power connections whether AC or DC shall be separately fused within the control. Light emitting diodes (LED's) shall be included to indicate (green) system power, (yellow) trouble, and (red) alarm; trouble and alarm shall also be annunciated on an alphanumeric display, which will give device number and location plus diagnosis of trouble. Momentary contact switches shall provide for Locate, Next Alarm, Next Trouble, Acknowledge/Silence and Reset. An audible

device shall sound within the control for alarm or trouble. This device shall have two distinct sounds, and shall be silenceable by the acknowledge/silence switch. Alarms shall override any trouble condition.

9. The control CPU and power supply shall be capable of powering up to 960 addressable early warning detectors and up to 960 addressable auxiliary relays. All system expansion modules shall interconnect through a card edge connector and shall require no inter-module wiring. The control shall be capable of measuring and adjusting the sensitivity of detectors. An alphanumeric display shall be provided to display custom messages and give readings of detector sensitivity, detector by detector. Each device on an addressable initiating circuit shall be checked continuously to include the following: sensitivity, response, opens, shorts, ground faults, functionality and status. The control shall report the failure of a device's transmitting component(s), open or shorted, on an addressable initiating circuit. The device shall be recognized and identified by location with the circuit to the specific device, and all other devices shall continue to function properly.

10. The control shall report, by specific device number, any device removed from an addressable initiating circuit and all other devices shall continue to function.

11. The control shall allow changing the status of configured circuits (arming or disarming and changing status of relays). 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.

12. The control shall support a printer. This printer shall be used for permanent hardcopy retrieval of system events.

13. The control shall allow for expansion and shall also be configurable without system inter-wiring. Leave 10% of points or addresses on each mapnet loop available for future additions on fire alarm system.

14. The manufacturer shall provide all system software, configuration software, training, licensing and required certification that is necessary in order to allow the F.I.T Fire Alarm Shop to perform their own modifications, additions and deletions to the fire alarm system.

15. The system shall be capable of providing a hardcopy written record of all alarms, troubles, and system activity by means of full carriage width terminal to print detection device designations and location messages on a single line of up to 128 characters wherein 32 are reserved for device or zone custom identification.

16. New unacknowledged alarms and troubles shall be distinctively displayed on both the visual display and the printer and differentiated from previous alarm and troubles.

17. The system shall automatically indicate the total quantity of alarms and of troubles, which have occurred prior to reset at the control unit.

18. No alarm or trouble indication shall be re-settable until it has been acknowledged. It shall not be possible to reset the system until all alarms have been acknowledged.

19. It shall be possible to display up to 127 alarms and up to 127 trouble indications, one at a time, on the digital annunciator and as a list on a printer. The printer or digital annunciator shall be capable of listing, upon request:

- a. Alarms with time, date and location.
- b. Troubles with time, date and location.
- c. Status of output functions, "on" or "off".
- d. Sensitivity of addressable smoke detectors.
- e. Device number, type and location.
- f. Status of remote relays, "on" or "off".

20. The fire alarm system's programmed database of initiation devices shall be "hard burned" (stored in permanent memory) not reliant on a power source of any form.

B. Printer Terminal: System printer/with keyboard terminal to provide system control and hardcopy retrieval of alarm conditions, detector sensitivity changes, hazardous conditions and other vital

- statistics. Terminal shall provide system control of the panel switches.
- C. Power Supply: Adequate to serve control panel modules, remote detectors, remote annunciator(s), door holders, smoke dampers, relays, and alarm signaling devices and 20% spare capacity.
- D. The system shall be connected to the life safety branch of emergency generator. The system shall have battery back up. Batteries shall be sized to provide 24-hours of standby operation followed by five-minutes of alarm. A dual rate battery charger shall be provided which is capable of recharging the batteries to 80% capacity in 12-hours. Loss of commercial power shall be annunciated as a system trouble. System trouble shall be indicated for over or under voltage conditions, blown fuse or disconnected batteries. The system shall visually and audibly indicate operation from standby power. The system shall automatically restart upon the return of power.
- E. Detection Circuits: Addressable device input supervisory modules capable of Class A supervision. Addressable devices shall be monitored, each device uniquely identifiable. Capable of supporting non-addressable initiating devices through installation of additional modules. Sized and programmed, suitable for all initiating devices connected to the system and an additional 100 possible future expansion devices.
- F. Signal Circuits: Supervised march time signal modules, sufficient for signal devices connected to system and two additional unused circuits, tested, installed and programmed for future expansion. All shall be designed for use with audible circuit operation with class A supervision.
- G. Remote Station Outputs: Provide a self-restoring relay to output common trouble conditions and a re-settable relay to output common alarm conditions to the Owner's security interface equipment.
- H. Auxiliary Relays: Provide sufficient SPDT auxiliary relay contacts to provide accessory functions specified.
- I. Provide one step, panel mounted RECALL switch.
- J. Do not provide panel with DRILL switches.
- K. Supervised booster panels, or remote power supplies may be used to power and supervise the notification appliance circuits. Install Manufacturer recommended transient absorption devices at booster panels. Remote booster panels or remote power supplies shall be installed in electrical rooms or mechanical rooms. Fire alarm system equipment shall not be installed in locations that are not readily accessible. Booster panels and remote power supplies shall be connected to the life safety branch of generator.

