#### SECTION 28 05 00

## COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
  - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - B. Section includes general requirements for all Division 28 sections: submittals, inspections, permits, substitutions and training. Reference Division 1 of specifications.

## 1.2 SUMMARY

- A. Section Includes:
  - 1. Electronic safety and security equipment coordination and installation.
  - 2. Sleeves for raceways and cables.
  - 3. Sleeve seals.
  - 4. Grout
  - 5. Common electronic safety and security installation requirements.
- 1.3 DEFINITIONS
  - A. EPDM: Ethylene-propylene-diene terpolymer rubber.
  - B. NBR: Acrylonitrile-butadiene rubber.
- 1.4 SUBMITTALS
  - A. All data for Division 28 must be submitted as a single package as the Engineer will commence review only when all data has been received. Submit shop drawings and product data grouped by Section as indicated in the "Electronic Safety and Security Submittal Register" at the end of this section. Electronic submittals are acceptable in accordance with Paragraph B below. Engineer will commence review only when all data has been received in the format required. Incomplete submittals will be returned to sender.
  - B. Electronic submittals will be reviewed when allowed by the Prime Design Professional (Architect or Other Engineer.) Electronic submittals will be reviewed provided the following conditions are met.
    - 1. Complete submittals in pdf format will be reviewed by CSI Specification Division
    - 2. All data for Division 27 must be submitted as a single package as the Engineer will commence review only when all data has been received.
    - 3. Submittals linked to a manufacturer's web site will not be reviewed
    - 4. Re-submittals must highlight changes from previous submittals.
    - 5. Mixed submittals (part paper and part electronic) will not be reviewed.
  - C. The Contractor shall determine and verify field measurements and field construction criteria for conformance with Drawings and Specifications and for conflicts with other items of Construction past or present. He shall coordinate each submittal with the requirements of the Work and of the Contract Documents and notify the Engineer in writing, at the time of the submission, of any and all deviations in the submittals from requirements of the Work and Contract Documents.
  - D. No fabrication or work which requires submittals shall begin until submittals are returned with the Engineer's approval.
  - E. Engineer's review does not constitute acceptance or responsibility for accuracy or dimensions, nor shall it relieve the Contractor from meeting any requirements of the Work and Contract Documents, nor shall it constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each

such variation. The Engineer's review will not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings.

F. Submit copies of materials for submittal review as required by Division 1.

## 1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
  - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
  - 2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
  - 3. To allow right of way for piping and conduit installed at required slope.
  - 4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
- C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
- D. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping".

## 1.6 FINAL INSPECTIONS

A. Engineer will make periodic inspections as appropriate and deemed necessary by Engineer. One final inspection for completion of project will be performed by the Engineer. Any and all additional inspections requested by the Contractor or required because of contractor's failure to complete Scope of Work shall be paid for by the Contractor. The cost of additional inspection(s) shall be deducted from the contract amount stated in the agreement between the Owner and the Contractor. Costs for additional inspections shall be assessed at the Engineer's hourly rates.

#### 1.7 PERMITS

A. Permits necessary for the performance of the work under this contract shall be secured and paid for by the Contractor. Final inspection by the Engineer will not be made or certificate of final payment issued until certificates of satisfactory inspection from the inspection authorities are delivered.

## 1.8 SUBSTITUTIONS

- A. Prior approval required. When required by Division 1 of the Specifications, materials and equipment in Division 28 will be reviewed for prior approval. Bidder is required to document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- B. Basis of Design. Equipment/materials indicated in schedules and details shown on the plans form the Basis of Design for this project. Alternate equipment/materials proposed by the contractor must match the specified in dimension, configuration, weight, electrical requirements, etc. Any revision to plans necessary to accommodate the alternate equipment will be the responsibility of the contractor and be reflected in a shop drawing prepared by the contractor and approved by the Engineer.

## 1.9 TRAINING

A. The contractor shall conduct a 4 hour minimum training session with owner designated staff to review all special systems equipment installed under this contract. At a minimum, the session will include operation and maintenance, programming, and basic operation of

the systems. Contractor shall physically demonstrate the operation of each piece of equipment. A sign in sheet and agenda indicating a list of all equipment reviewed shall be included in the close out documents.

