

DIVISION 28 – ELECTRONIC SAFETY & SECURITY

SECTION 28 31 00 – FIRE DETECTION AND ALARM

PART 1: GENERAL

1.01 Scope of Standard

- A. Codes and Standards: The codes and standards listed below are utilized as a design criterion for “MINIMAL” system coverage of building fire alarm system installation. 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 the University type setting.
- B. Texas State University requires all buildings with monitored fire alarm systems to be programmed for General Alarms and full evacuation.
- C. 100% fire protection coverage provided by the fire alarm system is required in all new non-fire sprinkled buildings.
- D. When remodeling an existing building or space, maintain the existing fire alarm systems in operational condition during the project. A Make Safe on-site meeting shall be scheduled with Technical Services and the contracting team prior to start of demolition and construction to ensure survivability of the existing fire protection system.

1.02 Reference Standards

- A. This is to be used in the development of all fire alarm and signaling system designs for buildings and structures on Texas State University campuses.
- B. This standard shall apply to all fire alarm and signaling system components and equipment installed at Texas State University campuses during new construction, or as part of any improvement project.
- C. The work addressed in this section consists of a fire protection system, which may include, and at least will be coordinated with, all of the following building systems or components:
 - 1. Fire Suppression Systems.
 - 2. HVAC, fire, smoke, and combination fire/smoke dampers.
 - 3. Elevator installations. See the Texas State Elevator Code ASME/ANSI A17.1 and ASME/ANSI A17.3.
 - 4. Emergency power systems.
 - 5. Central Control and Monitoring System.
 - 6. Gas Detection Systems.
 - 7. Mass Notification Systems.

8. Smoke Control Systems.
- D. Referenced Publications: The documents or portions that are listed in this section shall be considered part of the requirements of this document. (Utilize most recent editions)
1. NFPA 1, Uniform Fire Code
 2. NFPA 13, Standard for the Installation of Sprinkler Systems
 3. NFPA 14, Standard for the Installation of Standpipe and Hose Systems
 4. NFPA 17, Standard for Dry Chemical Extinguishing Systems
 5. NFPA 17A, Standard for Wet Chemical Extinguishing Systems
 6. NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection
 7. NFPA 70, National Electrical Code
 8. NFPA 72, National Fire Alarm and Signaling Code 2016ed
 9. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems
 10. NFPA 92, Standard for Smoke-Control Systems
 11. NFPA 101, Life Safety Code
 12. NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems
 13. NFPA 5000, Building Construction and Safety Code
 14. IBC-International Building Code
 15. IFC-International Fire Code
 16. UL Standard 268, Smoke Detectors for Fire Protective Signaling Systems
 17. UL Standard 268A, Smoke Detectors for Duct Application
 18. UL Standard 346, Water flow Indicators for Fire Protective Signaling Systems
 19. UL Standard 521, Heat Detectors for Fire Protective Signaling Systems
 20. UL Standard 864, Control Units for Fire Protective Signaling Systems
 21. UL Standard 1424, Cables for Power—Limited Fire Protective Signaling Systems
 22. UL Standard 1480, Speakers for Fire Protective Signaling Systems
 23. UL Standard 1481, Power Supplies for Fire Protective Signaling Systems
 24. UL Standard 1711, Amplifiers for Fire Protective Signaling Systems
 25. UL Standard 1971, Signaling Devices for the Hearing Impaired

26. UL Standard 2572, Control and Communication Units for Mass Notification Systems
27. ADA-Americans with Disabilities Act
28. TAS-Texas Accessibility Standards
29. American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI)
30. ANSI A17.1, Elevator Code, latest edition
31. ANSI A17.3, Elevator Code for Existing Elevators, latest edition
32. ANSI A117.1, Accessibility Code, latest edition

1.03 General Conditions and Special Conditions:

- A. The Contractor shall furnish all equipment, materials, tools, labor, engineering, drawings, etc. Necessary for a complete fire alarm system, with said system Being made ready for operation in accordance with the requirements of the authority having jurisdiction (AHJ), as follows.
- B. The purpose of the contract documents is to convey to the Contractor the scope of work required, all of which the Contractor is responsible to furnish, install, adjust, and make operable.
- C. The omission by the contract documents of any necessary system component(s) as required by the Authority Having Jurisdiction (AHJ) or applicable codes shall not relieve the Contractor of the responsibility for providing such necessity, without additional cost to the Owner.
- D. The Contractor shall visit the site before submitting his bid and shall examine all existing physical conditions, which may be material to the submission of the bid or performance of his work.
- E. No extra payments will be allowed to the Contractor as a result of extra work made necessary by his failure to adequately assess the physical conditions of the job site.
- F. Any case of error, omission, discrepancy, or lack of clarity shall be promptly identified to the Owner and/or Engineer for clarification prior to the bid due date.
- G. A Make Safe Meeting shall be scheduled with Technical Service, and the contracting team prior to any start of demolition and construction in an existing building.

1.04 Performance Guidelines:

- A. Provide labor, materials, and equipment for a complete and functional fire alarm and supervisory signaling system as outlined. The Contractor shall be responsible for compliance with the entire project specifications as well as the following guidelines set by the equipment manufactures and the 28.31.00 standards.
 1. Point addressable multiplex fire alarm control equipment, multiplex transponders, alarm signal initiating devices, notification appliances, annunciators, switches, relays, software and accessories.

2. Monitoring of all fire alarm systems installed on Texas State University campuses shall be monitored by the EST Fireworks campus monitoring system for fire protection. Coordinate with Technical Service to perform this installation on Fireworks and obtaining the IP addresses required for monitoring.
3. When remodeling an existing building or space, maintain the existing fire alarm systems in operational condition during the project. A Make Safe on-site meeting shall be scheduled with Technical Services and the contracting team prior to start of demolition and construction to ensure survivability of the existing fire protection system.
4. Core drilling and fire stopping.
5. Cutting, patching and painting.
6. Detailed shop drawings.
7. Coordination of the work with other trades for this project and coordination with any other Owner projects ongoing at the time of Fire Alarm Contractor's work.
8. On-site project supervision.
9. Permits, fees, and other charges required for the work.
10. Record documents.
11. Operating and maintenance instructions.
12. Training of Owner's personnel.
13. System testing, to include third party acceptance and 100% pre-testing prior to acceptance testing with the designated inspector from the office of Environmental Health, Safety, and Risk Management.
14. Warranty of equipment and labor. Warranty will begin upon Texas State Technical Services receiving warranty letter and acceptance letter.
15. Conducting weekly job progress meetings and issuing weekly written job progress reports to the Project Representative.
16. During the construction, it is the responsibility of the Contractor to assure that there is no disruption of the University's normal functions, such as studying, testing, classes, research or administration.

1.05 System Abbreviations and Definitions:

- A. ADAAG: Americans with Disabilities Act Accessibility Guidelines.
- B. AFF: Above Finished Floor.
- C. AHU: Air-handling unit.
- D. AHJ: Authority Having Jurisdiction Texas State University EHS/RM (512-245-3616)

- E. Approved: Unless otherwise stated, materials, equipment or submittals approved by the Owner, Engineer, or AHJ.
- F. Circuit: Wire path from a group of devices or appliances to a control panel or transponder.
- G. Concealed: Where used in connection with installation of piping or conduit and accessories, shall mean “hidden from sight” as in shafts, furred spaces, in soffits, or above suspended ceilings.
- H. Contractor: The company awarded the prime contract for this work and any of its subcontractors, vendors, suppliers, or fabricators.
- I. CPU: The central computer of a multiplex fire alarm control system.
- J. Engineer: Professional Engineer or NICET III
- K. Exposed: Where used in connection with installation of conduit and accessories, shall mean “visible” or “not concealed”.
- L. FACP: Fire Alarm Control Panel.
- M. FM: Factory Mutual.
- N. Furnish: Supply materials.
- O. HVAC: Heating Ventilating and Air Conditioning.
- P. IDC: Initiating Device Circuit.
- Q. Install: Install materials, mount, and connect equipment or assemblies.
- R. LED: Light Emitting Diode.
- S. Listed: Materials or equipment included in a list published by a nationally recognized laboratory that maintains periodic inspection of production of listed equipment and materials, and whose listing states either that the equipment or material meets nationally recognized standards or has been tested and found suitable for use in a specified manner.
- T. LCD: Liquid Crystal Display.
- U. NFPA: National Fire Protection Association.
- V. NAC: Notification Appliance Circuit.
- W. NICET: National Institute for Certification in Engineering Technologies.
- X. Owner: Texas State University
601 University Drive San Marcos, Texas
78666-4609
- Y. BPS: Booster Power Supply.
- Z. RTP: Remote Transponder Panel.

