

283100S05 FIRE DETECTION and ALARM
Fire Alarm System Multiplexed, Manual and Automatic Voice System

1. SCOPE AND RELATED DOCUMENTS

- A. The work covered by this section of the specifications includes the furnishing of all labor, equipment, materials, conduit, wiring junction boxes and performance of all operations associated with the installation of the Fire Alarm System as shown on the drawings and as herein specified.
- B. The requirements of the conditions of the Contract, Supplementary Conditions, and General Requirements apply to the work specified in this section.
- C. The complete installation shall conform to the applicable sections the latest revision of all applicable Federal, State and Local codes including but not limited to NFPA codes 72A, 72B, 72C, 72D, 72E, National Electric Code (NEC) article 760 in particular, Kentucky Building Code (KBC), Local (LFUCG) codes, and ADA. Note: All systems shall be voice systems even if the code does not require a voice system. All voice systems must have an external input for remote seizure and public address announcements via a phone line loop seizure, network interface seizure or a remote access and seizure scheme approved by the University. Any exceptions must have the University Fire Marshals' written approval.
- D. All equipment shall be approved by the State and Local Fire Marshal's Office. One set of shop drawings, reviewed and stamped by the Fire Marshal's Office, shall be included with shop drawings submitted to the Engineer. A final approval set of drawings from the State Fire Marshal's Office shall be given to the Engineer after 100% acceptance test is conducted. The Contractor shall coordinate these activities with the Fire Marshal's Office.
- E. In addition to specific instructions provided herein, complete system must be installed in accordance with all applicable sections of the U.K. Construction Standards No. 00000S01-499999SXX
- F. Provide fire stopping and fireproof seals in accordance with U.K. Standard 078400S01.
- G. Provide lightning/surge protection in accordance with U.K. Spec 664000S01.
- H. System guarantee shall be in accordance with UK Standard 010000S01.
- I. Provide submittals, shop drawings and documentation in accordance with U.K. Spec 010000S01.
- J. Provide Class A remote connection to a Central Station Monitoring System in accordance with the UK Spec 283100S02.
- K. System operation and training shall be provided per UK Spec 010000S01.
- L. System shall have Class B (Type 2) detection and signal circuits.
- M. All components of system shall be equipped with voltage and RF transient suppression devices and shielding to prevent false nuisance alarms.
- N. System shall not produce false alarms when subjected to power line transients and carrier signals. Two common power line carrier frequencies used by the University are the 2340 Hz. clock synchronizing signal and the 3218 Hz. bell ringing signal.

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- O. Additions to existing hardwire type Fire Alarm Systems are not recommended, however, this standard does apply to all U.K. Fire Alarm System renovations.
- P. Submittals, Shop Drawings and Documentation
Provide in accordance with U.K. Spec 010000S01 and in addition to this meeting this spec requirements, submittals must include a minimum of the following:
 - 1) Complete sequence of operations of the system.
 - 2) All required Drawings and Specs reviewed and stamped by the Ky. Dept. of Housing, Buildings and Construction.

2. GENERAL REQUIREMENTS

- A. Fire alarm system shall be as manufactured by Simplex, Notifier, or Edwards.
- B. On new construction, fire alarm enclosures, device boxes and devices shall be white, pull stations shall be red. All devices in a building shall be the same color, do not mix enclosure, device boxes and device colors. On renovations, replacement of notification devices shall match the color of the devices already installed in the building. The new white standard for notification devices shall only apply to new construction or a full system replacement in a building.
- C. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans; to be wired, connected, and left in first class operating condition. Include a control panel, manual pull stations, automatic fire detectors, smoke detectors, audio/visual devices, connection to existing Central Station, all wiring, connections to devices, outlet boxes, junction boxes, and all other necessary material for a complete operating system.
- D. No existing equipment, components, devices, appliances, conduit, junction boxes, equipment enclosures, wiring, system or part of a system shall be used to constitute part of this contract of this complete fire alarm system unless this use and/or reuse is specifically detailed in the original contract specs and shown on the original contract drawings.
- E. Zoning
 - 1) Alarm initiating devices shall be grouped in zones in accordance with the Kentucky Building Code and the UK authority having jurisdiction (UK Fire Marshal).
 - 2) Provide dedicated zones connected to all existing and new suppression systems including but not limited to one for each Halon System, CO2 System, Sprinkler Branch Paddle Switch, and Sprinkler Common Water Gong Pressure Switch. Sprinkler zones shall supervise the tamper switch on all valves serving heads in that zone. Sprinkler common alarm zone shall supervise all PIV valve(s).
 - 3) Sprinkler zones shall not overlap more than one fire alarm zone.
- F. System Supervision
The system in this spec must be electrically supervised for 100% operation at all times. If any part of this system is malfunctioning, or if a device, module or any part of this system is disconnected and/or out of place the system trouble indicator shall illuminate and the audible trouble signal shall sound.

