SECTION 280000 - ELECTRONIC SAFETY AND SECURITY

PART 1 – GENERAL

1.1 GENERAL

A. The purpose of this specification is to describe the requirements for the Security Systems for the Fair Lawn BOE SCHOOL. The following systems shall be provided and installed;

1. IP PoE Surveillance CCTV System will be utilized for monitoring the outside perimeters of the School, to include building approaches, parking lots, and playgrounds/athletic fields. The system will also monitor the main access into the building for visitor identification. The system will operate locally and will also allow for remote access over the Authority's WAN by authorized users. The IP PoE Surveillance CCTV System Network shall have cabling infrastructure and switch fabric dedicated to the application. This specification includes a video surveillance system consisting of the following:
   a. Network Video HD Recorder (NVR) and Software
   b. IP PoE cameras
   c. Data transmission wiring
   d. Control station with its associated equipment (PC and LCD Flat Panel Monitors).
2. Access Control System that shall electronically control the entrance/egress patterns of the building with equipment to lock/unlock doors based on preset and programmable building management criteria. The System will allow for door access by authorized users, utilizing card access technology. The System shall be comprised of the following:
   a. Central Monitoring System
   b. Proximity Type Access Card Reader (CR)
   c. Electric Strike (ES)
   d. Mechanical Panic Bars (P) and Electrical Panic Bars (PE)
   e. Motion Detectors (MD)
   f. System wiring infrastructure
3. Intrusion Alarm System will provide intrusion detection for designated doors and windows with hard-wired, modular, microprocessor-based controls, intrusion sensors and detection devices, and communication links to perform monitoring, alarm, and control functions. Intrusion sensors shall not be wired in series. The System shall include the following:
   a. Alarm Control Panels and keypads
   b. Magnetic Door Contacts on all ground level exterior doors
   c. Acoustical Glass Break Detectors in all ground level rooms with windows
   d. Magnetic Contacts on all ground level operable windows
   e. Dual Motion Detectors in all ground level rooms with windows
   f. System wiring infrastructure
4. A Video-Intercom Entry System installed at the main entrance and the exterior door of the Cafeteria Kitchen (for deliveries) which will allow visitors to request entry to the building. Telecommunications voice grade cable infrastructure shall be utilized to support the intercom system to provide Door Station to Master Station communications.
   a. The system shall enable staff to communicate directly with visitors, and permit visitors entrance into the facility via a door release system which will be controlled via remote devices such as door strikes from strategic locations within the building.
   b. A visitor would be able to call the Master Station intercom via a call button to gain access through a locked door. The staff would be able to verify the identity of the visitor via two-way verbal communication in conjunction with a visual verification provided by the video image and grant access to the visitor by pressing a key on the intercom Master Station. The Master Station will control all the remote intercom and door release functions.

5. There will be a Security Key in a secured lock box (Knox Box) for Fire personnel access into the building in case of an emergency, located at the main entrance. The box shall be interfaced with the Intrusion Alarm System to detect tampering.

1.2 TESTING, IDENTIFICATION AND ADMINISTRATION

A. The Authority may use any operating portion of the system prior to Acceptance.

B. Acceptance is defined as a satisfactory compliance with these specifications as determined by the Design Consultant.

C. The Contractor shall test the Security Systems connections to insure that all features specified in Division 28 are operational and working properly.

D. Contractor will insure that all Access Security and Surveillance CCTV equipment outlets, cable pairs are properly identified in accordance with TIA/EIA-606.

E. Furnish electronic record of all drawings, in software and format selected by the Authority.

F. Furnish Three (3) copies of Hardware and Software documentation to the Authority and Design Consultant.

1.3 CUTOVER AND TRAINING

A. The Contractor shall test all features upon cutover.

B. System Cut over shall not constitute acceptance or start of “Service” period.

C. The Contractor will provide Seven (7) day notice to the Authority and Design Consultant prior to Cutover.

D. Prior to Cutover, the Authority and Design Consultant will do a walkthrough of the building to ensure that all Access Security and Surveillance CCTV outlets and hardware are placed in correct locations and equipment is installed properly.

E. The Authority and Design Consultant will review cable plant with Contractor to insure proper installation. Contractor will provide training to the Authority maintenance staff and user training.

F. During Maintenance period, Contractor will provide training to the Authority for any new Software or System upgrades.

G. Cutover will take place during normal working hours.

H. The VENDOR shall train the Authority’s maintenance personnel to adjust, operate, and maintain Access Security and Surveillance CCTV Systems equipment.

1. Train the Authority’s maintenance personnel on programming equipment for starting up and shutting down, troubleshooting, servicing, and maintaining equipment.
2. For the first year, after the initial the Authority’s training the Vendor will provide up to three (3) training sessions for maintenance personnel upon the request of the Authority.
3. The Vendor will provide at a minimum three (3) user-training sessions. These sessions shall be coordinated with the Authority Technology Manager and School Principal’s office.

4. Scheduling of training and attendance will be coordinated with Authority Technology Manager and School Principal's office.

END OF SECTION 280000

SECTION 280500 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceways and cables.
2. Sleeve seals.
3. Grout.
4. Common electronic safety and security installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

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, provide products by one of 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. Nelson
   b. Hilti
   c. Specified Technologies, Inc.
   d. Metraflex Co.
   e. Pipeline Seal and Insulator, Inc.
   f. Or Approved Equal

3. Sealing Elements: 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: Include two for each sealing element.
5. Connecting Bolts and Nuts: of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, 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 3 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

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. 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.".

J. 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."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using 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.

M. 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."

END OF SECTION 280500

SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Coaxial cabling.
2. RS-232 cabling.
3. RS-485 cabling.
4. Low-voltage control cabling.
5. Control-circuit conductors.
6. Fire alarm wire and cable.
7. Identification products.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For coaxial cable, include the following installation data for each type used:

a. Nominal OD.
b. Minimum bending radius.
c. Maximum pulling tension.

B. Shop Drawings: Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Source quality-control reports.

E. Field quality-control reports.

F. Maintenance data.

1.3 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cablofil Inc.
b. Cooper B-Line, Inc.
c. Chatsworth Products Inc.
d. Or Approved Equal

2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by complying with ASTM B 633, Type 1, not less than 0.000472 inch thick.

a. Basket Cable Trays: 6 inches wide and 2 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.
b. Trough Cable Trays: 6 inches wide.
c. Ladder Cable Trays: 18 inches wide, and a rung spacing of 12 inches.
d. Channel Cable Trays: One-piece construction, 4 inches wide. Slot spacing shall not exceed 4-1/2 inches o.c.
e. Solid-Bottom Cable Trays: One-piece construction, 12 inches wide. Provide with solid covers.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

2.3 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Superior Essex

2. Belden CDT Inc.; Electronics Division.
3. CommScope, Inc.
4. Or Approved Equal

B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG59/U: NFPA 70, Type CATVR.

1. No. 20 AWG, solid, silver-plated, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Triple shielded with 100 percent aluminum polyester tape and 95 percent aluminum braid; covered by aluminum foil with grounding strip.
4. Color-coded PVC jacket.

E. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.
3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

F. RG59/U: NFPA 70, Type CATV.

1. No. 20 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum polyester tape and 40 percent aluminum braid.
3. PVC jacket.

G. RG59/U (Plenum Rated): NFPA 70, Type CMP.

1. No. 20 AWG, solid, copper-covered steel conductor; foam fluorinated ethylene propylene insulation.
2. Double shielded with 100 percent aluminum-foil shield and 65 percent aluminum braid.
3. Copolymer jacket.

H. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:

1. CATV Cable: Type CATV.
2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.

3. CATV Riser Rated: Type CATVR, complying with UL 1666.
4. CATV Limited Rating: Type CATVX.

2.4 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Leviton Voice & Data Division.
2. Superior Essex.
3. Or Approved Equal.

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.5 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Type Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.6 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM[**or CMG**].

1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Type Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.

3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.7 LOW-VOLTAGE CONTROL CABLE

A. Paired Lock Cable: NFPA 70, Type CMG.

1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Type, Paired Lock Cable: NFPA 70, Type CMP.

1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

C. Paired Lock Cable: NFPA 70, Type CMG.

1. 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

D. Plenum-Type, Paired Lock Cable: NFPA 70, Type CMP.

1. 1 pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Plastic jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.8 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, in raceway complying with UL 83.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, in raceway, power-limited cable, concealed in building finishes complying with UL 83.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.9 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden
2. Genesis Cable Products; Honeywell International, Inc.
3. West Penn Wire/CDT; a division of Cable Design Technologies.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG or size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.10 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Brady Corporation
2. Leviton
3. Panduit Corp.
4. Or Approved Equal

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

C. Cable will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.

B. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets or terminals.
2. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, and terminals.
3. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.
4. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
5. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.

6. Pulling Cable: Do not exceed manufacturer's instructions as to allowable pulling tension. Monitor cable pull tensions.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

D. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Coil cable 72 inches long shall be neatly coiled not less than 12 inches in diameter below each feed point.

E. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

3.3 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables.
3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.5 CONNECTIONS

A. Comply with requirements in Division 28 Section "Perimeter Security Systems" for connecting, terminating, and identifying wires and cables.

B. Comply with requirements in Division 28 Section "Intrusion Detection" for connecting, terminating, and identifying wires and cables.

C. Comply with requirements in Division 28 Section "Access Control" for connecting, terminating, and identifying wires and cables.

D. Comply with requirements in Division 28 Section "Video Surveillance" for connecting, terminating, and identifying wires and cables.

E. Comply with requirements in Division 28 Section "PLC Electronic Detention Monitoring and Control Systems" for connecting, terminating, and identifying wires and cables.

F. Comply with requirements in Division 28 Section "Fire Detection and Alarm" for connecting, terminating, and identifying wires and cables.

G. Comply with requirements in Division 28 Section "Refrigerant Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.6 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.7 GROUNDING

A. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding.
2. Visually inspect cable placement, cable termination, grounding, and bonding.
3. Coaxial Cable Tests: Comply with requirements in Division 27 Section "Master Antenna Television System."

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 280528 - PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Metal wireways and auxiliary gutters.
3. Surface pathways.
4. Boxes, enclosures, and cabinets.

1.2 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. GRC: Galvanized rigid steel conduit.

C. IMC: Intermediate metal conduit.

1.3 ACTION SUBMITTALS

A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Acceptable Manufacturers:

1. AFC Cable Systems, Inc.
2. Allied Tube & Conduit; a Tyco International Ltd. Co.
3. Alpha Wire Company.
4. Anamet Electrical, Inc.
5. Electri-Flex Company.
6. O-Z/Gedney; a brand of EGS Electrical Group.
7. Picoma Industries; Subsidiary of Mueller Water Products, Inc.
8. Republic Conduit.
9. Robroy Industries
10. Southwire Company.
11. Thomas & Betts Corporation.
12. Western Tube and Conduit Corporation.
13. Wheatland Tube Company; a division of John Maneely Company.
14. Or approved equal.

B. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. GRC: Comply with ANSI C80.1 and UL 6.

D. IMC: Comply with ANSI C80.6 and UL 1242.

E. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit IMC.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

F. EMT: Comply with ANSI C80.3 and UL 797.

G. FMC: Comply with UL 1; zinc-coated steel.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:
   a. Material: Steel.
   b. Type: Setscrew.
2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 467, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

I. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Acceptable Manufacturers:

1. Cooper B-Line, Inc.
2. Hoffman; a Pentair company.
3. Mono-Systems, Inc.
4. Square D; a brand of Schneider Electric.
5. Or approved equal.

B. Description: Sheet metal, complying with UL 870 and NEMA 250, unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

D. Finish: Manufacturer's standard enamel finish.

2.3 SURFACE PATHWAYS

A. General Requirements for Surface Pathways:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Comply with TIA-569-B.

B. Surface Metal Pathways: Galvanized steel with snap-on covers complying with UL 5. Manufacturer's standard enamel finish in color selected by Design Consultant or Prime coated, ready for field painting.

1. Acceptable Manufacturers:
   a. Mono-Systems, Inc.
   b. Niedax-Kleinhuis USA, Inc.
   c. Panduit Corp.
   d. Wiremold / Legrand.
   e. Or approved equal.