- AA. SLC: Signaling Line Circuit.
- BB. Style 4: As defined by NFPA 72, 2010 edition.
- CC. Style 7 As defined by NFPA 72, 2010 edition.
- DD. Supervisory: Signal indicating the need of action in connection with the supervision of fire suppression systems or equipment or with the maintenance of related systems.
- EE. Transponder: Single or multiple zone/point data collection panel used within a multiplex system.
- FF. Trouble: Signal initiated by the fire alarm system, indicative of a fault in a monitored circuit or component.
- GG. UL Listed: Materials or equipment listed by Underwriters Laboratories, Inc. (UL) and included in the most recent edition of the UL Fire Protection Equipment Directory.
- HH. Zone: Combination of one or more circuits or devices in a defined building area, i.e. 3 speaker circuits on a floor combined to form a single zone.

1.06 Objectives:

- A. This standard is intended to achieve consistently high levels of fire detection/alarm system performance by:
1. Allowing designers to incorporate required or desired features as early in the design development process as possible.
 2. Assuring all systems are designed to meet all applicable codes, ordinances, laws, and sound engineering practices.
 3. Providing a basis for a general understanding among all parties involved in the design of systems.

1.07 Concepts:

- A. All systems are to be compliant with applicable paragraphs of NFPA 101 "Life Safety Code".
- B. All systems are to be compliant with the requirements of NFPA 72 "National Fire Alarm and Signaling Code".
- C. All systems are to be compliant with approved types, styles, and equipment as approved by Facilities/Tech Services and Environment Health, Safety, and Risk Management.
- D. All systems are to be compliant with the requirements of NFPA 70 "National Electrical Code".

1.08 System Features:

- A. All system product lines shall be comprised of components capable of providing the following features when appropriate and specified by the project documents or the University:
1. General alarm notification. .
 2. Positive alarm sequence.

3. Voice alarm notification. (Texas State University will provide the voice evacuation message to be installed in the fire alarm panel.)
 4. Fireman's communications, with an Annunciator Panel, having remote microphone capability.
 5. Elevator capture/recall.
 6. Elevator power shunt trip.
 7. Smoke control/fan shutdown.
 8. Door release.
 9. Release locks on normally locked egress doors.
 10. Release and monitoring of clean agent and/or pre-action sprinkler systems.
 11. Alarm Verification.
 12. Monitor non-water-based fire suppression systems.
 13. Multiple channel digital voice.
 14. Provisions for Mass Notification signals (future).
- B. Provide audible notification throughout the building in accordance with NFPA 72. Provide an individually silence-able 10 inch, 24 VDC general alarm bell on the building exterior. Provide remote microphone capability.
- C. Visual notification to ADA levels and TAS requirements shall be provided throughout the building.
- D. Smoke detectors shall be provided at all elevator lobbies, elevator equipment rooms and elevator hoist ways to perform capture/recall functions; excepting elevator pits, where heat detectors shall be utilized in place of smoke detectors.
- E. All systems shall be designed to provide manual means of alarm initiation at every exit from every level. Elevators are not to be considered an exit or means of egress.
- F. Duct detectors for damper control shall be located within 5 feet of the damper. Install per IBC methods of coverage.
- G. Weatherproof speaker strobe shall be added outside of all egress points of buildings. EST 757A-WB WEATHER PROOF BOX .
- H. Outside Speaker Appliance Circuits shall be on dedicated circuits so that exterior notification can be isolated / disabled for testing purposes.

1.09 System Operation:

- A. The point addressable fire alarm and supervisory signaling system shall perform the following functions:
1. Continuous monitoring of the status of all fire alarm and supervisory signal initiating devices.

2. Visible point annunciation of all fire alarm point trouble conditions at FACP.
 3. Continuous monitoring of all fire alarm transponders.
 4. Operation of indicated control functions.
 5. Notify the campus fire alarm monitoring system and be associated to the building graphics.
- B. Change in status of any initiating device on the system shall:
1. Activate audible and visible status change indicators and display the system point number, point description, status and message associated with the point.
 2. Permanently record the change in status, time, date, point description and message associated with the point in the historical event memory log.
 3. Notify the campus fire alarm monitoring system and be associated to the building graphics.
- C. Activation of any manual station, smoke detector, heat detector, or other initiating device shall cause the following functions to occur:
1. Manual station operation shall:
 - a. Activate audible and visible status change indicators, display the system point number, point description, and message associated with the point on the system's operator terminal.
 - b. Permanently record the change in status, time, date, point description and message associated with the point in the historical event memory log.
 - c. Activate the audible and visible notification appliances throughout the building.
 - d. Notify the campus fire alarm monitoring system and be associated to the building graphics.
 2. Spot type heat detector or spot smoke detector operation shall:
 - a. Activate audible and visible status change indicators; display the system point number, point description, status and message associated with the point on the system's operator terminal.
 - b. Permanently record the change in status, time, date, point description and message associated with the point in the historical event memory log.
 - c. Activate the audible and visible notification appliances throughout the building.
 - d. Notify the campus fire alarm monitoring system and be associated to the building graphics.

- a. Activate audible and visible status change indicators and display the system point number, point description, status and message associated with the point on the system's operator terminal. Duct detector shall report a supervisory and shut down its associated unit.
 - b. Permanently record the change in status, time, date, point description and message associated with the point in the historical event memory log as a supervisory.
 - c. Shut down the fan unit associated with the duct detector or activate the appropriate smoke exhaust function.
 - d. Notify the campus fire alarm monitoring system and be associated to the building graphics.
4. Elevator lobby or elevator machine room smoke or heat detector operation shall:
- a. Activate audible and visual status change indicators and display the system point number, point description, and message associated with the point on the system's operator terminal.
 - b. Permanently record the change in status, time, date, point description and message associated with the point in the historical event memory log.
 - c. Immediately recall the affected elevators to the lobby level. If the alarm is on this level, recall the elevators to the alternate level. When appropriate with the sequence of operation, heat detectors in the elevator machine room and/or elevator hoist way shall shunt the elevator. All machine room detectors and hoist way detectors shall activate a flashing fire hat in the elevator cab.
 - d. Activate the audible and visible notification appliances throughout the building.
 - e. Activate the campus fire alarm monitoring system.
 - f. Upon alarm silence activation, audible and visible notification appliances in the affected area shall be silenced and shut off.
 - g. Notify the campus fire alarm monitoring system and be associated to the building graphics.
- D. Removal of any device, wiring disarrangement, or system component failure shall display on the fire alarm system operator's terminal, the change of status, time, date, point description and the message associated with the point.

1.10 Applicable Standards:

The following standards and guides (of the issue indicated) are hereby made a part of this work by reference thereto:

- A. National Fire Protection Association (NFPA):
 1. NFPA 1, Uniform Fire Code

2. NFPA 13, Standard for Installation of Sprinkler Systems
 3. NFPA 14, Standard for Installation of Standpipe and Hose Systems
 4. NFPA 70 - National Electrical Code, latest edition.
 5. NFPA 72 - National Fire Alarm Code, latest edition.
 6. NFPA 90A - Air Conditioning and Ventilating Systems, latest edition.
 7. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
 8. NFPA 101 – Life Safety Code, latest edition.
 9. NFPA 5000, Building Construction and Safety Code
 10. IBC- International Building Code
 11. IFC- International Fire Code
- B. Underwriters Laboratories, Inc. (UL):
1. UL Fire Protection Equipment Directory, latest edition.
 2. UL Standard 268, Smoke Detectors for Fire Protective Signaling Systems, latest edition.
 3. UL Standard 268A, Smoke Detectors for Duct Application, latest edition.
 4. UL Standard 346, Water flow Indicators for Fire Protection Signaling Systems
 5. UL Standard 464, Audible Signal Appliances, latest edition.
 6. UL Standard 521, Heat Detectors for Fire Protective Signaling Systems, latest edition.
 7. UL Standard 864, Control Units for Fire Protective Signaling Systems, latest edition.
 8. UL Standard 1424, Cables for Power-Limited Fire Protective Signaling Systems, latest edition.
 9. UL Standards 1480, Speakers for Fire Protective Signaling Systems
 10. UL Standard 1481, Power Supplies for Fire Protective Signaling Systems, latest edition.
 11. UL 1711, Amplifiers for Fire Protective Signaling Systems
 12. UL Standard 1971, Signaling Devices for the Hearing Impaired, latest edition.
- C. Americans with Disabilities Act Accessibility Guidelines (ADAAG), latest edition.
- D. TAS- Texas Accessibility Standards.

