PART 1 - GENERAL

1.1 GENERAL AND SPECIAL CONDITIONS:

A. Division 1 General Requirements of these specifications shall apply to the work in this section.

B. The Contractor shall furnish all equipment, materials, tools, labor, engineering, drawings, necessary for a complete point addressable fire alarm system with the system made ready for operation in accordance with the requirements of these specifications and associated drawings. The purpose of these specifications and drawings is to convey to the Contractor the scope of work required, all of which the Contractor is responsible to furnish, install, adjust, and make operable.

C. The Contractor shall visit the site before submitting their bid and shall examine all existing physical conditions that may be material to the performance of their work. No extra payments will be allowed to the Contractor because of extra work made necessary by their failure to do so. Any case of error, omission, discrepancy or lack of clarity shall be promptly identified to the Owner and Engineer for clarification prior to the bid due date.

D. All demolition and construction operations shall be in accordance with the Virginia State Fire Prevention Code and NFPA 241.

1.2 SCOPE OF WORK:

A. Provide labor, materials, and equipment for a complete and functional fire alarm and supervisory signaling system as outlined in these specifications and shown on the drawings.

B. The guidelines are not intended to be all-inclusive and do not limit or define the Contractor's Scope of Work. The work includes the following:

1. Furnishing and installing point addressable fire alarm control equipment, power supplies, initiating devices, notification appliances, remote graphic annunciator, switches, relays, software and accessories, to provide a complete fire alarm system throughout the building.

    a. All devices shall be new and either installed in the same location as existing devices to be removed or new locations. New devices in new locations are indicated as such on the drawings.

2. Installing new conduit and wiring necessary for a complete system as necessary. Where practicable, all conduit and wiring shall be hidden from view. Contractor shall reuse existing conduit where such conduit is installed in accordance with NFPA 70, National Electric Code.

3. Core drilling and firestopping as required.

4. Cutting and patching as required.

5. Maintaining the existing fire alarm systems in operational condition until the new system has been approved by the AHJ.

6. Removal of all existing fire alarm equipment and devices.

7. Submission of detailed shop drawings and submittal information.

8. Coordination of the work with other trades.

9. Providing on-site project supervision.

10. All permits, fees, and other charges required for the work.

11. Providing Record Documents upon completion of the project.

12. Providing operating and maintenance manuals including instructions for the use of all devices and equipment utilized on the project.

13. Providing training of designated Owner's personnel.

14. Conducting final system testing as required by the applicable Standards and the AHJ.

15. Providing a warranty for all equipment and labor.

1.3 SYSTEM ABBREVIATIONS AND DEFINITIONS:

A.	ADA:	Americans with Disabilities Act.
B.	ADAAG:	Americans with Disabilities Act Accessibility Guidelines.
C.	AFF:	Above Finished Floor.
D.	AHJ:	Authority Having Jurisdiction.
E.	Approved:	Unless otherwise stated, materials, equipment or submittals approved by the Owner, Architect, or AHJ.
F.	Concealed:	Where used in connection with installation of piping or conduit and accessories shall mean “hidden from sight” as in shafts furred spaces, soffits, or above ceilings.
G.	Engineer:	Aon Fire Protection Engineering
H.	FACP:	Fire Alarm Control Panel.
I.	GAP:	Graphic Annunicator Panel
J.	IDC:	Initiating Device Circuit.

K.	LCD:	Liquid Crystal Display
L.	LED:	Light Emitting Diode.
M.	Listed:	Materials or equipment included in a list published by a nationally recognized laboratory that maintains periodic inspection of production of listed equipment and materials.
N.	NFPA:	National Fire Protection Association.
O.	NAC:	Notification Appliance Circuit.
P.	Owner:	Arlington County Public Schools
Q.	Style 4:	As defined by NFPA 72, 2007 edition.
R.	Style Y:	As defined in NFPA 72, 2007 edition. Also known as Class B.
S.	UL:	Underwriters Laboratories, Inc.
T.	UL Listed:	Materials or equipment listed by Underwriters Laboratories and included in the most recent edition of the UL Fire Protection Equipment Directory.

1.4 RELATED WORK:

A. Materials furnished and installed by Others but completed by this Contractor:

- Existing elevator controls shall be wired to the fire alarm system for elevator recall. The Fire Alarm Contractor shall retain the services of the Owner's Elevator Contractor to perform final connections to the elevator controls.

