DIVISION 28
ELECTRONIC SAFETY AND SECURITY

Addendum 5

SECTION 28 31 00 - FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire alarm system; complete, including all wiring, raceways, terminal cabinets, pull boxes, outlet and mounting boxes, initiating devices, alarm indicating devices, annunciator(s), control equipment, tests, and all other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described.

B. Verify requirements with Jurisdictional authorities, i.e.: Insurance authority or Underwriter, Fire Department or Marshal, or Building Department. Provide system complete, functional and acceptable to Jurisdictions without penalty of any type to the insurance premium rate. This contractor shall be completely responsible for all aspects of coordination with other sections of these specifications and drawings. No change will be issued for lack of coordination or lack of verification of requirements of Jurisdictional Authorities.

C. Related Sections
   1. Section 01 33 00 – Submittal Procedures
   2. Section 26 05 00 - Common Work Results for Electrical
   3. Section 26 05 28 – Hangers and Supports for Electrical Systems
   4. Section 26 05 33.13 – Conduit for Electrical Systems
   5. Section 26 05 33.16 - Boxes for Electrical Systems

1.2 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI/ASME A117.1, A117.3 Standard for Accessible and Usable Building and Facilities.

B. National Electrical Manufacturer’s Association (NEMA)

C. National Fire Protection Association (NFPA):
   1. NFPA 70 – National Electrical Code
   2. NFPA 72 – National Fire Alarm Code
   3. NFPA 90A – Standard for the Installation of Air conditioning and Ventilating Systems
   4. NFPA 101 – Life Safety Code

D. Underwriters Laboratory, Inc. (UL):
   1. UL-864 – Control Units and Accessories for Fire Alarm Systems
   2. UL-1076 – Proprietary Burglar Alarm Units and Systems

E. International Fire Code (IFC)

F. The Americans with Disabilities Act (ADA)
   1. Public Law 101 - 336.

G. Underwriters Laboratories (UL) or Factory Mutual (FM) Approval.

H. Local Code requirements where applicable.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is an authorized representative of the fire alarm control panel (FACP) manufacturer for both installation and maintenance of units required for this Project. Installer shall be able to produce, upon request, references and proof of five (5) years minimum experience in the installation of systems of comparable size and performance to that specified.

B. Manufacturer's Representative:
   1. The system shall be commissioned by the authorized Manufacturer's Local Representative whose organization is factory-certified to service the system and maintains a qualified technical and engineering staff to program and service the system. This distributor shall fully stock and show evidence that they maintain a complete inventory of spare parts to properly and promptly service the system.
   2. Before commencing work, submit Representative's data showing the commissioned fire alarm systems of the same type and design as specified. Include the names and locations of at least five such installations. Identify the type and design for each system and furnish documentation that the system has performed satisfactorily for the preceding 48 months.

1.4 SYSTEM DESIGN REQUIREMENTS

A. Verify requirements with jurisdictional authorities (i.e. Insurance Carrier or Underwriter, Fire Department or Marshall, or local Building Code Department). This contractor shall be responsible for providing a complete and functional system, acceptable to the jurisdictions involved.

B. Qualification of System Technician: Installation drawings, shop drawing and as-built drawings shall be prepared by or under the supervision of an individual who is experienced with the type of work specified herein and is currently certified by the National Institute of Certification in Engineering Technologies (NICET) as an engineering technician with minimum Level III certification in the fire alarm and detection system program. This contractor shall submit data for approval showing the name and certification of all involved individuals with such qualifications at or prior to submittal of drawings. All submittals shall be stamped by a Registered Fire Protection Engineer.

C. Qualification of Fire Protection Engineer: The fire protection/life safety aspects of this project shall be supervised and reviewed by a qualified fire protection engineer. The fire protection engineer shall review all fire protection submittals and certify in writing that the design is in compliance with all applicable codes. A qualified fire protection engineer is defined as a registered professional engineer (PE) who has passed the National Council of Examiners for Engineering and Surveys (NCEE) fire protection engineering.

D. Notification circuits shall be designed with 20 percent spare capacity for future visual notification devices.

1.5 SUBMITTALS

A. Submit the following information in accordance with the requirements of section 01 33 00 and General Conditions of Contract:

B. This contractor shall submit shop drawings, product data and calculations to the Authority Having Jurisdiction, Fire Department/Marshall, Owner's Insurance Underwriter and/or other regulatory agency, and obtain approvals prior to submission to Engineer for review. Include approval documentation with submission to Engineer.