E. American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI):

1. ANSI A17.1, and Elevator Code, latest edition.

ANSI A17.3, Elevator Code for Existing Elevators, latest edition.

1.11 Submittals:

A. Prior to installation, the following documents shall be provided to Texas State University for reference and/ or approval:

1. Shop Drawings: Shall be prepared using latest AutoCAD. Shop drawings shall be drawn to scale: $\frac{1}{8}'' = 1'-0''$ for floor plans and $\frac{1}{4}'' = 1'-0''$ for details. Drawings shall not be reproduced or copied in contractor's preparation of shop drawings. Include manufacture's name, model numbers, ratings, power requirements, equipment layout, conduits, device arrangement, and complete point to point wiring diagrams along with other required information including but not limited to:
 - a. General Drawing Notes.
 - b. Complete panel layout showing location of all modules, power supplies and batteries.
 - c. Complete panel layout showing all field terminations.
 - d. Main panel elevations.
 - e. Complete system riser diagrams.
 - f. Electrical back box requirements.
 - g. Control Equipment Schedules.
 - h. Panel Schematics showing all connections, between modules within the panels, to all modules from field wiring with zones identified.
 - i. Scale floor plans with layout of all devices with point numbers for initiating and notification devices, wiring connections, zones, wire size, and routing.
 - j. Detailed Legend
 - k. Fire Safety and related symbols shown on drawings and diagrams shall comply with NFPA 170.
 - l. Detailed Input/ Output Matrix.
 - m. The contractor shall provide a signed "fire alarm and emergency communication system inspection and testing form for each system, consisting of completed copies of the appropriate pages from NFPA 72, at the final acceptance test. The fire alarm contractor shall attach the appropriate fire alarm tags to the panel as required by the State of Texas.

- B. Product Data: Provide electrical characteristics, connections' requirements, and compatibility listings showing that components are compatible with each other, including but not limited to:
1. Manufacturer's data sheets with equipment to be used.
 - a. Fire Alarm Control Panel
 - b. Wiring
 - c. Batteries
 - d. Detectors
 - e. Manual Pull Stations
 - f. Audible Signaling Devices
 - g. Visual Signaling Devices
 - h. Control Devices
 - i. Annunciator Panel
 - j. Remote Microphone
 - k. Sounder bases
 - l. MR-101 Relays
 - m. Terminal cabinets
 - n. Communication Modules
 2. Wiring diagrams of all equipment,
 3. Installation instructions for all equipment,
 4. Equipment testing procedures,
 5. Equipment maintenance manuals
 6. Wire data sheets
- C. Software and Database Information:
1. Proposed point numbers,
 2. Complete sequence of operation with input/output matrix for all points
 3. English action messages.
- D. System Calculations:
1. Complete calculations shall be provided which show the electrical load on the following system components:

- a. Each system power supply, including standalone booster supplies.
 - b. Standby Battery Calculations plus a 20 percent de-rating factor.
 - c. Voltage drop calculations for each type of circuit (identify all mathematical formulas, variables, and constants).
 - d. dB loss calculations for speaker circuits.
 - e. Speaker circuit loading and amplifier loading.
 - f. Strobe circuit loading with 20% available capacity on each circuit. CC1-S to extend capability of NACs 1-4 not allowed
 - g. All calculations shall use 10amp power supplies for visual and 24 volt dc power circuits (BPS-10A)
 - h. Calculations for sounder base power shall include all base's being activated simultaneously on each auxiliary control circuit that draws power from any system power supply.
- E. Submittal packages shall be signed by NICET III or signed and sealed by a Professional Engineer (P.E.) registered in the State of Texas.
- F. Prior to start of construction, submit the information outlined in A, B, C, D, and E above to the following:
1. One electronic complete submittal package to the Project Representative for review by the Owner and Engineer.
- G. Costs incurred by the Owner for the Engineer or the Project Representative to review additional submittals resulting from an initial rejection shall be the responsibility of the submitting contractor.
- H. PARTIAL SUBMITTALS ARE NOT ACCEPTABLE.

1.12 Delivery, Storage and Handling of Materials:

- A. The Project Representative will designate an area for storage of all materials. At the end of each working day, all materials shall be returned to the designated area.
- Material, equipment, tools, etc. will not be left outside the storage area without the consent of the Project Representative.
- B. The cost of all material handling, delivery and freight is the Contractor's responsibility. The Owner or his representatives will not be responsible for materials delivered to the site.
- C. Maintain premises free from accumulation of waste materials or rubbish caused by this work. At the completion of the work, remove all surplus materials, tools, etc., and leave the premises clean to the Owner's satisfaction.

1.13 Quality Assurance:

- A. 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 as well as an emergency contact list shall be provided to the owner prior to the start of any construction.
- B. The company specializing in installing the products specified in this section must demonstrate a minimum of five years' experience. The company shall also employ NICET certified personnel in the Sub-field of Fire Alarm Systems, for the engineering and technical installation and supervision of the system. This certification shall be Level III for engineering and Level II for technical installation and supervision. Proof of certification shall be provided, along with a complete list of project personnel. All work shall be performed by skilled technicians, under the supervision and direction of the designated NICET Engineering Technician, all of whom shall be properly trained and qualified for this work.
- C. The installing Fire Alarm Contractor shall hold a current license, issued by the State of Texas Commission on Fire Safety, to design, install, and service fire detection and alarm equipment.
- D. The Fire Alarm Contractor shall maintain a fully staffed branch office including application engineers, drafters and technical service personnel.
- E. All supplied equipment shall be standard products of the manufacturer and regularly stocked within the manufacturer's branch office.
- F. All technical service personnel shall be regularly employed by the fire alarm system contractor.
- G. All electrical installation of the fire alarm system, including wire installation and terminations, shall be performed by electricians in the employ of the Fire Alarm Contractor.
- H. Any subcontractors used to install portions of the system shall be approved by the Project Representative prior to commencement of the installation.
- I. All electrical requirements for system install will be performed by the electrical subcontractor of the fire alarm contractor.

PART 2: PRODUCTS

2.01 Fire Alarm Control Panel (FACP):

- A. Provide a UL listed point addressable fire alarm control system. Acceptable supplier EST or preapproved equivalent.
- B. Products shall be of the latest version. Models acceptable are EST-3 or preapproved equivalent. Obsolete or discontinued models are not acceptable.
 - 1. Acceptable model for Round Rock Campus is EST-3 or preapproved equivalent.
- C. All fire alarm control panels must be intelligent, addressable Central Processing Units (CPU) based and meets the latest edition of UL 864
- D. All FACP's must be capable of providing circuit integrity monitoring for all Signaling Line Circuits at a level of Class A, Style 6, as defined in NFPA 72
- E. All fire alarm initiating devices and notification appliances in finished areas shall be white.
- F. All FACP's must be capable of providing circuit integrity monitoring of Initiating Device Circuits (IDC's) at a level of Class B as defined in NFPA 72.
- G. Manufactured terminal boxes labeled "FIRE ALARM TERMINAL BOX" Space Age TC2 series or equal.
- H. With each installed field device affix a label to indicate the device's full address on its signaling line circuit.
- I. Mark each addressable device circuit cable or wire to designated terminal with permanent marker in all junction boxes, terminal cans, riser cans, ins and outs of SLC devices only, and at the FACP.
- J. All FACPs must provide twenty percent (20%) excess power for all input, and output circuit capacity to allow for future expansion by the owner.
- K. Zone labeling must be textual by alpha-numeric display at the FACP and remote annunciator to allow "first response" by persons not trained in fire alarm technology.
- L. Textual (alpha-numeric) language must be conventional, concise, clear and accurate to facilitate rapid response.
- M. All FACPs must provide a control to silence the Public Alarm to allow for maintenance and testing, and to reduce disruption to include sounder bases, visual notification, and audible notification. Water flow switches to remain non-silencible.
- N. All FACPs must provide a control to override for door holder release, smoke control/fan shutdown feature, sounder base, water flow, strobes, speakers and damper activation to allow for maintenance and testing. Program panel to allow functions to be disabled by floor or by group as required by Texas State University.

