



TEXAS
Health and Human Services

Attachment H-2

Project Specifications

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SECTION 01 1101

UNIT PRICES

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes:
 - 1. Related sections.
 - 2. Unit prices.

1.02 RELATED SECTIONS

- A. Uniform General Conditions and Supplementary General Conditions.
- B. 01 1100 – Summary of Work.
- C. 01 1102 – Infection Control Plan.
- D. 28 3100 – Fire Alarm System.

1.03 UNIT PRICES

- A. Provide unit prices for the items listed. In the event that additional work or material is authorized from what is shown in the contract documents, the unit prices will be used to adjust the contract value. In addition, the unit prices will be used to adjust the contract value when work or material is authorized to be subtracted from what is shown in the contract documents. The unit prices shall be submitted by the Contractor as part of the bid procedure and shall be guaranteed to apply for the duration of the project.
- B. The unit prices shall include all costs associated with material, labor, overhead, profit, miscellaneous devices, appurtenances, additional conduit, conductors, power supply, batteries, and programming.
- C. Provide unit prices for the following items:
 - 1. Addressable spot type smoke detector.
 - 2. Addressable spot type heat detector.
 - 3. Addressable duct smoke detector with 10-ft sampling tube and remote test station.
 - 4. Addressable monitor module.
 - 5. Addressable control relay module.
 - 6. Addressable manual pull station.
 - 7. Ceiling-mounted audible notification appliance.
 - 8. Ceiling-mounted audible/visual notification appliance with multiple candela settings.
 - 9. Ceiling-mounted visual notification appliance with multiple candela settings.
 - 10. Re-entrant wall-mounted audible/visual notification appliance.



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11. Weatherproof wall-mounted audible/visual notification appliance with multiple candela settings.
12. Weatherproof exterior bell.
13. Notification appliance power supply panel.
14. Fire Alarm Control Unit (FACU)
15. Fire Alarm Node
16. Fire Alarm Transponder
17. Remote Annunciator
18. Network Display Unit (NDU)
19. DACT
20. Fire alarm control unit.
21. Isolation module.
22. Control Module
23. Monitor Module
24. Surge protection
25. Synchronization module
26. Door hold open device
27. Water flow switch
28. Tamper Switch
29. 18/2 FPLP/1000'
30. 18/2 FPLR/1000;
31. 16/2 FPLP/1000'
32. 16/2 FPLR/1000'
33. 14/2 FPLP/1000'
34. 14/2 FPLR/1000'

END OF SECTION

SECTION 01 1102
INFECTION CONTROL PLAN

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes:
 - 1. Related sections.
 - 2. Infection Control.

1.02 RELATED SECTIONS

- A. Uniform General Conditions and Supplementary General Conditions.
- B. 01 1100 – Summary of Work.
- C. 01 1101 – Unit Prices.
- D. 28 3100 – Fire Alarm System.

1.03 INFECTION CONTROL

- A. The project activity will be defined as Type B: Small scale, short duration activities which create minimal dust.
- B. The patient risk will be defined as medium.
- C. The required control procedures will be defined as Class II. Approval is not required when Class II control procedures are necessary.
- D. The necessary Class II control procedures during construction are as follows:
 - 1. Provide active means to prevent airborne dust from dispersing into atmosphere.
 - 2. Water mist work surfaces to control dust while cutting.
 - 3. Seal unused doors with duct tape.
 - 4. Block off and seal air vents.
 - 5. Place dust mat at entrance and exit of work area.
 - 6. Remove or isolate HVAC system in areas where work is being performed.
- E. The necessary Class II control procedures upon completion of work are as follows:
 - 1. Wipe work surfaces with disinfectant.
 - 2. Contain construction waste before transport in tightly covered containers.
 - 3. Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
 - 4. Remove isolation of HVAC system in areas where work is being performed.



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- F. Prior to start of work, the Contractor shall coordinate and verify infection control procedures with Owner.

END OF SECTION

SECTION 28 3100
FIRE ALARM SYSTEM

PART 1 - GENERAL



1.01 General Requirements

- A. The Fire Alarm System Installing Contractor (herein referred to as the Contractor) shall furnish all labor, equipment, and materials, and perform all operations in connection with the demolition of the existing fire alarm system and the installation of a new, addressable fire alarm system throughout the designated buildings on the Lubbock State Supported Living Center in Lubbock, Texas, as indicated and described on the contract drawings and in this specification. Other than where noted by the design documents, the existing fire alarm system shall remain fully operational until acceptance of the new fire alarm system by Owner and Authority Having Jurisdiction (AHJ).
- B. The schedule for the new system is twenty-four (24) months as follows:
 - 1. Two (02) months to submit all design submittals after the Notice to Proceed (NTP) date.
 - 2. Up to ten (10) buildings are available to be worked at a time.
 - 3. Total duration from NTP to substantial completion of the project scope is twenty-four (24) months.
- C. Contractor to locate and provide 120VAC power as required for system installation. Provide potential spare circuit locations to Owner for approval prior to installation. Once new fire alarm system is accepted and the existing system is demolished, transfer to dedicated fire alarm system circuits utilized by the existing fire alarm system where possible. All 120VAC work to be performed by a licensed journeyman electrician with supervision from a licensed master electrician. Electricians shall be licensed to work in the State of Texas.
- D. Contractor to include phasing installation plan and schedule as part of the design narrative to be provided with the bid documents.
- E. Contractor shall ensure that when the fire alarm and detection system is out of service for more than eight (08) hours in a twenty-four (24) hour period, the contractor shall notify the AHJ and provide an approved fire watch for the affected areas until the fire alarm and detection system is back in service. The fire watch shall be provided at no additional cost to the owner.
- F. Contractor to provide pricing for annual service inspections and maintenance of the new campus fire alarm system.
- G. Contractor to provide pricing for annual system monitoring for the HHSC Lubbock Campus.
- H. This Section specifies the requirements for furnishing and commissioning a fully functional addressable fire alarm system with full interface with other related systems. Work shall include, but not be limited to, the following:
 - 1. Fire alarm control unit in each building within project scope.
 - 2. Cellular dialer installed at each building FACP for signal transmission to building 501
 - 3. Network Display Unit (NDU) and Starlink Cellular Communicator installed in building 501 to receive signals from all remote buildings and transmit to Central Monitoring Station
 - 4. Distributed power supplies.
 - 5. Smoke and heat detection.
 - 6. Duct smoke detection.
 - 7. Manual pull stations.

8. Audible and visual alarm notification appliances including but not limited to horns and strobes as required throughout each building in project scope.
9. Replacement of all existing water motor gongs and existing waterflow bells with new exterior-rated waterflow bells.
10. Interface with suppression systems for supervision of all required equipment including, but not limited to, tamper switches, waterflow switches, hi/lo air switches, manual releases, and pressure-type switches.
11. Interface for air handling unit shutdown.
12. Interface for smoke damper closure.
13. Interface for kitchen hood systems,
14. Magnetic door hold-open devices and/or interface to existing magnetic door hold-open devices.
15. Owner training and spare parts as required by this specification.
16. Remote Annunciators.
17. System acceptance testing and commissioning.
18. 120 VAC power as required for all fire alarm system and auxiliary power supply panels.

1.02 Related Sections

- A. Uniform General Conditions and Supplementary General Conditions.
- B. 01 1100 – Summary of Work.
- C. 01 1101 – Unit Prices.
- D. 01 1102 – Infection Control Plan.