2.3 INITIATING DEVICES

- A. Manual Station: Semi-flush mounted, double action manual station equipped with an addressable interface module that interfaces the manual station and the addressable initiating circuit. It shall be field programmable. The double action product shall not be of the type, which uses disposable components, (i.e.: break glass).
- B. Heat Detectors: NFPA 72; Combination rate-of-rise and fixed temperature, rated 135°F and temperature rate of rise of 15°F or 190°F (fixed only), as specified. Addressable and controlled by the system control panel. Each detector to be uniquely identifiable and be field programmed. Calibration and device identification monitored by the system control panel.
- C. Ceiling Mounted Smoke Detector: NFPA 72; Addressable detector that is controlled by the system control panel. Photoelectric type with adjustable sensitivity, removable from base, auxiliary relay contact, and visual indication of detector actuation, suitable for mounting on 4" (100 mm) outlet box. Each detector shall be uniquely identifiable and can be field programmed. The system control panel shall monitor calibration, device identification and sensitivity. The sensitivity controlled by and reading received by the system control panel upon request.
- D. Exceptions:
- E. In Additions to Existing Systems, where the control panel is a non-addressable type: The ceiling mounted smoke detectors shall be compatible to the existing system and the smoke detector shall be removable from its base. The base shall accommodate both ionization and photoelectric type area

smoke detectors.

- F. Duct Mounted Smoke Detector: NFPA 72; Photoelectric type with auxiliary SPDT relay contact, duct sampling tubes extending width of duct, and visual indication of detector actuation, in duct-mounted housing.
1. Provide remote test station with key switch and red LED status indicator.
 - a. Wire the remote test station to the duct smoke detector via remote relay.
 - b. Mount remote test stations 48" AFF.
 - c. Group all remote test stations at one place inside the mechanical room.
- G. The sensitivity controlled by and reading received by the system control panel upon request.
- H. In Additions to Existing Systems where the control panel is a non-addressable type the duct detector must be compatible with the existing system and the housing shall be molded plastic.
1. An integral filter system shall be included to reduce dust and residue effects on the detector and housing.
 2. Sampling tubes shall be easily installed after the housing is mounted to the duct by passing through the duct housing.
 3. The smoke detector shall be removable from the base and the base shall accommodate either ionization or photoelectric smoke detectors.
 4. The unit shall also accommodate a remote key operated test switch with visual remote indicator.

2.4 NOTIFICATION DEVICES

- A. Alarm Lights: NFPA 72; strobe lamp and flasher with red lettered FIRE on white lens.
- B. Alarm Horn: NFPA 72; flush type with wall trim plate (interior), surface type (exterior), fire alarm horn. Provide additional integral strobe lamp and flasher with red lettered FIRE on white lens.
- C. Remote Annunciator: Provide supervised remote annunciator including visual indication of fire alarm by device type (Manual pull stations - Green), (Heat, Smoke and Duct detectors - Red), (Sprinkler Flow - Yellow), (Sprinkler Tamper - Orange). Provide visual indication of common system trouble. Install in flush wall-mounted weatherproof enclosure a 24" x 30" graphic depiction of buildings with LED drivers. The graphic layout shall depict the building layout orientation exactly as viewed in the location where it is mounted. Map shall be capable of being read from a distance of 10' Include an arrow on map to indicate north. Install a light, approved by architect, over the exterior annunciator. Remote annunciator should be located under a covered area.
1. When additions are done to existing systems, the annunciator zone maps shall be updated to include the new or remodeled buildings.
 2. Location of facility's main electrical service disconnect switches, normal and emergency, shall be indicated on the annunciator panel.
- D. Remote smoke detector alarm lamp assembly: flush mounted with red LED. to indicate remote (above ceiling or obscured from normal view) detectors alarm status.