#### PART 2 - PRODUCTS

- 2.1 SLEEVES FOR RACEWAYS AND CABLES
  - A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
  - B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
  - C. Sleeves for Rectangular Openings: Galvanized sheet steel.
    - 1. Minimum Metal Thickness:
      - a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
      - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

## 2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    - a. Advance Products & Systems, Inc.
    - b. Calpico, Inc.
    - c. Metraflex Co.
    - d. Pipeline Seal and Insulator, Inc.
  - Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
  - 4. Pressure Plates: Plastic. Include two for each sealing element.
  - 5. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.
- 3.2 GROUT
  - A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

#### PART 3 - EXECUTION

#### 3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

- A. Comply with NECA 1.
- B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- E. Right of Way: Give to piping systems installed at a required slope.
- 3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS
  - A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
  - B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
  - C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
  - D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
  - E. Cut sleeves to length for mounting flush with both surfaces of walls.
  - F. Extend sleeves installed in floors 2 inches above finished floor level.
  - G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.
  - H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
  - I. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
  - J. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants".
  - K. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."
  - L. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
  - M. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
  - N. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

#### 3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

#### 3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

#### 3.5 EXISTING SERVICES

- A. The Contractor shall carefully examine the drawings and specifications, visit the site of the work, fully inform himself as to all existing conditions, dimensions and limitations before starting work.
- B. If existing active or non-active services (which are not shown on plans) are encountered that require relocation or disconnection, the Contractor shall notify the Engineer for a decision on proper handling of these services. The Contractor shall not proceed with the work until so authorized.

## 3.6 SUBSTANTIAL COMPLETION AND FINAL INSPECTION REQUIREMENTS

- A. Before Substantial Completion can be granted, the following items must be completed and submitted to the Owner/Engineer.
  - 1. Operation test.
  - 2. Control diagrams, wiring diagrams, control sequences, and engineering data on components.
  - 3. 4 hour training session of owner representative on maintenance, operation and control of all equipment.
- B. Prior to the Final Inspection or consideration of Final Payment, the Contractor shall:
  - 1. Provide copies of permits and/or inspection certificates.
  - 2. Provide a Check-out report.
  - 3. Provide Operating and Maintenance Manual(s).
  - 4. Provide Record as-built Drawings.
  - 5. Return keys to the Owner.
  - 6. Deliver all spare parts.
  - 7. Touch up any damaged finishes.
  - 8. Provide a copy of attendance roster for equipment training sessions.

## ELECTRICAL SUBMITTAL REGISTER

## PROJECT NAME:\_\_\_\_\_ GENERAL CONTRACTOR:\_\_\_\_\_

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SPEC SECTIO N#	SUBMITT AL REQUIRE D	DESCRIPTION OF SUBMITTAL	DATE SUBMITT AL RECEIVE D	ACTION/DA TE	RE- SUBMIT DATE	FINAL ACTION DATE	REMARKS	O & M REC.	O & M APP.
280500	Х	COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY							
281500	Х	ACCESS CONTROL HARDWARE DEVICES							
282000	Х	VIDEO SURVEILLANCE							
284621.1 1	Х	ADDRESSABLE FIRE ALARM SYSTEMS							

END OF SECTION 280500

#### SECTION 28 10 00

## ACCESS CONTROL

## PART 1 - GENERAL

#### 1.01 SECTION INCLUDES

- A. Card readers.
- B. Credentials.
- C. Door contact/door position switch.
- D. Door controllers.
- E. Access Control Software
- F. Wiring.
- G. Request to Exit (REX).
- H. Electric power hinge.
- I. Wireless door lock panel interface module.

#### 1.02 REFERENCES

- A. Reference Standards
  - 1. ANSI/BICSI 005-2016, Electronic Safety and Security (ESS) System Design and Implementation Best Practices.
  - 2. BICSI TDMM, 13th Edition.
  - 3. NFPA 70®, National Electric Code® (currently adopted edition).
  - 4. NFPA 70E®, Standard for Electrical Safety in the Workplace®.