1.03 References

- A. The fire alarm system shall comply with all applicable federal, state, and local codes and standards, the *National Fire Protection Codes*, State of Texas Fire Marshal's requirements, and the Texas Department of Aging and Disability Services (DADS) requirements.
- B. All equipment and devices shall be labeled, listed and/or approved for the intended use by a Nationally Recognized Testing Laboratory (NRTL) as acceptable to the Authorities Having Jurisdiction and the Owner. Each component of the fire alarm system shall be listed as a product of a single fire alarm system manufacturer under the appropriate category for the intended use by Underwriters Laboratories, Inc. (UL) and shall bear the "UL label". All control equipment shall be listed for releasing service and listed under UL category UOJZ Control Units System as a single unit. Partial listings, or multiple listings for various major sections of the control equipment, shall not be acceptable.
- C. Installation and testing shall be made in accordance with applicable provisions of the latest published edition of the following:
 1. NFPA 1, *Fire Code*, 2015 edition.
 2. NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2010 edition.
 3. NFPA 25, *Inspection, Testing and Maintenance of Water-Based Fire Protection Systems*, 2008 edition.
 4. NFPA 70, *National Electrical Code*, 2017 edition.
 5. NFPA 72, *National Fire Alarm and Signaling Code*, 2022 edition.
 6. NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilation Systems*, 1999 edition.

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7. NFPA 101, *Life Safety Code*, 2015 edition
8. UL Standard 268, Smoke Detectors for Fire Protective Signaling Systems, 5th edition.
9. UL Standard 268A, Smoke Detectors for Duct Application, 3rd edition.
10. UL Standard 346, Waterflow Indicators for Fire Protective Signaling Systems, 5th edition.
11. UL Standard 464, Audible Signal Appliances, 9th edition.
12. UL Standard 521, Heat Detectors for Fire Protective Signaling Systems, 7th edition.
13. UL Standard 864, Control Units for Fire Protective Signaling Systems, 9th edition.
14. UL Standard 1424, Cables for Power—Limited Fire Protective Signaling Systems, 3rd edition.
15. UL Standard 1480, Speakers for Fire Protective Signaling Systems.
16. UL Standard 1481, Power Supplies for Fire Protective Signaling Systems, 5th edition.
17. UL Standard 1711, Amplifiers for Fire Protective Signaling Systems, 4th edition.
18. UL Standard 1971, Signaling Devices for the Hearing Impaired, 3rd edition.
19. ADA Accessibility Guidelines (ADAAG), 2010 edition.
20. Texas State Insurance Code.
21. Texas Accessibility Standards (TAS), 2012 edition.
22. The latest published edition of the equipment manufacturers' product datasheets, technical specifications, and installation instructions and guidelines.
23. NFPA 170, *Fire Safety and Emergency Symbols*, 2012 edition.
24. Texas Licensing Standards for Intermediate Care Facilities for Individuals with an Intellectual Disability or Related Conditions (Texas Administrative Code Title 40, Part I, Chapter 90, Subchapter D)

1.04 Submittals

- A. The Contractor is responsible to prepare and submit a minimum of nine hard copies of submittals for approval. Each submittal package shall be prepared and presented in a professional manner, be bound and shall include a title page and index. Each section of the submittal shall be numbered. Submittal packages shall be complete and shall include all buildings within the project scope. Partial submittal packages, including individual or partial groups of buildings within the project scope, will be returned without review. Shop Drawings and calculations must be prepared and submitted for approval, by a fire protection engineer licensed in the State of Texas or a minimum NICET Level III certified technician who is legally qualified to practice in the State of Texas.
- B. The Contractor shall certify in writing that the submittal documentation is in conformance with all of the requirements of this specification and the applicable referenced local, state and national Codes, Standards and Regulations. Shop drawings shall not be copied from the design drawings.

Shop Drawings:

1. Indicate manufacturer's name, model numbers, ratings, power requirements, equipment layout,

conduit, device arrangement, and complete point to point wiring diagrams along with other required information including, but not limited to, the following:

- a. General Drawing Notes
 - b. Electrical backbox requirements
 - c. Control equipment schedules
 - d. Panel schematics, showing all connections, between modules within panels, to all modules from field wiring with zone identified
 - e. Riser diagrams indicating circuits, types of devices, number of devices, number of conductors, conduit size, junction boxes, candela value for visual appliances, sound output setting for audible appliances, addresses for all addressable devices, and zones
 - f. Scaled floor plans with layout of all devices with point numbers for initiating devices and notification appliances, wiring connections, zoning, wire sizes and routing
 - 1) Sound output setting for each horn labeled adjacent to the horn
 - 2) Candela rating for each strobe labeled adjacent to the strobe
 - g. Detailed Legend
 - h. Fire safety and related symbols shown on drawings and diagrams shall comply with NFPA 170
 - i. Detailed input/output matrix
- E. Product Data: Provide electrical characteristics, connection requirements, and compatibility listing showing that components are compatible with each other including but not limited to:
1. Full equipment list including model numbers and quantities
 2. Complete system operation
 3. Highlighted Data Sheets on Devices and Products
 - a. Fire Alarm Control Unit
 - b. Remote Annunciators
 - c. Network Display Unit
 - d. Starlink Dialer
 - e. Cellular Dialer(s)
 - f. Remote power supplies
 - g. Wiring
 - h. Batteries
 - i. Detectors and pull stations
 - j. Audible Notification Appliances
 - k. Visual Notification Appliances
 - l. Control Modules
 - m. Monitor Modules
 - n. Auxiliary Relays
 - o. Raceways, conduit, pull boxes, and electrical boxes
 - p. Auxiliary power supplies
 - q. Magnetic door hold-open devices
 4. Wiring diagrams of all equipment

5. Installation instructions for all equipment
 6. Equipment testing procedures
 7. Equipment maintenance manuals
 8. Wire data sheets
- F. System Calculations - Complete calculations shall be provided which show the electrical load on the following system components:
1. Each system power supply, including stand-alone booster supplies and auxiliary supplies.
 2. Standby Battery Calculations plus a 25 percent derating factor.
 3. Voltage drop calculations for each type of circuit (identify all mathematical formulas, variables, and constants - decreasing the wire resistance from NEC values shall not be permitted).
 4. Notification appliance circuit loading and power supply loading. No circuit shall be loaded beyond 80% voltage capacity, leaving 20% spare capacity for future use or modifications required during testing.
 5. Each auxiliary control circuit that draws power from any system power supply.
- G. Software and Database Information:
1. Proposed point numbers.
 2. Labels of all addressable devices.
 3. Proposed annunciator display messages for each event.
- H. No work shall be performed until the Owner and Authority Having Jurisdiction (AHJ) has approved the complete shop drawings, calculations, and data sheets. The contractor is solely liable for any work performed prior to this approval.
- I. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 72.
- J. Maintenance Data: Contractor shall provide owner with a complete maintenance manual for the system. The maintenance manual shall describe in detail the purpose and function of all system devices and inspection, testing and maintenance forms. Contractor shall provide Owner with one (1) copy of the latest edition of NFPA 72 in addition to the manufacturer's maintenance manual.
- K. Manufacturer's Certificate: Certify that the system has been tested and meets or exceeds requirements specified and suggested by listed codes.

1.05 Operation and Maintenance Data

- A. Submit under provisions of Division 01.
- B. Maintenance Instructions: Include installation instructions, spare parts lists, procedures, and treatment programs.
- C. These O&M Manuals shall include the following:
1. The Final As-Built Equipment List identifying the quantities and types of equipment listed by manufacturer's part number.