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- G. Hardware Location and Required Environment
If system provided requires conditioned space to operate properly, this must be included as part of this contract. Provide detailed specifications on what physical space conditioning is required for components and system to be provided. Include figures on BTU output of system, temperature requirement, humidity requirement, power conditioning requirement etc.
- H. Capacity and Flexibility
Provide complete details on the Input/Output capacity of complete system as proposed and the future maximum expansion capabilities. Expansion and capacity information shall include details on input points, output points, programs, RAM memory, ROM memory, disk memory, communications ports in, out and bi-directional, etc. Vendor shall provide a detailed block diagram with part numbers of system components depicting system architecture as originally proposed and as may be expanded in the future.
- I. Interface and Standardization
UK prefers systems which use industry standard hardware, interfaces, firmware, software and communications protocols. All data communications shall be standard EIA interfaces such as RS232, RS422 and RS485. Communications protocols shall be ASCII. Provide complete detailed information of communications of system.
- J. Memory
Provide details on memory organization of the system proposed. Include details on size of each type provided and expansion capacity in the future. Provide full details on non-volatile RAM, ROM, RAM, customer changes, reboot, backup, battery requirements, memory management utilities etc.
- K. Maintenance and Repair
The University of Kentucky Electronics Services Department currently maintains and repairs all fire alarm equipment on the UK campus. UK prefers systems which University personnel can maintain and repair. If any part of the system provided on this contract is propriety in design or if the documentation of the equipment is propriety, provide full details. If no exception is taken on all or a part of the system proposed, the University will assume its personnel will be supplied with sufficient documentation to maintain and repair the system being proposed.
- L. University Additions and Modifications
The University is always changing and UK personnel need the ability to make changes to the system being provided on this contract. Provide details on how this will be handled during installation and during the guarantee period without adding to the cost of this contract.
- M. Speed of System
Provide details on the minimum and maximum time for the system proposed to execute and complete a task. Provide details on speed of system as proposed and if expanded to full capacity.
- N. Survivability of Each Building Fire Alarm System
If operation of the central processor or communications between each or all buildings and the central processor becomes inoperable, each system in each building shall be capable of operating as a stand-alone Automatic Fire Alarm System as required by the NFPA until communications and operation of the central system is restored.

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- O. Installation and Repair Test Equipment
Provide full details on all test equipment required to install, operate, maintain, troubleshoot and repair this system. Is there programming required at equipment manufacturers or providers facility which cannot be done on sight at the University of Kentucky?
- P. Maintenance Contracts
If proposed system requires a maintenance contract provide full details and 5 year cost projections. Provide unit maintenance cost of components of the system.
- Q. Unit Cost
Provide unit cost on hardware, software, firmware, components, devices, appliances, engineering and installation labor.

3. QUALITY ASSURANCE

- A. Each and all items of the Fire Alarm System shall be listed under the appropriate category by Underwriters' Laboratories, Inc. (UL), and shall bear the "U.L." label.
- B. All control equipment must have transient protection to comply with UL864 requirements.
- C. Devices must be UL listed under standard #497B (Isolated Loop Circuit Protectors).
- D. System controls shall be UL listed for Power Limited Applications and all circuits must be labeled in accordance with NEC article 760-23.

4. INSTALLER CERTIFICATION

All contract submittals for this project shall list names, license numbers, and telephone numbers of two installers employed full time by the vendor to install and test fire alarm systems in the State of Kentucky.

5. INSTALLER QUALIFICATIONS

- A. The system installer must employ factory trained technicians and maintain a service organization within two (2) hours by ground transportation of the job site. This organization must have a minimum of 10 years of experience servicing fire alarm systems.
- B. This system must be installed under the supervision of a person certified to install fire alarm systems in the State of Kentucky. All submittals for this project shall list the name, license number, and telephone number(s) of one person with this certification and who is assigned to represent the successful bidder before, during and after this installation.

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EXECUTION

6. INTERRUPTION of SERVICES

- A. All existing fire alarm equipment and systems shall be left intact during installation of the new system. A changeover of new devices in old outlet boxes shall be coordinated in such a way as to minimize the amount of time any given area or floor is without a system, new or old. The maximum down time for any part of the system is 8 hours.
- B. Any planned interruption of service of existing Fire Alarm Systems must be authorized in writing by the U.K. Fire Marshall or his/her appointed representative prior to project start, otherwise, the University will assume that existing systems will remain 100% operational at all times and will only have one zone or signal circuit out of service at any time. The maximum down time for any part of the system is 7.5 hours unless otherwise specified in writing.
- C. If problems develop and system cannot be kept operational as this section specifies, contact the U.K. Fire Marshall for his/her recommendation. If the U.K. Fire Marshall request security guard(s) be put on duty until system is back into operation, this will be done at the expense of the contractor.

7. INSPECTION AND TESTING

- A. Installer shall provide a certified fire alarm inspector for final check out and test of every device. Check out to include check out of wiring to ensure compatibility with the system and proper operation of every device (alarm and trouble reporting). Completed fire alarm system shall be fully tested in accordance with NFPA-72H by the contractor in the presence of the owner's representative and the Local Fire Marshal. Upon completion of a successful test, the contractor shall so certify in writing to the owner and general contractor.
- B. All forms for the certification of the Fire Alarm System must be purchased from the State Fire Marshal's office. The "Fire Alarm System Certification and Description" report must be completed and filed with the State Fire Marshal's Office and the UK Project Manager before final system will be accepted.
- C. Installer to coordinate testing of new system so as to minimize inconvenience to the Owner. Change over all devices at once where possible.