- O. All FACP's must be connected to a Primary and Secondary Power source. The secondary power supply must be sized to provide 15 minutes of operation in alarm conditions after 24 hours of system operation in standby power. Where voice evacuation systems are utilized, 15 minutes of alarm shall be provided.
- P. All FACP's must provide a separate digital address for each initiating device to facilitate rapid response and maintenance and testing.
- Q. All FACP's must provide a separate digital address for each individual flow switch and tamper switch.
- R. All programming must be permanent and non-volatile to reduce outage time due to failure.
- S. All FACP's must be listed and approved and the smoke detector sensitivity test level set to reduce maintenance costs.
- T. All FACP's must be capable of providing drift compensation. Drift compensation is considered equal to adjustability at the detector.
- U. All FACP's must be field programmable, using internal or connected components, for all changes, alterations, modifications, additions, deletions and hardware and software upgrades.
- V. Texas State University will provide the voice evacuation message to be installed in the fire alarm panel.
- W. All FACP's shall be capable, using internal or connected components, of generating comprehensive reports for sensitivity, verification counts, address registers.
- X. A fault isolation device shall be provided electrically between each building level and building wing. This device shall be capable of automatically isolating wire-to-wire faults on each SLC to the building level or wing involved. The device shall be powered by the SLC loop. The device shall provide visual indication at the device of a short circuit (isolate) condition. The device shall reset to the normal mode upon elimination of the wire-to-wire short. All fault isolation devices shall be physically located within the terminal box for that floor.
- Y. All nodes to have 120VAC surge protection and dedicated 120vac.

Acceptable models: Eaton model AGPH12005 or preapproved equivalent provided by the fire alarm contractor and installed by the electrical contractor.

Provide an engraved label in the FACP identifying its 120 VAC power source. This label shall include panel board location, identification, and circuit number.

2.02 Point Addressable Equipment:

- A. The FACP shall be wall mounted and installed where shown on the drawings. The FACP shall be equipped with locked enclosures having removable access panels for servicing of electronic components. All controls and displays shall be mounted at heights allowing easy access by operating personnel. The FACP shall include, but not be limited to, the following major components, some of which may be physically separate from the main cabinet:

1. Central processing equipment.
 2. Normal AC power supplies.
 3. Data transmission equipment.
 4. Mass data storage (if required).
 5. Emergency power supplies.
- B. The central processing unit (CPU) shall be a “mini” or “micro” computer, listed in accordance with UL 864. The main memory system shall be adequately sized to provide display, print out and control of 150 percent of the actual alarm and command points as described herein and indicated on the drawings. All basic alarm and control software shall be included and be at the latest edition of SDU. The CPU shall be completely field programmable, and all data entered shall reside in the system memory.
- C. The CPU shall be equipped with a nonvolatile main memory system of EPROM, battery protected RAM, or EEPROM memory system. The mass storage system shall be equipped with all necessary control hardware and software.
- D. Normal operating power for the FACP shall be 120-volt AC supplied from dedicated circuits (of the emergency power panel, if provided). All circuits shall be protected by circuit breakers of proper size. In addition, the CPU shall be provided with an emergency battery standby power system, which shall operate the system for 24 hours in the standby mode and 15 minutes in full alarm condition. Remotely powered Audio/visual alarms must also function in a power outage.

Follow EST Standards for number of FACP's and BPS's on one dedicated 120vac circuit.

- E. The system operating terminal shall be the liquid crystal display type (LCD). The LCD shall include, at a minimum, control function keys, digital display window, programming keys and key-operated lock-out capability. Programmable bypass switch Control Display Module of 12 LEDs and switches. Programmed per owner's instructions.
- F. The time shall be permanently displayed on the LCD and shall always be visible. The LCD shall allow the operator to perform the following minimum tasks:
1. Inquire point status.
 2. Start or stop equipment manually.
 3. Test and reset equipment manually.
 4. Initiate control by event sequences.
 5. Bypass control zones and points during manual system tests.
 6. Push button bypasses shall be installed to bypass all outputs.
 7. Manually request “logs” of system status.
 8. Acknowledge status changes.

9. Silence local alarm sounder.
10. Monitor and control smoke detector sensitivity.

2.03 Expansion Node Panels:

- A. The Node panels shall accommodate all specified alarm input points, supervisory input points, command points and shall allow a 20 percent expansion of connected points. All assemblies within the Node panels shall be modular to allow for expansion and servicing of equipment. All power supplies, standby power, CPU's and terminal strips shall be included to accommodate specified future expansion so that expansion can be accomplished by simple installation of circuit boards and wiring to remote devices.
- B. Batteries for emergency standby power shall be sealed lead-acid or gel cell of enough quantity to provide 24-hour standby with 15 minutes in full alarm. Batteries shall be mounted in a separate vented enclosure.
- C. The Node panels shall accommodate all specified speaker circuits and strobe notification circuits and shall allow a 25 percent expansion of connected points. All assemblies within the Node panels shall be modular to allow for expansion and servicing of equipment. All power supplies, standby power, CPU's, amplifiers and terminal strips shall be included to accommodate specified future expansion so that expansion can be accomplished by simple installation of circuit boards and wiring to remote devices.
- D. Each remote transponder panel shall be capable of degraded mode operation. In this mode, the system shall receive an alarm from any analog or conventional initiating device and activate all indicating appliances served from the panel.
- E. One backup amplifier shall be installed per cabinet of amplifiers. Backup amplifier shall be 3ZA40A.
- F. Remote Strobe Power Supplies shall include:
 1. A minimum of four notification appliance circuits monitoring and control modules. The modules shall be designed to meet Style Y , class B NAC wiring.
 2. Power supply with battery charger and standby batteries. Batteries shall be sized for 24 hours in standby condition and 15 minutes in full alarm condition.
 3. Provision to be supervised and activated by the main fire alarm system.
 4. All remote strobe power supplies shall be BPS 10A's.
 5. All remote power supplies (NAC panels) shall leave 20% of each circuit available for future expansion. CC1-s to extend capability of NACs 1-4 not allowed.
 6. All remote strobe power supplies shall be independently activated by an addressable control module and use that control module for monitoring the power supply.
 7. ALL Remote Booster Power Supplies shall be EST BPS10A or preapproved equivalent.

2.04 Point Addressable System Software:

- A. As part of the initial system installation, provide all executive system software including, but not limited to, the following:
 - 1. Basic alarm processing programs.
 - 2. Control by event programs.
 - 3. System point scanning routines.
 - 4. Password control routines.
 - 5. Emergency file display routines.
 - 6. Smoke detector sensitivity routines.
 - 7. Provide all hardware, software, programming tools, access codes, access keys, documentation, and training necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones, and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power down of the system or loss of system fire protection while modifications are being made.
 - 8. If the system access code is either a hardware key or software key, the Contractor/ Vendor shall provide the proper key to meet the above requirements.
- B. Provide as part of the system all preparation and installation of data files including, but not limited to, the following:
 - 1. Point descriptions.
 - 2. Control by event sequences.
 - 3. Emergency file statements.
 - 4. Print statements.
 - 5. Password installation.
- C. Systems which rely on EPROM shall be factory reprogrammed at no additional cost to the Owner as many times as required until the system is accepted by the Owner.
- D. Point/zone descriptions shall consist of English language statements which adequately define the point or zone. The use of abbreviations shall be limited to commonly used fire alarm system abbreviations.
- E. All system device labels/ descriptions shall follow this standard:

Example Education Building: EDU SMK_RM202

2.05 Alarm Initiating Devices:

A. Manual Pull Stations

1. Provide point addressable manual stations where indicated. The manual stations shall be double-action key reset type, red with white lettering, and shall be mounted in the existing locations unless otherwise noted:
2. Surface mounted manual stations shall mount on a UL listed, red, smooth sided back box provided by the manufacturer. Semi-flush mounted manual stations shall mount on a standard electrical box.
3. Operation of a manual station shall cause its contacts to manually lock-in until manually reset and visibly indicate that the station was activated.
4. Manual stations mounted exposed to the environment shall be in weatherproof enclosures.
5. Manual pull stations shall be EST model SIGA-278 or preapproved equivalent.
6. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacturer specifications.