2. A detailed narrative description of the system inputs, notification signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations.
3. An equipment datasheet (or specification sheet) on every piece of equipment installed.
4. Operator instructions for basic system operations, including alarm acknowledgement, system reset, interpretation of system output, operation of manual notification signaling and ancillary functions controls.
5. Standby power calculations and voltage drop calculations that coincide with the equipment that has been installed in the building.
6. A point ID list referencing the signaling line circuit loops and the devices on those loops.
7. A sensitivity report for all smoke detectors at the time of acceptance.
8. The results of testing of all wiring free from faults, as specified.
9. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed.
 - a. This information shall include manuals that outline inspection, testing and cleaning procedures for all detectors and control equipment, as well as any other special maintenance procedures for any other pieces of automatic fire alarm equipment installed in the building. Include fire alarm control unit (FACU) password for access maintenance level software applications.
10. Detailed troubleshooting instructions for each trouble condition generated from the monitored field wiring, including opens, grounds, and loop failures.
 - a. These instructions shall include a list of all trouble signals annunciated by the system, a description of the condition(s) that causes such trouble signals, and step-by-step instructions describing how to isolate such problems and correct them (or how to call for service, as appropriate). Include fire alarm control unit (FACU) password for access maintenance level software applications.
11. Detailed As-Built drawings indicating the final location of all devices and appliances and the areas served by those devices. Drawings shall reflect the address for addressable devices, the candela setting for visual appliances, and the sounds output setting for audible appliances.
12. A service directory, including a list of names and telephone numbers of those who provide service for the system.
13. Provide three (3) copies of record drawings on compact disk in AutoCAD and Revit.
14. Provide three (3) hard copies of as-builts.
15. A copy of the system programming (on compact disk) shall be provided on-site for each fire alarm control unit, labeled by building. The disk shall contain all programming software and programming keys required to modify or restore the system program for each fire alarm control unit.
16. A completed electronic copy of the NFPA 72 Fire Alarm and Emergency Communication System Record of Completion [2022 NFPA 72, Figure 7.8.2(a)].

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17. A completed electronic copy of the NFPA 72 Fire Alarm and Emergency Communication System Inspection and Testing Form [2022 NFPA 72, Figure 7.8.2(g)].
18. A completed electronic copy of the Texas Department of Insurance Fire Alarm Installation Certificate (FM-009A form).
19. A completed electronic copy of the Texas Department of Insurance Fire Alarm Installation Inspection Form.

1.06 Quality Assurance

- A. Fire Alarm System: Perform work to NFPA 72 and Owner standards.
- B. Fire Alarm Installer Qualifications:
 1. Authorized and designated representative of fire alarm manufacturer to sell, install, and service proposed manufacturer's equipment. Verify equipment suppliers have technical factory training specifically for the system proposed. Include copies of training certificates for all installers and designers.
 2. Licensed by State Fire Marshal to sell, install, and service fire alarm systems. Include copies if all licenses of installers and designers.
 3. Actively engaged in business of selling, installing, and servicing fire alarm systems for at least five years with minimum of ten such installations completed and operating properly.
 4. Equipment furnished shall be of the most current manufacture and shall be expected to be serviceable for at least 10 ten years beyond the date of installation.
 5. The Contractor shall be licensed in the State of Texas, shall be experienced in the installation of fire alarm systems in buildings similar to those at the Lubbock State Supporting Living Center, and shall have obtained design approval and inspection approval for similar projects from authorities having jurisdiction.
- C. The fire alarm equipment furnished shall be listed and approved by a testing laboratory that has been approved by the State of Texas Commission on Fire Safety. This listing shall be for all functions required by this specification.
- D. Fire Alarm Equipment and Components: Bear UL listing.
- E. Fire Alarm Manufacturer Qualifications: Firms whose equipment, specialties, and accessories are listed by product name and manufacturer in UL's "Fire Protection Equipment Directory" and that comply with other requirements indicated shall be acceptable.
- F. Fire Alarm Components: Listing and labeled by a testing agency for the intended use and acceptable to the owner and the authorities having jurisdiction.
- G. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- H. All materials and equipment shall be new and unused.
- I. All equipment supplied shall be first quality and the manufacturer's best type and latest model capable of complying with all requirements of this specification and shall have been in continuous production and in continuous service in commercial applications for at least one year. Obsolete equipment shall not be used.
- J. Design and install system under direct supervision of a NICET certified Level III fire alarm system

technician or a registered professional fire protection engineer experienced in design of this work and licensed in the State of Texas. Supervision shall be accomplished with an individual with a minimum of five (5) years of relevant. All design submittal documents, and shop drawings shall bear the APS signature and date or the Fire Protection Engineer's seal with signature and date.

- K. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the Owner.
- L. Products shall be as required by the contract documents and the approved shop drawings. Product substitutions must be approved by the Owner, in writing, prior to installation. Substitution requests shall be prepared by the Contractor and shall include product identification, data sheet, reason for substitution, performance differences from the approved product, and cost differences from the approved product. Substitutions shall not impact the required warranty or project schedule. Cost savings resulting from product substitutions may result in deductions from the contractor value at Owner's discretion.

1.07 Delivery, Storage and Handling

- A. Deliver fire alarm system components in factory-fabricated containers.
- B. Store in a clean, dry space and protected from the weather.
- C. Handle control and annunciator panels carefully to avoid damage to material components, enclosure and finish.

1.08 Warranty

- A. The Contractor shall guarantee all new equipment installed from defects in workmanship and inherent mechanical and electrical defects for a period of three (3) years from the date of acceptance by the Owner. The Contractor shall be responsible for all parts and labor costs associated with the timely repair or replacement of equipment as necessary for the warranty period. The Contractor shall be responsible for obtaining the required equipment from the Manufacturer and for procuring and supervising the required labor. Dispute resolution with the Manufacturer shall be the responsibility of the Contractor.
- B. Upon completion of the installation of the automatic fire alarm system equipment, the Contractor shall provide the Owner with a signed written statement, substantially in the form as follows:

"The undersigned, having been engaged as the Contractor on the Texas HHSC 24-119-LBL Fire Alarm System Replacement – Multiple Buildings Project, confirms that the automatic fire alarm system equipment was installed in accordance with the system manufacturer's installation instructions and technical specifications provided to us by the manufacturer and the Owner."
- C. The warranty period shall begin on the date of substantial completion for the entire campus system including all buildings that are on the Certificate of Substantial Completion that is issued by Owner.

PART 2- PRODUCTS

2.01 Acceptable Manufacturers

- A. The following fire alarm system manufacturers are acceptable for this project.
 - 1. Simplex
- B. The new automatic fire alarm, detection, and occupant notification system shall be compatible with existing updated Simplex systems in buildings 504, and 513 through building 528.

2.02 Functional Description of the System

- A. The system shall include new control/communications equipment which is UL Listed to operate with the submitted smoke detectors, heat detectors, interface modules, and notification appliances. The system shall transmit signals to the Campus-Wide Proprietary Supervisory Signaling System, alert building occupants using audible and visible notification appliances, supervise each system for conditions which would impair proper system operation, annunciate such abnormal conditions, and where applicable, control related equipment as indicated on contract documents such as door closure, smoke damper closure, and air handling unit shutdown. All buildings shall have a cellular dialer installed that will transmit alarm, trouble, and supervisory signals to a Starlink Cellular Communicator and Network Display Unit (NDU) located in building 501. Upon receipt of signals to Building 501, transmission of signals shall be sent to a remote central monitoring station.
- B. Alarm Condition
 - 1. The system operation shall be such that the alarm operation of any alarm initiating device shall not prevent the subsequent alarm operation of any other initiating device due to wiring or power limitations.
 - 2. The system alarm operation subsequent to the alarm activation of any system-type automatic detection device (smoke detector or heat detector), manual pull stations, or sprinkler waterflow switch shall automatically perform the functions contained in this section and operate as follows:
 - a. All audible notification appliances in the corresponding building, as designated on the drawings, shall initiate the alarm evacuation sequence.
 - 1) Throughout the building, the horns shall broadcast an alert tone, transmitting the temporal code 3 National Evacuation Signal.
 - b. All visible (strobe) notification appliances shall flash in synchronization throughout the corresponding building.
 - 3. FACU Indication
 - a. Alarm conditions shall be immediately displayed on the control unit alphanumeric display and on all remote alarm annunciators, as shown on the drawings, indicating all information associated with the fire alarm condition including type of device, its location and the time and date of activation. The red "ALARM" LED shall flash on the control unit until the alarm has been acknowledged. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another initiating device after acknowledgment shall flash the alarm LED on the control unit and the display shall show the new alarm information.
 - b. During an alarm condition, a pulsing alarm tone shall sound within the control unit until the alarm is acknowledged.
 - c. If the audible alarm signals are silenced for any reason, they shall automatically resound if another initiating device is actuated.
 - d. Visual notification appliances shall be deactivated whenever audible notification appliances are silenced.
 - e. When the alarm signals are silenced by pressing the "ACKNOWLEDGE" push-button on the control module, the control unit LED's shall continue to flash until the alarm is reset at the control unit.
 - 4. Auxiliary Functions