1.5 PERFORMANCE REQUIREMENTS:

A. The Contractor shall provide UL listed point addressable fire alarm system complete and as specified in this section having the following primary features:

- Smoke detectors, heat detectors, and other initiating devices; notification appliances; control relays; and monitoring relays to form a complete fire alarm system per the referenced standards and as specified herein.
- Reuse of the existing Radionics Digital Alarm Communication Transmitter (DACT).
- Graphic annunciator panel at the building's main entrance.

B. Systems Circuit Wiring:

- All fire alarm point addressable circuits shall be NFPA 72, Style 4, supervised signaling line circuits.
- All fire alarm notification appliance circuits shall be NFPA 72, Style Y, electrically supervised circuits.

1.6 SYSTEM OPERATION:

A. The point addressable fire alarm and supervisory signaling system shall perform the following functions:

- Continuous monitoring of the status of all fire and supervisory alarm initiating devices.
- Visible point annunciation of all fire alarm point trouble conditions at the FACP and GAP.
- Operation of indicated control functions.

B. Change in status of any initiating device on the system shall:

- Activate audible and visible status change indicators and display the system point number, point description, status and message associated with the point on the FACP operator control panel LCD display.
- Activate audible and visible status indicators and display the system device type and building zone associated with the point of alarm on the GAP.
- Activate the building audible and visible systems as required by the matrix of operations indicated on the design drawings.
- Permanently record the change in status, time, date, point description and message associated with the point in fire alarm system historical event memory.

C. Activation of any manual station, waterflow, smoke detector, or heat detector system initiating device shall cause the following functions to occur:

- Activate audible and visible status change indicators, display the system point number, point description, and message associated with the point on the system's operator terminal and remote GAP.
- Permanently record the change in status, time, date, point description and message associated with the point in fire alarm system historical event memory.
- Activate the building audible and visual occupant notification system.

- Transmit an alarm signal to the central station using the existing Radionics DACT.

- Elevator lobby or elevator machine room smoke detector operation shall immediately recall the affected elevators to the lobby level. If the alarm is on this level, recall the elevators to the alternate level.

D. Duct smoke detector activation shall:

- Activate audible and visible status change indicators, display the system point number, point description, and message associated with the point on the system's operator terminal and remote GAP.

- Permanently record the change in status, time, date, point description and message associated with the point and in fire alarm system historical event memory.

- Activate the building audible and visual occupant notification system.

- Shut down the fan unit associated with the duct detector.

- Activate door unlocking system and door release system.

- Transmit an alarm signal to the central station.

E. Sprinkler valve supervisory device or other supervisory device activation shall:

- Activate audible and visible status change indicators, display the system point number, point description, and message associated with the point on the system's operator terminal and GAP.

- Permanently record the change in status, time, date, point description and message associated with the point in fire alarm system historical event memory.

- Transmit a supervisory signal to the central station.

F. Removal of any device, wiring disarrangement, or system component failure shall display on the fire alarm system operator's terminal and GAP. The change of status, time, date, point description and the message associated with the point shall be recorded.

G. When any point in the system returns to normal, the fire alarm control panel shall:

- Activate audible and visible status change indicators, display the system point number, point description, and message associated with the point on the FACP system's operator terminal and remote GAP.

- Acknowledgment of "system return to normal" will print the time, date, point identification and message. The acknowledgment will also silence all audible indicators associated with the point at the FACP and GAP.

1.7 APPLICABLE STANDARDS:

The following standards and guides (of the issue indicated) are hereby made a part of this work by reference thereto. The provisions of the VUSBC and its referenced standards shall take precedence over the other listed standards. Where standards are not specifically referenced by the VUSBC, the most recent edition shall be used.

A. Virginia Uniform Statewide Building Code, 2006 edition (effective May. 1, 2008).

B. NFPA 70 - National Electrical Code, 2005 edition.

C. NFPA 72 - National Fire Alarm Code, 2007 edition.

D. NFPA 241 – Safeguarding Construction, Alteration, and Demolition Operations, 2009 edition.

E. UL Standard 268, Smoke Detectors for Fire Protective Signaling Systems, 1996 edition.

F. UL Standard 268A, Smoke Detectors for Duct Application,1996 edition.

G. UL Standard 346, Waterflow Indicators for Fire Protective Signaling Systems, latest edition.

H. UL Standard 464, Audible Signal Appliances, latest edition.

I. UL Standard 521, Heat Detectors for Fire Protective Signaling Systems, 1996 edition.

J. UL Standard 864, Control Units for Fire Protective Signaling Systems, 2003 edition.

K. UL Standard 1424, Cables for Power-Limited Fire Protective Signaling Systems, latest edition.

L. UL Standard 1481, Power Supplies for Fire Protective Signaling Systems, latest edition.

M. Americans with Disabilities Act Accessibility Guidelines (ADAAG), 1990 edition.

N. American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) A17.1, Elevator Code, 1996 edition.

O. American Society of Mechanical Engineers (ASME)/American National Standards Institute (ANSI) A17.3, Elevator Code for Existing Elevators, latest edition.