8. EQUIPMENT REMOVAL AND SALVAGE

- A. Successful bidder is to completely remove all components and wiring of the existing fire alarm system. Components shall be disconnected at field wiring strips and turned over intact. Components of the existing fire alarm system which are concealed or otherwise inaccessible may be abandoned in place in a safe, workman-like, code-approved manner if so designated in writing in the contract specs and also shown on the contract drawings.
- B. All removed equipment shall be turned over to the U.K. Physical Plant unless proposed disposition is discussed and a written exception is included in the specifications or during the contract period.
- C. Removed equipment will be accepted by U.K. at a mutually agreeable acceptance time.

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EQUIPMENT

9. FIRE ALARM CONTROL PANEL (FACP)

- A. FACP construction shall be modular with solid state, microprocessor based electronics. It shall display only those primary controls and displays essential to operation during a fire alarm condition. Keyboards or keypads shall not be required to operate the system during fire alarm conditions.
- B. Control panel shall have a minimum of 20 zone positions with a minimum of 2 spare equipped zones and 2 spare unequipped positions specifically designated for zone expansion to 20 fully equipped identical zones. If this fire alarm is being installed for only part of a building and potential for expansion is indicated, install a control panel with a minimum of 30 possible zone positions.
- C. A local audible device shall sound during Alarm, Trouble or Supervisory conditions. This audible device shall sound differently during each condition to distinguish one condition from another without having to view the panel. This audible device shall also sound during each key press to provide an audible feedback to ensure that the key has been pressed properly.
- D. The following primary controls shall be visible through a front access panel:
 - 1) Individual red system alarm LED
 - 2) Individual yellow supervisory service LED
 - 3) Individual yellow trouble LED
 - 4) Green "power on" Led
 - 5) Alarm Acknowledge key
 - 6) Supervisory Acknowledge key
 - 7) Trouble Acknowledge key
 - 8) Alarm Silence key
 - 9) System Reset key
- E. The following secondary control switches and LED's shall be available behind a cut-key locked access door:
 - 1) A manual evacuation (drill) switch shall be provided to operate the alarm indicating devices without causing other control circuits to be activated. However, a true alarm shall be processed as previously described.
 - 2) Activation of an auxiliary bypass switch shall override the selected automatic functions.
 - 3) Auxiliary manual controls shall be supervised so that an "off normal" position of any switch shall cause an "off normal" system trouble.
- F. The control panel shall provide the following functions. Some of these functions may be essential during a fire emergency situation. These functions are indicated by an asterisk.
 - 1) Setting of time and date
 - 2) LED testing
 - 3) Alarm, trouble, and abnormal condition listing
 - 4) Changing operator access levels
 - 5) Running diagnostic functions
 - 6) Displaying software revision level

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- 7) Displaying card status
- 8) Point listing

G. For maintenance purposes the following lists shall be available from the point lists menu.

- 1) All points list by address
- 2) Monitor point list
- 3) Signal/speaker list
- 4) Auxiliary control list
- 5) feedback point list
- 6) Pseudo point list
- 7) LED/switch status list

Scrolling through menu options or lists shall be accomplished in a self-directing manner in which prompting messages shall direct the user. These controls shall be located behind an access door.

H. Primary Keys, LED's and LCD Display

The Control Panel shall have a display which shall be backlit for enhanced readability. So as to conserve battery standby power, it shall not be lit during an AC power failure unless an alarm condition occurs or there is keyed activity.

10. GENERAL SYSTEM OPERATION

A. System Alarm

System alarm operation occurs subsequent to the alarm activation of any manual station, automatic detection device (excluding duct smoke detectors and apartment/dwelling unit type smoke detectors), or sprinkler flow switch and shall automatically cause the following operations:

- 1) All audible alarm indicating devices shall sound a march time pattern until silenced by the alarm silence switch at the control panel. Voice systems shall initiate a voice evacuation sequence.
- 2) All visible alarm indicating appliances shall flash continuously until the system is reset.
- 3) A pulsing alarm tone shall occur within the control panel until the alarm has been acknowledged.
- 4) Release all magnetically held doors.
- 5) Shut-down or reroute all air handling systems according to established plans.
- 6) Lower fire curtains.
- 7) Close fire dampers.
- 8) Indicate on remote annunciators.
- 9) System alarm shall operate auxiliary pair of relay contacts for Class A remote connection to a Central Station Monitoring System in accordance with the UK Spec 283100S02.
- 10) Alarm shall be displayed on LCD. System alarm LED shall flash on the control panel until the alarm has been acknowledged at the control panel.
- 11) Duct smoke detectors shall shut down or reroute "associated" air handling systems according to established plans and shall send an addressable, identifiable supervisory signal to the central station.

Note: The previous system alarm operations shall automatically be restored to normal pre-alarm state when the F.A. Control Panel is reset.

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B. System Alarm Silence

System general audio devices may be silenced only by entering a cut key locked control cabinet and operating the proper "Alarm Silence" switch. Operation of this switch shall be indicated by a visible trouble light and audible signal.

A subsequent system general alarm received from another zone after "Alarm Silence" shall flash the system alarm LED on the FACP and resound the system alarm. The LCD display shall show the new alarm information.

C. System Reset

The system reset button shall be used to return the system to its normal state after an alarm condition has been cleared. The display shall step the user through the reset process with simple English Language messages.

D. Access Levels

System provided must have 4 or more access levels. Provide full details on access levels of the system and how functions can be restricted by each level.

E. Priority Levels

Provide full details on how priority levels of points, commands, reports and reporting are assigned and how they affect the operation of the system.