- a. Where applicable, all auxiliary functions shall be connected to and operated by the control unit.
- b. HVAC Fan Units
 - 1) Any active fire alarm signal shall cause shut down all fan units within the building in accordance with Texas Administrative Code Title 40 Part 1 Chapter 90 Subchapter D, Rule §90.65(C)(1)(B).
- c. Smoke Damper Controls
 - 1) Any active fire alarm signal shall cause closure of all smoke dampers within the building in accordance with Texas Administrative Code Title 40 Part 1 Chapter 90 Subchapter D, Rule §90.65(C)(1)(C). Smoke damper actuation is required to comply with NFPA 90A. Duct detectors shall be located within 5-feet of the smoke damper served or an array of spoke-type smoke detectors shall be used in accordance with NFPA 72 when a duct is not available. Duct detector sampling tubes shall not be permitted outside of ducts. An override switch control shall be installed in the FACU to allow the fire department to return the smoke dampers to their normal condition.
- d. Magnetically Held-Open Doors
 - 1) Any active fire alarm signal shall cause the release of all doors held open by magnetic hold-open devices throughout the building in accordance with Texas Administrative Code Title 40 Part 1 Chapter 90 Subchapter D, Rule §90.65(C)(1)(A)).

C. Supervisory Condition

- 1. The control unit shall have a "SYSTEM SUPERVISORY" LED and a supervisory signal "ACKNOWLEDGE" switch.
- 2. When a supervisory condition is detected, the following functions shall immediately occur:
 - a. The "SYSTEM SUPERVISORY" LED shall flash.
 - b. A pulsing alarm tone in the control unit shall sound.
 - c. The display shall indicate all information associated with the supervisory condition, including device, its location within the protected premises, and the time and date of that activation.
 - d. If more supervisory signals are in the system, the operator shall be able to scroll the display to view new signals.
 - e. All system output programs assigned via control-by-event equations to be activated by the particular point in trouble shall be executed, and the associated system outputs (Supervisory Notification Appliances and/or relays) shall be activated.
- 3. Unacknowledged alarm messages shall have priority over supervisory messages, and if an Alarm occurs during a supervisory sequence, the Alarm condition shall have display priority.
- 4. Activating the supervisory "ACKNOWLEDGE" switch shall silence the audible signal while maintaining an LED on, indicating the supervisory condition is still in the off-normal state.
- 5. Restoring the valve or supervisory contact to the normal position shall cause the supervisory service audible signal to pulse thus indicating restoration to normal position. Activating the "ACKNOWLEDGE" switch shall silence the audible signal and restore the system to normal.

6. The activation of any standpipe or sprinkler tamper switch shall activate an audible supervisory signal and illuminate the supervisory LED at the control unit.

D. Trouble Condition

1. When a trouble condition is detected, the following functions shall immediately occur:
 - a. An amber "SYSTEM TROUBLE" LED shall light and the system audible signal shall steadily sound when any trouble is detected in the system. Failure of normal power, opens or short circuits on the signaling line circuits or the notification appliance circuits, disarrangements in system wiring, failure of the microprocessor or any identification module, or system ground faults shall activate this trouble circuit.
 - b. A trouble signal may be acknowledged by actuating the "ACKNOWLEDGE" switch. This shall silence the control unit trouble buzzer. If additional trouble conditions occur, the trouble circuitry shall resound.
 - c. During an "alarm" condition, all "trouble" signals shall be suppressed with the exception of lighting the amber "COMMON TROUBLE" LED steadily.
 - d. The display shall indicate all information associated with the trouble condition, including type of trouble point, its location within the protected premises, and the time and date of that activation.
 - e. All system output programs assigned via control-by-event equations to be activated by the particular point in trouble shall be executed, and the associated System Outputs (Trouble Notification Appliances and/or relays) shall be activated.
2. Unacknowledged alarm messages shall have priority over trouble messages, and if such an Alarm occurs during a Trouble sequence, the Alarm condition shall have display priority.

E. System Supervision

1. All wiring extending from the FACU enclosure to fire alarm and occupant notification system components shall be supervised for opens, shorts and grounds. Systems containing unsupervised wiring of any type shall not be acceptable.
2. The occurrence of any fault shall activate the system trouble circuitry, but shall not interfere with the proper operation of any circuit that does not have a fault condition.
3. Incoming 120 VAC line power shall be supervised so that any power failure shall be audibly and visually indicated at the control unit and remotely at the Central Station.
4. Batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visually indicated at the control unit and at the central station.
5. Interconnected Fire Safety Systems shall be monitored for alarm and trouble conditions. The supervisory signal shall activate any time the monitored system indicates an off-normal condition. This would include, but not be limited to, kitchen hood suppression systems or other special suppression systems installed within the building.

F. System Reset

1. A "SYSTEM RESET" button shall be used to return the system to its normal state after an alarm condition has been remedied. Printed messages shall provide operator assurance of the sequential steps (i.e.: "IN PROGRESS", "RESET COMPLETED") as they occur, should all alarm conditions be cleared.

2. Should an alarm condition continue to exist, the system shall remain in an abnormal state. System control relays shall not reset. The control unit "ALARM" LED shall remain on. These points shall not require acknowledgment if they were previously acknowledged.

2.03 Fire Alarm Control Unit (FACU)

- A. FACU shall be intelligent, addressable Central Processing Units (CPU) based and meet the latest edition of UL 864.
- B. The FACU shall provide power, English display status, supervision, control, and programming capability for the fire detection and alarm system.
- C. The control unit shall be located, as specified by the Owner and as shown on the drawings.
- D. The control unit shall store a record of alarm and trouble events in a nonvolatile history file. This file shall contain, at least, the most recent 500 events, with time and date of each event. It shall be possible to select the number of events to be viewed in the history file so that the entire file does not have to be downloaded. The history file shall remain intact in the event of a loss of AC and battery power.
- E. The control unit shall be modular in construction and receive supervised plug-in component boards to provide system functions as hereinafter specified and/or to accommodate future system expansions.
- F. The control unit shall be capable of being expanded in the future to support a minimum of 1000 addressable points (inputs or outputs). The control unit shall be capable of being expanded and field reprogrammed at any time up to the predetermined maximum capacity of the system, without the requirement to return the operating system to the factory for program changes. All field programming shall be done by an authorized manufacturer's representative.
- G. The control unit shall support a minimum of six (6) signaling line circuits. Each signaling line circuit shall support a minimum of 100 addressable input devices or addressable monitor modules and a minimum of 10 output devices. All addressable input and output devices shall be capable of being intermixed on the same signaling line circuit.
- H. The control unit shall accommodate all addressable input devices in alarm simultaneously and shall be capable of operating all output relays while all inputs are in alarm.
- I. Each signaling line circuit shall be loaded to no more than 80% of its manufacturer specified voltage capacity. Additional SLCs shall be furnished and installed as necessary to comply with this requirement.
- J. The control unit shall supply power and communication protocol signals to the addressable input devices over two pairs of wires per signaling line circuit from the control unit. Signaling line circuits shall be installed for Class operation. Signaling line circuits shall only utilize 80 percent of the circuit device voltage capacity.
- K. The control units shall support a minimum of two (2) visible (strobe) notification appliance circuits per floor to provide an evenly distributed number of notification appliances per floor and circuit. All visible (strobe) notification appliance circuits shall be independent from the audible notification appliance circuits. Each circuit's power load shall not exceed 80 percent of the individual circuit power available from the FACU or power supply panel and new installed circuits shall be Class B circuits. Additional NACs shall be furnished and installed as necessary to comply with this requirement. Contractor shall survey and coordinate locations for NACs with Owner. Smoke detectors shall be provided to serve each panel location in accordance with NFPA 72.
- L. The control unit shall contain all the necessary equipment to support a minimum of two (2) horn notification appliance circuit per floor. Each floor shall be served by a minimum of two Class B horn circuits. Horn circuits may be installed in the same raceway with strobe notification appliance circuits but not signaling line circuits unless approved in writing by the supplier of the fire alarm. All horn