C. Provide complete submittals, which shall include schematic wiring drawings of the control panel showing internal and external control panel wiring and all devices. Floor plans/device layout drawings, sequence of operation, annunciator wiring schematics, battery calculations, and specification sheets for all equipment, all devices shall be provided. Drawings shall be formatted for full size sheets and to scale (1/8"=1'-0" minimum). Partial submittals will not be accepted.

D. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

1.6 OPERATION AND MAINTENANCE DATA

A. Submit to Engineer the following operation and maintenance information in accordance with the requirements of Metro North and General Conditions of Contract:
1. Instruction books and/or leaflets
2. Recommended renewal parts list
3. Final as-built drawings
4. Complete Wiring diagrams
5. NFPA 72 Test Report/Certificate

1.7 DEFINITIONS

A. Alarm-Initiating Device: A system component that originates transmission of a change-of-state condition, such as a manual pull station, smoke detector, heat detector, supervisory switch, etc.

B. Alarm Signal: Signifies a state of emergency requiring immediate action. Pertains to signals such as the operation of a manual station.

C. Class A Wiring: Circuits arranged and electrically supervised so a single break or single ground fault condition will be indicated by a trouble signal at the FACP and the circuit will continue to be capable of operation for its intended service in the faulted condition no matter where the break or ground fault condition occurs.

D. Class B Wiring: Circuits electrically supervised such that a single break or a single ground fault condition will be indicated by a trouble signal at the FACP no matter where the break or ground fault condition occurs.

E. Hard-Wired System: Alarm, supervisory, and initiating devices directly connected, through individual dedicated conductors, to a central control panel without the use of multiplexing circuits or devices.

F. Multiplex System: One using a signaling method characterized by the simultaneous or sequential transmission, or both, and the reception of multiple signals in a communication channel, including means for positively identifying each signal (also referred to as an Addressable System).

G. Supervisory Signal: Indicates abnormal status or need for action regarding fire suppression or other protective system.

H. Trouble Signal: Indicates that a fault, such as an open circuit, ground, etc. has occurred in the system.

I. NOT USED.

1.8 SYSTEM DESCRIPTION

A. General: UL and FM listed. Complete, zoned, non-coded, addressable, microprocessor-based fire detection and alarm system with manual and automatic alarm initiation, intelligent analog addressable smoke detectors, and automatic alarm verification for alarms initiated by certain smoke detectors as indicated.

B. Signal Transmission: Multiplex signal transmission dedicated to fire alarm service only.

C. Audible and Visual Alarm Indication: By sounding of audible notification devices and visual alarms.

D. System connections for alarm-initiation and alarm-indicating circuits: Class B (Style 4) wiring.

E. NOT USED.

1.9 RECORD DOCUMENTS

A. The As-Built drawings:
1. Submit, in accordance with the Contract Terms and Conditions, the following As-Built drawings:
   a. Contract base sheet drawings with any and all changes included and noted.
   b. The approved contract panel drawings and annunciator panel drawings
   c. Conduit plan showing the device address for all intelligent/analog-initiating devices.

B. The Operation and Maintenance Manual:
1. Submit an Operation and Maintenance Manual including:
   a. A complete set of equipment, component and device specification and data sheets
   b. A complete set of system drawings.
   c. A copy of the NFPA 72 Test Report/Certificate,
   d. A printed record of all test activity including the sensitivity readings for all intelligent/analog smoke detectors, the required system and component warrantee papers, and the name and address of the installer.

C. Five (5) sets of keys to all locks shall be provided in a proper key box or binder with each set of keys properly and legibly marked and tagged. Loose keys will not be accepted.

D. All documents and items described above shall be submitted for approval and turnover prior to the final testing and system certification with the exception of the NFPA 72 Test Report/Certificate which shall be delivered by hand to the Owner within two (2) days of the actual test and acceptance. One copy of the Test Report/Certificate shall be submitted to the Engineer.

1.10 ACCEPTANCE OF SYSTEM

A. Total acceptance of the system will only be made after the required tests, complete record document package and the instruction period have been provided.

1.11 GUARANTEE

A. Guarantee the labor, materials and equipment provided under this Contract against system defects for a period of one (1) year after the date of final acceptance of this work by the Owner.