11. SYSTEM FRONT PANEL OPERATION AND CAPABILITIES

- A. Under normal condition the front panel shall display a "System is Normal" message and the current time and date.
- B. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- C. The panel shall display the following information relative to the abnormal condition of a point in the system.
 - 1) Location label
 - 2) Type of device (i.e. smoke, pull station, waterflow, etc)
 - 3) Point status (i.e. alarm, trouble)
- D. For NFPA 72A requirements: Pressing the appropriate acknowledge button shall globally acknowledge every point in the list.

Acknowledge functions must be passcode protected if the user has insufficient privilege to acknowledge such conditions.

A message shall indicate insufficient privilege but allow the user to view the points without acknowledging them. Should the user have sufficient privilege to acknowledge, a message will be displayed informing the user that the condition has been acknowledged.

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- E. After all points have been acknowledged, the LEDs shall glow steady and the audible signal will be silenced. The total number of alarms, supervisory and trouble conditions shall be displayed.
- F. LED Supervision
All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur the LCD shall display the module and LED location numbers to facilitate location of that LED.
- G. System Trouble Reminder
Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound to act as reminder that the fire alarm system is not 100% operational.
- H. Maintenance Functions
The system shall have provisions for disabling and enabling all circuits individually for maintenance or testing purposes.
- I. Fire Alarm Control System Network
Each Fire Alarm Control Panel shall operate as a proprietary local system and be provided with the hardware, software, firmware, and interface for data communication to a higher order Central Processing Unit (CPU).
- J. Input/Output Ports
FACP as installed shall be equipped with one RS232 or RS485 ASCII terminal input/output port and two RS232 ASCII printer output ports.
- K. Audio Interface
On voice annunciation systems, provide mike and a phone line interface for dial up paging.

12. BATTERIES

- A. Batteries shall be sealed type Maintenance Free and shall provide sixty (60) hour stand-by power. Exception: reduce stand-by power to twenty-four (24) hours if all 120 volt power is connected to and emergency generator source.
- B. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in normal supervisory mode for a period of sixty (60) hours with five (5) minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and precharging operations shall be automatic.

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13. BATTERY CHARGER MODULE

An automatic dual-rate battery charger shall be installed in the control panel which shall be capable of charging either a Gel or Wet Cell battery. A constant trickle charge shall continuously be applied to the battery in order to maintain it at a full charge state. A method of adjusting the trickle charge rate shall also be provided in order to supply the selected battery with the exact charge rate it requires. In the event of a failure of the charger, the charger failure LED shall illuminate. Should the battery capacity drop below specified limits, the charger shall automatically change to high rate condition and an LED shall illuminate.

14. POWER SUPPLY

- A. The control panel shall receive 120 VAC power (as noted on the plans) via a dedicated circuit breaker. Breaker shall be labeled fire alarm.
- B. All external circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.
- C. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel. A green "power on" LED shall be displayed continuously while incoming power is present.
- D. A power supply module shall be furnished supplying 5 amperes (minimum) of continuous filtered power, or 8 amperes intermittent (minimum), of the proper voltage. The power supply shall be capable of furnishing the FACP power and power for all peripheral devices including but not limited to such as smoke detectors, auxiliary relays, door holders, etc. It shall contain a normal power LED, battery trouble LED and power supply trouble LED, all viewable on front of enclosure. Connections for adding a volt/amp meter shall be provided.

15. EQUIPMENT ENCLOSURES

- A. Provide all cabinets and enclosures of sufficient size to accommodate the equipment. Flush mount unless otherwise noted.
- B. Cabinet shall have an outer hinged door and be equipped with cut-key locks and durable transparent door panel providing freedom from tampering yet allowing full view of the various labels, lights and controls. Cabinet shall be tamper resistant, locked enclosure which can be mounted in easy-to-reach public areas such as lobbies or corridors.
- C. All equipment enclosures, cabinets and back boxes shall be white unless otherwise specified as white with red trim. All enclosure finishes shall have matched color manufacturer applied primer with baked on enamel finish.

16. FIREMEN'S SERVICE BOX

Provide one key to the fire alarm control panel in the Fireman's Service Box in the building for use by the fireman. If box does not exist, this project is to provide it.

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17. SOFTWARE

- A. Provide full details on what software and firmware applications and utilities will be provided and how software revisions are maintained. Provide unit pricing on source code in original bid.
- B. The fire alarm system shall allow for loading and editing special instructions and operating sequences as required. The system shall be capable of on site programming to accommodate system expansion, building parameter changes, or changes as required by local code. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
- C. Resident software shall allow for full configuration of initiating circuits so that additional hardware shall not be necessary to accommodate changes in, for instance, sensing of normally open contact devices to sensing of normally closed contact devices, or from sensing of normally open contact devices to sensing a combination of current limited and non-current limited devices on the same circuit and being able to differentiate between the two, or changing from a non-verification circuit to a verification circuit or vice versa.
- D. Resident software shall also allow for configuration of indicating appliance and control circuits so that additional hardware shall not be necessary to accommodate changes in, for instance changing a non-coded indicating appliance circuit to a coded circuit, or from a slow march time (20 BPM) to a fast march time (120 BPM).

18. PERIPHERAL DEVICES

A. Audible/Visual Device Circuits

There shall be a minimum of two (2) independently supervised and independently fused indicating circuits for audible and visual devices on each level of the building. Disarrangement conditions of any circuit and/or device shall not affect the operation of other circuits and shall indicate a trouble at the FACP.