notification appliance circuits shall be independent from the visual notification appliance circuits. Each circuit's power load shall not exceed 80 percent of the individual circuit power available from the FACU or power supply panel and new installed circuits shall be Class B circuits. Additional NACs shall be furnished and installed as necessary to comply with this requirement. Contractor shall survey and coordinate locations for NACs with Owner. Smoke detectors shall be provided to serve each panel location in accordance with NFPA 72.

- M. Power for all notification appliances shall come from integral power supplies. Remote power supplies, if needed, shall be of the same manufacturer as the FACU. The location of all remote control equipment, such as remote power supplies (extenders) shall be approved prior to installation by the Owner. All locations containing remote control equipment (such as a power supply extender) shall be protected with a smoke detector.
- N. FACU shall provide circuit integrity monitoring for all Signaling Line Circuits as defined in NFPA 72.
- O. FACU shall provide circuit integrity monitoring of Initiating Device Circuits (IDCs) at a level of Class B as defined in NFPA 72.
- P. FACU shall provide circuit integrity monitoring of Notification Appliance Circuits (NACs) at a level of Class B as defined in NFPA 72.
- Q. The control unit and system wiring requirements shall be specified by the equipment supplier in their bid to the Contractor.
- R. FACU shall be connected to a Primary and Secondary Power source. The secondary power supply shall be sized to provide 15 minutes of operation in alarm conditions after 24 hours of system operation in standby power.
- S. FACU shall provide a separate digital address for each initiating device to facilitate rapid response and maintenance and testing.
- T. All programming must be permanent and non-volatile to reduce outage time due to failure.
- V. FACU must be listed and approved as the smoke detector sensitivity test set to reduce maintenance costs.
- W. FACU must be capable of providing drift compensation. Drift compensation is considered equal to adjustability at the detector.
- X. FACU must be field programmable, using internal or connected components, for all changes, alterations, modifications, additions, deletions and hardware and software upgrades.
- Y. FACU must be capable, using internal or connected components, of generating comprehensive reports for sensitivity, verification counts, address registers.
- Z. At a minimum, a fault isolation device shall be provided electrically every 25 devices. This device shall be capable of automatically isolating wire-to-wire faults on each SLC to the building area 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 modules shall be physically located within the marshaling box for that floor.
- AA. At a minimum, the FACU shall contain the following:
 - 1. Display. A minimum 80 character, highly readable, display. Upon input activation, the display shall provide the following indication:
 - a. A device address display.

- b. A field programmed English label indicating the location of the device. Custom label verbiage shall be submitted to the Owner and the authorities having jurisdiction, for approval prior to system programming.
 - c. An English description of the type of device activated, such as smoke detector, manual pull station, water flow switch, etc.
 - d. The status of the input: alarm, supervisory or trouble.
 - e. Multiple alarm conditions shall be sequentially displayed automatically at not more than a five (5) second interval until manually acknowledged by priority.
2. Annunciation. Annunciation shall be an integral part of the control system and shall indicate alarm, supervisory and trouble conditions and the corresponding address. The following initiating devices shall be annunciated individually:
- a. Smoke detectors.
 - b. Heat detectors.
 - c. Sprinkler waterflow devices.
 - d. Other approved types of automatic fire detection devices or suppression systems.
3. Battery voltage and ammeter readouts shall be available from the LCD display.
4. Once acknowledged, individual alarms shall be viewed by operating a "next-alarm" switch.
5. Communication Ports. Two supervised RS232C communication ports shall be provided to support a printer or display output. Each RS232C port output shall be programmable for printer or display output and shall be programmable to provide access to the control unit's EEPROM operating system to perform the following functions:
- a. Local system programming, maintenance, and troubleshooting.
 - b. Listing and indicating status of all field devices.
 - c. Capability of performing alarm tests on any or all addressable smoke detectors and contact input devices.
 - d. Monitoring of the system from remote locations via printer, terminal, or computer.
6. The control unit shall be provided with a "silent" walk test feature. This feature shall allow for testing of the fire alarm without activating the notification appliances.
7. Clock. A 24-hour clock shall be provided to continually provide the time of day and day of the week information. During normal standby conditions, the control unit shall display time and date.
8. Any operation of an alarm silence, supervisory silence, trouble silence, acknowledge, lamp test, relay switches, or system reset switch shall cause a display indication of operation with time and date. These operations shall also be recorded in the system's history file.
9. For FACUs responsible for signal reporting: two additional addressable dry contact relay modules.

BB. FACU shall provide smoke detector "Alarm Verification."

- CC. FACU shall provide twenty percent (20%) excess power supply, input circuit, and output circuit capacity at final acceptance to allow for future expansion by the owner.
- DD. Zone labeling must be textual by alpha-numeric display at the FACU to allow "first response" by persons not trained in fire alarm technology.
- EE. FACU shall provide control to silence the Public Alarm to allow for maintenance and testing, and to reduce disruption.
- FF. FACU shall provide a control to override the door holder release, damper activation, and fan shutdown features to allow for maintenance and testing. A means to disable all waterflow alarms shall be provided.

2.04 Remote Monitor

- A. The FACU at building 501 must be capable of interconnection to the existing dialers for transmission of each of the following signals separately to an off-site monitoring service. Contractor shall provide annual monitoring costs as part of the bid package.
 - 1. ALARM
 - 2. WATERFLOW
 - 3. SUPERVISORY
 - 4. TROUBLE
- B. Provide control relays and any other equipment required to accommodate the connection between the new fire alarm system and the dialers. Control relay junction boxes shall be labeled with the corresponding signal, the devices address, and shall have visible indicating LEDs.
- C. Provide a Simplex Network Display Unit (NDU) at building 501 to receive and transmit alarm, trouble, and supervisory signals received from the outlying buildings.
- D. Provide a Starlink Cellular Communicator at building 501 to receive and transmit alarm, trouble, and supervisory signals received from the outlying buildings.

2.05 Distributed Power Supplies

- A. Distributed power supplies for powering notification appliance circuits, control output relays, and magnetic door holders.
- B. All distributed power supply inputs must be controlled by addressable interface devices controlled by the SLC serving the area to facilitate maintenance.
- C. The distributed power supplies must be sized to provide 15 minutes of operation in alarm after 24 hours of system operation in standby power.
- D. Provide minimum 20% spare voltage capacity for each output circuit.
- C. Contractor to locate and provide 120VAC power as required for system installation. Once new fire alarm system is accepted and the existing system is demolished, transfer to dedicated fire alarm system circuits utilized by the existing fire alarm system. All 120VAC work to be performed by a licensed journeyman electrician with supervision from a licensed master electrician. Electricians shall be licensed to work in the State of Texas.