#### **1.03 ADMINISTRATIVE REQUIREMENTS**

A. Coordination

1. Coordinate work carefully with the Architect, General Contractor, Electrical Contractor and other trades as required.

B. Pre-installation Meetings

1. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

C. Scheduling

1. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

#### 1.04 SUBMITTALS

- A. See Section 01 3000 Administrative Requirements, for submittal procedures.
- B. Product Data

1. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

C. Shop Drawings

1. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

#### 1.05 CLOSEOUT SUBMITTALS

A. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

- **1.06 QUALITY ASSURANCE** 
  - A. Basis of Design

1. Comply with requirements specified in Section 01 4000 and Section 01 6000.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

A. See Section 28 05 00 – Common Work Results for Electronic Safety and Security, for additional requirements.

1.08 SITE CONDITIONS

A. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

#### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Credential readers.
  - 1. Owner provided. DR4200 series multi technology by Blackboard/Transact
  - 2. Substitutions: Not permitted.
- B. Credentials.
  - 1. Owner provided. Multi technology by Blackboard/Transact
  - 2. Substitutions: Not permitted.
- C. Door contact/door position switch.- Hardwired doors only.
  - 1. GE Sentrol 1076C <sup>3</sup>/<sub>4</sub>" wide gap for recessed applications.
  - 2. Ademco Model 7939 with cover to match finish for surface mount applications.
  - 3. GE Sentrol 2200 Series for overhead door applications.
  - 4. Substitutions: Permitted with approval.
- D. Door controllers

ACCESS CONTROL

1. Owners provided. Blackboard/Transact SA3032, SA3000 Series (master and one door) plus input/out modules. Blackboard enclosure/power supply.

- 2. Substitutions: Not permitted.
- E. Access Control Software
  - 1. Owner provided. Blackboard/Transact
  - 2. Substitutions: Not permitted
- F. Wiring
  - 1. Belden, West Penn, Honeywell or General Cable

2. Cables for electronic access-controlled doors shall be bundled and include the followings conductor counts:

- a. Card readers and Key Pads 6 conductors, 22 AWG shielded.
- b. Lock power 2 conductors, 18 AWG unshielded.
- c. Door contact 2 conductors, 22 AWG unshielded

d. Request to exit and/or latch detection/spare – 4 conductors, 22 AWG unshielded

e. Honeywell WG32955099 Composite cable may also be used.

f. Doors supported by ADA door openers are to be supplied with an additional 4/18 AWG cable from the MDF to the ADA controller.

- G. Request to Exit (REX) Hardwired doors only.
  - 1. Bosch DS160
  - 2. Substitutions: Permitted with approval.
- H. Electric Power Hinge
  - 1. Von Duprin EPT-10
  - 2. Substitutions: Not permitted.
- I. Wireless Door Lock Panel Interface Module
  - 1. Owner provided. Allegion PIM400-485
  - 2. Substitutions: Not permitted.

#### PART 3 - EXECUTION

#### 3.01 INSTALLATION

A. Install all credential readers, door controllers and associated door status per the manufacturer's written instructions.

B. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

#### ACCESS CONTROL

#### 3.02 CLEANING

A. Waste Management

1. See Section 28 0500 – Common Work Results for Electronic Safety and Security, for additional requirements.

#### 3.03 CLOSEOUT ACTIVITIES

#### A. Testing

1. Test system for proper function.

**B.** Inspection

1. The project manager shall inspect the access control for proper placement and installation practices.

2. Card readers found to be incomplete or installed in a manner not conforming to code, standards and/or industry best practices shall be correctly re-installed and tested at no additional cost to the Owner.

## C. Labeling

1. See Section 28 0553 – Identification for Electronic Safety and Security, for additional requirements.

D. As-builts

1. Card readers, door controllers and contacts/door position switches shall be added to the As-builts.

2. Comply with Section 28 0500 – Common Work Results for Communications Systems, for additional requirements.

END OF SECTION 28 10 00

## SECTION 28 31 11 FIRE ALARM

#### PART 1 – GENERAL

## 1.1. SUMMARY

- A. This Section covers fire alarm systems, including initiating devices, notification appliances, controls, and supervisory devices.
- B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.
- C. The Fire Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:
  - 1. Fire alarm system detection and notification operations.
  - 2. Control and monitoring of elevators, smoke control equipment, door holdopen devices, fire suppression systems, and other equipment as indicated in the drawings and specifications.

