



C-24 - FIRE ALARM SYSTEMS

Table of Contents

<u>PART 1 GENERAL</u>	3
1.1 <u>RELATED DOCUMENTS</u>	3
1.2 <u>SCOPE</u>	3
1.3 <u>QUALITY ASSURANCE</u>	3
1.4 <u>SUBMITTALS</u>	5
<u>PART 2 PRODUCTS</u>	6
2.1 <u>MANUFACTURER'S / MODEL'S</u>	6
<u>PART 3 SPECIFIC SYSTEM PERFORMANCE GUIDELINES</u>	6
3.1 <u>FIRE ALARM CONTROL PANEL (FACP)</u>	6
3.2 <u>DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)</u>	12
3.3 <u>AUXILIARY POWER SUPPLY PANELS (APS)</u>	12
3.4 <u>ANNUNCIATION DEVICES</u>	14
3.5 <u>EMERGENCY VOICE / ALARM COMMUNICATIONS</u>	16
3.6 <u>INITIATING DEVICES</u>	17
3.7 <u>MONITOR AND CONTROL DEVICES</u>	20
3.8 <u>MISCELLANEOUS SYSTEM ITEMS</u>	21
..	
<u>PART4 SYSTEM TESTING & CERTIFICATION</u>	23
4.1 <u>CONTRACTOR/INSTALLER TESTING & CERTIFICATION</u>	23
4.2 <u>A/E TESTING & CERTIFICATION</u>	23
4.3 <u>OWNER TESTING & INSPECTION</u>	23
4.4 <u>SYSTEM ACCEPTANCE</u>	24
<u>PART 5 SYSTEM DOCUMENTATION, TRAINING & MAINTENANCE</u>	25
5.1 <u>SYSTEM DOCUMENTATION</u>	25
5.2 <u>SYSTEM TRAINING AND MAINTENANCE</u>	26
<u>PART 6 ALTERNATES AND ATTACHMENTS</u>	27
6.1 <u>ALTERNATES</u>	27
6.2 <u>ATTACHMENTS</u>	29
A. <u>TRANSFER OF SYSTEM RESPONSIBILITY/LIABILITY</u>	29



FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SCOPE

- A. This section of the specifications includes the furnishing, installation, and connection of the microprocessor controlled, addressable reporting fire alarm equipment required to form a complete coordinated system ready for operation. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, control panels, auxiliary control devices, annunciators, power supplies, and wiring as shown on the drawings and specified herein. It also includes the connections and appurtenances necessary to interconnect with the existing system as described above.
- B. The University maintains and services all fire alarm equipment on campus. The Contractor shall provide any site specific and end user type training of the system. Additionally, where any specific computers, printers, cabling, software and/or license agreements are necessary for the University to have the capability to develop a database and/or modify any operating scenario for the buildings fire alarm system without permission from outside distributors, a schedule of available manufacture certification training shall be provided. This training and certification shall recognize the University as a trained and licensed Fire Alarm System installer independent of local distributors and shall not be included in the price of the base bid. The authorized representative will coordinate training arrangements, costs, and specific support equipment needs with the owner.

1.3 QUALITY ASSURANCE

- A. **Manufacturer's Qualifications:** Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products are Listed and Labeled by UL, Inc. All products, including initiating devices and notification appliances, shall be as produced or supplied by the same manufacture as the main fire alarm control panel. Products of firms that do not maintain factory authorized service organization and spare parts stock are not acceptable for use on this project.

Manufacturer's shall agree to make factory training/certification, product programs and/or operating systems, and continued product updates and/or Tech notes available to the University. Any licensing and/or proprietary agreements between the manufacture/distributor and the University must be completed and in place prior to the manufacture and/or product being acceptable for installation.

- B. **Installer's Qualifications:** An experienced company who is an authorized representative of the FACP manufacturer for both installation and maintenance of all equipment is required



for installation of the FACP and connection of all circuits for any project. The Installer shall have a minimum of 5 years documented experience installing fire detection and alarm systems similar in size and scope to this project. The Installer technicians shall be individually certified NICET Level 2 and by the manufacturer of the equipment and trained and certified on the specific model being installed. The Installer shall have at least one technician on staff certified NICET Level 3. Certifications shall be current to latest release and must have occurred in the most recent 24 months. All connections to the FACP, system programming, and/or programming changes shall be accomplished only by the Installer technicians compliant with qualifications, and must be present for the 100% test, Engineer's inspection, and Owner inspections.

C. **Codes and Standards:** The codes and standards listed below are utilized as design criteria for "minimal" system coverage. The University may require additions to these codes and standards based on historical consensus criteria for design and installation of fire alarm systems specific to facility applications within University type settings.

1. **NFPA Compliance:** Comply with current applicable requirements of NFPA-72, National Fire Alarm Code.
2. **NEC Compliance:** Comply with current applicable requirements of NFPA-70, National Electrical Code (NEC) standards pertaining to fire alarm systems.
3. **State Building Code Compliance:** Comply with applicable requirements of the North Carolina State Building Code.
4. **NC Department of Insurance:** Comply with current Office of State Fire Marshal Fire Detection and Alarm Systems, and Fire Sprinkler Systems.
5. **Testing Laboratory Compliance:** Comply with provisions of UL safety standards pertaining to fire alarm systems. Provide products and components, which are Listed and Labeled.
6. **FM Compliance:** Provide fire alarm systems and accessories, which are FM approved.
7. **Comply with Authority(ies) Having Jurisdiction (AHJ):**
 - a) **NC State code requirement issues:** NC State Construction Office
 - b) **City of Chapel Hill code requirement issues:** Chapel Hill Fire Marshall
 - c) **University code requirement issues:** UNC Health & Safety Fire Marshall
 - d) **University policy and system application requirements:** UNC Facilities Services Manager Life Safety Systems

D. **Assumption of Existing System Responsibility/Liability:** Any construction project additions



and/or renovations that will require changing the current programming of an existing fire alarm system in any way shall require an official transfer of the entire FACP system responsibility to that contractor. This also includes significantly impairing any active system to accommodate phased construction projects where the FACP will either be: removed in its entirety at the completion of the project and/or significantly modified and/or totally replaced through a dual system coverage conversion type project. A signed letter transferring the responsibility of the system, or part thereof, as well as an emergency contact list shall be provided to the owner prior to the start of any construction. (**See Attachment A**).

1.4 SUBMITTALS - GENERAL

A. Submittals shall demonstrate compliance with technical requirements by reference to each subsection of this specification. Where a submitted item does not comply fully with each and every requirement of the specifications, the submittal shall clearly indicate such deviations and may be subject to rejection. Identification requirements for non-complying features of items are very specific.