B. Audible Devices

- 1) In special animal areas, speakers of variable volume and/or tone shall be supplied.
- 2) In sleeping rooms, provide individual speakers in each room. Sound level shall meet code and must be 87 dB minimum.
- 3) No signal devices are required in storage rooms.
- 4) Provide speaker levels in accordance with NFPA and ADA. Design with consideration for soundproofing as a result of fire rated walls or other reasons.

C. Audible/Visual Devices

- 1) The unit shall be complete with a tamper resistant lexan lens with "FIRE" lettering visible from a 180 degree field of view. Mount on wall unless written exception to mount on ceiling is speced. "FIRE" lettering on ceiling devices must appear as it appears on this page.

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- 2) Integral Xenon strobe shall provide 8000 peak candle power and be adjustable from 1 to 3 flashes per second. Xenon strobe shall provide 4-wire connection to insure properly supervised in/out system connection. Unit shall be complete with all mounting hardware including back box. Audio/visual unit shall be UL listed for its intended purpose. Provide double projectors for all corridor speaker/light units.

D. Visual Devices

Weatherproof strobe light shall be Wheelock #WH3T-24-FR or equal. The strobe light visual signal shall be UL listed for fire protective service and shall produce 70,000 peak candlepower with 3 watts input at approximately one flash per second with continuously applied voltage. Rated voltage shall range from 18 to 31.2 volts for nominal 24 VDC models. The xenon flash tube and associated circuitry shall be enclosed in a translucent white polycarbonate lens with the word FIRE inscribed on the lens. Unit shall surface mount to outdoor backbox. All DC models shall be polarized for DC supervision of alarm lines. Screw terminals (or double leads) shall be provided for in-out field wiring. Product finish shall be textured white enamel.

E. Manual Stations

- 1) Manual Stations shall be type 2099-9201, flush mounted. A downward pull of the level shall activate a positive snap action switch. The station shall remain activated until reset by means of a cut key. A red surface box shall be furnished for all surface mounted stations.
- 2) In high traffic areas and in areas frequently occupied by children, provide pull station device guards to assure protection from accidental bumps, etc.

F. Door Hardware

- 1) Door holders shall be FM 998 approved.
- 2) All door hardware shall be Yale, Von Duprin or Dorma and door keying shall be compatible with the UK Yale or Best master keying system.
- 3) Install a smoke detector on each side of any door equipped with a hold open device.

G. Smoke Detectors

- 1) Furnish and install as indicated on the plans and in this spec. Provide combination 24Vdc photoelectric smoke detectors equipped with 135 degree F fixed temperature detector and audible alarm.
- 2) The activation of any system smoke detector (excluding dwelling area/apartment combined smoke/heat detectors) shall initiate an Alarm Verification operation whereby the panel will reset the activated detector and wait for a second alarm activation. If a second alarm is reported from the same or any other smoke detector, the system shall process the alarm as a general system alarm. If no second alarm occurs the system shall resume normal operation. The Alarm Verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately.
- 3) Detectors shall be listed to U.L. standard 268 and shall be documented compatible with the control equipment to which it is connected. The operating voltage shall be 24VDC(nominal). Their light source shall be pulsed infrared LED for low power consumption under standby conditions.

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- 4) Each detector shall have a flashing status indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. The detector may be reset by actuating the control panel reset switch or a smoke alarm verification sequence.
- 5) The detector design shall provide full solid state construction and compatibility with other normally open fire alarm detection loop devices, (heat detectors, pull stations, etc.).
- 6) An installed detector smoke chamber shall require only 15 seconds disassembly time to make all components readily accessible for cleaning as required for routine maintenance and test.
- 7) Detectors shall have detector screens to prevent rodents and insects, large enough to cause a false alarm, from entering the detection chamber.
- 8) Detector circuit and wiring shall be sealed base construction such that air flow into and/or moisture in conduit or junction box shall not contaminate detector or cause false alarms. Base-less detectors are not acceptable.
- 9) On fixed smoke detectors, nominal detector sensitivity shall be 1.4% per floor obscuration with a range of 1% to 1.84%. Provide on smoke detector a 135 degree F. fixed heat element. Regardless of sensitivity setting, the detector's stability shall be unaffected by high air velocity. The detector shall be capable of operating on either a 2-wire loop with end-of-line resistor or on a 4-wire loop using 24VDC.
- 10) Removal of the any detector head shall interrupt the supervisory circuit of the alarm detection loop and cause a trouble signal to be generated at the control panel.

H. Dwelling Area/Apartment Combined Smoke/Heat Detector

- 1) Furnish and install in dwelling areas and apartments as indicated on the plans and in this spec. Provide combination 24Vdc photoelectric smoke detectors equipped with 135 degree F fixed temperature detector and audible alarm.
- 2) Smoke actuation of a combined smoke/heat detector shall cause the following: A local alarm within the room via an internal speaker, the Fire Alarm Control Panel will report a Stage 2 alarm, and the operation of a dedicated auxiliary DPDT relay (which is not used for General Remote Alarm and Trouble outputs) to the Central System.
- 3) Smoke detector and auxiliary outputs shall automatically reset when obscuration returns to acceptable levels.
- 4) Detector shall have inputs for remote actuation of audible alarm and remote reset with dry contacts.
- 5) Heat actuation of a combined smoke/heat detector shall cause the operation procedures as outlined in 7.01 of this section as well as operation of the Central System remote auxiliary alarm contact. The main Fire Alarm Control Panel connection to the heat sensor shall be supervised and shall operate the Central System remote auxiliary trouble contact when the alarm loop is in a trouble condition.