P. American National Standards (ANSI) A117.1, Accessibility Code, latest edition.

1.8 SUBMITTALS:

A. Submit the following equipment information:

- Manufacturer's data sheets with equipment to be used highlighted
- Wiring diagrams of all equipment
- Installation instructions for all equipment
- Equipment dimensions
- Equipment testing procedures
- Equipment maintenance manuals
- Wire data sheets

B. Submit the following software information:

- Proposed point numbers
- Point descriptors
- Complete sequence of operation with input/output matrix for all points and
- English action messages

C. Submit the following shop drawing information:

- Complete panel layout showing all field terminations
- Complete panel layout showing location of all modules, power supplies and batteries
- Complete system riser diagrams
- Main panel elevations
- Complete floor plans showing all devices with point numbers and all wire between devices

D. Submit the following system calculations:

- Standby battery capacity for fire alarm (identifying both the nonalarm and alarm load associated with each, and demonstrate conformance to the requirements of these specifications),
- Standby battery capacity for all remote panels (identifying both the nonalarm and alarm load associated with each, and demonstrate conformance to the requirements of these specifications),

- Voltage drop calculations for each type of circuit (identifying all mathematical formulas, variables, constants, and sources of the mathematical constants),
- Strobe circuit loading,
- Normal 120 VAC fire alarm panel(s) circuit loading,

E. Prior to start of construction, submit the information outlined in A, B, C and D above to the following:

- Two complete submittal packages to the Engineer for review.
- One complete submittal package to the Owner for review.
- **PARTIAL SUBMITTALS ARE UNACCEPTABLE.**

F. Costs incurred by the Owner for the review of additional submittals resulting from an initial rejection shall be the responsibility of the submitting contractor.

1.9 WARRANTY:

A. This Contractor shall provide a two year written warranty against defects in material and workmanship furnished under this Contract. The costs of such warranty shall be part of the purchase price. The warranty commences when the system and installation are accepted by the AHJ, the Owner, and the Engineer.

B. The warranty shall include all necessary material, travel, labor, and parts to replace defective components or materials at the job site. This Contractor shall commence repair of any “in warranty” defects within eight hours of notification of such defects.

C. The warranty shall include all necessary factory and field software required to perform the specified tasks. This item does not include software installed after system acceptance unless the defective software was installed at the direction of the system manufacturer.

D. The Contractor shall make allowances in the warranty to cover diagnosis of system defects that may ultimately be the responsibility of others to correct. When this occurs, the Owner and other affected trades shall be notified.

E. If the Owner experiences more than two spurious or unexplained false alarms or troubles in any 48 hour period while the system is under warranty, the Contractor shall provide the necessary labor, materials, and technical expertise to promptly correct the problem(s) without additional cost.

F. The Contractor shall include, as part of the warranty, a test and inspection of the entire fire alarm system at least one month prior to the expiration of the construction warranty. The Contractor shall provide a written report of any deficiencies and repair all of the deficiencies. The test and report shall conform

to the certification described in NFPA 72 and as required by the AHJ, the Owner, and the Engineer.

1.10 ~~ADDITIONAL DEVICES~~ ALTERNATES AND UNIT PRICES

A. Alternate No. 1: The Contractor may, at their option, provide a voluntary alternate for the reuse of existing fire alarm system wiring where deemed feasible by the contractor for use with the new Simplex equipment and 4100U Control Panel. Such an alternate shall comply with the requirements and intent of the drawings and specifications. The base bid is to provide new wire and, where necessary new raceway. Should the contractor elect to reuse part of all of the existing wire, the contractor shall confirm reused existing circuits are in compliance with the applicable codes and performance criteria of these specifications (e.g. notification appliance circuits are not paralleled and report trouble conditions appropriately) and shall warranty the reused wire for one year from acceptance of the system by the Owner.

B. The Contractor shall provide with the bid, prices for providing additional devices as stated as follows. The unit prices shall include the device, installation, 20 feet of conduit, wire, programming and any other required work.