2.4 BOXES, ENCLOSURES, AND CABINETS

A. Acceptable Manufacturers:

1. Adalet.
2. Cooper Technologies Company; Cooper Crouse-Hinds.
3. EGS/Appleton Electric.
4. Erickson Electrical Equipment Company.
5. Hoffman; a Pentair company.
6. Hubbell Incorporated; Killark Division.
7. Lamson & Sessions; Carlon Electrical Products.
8. Milbank Manufacturing Co.
9. Molex, Woodhead Brand
10. Mono-Systems, Inc.
11. O-Z/Gedney; a brand of EGS Electrical Group.
12. RACO; a Hubbell Company.
13. Robroy Industries.
14. Spring City Electrical Manufacturing Company.
15. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
16. Thomas & Betts Corporation.
17. Wiremold / Legrand.
18. Or approved equal.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Comply with TIA-569-B.
2. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

E. Device Box Dimensions: 4-inches square by 2-1/8 inches deep or 4 inches by 2-1/8 inches by 2-1/8 inches deep.

F. Gangable boxes are allowed.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

A. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: Wiremold surface mounted raceway in finished areas. EMT in utility spaces.
2. Exposed and Subject to Physical Damage: Wiremold surface mounted raceway in finished areas. EMT in utility spaces.
   a. Loading dock.
   b. Mechanical rooms.
   c. Gymnasiums
   d. Locker Rooms
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, communications-cable pathway.
5. Pathways for Optical-Fiber or Communications-Cable Risers in Vertical Shafts: Riser-type, communications-cable pathway.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

B. Minimum Pathway Size: 1/2-inch trade size.

C. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

D. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

E. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Pathways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure pathways to reinforcement at maximum 10-foot intervals.
2. Arrange pathways to cross building expansion joints at right angles with expansion fittings.
3. Arrange pathways to keep a minimum of 1 inch of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Design Consultant for each specific location.

J. Stub-ups to Above Recessed Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

K. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

L. Coat field-cut threads on PVC-coated pathway with a corrosion-preventing conductive compound prior to assembly.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

N. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

O. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.

P. Cut conduit perpendicular to the length. For conduits of 2-inch trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

Q. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

R. Surface Pathways:

1. Install surface pathway for surface electrical outlet boxes only where approved in field.
2. Install surface pathway with a minimum 2-inch radius control at bend points.
3. Secure surface pathway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight pathway section. Support surface pathway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

S. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

T. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service pathway enters a building or structure.
3. Where otherwise required by NFPA 70.

U. Comply with manufacturer's written instructions for solvent welding PVC conduit and fittings.

V. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

W. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

X. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Y. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Z. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 7.

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 280528

SECTION 283101 - FIRE ALARM SYSTEM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The work covered by this section is to be coordinated with related work as specified elsewhere in the specifications. Requirements of the following sections apply:

1. 260501 Basic Electrical Materials and Methods
2. 260524 Electrical Identification

C. The system and all associated operations shall be in accordance with the following:

1. Requirements of the following Model Building Code: IBC 2015 Edition
2. Requirements of the following Model Fire Code: IFC 2015 Edition
3. Requirements of the following Model Mechanical Code: IMC 2015 Edition
4. NFPA 72, National Fire Alarm Code, 2016 Edition
5. NFPA 70, National Electrical Code, 2014 Edition
6. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2015 Edition
7. ANSI/ASME A17.1 / CSA B44, Safety Code for Elevators and Escalators, 2013 Edition
8. Local Jurisdictional Adopted Codes and Standards
9. ADA Accessibility Guidelines

1.02 APPLICABLE STANDARDS

A. All equipment shall be UL listed for its intended use and conform to the latest UL Standards.

B. Underwriters Laboratories Inc.: The system and all components shall be listed by Underwriters Laboratories Inc. for use in fire protective signaling system under the following standards as applicable:

UL 864/UOJZ, APOU Control Units for Fire Protective Signaling Systems.
UL 268 Smoke Detectors for Fire Protective Signaling Systems.
UL 268A Smoke Detectors for Duct Applications.
UL 217 Smoke Detectors Single Station.
UL 521 Heat Detectors for Fire Protective Signaling Systems.
UL 228 Door Holders for Fire Protective Signaling Systems.
UL 464 Audible Signaling Appliances.
UL 1638 Visual Signaling Appliances.
UL 38 Manually Activated Signaling Boxes.
UL 346 Waterflow Indicators for Fire Protective Signaling Systems.
UL 1971 Standard for Signaling Devices for the Hearing Impaired
UL 1481 Power Supplies for Fire Protective Signaling Systems.
UL 17 I 1 Amplifiers for Fire Protective Signaling Systems.

UUKL The Fire Alarm system shall be UUKL for Smoke Control.

1.03 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 hold-open devices, fire suppression systems, and other equipment as indicated in the drawings and specifications.
3. One−way supervised automatic voice alarm operations.

D. The requirements of the Contract Documents, including the General and Supplementary General Condition and Division I - General Requirements shall apply to the work of this section.

E. If equipment of another manufacturer is to be submitted for approval as equal, the contractor shall, 2 weeks prior to the bid, provide a line by line specification comparison, listing any and all exceptions taken to these Specifications, along with the manufacturer's technical data sheets. All variances from these Specifications and all substitutions of operating capabilities must be forwarded to said Engineer. Any such exceptions, variances or substitutions that were not submitted and approved 2 weeks prior to the bid, shall be grounds for immediate disapproval without comment. Final determination of compliance with these Specifications shall rest with the Engineer, who, at his discretion, may require proof of performance.

F. The entire system shall be installed with aesthetics in mind. All control panels and remote annunciators installed in public spaces shall be semi-flush mounted with no exposed conduit or cable trays.

G. The work covered by this Section of the Specification shall include all labor, equipment, materials and services to furnish and install a complete fire alarm system of the addressable, non-coded type. It shall be complete with all necessary hardware, software and memory specifically tailored for this installation. It shall be possible to permanently modify the software on site by using a plug-in programmer. The system shall consist of, but not be limited to, the following:

1. Fire alarm Control Panel and related remote data gathering panels.
2. Remote Annunciators with semi flush backbox.
3. Addressable manual fire alarm stations.
4. Addressable area smoke detectors.
5. Addressable duct smoke detectors.
6. Addressable carbon monoxide detectors.

7. Addressable heat detectors.

8. Magnetic door/card access release override control.

9. Audible notification appliances – Speakers.

10. Visual notification appliances – strobes.

11. Central station alarm Connection control.

12. Air handling systems shutdown control.

13. Magnetic door holder release.

14. Battery standby.

15. Digital alarm communicator transmitter.

16. System printer.

1.04 DEFINITION

A. ADA: Americans with Disabilities Act
B. AHJ: Authority Having Jurisdiction
C. ANSI: American National Standards Institute
D. ASME: American Society of Mechanical Engineers
E. FACP: Fire Alarm Control Panel
F. FM: Factory Mutual
G. IBC: International Building Code
H. ICC: International Code Council
I. IDC: Initiating Device Circuit
J. IEEE: Institute of Electrical and Electronic Engineers
K. IFC: International Fire Code
L. IMC: International Mechanical Code
M. IRI: Industrial Risk Insurers
N. LED: Light-emitting diode.
O. NAC: Notification Appliance Circuit
P. NFPA: National Fire Protection Association
Q. NICET: National Institute for Certification in Engineering Technologies.
R. RAC: Releasing Appliance Circuit
S. SLC: Signaling Line Circuit
T. UL: Underwriters Laboratories
U. ULC: Underwriters Laboratories, Canada

1.05 SYSTEM DESCRIPTION

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

B. Power Requirements

1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period of 48 hours with 10 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
3. All circuits requiring system-operating power shall be 24 VDC nominal voltage 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.

C. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary.
1. The system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation.
2. 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.
3. Panels shall be capable of full system operation during new site specific configuration download, master exec downloads, and slave exec downloads.
4. Remote panel site-specific software and executive firmware downloads shall be capable of being performed over proprietary fire alarm network communications.
5. Panels shall automatically store all program changes to the panel’s non-volatile memory each time a new program is downloaded. Panels shall be capable of storing the active site-specific configuration program and no less than 9 previous revisions in reserve. A compare utility program shall also be available to authorized users to compare any two of the saved programs. The compare utility shall provide a deviation report highlighting the changes between the two compared programs.
6. Panels shall provide electronic file storage with a means to retrieve a record copy of the site-specific software and up to 9 previous revisions. Sufficient file storage shall be provided for other related system documentation such as record drawings, record of completion, owner’s manuals, testing and maintenance records, etc.
7. The media used to store the record copy of site-specific software and other related system documentation shall be electrically supervised. If the media is removed a trouble shall be reported on the fire alarm control unit.

D. 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 log shall be provided.

E. Recording of Events: The system shall be capable of recording all alarm, supervisory, and trouble events by means of system printer. The printout shall include the type of signal (alarm, supervisory, or trouble) the device identification, date and time of the occurrence. The printout shall differentiate alarm signals from all other printed indications.

F. Wiring/Signal Transmission:

1. Transmission shall be hard-wired using separate individual circuits for each zone of alarm operation, as required or addressable signal transmission, dedicated to fire alarm service only.
2. System connections for initiating device circuits shall be Class B, Style D, signaling line circuits shall be Class B, Style 4 and notification appliance circuits shall be Class B, Style Y.
3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.
4. Constant Supervision Audio: When provided, audio notification appliance circuits shall be supervised during standby by monitoring for DC continuity to end-of-line resistors.

G. Supplemental Notification and Remote User Access (Fire Panel Internet Interface)

1. Fire Alarm Control Panel (FACP) shall provide the necessary hardware to provide supplemental notification and remote user access to the FACP using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3.
2. A standard RJ-45 Ethernet connection shall connect to the owner's Ethernet network. Provisions for that connection must be provided at each fire alarm control unit as part of the contract.
3. The means of providing supplemental email and SMS text messaging notification shall be agency listed for specific interfaces and for the purpose described in this section. The use of non-listed external third party products and interfaces is not acceptable.
4. The fire panel internet interface shall be capable of sending automated notification of discrete system events via email and SMS text messaging to up to 50 individual user accounts and via email to up to 5 distribution lists.
5. Each user account and distribution list shall be capable of being configurable for the specific type of events to be received. Each account shall be configurable to receive notification upon any combination of the following types of events:
   a) Fire Alarm,
   b) Priority 2,
   c) Supervisory,
   d) Trouble,
   e) Custom Action Messages,
   f) Fire Panel Internet Interface Security Violations
6. Each user account and distribution list shall be capable of being configurable for the specific content to be received. Each account shall be configurable to receive any combination of the following message content:
   a) Summary,
   b) Event Information,
   c) Message,

d) Emergency Contacts,
e) Host Fire Alarm Control Unit Information

7. Each user account and distribution list shall be capable of being configurable for the type of Fire Alarm Control Unit Logs and Reports to be received. Each account shall be configurable to receive any combination of the following Logs and Reports via email:
   a) Alarm Log,
   b) Trouble Log,
   c) Analog Sensor Status Report,
   d) Analog Sensor Service Report,
   e) Almost Dirty, Dirty and Excessively Dirty Sensor Report,
   f) CO Analog Sensor Service Report,
   g) Addressable Notification Appliance Candela Report,
   h) Addressable Notification Appliance Status Report
8. Each user account and distribution list shall be capable of receiving email distribution of Fire Alarm Control Unit Logs and Reports On-Demand or automatically on a Pre-Determined schedule. Receipt of Logs and Reports shall be capable of being scheduled as follows:
   a) Weekly, or
   b) Bi-weekly, or
   c) Monthly
9. The Fire Alarm Control Panel Logs and Reports shall be sent in CSV file format which can be imported into common database applications for viewing, sorting, and customization.
   a) Each user account shall be capable of being configured to receive system events via email and/or SMS text messaging.
   b) Each distribution list shall be capable of supporting up to 20 email address recipients.
10. The means to provide email notification shall be compatible with SMTP mail servers, ISP email services, and Internet email services. Communication with the email server shall be verified at selectable intervals of 5 to 30 minutes.
11. Email operation shall be capable of being disabled for service by the system administrator.
12. An email log shall be accessible to authorized users. The email log shall display the 25 most recent email notifications sent.
13. The fire panel internet interface for supplemental notification and remote user access shall support:
    a) Secure HTTPS/SSL encrypted connections,
    b) Up to 50 individual password protected user accounts,
    c) Dynamic and Static IP addressing,
    d) IP Address Blocking,
    e) Restricted number of log-in attempts before lock-out configurable from 1 to 20,
    f) Lock-out duration after unsuccessful log-in attempts configurable from 0 to 24 hours,
    g) Email notification to Administrators of unsuccessful log-in attempts,
    h) Automatic lock-out reset upon a new event,
    i) Automatic inactivity logout configurable from 10 minutes to 24 hours,
    j) Firmware updates over Ethernet,
    k) Set-up and configuration via Local Service Port or via Remote Services over LAN/WAN connection
14. Authorized users shall be capable of accessing the fire alarm panel using a compatible web browser (Internet Explorer 6.0 or higher) and a secure HTTPS/SSL encrypted connection.
15. The fire panel internet interface shall support concurrent connections for up to 5 users plus 1 administrator.
16. Authorized users with remote access shall be capable of:

a) Viewing the fire panel internet interface web home page
b) The fire panel internet interface home page shall display system status information and provide links to detailed status information and fire alarm panel reports and history logs
c) The web browser on the user's computer shall automatically refresh system status information upon a new event
d) Systems that require a manual refresh to acquire updated system status information shall not be accepted
e) Viewing the fire alarm panel detailed card status information
f) Viewing the fire alarm panel detailed point status information
g) Viewing the fire alarm panel reports and history logs
h) Viewing the fire panel internet interface email log
i) Viewing system summary information
j) Accessing Custom Hypertext Links

17. The fire panel internet interface home page shall support customization to display the following information:
    a) Customer Name and Address,
    b) Fire Panel Location or Building Name,
    c) Up to 10 Custom Hypertext Links with Text Descriptions

H. Remote Services Access:

1. Fire Alarm Control Panel (FACP) shall provide the necessary hardware to provide a remote service access feature using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3. The Remote Access feature shall provide automatic notification of system faults and remote diagnostics of system status for responding technicians prior to arrival on site.