B. Photoelectric Smoke Detectors

1. Point addressable analog photoelectric type smoke detectors shall be provided in all common spaces, hallways, open study area, open work spaces, labs, group study rooms, conference rooms, storage rooms and closets, telecom/MDF rooms, electrical equipment rooms, and special hazard areas. If building is not sprinkled than 100% smoke/heat coverage is required
2. Smoke detectors shall be provided with integral LEDs to indicate detectors in alarm. The detectors shall operate from the two-wire alarm initiating circuit (SLC) and be listed under UL Standard 268, latest edition.
3. Sounder base installation in ALL residence rooms. These circuits shall have power failure monitoring at the end of the circuit.
4. All residence rooms shall comply with the 520 Hz rule in NFPA 72.
5. All smoke detectors shall be EST model Sigs-PD, Siga-OSD, mounted on Siga-SB4 bases in standard locations.
6. In Dorm room locations Siga-AB4G-LF bases are required,
 - a. All sounder base power circuits shall be wired separately per wing per floor.
7. Photoelectric smoke detectors shall be EST model SIGA-PD or SIGA OSD with SIGA-SB4 bases in standard locations and SIGA-AB4G-LF in all sleeping rooms or preapproved equivalent.
8. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacturer specifications.

C. Duct Mounted Smoke Detectors

1. Point addressable analog photoelectric type duct mounted smoke detectors shall be provided where indicated. The duct detectors shall be provided with integral LEDs to indicate detectors in alarm. The detectors shall operate from the two wire alarm initiating circuit (SLC). The smoke detectors listed under UL Standard 268A, latest edition, shall be provided with approved duct housings mounted on the exterior of the duct, and shall have perforated sampling tubes extending across the width of the duct. Provide an auxiliary DPDT load relay for fan shutdown control where required by the points list.
 2. Each duct detector shall have installed a remote test switch. Test switches shall be EST model SD-TRK or preapproved equivalent.
 3. Duct detectors above ceiling grid shall have a 1" label installed on the grid or at the access to the duct detector White background red letters.
 4. Duct detectors shall be EST model SIGA-SD with a sampling tube to extend the full length of the duct.
 5. PRESSURE DIFFERENTIAL READINGS FOR DUCT DETECTOR SAMPLE AIR FLOW WILL BE LABELED ON THE FRONT OF THE DETECTOR. A 1 -inch label will be placed on cover of duct detector.
 6. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacture specifications.
 7. All duct detectors will be connected using seal tight and plastic seal tight connectors.
 8. The contractor shall mark the direction of airflow on the duct at each duct detector location. Provide duct detector access doors as needed for accessibility.
 9. These detectors shall be installed in a manner that provides suitable access for required periodic cleaning and calibration.
 10. Use SD-PD super duct protective housing on all duct detector, install with hinges down.
- D. Heat Detectors
1. Point addressable heat detectors listed under UL Standard 521, latest edition, shall be provided-in all mechanical rooms, kitchen areas, break rooms and in elevator lobbies in an outdoor environment. The heat detectors shall be rate compensated type or analog type. Intelligent heat detectors shall be EST model SIGA2-HRS with SIGA-SB4 bases or preapproved equivalent.
 2. Conventional rate of rise heat detectors listed under UL Standard 521, latest edition, EST model 302-ET or preapproved equivalent, shall be provided where indicated. Temperature ratings of the heat detectors shall be appropriate for the area protected.
 3. Addressable point monitoring interface modules shall be used to monitor the conventional heat detectors. The interface modules shall provide Style B electrical supervision of monitored devices.

4. Conventional heat detectors listed under UL Standard 521, latest edition, EST model 302-ET or preapproved equivalent shall be installed in all outside elevator lobbies, or specified areas by Technical Services.
 5. Addressable point monitoring interface modules shall be used to monitor the conventional heat detector. The monitor module shall provide Style B electrical supervision of the monitored device.
 6. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacturer specifications.
- E. Project-Beam Detector
1. All projected-beam detectors must operate on the infrared principle. OSID style only
 2. Transmitting and receiving units of projected-beam detectors must be protected from physical damage in active environments.
 3. All projected-beam detectors must have circuits to prevent “false” alarms due to sudden and complete obscuration.
 4. All projected-beam detectors shall be installed in a safe and accessible manner.
 5. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacturer specifications.
- F. Air Sampling Smoke Detection
1. Provide air sampling smoke detection if required by the project.
 2. Locate air sampling smoke detection ports in accordance with NFPA 72 and manufacture’s requirements.
 3. Maintain a maximum transport time of 120 seconds, or the transport time specified by the manufacturer, from the farthest sampling point, whichever is less.
 4. Utilize CPVC piping that is listed for use in air sampling systems. Label piping as required per NFPA 72.
 5. Air sampling system shall be VESDA or preapproved equivalent.
 6. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacturers specifications.
- G. Water Flow Switches
1. Fire detection / alarm systems must be interconnected to the fire alarm sprinkler systems by water flow switches and must be set for a 60 second delay prior to “ALARM”.
 2. Each water flow switch shall be monitored by an individual addressable module on the SLC. Acceptable device type: Siga CT-1, MCT-1, Siga-CT1HT

3. It is the responsibility of the Sprinkler Contractor to locate the water flow switches to assure indication of water flow within the building and at each level of the building.
4. Water flow switches shall be monitored by a SIGA-CT1,, or preapproved equivalent. Contractor shall not use the SIGA-WTM, SIGA-CT2, SIGA-MCT2 or SIGA-HT2 modules.
5. All addressable device/modules will be located indoors and mounted on proper mounting plates per the manufacturer's specifications.

H. Supervisory (Tamper) Switches

1. Connect tamper switches installed on all sprinkler, PIV, or standpipe valves to the fire alarm system to indicate closing or opening of the valves.
2. Each tamper switch shall be monitored by an addressable module on the SLC.
3. It is the responsibility of the Sprinkler Contractor to locate the tamper switches to assure indication of the valve position within the building and at each level.
4. Tamper switches shall be monitored by an individual SIGA-CT1, MCT-1, SIGA-CT1HT. Contractor shall not use the SIGA-WTM module.
 - a. All addressable devices/modules will be located indoors and mounted on proper mounting plates per manufacturer specifications.

I. Smoke Control System

1. Panel Type shall be Kirkland back box and Kirkland display.
2. Smoke control panel shall communicate by means of 3-ANNCPU3
3. Power supply shall be 3-EVPWR
4. LED and switch Drivers shall be 3-EVDVRA
5. Smoke control panel shall be in color and reflect by LED of active points
6. Smoke control panel graphics and display layout shall be approved by Texas State University, Technical Services prior to install.
7. Smoke control panel shall monitor pressure fans for power loss.
8. Smoke control panel shall be in designated fire command room.

2.06 Alarm Notification Appliances:

- A. Fire alarm system audible notification is required to be provided by speakers in all buildings. The fire alarm signal generated must be the distinctive three-pulse temporal pattern described by NFPA and ANSI codes.
- B. Provide audible systems with voice intelligibility measured in accordance with the guidelines in Annex A of IEC 60849, Sound Systems for Emergency Purposes. When tested

in accordance with Annex B, Clause B1, of IEC 60849, the system shall exceed the equivalent of the common intelligible scale (CIS) score of 0.70.

1. Voice Alarm Notification

- a. Provide speakers for annunciation of voice messages. Texas State University will provide the voice evacuation message to be installed in the fire alarm panel.
 - b. Digitized audible evacuation messages shall sound once and shall be preceded by a minimum of two cycles of the three-pulse temporal pattern emergency evacuation signal.
- C. Strobe units, listed to UL Standard 1971, shall be provided where indicated.
- D. Whenever possible, units shall be ceiling mounted. Wall mounted units, if necessary due to installation environment shall be semi-flush type.
- E. Notification Appliances shall operate on 24-volt DC polarized power to allow for supervision. The strobe minimum effective intensity shall be 15 candelas and have a flash rate of 1 to 3 Hertz as defined by UL 1971. All strobes shall be ceiling mounted.
- F. All notification devices shall be white in color and without the word “FIRE” on the device. Switch to blank for Mass Notification.
- G. Strobes may be combined with speakers where shown on the drawing.
- H. All visual notification appliances must be LED compliant with the current requirements of ADA and TAS.
- I. All visual notification devices within a room or adjacent space within field of view must be synchronized as required per NFPA 72.
- J. Ceiling mounted strobes and speaker/strobes shall be used where installation location meet manufactures and NFPA 72 guidelines.
- K. Speakers shall be provided where indicated. Sound pressure level shall be 15 dB above ambient or 5dB over maximum having of over 60 seconds whichever is greater per the latest edition of NFPA 72 throughout the building. 520Hz speakers to be installed in all sleeping rooms.