- Manual pull station
- Audible horn
- Multi-candela strobe
- Combination audible horn/multi-candela strobe
- Addressable monitor module
- Addressable control module
- Remote power supply

1.11 DELIVERY, STORAGE AND HANDLING OF MATERIALS:

A. Contractor will deliver all materials to area of project designated by Owner's representative. Vehicles shall not block fire lanes or fire doors during delivery of materials.

B. The Owner's representative will designate an area within the facility for storage of all materials. At the end of each working day, all materials shall be returned to the designated area. Material, equipment, tools, etc. will not be left outside the storage area without the consent of the Owner's representative.

C. The cost of all material handling, delivery and freight is the Contractor's responsibility. The Owner or their representatives will not be responsible for materials delivered to the site.

D. Maintain premises free from accumulation of waste materials or rubbish caused by this work. At the completion of the work, remove all surplus materials, tools, etc., and leave the premises clean to the Owner's satisfaction.

1.12 QUALITY ASSURANCE:

A. The fire alarm system manufacturer shall maintain a fully staffed branch office including application engineers, drafters and technical service personnel within the Washington, DC/Northern Virginia metropolitan area.

B. All supplied equipment shall be standard products of the manufacturer and regularly stocked within the manufacturer's branch office.

C. All technical service personnel shall be regularly employed by the fire alarm system manufacturer.

D. All electrical installation of the fire alarm system, including wire installation and terminations, shall be performed by electricians in the employ of the Electrical Contractor.

E. Any subcontractors used to install portions of the system shall be approved by the Owner and the Engineer prior to commencement of the installation.

1.13 EXISTING CONDITIONS:

A. The existing DACT to be reused is a Radionics.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Provide a UL listed point addressable fire alarm control system. Acceptable fire alarm equipment supplier shall be limited to Simplex per Arlington County Public Schools.

B. Products for this project shall be of the latest design. Obsolete or discontinued models are not acceptable.

C. All equipment supplied shall be UL listed for the required function.

D. All fire alarm equipment shall be a product of one system manufacturer.

2.2 FIRE ALARM CONTROL PANEL (FACP):

A. FACP shall be Simplex Model 4010, surface mounted and installed in the Boiler Room as shown on the drawings. The FACP shall be equipped with locked enclosures having removable access panel for servicing of electronic components. The FACPs shall be completely prewired requiring only the connection of incoming field wiring and the plugging in of accessory modules. All controls and displays shall be mounted at height of 60-inches measured to the top of the cabinet and allowing for easy access by operating personnel. The FACPs shall include, but not be limited to, the following major components, some of which may be physically separate from the main cabinet:

1. Central processing equipment.

2. Normal AC power supplies.

3. Data transmission equipment.

4. Emergency power supplies.

B. The central processing unit (CPU) shall be a "mini" or "micro" computer, listed in accordance with UL 864. (Use of non-UL listed computers is strictly forbidden.) The main memory system shall be adequately sized to provide display, printout and control of 150 percent of the actual alarm and command points as described herein. All basic alarm and control software shall be included. The CPU shall be completely field programmable and all data entered shall reside in the system memory.

C. The CPU shall be equipped with a nonvolatile main memory system of EPROM, battery protected RAM, or EEPROM memory system. The mass storage system for all English descriptors, English language operator's messages and associated data files shall be bubble type or fully encapsulated hard disk. The mass storage system shall be equipped with all necessary control hardware and software.

D. The system operating terminal shall be the liquid crystal display (LCD) type and shall include, at a minimum, control function keys, digital display window, programming keys and key-operated lockout capability. The time shall be permanently displayed on the LCD and shall be visible at all times. The LCD shall allow the operator to perform the following minimum tasks:

1. Inquire point status.

2. Start or stop equipment manually.

3. Test and reset equipment manually.

4. Bypass control points during manual system tests that shall include:

   - Notification
   - Elevator recall
   - HVAC shut down
   - Door release

5. Initiate control by event sequences.

6. Manually request "logs" of system status.

7. Acknowledge status changes.

8. Silence local alarm sounder.

9. Monitor and control smoke detector sensitivity.

E. Normal operating power for the FACP shall be 120 volt AC supplied from dedicated circuits of the local power panel. Emergency power shall be utilized where available. All circuits shall be protected by circuit breakers of proper size.

F. The fire alarm system shall be provided with an emergency standby power system consisting of backup batteries. Batteries shall be sealed lead-acid or gel cell of sufficient capacity to provide 24-hour standby operation plus 5 minutes in full alarm condition. All calculations shall allow a minimum of 15% safety factor for battery degradation.