2. A standard RJ-45 Ethernet connection shall connect to the owner's Ethernet network. Provisions for that connection must be provided at each fire alarm control unit as part of the contract.

3. The Ethernet access feature shall be agency listed for specific interfaces and for the purpose described in this section. The use of non-listed external third party interfaces is not acceptable.

4. The internet remote access service function shall provide automated real time off-site reporting of discrete system events to a remote service support center with details of internal FACP fault conditions allowing a pre-site visit analysis of repair requirements.

5. Existing FACP controls shall be capable of retrofitting the Remote Service module as a plug-in upgrade feature.

6. The remote service network shall work on the customers Ethernet infrastructure and be Fire-Wall friendly for two-way communications for off-site reporting. The feature shall be compatible with existing proxy servers and firewalls shall not require any special changes or modifications.

7. The remote service system shall be able to connect to the remote service center without the need for a VPN account or similar tunnel.

8. The remote service system shall be a non-Windows based application to protect against conventional virus attacks.

9. The remote service system shall support a secure connection with strong encryption, 128 bit or better, and an optional secondary encryption method if required.

10. The remote service system shall be compatible with virtual LANS (VLAN).

11. The remote service system shall work on an outbound communication premise (panel calls home) in order to eliminate the possibility of any inbound connection into the network (from trusted or non-trusted sites).
12. The remote service system shall provide an audit trail of all events and service connections.
13. The Remote Service connection will provide access for panel software downloads and uploads for archiving job specific programs back at the enterprise server.
14. The supplier shall provide a service contract for the Remote Service program that provides the following requirements:
    a) 24/7 recording of FACP service activity.
    b) Off-site diagnostics by a technical specialist to provide repair and parts guidance to the service technician prior to a site visit.

I. Required Functions: The following are required system functions and operating features:

1. 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. Noninterfering: An event on one zone does not prevent the receipt of signals from any other zone. All zones are manually resettable from the FACP after the initiating device or devices are restored to normal. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.
3. Transmission to an approved Supervising Station: Automatically route alarm, supervisory, and trouble signals to an approved supervising station service provider, under another contract.
4. 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.
5. Selective Alarm: A system alarm shall include:
    a) Indication of alarm condition at the FACP and the annunciator(s).
    b) Identification of the device /zone 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 building wide.
    g) Closing smoke dampers on system building wide.
    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.) in accordance with ANSI/ASME A17.1 / CSA B44, Safety Code for Elevators and Escalators, when specified detectors are activated, as appropriate.
6. Supervisory Operations: Upon activation of a supervisory device such as a sprinkler flow 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.

7. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible alarm signals shall cease operation.

8. Priority Two Operations: Upon activation of a priority two condition such as gas detection, the system shall operate as follows:
   a) Activate the system priority two audible signal and illuminate the LED at the control unit and the remote annunciator.
   b) Pressing the Priority 2 Acknowledge Key will silence the audible signal while maintaining the Priority 2 LED "on" indicating off-normal condition.
   c) Record the event in the FACP historical log.
   d) Transmission of priority two signal to the supervising station.
   e) Restoring the condition shall cause the Priority 2 LED to clear and restore the system to normal.

9. 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.

10. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.

11. 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.

12. Install Mode: The system shall provide the capability to group all non-commissioned points and devices into a single "Install Mode" trouble condition allowing an operator to clearly identify event activations from commissioned points and devices in occupied areas.
    a) It shall be possible to individually remove points from Install Mode as required for phased system commissioning.
    b) It shall be possible to retrieve an Install Mode report listing that includes a list of all points assigned to the Install Mode. Panels not having an install mode shall be reprogrammed to remove any non-commissioned points and devices.

13. Module Distribution:

a) The fire alarm control unit shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):
   (1) Initiating Device Circuits
   (2) Notification Appliance Circuits
   (3) Auxiliary Control Circuits
   (4) Graphic Annunciator LED/Switch Control Modules
      ((a)) In systems with two or more Annunciators and/or Command Centers, each Annunciator/Command Center shall be programmable to allow multiple Annunciators/Command Centers to have equal operation priority or to allow hierarchal priority control to be assigned to individual Annunciator/Command Center locations.
   (5) Initiating Device Signaling Line Circuits
   (6) Notification Appliance Signaling Line Circuits
   (7) Power Supplies
   (8) Voice System Amplifiers

14. Service Gateway: A Service Gateway software application shall be provided that allows an authorized service person to remotely query panel status during testing, commissioning, and service without the need to return to the panel using standard email or instant messaging tools. For systems without a service gateway application the service provider shall provide a minimum of two technicians for any system testing or commissioning.

J. Integrated Automation

1. Building Automation and Control Network (BACnet) Integration
   a) The fire alarm control unit shall be capable of providing a one-way communications interface between the fire alarm control unit and an industry-standard Building Automation and Control Network (BACnet) using ASHRAE® BACnet® IP (internet protocol) compliant with ANSI/ASHRAE Standard 135.
   b) The BACnet communications module shall be agency listed to UL Standard 864.
   c) The fire alarm control unit shall be capable of communicating up to 1000 status changes to the building automation system.
   d) MS/TP Master and MS/TP Slave data link layer options communicating at baud rates up to 76,800 bps shall be supported.
   e) A standard RJ-45 Ethernet connection to the Building Automation System Ethernet network shall be provided at the fire alarm control unit as part of the contract.
   f) Systems using relay interfaces shall not be accepted.

K. 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.
   a) Reports shall be capable of being printed for annual recording and logging of the calibration maintenance schedule.
   b) Where required, reports shall be accessible remotely through:

c) A Fire Panel Internet Interface using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3. The Fire Panel Internet Interface shall be capable of automatically scheduling email reports to individual user accounts on a weekly, bi-weekly, or monthly schedule
d) A PC Annunciator using an RS232-C connection to the FACP or a PC Annunciator Client using a TCP/IP communications protocol connection to the PC Annunciator server compatible with IEEE Standard 802.3.

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. Multi-Sensors shall combine photoelectric smoke sensing and heat sensing technologies. An alarm shall be determined by either smoke detection, with selectable sensitivity from 0.2 to 3.7 %/ft obscuration; or heat detection, selectable as fixed temperature or fixed with selectable rate-of-rise; or based on an analysis of the combination of smoke and heat activity.
8. Programmable bases. It shall be possible to program relay and sounder bases to operate independently of their associated sensor.
9. Magnet test activation of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

L. Fire Suppression Monitoring:

1. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
2. Water flow switch and sprinkler valve tamper switch shall be capable of existing on the same initiating zone. Activation of either device shall distinctly report which device is in alarm on the initiating zone.
3. Water flow: Activation of a water flow switch shall initiate general alarm operations and remote sprinkler system activation bell.

M. Audible Alarm Notification: By horns in areas as indicated on drawings.

N. Audible Alarm Notification: By voice evacuation and tone signals on loudspeakers in areas as indicated on drawings.

1. Automatic Voice Evacuation Sequence:
   a) The audio alarm signal shall consist of an alarm tone for a maximum of five seconds followed by an automatic digital voice message. At the end of the voice message, the

alarm tone shall resume. This sequence shall sound continuously until the "Alarm Silence" switch is activated.

b) All audio operations shall be activated by the system software so that any required future changes can be facilitated by authorized personnel without any component rewiring or hardware additions.

O. Speaker: Speaker notification appliances shall be listed to UL 1480.

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 speaker shall have a frequency response of 400 to 4000 Hz for Fire Alarm and 125 to 12kHz for general signaling.

P. Manual Voice Paging

1. The system shall be configured to allow voice paging. Upon activation of any speaker manual control switch, the alarm tone shall be sounded over all speakers in that group.
2. The control unit operator shall be able to make announcements via the push-to-talk paging microphone over the pre-selected speakers.
3. Total building paging shall be accomplished by the means of an "All Call" switch.

Q. Constant Supervision of Non-Alarm Audio Functions

1. When required, the system shall be configured to allow Non-Alarm Audio (NAA) functions such as background music or general/public address paging.
2. During NAA operation, the speaker circuit shall be electrically supervised to provide continuous monitoring of the speaker circuit.
3. During an alarm condition, supervision shall be disabled and alarm signals delivered to speakers.

R. Network Communication:

1. Network node communication shall be through a token ring, hub, or star topology configuration, or combination thereof.
2. A single open, ground or short on the network communication loop shall not degrade network communications. Token shall be passed in opposite direction to maintain communications throughout all network nodes. At the same time the status of the communication link shall be reported.
3. If a group of nodes becomes isolated from the rest of the network due to multiple fault conditions, that group shall automatically form a sub-network with all common interaction of monitoring and control remaining intact. The network shall be notified with the exact details of the lost communications.
4. The communication method shall be NFPA 72 style 7.

S. Network Synchronization of Notification Appliances

1. The fire alarm and emergency communications network shall be capable of providing UL Listed synchronization across all the notification appliance circuits for all panels on a network loop in accordance with the requirements of UL 1971.
2. Systems that require all notification appliances to be connected to a single panel for synchronization thus creating a potential single point of failure shall not be acceptable.

3. Up to 99 panels on a network loop shall be capable of UL Listed synchronization of all notification appliance circuits across the network loop in accordance with the requirements of UL 1971.
4. Should network communications be disrupted, re-synchronization shall occur across all nodes that continue to communicate together after network re-initialization is completed and restored to affected nodes.
   a) Addressable Notification Appliances (Applies only where addressable notification is provided):
5. Monitoring: The FACP shall monitor individual addressable notification appliances for status, condition, type of appliance, and configured appliance settings. A fault in any individual appliance shall automatically report a trouble condition on the FACP.
6. Individual Appliance Custom Label: Each addressable appliance shall have its own 40 character custom label to identify the location of the appliance and to aid in troubleshooting fault conditions.
7. Individual Appliance Information Display:
   a) The FACP shall be capable of calling up detailed information for each addressable appliance including the appliance location, status, condition, type of appliance, and configured appliance settings.
   b) Notification appliances that are not capable of communicating and reporting their individual location, status, condition, type of appliance, and configured appliance settings to the FACP shall not be accepted.
8. Programmable Appliance Settings:
   a) The selectable operation of each addressable notification appliance shall be capable of being configured by the FACP without having to replace or remove the appliance from the wall or ceiling.
   b) Programmable appliance settings for applicable addressable notification appliances shall include:
      (1) Operation:
         ((a)) General Evac
         ((b)) Alert
         ((c)) User Defined
      (2) Style:
         ((a)) Indoor
         ((b)) UL Weatherproof
         ((c)) ULC Weatherproof
      (3) Candela Selections:
         ((a)) Indoor: 15, 30, 75, 110, 135, or 185 cd (per UL1971)
         ((b)) UL Weatherproof: 15 or 75 cd (per UL1971), and 75 or 185 cd (per UL1638)
         ((c)) ULC Weatherproof: 20, 30 or 75 cd (per ULCS526)
      (4) Horn Volume:
         ((a)) Hi
         ((b)) Low
      (5) Horn Cadence:
         ((a)) Temporal 3
         ((b)) Temporal 4
         ((c)) March Time 20 bpm
         ((d)) March Time 60 bpm
         ((e)) March Time 120 bpm
         ((f)) Steady
      (6) Horn Tone:
         ((a)) 520 HZ

((b)) Bell
((c)) Slow Whoop
((d)) Siren
((e)) Hi / Lo

c) Systems that require replacement or removal of the appliances from the wall or ceiling to change their applicable operation or settings shall not be accepted.