1. **Installer Certifications:** Copies of manufacturer signed certifications and NICET certifications as required in section 1.3.B above.
2. **Product Data:** Submit Manufacturer's technical product data, including specifications and installation instructions, for all system components (i.e, boards, devices and/or modules, duct mounted smoke detectors, flow switches, tamper switches, supervisory switches, and/or other similar items which require mechanical installation.) that will support the entire fire alarm system. Submit technical product data on any required fire alarm system servicing and/or support equipment.
3. **Maintenance Data:** Submit maintenance data and parts lists for each type of fire alarm equipment installed, including furnished specialties and accessories. Include this data, product data, and shop drawings in maintenance manual.
4. **Standby Battery Sizing Calculations:** Battery calculations shall be sized considering the University has its own Central Station and provides runner service. The University is considered Proprietary and a contiguous campus. For those facilities off campus, they shall be sized as a remote station.
5. **Owner Training and Certification:** Provide the owner a current factory approved certification/ training schedule for the specific system installed.
6. **Maintenance Contract:** Provide maintenance contract per [Alternate E1](#) if agreed to by all interested parties. Interested parties include: UNC Facilities Planning Project Manager, the Building Representative, and the Life Safety & Access Controls Superintendent.
7. **Network Interface Connection:** Provide interface equipment that would allow Ethernet connections if available from manufacturer. Arrangements for two data drops at the



panel should be made.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S/MODELS

A. **Manufacturer's/Models:** Subject to compliance with requirements in section 1.3.A above, the current manufacturers and corresponding panel models that are acceptable to be incorporated into the contract are limited to the following:

1. Edwards System Technology - (EST3, *EST3X),
2. Notifier; Div. of Pittway Corp. - (*NFS2-640, NFS2-3030),
3. Seimens, Inc. - (Fire Finder XLS)
4. Simplex – (4100ES)

*Only for small installations deemed appropriate by owner

Substitution request for other manufacturers must be made with proof of compliance with manufacturer qualifications in section 1.3, including manufacturer signed licensing and proprietary agreements, a minimum of 10 (or 14?) days before bid opening. Substitution requests after bid opening will not be considered.

PART 3 – SPECIFIC SYSTEM PERFORMANCE GUIDELINES

3.1 FIRE ALARM CONTROL PANEL (FACP)

A. FACP - Minimum Requirements:

1. The system shall be electrically supervised for open or (+/-) ground fault conditions in SLC, alarm circuits, and control circuits. Removal of any detection device, alarm appliance, plug-in relay, system module, or standby battery connection shall also result in a trouble signal. Fire alarm signal shall override trouble signals, but any pre-alarm trouble signal shall reappear when the panel is reset.
2. Detect the activation of any initiating device and the location of the alarm condition. Operate all notification appliances and auxiliary devices as programmed.
3. Visually and audibly annunciate any trouble, supervisory or alarm condition on operator's terminals, panel display, and annunciators.
4. The FACP shall include a full featured operator interface control and annunciation panel



that shall include a backlit, liquid crystal display, individual, color coded system status LED's, and an alphanumeric keypad for the field programming and control of the fire alarm system.

5. The system must comply with UL 9th edition.

B. System Capacity and General Operation: The system shall have the following capacities and general operation modes:

1. **Signal Line Circuits (SLC's):** Capacity for expansion up to at least 198 total addressable devices per SLC and up to at least 2048 total annunciation points per system. The number of SLC's provided shall be as indicated on the Drawings, with a minimum of (1) one spare for future use.
2. **Digitized Electronic Signals:** Shall employ check digits or multiple polling. In general a single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
3. **System Response to an Alarm Condition:** When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:
 - a) The system alarm LED shall flash.
 - b) A local piezo-electric signal in the control panel shall sound.
 - c) The LCD display shall indicate all information associated with the fire alarm condition including: the type of alarm point, the initiating device address and the description of its physical location within the protected premises.
 - d) History logging of all information associated with the event, including time and date of occurrence.
 - e) Activate all system outputs, including program assigned via control-by-event equations, shall be executed by the particular point in alarm. Exact programming shall be provided by the Contractor to meet the Owners requirements.
 - f) Activate all fire alarm Notification Appliances in the building, sounding and flashing in synchronization continuously until manually silenced, or until the initiating device and control unit has been reset to normal condition.
 - g) Activate digital alarm communicator.
 - h) Deactivate door hold control relay such that all smoke doors are allowed to close.
 - i) Deactivate control relays allowing HVAC units to stop.



- j) Activate elevator recall sequence if smoke is detected in any elevator lobby or in the elevator equipment room.
- k) Release all doors, which may be secured by “fail secure” methods.
- l) Transmission of all data to any remote annunciation panels.

4. System Response to Trouble Conditions:

- a) The system trouble LED(s) shall flash.
- b) A local piezo-electric signal in the control panel shall sound.
- c) The LCD display shall indicate all information associated with the trouble condition including: the type of device point, the device address and the description of its physical location within the protected premises.
- d) History logging of all information associated with the event, including time and date of occurrence.
- e) Activate digital alarm communicator.
- f) System AC power trouble signal shall not be sent unless maintained for 8 hours (or more).
- g) Provide adjustable time delay for all trouble signals prior to transmission.
- h) Transmission of all data to any remote annunciation panels.
- i) Disable 24 hour resound in FACP program.

5. System Response to Supervisory Conditions (typically associated with sprinkler system monitored type devices only):

- a) The system supervisory LED(s) shall flash.
- b) A local piezo-electric signal in the control panel shall sound.
- c) The LCD display shall indicate all information associated with the supervisory condition including: the type of device point, the device address and the description of its physical location within the protected premises.
- d) History logging of all information associated with the event, including time and date of occurrence.
- e) Activate digital alarm communicator.
- f) Transmission of all data to any remote annunciation panels.



- C. System Features:** The FACP shall be capable of providing the following features:
1. Upload/Download to PC Computer
 2. Charger Rate Control
 3. Drift Compensation
 4. Automatic Day/Night Sensitivity Adjust
 5. Device Blink Control
 6. Pre-alarm Control Panel Indication
 7. NFPA 72 Smoke Detector Sensitivity Test
 8. Walk Test
 9. System and Device Status and History Reports
 10. Periodic Detector Test
 11. Alarm Verification, by device, with tally
 12. Printer and CRT Display Interface
 13. Non-Alarm Module Reporting
 14. Block Acknowledge
 15. Smoke Detector Maintenance Alert - When any smoke detector approaches 80% of its alarm threshold due to gradual contamination.
 16. Control-By-Time and Event
- D. Operator's Terminal:** Provide an operator's terminal, which allows the following minimum functions. In addition, the operator's terminal shall support any other functions required for system control and/or operation:
1. Acknowledge (ACK/STEP) Switch
 2. Signal Silence Switch
 3. System Reset Switch
 4. System Test Switch
 5. Lamp Test Switch
- E. Remote Transmissions:** On board communicators shall be acceptable on the condition of total compatibility with the owners receiving station equipment, provides dual line capability one of which is capable of communications via LAN.
- F. Power Supply(ies):** The FACP power supply(ies) shall operate on 120 VAC, 60 Hz and shall be adequate to power all equipment and functions in full alarm continuously utilizing only 80% of the rated output. Signal circuits shall each be loaded no more than 80% of their rated



capacity. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line- to-ground, without damage.

- G. Emergency Power Supply:** Components include batteries, charger, and automatic transfer circuitry.
1. **Batteries:** Shall be completely maintenance free, sealed lead acid type. Battery nominal life expectancy of 3 years, minimum, is required. Battery voltage and capacity shall be determined by the measured load calculations required by the FACP and related connected equipment.
 2. **Battery Charger:** Solid state, fully automatic, variable-charging-rate type. Provide capacity for 150% of the connected system load while maintaining batteries at full charge. If batteries are fully discharged, the charger charges them completely within four hours. Charger output is supervised as part of system power supply supervision.
 3. **Integral Automatic Transfer Switch:** Transfers the load to the battery without loss of signals or status indications when normal power fails.
- H. Serial Interface Board:** The FACP shall contain a serial interface board to provide an EIA-232 interface between the fire alarm control panel and the UL Listed Electronic Data Processing (EDP) peripherals. The serial interface board shall allow the use of multiple printers, CRT monitors, and other peripherals connected to the EIA-232 ports. In addition, the serial interface board shall provide one EIA-485 port for the serial connection to annunciation and control subsystem components; LED's shall be provided to show operational status. All serial interface input/outputs shall be optically isolated to provide protection from surges and/or earth grounds.
- I. Network Interface Capability:** Provide interface equipment that would allow Ethernet connections if available from manufacturer. Arrangements for at least two data drops at the panel should be made.
- J. Enclosures:** The FACP shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be hinged on either the right or left side (field selectable). Where multiple enclosures are required in the same area, the cabinets shall all be the same size and color. Cabinet doors must be electrically bonded to enclosure it serves.
- K. General Requirements:**
1. A copy of the final building floor plans with all device locations and assigned system addresses shall be permanently mounted at the location of the main FACP. All AV circuit EOL's, riser cabinets, and Isolation Modules shall also be included on these drawings. A separate sheet shall be provided for each floor. Sheets shall be laminated. Provide legend for symbols.