G. FACP shall be capable of synchronizing all strobes.

2.3 NOTIFICATION APPLIANCE CIRCUITS:

A. Notification Appliance Circuit (NAC) shall be integral to the FACP to the greatest extent possible to limit the use of remote power supplies.

B. NAC circuits shall be configured such that the devices connected shall not draw more than 80 percent of the 2 A rating.

2.4 REMOTE GRAPHIC ANNUNCIATOR PANEL:

A. GAP shall be provided in the building lobby and shall be of the approximate same size and detail as the existing panel. GAP shall be provided with an LED indicator lamp for each type of device monitored, system lamp test, and system trouble silence switch. The existing GAP cabinet and surface mounted wiremold shall be reused as practical.

2.5 POINT ADDRESSABLE SYSTEM SOFTWARE:

A. As part of the initial system installation, provide all executive system software for the fire alarm system including, but not limited to, the following:

1. Basic alarm processing programs.
2. Control by event programs.
3. System point scanning routines.
4. Password control routines.
5. Emergency file display routines.
6. Printer routines.
7. Smoke detector sensitivity routines.

B. Provide as part of the system all preparation and installation of data files including, but not limited to, the following:

1. Point descriptions.
2. Control by event sequences.
3. Emergency file statements.

4. Print statements.

5. Password installation.

C. Systems which rely on EPROM shall be factory reprogrammed at no additional cost to the Owner as many times as required until the system is accepted by the Owner, Engineer, and AHJ.

D. Point descriptions shall consist of English language statements that adequately define the point or zone. The use of abbreviations shall be limited to commonly used fire alarm system abbreviations.

E. System emergency file statements shall be assigned to individual points/zones to assist operator response to an emergency condition. The emergency file shall consist of English language statements that adequately define the desired action. The use of look-up tables is expressly forbidden.

2.6 ALARM INITIATING DEVICES:

A. The manual stations shall be double-action type (Simplex Model 4099-9001), red with white lettering, and shall be provided where iindicated on the drawings.

1. Semi-flush mounted stations shall mount on a standard electrical box.

2. Operation of a manual station shall cause its contacts to manually lock-in until manually reset and visibly indicate that the station was activated.

3. Existing wire type covers shall be reused and provided for all manual stations.

B. Point addressable, analog, photoelectric type smoke detectors shall be provided where indicated on the drawings. The smoke detectors shall be provided with integral LEDs to indicate detectors in alarm. Line transient and RFI protection shall be built into the detector. Detectors mounted in electrical vaults shall have a remote indicator light mounted above the entrance to the vault.

C. Point addressable, analog, photoelectric type duct mounted smoke detectors shall be provided where indicated on the drawings. The smoke detectors, listed under UL Standard 268A, shall be provided with approved duct housings mounted on the exterior of the duct, and shall have perforated sampling tubes extending across the width of the duct. Each mounted concealed detector shall have a remote indicator light. Provide an addressable control relay for fan shutdown control where required.

D. Point addressable heat detectors shall be a combination of rate-of-rise and fixed temperature, listed under UL Standard 521, shall be provided where indicated on the drawings. The heat detectors shall be rate compensated type or analog type. Temperature ratings of the heat detectors shall be appropriate for the area protected. The detectors shall have a listed spacing for coverage up to 2,500 square feet.

E. Addressable point monitoring modules shall be used to monitor the waterflow devices and similar alarm initiating device relays. The interface modules shall provide Style B electrical supervision of monitored devices and be equipped with terminal strips or terminal blocks.

2.7 SUPERVISORY INITIATING DEVICES:

A. Valve supervisory devices are existing and shall be reused unless noted on drawings otherwise for all indicated sprinkler control valves. The valves to be supervised may be OS&Y or butterfly-type, or a combination of both.

B. Addressable point monitoring modules shall be used to monitor all supervisory points. The monitoring modules shall provide Style B electrical supervision of monitored devices. The interface modules shall provide Style B electrical supervision of monitored devices and be equipped with terminal strips or terminal blocks.

2.8 ALARM NOTIFICATION APPLIANCES:

A. Strobe units shall be TrueAlert multi-candela appliances. The units shall be flush or surface mounted similar to the respective existing device to be replaced in existing locations and red color installed with integral backbox. The units shall operate on 24 volt DC polarized power with a flash rate of 1 to 2 Hertz. All strobes shall be synchronized from the FACP.

B. Horns shall be TrueAlert electronic type, 24 volt DC non addressable type rated at nominal 85 dB @ 10-feet. Devices shall be flush or surface mounted similar to the respective existing device to be replaced and red color installed with integral backbox.