2.5 AUXILIARY DEVICES

- A. Door Release: Door closer as specified in Section 08721. Magnetic door holder with integral diodes to reduce buzzing, 24 VAC coil voltage. Armature shall be mounted with bolts extending through the entire depth of the door, (through bolted).

2.6 SYSTEM RACEWAY

- A. Install all raceway necessary to provide specified equipment function and per print sheets as under the provisions of Sections 16111, 16130, 16160 and 16195.
- B. Install flexible weather tight conduit to duct detectors.
- C. Install an 24" x 24" x 6" minimum size cabinet with hinged and lockable cover and with internal wood backboard and screw type terminals in point of entry room to each building. All wiring shall terminate through the terminal strips, one wire per connector screw. All ends of line devices (resistors)

shall be mounted in these cabinets.

- D. Install a 36" x 36" x 6" minimum size cabinet with hinged, lockable cover, wood backboard and terminal strips located on the same or adjacent wall as the main fire alarm control. All system field wiring shall terminate through terminal connections in this cabinet. Use one wire per connector screw.
- E. Conduit at each terminal cabinet shall be labeled as to its destination. (Building number), (Direction), (Interior or Exterior).
- F. Install a 10-foot driven ground rod at each building entry terminal box location. Provide grounding bar in every box and bond to the ground rod with solid #8 minimum wire. Grounding bar buss is to be used as earth potential for the installed transient protection devices.
- G. All fire alarm terminal boxes, panels and relay enclosures shall be permanently labeled (Fire Alarm).
- H. All fire alarm junction box covers shall be painted orange and an orange round dot shall be installed on the ceiling tile grid below all fire alarm junction boxes and equipment located above the ceiling.
- I. All conduit connections to terminal cabinets and control cabinet shall have grounding bushings installed.
- J. Provide a recessed mounted 4" x 4" x 1/0 junction box with flush single gang stainless steel cover with hole in the middle to install a four conductor twisted shielded cable for the fire alarm printer. Extend conduit from junction box to the fire alarm control panel. Wire printer complete to the fire alarm system. Florida Tech, prior to rough in, shall approve location of the fire alarm printer.
- K. Raceway shall not exceed 400' without a pull box.
- L. Maximum Number of conductors in a conduit shall not exceed 40%.

2.7 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm Power Branch Circuits: Building wire as specified in Section 16123.
- B. Initiating Circuits and Auxiliary Control: Building wire as specified in Section 16120. Non-power limited fire-protective signaling cable, copper conductor, Class 1, 600 volt insulation and Article 760 of NEC Power limited circuits, Constructed in accordance with articles 318, 340, 500 & 501 of NEC. Passing VW-1 Vertical Flame Test. If stranded, maximum of seven strands.
- C. Signal Circuits, Door Holder and Annunciator point wiring: Building wire as specified in section 16120, 600 volt insulation, Type THWN stranded (maximum of 19 strands), and in accordance with NEC 310.
- D. Each separate circuit, initiation, signal and auxiliary shall have a specific number. Label each conductor by this circuit number at the control connections and at each terminal connection in the terminal boxes.
- E. A grounding conductor shall be installed through the entire conduit system and bonded to each device, junction box, terminal box, conduit grounding bushing and control panel.

2.8 SURGE SUPPRESSION

- A. Provide surge protection devices on all wires that enter and leave the fire alarm control panels and the fire alarm booster panels.
 - 1. Provide surge protection devices on all 120-volt power circuits serving the fire alarm control panels and the fire alarm booster panels.
 - 2. Provide a dedicated cabinet to house the surge protection devices; provide a 10 feet ground rod within 10 feet of the surge suppression devices cabinet.
 - 3. If conductors leave the building install a surge suppressor.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install system in accordance with manufacturer's instructions.
- B. Install manual station with operating handle 48" AFF. Install audible and visual signal devices 80"