1. Average Ambient Sound Level According to Location. The following sound levels shall be used for design purposes.

| | |
|------------------------------|-------|
| a. Business occupancies | 55 dB |
| b. Educational occupancies | 45 dB |
| c. Industrial occupancies | 80 dB |
| d. Institutional occupancies | 50 dB |
| e. Mercantile occupancies | 40 dB |
| f. Mechanical rooms | 85 dB |
| g. Places of assembly | 55 dB |
| h. Residential occupancies | 35 dB |
| i. Storage occupancies | 30 dB |

- L. Sounder Base notification shall be used in all dormitory residence rooms.

1. All amplifiers will be ZA40A only.

2.07 Monitoring:

- A. Monitoring of all fire alarm systems installed on Texas State University campuses shall be monitored by the EST Fireworks campus monitoring system for fire protection. This monitoring shall utilize the campus Ethernet IP configuration. All IP addresses needed for this installation will be issued by Technical Services to reside on their VLAN.
- B. Monitoring shall consist of graphics for all-addressable points in the fire alarm system. Point associations shall be completed between the point and the graphics.

2.08 Control Devices:

- A. Provide addressable control module and isolation relays (MR101 style) for all interconnections to other systems for controls. (control module shall be a siga cc1s or mcc1s) or preapproved equivalent 24VDC control voltage for the isolation relays shall come from the fire system 24VDC power and will be monitored for integrity. Control devices as such but not limited to:
 1. HVAC Control - Provide relays/contacts for fan shutdown and smoke control sequence where indicated. The control relays/contacts shall be 24 volts DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty. (MR101 style) or preapproved equivalent
 2. Elevator Controls Provide control relays/contacts for elevator recall where indicated. The control relays/contacts shall be MR101 style or preapproved equivalent, 24volt DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty. (MR101 style) or preapproved equivalent. Technical Services will designate device and equipment layout for this integration due to site specific needs.

3. Security Controls Provide control relays/contacts for security tie in where indicated. The control relays/contacts shall be MR101 style or preapproved equivalent, 24volt DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.
4. Fire Damper Control Provide control relays/contacts for fire dampers where indicated. The control relays/contacts shall be MR101 style or preapproved equivalent, 24volt DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.
 - a. Duct detectors for damper control shall be located within 5 feet of the damper. Install per IBC methods of coverage.
5. Stairwell Fan Control Provide control relays/contacts for stair well pressurization fans where indicated. The control relays/contacts shall be MR101 style or preapproved equivalent, 24volt DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.
6. Smoke Evac Control Provide control relays/contacts for smoke evacuation control where indicated. The control relays/contacts shall be MR101 style, 24volt DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.
7. Automatic Door Control Provide control relays to release Smoke control doors that are normally open electrically. These doors shall close on any "ALARM" condition. All door control will be 24 vdc provided by fire alarm power supply. Releasing will be by a MR101 style relay or preapproved equivalent.
8. 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.
9. Access Control Doors Provide control relays to release normally electrically locked security access doors. These doors shall unlock on any "ALARM". Releasing will be provided by a MR101 style relay or preapproved equivalent.
10. All control devices are to be installed within 3 feet of the controlled power origination or controlled device.

2.09 Bypass Functions

- A. Bypass switches shall be installed at the FACP to bypass the following controlled outputs that pertain to the project:
 1. NACs by Floor
 2. AHU Shut-down
 3. Elevator Recall
 4. Door Release / Fire Curtains

5. Security Override / Access Control
6. Fire smoke Dampers
7. Stairwell Pressurization Fans
8. Smoke Evacuation Control
9. Sounder Bases

2.10 Documentation:

- A. Document Storage shall be provided. Location to be determined by Technical Services project specific. Installation Certificate.
- B. 18"x24' as-built drawings and electronic copy on the electronic storage device.
- C. Copy of the most recent program shall be installed into the storage container USB drive.

Storage cabinet -manufacturer, Space Age Electronics Manufacturer Part#: SSU00685 or preapproved equivalent

PART 3: EXECUTION OF INSTALLATION

3.01 Installation Contractor:

- A. The Fire Alarm System Supplier shall furnish on-the-job supervision for the proper installation of his devices in cooperation with, or as may be required by, other trades. This supervision shall include, but not be limited to, the following:
 1. Provide specific on-site instructions to others on mounting and installation of each type of device by physically observing the mounting of one or more of each type of device, as required, to assure that the installer is properly instructed in the work.
 2. Provide other supervision as required by the trades to properly perform alarm installation work.
 3. Perform a complete test of the system, certifying that all devices have been activated and that the devices and systems perform in accordance with the requirements of these specifications.
 4. Install, test, trouble-shoot and correct all system software provided under these specifications. This includes, but is not limited to, actual keyboard entry, reprogramming required to meet these specifications and any other task associated with the system software. Contractor shall provide 10% testing after every program change.
 5. Provide layout drawings and detailed wiring diagrams to the Authority Having Jurisdiction as required by the Submittal section of these specifications and current NFPA 101 requirements.
- B. The Fire Alarm Contractor shall furnish all material and labor to provide a complete and functional system, which operates in accordance with the requirements of these specifications, Texas State University Construction Standards and Texas State University Technical Standard on the Construction Documents CD or on the Facilities Planning Design and Construction website.

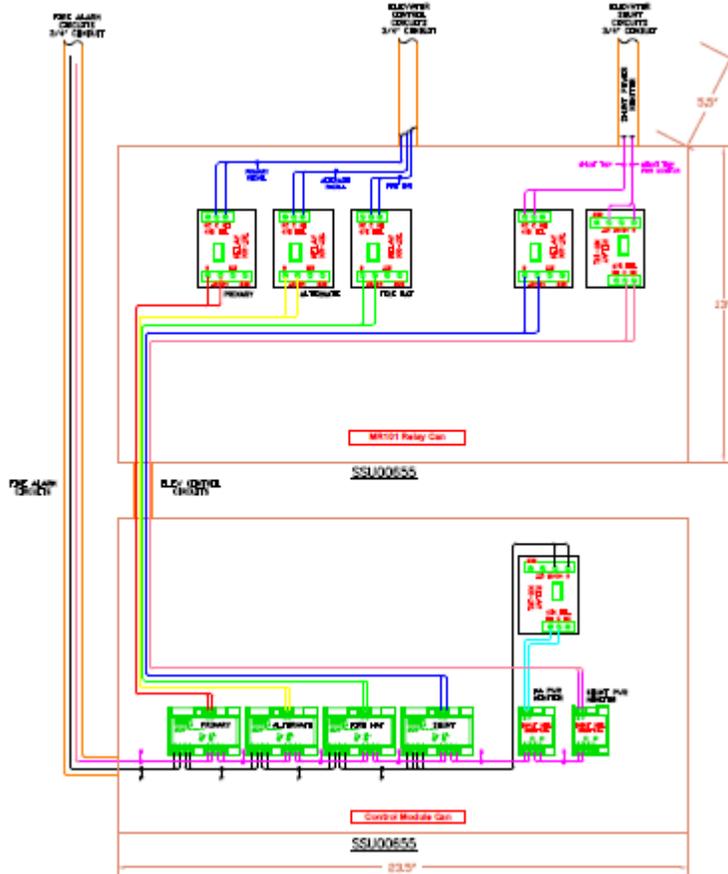
3.02 Installation, Interconnection and Operation

- A. Conduit, raceway and wiring systems as indicated herein.
1. Exposed areas shall have wiring installed in steel conduit with steel connectors conduit or approved raceway, parallel to existing building structure.
 2. Exposed conduit or wire mold will require painting to blend with architecture.
 3. All riser-wiring and wiring between floors shall be installed in conduit.
 4. In any areas where hard ceilings are use, a conduit raceway shall be provided from hallway to device/s in room. (i.e. Initiating and notification devices)
 5. FMC runs shall not exceed six feet.
 6. ½" FMC and associated connectors are acceptable for duct detector and MR-101 relay installations.
 7. Concealed wiring may be plenum cable (see NFPA 70, NEC per application) and bundled and secured in a proper manner.
 8. All wire installed for this project shall be new and be UL listed for use in fire alarm systems.
 9. All plenum wiring will be supported by Panduit J-Pro Cable Support System, J-hooks or D-rings. One-hole cable straps are not acceptable. All J-hooks will be red in color. Model # JP75W-L2. Wire Management, strap or bundle all cables and wires (using Velcro straps) inside equipment enclosures and terminal cabinets, parallel to the enclosure sides.
 10. All plenum wiring will be supported by J-hooks or D-rings. One-hole cable straps are not acceptable.
 11. Ductwork insulation shall not adhere to the face of the housing, leave a 1" barrier all the way around the duct detector housing from the face down the side.
 12. Protective bushings shall be installed in all boxes with fitting or knockouts.
- B. Wiring Requirements
1. Wire: Basic wiring materials and installation must comply with NFPA 70, conductor sizes must be sized in accordance with NFPA 72 and NFPA 70 to provide the minimum required voltage drop
 2. Wire used for 120 VAC power circuits shall be a minimum of 12 AWG standard copper conductors, with THHN insulation.
 - a. Surge protection shall be installed in accordance with NFPA 70 and 72. 120VAC Power Filters shall be installed on all fire alarm panels. (Eaton power line filter ADPV12005) or preapproved equivalent
 3. Wire used for 24 VDC power circuits shall be a minimum of 14 AWG solid copper conductors with outer jacket "Black".