C. Combination horn-strobes shall be TrueAlert multi-candela appliances. The units shall be flush or surface mounted similar to the respective existing device to be replaced in existing locations and red color installed with integral backbox. The units shall operate on 24 volt DC polarized power with a flash rate of 1 to 2 Hertz. All strobes shall be synchronized from the FACP.

2.9 CONTROL DEVICES:

A. Provide control relays/contacts for HVAC unit shutdown associated with duct detectors where indicated. The control relays/contacts shall be 24-volt DC low voltage type, each with number of contacts as required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.

B. Provide control relays/contacts for elevator recall where indicated. The control relays/contacts shall be 24-volt DC low voltage type, each with number of contacts required and housed in metal enclosure. The contacts shall be rated as required for continuous duty.

C. Addressable point control devices shall be used to provide all required control functions. Control relays connected to unsupervised circuits shall be located within 3 feet of the controlled device.

2.10 GRAPHIC ANNUNCIATOR PANEL:

A. GAP shall provide a representation of the building floor plan and common LED indicator lamps for each type of initiating device monitored by the FACP. GAP shall consist of a 4-inch deep surface mounted backbox equipped with a continuous hinge and lock complete with aluminum graphic frame, minimum 7-mil photographic film applied to 3/16-inch non-glare polycarbonate. As a minimum, graphic layout shall include building footprint, stairs, elevators, and zone designations. Proposed layouts shall be approved by the Owner, AHJ, and Engineer prior to fabrication.

B. Provide a red LED for each zone within the corresponding zone on the graphic floor plan, and provide one red LED for each type of alarm initiating device. Provide one additional red LED with no label.

C. Provide an orange LED for each zone within the corresponding zone on the graphic floor plan, and provide one orange LED for each type of alarm initiating device. Provide one additional orange LED with no label.

D. Provide a yellow LED for indication of trouble conditions. Provide green LED's for indication of power supervision.

E. GAP shall include all LED's and control switches required by the Authority Having Jurisdiction.

F. Electronic drivers, power supplies, and any other components required for proper operation shall be enclosed within the GAP.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER:

A. The existing DACT shall be reused.

2.12 DEVICE GUARDS:

A. Manual pulls stations in public areas shall be provided with existing wire type covers to be reused.

B. Audible and visual indicating appliances installed in the gymnasium shall be provided with wire mesh protective guards, minimum 6 gauge steel wire, painted red. Appliance guards shall be Gorilla Guard G2007-R or equivalent.

PART 3 EXECUTION

3.1 INSTALLATION:

A. The Fire Alarm System Supplier shall furnish on-the-job supervision for the proper installation of their devices in cooperation with, or as may be required by, other trades. This supervision shall include, but not be limited to, the following:

1. Provide specific on-site instructions to others on mounting and installation of each type of device by physically observing the mounting of one or more of each type of device, as required, to assure that the installer is properly instructed in the work.

2. Provide other supervision as required by the trades to properly perform alarm installation work.

3. Perform a complete test of the system, certifying that all devices have been activated and that the devices and systems perform in accordance with the requirements of these specifications and local codes.

4. Install, test, trouble-shoot and correct all system software provided under these specifications. This includes, but is not limited to, actual keyboard entry, reprogramming required to meet these specifications and any other task associated with the system software.

5. Provide layout drawings and detailed wiring diagrams as required by the Submittal section of these specifications and current requirements.

B. The Fire Alarm Contractor shall furnish all material and labor to provide a complete and functional system that operates in accordance with the requirements of these specifications. This shall include, but not be limited to, the following:

1. Conduit, raceway and wiring systems as indicated herein.

a. Exposed surface mounted wiring shall be in Wiremold and not standard electrical metallic tubing (EMT).

b. All riser wiring and wiring between floors shall be installed in EMT.

c. All wire installed for this project shall be new and be UL listed for use in fire alarm systems.

d. Strap or bundle all cables and wires inside equipment enclosures and terminal cabinets, parallel to the enclosure sides.

e. Wire:

(1) Wire used for 120 VAC power circuits shall be minimum size of 12 AWG stranded copper conductors, with THHN insulation.

(2) Wire used for 24 VDC power circuits and strobe circuits shall be minimum size of 14 AWG solid copper conductors, with TFN insulation and UL listed for fire alarm use and labeled FPL.

(3) Wire used for point addressable, signaling line circuits, and Network transmission systems shall be minimum size of 18 AWG solid copper conductor, UL listed for fire alarm system use and labeled FPL.