B. Provide service by the equipment supplier during the guarantee period, seven (7) days a week, including holidays, within four (4) hours after notification. Repairs shall be affected within twenty-four (24) hours of notification.

C. Should this contractor fail to comply with the above requirements, the Owner will then have the option to make the necessary repairs and back charge the contractor without any loss of warranty or guarantee as provided by the Contract.

D. Any guarantee which is in conflict with the above will not be acceptable.

1.12 EXTRA MATERIALS

A. Spare Parts: At the completion of the project, the contractor shall turn over to the Owner, with transmittal documentation, the following extra materials described below (match products installed, package with protective covering for storage, and identify with labels describing contents):
   1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
   2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but not less than one unit.
   3. Smoke Detectors and Heat Detectors: Quantity equal to 10 percent of amount of each type installed, but not less than one unit of each type.
   4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but not less than one unit of each type.
   5. Keys and Tools: One extra set for access to locked and tamperproof components.

PART 2 - PRODUCTS

A. NOT USED.

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of System: By the FACP. Provide all programming required for a complete and operating fire alarm and detection system, to the complete satisfaction of the Owner and the Engineer. Backup of program shall be provided.

B. System Supervision: Automatically detect and report open circuits, shorts, and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.

C. Priority of Signals: Automatic alarm response functions resulting from an alarm signal from one zone or device are not altered by subsequent alarm, supervisory, or trouble signals. An alarm signal is the highest priority. Supervisory and trouble signals have second- and third-level priority. Higher-priority signals take precedence over signals of lower priority, even when the lower-priority condition occurs first. Annunciate and display all alarm, supervisory, and trouble signals regardless of priority or order received.

D. Noninterference: A signal on one zone shall not prevent the receipt of signals from other zones.

E. Transient voltage Protection: Provide protection on all circuits in accordance with manufacturer's recommendation.

F. System Reset: All zones are manually resettable from the FACP after initiating devices are restored to normal.

G. Transmission to Remote Alarm Receiving Station: Automatically route alarm, supervisory, and trouble signals to a remote alarm station by means of a digital alarm communicator transmitter and two (2) telephone lines.

H. Loss of primary power at the FACP initiates a trouble signal at the FACP and the annunciator. An emergency power light is illuminated at both locations when the system is operating on the secondary power supply.

I. Basic Alarm Performance Requirements: Unless otherwise indicated, operation of a manual station, automatic alarm operation of a flame or heat detector, operation of a sprinkler flow device, or verified automatic alarm operation of a smoke detector initiates the following:
   1. Notification-appliance operation.
   2. Audible and visual annunciation of ‘alarm’ condition at the FACP and the remote annunciator(s).
   3. Identification, in plain-text English via alpha-numeric display, at the FACP and the remote annunciator(s) of the device originating the alarm.
   4. Transmission of an alarm signal to the remote alarm receiving station.
   5. Unlocking of electric door locks in designated egress paths.
   6. Release of fire and smoke doors held open by magnetic door holders.
   7. Shutdown of fans and other air-handling equipment serving zone where alarm was initiated.
   8. Closing of smoke dampers in air ducts of system serving zone where alarm was initiated.
   9. Recording of the event in the system memory.
   10. Alarm Silencing, System Reset and Indication: Controlled by switches on the FACP and the remote annunciator.
   11. Silencing-switch operation halts alarm operation of notification appliances and activates an "alarm silence" light. Display of identity of the alarm zone or device is retained.
   12. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
   13. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

J. Activation of a smoke detector in an elevator lobby or a combination smoke/heat detector in an elevator hoistway or elevator machine room shall initiate the elevator recall operation and the facility fire alarm system.
   1. The FACP shall transmit appropriate signal(s) to the elevator controller(s) to initiate elevator recall operation. Verify interconnection details with Elevator Manufacturer and Elevator Installer.

K. Activation of a heat detector in the elevator hoistway or elevator machine room shall initiate the elevator shutdown operation and the facility fire alarm system. The elevator shutdown operation is intended to shut down the elevator power (prior to sprinkler operation) by activating a shunt trip in the fused switch serving the elevator, which is accomplished as follows:
   1. A field-mounted relay activated by the heat detector in the elevator hoistway or elevator machine room or the FACP closes the shunt trip for the fused switch serving the elevator power, causing the elevator to shut down, and operates the building notification appliances and annunciator. Aforementioned shunt trip shall be monitored and powered (24VDC) by the fire alarm system at all times.