- a. Surge protection shall be installed in accordance with NFPA 70 and 72. (Ditek DTK-2MH-LP36B) or preapproved equivalent.
4. Wire used for strobe circuits shall be a minimum of 14 AWG solid copper conductors with outer jacket “Yellow”.
 - a. Surge protection shall be installed in accordance with NFPA 70 and 72.
5. Wire used for point addressable, signaling circuits, network transmission systems shall be a minimum of 18 AWG solid copper conductor with outer jacket “Red”.
 - a. Surge protection shall be installed in accordance with NFPA 70 and 72.
6. Wire shall be UL listed for use in fire alarm speaker systems or as required by NFPA 70, article 760. All wire shall be solid conductors of copper, minimum 16 AWG with outer jackets “Blue”.
 - a. Surge protection shall be installed in accordance with NFPA 70 and 72.
 - b. All networking cabling shall be at a level of class A between all CPU’s.
7. All SLC riser-wiring shall be monitored at a level of Class A. All floor level circuits shall be at a level of class B.
 - a. Isolation Modules shall be installed per floor and per wing with floors with more than one wing.
 - b. 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. automatic. It shall not be necessary to replace or reset an Isolator Module after its normal operation.
 - c. For each circuit extending outside the building.
 - d. The Isolator Module shall be 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.

Surge protection shall be installed in accordance with NFPA 70 and 72.
8. All Field Initiating Device Circuits (SLC) shall be monitored at a level of Class B.
9. All Notification Appliance Circuits shall be monitored at a level of Class B
 - a. Surge protection shall be installed in accordance with NFPA 70 and 72.
10. Elevator interface wiring must meet NEC 620. Colors for control wiring:
 - a. Main Floor Recall---Red
 - b. Alternate Floor Recall---Blue
 - c. Fire Hat Signal---Yellow

- d. Supply Power---Black
- 11. Elevator Interface Wiring shall be installed in 2 separate SpaceAge SSU00655 terminal cans laid out as follows:



- 12. 120 VAC dedicated circuit primary power from the nearest emergency lighting panel shall be connected to each fire alarm control panel, remote transponder panel and strobe power supply panel.
- 13. Dedicated lockable breakers for the fire alarm system circuits shall be provided for the fire alarm system.
- 14. Dedicated fire alarm system 120 VAC primary power circuit shall not be loaded beyond 80 percent of the circuit’s rated capacity.
- 15. Conduit:
 - a. Conduit shall be EMT type except where otherwise required by local code or these specifications.
 - b. EMT Conduit fills per NFPA 70, NEC with 3/4- inch minimum conduit size.
 - c. All fittings shall be steel compression type.

- d. All conduit fittings and connections shall be painted red.
 - e. All box fittings shall have plastic inserts.
 - f. Seal Tight flexible conduit and plastic connectors shall be used for all duct detector interconnect wiring.
16. Junction boxes covers in the field other than terminal cans shall be Space Age SSU00460 4 Square box covers.
- a. Each box shall be large enough to accommodate required splices with terminal strips and conduit in accordance with the NFPA 70. Splices shall be indicated on final drawings (as builds)and on the cover of the junction box.
17. 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. No exceptions to this rule.
- C. Field Terminal Cabinets (FTC):
- 1. FTC shall be UL listed for use in electrical wiring systems.
 - 2. SPACE AGE ELECTRONICS FIRE ALARM TERMINAL CABINETS WITH A MINIMUM OF 10% SPARE TERMINALS AVAILABLE FOR FUTURE USE. or preapproved equivalent.
 - 3. FTC shall be painted red with label “Fire Alarm Equipment” stenciled on cover.
 - 4. UL listed terminal strips shall be provided for all wiring splices in terminal boxes. All terminals shall be permanently labeled. **Wire nuts are not acceptable.**
 - 5. Use Velcro straps for ALL wire management.
- D. Mounting:
- 1. Manual stations in finished areas shall be mounted flush boxes unless otherwise noted. Stations located in unfinished areas shall be surface mounted on backboxes provided by the station manufacturer. All stations shall be mounted at 48 inches AFF as measured from the pull lever.
 - 2. Strobes and speaker/strobes shall be ceiling mounted unless approved by Technical Service, where wall mounted devices are acceptable, devices shall be mounted such that the entire lens is not less than 80 in and not greater than 96 in. al the finished floor or 6 inches below the ceiling, whichever is lower in cases where ceiling mounted is not an option.
 - 3. Speaker only devices shall be ceiling mounted where applicable, wall mounted at 80 inches AFF or 6 inches below the ceiling up 96”s AFF, whichever is lower in cases where ceiling mounted is not an option.

4. All alarm devices, speakers, and strobes shall be mounted in accordance with the manufacturer's installation instructions and utilize the manufacturer's suggested mounting box.
 5. All surface mounted speaker and strobes boxes shall be smooth sided, without knockouts. Use of standard electrical boxes for surface mounted equipment is prohibited.
 6. Point addressable monitor modules and control modules shall be securely mounted in back-boxes or mounted on rails within a larger enclosure.
 7. All flush and semi-flush devices or panels shall be installed with trim rings or cover plates.
 8. All panels visible to the public or noted on the drawings shall be finished as directed by the Owner.
- E. Repairing and patching surfaces to match existing finish.
- F. X-raying of floor areas prior to core drilling.
- G. All coring and sleeve required.
- H. All fire alarm system data transmission shall be enclosed in 2-hour fire rated construction or other method acceptable to the Authority Having Jurisdiction.
- I. Connecting to Existing Systems
1. A Make Safe Meeting shall be scheduled with Technical Service, and the contracting team prior to any start of demolition and construction for existing building modifications.
 2. Operations of and connections to existing fire alarm systems must be supervised and/or coordinated by Texas State University's Technical Services Shop.
 3. Existing systems must remain operational during modifications or additions to the existing system throughout the duration of the project unless approved by the AHJ.
 4. Where part or all the fire alarm system is required to be demolished, remove the existing fire alarm components only after the new system installation is completed and accepted by the Third-Party Inspection.
 5. Existing equipment that is required to be salvaged for Texas State use shall be stored in a secure area designated by Texas State University.
 6. Smoke Detectors located in a construction area/project area shall not be re-used for the project area.
 7. Existing wiring in the construction space pertaining to the fire alarm system in the construction space shall not be reused. Existing wiring passing through a construction space shall be addressed with Technical Services in the make safe meeting of the project and proper wire management will be implemented to protect the surviving spaces surrounding the construction project.

8. All modifications shall be reflected on the FireWorks Monitoring system graphics for the building being modified.

3.03 Record Drawings Shall Include the Following:

- A. An electronic copy of “as-built” drawings and wiring diagrams in AutoCAD.
- B. Final SDU programming shall be placed on the USB drive inside the document cabinet for the building or the new document cabinet for the project.
- C. The completed test form which complies with NFPA 72, signed, and dated by the fire alarm system manufacturer or his agent.
- D. The NFPA 72 completion certificate, signed by the Authority having Jurisdiction.

All items of this section shall be provided to the owner prior to final payment request.

Part 4: Tests/Field Quality Control and Commissioning:

4.01 General

- A. Upon completion of the fire alarm system, the contractor will perform a complete and comprehensive pre-test of the entire system in accordance with the provisions of NFPA 72. Contractor shall document testing electronically using logging software commonly available and provide to Third Party Company and Texas State University Technical Services .
- B. Third Party Installation Inspection and Testing will be performed, and all deficiencies will be documented and corrected by the fire alarm contractor prior to Texas State University’s acceptance testing being scheduled with Campus Fire Marshal and Technical Services. After the Third-Party Inspection is completed, the fire alarm contractor is to provide Third Party approved testing documentation to Technical Services.
- C. All NFPA 72-16 Inspection and Test forms, ambient and alarm db readings, closed loop readings, end of line resistance readings, HDT readings testing documents and verification of document storage cabinet installation (new installations only) will be delivered to Texas State Technical Services 48 hours prior to acceptance testing schedule request for review and approval. Once approved, approval notification will be sent to the Texas State project management team.
- D. It is required for both the Campus Fire Marshal and Technical Services to approve all installation and performances of the fire alarm system to be final approved and substantially complete.