9. Programmable Notification Zones:
   a) Changing the notification zone assigned to a notification appliance shall be configurable by the FACP and shall not require additional circuits or wiring.
   b) Systems that require additional circuits and wiring to change the notification zone assigned to a notification appliance shall not be accepted.

10. Other Emergency and Non Emergency Notification:
   a) Where required, notification appliances for purposes not related to fire alarm shall be capable of:
      (1) being connected to the same circuit as the fire alarm appliances, and
      (2) being individually configured for their intended use without requiring additional circuits or wiring.
   b) Systems that require separate circuits and wiring for other Emergency and Non Emergency notification shall not be accepted.

11. Addressable Notification Appliance Automated Self-Test:
   a) The fire alarm control unit shall be capable of performing an automated functional self-test of all self-test notification appliances and meet the requirements in NFPA 72, 2013 Edition, 14.2.8 Automated Testing and Table 14.4.3.2 testing requirements.
   b) Test results for each self-test notification appliance shall be stored in non-volatile memory at the fire alarm control unit.
   c) The fire alarm control unit shall be capable of running a functional automated test for all self-test notification appliances in a general alarm group or for all self-test appliances within a specific notification zone.
   d) The duration required to complete the automated functional test for all self-test notification appliances shall be accomplished in 2 minutes or less.
   e) The automated test results for all self-test notification appliances shall be available from the fire alarm control unit within 4 minutes from the start of the test.
   f) If any notification appliance fails its automated functional self-test an audible and visual trouble signal shall be annunciated at the fire alarm control unit.
      (1) The self-test trouble signal shall be a latching trouble signal which requires manual restoration to normal.

12. Addressable Notification Appliance Reports:
   a) The fire alarm control unit shall maintain configuration and test data for each self-test addressable notification appliance.
   b) The fire alarm control unit shall be capable of generating configuration, self-test, and deficiency reports, that can be viewed through the fire alarm control unit user interface or printed via the fire alarm control unit service port.
      (1) At minimum, the configuration report shall include the following information applicable for each addressable notification appliance:
         ((a)) Point ID
         ((b)) Custom Label
         ((c)) Device Type
         ((d)) Candela Setting
      (2) At minimum, the self-test report shall include the following information applicable for each self-test notification appliance:
         ((a)) Point ID
         ((b)) Custom Label

((c)) Time and Date of last test
((d)) Pass / Fail results of last visual test
((e)) Pass / Fail results of last audible test
((f)) The fire alarm control unit shall also be capable of providing a deficiency report that includes a list of all self-test notification appliances that have failed self-test.

13. Magnet test: When the control unit is in diagnostic mode, the appliances shall be capable of being tested with a magnet. The magnet diagnostics shall:
    a) Pulse the appliance LED to indicate appliance address, briefly sound the individual horn to confirm the audible appliance operation. [briefly flash the individual strobe to confirm visible appliance operation

1.06 GENERAL SUBMITTAL

A. Provide list of all types of equipment and components provided. This shall be incorporated as part of a Table of Contents, which will also indicate the manufacturer's part number, the description of the part, and the part number of the manufacturer's product datasheet on which the information can be found.

B. Provide description of operation of the system (Sequence of Operation), similar to that provided in Part 2 of this Section of the Specifications, to include any and all exceptions, variances or substitutions listed at the time of bid. Any such exceptions, variances or substitutions which were not listed at the time of bid and are identified in the submittal, shall be grounds for immediate disapproval without comment. The sequence of operation shall be project specific and shall provide individual sequences for every type of alarm, supervisory, or trouble condition, which may occur as part of normal or off-normal system use.

C. Provide manufacturer's ORIGINAL printed product data, catalog cuts and description of any special installation procedures. Photocopied and/or illegible product data sheets shall not be acceptable. All product datasheets shall be highlighted or stamped with arrows to indicate the specific components being submitted for approval.

D. Provide manufacturer’s instruction manual for specified system.

E. Provide copy of State License to perform such work.

F. Provide copies of NICET Level II Fire Alarm certifications for the two (2) technicians assigned to this project.

G. Provide shop drawings as follows:

1. Coversheet with project name, address and drawing index.

2. General notes drawing with peripheral device backbox size information, part numbers, device mounting height information, and the names, addresses, point of contact, and telephone numbers of all contract project team members.

3. Device riser diagram that individually depicts all control panels, annunciators, addressable devices, and notification appliances. Shall include a specific, proposed point descriptor above each addressable device. Shall include a specific, discrete point address that shall correspond to addresses depicted on the device layout floor plans. Drawing shall provide wire specifications, and wire tags shown on all conductors depicted on the riser diagram. All circuits shall have designations that shall correspond with those require on the control panel and floor plan drawings. End-of-line resistors (and values) shall be depicted.

4. Control panel termination drawing(s). Shall depict internal component placement and all internal and field termination points. Drawing shall provide a detail indicating where conduit penetrations shall be made, so as to avoid conflicts with internally mounted batteries. For each additional data gathering panel, a separate control panel drawing shall be provided, which clearly indicated the designation, service and location of the control enclosure. End-of-line resistors (and values) shall be depicted.

5. See section 3.4 DOCUMENTATION AND TRAINING for other documents relating to this section.

6. Device typical wiring diagram drawing(s) shall be provided which depict all system components, and their respective field wiring termination points. Wire type, gauge, and jacket shall also be indicated. When an addressable module is used in multiple configurations for monitoring or controlling various types of equipment, different device typical diagrams shall be provided. End-of-line resistors (and values) shall be depicted.

7. Device layout floor plans shall be created for every area served by the fire alarm system. CAD Files (AutoCAD latest version) shall be provided by the consulting engineer for the use of the fire alarm system equipment vendor in the preparation of the floor plans. Floor plans shall indicate accurate locations for all control and peripheral devices. Drawings shall be NO LESS THAN 1/8 INCH SCALE. All addressable devices shall be depicted with a discrete address which corresponds with that indicated on the Riser Diagram. All notification appliances shall also be provided with a circuit address which corresponds to that depicted on the Riser Diagram. If individual floors need to be segmented to accommodate the 1/8" scale requirements, KEY PLANS and BREAK-LINES shall be provided on the plans in an orderly and professional manner. End-of-line resistors (and values) shall be depicted.
8. Contained in the title block of each drawing shall be symbol legends with device counts, wire tag legends, circuit schedules for all addressable and notification appliance circuits, the project name/address, and a drawing description which corresponds to that indicated in the drawing index on the coversheet drawing. A section of each drawing title block shall be reserved for revision numbers and notes. The initial submission shall be Revision 0, with Revision Am, B, or C as project modifications require.
H. Battery calculations shall be provided on a per power supply/charger basis. These calculations shall clearly indicate the quantity of devices, the device part numbers, the supervisory current draw, the alarm current draw, totals for all categories, and the calculated battery requirements (which reflect a 20% DEGRADE, for 24 Hour supervisory, 15 minute alarm operation). Battery calculations shall also reflect all control panel component, remote annunciator, and auxiliary relay current draws. Failure to provide these calculations shall be grounds for the complete rejection of the submittal package.
I. Table of contents, product data sheets, sequences of operation, battery calculations, installation instructions, licenses, NICET certifications and B-Size (blackline) reduced shop drawings shall be provided by the fire alarm vendor as part of a single, spiral bound submittal book. The submittal book shall have laminated covers indicating the project address, project number, system type, and contractor. The book shall consist of labeled dividers, and shall not exceed 9 ½" in width, and 11 ½" in height. No less than three (3) sets of submittal booklets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.
J. Scale drawing sets shall be submitted along with the submittal booklets. These drawings may be either D-Size or E-Size Blueline drawings and of a sufficient resolution to be completely read. Sets shall be bound and folded so that it does not take up more than 100 square inches of space. No less than three (3) sets of scale drawing sets shall be provided to the consulting engineer for review and comment. Additional copies may be required at no additional cost to the project.
K. Scaled drawings showing the intelligible speaker layout with all ADS (Acoustically Distinguishable Spaces) locations.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

1.8 CLOSEOUT SUBMITTALS

C. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 deliver copies to authorities having jurisdiction and include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
a. Frequency of testing of installed components.
b. Frequency of inspection of installed components.
c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

D. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.9 Submission to Authorities Having Jurisdiction:

A. In addition to routine submission of the above material, make an identical submission to the authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Upon receipt of comments from the authorities having jurisdiction, submit them for review. Resubmit if required to make clarifications or revisions to obtain approval.

B. Extra Materials: Submit one month prior to date of Substantial Completion.

C. Submit certification for training of Owner’s Maintenance personnel.

1.10 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Smoke Detectors and Fire Detectors: Quantity equal to 5 percent of amount of each type installed, but no less than 1 unit of each type.
2. Audible and Visual Notification Appliances: 5 percent of amount of each type installed.

1.10 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.

1.10 PROJECT CONDITIONS

A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by the Authority or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:

1. Notify Construction Manager no fewer than 7 days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Construction Manager's written permission.

1.11 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to the Authority to allow scheduling and access to system and to allow the Authority to upgrade computer equipment if necessary.

1.12 WARRANTY

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance or approval by AHJ. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

1.07 QUALITY ASSURANCE

A. Installer Qualifications: A factory-authorized Installer to perform work of this Section.

B. Single-Source Responsibility: Obtain fire alarm components from a single source who assumes responsibility for compatibility of system components.

C. Compliance with Local Requirements: Comply with the applicable building code, local ordinances, and regulations, and the requirements of the authorities having jurisdiction.

D. Comply with NFPA 70.

E. Comply with NFPA 72.

F. Listing and Labeling: Provide systems and equipment specified in this Section that are listed and labeled.

G. Provide services of manufacturer's factory-authorized service representative to supervise field quality control.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.08 SOFTWARE TERMS

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade to include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.09 WARRANTY

A. Provide a one year labor and materials warranty on the complete system. Provide all maintenance during the warranty period at no cost to the owner.

1.010 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

1. Notification Appliances: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
2. Smoke Detectors and Heat Detectors: Furnish quantity equal to 10 percent of each type and number of units installed, but not less than one of each type.
3. Detector Bases: Furnish quantity equal to 2 percent of each type and number of units installed, but not less than one of each type.
4. Printer ribbons: Furnish 6 spare printer ribbons.

PART 2 - PRODUCTS

2.01 ACCEPTABLE EQUIPMENT AND SERVICE PROVIDERS

A. Manufacturers: Subject to compliance with the requirements of this specification, provide products by one of the following:

1. Simplex, a Tyco Company.

2. FCI – Fire Control Instruments, Inc.

3. Edwards Systems Technologies.

4. Basis-of-Design: Edwards; A UTC Building & Industrial Systems. The catalog numbers used are those of Edwards EST by UTC Fire and Security and constitute the type and quality of equipment to be furnished or approved equal.

B. Being listed as an acceptable Manufacturer in no way relieves obligation to provide all equipment and features in accordance with these specifications.

C. Alternate or as-equal products submitted under this contract must provide a detailed line-by-line comparison of how the submitted product meets, exceeds, or does not comply with this specification.

D. 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 certified technicians, and shall maintain a service organization within 50 miles of this project location. The equipment and service provider shall have a minimum of 10 years experience in the fire protective signaling systems industry.

2.02 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow.
7. Heat detectors in elevator shaft and pit.
8. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Release fire and smoke doors held open by magnetic door holders.

5. Activate voice/alarm communication system.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Recall elevators to primary or alternate recall floors.
8. Close smoke dampers in air ducts of designated air-conditioning duct systems.
9. Activate emergency shutoffs for gas and fuel supplies.
10. Record events in the system memory.
11. Record events by the system printer.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.
3. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal AC voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer where provided.