2.06 Heat Detectors

- A. All heat detectors shall be fixed temperature (135 °F).
- B. Each addressable heat detector must have a unique address on the SLC.
- C. Non resetting detectors must give visual indication of "ALARM" condition to facilitate rapid response.
- D. Where separate addressable monitor modules are used for monitoring conventional type heat detectors, the modules are required to be installed within the heat detector junction box.

2.07 Smoke Detectors

- A. All spot type smoke detectors shall be photoelectric or combination photoelectric and ionization type.
- B. Beam smoke detectors shall not be used for this project.
- C. Each smoke detector must have a unique digital address on the SLC.
- D. All smoke detectors must be field measurable and adjustable for sensitivity.
- E. All smoke detectors must be powered from the SLC.
- F. The FACU must function as the smoke detector sensitivity test set and must be approved and listed for that service.
- G. All smoke detectors must meet or exceed the requirements of Underwriter's Laboratory Standard 268, as amended, and must be listed and approved for use with the FACU provided.

2.08 Duct Smoke Detectors

- A. It is the responsibility of the Contractor to coordinate and verify duct smoke detector installation. Provide label indicating the direction of air flow and identify the proper locations for duct detectors. Provide only addressable system duct detectors; factory installed duct detectors within the air handling unit are not acceptable.
- B. It is the responsibility of the Contractor to ensure that all smoke and combination fire/smoke dampers are served by an addressable duct smoke detector, spot-type smoke detector array, or other smoke detector arrangement such that smoke damper actuation complies with NFPA 90A requirements. Contractor shall coordinate with Owner to verify smoke damper locations.
- C. Duct smoke detector sampling ports shall not be located outside ducts. Sampling tubes shall be cut to length with the number of ports require by the manufacturer's instructions. Contractor shall drill additional ports if required by manufacturer's instructions.
- D. The fire alarm planner/designer shall affix a label at the locations on duct work intended for smoke monitoring. The label will identify the fan unit served, identify if the duct is for supply or return air, and the direction of the airflow in the duct. Labels shall be professional in quality and not hand-written. Proposed labels shall be included in submittal for approval prior to installation.

2.09 Waterflow Switches

- A. Fire detection/alarm systems shall be interconnected to the fire sprinkler systems by waterflow switches and must be set for a 60 second delay (retard) prior to the "ALARM". All required sprinkler system work shall be performed by Contractor.
- B. Each waterflow switch must be monitored for a unique digital address on the SLC.

- C. It is the responsibility of the Contractor to locate the waterflow switches to assure indication of water flow within the building. Contractor shall coordinate with Owner to ensure all waterflow and pressure-type switches are identified.

2.10 Valve Supervisory (Tamper) Switches

- A. Connect tamper switches installed on all fire suppression or standpipe system valves to the fire alarm system to indicate closing or opening of the valves. Each valve supervisory device must be monitored for a unique digital address on the SLC. The contractor shall coordinate with Owner to ensure all tamper switch locations are identified. All required sprinkler system work shall be performed by Contractor.

2.11 Audible Notification Appliances

- A. Provide exterior rated 10-inch electric bell at approved exterior location for each building containing a sprinkler system. Bell shall be activated upon waterflow signal only and shall be silenceable. Contractor to confirm exact bell location with Owner prior to installation. Where water motor gongs are existing, contractor shall perform all work required to remove all water motor gongs and replace each water motor gong with an electric bell.
- B. Fire alarm horns are required throughout the building. The fire alarm signal generated must be the distinctive three-pulse temporal pattern described by NFPA and ANSI codes. The signal shall be square wave type with a fundamental frequency of 520 Hz throughout all buildings.
- C. Horns shall be provided with multi-tap settings. Contractor to select horn models and settings based upon the audibility requirements of NFPA 72. Contractor is responsible for determining ambient sound levels.

2.12 Visual Appliances

- A. All visual notification appliances must be xenon strobe, compliant with current requirements of ADA and TAS.
- B. All visual notification appliances within a room or adjacent space within the field of view must be synchronized as required per NFPA 72.

2.13 Monitoring Devices

- A. Addressable monitoring devices used to monitor contact-closure devices, such as waterflow switches and tamper switches, must derive power from the SLC to which they are connected.
- B. Each monitoring device must have a unique digital address on the SLC.
- C. Monitor modules shall be enclosed with visible LED indicating normal operational status and activation. Enclosures shall be labeled with SLC address and the specific device and function served. Labels shall be professional quality and not handwritten. Proposed labels shall be included in submittal for Owner approval prior to installation.

2.14 Control Devices

- A. Addressable control devices must not control more than one type of appliance/device.
- B. Each control device must have a unique digital address on the SLC.

- C. Control relay modules shall be enclosed with visible LED indicating normal operational status and activation. Enclosures shall be labeled with SLC address and the specific device and function served. Labels shall be professional quality and not handwritten. Proposed labels shall be included in submittal for Owner approval prior to installation.
- D. Provide auxiliary power and interposing relays as required for control output module interface.

2.15 Manual Pull Stations

- A. Manual pull stations shall be installed within 5-feet of every exit.
- B. All manual pull stations must be of the "double-action" type with the exception of the institutional manual pull stations in the buildings listed below.. Pull stations required to break glass to activate are not acceptable. Provide pull stations that utilize the same key as FACU for resetting.
- C. Each manual pull station must have a unique digital address on the SLC.
- E. Where separate addressable monitor modules are used for monitoring conventional type manual pull stations, the modules are required to be installed within the manual pull station back box.
- F. Institutional key operated manual pull stations shall be installed in the following buildings: 504, 513, 514, 515, 516, 517, 518, 519, 520, 521, 523, 524, 525, 526, 527, 528, 511, 536, 537, & 540.
- E. Existing alarmed pull station covers shall be removed and returned to the Owner during demolition.

2.16 Documentation Storage

- A. Documentation storage enclosure shall be provided at or adjacent to (within five feet of) the FACU at each building. This storage enclosure shall be capable of storing and securing all documents required for system maintenance and response, including a complete set of as-built drawings and maintenance manuals. Storage shall be separated from all active electrical, electronic, or electromechanical parts and components. If adequate, storage may contain unconnected spare/repair parts.

2.17 Magnetically Held Door Holders

- A. Existing devices may be re-used; it is the Contractor's responsibility to locate existing magnetic door holder power supplies and circuits and to determine compatibility with the new fire alarm system.
- B. If provided, new devices shall be wall mounted and properly anchored to building structure. New devices shall be 24 VDC powered.
- C. The power shall be received from an auxiliary power supply.
- C. Coordinate compatibility of magnetic door hold-open device make/model and installation with existing doors and construction.

2.18 Digital Alarm Communicator Transmitter

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.
- B. Transmission Channels: Unit shall employ a single telephone line (number) as the primary transmission means and one of the following as the secondary transmission means:
 - 1. One-way private ratio alarm system.
 - 2. Two-way RF multiplex system.
 - 3. Transmission means complying with NFPA 72, § 26.6.3 Performance-Based Technologies.
 - 4. A second telephone line (number) meeting the requirements of NFPA 72, § 26.6.4.1.4(A)(4).