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6) Heat detector alarm contacts shall be isolated from smoke alarm output contacts and shall also activate detector audible alarm.

I. Miscellaneous Combined Smoke/Heat Detectors

1) Classrooms: Install area smoke/heat detectors in accordance with this UK Spec.

2) Corridors: Install area smoke/heat detectors in accordance with this UK Spec.

J. Heat Detectors

All heat detectors shall be combination rate of rise/136 degrees F. fixed temperature, unless special applications of the areas require other types heat detectors as noted shall contain a normal power LED, battery trouble LED and power supply trouble LED, all viewable on front of enclosure. Connections for adding a volt/amp meter shall be provided.

K. Miscellaneous Heat Detectors

1) Office areas: Install combination 135 degree F. fixed temperature/rate of rise detectors with latching LED on alarm.

2) Storage Areas: Install heat detectors in general storage areas.

3) Mechanical Rooms: Install 135 degree fixed temperature heat detector with latching LED if nominal room temperature is below 135 degree F.

4) Mechanical rooms, autoclave rooms, dishwasher rooms, steam table rooms, and other rooms subject to reach temperature above 135 degree F. Install 190 degree F fixed temperature heat detectors

L. Other Area Detectors

1) Flammable storage: Sprinkle with flow switch connection to dedicated zone on FACP or install CO2 if absolutely required and connect to dedicated zone on FACP

2) Computer Rooms: Sprinkle with flow switch to dedicated zone on FACP or if absolutely required install pre-acting sprinkler system and connect to a dedicated zone on FACP

M. Multiple Addressable Peripheral Network

1) Communication with Addressable Devices.

The system must provide communication with initiating and control devices individually. All of these devices will be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

- a) Alarm
- b) Trouble
- c) Open
- d) Short
- e) Device missing/failed

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- 2) All addressable devices shall have the capability of being disabled or enabled individually.
- 3) Systems that require factory reprogramming to add or delete devices are unacceptable.
- 4) Identification of Addressable Devices
 - f) Each addressable device must be uniquely identified by an address code entered on each device at time of installation.
 - g) The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact. Device identification schemes that do not use uniquely set addresses but rely on electrical position along the communication channel are unacceptable. These systems cannot accommodate t-tapping and the addition of an addressable device between existing devices requires reprogramming all existing electrically further devices. The system must verify that proper type device is in place and matches the desired software configuration.
- 5) Wiring Type, Distances, Survivability and Configurations Wiring types will be approved by the equipment manufacturer. Existing wiring will not be utilized in retrofit applications. The system shall allow a line distance of up to 2,500 feet to the furthest addressable device on a Class B circuit. To minimize wire routing and to facilitate future additions, t-tapping of the communications channel will be supported except where Class A wiring is required.

N. Addressable Devices

1) General

The system control panel must be capable of communicating with the types of addressable devices in this spec.

2) Smoke/Heat Detector in Individual Apartment Units

- a) As indicated on the drawings, each apartment shall be provided with smoke/heat detector located toward the center of each room. The detector shall be a Gentex Model 624PHY or equal and shall operate on the photo electric light scattering principle and shall be UL-268 listed.
- b) The smoke detector shall contain an infrared LED light source and a light sensing photo-diode. The detector shall be capable of operating on a 4-wire alarm loop that supplies 24VDC normal power.
- c) Nominal detector sensitivity shall be 1.4% per foot obscuration with a range of 1% to 1.84%. Regardless of sensitivity setting, the detector's stability shall be unaffected by high air velocity. When the amount of light reflected onto the photo-diode reaches the specified level, the detector shall latch into local alarm through an internal 90Db speaker (at 10 feet) and operate a dry contact.
- d) The speaker shall continue to sound and the dry contact shall remain operated until the smoke detector senses normal obscuration levels and automatically resets. Once reset, the speaker shall stop sounding and the dry alarm contact shall restore to normal conditions.

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- e) The detector shall be provided with a self-restoring isolated heat sensor set to alarm through the fire alarm system at 135 degrees F. Heat sensors shall report an alarm status through a hard-wired zone as indicated on drawings as well as sound the 90Db speaker in the detector.
- f) Heat sensor shall close a set of normally isolated dry contacts to report to the control panel.
- g) An addressable module shall be provided to monitor and provide the ability to individually annunciate the trouble status of the smoke detector. The module shall report a trouble condition to the control panel if the detector head is removed from the mounting plate or the smoke detector goes into alarm.
- h) The detector smoke sensing chamber shall require only 15 seconds disassemble time to make all components readily accessible for cleaning as required or routine maintenance and test. Detectors shall have detector screens to prevent rodents and insects, large enough to cause a false alarm, from entering the detector chamber. Detector circuit and wiring shall be sealed base construction such that moisture condensing in or entering junction box shall not contaminate detector or cause false alarms.
- i) The detector shall mount on a 4" square X 1-1/2" junction box with a 4" square X 1-1/2" extension ring (to house the module) using a standard bracket that does not have to be purchased separately.

3) Addressable Detector Bases

All addressable smoke and heat detector heads as specified below will be pluggable into their bases. The unit will contain electronics that communicate the detector status (normal, alarm, trouble) to the control panel over two wires. The same two wires shall also provide power to the base and detector. Different detector heads (smoke or heat) must be interchangeable. Upon removal of the head, a trouble signal will be transmitted to the control panel.