2.03 FIRE ALARM CONTROL PANEL (FACP)

A. General: Comply with UL 864, "Control Units and Accessories for Fire Alarm Systems".

B. The following FACP hardware shall be provided:
1. Power Limited base panel with red cabinet and door, 120 VAC input power.
2. 2,500 point capacity where (1) point equals (1) monitor (input) or (1) control (output).
3. 2000 points of annunciation where one (1) point of annunciation equals:
a) 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
b) 1 LED on panel or 1 switch on panel.
4. 9 Amp Power Supply minimum with temperature compensated, dual-rate battery charger capable of charging up to 110 Ah batteries without a separate external battery charger. Battery charger voltage and amperage values shall be accessible on the FACP LCD display.

5. One Auxiliary electronically resettable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
6. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
7. Three (3) Class B Addressable Notification Appliance Signaling Line Circuits (SLCs).
   a) Each Addressable Notification Appliance SLC shall be rated at 3A and capable of supporting up to 127 Notification Appliances per channel.
   b) Wiring shall be 18 AWG to 12 AWG unshielded twisted pair wire. Systems that require shielded wire for Notification Appliances shall not be accepted.
   c) A constant voltage under both primary and secondary power conditions shall be maintained at the notification appliance field wiring terminal connections in the FACU to ensure the voltage drop on the circuit is consistent under both primary and secondary power conditions.
   d) For systems that do not provide a constant voltage source at the FACU notification appliance field wiring terminal connections, the fire alarm contractor shall:
8. Provide separate point-to-point voltage drop calculations for all notification appliances under worst case secondary power specifications, and
9. Perform a complete functional test of all notification appliances under worst case secondary power conditions.
10. Three (3) Class B Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).
11. NAC's shall be conventional reverse polarity operation and shall be for synchronized strobes and independent horn/strobe operation over two wires.
    a) NACs shall be selectable as auxiliary power outputs derated to 2 A for continuous duty.
    b) Strobe synchronization and audible cadence synchronization shall be across all panel NAC circuits. Systems that cannot provide listed synchronization across all panel NAC's shall not be acceptable.
12. Where required provide Intelligent Remote Battery Charger for charging up to 50Ah batteries.
13. Expansion Power Supplies with three (3) Class B integral Intelligent Addressable Notification Appliance Signaling Line Circuits (SLCs) for system expansion. Expansion power supplies shall provide complete capability as the primary power supply.
14. Power Supplies with integral conventional reverse polarity Notification Appliance Circuit Class B for system expansion. Expansion power supplies shall provide complete capability as the primary power supply.
15. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.
16. Where required, the FACP shall support up to (5) RS-232-C ports. Each RS-232 Port shall be capable of two-way communications.
17. Remote Unit Interface: supervised Class B (Style 4) or Class X (Style 7) signaling line circuit (SLC) for control and monitoring of remotely located annunciators and I/O panels.
18. Modular Network Communications Card.

C. 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 a more than single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.

D. Alphanumeric Display and System Controls: Panel shall include an 854 character, expanded content multi-line QVGA LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

1. The system shall include the necessary hardware to provide expanded content, multi-line, operator interface displays. The expanded content multi-line displays shall be Quarter-VGA (QVGA) or larger and be capable of supporting a minimum of 854 standard ASCII characters to minimize or eliminate the levels of navigation required for access to information when responding to critical emergencies and abnormal system conditions. The QVGA operator interface shall provide operator prompts and six context sensitive soft-keys for intuitive operation.
   a) Expanded content, multi-line operator interfaces shall be capable of providing the following functions:
      (1) Dual language operation with Instant-Switch language selection during runtime.
      (2) Activity display choices for:
         ((a)) First 8 Events.
         ((b)) Scrollable List Display displays a scrollable list of active points for the event category (alarm, priority 2, supervisory, or trouble) selected. The position in this list will be the last acknowledged point (not flashing) at the top followed by the next 7 unacknowledged points (flashing)
         ((c)) General Event Status (alarm, priority 2, supervisory, or trouble in system)
         ((d)) Site Plan
      (3) Equal or hierarchal priority assignment. In systems with two or more operator interfaces, each operator interface shall be programmable to allow multiple operator interfaces to have equal operation priority or to allow hierarchal priority control to be assigned to individual operator interfaces (locations).
      (4) Up to 50 custom point detail messages for providing additional point specific information in detailed point status screens.
      (5) Bitmap file import for operator interface display of site plan and background watermark images. Site plan status icons shall indicate area status for highest priority active events.

E. Distributed Module Operation: FACU shall be capable of allowing remote location of the following modules; interface of such modules shall be through a Style 4 (Class B) supervised serial communications channel (SLC):

1. Addressable Signaling Line Circuits
2. Initiating Device Circuits
3. Notification Appliance Circuits
4. Auxiliary Control Circuits
5. Graphic Annunciator LED/Switch Control Modules
   In systems with two or more Annunciators and/or Command Centers, each Annunciator/Command Center shall be programmable to allow multiple Annunciators/Command Centers to have equal operation priority or to allow hierarchal priority control to be assigned to individual Annunciator/Command Center locations.
   (1) Amplifiers, voice and telephone control circuits.

F. Voice Alarm: Provide an emergency communication system, integral with the FACU, including voice alarm system components, microphones, amplifiers, and tone generators. Features include:

1. Amplifiers comply with UL 1711, "Amplifiers for Fire Protective Signaling Systems." Amplifiers shall provide an onboard local mode temporal coded horn tone as a default backup tone.

Test switches on the amplifier shall be provided to test and observe amplifier backup switchover. Each amplifier shall communicate to the host panel amplifier and NAC circuit voltage and current levels for display on the user interface. Each amplifier shall be capable of performing constant supervision for non-alarm audio functions such as background music and general paging.

2. All announcements are made over dedicated, supervised communication lines. All risers shall support Class B wiring for each audio channel.
3. Eight channel digitally multiplexed audio for systems that require more than two channels of simultaneous audio. Up to 8 channels of audio shall be multiplexed on either a style 4 or style 7 twisted pair.
4. Emergency voice communication audio controller module shall provide up to 32 minutes of message memory for digitally stored messages. Provide supervised connections for master microphone and up to 5 remote microphones.
5. Status annunciator indicating the status of the various voice alarm speaker zones and the status of fire fighter telephone two-way communication zones.
6. When required, Redundant Voice Command Centers shall be capable of generating voice paging from more than one node in a network audio system.

G. Evacuation System - Non-Alarm Audio

1. The fire alarm control panel shall provide non-alarm audio from an owner supplied paging and/or music source over the fire alarm evacuation speakers. This feature shall be an integral part of the fire alarm system, and shall use some or all of the audio components from the fire alarm evacuation system.
2. The fire alarm system and the non-alarm audio operation shall comply with NFPA 72 requirements for non-emergency purposes at a fire command center that is not constantly attended by a trained operator.
3. All fire alarm system hardware and software shall be U.L. listed for non-alarm audio use. The fire alarm system shall supervise for system hardware and field wiring faults while playing non-alarm audio over the evacuation speakers. Any hardware failure or speaker circuit fault detected when the system is playing non-alarm audio shall report a trouble on the fire alarm control unit. All audio components used for both the non-alarm audio and the fire alarm evacuation system shall be manufactured by the same supplier.
4. The non-alarm audio shall have two dedicated audio inputs to the fire alarm control panel. Terminal strip connections and an industry standard RCA receptacle shall be provided at the fire alarm control unit for terminating the owner's audio source. The fire alarm input shall be 600-Ohm impedance. The inputs on the fire alarm control unit shall be electrically isolated via an isolation transformer.
5. The fire alarm control panel shall accept industry standard "line level audio input" from the owner's non-alarm audio source. The fire alarm system hardware and software shall distribute the audio over the fire alarm evacuation speakers. The selection of which speaker zones to distribute the non-alarm audio to the building occupants shall be coordinated with the owner's representative.
6. The fire alarm control panel shall be able to make audio input level adjustments from the owner's non-alarm audio source. This adjustment will match the non-alarm audio source to the fire alarm input. After the audio levels are adjusted, the owner shall control the volume level from the non-alarm audio source.

7. The fire alarm system will have the capability to provide operator "keys" that will adjust the volume level of pre-assigned non-alarm audio zones. The volume level of non-alarm audio that is being broadcast to any audio zone will also be individually adjustable by time of day via a pre-specified schedule.

8. The non-alarm audio shall be the lowest priory audio on the fire alarm system. The non-alarm audio shall not interfere with any of the fire alarm emergency signals that may include live voice, pre-recorded emergency voice messages, or any alert tones. Switches shall be located on the fire alarm control unit to turn on or off the non-alarm audio system feature. The fire alarm control unit shall have LED lamps to indicate the ON vs. OFF status of the non-alarm audio feature. Speaker circuits that are actively broadcasting non-alarm audio will also be indicated by LEDs.

9. The non-alarm audio shall be synchronized throughout the fire alarm life safety system amplifiers and speaker circuits. Any remote amplifier panels located on the fire alarm system network shall also be synchronized. The system shall be capable of accepting a system-wide non-alarm audio input at the main fire alarm control or another local non-alarm audio input at a remote amplifier panel to serve only the areas served by that remote panel.

10. Multiple non-alarm audio sources must be accessible by the fire alarm non-alarm audio system. Each separate non-alarm audio source will have the ability to be broadcast into a distinct fire zone, depending on occupant preference. Any system restricted to a limited number of non-audio sources will not be accepted. The system must have the capability of broadcasting an unlimited number of non-alarm sources, except as determined by the number of individual fire zones served by the fire alarm system.

11. Non-alarm audio shall be automatically turned off in the event of primary power failure to the fire alarm control unit or any of the remote amplifier panels controlled by the main fire alarm control unit.

2.04 ADDRESSABLE INITIATING

A. ADDRESSABLE MANUAL PULL STATIONS

1. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

2. Description: Addressable double-action type, red LEXAN. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units. Station shall be pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit. Where double-action stations are provided, the mechanism shall require two actions push top activation door to initiate an alarm.

3. Provide with a front showing red LED showing that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the station LED shall be on steady.

4. Indoor Protective Shield: All manual pull stations in building, provide a factory-fabricated, tamperproof, clear LEXAN enclosure shield and red frame that easily fits over manual pull stations which shall be hinged at the top to permit lifting for access to initiate a local alarm. Unit shall be NRTL listed. Lifting the cover shall actuate an integral battery-powered audible horn intended to discourage false-alarm operation. The horn shall be silenced by lowering and realigning the shield. The horn shall provide 85dB at 10 feet and shall be powered by a 9 VDC battery.

5. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

B. ADDRESSABLE ANALOG SMOKE DETECTORS

1. General Requirements for System Smoke Detectors:
   a) Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
   b) Factory Nameplate: Serial number and type identification.
   c) Operating Voltage: 24 VDC, nominal and shall be two-wire type.
   d) Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
   e) Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. Provide terminals in the fixed base for connection to building wiring. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit. Sensors shall include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors. Integral Addressable Module shall be arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit. Each sensor base shall contain an integral visual-indicating LED that will flash to provide power-on status each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Quick Connect Arrangement: Photoelectric sensor and electronics in a single piece construction which shall twist-lock onto a mounting base that attaches to a standard electrical box. Provide terminals in the fixed base for connection to building wiring. Sensors shall include an internal communication transmitter and receiver in the sensor having a unique identification and capability for status reporting to the FACP. Integral Addressable Module shall be arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit. Each sensor shall contain an integral visual-indicating LED that will flash to provide power-on status each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor LED shall be on steady. Sensor and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base.
   f) Each sensor base shall contain a magnetically actuated test switch to provide for easy pre-certification alarm testing at the sensor location.
   g) Each sensor shall be scanned by the Control Panel for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
   h) Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit. Provide multiple levels of detection sensitivity for each sensor.
   i) Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct smoke sensor shall be provided by the FACP.
   j) The sensor's electronics shall be immune from nuisance alarms caused by EMI and RFI. Removal of the sensor head for cleaning shall not require the setting of addresses.

k) Bases: CO Sensor, relay output, sounder and isolator bases shall be supported alternatives to the standard base.

2. Addressable Sensor Bases
   a) Standard base - Twist lock addressable base with address selection DIP switch accessible from front with sensor removed. Integral red LED for power-on (pulsing), or alarm or trouble (steady on). Locking anti-tamper design mounts on standard outlet box.