2. All external modules required to be mounted at the main FACP location shall be housed in a UL listed cabinet suitable for surface or semi flush mounting. Cabinet and front shall be corrosion protected, given a rust resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock. For convenience, the door may be hinged on either the right or left side (field selectable). Where multiple enclosures are required in the same area, the cabinets shall all be the same size and color. Cabinet doors must be electrically bonded to enclosure it serves.
3. The system shall be new and furnished with a warranty (parts & labor) of at least one year from the date of final inspection and acceptance by the Owner. Equipment, initiating devices, and alarm appliances shall be arranged as described in the Drawings; annunciator zones shall be configured as described in the Drawings.
4. All system components shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (*e.g.*, detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load. Adhesives are not permitted to mount fire alarm system components to building surfaces or structure.
5. Loops shall be confined to one floor of coverage and shall not include any devices/modules located or serving other floor areas of coverage. Loop 1 shall be assigned to the lowest elevation level of the building. Loop numbers shall increment with elevation levels of the building floors. Device numbering starts the loop with address 001 and increments sequentially accordingly as electrically connected in the circuit to the return of the loop.

Note: With the written prior approval of UNC Life Safety Systems, multistory buildings with small footprints may be allowed more than one floor per loop.

6. The FACP must have an Alarm Silence switch, and be equipped with the Subsequent Alarm (alarm resound) feature. Any remote annunciators or graphic displays located away from the alarm area must also include an audible signal with alarm resound feature and must be silence- able from the main panel.
7. A supervised programmable "Hot Key" for defeating or bypassing all AV circuits, including sounder base units, must be provided in the FACP. The switch must indicate "Normal" or "Off Normal" position.
8. If the system design includes any type of door control features, a supervised programmable "Hot Key" for defeating or bypassing all door hold open circuits and fire shutter doors or smoke curtains must be provided in the FACP. The switch must indicate "Normal" or "Off Normal" position.
9. If the system design includes any elevator controlling equipment, a supervised programmable "Hot Key" for defeating or bypassing all elevator capture and shunt trip features must be provided in the FACP. The switch must indicate "Normal" or "Off



Normal" position.

10. If the system design includes AHU shutdown or smoke removal startup, silencing the alarm (without resetting) must not reverse them. A supervised programmable "Hot Key" for all AHU Shutdown Defeat modules must be provided in the FACP. The switch must indicate "Normal" or "Off Normal" position. In addition, provide supervised Hand-Off-Auto switch(es) at the FACP for any building smoke control equipment (pressurization, smoke purge or exhaust fans).
11. The coverage of each fire alarm loop as described in the Drawings shall be indicated on the FACP and any remote annunciator. This may be accomplished by engraved labels, framed directories, and/or graphic displays. Label tape or handwritten labels are not acceptable.
12. System shall provide printer data connection.

L. Input Power Requirements:

1. All fire alarm equipment 120 VAC supply power shall be fed from the facility "Emergency Power" circuit if available. Systems are to be provided with a separate and independent source of emergency power. Switching to emergency power during alarm shall not cause signal drop-out. Batteries must meet the appropriate NFPA capacity requirements, with a 25% safety factor. This requirement is in effect even if generator power is supplied to the Fire Alarm Control Panel.
 - a) Provide an engraved label in the FACP identifying its 120 VAC power source. This label shall include panel board location, identification and circuit number.
 - b) The AC power source shall be protected with surge arrester(s) such as the DITEK DTK-120SRD. Surge arresters shall have trouble contacts that can be monitored by the FACP.
 1. Provide Fire Alarm Monitor Module to supervise trouble contacts
2. Provide 120V receptacles for printer use at the main panel. Provide printer data connection at the main panel.

M. Wiring:

1. Style 6 Circuits Required: Systems with one or more addressable sub-panels that (1) have an integral addressable loop controller, or (2) monitor multiple conventional initiation zones, shall comply with the NFPA 72 requirements for Style 6 circuits.
2. All wiring shall be color coded in accordance with the following scheme, which shall be maintained throughout the system, without color change in any wire run:

Addressable Devices

Approved Manufacture Data



Signal Line Circuit cable	Red jacket with Red(+)/Black(-)
Alarm Indicating Appliance Circuits	Blue (+)/Black (-)
<u>Conventional Type Devices or Circuits connected directly to the FACP or to Monitored or Controlled Addressable Devices</u>	
Initiating Circuits, General*	Red (+)/White (-)
Initiating Circuits, Smoke Detectors Only*	Violet (+)/Gray (-)
AHU Shutdown Circuits	Yellow (+)/Brown (-)
Door Control Circuits	Orange
Elevator Capture Circuits	Brown

3. All wiring and cable must be in EMT, 3/4" minimum diameter, unless indicated otherwise on the Drawings or elsewhere in the Specifications. All fire alarm system raceway, couplings, and connectors must meet the performance and installation requirements of Section 16000 "RACEWAYS". Couplings shall be steel compression type and connectors shall be steel compression type with insulated throats.
4. All wiring shall be checked for grounds, opens, and shorts, prior to termination at panels and installation of detector heads. The minimum resistance to ground or between any two conductors shall be ten megohms (10 MW), as verified with a megger. Provide advance notice to the A/E of these tests.

3.2 RADIO ALARM TRANSMITTERS (RAT)

- A. **Minimum Requirements:** Provide a Radio Alarm Transmitter (RAT) which is compliant with NFPA 72 Chapter 26.6 for One Way Radio Systems and fully compatible with the Owner's Proprietary alarm receiving equipment or the listed central station as indicated on the Drawings. The RAT must be capable of interfacing with the FACP, and shall be listed for UL 864 Standard for Control Units and Accessories for Fire Alarm Systems and UL 681 Standard for Installation and Classification of Burglar and Holdup Alarm Systems.. The following signals, in order of precedence shall be reported as applicable:

1. Fire
2. Trouble
3. Water-flow
4. Supervisory

1. The DACT shall be capable of and equipped with:



- a) 8-channel minimum,
- b) Backup batteries with an automatic battery charging circuit,
- c) Capable of performing a self test every 6 hours and generating a 6 hour communication test report to the receiving station equipment,
- d) Any failure shall initiate a trouble condition, The "Trouble" signal for AC power loss must not be sent unless maintained for 1 hour or more to avoid nuisance transmissions due to momentary 120 VAC power outages or alarm verification cycles,
- e) Radio Mesh Technology,
- f) Any off-normal condition shall be reported to the RAT for transmission,

***Contact UNC Life Safety for recommended equipment that is compatible with the Owner's Proprietary Alarm Receiving System.**

2. Any deviations from the RAT requirements above must be approved in writing by the UNC Life Safety Supervisor and UNC Life Safety Manager.