(4) Wire shall be UL listed for use in fire alarm signaling systems or as required by NFPA 70, Article 760. All wire shall be a solid conductor of copper, minimum size of No. 18 AWG and insulation rated at 300 volts.

(5) All wire shall meet the requirements and recommendations of the system manufacturer.

f. The installation of all exterior wiring shall meet the requirements of NFPA 70, Article 800.

2. Power Supplies:

a. Dedicated primary 120 VAC power from the nearest emergency power panel shall be connected to FACP.

b. Where existing 120 VAC power connections to the existing FACP cannot be reused, dedicated lockable breakers shall be provided for power circuits of the FACP.

c. Where necessary, no new fire alarm system 120 VAC primary power circuit shall be loaded beyond 80 percent of the circuit's rated capacity.

d. Design load connected to any power supply/standby battery shall not exceed 85% of its rated capacity.

3. Conduit:

a. New conduit shall be 3/4-inch minimum size and be EMT type except where otherwise required by local code or these specifications. Metal clad cable is permitted in concealed spaces for horizontal fire alarm branch circuits and connections to devices and fixtures.

b. All EMT conduit fittings shall be compression type.

c. Flexible conduit and associated junction boxes connecting sprinkler waterflow and supervisory switches shall be water resistant.

d. Conduit shall be installed as required by NFPA 70, Article 501.

e. All exposed surface mounted conduit in corridors, classrooms, office, or similar public view areas shall be wiremold.

4. Junction Boxes:

a. Sectional boxes shall not be used.

b. Each box shall be large enough to accommodate required splices and conduit in accordance with the NFPA 70.

c. All box covers shall be painted red.

5. Field Terminal Cabinets (FTC):

a. FTC shall be UL listed for use in electrical wiring systems.

b. FTC minimum size shall be 12 inches by 12 inches by 4 inches with hinged lockable cover or plate cover attached with tamper resistant screws.

c. FTC shall be painted red with label "Fire Alarm Equipment" stenciled on cover.

d. UL listed terminal strips shall be provided for all wiring splices in terminal boxes. All terminals shall be permanently labeled. **The use of wire nuts to make wiring splices is strictly prohibited.**

6. Patching of all walls, floors and ceilings that are penetrated or damaged during construction.

a. All slab penetrations shall be completely sealed and made watertight.

b. Restore all firewalls to rated conditions.

7. X-raying of floor areas prior to core drilling.

8. All coring and sleeving required.

C. Mounting:

1. Manual stations in finished areas shall be mounted in flush or surface mounted boxes in existing locations respective to the mounting of the existing device to be replaced. Manual stations located in unfinished areas shall be surface mounted on back boxes provided by the device manufacturer. All manual stations shall be mounted in existing locations unless otherwise noted.

2. All notification devices shall be mounted in existing device locations.

3. All alarm devices and strobes shall be mounted in accordance with the manufacturer's installation instructions and use the manufacturer's suggested mounting box.

4. Point addressable monitor modules and control modules shall be securely mounted in back boxes or mounted on rails within a larger enclosure. **The use of wire nuts to make connections to these modules is strictly prohibited.**

5. Panels including Fire Alarm and Annunciators shall be mounted so that no control switch or visible indicator will be installed less than 36 inches AFF or greater than 72 inches above the finished floor.

6. All flush and semi-flush devices or panels shall be installed with trim rings or cover plates.

7. Locations in ceilings or walls where devices are removed and not being provided with a new device shall be covered with custom cover plates finished to match the decor. The cover plates shall fully cover the opening by at least 2 inches on all sides.

8. All panels visible to the public or noted on the drawings shall be finished as directed by the Owner.

D. X-raying of floor areas prior to core drilling.

E. All coring and sleeving required.

F. Pay for all permits, fees and charges required to complete this work.

G. The existing building fire alarm system shall remain operational during the installation of the new fire alarm system. As new equipment is installed, it shall be labeled “NOT IN SERVICE” until the new equipment is accepted. Upon acceptance of the new fire alarm system and placement into service, all new equipment shall have tags removed and the existing equipment shall be tagged “NOT IN SERVICE” until removed from the building.

H. Remove designated devices and repair surface to match the existing area. Removed equipment shall be given to the Owner by the Fire Alarm Contractor.

3.2 PAINTING, PATCHING AND FIRESTOPPING:

A. Firestopping shall be installed wherever the conduits penetrate floors and fire walls. The firestopping material shall meet the requirements of UL 1479.

B. Installation of firestopping:

1. Install firestopping in accordance with the manufacturer’s recommendations and as necessary to meet the specified fire rating requirements.