C. ADDRESSABLE DUCT SMOKE DETECTORS

1. Standard Addressable Duct Smoke Detector Unit. Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Duct housing shall include relay or relay driver as required for fan shutdown.
   a) Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct smoke detector shall be provided by the FACP.
   b) The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable independent of the sensor head for activation by other alarm initiating devices within the fire alarm system. Relay shall be mounted within 3 feet of HVAC control circuit.
   c) Duct Housing shall provide a magnetic test area and Red detector status LED and Duct Housing shall provide a relay control Yellow LED trouble indicator.
   d) Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
   e) Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
   f) For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
   g) Each duct smoke sensor shall be provided with a Remote Test Station with an alarm LED and test switch.
   h) 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.

D. ADDRESSABLE HEAT DETECTORS

1. General Requirements for Heat Detectors: Comply with UL 521.
2. Thermal Sensor Combination type: Fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.
3. Thermal detector shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag. Selectable rate compensated, fixed temperature sensing with or without rate-of-rise operation.
4. Mounting: Twist-lock base interchangeable with smoke-detector heads.
5. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

6. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
7. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.
8. Unless otherwise indicated, sensors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for temperature by fire-alarm control unit.
   a) Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F (8 or 11 deg C) per minute.
   b) Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F (57 or 68 deg C).

E. ADDRESSABLE CO SENSOR

1. Addressable CO Sensor
   a) The CO Sensor shall be an addressable carbon monoxide (CO) sensing module providing both CO toxic gas detection and enhanced fire detection, and shall be listed to UL 268, Smoke Detectors for Fire Alarm Signaling Systems and UL 2075, Gas and Vapor Detectors and Sensors; allowing systems to be listed to UL 2034, Single and Multiple Station Carbon Monoxide Alarms.
   b) The CO Sensor shall include CO sensor element mounted in the sensor base which can be easily replaced without replacing the complete sensor base assembly.
   c) The CO Sensor base shall provide address selection in the base allowing the address to remain with its location when the sensor is removed for service or type change.
   d) The CO Sensor base shall include an integral red LED to indicate the power-on, trouble, test mode or alarm status.
   e) CO sensor shall provide enhanced fire detection with the addition of two selectable modes of operation: Nuisance Alarm Reduction Mode and Faster Fire Detection.
   f) The CO Sensor shall provide a 10 year life expectancy before replacement is necessary or required.
   g) The CO Sensor base shall report the following CO Sensor troubles: Communication loss, Disabled, Almost Expired 12 Months, Almost Expired 6 Months, Expired (End of Life), and Sensor Missing/Failed.

2. Addressable CO Sensor Sounder Base
   a) The CO Sensing element shall support operation with a Sounder base; the CO Sensor Sounder base shall provide temporal code 3 (TC3) for fire, or temporal code 4 (TC4) for toxic carbon monoxide alarms.
   b) The CO Sensor Sounder base shall be listed to UL464, Audible Signal Appliances.
   c) CO sensor shall provide enhanced fire detection with the addition of two selectable modes of operation: Nuisance Alarm Reduction Mode and Faster Fire Detection.
   d) The CO Sensor Sounder Base shall include CO sensor element mounted in the sounder base which can be easily replaced without replacing the complete sensor base assembly.
   e) The CO Sensor Sounder base shall provide address selection in the base allowing the address to remain with its location when the sensor is removed for service or type change.
   f) The CO Sensor Sounder Sensor base shall include an integral red LED to indicate the power-on, trouble, test mode or alarm status.
   g) The CO Sensor Sounder base shall report the following CO Sensor troubles: Communication loss, Disabled, Almost Expired 12 Months, Almost Expired 6 Months, Expired (End of Life), and Sensor Missing/Failed.
   h) The CO Sensor Sounder Base shall be interchangeable with the CO Sensor 520 Hz Sounder Base.

F. ADDRESSABLE CIRCUIT INTERFACE MODULES

1. Addressable Circuit Interface Modules: Arrange to monitor or control one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, fan shutdown relays, valve tamper, non-addressable devices, and for control of AHU and exhaust systems.
2. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line circuit or a separate two wire pair running from an appropriate power supply, as required.
3. All Circuit Interface Control Modules shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.

2.05 ADDRESSABLE NOTIFICATION

A. ADDRESSABLE ALARM NOTIFICATION APPLIANCES

1. Addressable Notification Appliances: The Contractor shall furnish and install Addressable Notification Appliances and accessories to operate on compatible signaling line circuits (SLC).
   a) Addressable Notification appliance operation shall provide power, supervision and separate control of horns and strobes over a single pair of wires. The controlling channel (SLC) digitally communicates with each appliance and receives a response to verify the appliance's presence on the channel. The channel provides a digital command to control appliance operation. SLC channel wiring shall be unshielded twisted pair (UTP), with a capacitance rating of less than 60pf/ft and a minimum 3 twists (turns) per foot.
   b) All Notification Appliances shall operate as a completely independent device allowing for specific location alerting of both fire alarm and Mass Notification functions. Each visible device (both clear fire alarm and amber mass notification) shall be capable of operating on multiple notification zones or completely separate from all other notification devices, this allows “On the fly” program operation changes for Mass Notification alerting and fire alarm notification.
   c) All Notification Appliances shall operate as a completely independent device allowing for appliances in handicap accessible rooms and other locations to operate on the same SLC and to activate individually based on an alarm condition in a room or as part of a general alarm condition where all appliances activate together.
   d) Individual Notification Appliances shall be able to be grouped into zones (or operational groups) by central programming at the main fire alarm control unit.
   e) Notification Appliances shall provide for “unobtrusive” testing. Each Notification Appliance shall be tested for audible and visible operation on an individual basis at the device or from the main fire alarm control unit, allowing for minimal invasive impact.
   f) Class B (Style 4) notification appliances shall be wired without requiring traditional in/out wiring methods; addressable "T" Tapping shall be permitted. Up to 127 addresses can be supported on a single channel.
   g) Each Addressable notification appliance shall contain an electronic module and a selectable address setting to allow it to occupy a unique location on the channel. This on-board module shall also allow the channel to perform appliance diagnostics that assist with installation and subsequent test operations. A visible LED on each appliance shall

provide verification of communications and shall flash with the appliances address setting when locally requested using a magnetic test tool.

h) Each addressable notification appliance shall have electrical test point access without removing the device cover.

i) Both wall mount and ceiling mount devices shall be available.

2. Addressable Visible/Only strobe device: Addressable strobe shall be listed to UL 1971. The V/O device shall consist of a xenon flash tube and associated lens/reflector system, cover and mounting plate. For ease of installation the mounting plate shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. When the appliance is connected to an active circuit, the front cover of the appliance shall be removable without causing a trouble indication on the fire alarm control unit. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. The V/O appliance shall be provided with multiple minimum flash intensities of 15cd, 30cd, 75cd, 110cd, 135cd and 185cd. The Candela levels shall be settable from the fire alarm control unit or by using a hardware selector on the appliance.

3. Addressable Audio Speaker Device: Addressable Speaker notification appliances shall be listed to UL 1480. Individual device level supervision and activation control shall be provided by the fire alarm control unit.

   a) Speakers shall be individually powered, addressed, and controlled from a compatible fire alarm control unit Signaling Line Circuit (SLC) using Unshielded Twisted Pair (UTP) cable and T-taps shall be allowed for Class B installation reducing wiring costs and wiring distances. Shielded cable shall not be required.

   b) Speakers shall provide for Fire Alarm and General Signaling functionality in a single unit, eliminating additional devices. Device “Self-Test” shall be supported by a compatible fire alarm control unit and shall be UL listed and NFPA 72 compliant. Speakers shall be UL listed to provide a 520Hz audio tone in compliance with NFPA 72 for sleeping areas.

   c) The speaker audio shall be provided by a standard 25VRMS or 70.7VRMS audio circuit using Unshielded Twisted Pair (UTP) cable and T-taps shall be allowed for Class B installation reducing wiring costs and wiring distances. Supervision of this circuit shall be provided by the addressable speaker. Shielded cable shall not be required.

   d) Speaker power taps shall be at a minimum of 0.25W, 0.50W, 1.0W and 2.0W. At the 1.0W tap, the speaker shall have a minimum UL rated sound pressure level of 86dBA at 10 feet for the Standard Output version and 84dBA at 10 feet for the High Fidelity version.

   e) Speakers shall be available in either “Standard Output” with a minimum frequency response of 400 to 4000 Hz or in “High Fidelity Output” with a minimum frequency response of 200 to 10,000 Hz. Standard Output speakers shall use a multi-tapped speaker for audio/tone notification.

   f) Wall mount appliances shall be available in White and Red and ceiling mount appliances shall be available in White, Red, and Black. Labeling shall be available as either “FIRE”, “ALERT” or no labeling.

   g) The speaker shall install directly to a 4" square, 2 1/8" deep electrical box. Extensions for these boxes shall not be required. Units shall be modular in design to allow for easy installation and for easy changing of device color and labeling.

4. Addressable Speaker/Visible Device: Combination Speaker/Visible (S/V) units combine the speaker and visible functions into a common housing. The S/V shall be listed to UL 1971 and UL 1480. Addressable functionality controls visible operation, while the speaker shall operate on a 25VRMS or 70.7VRMS NAC.

   a) Operational functions and features of Addressable Speaker above shall apply to this section. Operational functions and features of Addressable Strobe above shall apply to this section.

b) Wall mount appliances shall be available in White and Red and ceiling mount appliances shall be available in White, Red, and Black. Labeling shall be available as either “FIRE”, “ALERT” or no labeling.
c) The speaker shall install directly to a 4" square, 2 1/8" deep electrical box. Extensions for these boxes shall not be required. Units shall be modular in design to allow for easy installation and for easy changing of device color and labeling.

5. Addressable Weatherproof Visible strobe Only Device: Addressable weatherproof strobe shall be UL 1971 listed for indoor applications with strobe intensity selectable as 15 or 75 cd or UL 1638 listed for outdoor applications with strobe rated at 75 cd (WP75) or 185 cd (WP185). The appliances shall be acceptable for indoor and outdoor, extended temperature and extended humidity applications. The V/O device shall consist of a xenon flash tube and associated lens/reflector system, weatherproof cover and weatherproof mounting box. The V/O appliance shall be provided with multiple minimum flash intensities of 15, 75, WP 75, or WP 185 candela. The Candela levels shall be settable from the fire alarm control unit or by using a hardware selector on the appliance.

6. Weatherproof Addressable Speaker/Visible Device: Combination Speaker/Visible (S/V) units combine the speaker and visible functions into a common housing. The S/V shall be listed to UL 1971 and UL 1480. Addressable functionality controls visible operation, while the speaker shall operate on a 25VRMS or 70.7VRMS NAC.
   a) Operational functions and features of Addressable Speaker above in Item 3 shall apply to this section. Operational functions and features of Addressable Strobe above shall apply to this section.
   b) Wall mount appliances shall be available in White and Red and ceiling mount appliances shall be available in White, Red, and Black. Labeling shall be available as either “FIRE”, “ALERT” or no labeling.
   c) The speaker shall install directly to a 4" square, 2 1/8" deep electrical box. Extensions for these boxes shall not be required. Units shall be modular in design to allow for easy installation and for easy changing of device color and labeling.

B. NAC Power Extender

1. The SLC 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.

2. The internal power supply and battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.

3. The NAC extender panel may be mounted close to the host control unit or can be remotely located. The SLC Addressable NAC Extender Panel when connected to an addressable panel shall connect to the host panel via an SLC communications channel. Via the SLC channel each output NAC can be individually controlled for general alarm or selective area notification.

4. For SLC connected NAC extender panels up to five panels can be connected on a single SLC channel.

5. When connected to a conventional (non-addressable panel) one or two standard notification appliance circuits from the main control unit may be used to activate all the circuits on the NAC power extender panel.

6. Alarms from the host fire alarm control unit shall signal the NAC power extender panel to activate. The panel shall monitor itself and each of its NACs for trouble conditions and shall report trouble conditions to the host panel.

2.06 MAGNETIC DOOR HOLDERS

A. Description: Units provided in door hardware specification 087100. Unit shall be connected to fire alarm system and operate from a 120VAC, a 24VAC or a 24VDC source.

B. Material and Finish: Match door hardware.

2.07 REMOTE QVGA LCD ANNUNCIATOR

A. Provide a remote QVGA LCD Annunciator, where required, with the same "look and feel" as the FACP operator interface. The Remote QVGA LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys as the FACP.