3.3 AUXILIARY POWER SUPPLY PANELS (APS)

- A. **Auxiliary Power Supply(ies) - General:** Typical applications for usage of APS panels include but are not limited to: notification appliance circuits (NAC), door holders, control relays, and sounder base power extenders.
- B. **APS - Minimum Requirements:** All APS(s) shall operate on 120 VAC, 60 Hz and shall have a continuous rating adequate to power all equipment and functions in full alarm continuously utilizing no more than 80% of the total rated ampere output capacity. All modules and drivers must be able to withstand prolonged short circuits in the field wiring, either line-to-line or line-to-ground, without damage. All APS's shall be capable of providing the following general requirements, features, and functions when utilized as an integral part of the system:
 1. Each APS utilized in the system shall be supervised **individually** by the FACP. This may be accomplished by:
 - a) On board means of setting the FACP assigned address.
 - b) Utilization of a system addressable monitor type module.
 2. Each APS must capable of supervising all input/output circuitry with on board LED's for specific fault indications. On board supervision includes:
 - a) AC power failure,
 - b) Battery fault,
 - c) Ground fault,



- d) Individual output circuit faults,
 - e) And any auxiliary power output circuits.
3. Shall provide multiple regulated and conditioned +24VDC output circuits.
 4. Shall provide at least (1) one +24VDC auxiliary type output.
 5. Shall be capable of being externally triggered or initiated by the FACP, via an addressable control module, for all required output activations.
 6. Shall provide at least (1) Form "C" dry contact or other on board form of dry contact output that will change states during any fault condition detected, for connection to (1) one addressable monitoring device for individual APS, FACP supervision.
 7. Output circuits shall have the capability of being selectively disabled, via on board switch configurations, during any AC power failures.
- C. **Enclosures:** The APS shall be housed in a UL listed cabinet suitable for surface or semi-flush mounting. Cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The door shall provide a key lock. For convenience, the door may be hinged on either the right or left side (field selectable). Where multiple enclosures are required in the same area, the cabinets shall all be the same size and color. Cabinet doors must be electrically bonded to enclosure it serves.

3.4 ANNUNCIATION DEVICES

- A. **Alarm Notification Appliances - General:** Both audible and visible alarm signals shall be provided. Visible signals must be the strobe (flash discharge) type, with white or clear lens.
1. All and each AV circuits shall have a supervised means to individually bypass.
 2. All NAC devices shall have circuit and device designation identification labels.
 3. In ADA designated locations, where placement of additional specialized AV devices are required, those device shall follow the action of the roomsounder base.
- B. **Audible (Horns):** Shall be located as shown on the Drawings; sounders located outdoors or indoor locations subject to moisture, shall be listed for use in wet locations. Electric sounders shall have the following specifications:
1. **Voltage:** Horns shall operate on 24 VDC nominal.
 2. **Programming:** Horns shall be field selectable without the use of special tools, to provide slow whoop, continuous, three pulse temporal or interrupted tones. Evacuation signal shall be the ANSI 53.41 three-pulse temporal pattern. Animal



quarters and patient areas must be served by chimes. Animal quarters shall have means to bypass chimes with supervised override switch to facilitate testing of system.

3. **Mounting:** Ceiling mounted devices are not permitted without specific location approvals by the owner.
- C. **Visual (Strobes):** Strobes shall be located as shown on the Drawings. Strobes indicated for use exterior to the building or indoor locations subject to moisture, shall be mounted at the indicated elevation and listed for use in wet locations.
1. **Voltage:** Strobe lights shall operate on 24 VDC nominal.
 2. **Mounting:** Ceiling mounted devices are not permitted without specific location approvals by the owner.
- D. **Audible/Visual Combination Devices:** Shall be located as shown on the Drawings and shall comply with all applicable requirements for both Audible and Visual.
- E. **Sounder Bases:** Where indicated on the Drawings, provide bases with a built-in (local) sounder rated at 85dB minimum. Configure sounder bases such that sounders are activated under conditions as described or otherwise indicated on the Drawings. All areas that require the installation of Sounder Base Units shall be configured to function as follows:
1. **Voltage:** The sounder base power shall be supervised by the FACP.
 2. **Programming:** All areas that require the installation of Sounder Base Unit Devices shall be programmed to perform the following sequence of operation:
 - a) The sounder base initiating device shall report the 1st alarm condition to the FACP, which in turn shall sound that individual sounder base and any special ADA AV device additionally required in that area ONLY and be silence-able from the FACP.
 - b) The 1st alarm received by the FACP shall initiate the DACT.
 - c) All sounder bases shall sound on any general alarm condition initiated by any common area initiating device including: smoke detectors, thermal (heat) detectors, manual stations, water-flow, duct detectors, or by a 2nd or subsequent alarm from any other sounder base initiating device.
 - d) Individual sounder bases must and be capable of alarm resound.
 - e) The initiating device connected to the sounder base shall be supervised by the FACP.
- F. **Bells:** Shall be 10" diameter vibrating type located as shown on the Drawings; bells located outdoors shall be listed for use in wet locations. Bells shall have the following specifications:
1. **Voltage:** Bells shall operate on 24 VDC nominal.
 2. **Mounting:** Provide flush mounting devices. Bell mounting elevation shall be as described on the Drawings.



- G. Device Remote Annunciation:** Remote annunciator indicator lights (RAIL's) shall be provided in locations where indicated on the Drawings. In addition, RAIL's shall have the following features:
1. RAIL's shall be provided with a key type switch for testing of the annunciated device. Testing device activation shall be accomplished through direct hardwiring to the device NOT through software activation, be program activated, or by any external logic controlling.
 2. **Voltage:** RAIL's shall operate on 24 VDC nominal.
 3. **Mounting:** Device shall be mounted in/to the wall at the same height requirements per NFPA72 as A/V devices. Do not mount in ceiling tiles. Devices shall be located in the nearest corridor or public area and identified by an engraved affixed label.
- H. Alphanumeric Display Annunciators:** Shall be supervised and remotely located as specified on the Drawings.
1. Unit shall have a back-lit LCD display in clear English text.
 2. The LCD annunciator shall display all alarm, trouble, and supervisory conditions in the system and provide duplicate "active" manual switching functions of the FACP, including: Acknowledging, Signal Silencing, System Reset, and Test/Drill.
 3. The annunciator shall be in a lockable cabinet keyed the same as the FACP.
 4. **Connections:** The annunciator shall connect to a two-wire EIA-485 interface. The two-wire connection shall be capable operation at distances of 6,000 feet. Provide interface to fiber optic cable systems and/or repeater units where such are indicated on the Drawings.
 5. **System Capacity:** The system shall allow a minimum of four LCD annunciators. In addition to annunciation functions, each LCD annunciator shall be capable of the following software programmed system functions: Acknowledge, Signal Silence and Reset.
- I. Serially Connected LED Annunciator:** Annunciator shall communicate with the fire alarm control panel *via* an EIA-485 communications loop (four-wire) and shall individually annunciate all zones in the system. System zones shall be as indicated on the Drawings.
1. **Annunciator Indicators:** The annunciator shall provide a red Alarm LED per zone, yellow Trouble LED, and Supervisory Trouble LED per zone. The annunciator shall also have an "ON- LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels. Annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset. All annunciator switches and indicators shall be software programmable.