## 1.2. ENGINEERS

A. The Engineer shall conform to all the requirements of this document and shall include all pertinent requirements of the document in the job specifications. Only sections not required for a particular job may be omitted. Any alteration, deletion or omittance of the requirements must be approved by Fort Lewis College. Any job specifications not meeting these requirements shall be rejected.

## 1.3. ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

- A. Manufacturers: The equipment and service described in this specification shall be supplied and supported by the existing SimplexGrinnell only.
- B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.
- C. The equipment and service provider shall be a nationally recognized company specializing in fire alarm and detection systems. This provider shall employ factory trained and NICET certified technicians. The equipment and service provider shall have a minimum of 10 years' experience in the fire protective signaling systems industry.

## 1.4. SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded addressable, microprocessorbased fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.

- B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory. System shall be capable of storing dual configuration programs with one active and one in reserve. Panel shall be capable of full system operation during a new configuration download.
- C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble logshall be provided.
- D. Wiring/Signal Transmission
  - 1. System connections for signaling line circuits shall be Class B, Style 4 and notification appliance circuits shall be Class B, Style Y.
  - 2. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
- E. Remote Access
  - 1. A personal computer or technician's laptop, configured with terminal emulation software shall have the ability to access the FACP for diagnostics, maintenance reporting and information gathering.
- F. Required Functions: The following are required systemfunctions and operating features
  - Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority, respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower- priority condition occurred first. Annunciate all events regardless of priority or order received.
  - 2. Transmission to an approved Supervising Station: Automatically route alarm, supervisory, and trouble signals to an approved supervising station service provider, under another contract.
  - 3. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the type of device, the operational state of the device (i.e. alarm, trouble or supervisory) and shall display the custom label associated with the device.
  - 4. General Alarm: A system general alarm shall include:
    - a) Indication of alarm condition at the FACP and the annunciator(s).
    - b) Identification of the device that is the source of the alarm at the FACP and the annunciator(s).
    - c) Operation of audible and visible notification appliances until silenced at FACP.

- d) Closing doors normally held open by magnetic door holders.
- e) Unlocking designated doors.
- f) Shutting down supply and return fans where alarmis initiated.
- g) Closing smoke dampers on system where alarmis initiated.
- h) Initiation of smoke control sequence.
- i) Transmission of signal to the supervising station.
- j) Initiation of elevator Phase I functions (recall, shunt trip, illumination of indicator in cab, etc.), when specified detectors or sensors are activated, as appropriate.
- 5. Supervisory Operations: Upon activation of a supervisory device such as a low air pressure switch and tamper switch, the system shall operate as follows:
  - a) Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.
  - b) Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off- normal condition.
  - c) Record the event in the FACP historical log.
  - d) Transmission of supervisory signal to the supervising station.
  - e) Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
- 6. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.
- 7. System Reset
  - a) The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
  - b) Should an alarm condition continue the system will remain in an alarmed state.
- 8. WALKTEST: The system shall have the capacity of 8 programmable passcode protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one-person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:
  - a) The city circuit connection and any suppression release circuits shall be bypassed for the testing group.
  - b) Control relay functions associated with one of the 8 testing groups shall be bypassed.
  - c) The control unit shall indicate a trouble condition.

- d) The alarm activation of any initiating device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.
- e) The unit shall automatically reset itself after signaling is complete.
- f) Any opening of an initiating device or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.
- G. Analog Smoke Sensors
  - 1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
  - 2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
  - **3**. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
  - 4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
  - 5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. The first level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported to the Supervising Station. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
  - 6. The FACP shall continuously perform an automatic self-test on each sensor that will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
  - 7. Programmable bases: It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
  - 8. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

- H. Audible Alarm Notification: By horns and speakers in areas as indicated on drawings.
- I. Fire Suppression Monitoring
  - 1. Water flow: Activation of a water flow switch shall initiate general alarm operations.
  - 2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
- J. Power Requirements
  - 1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
  - 2. Components include battery, charger, and an automatic transfer switch.
  - 3. All circuits requiring system-operating power shall be 24VDC and shall be individually fused at the control unit.
  - 4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
  - 5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
  - 6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
  - 7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
  - 8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

K. Fire alarm system shall be integrated into existing Simplex or Notifier workstations located in the Physical Plant Services offices. Include all costs for providing backbone communications between individual fire alarm systems and designated workstations using existing FLC fiber infrastructure.