B. The QVGA Annunciator shall have an expanded content, multi-line display capable of supporting a minimum of 854 standard ASCII characters to minimize or eliminate the levels of navigation required for access to information when responding to critical emergencies and abnormal system conditions. The QVGA Annunciator shall provide:

1. Operator prompts and six context sensitive soft-keys for intuitive operation.
2. Seven (7) programmable control switches and associated LEDs.
3. Three (3) programmable general purpose LEDs.
4. Capability of supporting Dual Languages with Instant-Switchover between languages in runtime operation.
5. Support for both one-byte and two-byte characters.

C. Under normal conditions the QVGA LCD shall display a "SYSTEM IS NORMAL" message, the current time and date, and the quantity of abnormal status conditions for each event category (i.e., fire alarm, priority 2, supervisory, and trouble) with a watermark background image a site plan of the facility layout with status icons to indicate area status for highest priority active events.

D. The QVGA Annunciator shall be programmable for the following Activity display choices:

1. First 8 Events.
2. First 5 Events and Most Recent Event with First and Most Recent event time and date stamps.
3. First Event and Most Recent Event with First and Most Recent event time and date stamps.
4. Scrollable List Display displays a scrollable list of active points for the event category (alarm, priority 2, supervisory, or trouble) selected. The position in this list will be the last acknowledged point (not flashing) at the top followed by the next 7 unacknowledged points (flashing).
5. General Event Status (Alarm, Priority 2, Supervisory, or Trouble in system).
6. Site Plan with optional status icons to indicate area status for highest priority active events.

E. Should an abnormal condition be detected the appropriate LED (Alarm, Priority 2, Supervisory or Trouble) shall flash. The unit audible signal shall pulse for alarm conditions and sound steady for trouble and supervisory conditions.

F. The QVGA LCD shall display the following minimum 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, waterflow).

3. Point status (e.g., alarm, trouble).

G. QVGA Annunciators shall be protected from unauthorized use via a locked door or equivalent means. In addition, in systems with two or more Annunciators, each Annunciator shall be programmable to allow multiple Annunciators to have equal operation priority or to allow hierarchal priority control to be assigned to individual Annunciators (locations). Acknowledge, Silence and Reset operation shall be the same as the FACP.

2.08 GRAPHIC ANNUNCIATOR - LED TYPE

A. Annunciator Unit, zoned system: Provide an LED-indicating light located on the floor plan for each zone. Mark zone boundaries on the annunciator floor plan.

B. Annunciator Unit, addressable system: Provide an LED-indicating light located on the floor plan for each device indicating the type of device and floor on which a signal was actuated.

C. Provide individual LED indicators for each alarm and supervisory device or zone and a LED to indicate system trouble. Additional LEDs indicate normal power and emergency power modes for the system. A toggle or push-button switch tests the LEDs mounted on the unit. The test switch does not require key operation.

D. Enclosure: Finish to match Fire Alarm Control Units. The locking cover/display assembly is hinged on the left. Key and lock shall be common to all secured fire alarm system enclosures.

2.09 NETWORK ANNUNCIATORS

A. Network Display Unit (NDU) shall contain the following features:

1. 854 character, expanded content multi-line QVGA LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2. Capacity to annunciate 12,000 network points and/or point lists.

3. Historical event logs shall maintain separate 1,250 Alarm and 1,250 Trouble events.

4. The network shall provide a means to log into any node on the system via a laptop computer and have complete network access (Set Host) for diagnostics, maintenance reporting, and information gathering of all nodes in the system. Systems not meeting this requirement must provide all diagnostic tools required to support this function from selected points on the network.

5. A DACT with partitioning capability shall be available as an option that shall receive an alarm, supervisory, or trouble signal from any network connected fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station.
   a) When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, DACT shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line.
   b) DACT shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
   c) Digital data transmission shall include the following:
      (1) Address and node information of the alarm-initiating device.
      (2) Address and node information of the supervisory signal.

(3) Address and node information for trouble condition.
(4) Abnormal test signal.
(5) Communication failure.

d) Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

6. The Network Display Unit shall support up to (5) RS-232-C ports and one service port. All (5) RS-232 Ports shall be capable of two-way communications. RS-232-C printer ports shall provide activity log and on demand report print-outs for all network activity.

7. A Remote Unit Interface shall be available to provide supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.

8. 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.

9. Remote Services Access:
   a) The Network Display Unit shall have the capability to provide a remote service access feature using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3. The Remote Access feature shall provide automatic notification of system faults and remote diagnostics of system status for responding technicians prior to arrival on site.
   b) A standard RJ-45 Ethernet connection shall connect to the owner's Ethernet network. Provisions for that connection must be provided at each fire alarm control unit as part of the contract.
   c) Operation shall be as described under Section 1.5 SYSTEM DESCRIPTION; Remote Services Access.

10. Supplemental Notification and Remote User Access (Fire Panel Internet Interface).
    a) The Network Display Unit shall have the capability to provide supplemental notification and remote user access to the FACP using Ethernet and TCP/IP communications protocol compatible with IEEE Standard 802.3.
    b) A standard RJ-45 Ethernet connection shall connect to the owner's Ethernet network. Provisions for that connection must be provided at each fire alarm control unit as part of the contract.
    c) Operation shall be as described under Section 1.5 SYSTEM OPERATION; Supplemental Notification and Remote User Access (Fire Panel Internet Interface).

2.010 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture two telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines 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.

D. Digital data transmission shall include the following:
1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address or loss of power.
4. Low battery.
5. Abnormal test signal.
6. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.011 RESCUE ASSISTANCE SYSTEM

A. Rescue Assistant System: System provides two way voice communications between the Rescue Assistant Station (RAS) and the Rescue Assistant Master Telephone (RMT).
1. When the “Push for Assistance” button at the RAS is pressed the LED starts to Flash and a tone is sounded indicating the call has been placed.
2. The RMT begins to ring and the number of the calling station is displayed.
3. Communication is established by lifting the handset at the RMT.
4. When the call has been answered at the RMT, the LED at the RAS will flash at a slower rate and a dual tone is sounded.
5. Upon completion of the call, the LED at the RAS becomes steady and remains lighted until the reset button at the station is activated.
6. Communication between the stations is voice activated and does not require push to talk switches.
7. System shall provide access to public (outside) telephone line to allow for a call to be placed to notify authorities of alarm.

B. Control Panel (RASP): Metal enclosure housing the card frame, CPU, power converter board and graphic I/O board power supply. System shall have minimum capacity of 8 stations.

C. Rescue Assistance Station: Flush mounted Faceplate with the following:
1. Inscription reading “Area of Rescue”.
2. “Push For Assistance” button.
3. Speaker located behind faceplate grille.

4. LED with faceplate inscription “FLASHING - Call Placed, STEADY- Help coming”.
5. Reset switch.
6. Access to public telephone line to place a call to a designated location to notify of alarm.

D. Rescue Assistance Master Telephone: Flush mounted enclosure with the following:
1. Handset located behind locking door.
2. LCD readout of location where call was placed and Time/Date of call.
3. Faceplate inscription reading “Area of Rescue Assistance Master Telephone”.

2.012 SYSTEM PRINTER

A. General: Provide a dot-matrix type, listed and labeled as an integral part of the fire alarm system.

2.013 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

2.014 EMERGENCY POWER SUPPLY

A. General: Components include Maintenance free lead Calcium battery, charger, and an automatic transfer switch.

B. Battery capacity is adequate to operate the complete alarm system, digital communicator and Rescue Assistant System in normal or supervisory (nonalarm) mode for a period of 24 hours. At the end of this period, the battery has sufficient capacity to operate the system, including alarm-indicating devices in either alarm or supervisory mode, for a period of 5 hours minimum.
1. 24 Vdc Secondary (Battery) Power Supplies: Sealed maintenance free lead-calcium battery:
a) Ampere-hour capacity to operate under load conditions.
b) Meters for battery voltage and charging current.
c) Batteries and charger integrally mounted or separate cabinet mounted as recommended by the company producing the system.
2. Magnetic door holders are not served by emergency power. Magnetic door holders are released when normal power fails.

C. Battery Charger: Solid-state, fully automatic, variable-charging-rate type. Provide capacity for 150 percent of the connected system load while maintaining the batteries at full charge. In the event batteries are fully discharged, the charger recharges them completely within 4 hours. Charger output is supervised as part of system power fails.

D. Integral Automatic Transfer Switch: Transfers the load to the battery without loss of signals or status indications when normal power fails.

2.015 WIRE

A. Wire: Solid-copper conductors with color-coded plenum rated insulation.

1. Low-Voltage Circuits: No. 18 AWG, minimum for communication circuits and No. 14 AWG minimum for 24v power circuits.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

B. Conductor size shall be as recommended by system manufacturer, except that size shall not be less than specified above.

2.016 TERMINAL STRIP CABINETS (TSC)

A. Lockable, vandal resistant, surface mounted cabinets constructed of 14 gage steel, size as recommended by the Company producing the system. Equip cabinets with barrier type double screw terminals rated 300V minimum, meeting UL 94 requirements for materials classed 94V-0. Use identification strips, tags or labels to identify each conductor. Paint cabinets red and stencil on front in 1/2 inch high white letters, the purpose of each terminal strip cabinet.

2.017 ACCESSORIES

A. Provide equipment as required to connect existing fire alarm system addressable loop devices to new system.

2.018 SYSTEM RECORD DOCUMENT CABINET

B. Provide system record document cabinet with 4GB flash drive, USB B connector, business card holder for key contacts, minimum 2 key ring hooks and 18 gauge steel powder coated red finish with white silk screened 1” high lettering indicating “ SYSTEM RECORD DOCUMENTS”. Shall accommodate standard 8-1/2” x 11” manuals and loose document records. Manufactured by Space Age Electronics, Inc. Model SRD Ace-11 SSU00689 or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION, GENERAL

A. Install system components and all associated devices in accordance with applicable NFPA standards and manufacturer’s recommendations.

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 limited to, the following:

1. Factory trained and certified personnel
2. National Institute of Certification in Engineering Technologies (NCICET) fire alarm level II certified personnel.
3. Personnel licensed or certified by state or local authority.

3.02 EQUIPMENT INSTALLATION

A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturer’s wiring diagram. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation. All wiring shall be of the type recommended by the manufacturer, approved by the local Fire Department and specified with in.

B. All penetration of floor slabs and firewalls shall be sleeved (1” conduit minimum) fire stopped in accordance with all local fire codes.
C. End of Line Resistors shall be furnished as required four mounting as directed by the manufacturer. Devices containing end-of-line resistors shall be appropriately labeled. Devices should be labeled so removal of the device is not required to identify the EOL device.
D. All manual pull stations shall be mounted 48 inches above the finished floor, as measured to the handle.
E. All audio/visual devices shall be mounted 80 inches above the finished floor, as measured to the lens. Devices shall be mounted no less than 6 inches from the ceiling. All audiovisual devices shall have lexan covers in all areas subject to mechanical damage.
F. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 24 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A and Appendix B in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
G. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
H. No area smoke or heat detector shall be mounted within 12 inches of any wall. All detectors shall be installed in strict accordance with NFPA 72 (1999) guidelines for such devices.
I. All mechanical rooms, boiler rooms, gymnasiums, wiring closets, custodian rooms, attic spaces, et. Or areas with no hung ceiling shall be piped with ¾” conduit. All device plenum rated wiring shall be mechanically protected with conduit. All existing areas in public view shall be in metal V-700 wiremold (or equal). All boxes must be painted red and labeled “FIRE ALARM”.
J. All addressable modules shall be mounted within 36 inches of the monitored or controlled point of termination. This shall include, but is not necessarily limited to, fan shutdown, elevator recall, shunt trip, Ansul/Hood subsystems, or door release. Label all addressable modules as to their function.
K. New door holders shall derive their 24 VAC/VDC power from a separate power supply housed in a dedicated, metal enclosure. The power supply shall have a 120 VAC feed, and is to be centrally located to serve door holders on a per floor or area basis. All existing door holders shall be connected to new FACP. E.C. shall extend all existing wiring in order to make this work. Locations and quantities of door holder power supplies shall be referenced and submitted in the submission package for approved by the Consulting Engineer.
L. All low voltage wiring terminated to the fire alarm system shall be PLENUM RATED with no exceptions and no less than No. 18 AWG in size, and solid copper.
M. All line voltage (120 VAC) wiring shall be no less than No. 12 AWG in size, and solid copper. This shall include all system grounding. FACP must have a DEDICATED 20 amp circuit marked back at the power panel NO EXCEPTIONS.
N. All wiring shall be color-code throughout, to National Electrical Code standards.
O. Power-limited/non-power-limited NEC wiring standard SHALL BE OBSERVED.
P. All junction box covers shall be painted federal safety red and labeled FIRE ALARM SYSTEM ONLY in black letters.
Q. Fire alarm system wiring shall not co-mingle with any other system wiring in the facility. Conduits shall not be shared under any circumstance. Only when fire alarm wiring enters the enclosure of a monitored or controlled system will co-habituation be permitted (i.e. at fan starters or elevator controllers). THIS WILL BE FIELD INSPECTED BY THE PROJECT ENGINEER.
R. Fire alarm control panel enclosures shall have engraved labels indicating “FIRE ALARM SYSTEM”, and the areas of the building served by that panel.