L. NOT USED.

M. NOT USED.

N. Removal of an alarm-initiating device or a notification appliance initiates the following:
   1. A "trouble" signal indication at the FACP and the annunciator(s).
   2. Identification, in plain-text English via alpha-numeric display, at the FACP and the remote annunciator(s) of the device or zone involved.
   3. Recording of the event by the system printer.
   4. Transmission of trouble signal to remote alarm receiving station.

O. Permissible Signal Time Elapse: The maximum permissible elapsed time between the actuation of any fire alarm or fire-detection system alarm-initiating device and its indication at the FACP is ten seconds.

P. Circuit Supervision: Indicate circuit faults by means of both a zone and a trouble signal at the FACP. Provide a distinctive indicating audible tone and (LED) indicating light. The maximum elapsed time between the occurrence of the trouble condition and its indication at the FACP is 200 seconds.

Q. FACP Alphanumeric Display: Plain-English-language descriptions of alarm, supervisory, and trouble events; and addresses and locations of alarm-initiating or supervisory devices originating the report. Display monitoring actions, system and component status, system commands, programming information, and data from the system's historical memory.

2.3 MANUAL PULL STATIONS

A. Description: Fabricated of metal or plastic, and finished in red with molded, raised- letter operating instructions of contrasting color.
   1. Single-action mechanism, with positive visual indication of activation, initiates an alarm. Pull stations shall incorporate a key reset device.
   2. For manual pull stations exposed to weather, provide weatherproof protective shield factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.

3. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
4. Pull station body shall be red, with clearly visible operating instructions provided on the cover. The word “fire” shall appear on the front of the station in raised letters of contrasting color.

2.4 SMOKE DETECTORS

A. General requirements:
1. Operating Voltage: 24-V dc, nominal.
2. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
3. Plug-in Arrangement: Detector and associated electronic components are mounted in a module that connects in a tamper-resistant manner to a fixed base with a twist-locking plug connection. Terminals in the fixed base accept building wiring.
4. Integral Visual-Indicating Light: LED type. Indicates detector has operated.
5. Sensitivity: Can be tested and adjusted in-place after installation.
6. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
7. Photoelectric Smoke Detectors include the following features:
   a. Sensor: LED or infrared light source with matching silicon-cell receiver.
   b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
   c. Where combination smoke/thermal detectors are noted to be utilized on the drawings, provide integral Thermal Detector: Fixed- temperature type with 135 degrees F setting.
8. Ionization Detectors (to be utilized only where specifically noted on plans) shall include the following features:
   a. Responsive to both visible and invisible products of combustion.
   b. Self-compensating for changes in environmental conditions.

9. NOT USED.

2.5 HEAT DETECTORS

A. Heat Detector, Fixed-Temperature/Rate-of-Rise Type: Actuated by temperature that exceeds a fixed temperature of 135 degrees F. Rate-of-rise element shall be rated at 15 degrees F per minute.
1. Mounting: Plug-in base, interchangeable with smoke detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.6 NOTIFICATION DEVICES

A. Description: Equip for mounting as indicated and have screw terminals for system connections.

B. Combination Devices: Factory-integrated audible and visible devices in a single- mounting assembly. Device shall have field selectable output for audible and visual settings.

C. Electronic Horns: Electronic sounder, rated for 24-V dc operation; with provision for housing the operating mechanism behind a grille. Horns produce a sound-pressure level of 90 dB, measured 10 feet from the horn. Housing shall be red in color, with the word “FIRE” clearly printed in white. Device shall have field selectable output for audible setting.

D. NOT USED.

E. NOT USED.

F. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. Housing shall be red in color, with the word "FIRE" clearly printed in white.
1. Strobe Leads: Factory connected to screw terminals.
2. Minimum strobe intensity for devices is noted on drawings.
3. All strobe lights visible within the same area shall be fully synchronized.
4. Device shall have field selectable output for visual settings.

G. NOT USED.

2.7 NOT USED.

2.8 REMOTE DEVICE LOCATION-INDICATING LIGHTS AND IDENTIFICATION PLATES

A. Description: LED indicating light near each smoke detector that may not be readily visible, and each sprinkler water-flow switch and valve-tamper switch. Light is connected to flash when the associated device is in an alarm or trouble mode. Lamp is flush mounted in a single gang plate. A red, laminated, phenolic-resin identification plate at the indicating light identifies, in engraved white letters, device initiating the signal and room where the smoke detector or valve is located. For water-flow switches, the identification plate also designates protected spaces downstream from the water-flow switch.