2. Where firestopping is used to seal around penetration through waterproof membranes, install to maintain integrity of waterproof barrier.

3. Contractor shall document specific fire stopping systems and methods used for each location. Documentation shall be issued to the Engineer prior to field inspections.

C. Patching of all walls, floors and ceilings that are penetrated or damaged during construction and returning the surface to a condition matching existing adjacent surfaces.

1. All slab penetrations shall be completely sealed and made watertight.

2. Restore all fire resistance rated walls to rated conditions.

3.3 TESTS/FIELD QUALITY CONTROL:

A. The final alarm acceptance test shall be coordinated with the Engineer. Prior to the acceptance test, the Contractor shall conduct a full pre-test of the system to verify proper operation. A letter certifying that the installation is complete and operational shall be forwarded to the Owner and Engineer.

B. Prior to the start of acceptance testing, the Contractor shall provide the Engineer with a printout of the system point numbers, point descriptions, English messages, event control description and sequence of system operation.

C. The Owner, Fire Alarm Contractor, Fire Alarm System Supplier, the Engineer and an authorized representative from each supplier of equipment shall be in attendance at the final acceptance test to make necessary adjustments. A final test shall be conducted in accordance with NFPA 72 requirements. The test shall include, but not be limited to:

1. A test of the complete system for grounded, open and shorted circuits.

2. A test of each alarm-initiating device for functions specified and for the required alarm actions.

3. A test to verify smoke entry into sensing chamber of smoke detectors.

4. A test of the system for electrical supervision.

5. A test to verify that the emergency power source is capable of operating the system for specified periods.

6. A test to verify that alarm signals will operate under specified trouble conditions.

7. A test to verify that the system will operate under specified trouble conditions.

8. A test to verify that the system will perform all specified tasks.

9. A test to verify that audible sound level coverage has been achieved.

10. A test to verify remote monitoring transmission will operate as required.

11. A test to verify that a hard copy of all required system actions will be properly recorded.

D. During the system testing, the Contractor shall provide at the site a wide carriage printer connected to the FACP to document system testing. The Contractor shall provide a copy of the printed record to the Engineer.

E. The Contractor shall provide all materials, equipment, coordination and personnel necessary to perform and document all required tests. All test equipment shall be subject to approval by the Owner and Engineer.

F. A minimum of two (2) days will be required for these tests.

G. If the system requires a retest by the Engineer or the AHJ, all costs of the retest shall be the responsibility of the Fire Alarm Contractor.

3.4 TRAINING:

A. Provide three (3) operating manuals containing illustrations, description of each detection device, operation of control panels, switches, pilot lights, etc to Owner.

B. Conduct two (2) separate 4-hour training sessions for operating personnel. These sessions are to cover proper operating and response procedures. These instructions shall be sufficient to enable a previously untrained person to properly operate and maintain the system.

C. Provide three software manuals containing a listing of all points, event programs, basic programming and instructions, and software trouble-shooting information.

3.5 RECORD DOCUMENTS:

A. Provide one (1) reproducible print, two (2) plain paper prints, and a set of disks or CD-Rom in AutoCAD 2010 of drawings, floor plans with device locations, device addresses, wire routing and wiring diagrams reflecting "as-built" conditions to the Owner.

B. Provide two (2) complete sets of "as-built" data sheets for all system-connected equipment to the Owner.

C. Provide two (2) sets of the complete "as-built" software listing of all data files, event programs, print statements, points lists, etc. to the Owner.

D. Provide three (3) sets of customized "as-built" operating manuals to the Owner.

E. Provide one (1) complete set of "as-built" drawings and wiring diagrams to the Engineer.

F. Provide a completed test form which complies with NFPA 72, signed and dated by the fire alarm system manufacturer or his agent in each operating manual.

G. Provide NFPA 72 completion certificate, in each operating manual.

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

3.6 SPARE PARTS:

A. All spare parts shall be directly interchangeable with the corresponding components of the installed systems.

B. The Fire Alarm Contractor shall furnish a listing, in duplicate, of all spare parts and accessories that the manufacturer recommends to be stocked for proper maintenance of system.

C. The Fire Alarm Contractor shall furnish the following spare parts:

a. Four point addressable manual stations.

b. Four point addressable spot smoke detectors and bases.

c. One point addressable duct smoke detectors with housings.

d. Four point addressable monitoring modules.

e. Four point addressable control modules

f. Four horn-strobes.

g. Four multi-candela strobe lights.

h. Three sets of keys for each type of lock.

END OF SECTION 13850