4) Photoelectric Detector Head

- a) The Photoelectric type detector shall be a plug-in unit which mounts to a twist-lock base, and shall be UL approved. The detectors shall be of the solid state photoelectric type and shall contain no radioactive material. They will use a pulsed infrared LED light source and be sealed against rear air flow and moisture entry.
- b) The detector shall fit into a base that is common with both the heat detector and ionization type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable Zone Adapter Modules on the same circuit. The detector shall also fit into a non-addressable base that is capable of being monitored by an addressable Zone Adapter Module.
- c) There shall be no limit to the number of detectors or Zone Adapter Modules which may be activated or "in alarm" simultaneously.

5) Addressable Thermal Detector Head

Provide combination rate-of-rise and fixed temperature type, automatically restorable. Detector bases for thermal detector heads shall have LED visual indication of its operation.

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6) Addressable Pull Stations

- a) Addressable pull stations will contain electronics that communicate the station's status (alarm, normal) to the transponder over two wires which also provide power to the pull station. The address will be set on the station.
- b) They will be manufactured from high impact red Lexan.
- c) Station will mechanically latch upon operation and remain so until manually reset by opening with a cut key common to all system locks. Pull stations will be single or dual action.
- d) The front of the station is to be hinged to a back plate assembly and must be opened with a cut key to reset the station. The key shall be common with the control panels.
- e) Stations which use Allen wrenches or special tools to reset, will not be accepted. The station shall consist of high impact lexan plastic, red in color.
- f) The addressable manual station shall be capable of field programming of its "address" location on an addressable initiating circuit. The manual station shall be fitted with screw terminals for field wire attachment.
- g) There shall be no limit to the number of stations, detectors or Zone Adapter modules, which may be activated or "in alarm" simultaneously.
- h) The addressable manual station shall be Underwriters' Laboratories Inc. listed.
- i) On selected pull stations as shown on the drawings furnish and install a tamper-proof clear Lexan shield prevention device consisting of Lexan cover, frame, and 9V battery operated warning horn. This prevention device to be equal to Direct Safety Company number B11-666 or Safety Technology International Model STI 1100.

7) Addressable Device Supervision

- a) All devices will be supervised for trouble conditions.
- b) The system control panel will be capable of displaying the type of trouble condition (open, short, device missing/failed).
- c) Should a device fail it will not hinder the operation of other system devices. Should a problem occur on a particular wire run it will not affect other wire runs.

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19. REMOTE ANNUNCIATOR

- A. Provide only when design is such that the Main Fire Alarm Control Panel (FACP) cannot be located near the designated entrance to provide all required annunciation or more than one annunciator is required. Remote annunciator shall be completely free from screws or other fastenings on its face to prevent tampering and shall be cut keyed to match the FACP. At minimum, the main FACP common alarm and trouble and the alarm and trouble for each zone shall be annunciated on the remote annunciator. LED labels shall be permanent, professionally made and shall meet UK Construction Administrators approval. Unit shall be flush mounted, factory baked onwhite enamel with red trim and shall be complete with trouble LEDs and internally mounted silence and reset switches.
- B. Where specified, remote annunciator for director's office shall be single zone with indicator lamp, buzzer and silence switch.

20. FIELD INSTALLED AUXILIARY RELAYS AND MODULES

- A. All relays added to any standard fire alarm panel or auxiliary panel shall be UL listed plug-in type with mounting bases installed and wired for every existing and initial installation spare zone provided or equitable.
- B. Provisions shall be made to test all equipped and equitable spare positions for alarm, annunciation, and supervision, during the final acceptance testing of all new and renovated fire alarm systems.

21. BUILDING MAP(S)

- A. Building map(s) shall be provided adjacent to the fire alarm control panel in each Building and shall consist of floor plans with color coded zones. The color coding shall be the sprinkler zones if the building is 100% sprinkled, otherwise the zones shall be the smoke and heat detector zones. Zone indications shall depict the exact zone number. Building map shall be a detailed floor plan with all room numbers, fire alarm zones, detectors, speakers, alarm indicators, address numbers and all other devices shown. "Zone No." shall be in 1/4 inch high Helvetica font. Provide durable aluminum frames and all required mounting hardware and mount where indicated on the drawing. Aluminum frame must be such that it can be removed, disassembled and reassembled to allow replacement or revisions to the prints. Maps shall be properly oriented and shall be 1/8 inch equals 1 foot scale, unless written permission to change scale for practical purposes is granted.
- B. Maps shall be generated in CAD as full scale architectural drawings with double line walls for all exterior and interior walls. The CAD file shall become the property of the University at the end of the project and shall be turned over to the University upon acceptance by the University. The zone map files shall be turned over to the University in digital formats.

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- C. The layers of the map in the frame from back of the frame to the front of the frame shall be as follows:
 - 1) Print with floor plan Address Numbers, Room Numbers, Fire Alarm Zones, Detectors, Speakers, Alarm Indicators, and all other devices dry mounted on 1/4" foam mounting board
 - 2) 1/8" ultraviolet blocking Plexiglas
 - 3) 1/8" clear lexan to prevent scratching
- D. Building map(s) shall be installed, complete with "as built" corrections before system is left in operation and before the University will consider the project for substantial completion. Before the system is left operational maps must be in place.