## 1.5. QUALITY ASSURANCE

A. Each and every item of the Fire Alarm System shall be listed under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

## 1.6. EXTRA MATERIALS

- A. General: Furnish extra materials, packaged with protective covering for storage, and identified with labels clearly describing contents as follows:
  - 1. Manual Stations: Furnish quantity equal to 15 percent of the number of

manual stations installed, but not less than one of each type.

- 2. Notification Appliances: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
- 3. Smoke Detectors or Sensors, Fire Detectors, Duct Detectors and Flame Detectors: Furnish quantity equal to 10 percent of each type and number of units installed but not less than one of each type.
- 4. Sensor Bases: Furnish quantity equal to 10 percent of each type and number of units installed but not less than one of each type.

#### PART 2 – APPROVED PRODUCTS

- 2.1. FIRE ALARM CONTROL PANEL (FACP) 4100ES
  - A. The following FACP hardware shall be provided:
    - 1. Emergency Voice/Alarm Communications Equipment.
    - 2. Flexible User Interface.
  - B. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.

## 2.2. REMOTE LCD ANNUNCIATOR 4603-9101

- A. Provide a remote LCD Annunciator, where required, with the same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys; Status LEDs and LCD Display as the FACP.
- B. Annunciator shall have super-twist LCD display with two lines of 40 characters each. Annunciator shall be provided with four (4) programmable control switches and associated LEDs.
- C. Under normal conditions the LCD shall display a "SYSTEMIS NORMAL" message and the current time and date.
- D. Should an abnormal condition be detected the appropriate LED (Alarm, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.
- E. The LCD shall display the following information relative to the abnormal condition of a point in the system:
  - 1. 40 character custom location label.
  - 2. Type of device (e.g., smoke, pull station, water flow).
  - 3. Point status (e.g., alarm, trouble).
- F. Operator keys shall be key switch enabled to preventunauthorized use. The key shall only be removable in the disabled position. Acknowledge, Silence and Reset operation shall be the same as the FACP.

## 2.3. ADDRESSABLE MANUAL PULL STATIONS 4099-9003

A. Description: Addressable double-action push/pull type. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

## 2.4. SMOKE SENSORS & BASES

- A. Type: Photoelectric Sensor Smokes 4098-9714.
- B. Base: Standard Base 4098-9792.
- C. Duct Smoke Sensor: Duct Detector with Relay 4098-9756 photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay for fan shutdown.
  - 1. Test Switch 2098-9806 each duct smoke sensor shall have a Remote Test Station with an alarm LED and test switch.
  - 2. Where indicated provide a NEMA 4X weatherproof duct housing enclosure that shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

## 2.5. HEAT SENSORS 4098-9733

A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plugin base and alarm indication lamp; 135-deg Ffixed- temperature setting except as indicated.

## 2.6. VERY EARLY SMOKE DETECTION SYSTEM VLC-600

A. Provide an air sampling smoke detection system (Very Early Smoke Detection Apparatus - VESDA) for each area shown in the Contract Documents. Provide a LaserCOMPACT air sampling smoke detection system for areas up to 8000 sq. ft. in accordance with manufacturer's recommendations.

## 2.7. ADDRESSABLE CIRCUIT INTERFACE MODULES

- A. There shall be the following types of modules:
  - 1. Type 1: Individual Addressable Module (IAM) 4090-9001
    - a) Receive both power and communications from a two- wire MAPNET II or IDNet circuit. They provide location specific addressability to a single initiating device (such as single station smoke detector alarm contacts or heat detector contacts) or multiple devices at the same location by monitoring normally open dry contacts and the wiring to an end-of-line resistor.
  - 2. Type 2: IDNet Relay IAM (RIAM) 4090-9002

- a) IDNet Relay IAMs allow fire alarm control panels to control a remotely located Form "C" contact using IDNet addressable communications for both data and module power. Typical applications would be for switching local power for control functions such as elevator capture, or control of HVAC components, pressurization fans, dampers, etc. Relay status is also communicated requiring only one device address.
- B. Addressable Circuit Interface Modules: Arrange to monitor or control one system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of water flow, valve tamper, non-addressable devices, and for control of AHU systems.