- C. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire alarm control unit and automatically capture the selected transmission channel and contact the remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either channel is interrupted for longer than 90 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of transmission channel to the remote alarm receiving station over the other channel. Transmitter shall automatically report transmission channel restoration to the central station. If service is lost on both transmission channels, transmitter shall initiate the local trouble signal.
- D. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both transmission channels are available.
 - 2. Programming device.
 - 3. LED display.
 - 4. Manual test report function and manual transmission clear indication.
 - 5. Communications failure with the central station or fire alarm control unit.
- E. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address of the supervisory signal.
 - 3. Address of the trouble-initiating device.
 - 4. Loss of ac supply.
 - 5. Loss of power.
 - 6. Low battery.
 - 7. Abnormal test signal.
 - 8. Communication bus failure.
- F. Secondary Power: Integral rechargeable battery and automatic charger.
- G. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.19 Network Display Unit (NDU)

- A. NDU shall be mounted in the same 4100ES FACU cabinet in building 501
- B. NDU Shall include:
 - a. Mater controller assembly with operator interface.
 - b. 4100ES CPU with dual configuration programs, convenient service port access, and a capacity for up to 12,000 points.
 - c. System power supply (SPS) and charger (9 A total) with on-board programmable auxiliary output
 - d. Operator interface that is conveniently color coded with raised switches providing high confidence feedback
 - e. Available with InfoAlarm command center expanded content user interface.
 - f. Glass door (ordered separately) provides view of available operator controls visible behind locked door
 - g. Remote annunciator module support via RUI (remote unit interface) communications port.

PART 3 - EXECUTION

3.01 Inspection

- A. Contractor shall examine the areas and conditions under which the fire alarm system is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.
- B. The following inspections shall be performed by a licensed fire alarm technician or planner, be documented on the State of Texas inspection form and submitted to the Owner prior to the start of the next installation phase:
 - 1. Inspect the raceway system at the completion of the device back-box installation but prior to the start of cable installation. The required inspection shall be documented on the Fire Alarm System

Installation Form located in the Texas Administrative Code, Title 28 Insurance, Part 1 Texas Department of Insurance, Chapter 34, State Fire Marshal, Subchapter R, Fire Alarm Rules.

- 2 Inspect cable installation at the completion of the cable installation but prior to the start of device installation. The required inspection shall be documented on the Fire Alarm System Installation Form located in the Texas Administrative Code, Title 28 Insurance, Part 1 Texas Department of Insurance, Chapter 34, State Fire Marshal, Subchapter R, Fire Alarm Rules.
 - 3 Inspect device installation at the completion of device installation but prior to activating the fire alarm system. The required inspection shall be documented on the Fire Alarm System Installation Form located in the Texas Administrative Code, Title 28 Insurance, Part 1 Texas Department of Insurance, Chapter 34, State Fire Marshal, Subchapter R, Fire Alarm Rules.
- C. Examine walls and partitions for fire- and smoke-rated construction. Provide classified through-penetration firestop systems for all penetrations through fire- and smoke-rated construction. Assume all floors and full-height partitions are minimum 1-hour fire barriers unless directed otherwise. Sleeves shall be provided in all rated wall penetrations.

3.02 Installation

- A. Installation, workmanship, fabrication, assembly, erection, examination, inspection and testing shall be in accordance with NFPA 72, except as modified herein.
- B. The Contractor shall provide and install all required equipment, labels and accessories necessary for the proper operation of the system.
- C. All work shall be performed in accordance with the best and the most modern practices of the trade. The entire system shall be installed in a neat and workmanlike manner, in accordance with the standard instructions and recommendations of the manufacturer and in accordance with the approved manufacturer's wiring diagrams unless otherwise specifically permitted by the Owner.
- D. The system shall be installed under the supervision of a qualified, trained, NICET (minimum Level III) Certified manufacturer's representative. The technical representative is expected to be on site with the Contractor during the installation of wiring and during the entire time of final connections and testing of the fire alarm and occupant notification system. The system shall be demonstrated to perform all of the functions as specified.
- E. The supervisory work of the qualified manufacturer's technical representative shall include, but not necessarily be limited to, checking all the system wiring connections; advising the Contractor regarding technical details of the installation; and the adjustment and testing of all components of the system in order to ensure a complete and satisfactorily operable system. The manufacturer's technical representative shall be on site, as required by the Owner, during the entire installation and connection of the new control equipment. The technical representative shall monitor all wiring changes and assist the Contractor to ensure a smooth transition to the new control equipment. The cost of the technical representative shall be paid by the Contractor and shall be included in the bid price.
- F. The manufacturer's technical representative shall also be required to instruct designated building and management personnel in the general operation of the system and to give the designated personnel an overview of the system functions when the system is in normal, supervisory mode, alarm mode, and trouble mode, as specified in this specification.

3.03 Wiring

- A. All wiring shall comply with this section.
- B. The entire wiring and raceway system for the fire alarm system shall be in full accordance with NFPA 70, *National Electrical Code*.

- C. The Contractor shall furnish all metal raceway, wiring, outlet boxes, junction boxes, cabinets, labels and similar devices necessary for the complete installation of the fire alarm system. All wiring shall be of the type as specified herein and recommended by the manufacturer. Utilize FPLP plenum fire alarm cable where possible. All wiring system junction and outlet boxes, tamper switches, flow switches, and smoke detectors (spot type and duct) shall be identified by means of self-adhesive-backed, pre-printed, color-coded, vinyl labels indicating system and function. "Dymo" type labeling machine strips will not be acceptable unless riveted or screwed to surfaces.
- D. All wiring, conductors and raceways shall be concealed within the construction to the extent possible. Where concealed wiring and or raceways is not possible, the Contractor shall consult with the Owner for the location of the installation.
- E. Terminal cabinets with hinged, lockable red covers shall be provided at all junction points. Terminal cabinets shall be Space Age TC2 series or approved equal and labeled "FIRE ALARM TERMINAL BOX". All conductor splices shall be made on screw-type terminal blocks – wire nuts, butt, crimp or screw type connectors shall not be used. All terminals within a terminal cabinet shall be properly and permanently labeled.
- F. All junction box covers shall be painted red.
- G. Raceways containing conductors identified as "Fire Alarm System" conductors shall not contain any other conductors, and no AC carrying conductors shall be allowed in the same raceway with the DC fire alarm detection and signaling conductors.
- H. The conductors for the notification appliance circuits shall not be installed in the same raceway as the conductors for signaling line circuits unless written certification from the manufacturer is supplied to the Owner indicating that the inclusion of these circuits in the same raceway is acceptable and that no additional consideration is needed for these circuits.
- I. Conductors shall be tested in accordance with the requirements of 2013 NFPA 72, Chapter 14, Table 14.4.3.2, Test Methods, #15 – Conductors Metallic and #16 – Conductors non-metallic. To ensure all wiring meets this requirement, the wiring shall be tested by the Contractor. All values identified during the testing shall be recorded for each conductor, signed by the Contractor, and forwarded to the supplier and the Owner. No connections to the FACU shall be made until the system wiring has been accepted by the equipment supplier.
- J. All wiring for the initiating devices, notification appliances and remote 80 character LCD display shall be solid or stranded copper and shall comply with the appropriate sections of the *National Electrical Code*. All system wiring size shall be as determined suitable by the manufacturer and in compliance with the *National Electrical Code*, yet they shall not be any smaller than as specified herein.
- K. Unless otherwise indicated on the design drawings, the following minimum sizes of conductors shall be used for all new wiring:

1. Power Supply Conductors (Primary and Secondary)	No. 12 AWG
2. Signaling Line Circuit Conductors	No. 18 AWG
3. LCD Remote Alarm Annunciators	No. 18 AWG
4. Notification Appliance Circuits	No. 14 AWG
5. 24VDC Power Conductors	No. 14 AWG
6. Supervisory Conductors	No. 18 AWG
- L. Color coding of conductors shall be approved by the Owner and the authorities having jurisdiction. Color coding shall be as follows:

1. SLC & FAA	Red Jacket
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|---------------------------------|--------------|
| 2. Horn Circuits | Blue Jacket |
| 3. Strobe Circuits | White Jacket |
| 4. Power Circuits | Black Jacket |
| 5. Relay/Supervisory Conductors | Red Jacket |
| 6. Grounding Conductors | Green Jacket |