- AFF or 6" below ceiling, whichever is lower.
- C. All terminal connections in terminal cabinets and in equipment shall be made using solder less block spade connectors suitable for use with the wire gauge and screw terminal applied to. Soldered when used with solid wire.
 - D. Mount end-of-line devices (resistors) in the building terminal cabinet nearest the circuit.
 - E. Mount outlet box for electric door holder to withstand 80 pounds (36.3 kg) pulling force. Wall magnet mounting boxes shall have solid backing support behind.
 - F. Make conduit and wiring connections to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, duct smoke detectors and all other specified peripherals.
 - G. Automatic detector installation shall comply with NFPA 72.
 - H. Duct access panels shall be installed at all locations where sampling tubes are installed.
 - I. Fire Alarm equipment mounting boxes shall house only the wiring pertinent to the equipment mounted on the box and are not to be used as junction points or run through pathways.
 - J. All exterior equipment, mounting boxes and junction boxes shall be installed with all precautions necessary to insure the wiring and equipment being "weatherproof".
 - K. In additions to existing systems, the contractor shall phase the contract with the concurrence of the Owner; to assure that the minimum amount of manipulation events occur to the existing fire alarm system. All modifications and additions to the existing fire alarm panel or circuits shall be scheduled in advance with the concurrence of the Owner, in order to allow them to observe the code required re-acceptance inspection.
 - L. Duct smoke detectors shall be installed within mechanical rooms at heights that are accessible for service, usually no more than 20' AFF.
 - M. Rigid steel conduit shall be used for underground fire alarm wiring in new construction and renovations. Portable classrooms are excluded from this requirement.
 - N. Clean the inside of the terminal cabinets and other enclosures from wire cuts and other installation debris.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 01400.
- B. Test in accordance with NFPA 72 and additional owner requirements.
- C. The equipment manufacturer's certified technician shall review and approve, (in order to assure manufacturer's guidelines and NFPA requirements are met), the installation, adjustments, final connections, and to provide system testing and field certification of the system.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services under provisions of Section 01400.
- B. Include services of certified technician to supervise installation, adjustments, final connections, and system testing and field service certification per NFPA 72.
- C. The equipment installer and/or manufacturer as required by NFPA 72 shall prepare a certificate of completion. Complete parts 1, 2, and 4 through 10 after installing the system and installation wiring is checked. Complete part 3 after the operational acceptance tests are completed. Provide a filled-out preliminary copy of the certificate to the Owner after the completion of the installation wiring tests. Submit a final copy to the Owner, after completion of the operational acceptance tests.
- D. After each re-acceptance test and after final acceptance testing, the Contractor shall provide the Owner with completed NFPA 72 inspection and test forms, verifying that the system passes the testing requirements of NFPA 72 (Chapter 7) and is thereby "operational".
- E. Upon final acceptance of the systems, the Contractor shall provide the Owner with an operator's manual, installation instructions covering all new system equipment, a hard copy and an AutoCAD computer disk of the fire alarm system "As-Built" depicting architectural room along with fire alarm

device layout, fire alarm riser diagrams depicting point to point conduit runs with wiring counts, wire gauge, wire color, and function noted on each conduit run, second copy of "as-builts (fire alarm) to the Fire Alarm shop.

3.4 FIRE ALARM WIRE AND CABLE COLOR CODE

A. Provide fire alarm circuit conductors with color-coded insulation as follows:

1. Additions to Existing Systems.
 - a. Match existing gauges and color code, except for signal circuits. Signal circuits shall be specified as for new systems.
 - b. If non-addressable devices are utilized, use Purple and Blue for initiation devices and Pink (positive) and Grey (negative) for A/C shut down and gas shut down.
2. New Systems.
 - a. Initiating Device Circuit and field relay controls: 1 pair #18 gauge shielded Cable, Red casing. F.I.T. requires the initiating device circuits for underground installations to be twisted/shielded cable. Initiating device circuits for the above ground installations shall be twisted/shielded, if required by the equipment manufacturer.
 - b. Horn Circuit: #12 AWG Orange (positive), #12 AWG Brown (negative). For longer than 200' wire run increase wire gauge to #10 for both conductors.
 - c. Strobe Circuit: #12 AWG Yellow (positive), #12 AWG Gray (negative). For longer than 200' wire run increase wire gauge to #10 for both conductors.
 - d. Door Release: #12 AWG Yellow (positive), #12 AWG blue (negative).
 - e. Annunciator Point Wiring: Power (#14 AWG Orange, positive. #14 AWG brown, negative). Processor connection #18 AWG shielded pair.
 - f. Equipment Grounding Conductor: #12 AWG Green.
 - g. Spares: Provide 4 #10 AWG, White spare wires in each fire alarm system terminal cabinet.

END OF SECTION