B. Mounting: Mounted in ceiling/wall in close proximity to smoke detector.

2.9 NOT USED.

2.10 EXTERIOR EQUIPMENT

A. Any devices, junction boxes, or equipment associated to the fire alarm system located exterior to building shall be gasketed and approved for use in wet environments. Conduit to exterior devices shall be sealed in order that water cannot gain access to interiors of devices via conduit system.

2.11 WIRE

A. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 degrees C, color-coded insulation.
1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

3. Power-Limited Circuits: NFPA 70, Types FPL, FPLR, or FPLP, as recommended by manufacturer.

2.12 PULL BOXES AND TERMINAL CABINETS

A. Pull boxes shall be Hoffman NEMA type 1 hinged cover cabinets only. Sizes as shown on the fire alarm system drawings. Paint all pull box doors red and label F/A PULL BOX. Pull boxes shall be rated for the environment they are placed in (i.e. NEMA 1, NEMA 3R, NEMA 4X, etc.)

B. Terminal cabinets:
1. Terminal cabinets shall be Hoffman NEMA type 1 hinged cabinets with a painted steel removable subplate and 'T' handle latch. No locks are required.
2. Each terminal cabinet shall have a factory painted red finish.
3. Provide on the door of each terminal cabinet a red lamacoid nameplate with ¾ inch white letters to read Fire Alarm Terminal Cabinet # .
4. Flush cabinets shall be the same type except for factory supplied flush mounting trim.
5. Provide one (1) IDEAL (389-061) terminal block per wire entering and leaving the terminal cabinet, plus 10% spare terminal blocks. Mount terminal blocks vertically and use the appropriate terminal block mounting channel and terminal block end plates (89-062) as recommended by the manufacturer. Each terminal shall be properly identified and the respective Terminal Cabinet Directory as shown in the drawings shall be attached to the inside cover with an adhesive backed vinyl envelope.

PART 3 - EXECUTION

3.1 INSTALLATION

A. SCOPE
1. The system shall electrically supervise all wiring between the control panel and all initiating and indicating devices.
2. The system shall be capable of differentiating between a system trouble condition and the activation of a supervisory device.

B. EQUIPMENT INSTALLATION
1. All wiring shall be installed in conduit except as otherwise shown. Entire conduit system housing fire alarm cabling shall be red in color. Prepainted EMT conduit shall be as manufactured by Allied Tube and Conduit or approved equal.
2. All conduits, cabinets and device back boxes shall be recessed unless shown otherwise on the drawings and as directed by the Architect or Engineer.
3. Provide smoke detector above fire alarm control panel and each auxiliary power supply (not shown on floor plans).
4. All spot type detectors shall be located on the suspended ceilings, except as noted. If suspended ceilings do not exist, the detectors shall be mounted on the slab.
5. All detectors shall be centered in the ceiling tiles and back boxes and conduits shall be recessed in areas with suspended ceilings. The back boxes and conduits for detectors on the slab shall be surface mounted with conduits run perpendicular/parallel to the walls.
6. All detectors shall be located at the highest point on the ceiling or slab except as specifically noted.

7. Exact location of all automatic detectors shall be as directed by the manufacturer's representative.
8. Smoke detectors shall not be located within three (3) feet of or in the direct air stream from supply air diffusers. Additionally, smoke detectors shall not be located within three (3) feet of return air grilles.
9. Automatic detectors shall not be mounted on or within three (3) feet of doorways, beams, columns or walls, except smoke detectors at doors with door holders shall be mounted between two (2) and four (4) feet from the doors.
10. NOT USED.
11. All manual stations located at egress doors shall be located adjacent to and within five (5) feet of the respective egress doors.
12. NOT USED.
13. NOT USED.
14. The conduit, device back boxes, pull boxes, terminal cabinets, panels and wiring as shown on the Fire Alarm System drawings shall be installed as shown. The device back boxes and conduit wire fill shall be in compliance with the National Electrical Code.
15. Provide white lamacoid nameplates on the ceiling grid with ¼ inch red letters to identify all above ceiling devices.
16. The fire detection and alarm system shall be operational at all times, except that when work is being performed on the system during normal working hours only those portions actually undergoing modification shall be out of service. All detectors in the construction area shall be bagged with plastic bags during the working hours and de-bagged after working hours.
17. At the end of each workday, and before workmen leave the site, proper operation of the system shall be demonstrated to the designated Owner's representative.