- M. Exposed raceways shall be run parallel and perpendicular to the walls and ceilings. Diagonal wiring is not acceptable. Wherever practical, exposed raceways shall be run on the ceiling as close as possible to a wall or as high as possible on a wall. Where exposed raceways shall cross under a structural beam or rib, they shall be run down on one side of the beam or rib, across its bottom, and up to the ceiling on the other side of the beam or rib. No spanning from beam to beam or rib to rib shall be permitted. The use of a raceway body on one side of a beam or rib shall be permitted provided it shall be readily accessible. Where metal raceway is installed exposed, it shall be painted to match the walls and/or ceilings on which it is installed, as instructed by the Owner. The method and location of all exposed raceways shall be approved by the Owner prior to start of any installation work.
- N. Concealed plenum rated fire alarm cable shall be installed parallel and perpendicular to the walls and ceilings. Diagonal wiring is not acceptable. The cable shall be suspended from structure only with j-hooks or other approved means in accordance with NFPA 70 and the manufacturer recommendations. The cable shall be installed close to the structure above with no excessive cantilevered lengths. Suspending fire alarm cable from piping, cable trays, ductwork, or any other building element aside from structure is prohibited.
- O. Fault isolator modules shall be furnished as required and shall be mounted as directed by the manufacturer. The field location of the fault circuit isolators shall be labeled so that the devices may be easily located, and that location shall be noted on the point-to-point and as-built drawings.
- P. The power employed to operate the fire alarm and occupant notification system shall have a high degree of reliability and capacity for the intended service. Connections to this power service shall be made on a dedicated branch circuit(s). The circuit shall be mechanically protected.
- Q. The electrical supply to the FACU shall be equipped with a dedicated fused disconnect with a handle that can be locked in the **“power on”** position. This disconnect is to be provided at the connection to the normal power supply serving the FACU. Circuit disconnecting means shall have a red marking, shall be accessible to authorized personnel, and shall be identified as **“FIRE ALARM CIRCUIT CONTROL.”** The location of the circuit disconnecting means shall be permanently identified on a nameplate installed on the inside of the FACU.
- R. All wiring within the control unit shall be neatly served in the panel gutters and be secured by means of Thomas & Betts "Ty-Raps" or by other approved means.
- S. Devices and/or enclosures containing end-of-line resistors shall be labeled **“EOLR”**. Labels shall be of professional quality and not hand-written.

3.04 Panting and Patching

- A. All fire alarm raceway shall be thoroughly cleaned, removing all dirt, oil, etc. and made ready to receive paint.
- B. Holes or penetrations shall be permitted to be cut only in locations specifically approved by the Owner. Holes in walls or floors cut during the performance of this work shall be patched so as to completely conceal the cuts where they would otherwise be exposed to view. Patched surfaces shall be prepared to accept final finishes that match the finish of the existing adjacent surfaces so as to completely conceal patched holes. Final finishes shall be approved by the Owner and will be the responsibility of the Contractor to provide. Access panels may be installed at those locations approved by the Owner in lieu of patching.
- C. All holes or cuts revealed by the removal of existing fire alarm system devices, equipment or circuits

shall be patched appropriately for the finish of the wall.

- D. Fire stop all penetrations of fire rated assemblies. It is the Contractor's responsibility to survey all penetration locations and determine if a fire rated assembly is penetrated.
- E. Notify the Owner immediately if decaying conditions or hazardous materials (asbestos, lead, etc.) are encountered at any time.

3.05 Testing

- A. Upon completion of the system, the Contractor must perform a complete and comprehensive test of the entire system (all buildings at once) in accordance with the provisions of the Uniform General Conditions and Supplementary General Conditions and NFPA 72. All testing shall be captured and documented electronically and provided to the Owner as part of the testing.
- B. It is the responsibility of the Contractor to demonstrate to the Owner that the system is installed and functions in accordance with the project documents and applicable codes.
- C. Specific Tests
 - 1. An acceptance test will be conducted at the completion of the project. The test will be the responsibility of the Contractor and must be performed in strict compliance with the provisions of NFPA 72. The Contractor shall provide a signed Fire Alarm System Inspection and Testing Form for the individual system in each building, consisting of completed copies of the appropriate pages from NFPA 72.
 - 2. In addition to the provisions of NFPA 72 and/or the above paragraph, it is the responsibility of the Contractor to provide all of the following:
 - a) Smoke detector sensitivity report.
 - b) Pressure differential readings for duct detector sample air flow.
 - c) Closed loop resistance and EOL resistance readings for all field wiring.
 - d) Programming volatility test.
 - e) Intelligibility and sound pressure readings.
 - 3. Fix Deficiencies:
 - a) A copy of the punch out list shall be provided to the Contractor for the correction of the noted deficiencies. The Contractor shall notify the Owner in writing that the deficiencies have been corrected along with a copy of the punch out list with the corrected deficiencies initialed by the Contractor to indicate the corrections.
 - b) The Contractor shall provide updated certification forms as set forth in Section II Certification of this document.
 - 4. Retest:
 - a) Each deficient item shall be retested by the Contractor. Retesting of the system shall be conducted in accordance with 2013 NFPA 72, Table 10.4.3.2, Test Methods. If any software changes are made to the system updated site-specific software print out with all changes highlighted will be submitted to the verifying party prior to the start of retesting.
 - 5. Certification:
 - a) The Verifying Party shall then retest each portion of the system affected by the corrections. If no additional deficiencies are found, the Verifying Party shall issue a Certification Letter stating that they have tested the system and certify that it complies with the appropriate sections of NFPA 72.

Such certification shall not contain any disclaimers or similar comments. If additional deficiencies are found, the testing process shall be repeated and the Contractor shall be responsible for additional Verifying Party testing at a rate of \$1,940 per day

6. Acceptance:

- a) Upon receipt of all documents from the final "Contractor's Certification" and the "Verifying Party Certification," the Owner will conduct 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, they will accept the system. If additional deficiencies are found, the testing process will repeat and the Contractor will be required to correct the deficiencies, retest and recertify the system. Such retesting shall include Supervision testing of 100% of the Initiating Device Circuits, Notification Appliance Circuits, and Signaling Line Circuits. The Verifying Party shall then retest each portion of the system affected by the corrections; the Contractor shall be responsible for additional Verifying Party testing at a rate of \$1,940 per day. If no additional deficiencies are found, the Third Party shall reissue a Certification.

6. Additional Tests

- a) Additional testing shall be performed as required by the Owner in accordance with the Uniform General Conditions and Supplementary General Conditions.

3.06 Training

- A. Upon completion of the installation, the Contractor must perform complete and comprehensive training of the system to personnel as designated by the Owner. Training shall include one 4-hour session to train personnel on the proper use of and response to the system. Training shall be per building.

3.07 Spare Parts

- A. Upon completion of the installation, the Contractor shall provide spare parts to the Owner. The spare parts shall match the make and model of the equipment installed as part of the project.
- B. The following spare parts (count in parenthesis) shall be provided:
 - 1. Addressable spot-type smoke detector (5)
 - 2. Addressable spot-type heat detector (2)
 - 3. Addressable duct smoke detector with 10-ft sampling tube and remote test station (2)
 - 4. Addressable monitor module (5)
 - 5. Addressable control relay module (5)
 - 6. Addressable manual pull station (5)
 - 10. Ceiling-mounted horn-strobe with multiple candela setting, 95 cd max (2)
 - 11. Ceiling-mounted horn (2)
 - 12. Ceiling-mounted strobe with multiple candela setting, 95 cd max (2)
 - 14. Exterior rated weatherproof electric bell (2)

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- 15. Weatherproof wall-mounted horn-strobe with multiple candela setting, 110 cd max (2)
- 16. Notification appliance power supply panel (2)
- 17. Fire alarm control unit (1)
- 18. Isolation module (5)

END OF SECTION