S. Auxiliary relays shall be appropriately labeled to indicate “FIRE ALARM SYSTEM” and their specific function (i.e. FANS S-1 SHUTDOWN).
T. All fire alarm wiring shall be continuous and unspliced. Terminations shall only occur at fire alarm devices or control panel enclosures under terminal screws. All other splicing methods are specifically disallowed (i.e. plastic wirenuts).
U. All fire alarm wiring shall be installed using a dedicated system of supports (i.e. bridle rings). Fire alarm wiring shall not be bundled or strapped to existing conduit, pipe or wire in the facility. THIS WILL BE FIELD INSPECTED BY THE PROJECT ENGINEER.
V. All fire alarm wiring shall be sleeved when passing through any wall, using conduit sleeves (1” min.) with bushings, and fire stopped in accordance with Code.
W. The system shall be arranged to receive power from one three wire 120 Vac, 20 A supply. All low voltage operation shall be provided from the fire alarm control panel.
X. All fire alarm devices shall be accessible for periodic maintenance. Should a device location indicated on the Contract Drawings not meet this requirement, it shall be the repsonsiblity of the installing contractor to bring it, in writing, to the attention of the Project Engineer. Failure to bring such issues to the attention of the Project Engineer shall be the exclusive liability of the installing Electrical Contractor.
Y. The existing fire alarm system shall remain in operation unit such time that approval has been granted for its removal. The installing Electrical Contractor shall be responsible for the upkeep of the existing system unit such time that it can be removed.
Z. The installing Electrical Contractor shall be responsible for the removal of the ENTIRE existing fire alarm system components and controls on the demolition drawing shown or not, upon approval of the AHJ and the Consulting Engineer. The End-User reserved the right to retain any existing fire alarm system components, upon their request. All existing fire alarm system components requiring special handling for disposal (due to radioactivity) shall be the responsibility of the installing contractor. Written proof of proper disposal by the installing contractor shall be required prior to release of outstanding retainage.

A. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

B. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

C. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

D. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

E. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

F. Device Location-Indicating Lights: Locate in public space near the device they monitor.

G. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

H. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

I. Equipment Removal: After acceptance of the new fire alarm system, disconnect and remove the existing fire alarm equipment and restore damaged surfaces. Package operational fire alarm

and detection equipment that has been removed and deliver to the Owner. Remove from the site and legally dispose of the remainder of the existing material.

J. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.

K. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.

L. Mount outlet box for electric door holder to withstand 80 pounds pulling force.

M. Make conduit and wiring connections to door release devices, sprinkler flow switches and duct smoke detectors.

N. Automatic Detector Installation: Conform to NFPA 72.

O. Ethernet Drop: A standard RJ-45 Ethernet connection to the owner's Ethernet network shall be provided at each fire alarm control unit as part of the contract.

3.03 PREPARATION

A. Coordinate work of this Section with other affected work and construction schedule.

3.04 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Smoke dampers in air ducts of designated air-conditioning duct systems.
3. Alarm-initiating connection to elevator recall system and components.
4. Supervisory connections at valve supervisory switches.
5. Supervisory connections at elevator shunt trip breaker.

3.05 WIRING INSTALLATION

A. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).

B. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction

shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.

C. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

D. Mount end-of-line device in box with last device or separate box adjacent to last device for Class “B” supervision.

E. Ethernet Circuits:

1. Ethernet circuits shall be provided to the Fire Alarm Control Unit as shown on the plans.
2. Where a dedicated Fire Alarm Ethernet LAN is specified only Agency Listed Fire Alarm Ethernet hardware shall be installed.
3. The electrical contractor shall coordinate and ensure proper Ethernet connections occur at the fire alarm control unit and other designated equipment locations prior to system turnover.

3.06 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

C. Label each device with its corresponding system address.

3.07 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.08 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. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace

malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

D. 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.

E. 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. Submit written report indicating sound pressure levels at specified distances.
   c) Test Fire Alarm Control Unit and Remote Annunciator.

2. Provide minimum 10 days notice of acceptance test performance schedule to Owner, and local Authority Having Jurisdiction.

F. 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.

G. 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.

H. 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.

3.09 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

3.010 CLEANING AND ADJUSTING

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

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound pressure levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.011 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26.

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING: Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

1.1 FIELD QUALITY CONTROL

A. The system shall be installed and fully tested under the supervision of a trained manufacturer's representative. The system shall be demonstrated to perform all of the function as specified.

B. The installing contractor or fire alarm equipment vendor shall have no less than two (2) NICET Level II fire alarm technicians dedicated to this project.

C. The Installing Contract and the Fire Alarm System Vendor shall, upon the request of the Consulting Engineer or End-User, attend any and all project meeting for the purpose of accurately determining progress.

D. It shall be the responsibility of the installing contractor to assure that construction debris does not adversely affect any sensing devices installed as part of this project. Should it be deemed necessary by the Consulting Engineer, End-User or AHJ, the installing contractor shall be responsible for the cleaning of all smoke detectors prior to final acceptance.

1.2 DOCUMENTATION AND TRAINING

A. The contractor shall compile and provide to the owner three (3) complete manual on the completed system to include SITE SPECIFIC operating and maintenance instruction, catalog cuts of all equipment and components, as-built wiring diagrams and a manufacturer's suggested spare parts list. An operational Video, on DVD media, shall also be included.

B. In addition to the above manuals, the Electrical Contractor shall provide the services of the manufacturer's trained representative for two (2) separate calendar days for a period of four (4) hours per day to instruct the owners' designated personnel on the operation and maintenance of the entire system.

C. As-built drawings shall consist of the following:

1. Complete revision of all previously submitted drawings.

2. Point-to-point depiction of all device wiring on the device layout floor plans.

3. One (1) set of B-size, laminated as-built drawings.

4. Two (2) sets of 30" x 42" inch 1/16"-1' scale drawings showing all points of fire alarm. One set shall be submitted with the close-out documents. Second set shall be mounted in frame with a Lexan cover. These drawings must be submitted to the project Engineer for approval.

D. Turnover of all software database hard/soft copies shall be required. This shall include all possible programming software logs, diskettes or CDs containing exported project files, hard copies of all device maps, the revision number of the version of programming utility used, and all required passwords. The turnover of all database information shall occur prior to the endo of the one (1) warranty period (or period as amended earlier in this specification.

3.5 Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.
   a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
   b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

A. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

B. Fire-alarm system will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

E. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.012 EVALUATION CRITERIA

A. The proposal response will be evaluated based upon the following best value criteria:
   1. Ability to Meet RFP Requirements 5 Points
   2. Thoroughness of Response 10 Points

3. Design Capabilities 10 Points
4. Product Capabilities 10 Points
5. References 5 Points
6. Warranty and Service Support Capability 10 Points
7. Staffing Approach 5 Points
8. Scope of Work 5 Points
9. Safety Approach 5 Points
10. Training Capability 5 Points
11. Quality Assurance 5 Points
12. Manufacturing Capacity 5 Points
13. Disaster Recovery Plan 5 Points
14. Central Monitoring Capability 5 Points
15. Cost 10 Points

B. Executive Summary

1. The system vendor shall provide an overview of their company. The summary should also include additional information demonstrating how your product and services are differentiated from the competition. Please include a one-page overview of the company including a summary of the ownership of the company.

C. Design Capability

1. The system vendor shall demonstrate capabilities to provide fire alarm system design services in the local area. The overview should include a summary of CAD resources and project configuration management techniques. New product development capabilities shall be demonstrated and a list of patent innovations is requested.

D. System Overview

1. The system vendor shall provide a system overview for the proposed fire alarm equipment. Please include features and functions of the proposed:
   a) Fire Alarm Network
   b) Fire Alarm Panels
   c) Graphic User Interface (GUI)
   d) Initiating devices
   e) Notification devices
2. The system vendor shall detail other systems the proposed fire alarm system is capable of integrating to.
3. The system vendor shall detail the fire alarm systems network diagnostic capability.
4. The system vendor shall describe recent fire alarm technology that can contribute to project installation cost savings, service efficiency, and ensure the highest levels of survivability.

E. References

1. The system vendor shall provide four references. References must include equipment similar to the requirements included in this solicitation.

F. Warranty/Service Availability

1. The system vendor shall explain their local warranty and service capability that's available from the system vendor's local office. Warranty and Service Information shall include:
   a) Preventative Maintenance
   b) Local Trained Technicians
   c) Repair Parts
   d) A Strategy for resolving system malfunctions during business hours, non-business hours, and weekends
   e) A Process of tracking service calls and escalation of recurring problems.

G. Staffing and Management

1. The system vendor shall provide a description of their local office personnel.
2. The system vendor shall describe their local Project Management capability, Service and Installation Personnel.
3. The system vendor shall describe additional resources (i.e. Corporate, Manufacturing, Quality Assurance Resources).

H. Scope of Work

1. The system vendor shall describe their design and phasing approach on this fire alarm system upgrade project. Please describe your system design, project management approach, professional installation services, and technical installer support. Also, include a fire alarm system test procedure.

I. Safety

1. The system vendor shall explain why safety is important on this type of installation project. The system vendor shall appoint an accountable safety foreman on this project. An overview of a safety plan must be described.

J. Training

1. The system vendor shall demonstrate their ability to meet both on-site and off-site fire alarm operation and maintenance training.

K. Quality Assurance/Quality Control Plan

1. The system vendor shall provide a Quality Assurance/Quality Control Plan.
2. Please provide the name of the project's site foreman and describe their assigned project responsibilities. The assigned foreman must be NICET certified for the installation and maintenance of fire alarm systems.
3. Please explain how quality is implemented in both Project Management and Technical Installation Support on this project. The system vendor shall provide start-up procedures, construction procedures, and close-out procedures for this fire alarm system upgrade project.
4. The system vendor's processes must be ISO 9001 and ISO 9002 compliant. The seller shall provide their UL Certificate of Registration.
5. Please explain how defect prevention is conducted both in your manufacturing facility as well as with your existing fire alarm customers.
6. Please describe how Software Quality Assurance (SQA) and product life cycle development work together in the various stages of a new product.

7. The system vendor must demonstrate two problem-solving examples that show how their field office and the seller's headquarter manufacturing personnel work together to solve a fire alarm issue.

L. Manufacturing Capacity

1. The system vendor shall explain an overview of their manufacturing capability.
2. The system vendor shall explain the technology used to manufacture and test small systems, large systems and high volume peripherals. In addition the system vendor shall provide an overview of additional manufacturing conducted at the facility.
3. The system vendor shall describe the facilities' throughput capacity on manufactured Printed Circuit Assemblies (PCA).
4. The system vendor shall provide a layout of the manufacturing facility and include graphics of selected manufacturing equipment in the factory.

M. Disaster Recovery Plan

1. The system vendor shall provide a description of their disaster recovery plan, including an example of how the plan was followed during an actual disaster situation.

N. Cost

1. The system vendor shall provide a complete turnkey price for design/build and installation of a retrofit fire alarm system.

O. Central Monitoring

1. The system vendor shall provide around the clock electronic monitoring for trouble and alarm conditions. Please describe the process used to notify agencies and/or individuals if a condition occurs. Note any value added features such as redundancy or technology enhancements.

P. Security Integration to the Proposed Fire Alarm System

1. The system vendor shall provide an optional overview of a security access control platform that integrates to the proposed fire alarm system. The system vendor shall describe the variety of network solutions that are available for this security platform (i.e. dedicated fault tolerant network, Ethernet Network, Wide Area Network.)

END OF SECTION 283101