2. The annunciator shall be in a key lockable cabinet.
- J. LED Graphic Display Panel:** In high rise, complex, or higher square footage facilities, a Graphic Annunciator shall be installed. The University must approve the application and manufacturer of the annunciator.
1. **Annunciator Indicators:** The annunciator shall provide a red Alarm LED per zone, yellow Trouble LED, and Supervisory Trouble LED per zone. The annunciator shall also have an "ON- LINE" LED, local piezo sounder, local acknowledge/lamp test switch, and custom zone/function identification labels. Annunciator switches may be used for System control such as, Global Acknowledge, Global Signal Silence, and Global System Reset. All annunciator switches and indicators shall be software programmable.
 2. Framed under glass graphic shall provide a LED lamp zone matrix/grid displaying each type of initiating device (manual stations, smoke detectors, thermal detectors, elevator lobby detectors, water flow, and supervisory) for each floor contained in the facility. The University must approve the specific floor labeling prior to construction. Floor references may vary per facility (i.e. Ground Floor may be referred to as 1st Floor).
 3. The annunciator shall be in a key lockable cabinet.

3.5 EMERGENCY VOICE/ALARM COMMUNICATIONS

- A.** Where emergency voice communications systems are indicated on the Drawings, provide systems with the following characteristics and features:
1. One-way voice/alarm systems shall be dual channel, permitting the application of an evacuation signal to one or more zones simultaneously with manual voice paging to the other zones. Communication zones shall be capable of being selected in any combination.
 2. Provide duplicate tone generators, pre-amps, and power amplifiers. Failure of any of these shall automatically result in the defective unit being promptly switched off-line and replaced with the backup so that operation as described elsewhere is uninterrupted.
 3. Normal amplifier power shall be a minimum of 125% RMS of the full speaker load, per channel. For purposes of this calculation, use the amplifier's continuous two-tone output rating and assume one watt per speaker. A copy of this calculation shall be included with the submittals.
 4. Communications equipment shall be housed in the FACP and/or in adjacent cabinets(s) of matching appearance and size. All connections between the FACP and the voice communications panel shall be made via cables or harness assemblies, which have been prewired and tested by the system manufacturer.



5. Evacuation signal shall be a "three-pulse" temporal pattern complying with ANSI S3.41-1990.
6. Existing Wiring: Where existing wiring is reused provide a written guarantee that it is acceptable for use with the equipment provided under this contract. Existing wiring may be used only with the owner's written permission.

3.6 INITIATING DEVICES

- A. **Non-Addressable Type Devices – General:** In some cases, the use of non-addressable devices with an addressable monitor type module is acceptable. These areas shall be identified on the Drawing with the acceptable device type for the specific locations. Affected areas may include where:
1. **Temperature Ratings:** Non-addressable devices shall be utilized in unconditioned spaces where temperature and/or humidity ranges can exceed the manufactures recommended ratings of the electronic component circuitry for proper operation of addressable type devices. Acceptable substitutions with these non-addressable type devices may include:
 - a) Thermal Detection Devices
 - b) Manual Stations
 - c) Tamper Switches
 - d) Duct Smoke Detectors
 2. **Harsh Environments:** Areas that is environmentally detrimental to addressable type devices. Acceptable substitutions with these conventional type devices may include:
 - a) Explosion proof devices
 - b) Flame detection devices
 3. **Mounting:** When using non-addressable type devices monitored with an addressable monitor type modules. Mount addressable monitor type modules in nearest conditioned space and indicate its address on the outside of the enclosure by means of a label.
- B. **Addressable Type Devices – General:** Unless otherwise indicated on the Drawings all initiating devices shall be individually addressable. Addressable devices shall comply with the following general requirements:
1. **Address Setting:** Addressable devices shall provide an address setting means inherent within the device. Devices, which are addressed by the FACP are also acceptable.
 2. **Device Identification:** Addressable devices shall store an internal specific identifying



“type” code that the FACP shall use to identify the type of device.

3. **Temperature Ratings:** Addressable devices shall not be utilized in unconditioned spaces where temperature and/or humidity ranges can exceed the manufactures recommended ratings of the electronic component circuitry for proper operation.
 4. **Operational Indications:** Addressable devices shall provide powered LED’s. LED’s shall flash under normal conditions, indicating that the device is operational and in regular communication with the FACP. LED’s shall be placed into steady illumination by the FACP to indicate that an alarm or off normal condition has been detected. The flashing mode operation of the detector LED’s shall be optional through the system field program. An output connection shall also be provided in the device base to connect an external/remote LED indication of an alarm or off normal condition in specific required locations.
 5. **Device Mounting:** Unless otherwise specified all devices shall provide the following mounting criteria:
 - a) All detectors shall be ceiling-mount.
 - b) All other addressable devices, remote LED indicators, remote test switches, and isolation modules shall be wall-mount type.
- C. **Addressable Manual Stations (Pull Stations):** Unless otherwise indicated on the Drawings all pull stations shall comply with the following additional requirements:
1. All pull stations shall have a dual-action mechanism requiring two actions to initiate an alarm condition.
 2. All pull stations shall provide a clear visual indication when operated, and shall utilize a key type reset for restoral to normal operation. Pull stations that employ a glass break rod are not acceptable.
 3. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel.
 4. **Construction:** Pull stations shall be constructed of Lexan or other material suitable to the installation environment with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger. Stations shall be suitable for surface mounting or semi flush mounting as shown on the plans.
 5. In facilities that are fully sprinklered the University requires additional manual stations located at all exits from the building and at all exits per floor within the building (including rooms that only have outside entrances with no access into the facility such as outside mechanical, electrical, and sprinkler riser rooms etc.).
- D. **Addressable Smoke Detectors:** Unless otherwise indicated on the Drawings all smoke



detectors shall comply with the following additional requirements:

1. All smoke detector sensitivity shall be set through the FACP and shall be capable of adjustment in the field through the field programming of the system. Sensitivity shall be capable of being automatically adjusted by the FACP program on a time-of-day basis. Devices shall be capable of reporting obscuration levels and maintenance alerts when any smoke/duct detector approaches 80% of its alarm threshold due to gradual contamination.
2. In facilities that are fully sprinklered the University requires additional smoke detection in telecommunication closets, electrical closets, and rooms that contain significant electronic equipment such as computer server rooms and audio and/or video projection rooms.
3. Must be the plug-in type, each having a separate base, to facilitate replacement and maintenance. When installed in a room, detectors shall be oriented so their alarm light is visible from the nearest door to the corridor.
 - a) In areas where smoke detector placements are not easily visible a Remote Alarm Indicator Light (RAIL) must be provided, or in areas that will allow, a RED circle shall be painted on the floor directly below the detector with the device system address.
4. Spot type smoke detectors mounted within 12 feet of a walking surface shall have their built-in locking device activated.
5. Unless suitably protected against dust, paint, etc., detectors shall not be installed until the final construction clean-up has been completed. Contaminated detectors must be REPLACED by the Contractor at no additional cost to the Owner.
6. Identification of individual detectors is required. These device numbers, which must also be shown on the shop drawings, shall be permanently affixed to the detector base. Device labels may not be affixed to the device. Identification labels must be printed labels with black lettering on a white background. Handwritten labels or labels made from embossed tape are not acceptable. Device labels shall be legible from floor level. If this is not feasible, a suitable form of identification must be agreed upon by the owner.
7. Smoke detector guards, where indicated on the Drawings shall be Listed for use with the specific model of smoke detector being protected. All smoke detector guards are to have a separate base which must be very securely anchored to wall or ceiling. The cover must be readily removable by the Owner for periodic detector cleaning and servicing but, to prevent unauthorized entry, must be secured to the base by a lock or tamper resistant screws approved by the A/E. Metal guards must be 16 gauge or heavier steel.
8. Devices used for elevator capture are identified on the Drawings by the designation EL adjacent to the detector. Primary and/or alternate recall points are indicated on the drawings. Elevator capture or control signals must come from the FACP as relayed by



control modules. Use of detector auxiliary contacts for elevator capture is not acceptable or permitted.