C. WIRING INSTALLATION

1. All alarm initiating devices and supervisory initiating devices shall be connected on Class B (Style 4) OR Class A two (2) wire Signaling Line Circuits (SLC). Unsupervised wiring (point wires) shall not be permitted. T-tapping and parallel branch circuit wiring shall be permitted on the addressable SLCs, in accordance with the manufacturer's recommendations.
2. All alarm indicating devices shall be connected on Class B OR Class A two (2) wire electrically supervised circuits and on a minimum of two active circuits.
3. Wiring to initiating and supervisory devices and to fire alarm annunciators shall be with two- (2) conductor, twisted solid copper UL listed fire alarm system wire subject to manufacturer's recommendations (#16 AWG minimum).
4. Wiring to alarm indicating devices shall be with two- (2) conductor twisted solid copper UL listed jacketed fire alarm system wire subject to manufacturer's recommendations (#14 AWG minimum).
5. All other wiring shall be as recommended by the system manufacturer.
6. No splicing of wires is permitted except on terminal blocks in annunciators, control panels or properly labeled terminal cabinets as shown on the drawings. The use of wire nuts or similar type devices is not permitted. All devices shall have terminals for each wiring connection. No splicing of any type shall be permitted in pull boxes, to include crimp terminals.
7. All wires shall be labeled at both ends with ¾" x 1-3/9" Scotch Code SWD Write- On Tape and SMP Write-On Marking Pen only.
8. Use plastic wire ties and wire tie mounts to insure a neat quality appearance.

3.2 TESTS

A. Prior to the acceptance test of the project by the Owner, a factory-trained technician from the equipment supplier shall inspect, test and adjust the complete Fire Alarm System according to NFPA-72, including, but not limited to, the following:
   1. NOT USED.
   2. Visual inspection of all equipment.
   3. Verification of alarm, supervisory and trouble signals at all receiving locations and circuits, including audible and visual alarms, annunciators, control panels, and central monitoring control panel.
   4. Test each alarm initiation device for alarm and correct annunciation.
   5. Test each alarm bell and strobe light for proper operation.
   6. Test the sensitivity of each smoke detector with a manufacturer's detector test set (the fire alarm control panel shall be UL listed for this purpose). Retain a printed recorded of all firing voltages. Correlate firing voltage records to the device addresses as shown on the as-built drawings.
   7. Test the operation of each magnetic door holder, elevator recall and elevator shutdown operation, damper closure and smoke control
   8. Check all end of line devices for proper installation and polarity.

B. All smoke detector sensitivity adjustments and tests shall be performed:
   1. From the Fire Alarm Control Panel with each detector in its exact operating location and not at some convenient place.
   2. Only under normal, balanced and completed maximum air flow conditions, with supply air systems constant and not undergoing balancing or other alterations, and air conditioning refrigeration systems operating properly.
   3. A complete printout showing all sensitivity readings shall submitted.

C. After the system has been installed, the DACT shall be completely tested by the equipment manufacturer's representative for proper operation. A letter shall be provided to the Owner by the manufacturer's representative confirming the test, indicating their approval and that all zones are capable of being transmitted to and satisfactorily received by the central monitoring station.

D. The Owner’s acceptance test will only be made after the above tests are made and the copy of the NFPA 72 Test Report/Certificate results is turned over to the Owner for evaluation. The Owner's test will be the same as the above contractor tests. Demonstrate to the Owner that no wire nuts or similar devices have been used in the system. Perform these tests in the presence of the Owner or the Owner's representative.

3.3 FIELD ADJUSTMENTS

A. Repair or replace at his expense any defective devices, equipment or wiring and perform additional testing required to demonstrate that the system is in full compliance with the drawings and specifications.

B. The cost of any re-testing as a result of the failure of the system to operate in accordance with these specifications and/or non-compliance with the drawings or applicable codes shall be paid by the contractor to the Owner. A purchase order shall be delivered to the Owner before the re-testing is scheduled or started.

Note: Contractor can use Firelite System and devices or approve equal.

END OF SECTION