22. INSTALLATION AND WIRING

- A. Install the Main Fire Alarm Control Panel (FACP) at the Firemen's designated entrance as approved by the UK Authority Having Jurisdiction, (UK Fire Marshall).
- B. Installation of equipment and devices that interface with work in this or any other contract shall be closely coordinated with the appropriate contractor or subcontractors.
- C. All wiring shall meet the requirements of the national, state, and local electrical codes. The sizes of different wires shall be those specified by the manufacturer or larger as specified in this standard. Color codes shall be used where specified. All wires shall test free from ground and crosses between equipment.
- D. Where fan shut down, elevator recall or special auxiliary functions are required, contractor is to provide wiring diagrams before connections are made.
- E. The contractor shall clean all dirt and debris from the inside and the outside of the fire alarm equipment after completion of the installation.
- F. Cover all smoke detection devices with plastic bags immediately after installation to maintain cleanliness. Remove plastic bags prior to operation.
- G. Smoke detectors are not to be mounted within three feet of air outlets.
- H. In cases where a detector is installed in a room or closet, the detector shall be mounted as close as possible to the center of the room unless written exception is obtained from the University D&C Division. One exception, when room has a door opening into a shower or bath, mount the detector as far away from that room door as the code permits to reduce potential false alarms.
- I. Mount wall mounted smoke detectors per NFPA, Note: normally a minimum of 6 and a maximum of 12 inches from the ceiling to the top of the detector.
- J. Smoke detectors to be installed on either side of a set of fire doors should be mounted no more than five feet and no less than twelve inches from the wall section above the door.
- K. Visuals should not be obscured by support beams or protrusions on walls. Visuals should not be mounted within three feet of wall mounted lights.

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- L. Final connections of the control panel shall be made under direct supervision of a representative of the manufacturer. Do not power-up system until manufacturer field representative is present.
- M. Minimum conduit size is 3/4".
- N. Metal raceway used in exterior locations shall be aluminum as manufactured by Wiremold or equivalent unless written exception is obtained from the UK Project Manager.
- O. Loads greater than 10 AMPS (for auxiliary functions) shall not be run in conduit with other circuits.
- P. Manual Stations shall be installed not more than 4 feet from the floor and five feet from exit or door.
- Q. All panels, cabinets and metal components of system shall be grounded. Do not use the conduit as a grounding system for this purpose. Pull separate grounds wires for this application.
- R. Do not use ceiling wire hangers or wire supports to support any equipment or conduit added on this project.
- S. Provide an isolated run of conduit from the 120 VAC power source to the Fire Alarm Panel. If an existing system is being replaced and the existing power is being reused, it is the responsibility of the provider to isolate or verify isolation of the existing 120 VAC power run(s).
- T. Do not run any 120 VAC wiring with any DC wiring.
- U. All junction boxes shall be sprayed red and labeled "Fire Alarm".
- V. All fire alarm components are to be flush mounted except where specifically noted in the contract specs and shown on the contract drawings. Exceptions to flush mounting will be mounted on fire alarm manufacturer supplied back boxes and these boxes shall match the main FACP paint in color and method of finish application.
- W. Fire alarm visual and audible notification devices shall not be installed in exit stair enclosures or rated exit passageways.

23. CONDUIT LOCATION, APPEARANCE AND SUPPORT

All conduit shall be concealed except in University of Kentucky designated mechanical rooms or unless otherwise specified and shown on drawings approved by the UK Project Manager. Conduits which are not concealed must have written approval of the UK Project Manager prior to installation and shall be surface metal raceway (wiremold) unless otherwise noted in the approval. Conduit or tubing shall have supports installed and spaced in accordance with the NEC. Conduit shall be installed with runs parallel or perpendicular to walls, structural members on intersections of vertical planes and ceilings, with right angle turns consisting of cast metal fittings or symmetrical bends. Bends or offsets shall be avoided where possible but where necessary shall be made with approved conduit bending machine. Conduit or tubing which has been crushed or deformed in any way shall not be installed.

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24. WIRING

The contractor shall furnish and install, in accordance with manufacturer's recommendations, all wiring, conduit, and outlet boxes required for the installation of a complete system as described herein and as shown on the drawings.

WIRING SCHEDULE

<u>CIRCUITS</u>	<u>WIRE SIZE-AWG</u>	<u>WIRE COLOR</u>
ALARM CIRCUITS WIRES	#18	ORANGE (POS) BLUE (NEGATIVE)
Stations		
Smoke Detectors		
Heat Detectors		
TROUBLE CIRCUIT WIRING	#18	BROWN
COMMON ANNUNCIATOR WIRES	#18	VIOLET
POINT ANNUNCIATOR WIRE	#18	PINK WITH BRADY TAG
120 VAC WIRING	#12	BLACK WHITE (NEUTRAL)
24 VDC WIRING	#14	RED (POSITIVE) BLACK (NEGATIVE)
PARALLEL SIGNAL WIRES	#14	RED (POSITIVE) BLACK (NEGATIVE)
SERIES SIGNAL WIRES	#14	YELLOW
TELEPHONE WIRES	#18	TWISTED/SHIELDED

NOTE: All wire shall be stranded unless otherwise indicated.

Wiring color code shall be maintained throughout the installation according to wiring legend.

T-tapping of signal device conductors to signal circuit conductors SHALL NOT be accepted.