## 2.8. MAGNETIC DOOR HOLDER

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Unit shall operate from a 24VDC source and develop a minimum of 25 lbs. holding force.
- B. Material and Finish: Match door hardware.

## 2.9. STANDARD ALARM NOTIFICATION APPLIANCES

- A. Horn 4901-9820: Piezoelectric type horn shall be listed to UL 464. The horn shall have a minimum sound pressure level of 85 dBA@ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings.
- B. Visible/Only 4906-9101: Strobe shall be listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.
- C. Audible/Visible 4906-9127: Combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 85 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings.
- D. Speaker/Visible 4906-9151: Combination Speaker/Visible (S/V) units combine the speaker and visible functions into a common housing.
  - 1. Twisted/shielded wire is required for speaker connections on a standard 25VRMS or 70.7VRMS NAC.
  - 2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.

- 3. The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12 kHz for general signaling.
- 4. The S/V installs directly to a 4" square, 1  $\frac{1}{2}$ " deep electrical box with 1  $\frac{1}{2}$ " extension.
- E. Speaker/Visible Wheelock E50-24MCWH-FR: Combination Speaker/Visible (S/V) unit.
  - 1. Twisted/shielded wire is required for speaker connections on a standard 25VRMS or 70.7VRMS NAC.
  - 2. The following taps are available: 1/8 watt up to 2 watts.
  - **3.** High efficiency design for maximum output at minimum wattage across a frequency range of 400 to 4000 HZ.
  - 4. Wall mounted S/V with field selectable candela settings of 135/185cd.
  - 5. Mount to 4" square x 2-1/8" deep back box with no extension ring required.
- F. Speaker 4902-9716:
  - 1. The speaker shall operate on a standard 25VRMS or 70.7VRMS NAC using twisted / shielded wire.
  - 2. The following taps are available: 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker has minimum UL rated sound pressure level of 84dBA at 10 feet.
  - **3**. The S/V shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12 kHz for general signaling.
  - 4. The S/V installs directly to a 4" square, 1  $\frac{1}{2}$ " deep electrical box with 1  $\frac{1}{2}$ " extension.
- G. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a temporal cadence operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.
- H. System Sensor P2RK & LENS-A
  - 1. The SpectrAlert Advance P2RK is a weatherproof, red, two- wire, outdoor horn strobe with selectable strobe settings of 15, 15/75, 30, 75, 95, 110 and 115 cd. Outdoor back boxincluded.
  - 2. The SpectrAlert Advance LENS-A is amber lens used for any indoor or outdoor wall mount strobes.
- I. Accessories: The contractor shall furnish any necessary accessories.

## 2.10. NAC POWER EXTENDER 4009-9201

A. The IDNet NAC Power Extender panel shall be a stand-alone panel capable of

powering a minimum of 4 notification appliance circuits. Notification appliance circuits shall be Class B, Style Y rated at 2 amps each. Panel shall provide capability to be expanded to 8 notification appliance circuits.

B. The NAC extender panel will be mount next to the host control panel.

## 2.11. ALTRONIX DC POWER SUPPLY AL600ULX

A. Red enclosure, power supply/charger converts an 115VAC60Hz input, to a continuous supply current @ 12VDC or 24VDC non- power limited output.

## 2.12. FIRERAY 3000 or 5000 BEAM DETECTOR

A. In high-ceiling areas, such as atriums, where spot-type smoke detectors are not accessible for periodic maintenance and testing, projected beam-type detectors should be used where access can be provided.

#### PART 3 – EXECUTION

- 3.1. INSTALLATION, GENERAL
  - A. Install system components and all associated devices in accordance with applicable NFPA Standards.
  - B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems.
    Examples of qualified personnel shall include, but not be limited to, the following:
    - 1. Factory trained and certified personnel.
    - 2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
    - 3. Personnel licensed or certified by state or local authority.