4.02 Third Party Testing Requirements:

- A. Third Party Testing:
 1. Third Party testing shall be conducted by an independent third party, who shall be independent of the Professional Service Provider or design team companies, reporting to and approved by the Owner. Third Party testing shall include repeating all the tests described in “Fire Alarm Contractors Test” above.

2. Detailed listing of any deficiencies found during these tests shall be forwarded to the Fire Alarm Contractor and Texas State University's office of Campus Fire Marshal and Technical Services and shall serve as a punch list for the system.
 3. All witness testing shall be performed by a State of Texas Fire Alarm Planning Superintendent (NICET Level III for Fire Alarm Systems) or by a Professional Engineer (P.E.) registered in Fire Protection in the State of Texas.
 4. The Campus may at its sole option witness and /or participate in all tests.
 5. If, at any point during their tests, the Third Party finds significant deficiencies they are to report those to the Owner who will then determine an appropriate course of action. If the Owner determines that the number of and/or severity of the deficiencies so justify, they may stop the Third-Party Testing and instruct the Fire Alarm Contractor to correct the deficiencies and re- certify the system. Such retesting shall include Supervision testing of 100% of the Initiating Device Circuits, Notification Appliance Circuits, and Signaling Circuits Devices.
 6. If retesting by the Third Party is required due to significant deficiencies in the work of the Contractor, the Contractor shall reimburse the Owner for the cost of the Third-Party Tests conducted to that point.
- B. Fire Alarm Contractor Deficiencies Repairs:
1. A copy of the formatted check list shall be transmitted to the contractor to serve as Third Party Inspectors punch list for the correction of the noted deficiencies. The fire alarm contractor shall notify the verifying party, in writing, that the deficiencies have been corrected along with a copy of the punch out list with the corrected deficiencies initialed by the fire alarm contractor to indicate the corrections.
 2. The Fire Alarm Contractor shall provide updated certification forms as set forth in Section 3.01 prior to Texas State University acceptance inspection.
- C. Third Party Retest:
1. Each deficient item shall be retested. Retesting of the system shall be conducted in accordance with NFPA 72, Table 14.4.2.2, test Methods. If any software changes are made to the system, updated site-specific software and print out with changes highlighted will be submitted to the verifying party prior to the start of the retest. F. Third Party Certification:
 2. The Third Party shall then retest each portion of the system affected by the corrections. If no additional deficiencies are found, the Third Party shall issue a "Third Party Certification" stating that they have tested the system and certify that it complies with the appropriate sections of NFPA72.

4.03 Texas State University Acceptance Tests/ Inspections Requirements:

A. Texas State University Testing:

1. Upon receipt of all documents from the Fire Alarm Contractor's pre-test and the Third-Party Certification, Texas State University will conduct a 100% functional system test, and any tests it determines to be necessary, consistent with the specified survivability style and performance requirements for the system. If no additional deficiencies are found by the Campus Fire Marshal and Technical Services, the system will be accepted as completed.

It is required for both the Campus Fire Marshal and Technical Services to approve all installation and performances of the fire alarm system to be final approved and substantially complete.

If additional deficiencies are found, the fire alarm contractor will be required to correct the deficiencies, re-test and re-certify the system. Such re-testing shall include Supervision testing 100% of the Initiating Device Circuits, Notification Appliance Circuits, and Signal Line circuits. The Third Party shall then re-test each portion of the system affected by the corrections; if no additional deficiencies are found, the Third Party shall re-issue a "Third Party Certification" as set forth in Section "F" Third Party Certification of this document.

B. Fire Alarm Contractors Required Provisions in addition to the provisions of NFPA 72 and/or the paragraph above, it is the responsibility of the Contractor to provide all the following:

1. In addition to the provisions of NFPA 72 and/or the paragraph above, it is the responsibility of the Contractor to provide all the following:
2. Provide a clean set of red line prints prior to the acceptance testing to Texas State Technical Services for final testing.
3. Provide smoke detector sensitivity report. Smoke detector percent dirty shall not exceed 10% at the time of acceptance.
4. Contractor shall provide a HDT readings report or preapproved equivalent.
5. Provide pressure differential readings for all duct detectors on the red line drawings used for final acceptance.
6. Provide closed loop resistance and EOL resistance readings for speaker, NAC and power circuits on the red line drawings used for final acceptance.
7. Amp draw readings shall be performed on all final installed circuits and recorded on red line drawings prior to acceptance testing to verify submittal calculations as part of acceptance approval.
8. Audible decibel readings for the entire building shall be documented on the red line drawings used for final acceptance testing.

9. The fire alarm contractor shall provide the Texas Insurance Code Fire Alarm System Installation Inspection Form to Texas State University Technical Services Department at the following intervals for formal installation approval at the applicable timeline of the project. Phased projects may require scheduling of multiple inspections at once ,not to hinder project progress.
 - a. At the completion of the device back-box installation.
 - b. At the completion of cable installation.
 - c. At the completion of device installation but prior to activating the fire alarm system. A & B above shall be completed and approved prior to C trim out.
 - d. All formal inspection requests shall comply with the project management communication chain and be submitted to Technical Services 48 hours in advance for the project inspection date.

Part 5: Warranty and Training

5.01 Warranty

- A. The contractor shall provide a two-year written warranty against defects in material and workmanship furnished under this Contract. The costs of such warranty shall be part of the purchase price. **The warranty commences when the system and installation are accepted by the Owner.**
- B. The warranty or any part of the warranty shall not be made void by any required operation and maintenance or annual inspections of the system by Texas State University certified technicians after acceptance during the warranty period.
- C. The warranty shall include all necessary material, travel, labor, and parts to replace defective components or materials at the job site. This Contractor shall commence repair of any “in warranty” defects within 8 hours of notification of such defects.
- D. The warranty shall include all necessary factory and field software required to perform the specified tasks. This item does include software installed prior to system acceptance. Software updates, equipment revisions, releases updated by the manufacture are to be included in this warranty.
- E. The Contractor shall include, as part of the two-year warranty, a test and inspection of the entire fire alarm system 11 months after the date of completion. The Contractor shall provide a written report of any deficiencies and repair any of the deficiencies. The test and report should be conducted by a third party and shall conform to the certification as described in NFPA 72 and as required by the Owner.

5.02 Training:

- A. A. Operator Training

1. Provide training of operating personnel in proper system operation and required user maintenance procedures.
 2. One operating manual containing illustrations, description of each detection device, operation of control panels, switches, pilot lights, etc.
 3. 4-hours of training for operating personnel. These sessions are to cover proper operating and response procedures. These instructions shall be sufficient to enable a previously or untrained person to properly operate the system. This training shall be scheduled by the project management team and include the University first responders from UPD. Contact the UPD Admin Sergeant to schedule the dispatched officers.
- B. Technical Training
1. Provide 40 hours of Offsite Factory Certified Training for a Technical Services technician. This class will be stated in the project design review process for the fire alarm contractor to include in the bid package for their portion of the project.
 2. The Technical Service Staff shall be fully trained and be given the capability by the product Vendor and Installation Contractor to modify, to program, to fully repair, to service, and to maintain the system before and after the warranty period.
 - a. Such training shall consist of one Technical Services Staff to be factory trained and certified to perform any programming and maintenance or class of choice pertaining to the system outlined in these standards.
 - b. Factory training shall include all travel, per diem, housing, etc.

**Texas State University Life Safety System
Transfer of Responsibility Form**

BUILDING NAME: _____

EFFECTIVE DATE: _____

Texas State University Project Manager: _____

The 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 and liability 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.:

Technical Services Supervisor Releasing System Date:

Vendor/Contractor Accepting System Date:

Technical Services Supervisor Re-Accepting System Date:

CONTRACTOR NOTIFICATION CONTACT LISTS:
(Responsible respondent for Daytime and After hours calls)

DAYTIME WORKING HOURS

Name: Phone #:

- 1. _____
- 2. _____
- 3. _____

NIGHTS, WEEKENDS, AND HOLIDAYS

- Name: Phone #:** 1. _____
2. _____
3. _____

END OF SECTION 28 31 00