E. ALARM VERIFICATION FOR SMOKE DETECTORS

1. The fire alarm system shall be equipped with logic method of verifying the presence of smoke.
2. Alarms from other than spot type smoke detectors must not be delayed by Alarm Verification. Alarm Verification is NOT to be applied to linear beam, duct smoke detectors, elevator lobby and machine room detectors, nor to any software configured "cross zoned" detection devices. When programming the system, activate the automatic drift compensation feature for all spot- type smoke detectors. Whether or not to activate the alarm verification feature for such detectors is to be determined by the design engineer/ owner's representative.

NOTE: UNC Life Safety recommends Alarm Verification where applicable to help prevent nuisance alarms.

3. Systems with Alarm Verification must be permanently labeled to indicate that fact.
4. While a verification cycle is in progress, an alarm, which occurs on another zone, must not cause the verification cycle under way to be restarted or extended. It may have the same effect on the system as a verified alarm.
5. The equipment must be Listed for Alarm Verification purposes. It must either be installed at the factory, or field programmable and tested by the Manufacturer's authorized representative.

F. Addressable Thermal Detectors (Heat): Unless otherwise indicated on the Drawings all addressable heat detectors shall comply with the design criteria of the conditioned protected space.

G. Addressable Duct Smoke Detectors: Unless otherwise indicated on the Drawings all duct smoke detectors shall be the photoelectric type.

1. **General:** The contractor shall mark the direction of airflow on the duct at each duct detector location. Provide duct access doors
 - a) Air duct/plenum detectors must have device remote annunciation. See section 3.3.G above for guidelines pertaining to these specific devices.
 - b) These detectors shall be installed in a manner that provides suitable access for required periodic cleaning and calibration.
2. **Air Sampling Tubes:** The preferred method for providing support is to extend the intake tube through the far side of the duct, seal around the tube where it penetrates the duct wall, and plug the end with a rubber stopper. This facilitates visual inspection, intake tube cleaning, and injection of smoke or equivalent aerosol for testing the detector. Those over 36 inches long must be provided with center support.



3. **Outside Air Intakes, Lab Exhaust and Autoclave Exhaust:** Do not use duct detectors on outside air intakes, lab exhaust snorkels, autoclave exhaust and general DCM exhausts as this can lead to nuisance alarms and maintenance issues from moisture and debris.

H. Air Sampling Detectors:

1. Air Sampling Detectors shall intelligently interface with the FACP.
2. Air Sampling Detectors with multiple sampling ports shall be addressable per port.

3.7 MONITOR AND CONTROL DEVICES

- A. **Addressable Dry Contact Monitor Modules:** Addressable Monitor Modules shall be provided to connect (1) one non-addressable device or to supervise a non-addressable IDC zone (either Style D or Style B) of conventional type alarm initiating devices (any Normally Open [N.O.] dry contact device) to one of the Fire Alarm Control Panel Signaling Line Circuit Loops. Monitor modules shall be installed as required by the system configuration. All required monitor modules shall be shown on the Drawings.

1. **Indication of Operation:** Unless otherwise indicated on the Drawings an LED shall be provided that shall flash under normal conditions, indicating that the Monitor Module is operational and in regular communication with the FACP.
2. **Mounting Requirements:** Shall be mounted at the same height requirement as Notification Appliance devices in a clearly visible location.
3. **Device Labeling:** Monitor Module and device supervised shall be labeled identically.

- B. **Addressable Control Modules:** Addressable Control Modules shall be provided to supervise and control the operation of (1) one conventional Notification Appliance Circuit (NAC) of compatible, 24 VDC powered, polarized Audio/Visual (A/V) Notification Appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay. The control module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. An LED shall be provided that shall flash under normal conditions, indicating that the control module is operational and is in regular communication with the control panel. Control modules shall be rated for the load they control. (Inductive Loads require inductive rated modules.)

1. **Mounting Requirements:** Shall be mounted at the same height requirement as Notification Appliance devices in a clearly visible location.
2. **Configuration:** The control module NAC circuit may be wired for Style Y Class B with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form C) relay. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relay or NAC's may be energized at the same time on the same



pair of wires.

3. **Power Source:** Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply. A/V power sources and connections are not shown on the Drawings.
 4. Supervision required: The connection between individual addressable modules and their contact type initiating device(s) must be supervised.
- C. **Isolator Modules:** Isolator Modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The Isolator Module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop.
1. **Operation:** Isolator Modules shall operate such that if a wire-to-wire short occurs, the Isolator Module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the Isolator Module shall automatically reconnect the isolated section. The Isolator Module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
 2. To minimize the impact of a wiring fault on the system, isolation modules must be provided as follows:
 - a) After each 20 devices/control points on any addressable circuit.
 - b) For each circuit extending outside the building.
 - c) In the FACP, at each end of the loop.
 - d) On loops containing less than the 20 devices place an isolator at each end of the loop and one in the electrical center of the loop.
 3. **Mounting:** The Isolator Module shall be wall mounted at the same height as A/V devices in a clearly viewable area in corridors. It shall provide a single LED that shall flash to indicate that the Isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.
 4. **Labeling:** Label each Isolator Module with loop information.

3.8 MISCELLANEOUS SYSTEM ITEMS

- A. **Door Hold-Open Magnets:** Door hold open magnets shall be furnished with keepers, door chains, and other accessories as required to properly hold open doors as indicated on the Drawings. Holding force of the magnet shall be appropriate for the door to be held open. Door hold open magnets shall operate in a fail-safe manner, *i.e.*, the door shall release in event of a failure of voltage to the device.



1. **Power Supply:** Door hold open magnets shall be configured to operate from a nominal 24 VDC system as supplied by the FACP or other power supply listed for the purpose. All hold open magnet supply sources, whether a part of the FACP or whether derived from a separate power supply, shall be supervised. Door hold open magnets which use step-down transformers, 120 VAC, or local relays are not acceptable. Magnets shall release on a power failure.
2. **Device box support:** Door hold open magnet device boxes shall be securely attached to the building structure by effective means. Boxes attached directly to only one metal stud or boxes supported by means of expansion type fasteners are not acceptable.
3. Wall mounted magnetic door holders and separate heavy-duty closers shall be used, instead of combination door control units. The electromagnets shall be controlled by the building's smoke detection system FACP. Individual smoke detector auxiliary contacts shall not be used to release door holders.

B. Rolling Fire or Smoke Doors: Rolling Fire or Smoke Doors shall be motor operated. No manual reset doors are permitted.

1. **Remote Power Supplies:** Where remote power supplies are required, they shall meet the same requirements as those for the main fire alarm control panel, including the requirements for batteries and supervision.
2. **Keys and Locks:** All panels, terminal cabinets, and pull stations shall be keyed alike. Coordinate key/lock with the Owner's requirements.