## 3.2. EQUIPMENT INSTALLATION & PROGRAMMING

- A. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
- B. All Duct Detectors will have:
  - a) PAM-SD's.
  - b) 24VDC from FACP.
  - c) Remote switch mounted no higher then 5 feet.
- C. FACP will be located in the telecommunications room where the fiber optics is located.

- D. All NAC Extenders will be mounted next to FACP.
- E. FACP will be added to fire alarm fiber optic network.
- F. All exterior A/V devices will be waterproof.
- G. All Graphic point descriptors will include room numbers.
- H. Fire Department building access will have a remote annunciator.
- I. Remote annunciator will be programmed to display fire only.
- J. VESDA will be installed on all raised floors requiringsmoke detection.
- K. Building's interior will use speaker, visual or speaker/visual for notification.
- L. Building's exterior will use horn/strobe for notification, waterflow A/V lens clear, general alarm A/V lens amber.
- M. "T" tapping or splicing of conductors is prohibited.
- N. 120VAC outlet will be mounted next to FACP.
- O. Install all fire alarm cabling in metallic conduit and boxes.

## 3.3. CABLING INSTALLATION

- A. Wire Insulation Color Coding
  - 1. Signal Circuits: Blue insulation on positive (+) conductor, White insulation on negative (-) conductor.
  - 2. 24VDC Circuits: Red insulation on positive (+) conductor, Black insulation on negative (-) conductor.
  - **3.** Door Holder Circuit: Yellow insulation on positive (+)conductor, Brown insulation on negative (-) conductor.
  - 4. SLC Circuit: Red Jacket.
  - 5. Speaker Circuit: Blue Jacket.

## B. Wiring Type

- 1. Signal, Door Holder, Sounder Base and 24VDC Circuits:
  - a) THHN 14 AWG, stranded-copper conductors with 600-V rated, 75 degrees C, color-coded insulation.
- 2. SLC:
  - a) 18/2 Twisted, Unshielded Plenum FPLP Red Jacket, Solid-copper conductors with 300-V rated, 75degrees C, color coded insulation. Anixter FA-1802C-1-2N- 03.
- 3. Speakers:

- a) 18/2 Twisted Shielded Plenum FPLP Blue Jacket, solid-copper conductors with 300-V rated, 75 degrees C, color-coded insulation. Anixter FA-1802C-1-2S- 06.
- C. All fire alarm cable shall be installed in EMT
- D. EMT, junction boxes, device boxes and covers shall be painted red enamel.
- E. Install input wire from FACP to Energy Management System for EMS shutdown.

## 3.4. FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Provide services of a factory- authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
- B. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
  - 1. Factory trained and certified.
  - 2. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
  - 3. International Municipal Signal Association (IMSA) fire alarm certified.
  - 4. Certified by a state or local authority.
  - 5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
- C. Inspection
  - 1. Inspect equipment installation, interconnection with system devices, mounting locations, and mounting methods.
  - 2. Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
- D. Acceptance Operational Tests
  - 1. Perform operational system tests to verify conformance with specifications:
    - a) Each alarm initiating device installed shall be operationally tested. Each device shall be tested for alarm and trouble conditions. Contractor shall submit a written certification that the Fire Alarm System installation is complete including all punch-list items. Test battery operated emergency power supply. Test

emergency power supply to minimum durations specified. Test Supervising Station Signal Transmitter. Coordinate testing with Supervising Station monitoring firm/entity.

- b) Test each Notification Appliance installed for proper operation.
- c) Test Fire Alarm Control Panel and Remote Annunciator.
- 2. Provide minimum 10 days' notice of acceptance test performance schedule to Owner, and local Authority Having Jurisdiction.
- 3. Certification of point to graphics will be performed.
- E. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
- F. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Use NFPA 72 Forms for documentation.
- G. Final Test, Record of Completion, and Certificate of Occupancy:
  - 1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy. Provide completed NFPA 72 Record of Completion form to Owner and AHJ.

## 3.5. CLEANING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

## 3.6. TRAINING

- A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
  - 1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8

hours' training.

2. Schedule training with the Owner at least seven daysin advance.