C. Building Automatic Door Locking Systems Interface Requirements:

1. Automatic door locks controlled by the system must be either fail-safe magnetic locks or fail-safe electro-mechanical with reverse bevel dead bolts.
2. All lock protected doors must immediately unlock upon fire alarm, loss of AC power, disablement of the fire alarm system (defined as loss of 24 VDC power) or upon manual operation of an unlocked supervised switch at a constantly attended location.

D. Spare Parts Requirements:

1. **Spare Parts:** Provide at least one spare of each type field device installed and the following spare parts with the system, each individually packaged and labeled. For multi-building projects, calculate separately for each building:

Fuses	2 of each size used in system
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Isolation Modules	2% of installed quantity
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Manual Stations	2% of installed quantity
Notification Devices	4% of installed quantity Spot Smoke Detectors,
Bases	6% of installed quantity
Heat Detectors	6% of installed quantity
Monitor/Relay Modules	2% of installed quantity
Air Sampling Detectors	5 years of filters
Duct Smoke Detectors, Bases	6% of installed quantity

2. Increase decimal quantities of spare parts to the next higher whole number. For example if a system has 20 spot-type smoke detectors provide 2 spare detectors with bases.

PART 4 SYSTEM TESTING & CERTIFICATION

4.1 Contractor/Installer Testing and Certification

- A. Upon successful completion of the Pre-final Inspection, per the NCDol checklist, and correction of all deficiencies, the manufacturer's authorized representative shall issue a test report to: the A/E, the Facilities Services Life Safety Shop, and the UNC Health and Safety Officer detailing and certifying the test, including those requirements as specified in this document.

4.2 A/E Testing and Certification

- A. **A/E System Inspection:** In an effort to expedite the inspection process for projects already seriously behind schedule, the A/E can request UNC Construction Management to schedule the Facilities Services Life Safety Shop Owner acceptance commissioning field inspection and test to be performed in conjunction with the A/E inspection. This is not recommended and has proven to produce lengthy punch- lists and numerous re-inspections by the Owner.
- B. Once the A/E has inspected, tested and is satisfied the system is 100% operational, and has met all aspects of the A/E design, the A/E shall notify UNC Construction Management to schedule the Facilities Services Life Safety Shop owner acceptance commissioning inspection and test. At that time the A/E shall also and submit the following:
 - The latest copy of Detector Sensitivity Report.
 - A printout of the current installed site-specific database.
 - Signed copy of the NFPA "Record of Completion" form per NFPA 72.
 - Signed copy of the NCDol checklist.
 - Current copy of as-built drawings with correct room numbers and device system addresses.



Room numbers must be installed.

- Copy of battery calculations.
- Copy of record for the Notification Appliance Circuit voltage measurements taken at the EOL devices during the A/E test. Take readings at the start of the test and every 15 minutes during NAC test. Test shall be 30 minutes minimum. Test shall be conducted with AC power off and under battery power only.

4.3 Owner Testing and Inspection

A. Database and Drawing Inspection: The Facilities Services Life Safety Shop will require all the above and a minimum of 3 days for review of the system databases and drawing review, prior to scheduling any on-site test.

1. Upon completion of the system databases and drawing review any discrepancies will be documented and forwarded to UNC Construction Management requiring action and corrections from the A/E's system installer/programmer. When the required actions and corrections have been addressed and performed a corrected printout of the installed site-specific databases and drawings shall be forwarded to the Life Safety Shop for re-review. After review and satisfaction that the corrections have been made, then and only then, will the Life Safety Shop schedule their field inspection and test. The Life Safety Shop will notify UNC Construction Management of the scheduled date and time.

B. Owner acceptance commissioning field inspection: A 100% fully functional test of all aspects of the system will be conducted. Therefore, it is expected that the system shall be complete in all aspects. Each function and aspect of system will be tested along with each and every initiating device. Also, all other system functions shall be verified, including but not limited to (where applicable): elevator capture features, control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, sprinkler systems, etc. The trades' personnel representing the various aspects must be present. The A/E representative does not have to attend but may attend if so desired. The fire alarm vendor's technician who programmed the system must be present.

NOTE: If at any time, during the owner's acceptance commissioning field inspection and test, it appears that the installation contractor has not performed a prior 100% performance test, the current test will be terminated and rescheduled.

1. Upon completion of the acceptance commissioning field inspection and test, the Facilities Services Life Safety Shop will forward a list of discrepancies in the form of a formal "Punch List" to UNC Construction Management for comment and/or inclusion in the A/E's punch-list of items requiring action and/or corrections from the effected systems contractors/installers. Once the contractors/installers have corrected these items, the A/E shall notify UNC Construction Management and schedule a re-inspection by the Facilities Services Life Safety Shop. When the systems are verified to be satisfactory by the Life Safety Shop, the A/E shall be notified by UNC Construction Management to schedule an inspection and test with the Office of State Construction.



On or before the day of the Office of State Construction the following must be completed and/or provided to the Owner:

- Copy of current databases installed in the system on CD or USB drive (preferred).
- All drawings shall be posted.
- All spare parts and test equipment as described in the specification shall be turned over to the owner.
- All training requirements shall be met or scheduled.
- All required software on CD or USB drive shall be turned over to the owner.
- All certifications.
- A new signed and dated NFPA "Record of Completion" form per NFPA 72, signed by the contractor, the Designer/Engineer of Record and/or the Construction Management Representative.
- The FACP shall be turned on but not reporting to the UNC Central Alarm Receiving System (CARS).

4.4 System Acceptance

A. **Office of State Construction inspection:** The above items must be completed before the Office of State Construction inspection. Upon completion of Office of State Construction inspection any items or discrepancies must be corrected. When this obligation has been met the warranty shall begin on the day the A/E notifies the Office of State Construction and the Facilities Services Life Safety Shop to that effect.

1. Beneficial or partial occupancy acceptations shall require the system contractor/installer to remain responsible for the "live" system. A daytime and after hours contact list shall be provided to the Life Safety Shop which will include the names and phone numbers for three (3) responsible individuals until Final acceptance has been granted.

B. **UNC Central Alarm Receiving System (CARS) Activation:** The Life Safety Shop will activate the FACP account in the UNC Central Alarm Receiving System (CARS). In the event of malfunctions or excessive nuisance alarms, the Contractor must take prompt corrective action. The Owner may require a repeat of the Contractor's 100% system test, or other inspections. Continued improper performance during the warranty period shall be cause to require the Contractor to remove the system and replace it.

C. The contractor shall notify the supervisor of the Facilities Services Life Safety Shop prior to performing any work on the system after the final acceptance by the Office of State Construction.

PART 5 SYSTEM DOCUMENTATION, TRAINING, & MAINTENANCE

5.1 System Documentation

A. The Contractor/Installer shall provide the Owner with the following:



1. A current factory approved certification/ training schedule for the specific system installed.
2. **As-Built Drawings:** Submit: **(1)** Bound full size set **(2)** One 11"x17" set **(3)** Electronic copy in a format compatible with the most recent release of AutoCAD

The As-Built Drawings should include scaled architectural floor plans depicting final device/module and equipment locations with corresponding system addresses, all circuiting, pathways, and terminal cabinet locations **for the full building (or full floor for renovations)**. Include wiring and riser diagrams with actual field measured battery calculations for the main fire alarm panel and all individual circuits of the Notification Appliance Circuit panels (NAC's).

- a) Electrical and Electronic circuit diagrams of all control panels, modules, annunciators, communications panels, riser panels, etc.
3. Three (3) copies of all software required, both for the installed fire alarm system and for any personal computer (PC) necessary to access the fire alarm system for trouble shooting, programming, modifications, monitoring, de-bugging, or similar functions.
 4. Three (3) copies of the complete maintenance, installation, and programming manuals for the installed fire alarm system. If available a CD version is desired and acceptable. Also provide all technical literature on all major parts of the system, including control panels, batteries, detectors, manual stations, alarm indicating appliances, power supplies, and remote alarm transmission means.
 5. Three (3) of each interconnection cables that are required to connect the fire alarm system to a PC.
 6. Three (3) each of any proprietary programmers/software/tools needed to program, maintain and trouble shoot field devices, including but not limited to Air Sampling Detectors.

C. The Equipment Manufacturer's shall provide the Owner: with the following:

1. Agreement to License and/or factory certification system training for the Facilities Service Life Safety Shop technicians to maintain and service the equipment installed under this contract.
2. Direct access and support for the Facilities Service Life Safety Shop technicians from the Manufacturer's or Factory's Technical Services.

5.2 System Training and Maintenance

- A. During the design specification review process, the Design Manager, the Life Safety Supervisor and the Life Safety & Access Controls Manager will jointly review the proposed specifications



to determine if training is required for the proposed life safety system. Training requirements, scheduling, and purchasing of computers will be coordinated by the Life Safety & Access Controls Division directly with the installation equipment Contractor/Installer and the equipment Vendor/Factory. All cost involved with training travel (transportation, accommodations, meals, etc.) will not be assessed to the Contractor/Installer as part of the contract, but will be funded separately by UNC from allocated reserves.

B. The Equipment Manufacturer's shall provide the Contractor/Installer and/or the Owner: with the following:

1. The schedule of available dates when classes are available to obtain License and/or factory certification system training for the Facilities Service Life Safety Shop technicians to maintain and service the equipment installed under this contract.
2. **Training Content:** Factory/Manufacture classes, training and testing shall provide what is necessary to certify and/or authorize attendees to program and service the fire alarm system installed for this project, including system hardware and software. Additionally, the training shall cover the following topics as a minimum:
 - a) Preventative maintenance service techniques and schedules, including historical data trending of alarm and trouble records.
 - b) Overall system concepts, capabilities, and functions. Training shall be in depth, so that the owner shall be able to add or delete devices to the system and to take any device out of service and return any device to service without need for Manufacturers approval.
 - c) Explanation of all control functions, including training to program and operate the system software.
 - d) Manuals, drawings, and technical documentation.
 - e) The actual system software used to support the fire alarm system installed for this project shall be provided on CDs or USB drive (preferred), any required "software keys" and/or peripheral hardware to successfully operate the software on the technicians computers shall be provided to the Owner's technicians upon successful completion of the training.

C. The Contractor/Installer shall provide the Owner: with the following:

1. The contractor shall submit a complete site specific system orientation training schedule including dates, times and location for approval by the owner and engineer. which shall include:
 - a) Preventative maintenance and any special servicing and/or maintenance techniques, including methods and means of troubleshooting and replacement of



all field wiring and devices and, methods and procedures used for troubleshooting the main fire alarm control panel, including field peripheral devices as to programming, bussing systems, internal panel and unit wiring, circuitry and interconnections.



- b) Overall system concepts, capabilities, and functions.
 - c) Explanation of all control functions, input or output.
 - d) Any device and/or equipment locations that are not easily found.
 - e) Any programming peculiarities that is inherent in the system.
2. The Contractor/Installer is responsible for ensuring that the manufacturer's authorized representative shall provide a schedule of the available manufacture certification training for attendance by the Owner's designated employees. The training will include the proper programming procedures, operation of the system, troubleshooting and maintenance aspects, and all required periodic maintenance.
- a) The authorized representative will coordinate training arrangements with the Owner's schedule.
 - b) **Location:** On-site certification training is preferred and UNC will make available classroom space as needed by the manufacturer. If travel is required, the Life Safety & Access Controls Division will determine the personnel required to be trained.
3. The Contractor/Installer is responsible for ensuring the manufacturer provides the Owner with the following:
- a) Licenses and/or certifications to maintain and service the equipment installed under this contract.
 - b) Direct access and support for the University Technicians to the Manufacturers Technical Services.
4. **Equipment:** The Contractor/Installer is responsible for providing a list of all required support equipment necessary to support the fire alarm system installed for this project. This list shall include computers (laptop or desktop), software, connecting cables, accessories and auxiliary equipment necessary to effectively operate the life safety system.
5. **Warranty Information:** Contractor shall provide warranty information to UNC Life Safety Shop Representative and UNC Construction Management Representative.

PART 6 ALTERNATES AND ATTACHMENTS

6.1 ALTERNATES

Alternate E1 - Submit a quote for a maintenance contract to provide all maintenance, test, and



repair described below and/or in accordance with NFPA-72, "Inspection, Testing, and Maintenance". Include also a quote of unscheduled maintenance/repair, including hourly rates including travel cost, for technicians trained on this equipment, and including an "on call" type response time within one (1) hour from time of notification 24-7, 365 days a year. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the warranty. Inspections and testing shall be performed as prescribed below. A preventive maintenance schedule shall be provided by the Contractor that shall describe the protocol for preventive maintenance. The schedule shall include:

- a) Quarterly inspections of any radiant energy fire detectors, supervisory signal devices, and water-flow devices. Functional testing of entire system batteries and battery charging circuits.
- b) Semiannual inspections of entire system batteries and battery charging circuits, transient suppressors, control unit trouble signals, emergency voice / alarm communications equipment, remote annunciators, initiating devices, interface equipment, alarm notification appliances, and the Radio Alarm Transmitter (RAT). Functional testing of entire system batteries and battery charging circuits, radiant energy fire detectors, water- flow devices and valve tamper switches. systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, and water flow switches and all accessories of the fire alarm system.
- c) Annual inspection and functional testing of all control equipment, entire system batteries and battery charging circuits, control unit trouble signals, emergency voice / alarm communications equipment, remote annunciators, initiating devices, interface equipment, special hazard equipment, alarm notification appliances, and the Radio Alarm Transmitter (RAT).



Attachment A:



Life Safety System Transfer of Responsibility

BUILDING NAME

EFFECTIVE DATE

The current status of the Life Safety System that serves this facility is in the following condition:

The following parties have acknowledged the condition and status of the Life Safety System in this facility and have accepted the transfer of responsibility of this system in its present condition with the understanding that the system will be returned to the University in the same or better condition. Programming changes must be made to the main systems database to support ongoing building construction and/or renovations. In buildings where occupancy must continue, the accepting contractor/vendor will be responsible for the main system and all issues that are a result of the constructed and/or renovated areas. Issues that occur outside the constructed and/or renovated areas that are a direct result from the constructed and/or renovated areas are also the responsibility of the accepting contractor/vendor. The University will be the 1st responders, will notify the contractor/vendor when appropriate, and will be responsible for all areas outside the constructed and/or renovated areas. Upon completion both parties will conduct a 100% test of the devices in the constructed and/or renovated areas and if required, will perform a 10% inspection on the rest of the building per NFPA72.

Life Safety Shop Supervisor Releasing System

Date

Vendor/Contractor Accepting System

Date

Life Safety Shop Supervisor Re-Accepting System

Date



**EMERGENCY NOTIFICATION CONTACT LISTING
DAYTIME WORKING HOURS**

Name:

Phone and or Pager #:

1. _____

2. _____

3. _____

NIGHTS, WEEKENDS, AND HOLIDAYS

Name:

Phone and or Pager #:

1. _____

2. _____

3. _____