



**PDHonline Course E341 (3 PDH)**

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**Design to the Fire Alarm Code, NFPA  
72-2010**

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**2020**

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SECTION 16720  
FIRE DETECTION AND ALARM SYSTEM  
WITH CENTRAL OFFICE CONNECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. The Work shall include all labor, equipment, materials and necessary services to provide a complete addressable Manual, Automatic Smoke/Heat Detection and Sprinkler Alarm System with Central Office Connection (hereinafter denoted by the phrase "the system"). The system shall be addressable, with all initiating devices individually annunciated on the Fire Alarm Control Panel, the remote annunciator and the printer. Evacuation alarm tones shall be programmed to be

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- TEMPORAL 3 in accordance with NYC Building Code Appendix Q (NFPA 72/2002 with NYC modifications. The system shall have supervised wiring with all operations as herein described. The system shall consist of, but not be limited to, the following:
1. Fire alarm control panel(s) with English text annunciator/printer and remote annunciator.
  2. Manual pull stations.
  3. Area smoke detectors.
  4. Duct smoke detectors.
  5. Carbon monoxide detectors.
  6. Heat Detectors.
  7. Sprinkler waterflow switches.
  8. Audible Notification Appliances (Horns).
  9. Visual Notification Appliances (Strobes).
  10. Air handling systems and Rooftop Heating and Cooling Units (RTU) shutdown controls.

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11. Exhaust fan control, make-up air fan control and fire/smoke damper control for post-fire smoke

purge system in accordance with BC 912 (a mechanical or natural ventilation system intended to remove smoke from the smoke zone to the exterior of the building).

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12. Exhaust fan, make-up air fan and fire/smoke damper control for smoke control systems.
  13. Elevator recall control.
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14. Electromagnetic door holders, electromagnetic fail-safe door locks and release controls.
  15. Sprinkler valve tamper switches for sprinkler valve supervision.
  16. Fused disconnect switch in the electrical room.
  17. Battery Backup.
  18. Remote Annunciation at:
    - a. Custodian's Office (Printer).
    - b. General Office (Remote Annunciator with LCD Display).
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19. Flame detectors (Ultraviolet principle of detection).
  20. Digital Alarm Communicator Transmitter (DACT) for Central Station notification.
  21. Emergency Generator status monitoring.
  22. Fire pump and sprinkler booster pump status monitoring (if fire pump/sprinkler booster pump is provided).

#### **1.02 APPLICABLE LISTINGS, CODES AND STANDARDS**

- A. The 2008 New York City Building Code.
- B. The 2008 New York City Mechanical Code.
- C. The 2008 New York City Fire Code.

- D. New York City Electrical Code - NFPA 70 as amended by New York City.
- E. NFPA 72 - 2002 edition, as modified for use in NYC - See Appendix Q of the NYC Building Code.
- F. NFPA 72 - 2002 edition - Chapter 10, as adopted without modifications by the NYC Fire Code, shall be used for all acceptance and re-acceptance testing and maintenance of fire alarm systems.
- G. NFPA 13 - 2002 edition, as modified for use in NYC - See Appendix Q of the NYC Building Code.
- H. Section 4000-06 of Title 1 of the rules of the City of New York (NFPA 70/2008 Art. 760 with NYC Modifications) for fire alarm power, wiring and installation methods.
- I. The New York City Department of Buildings - Office of Technical Certification and Research (OTCR) for other equipment not specifically described by the NYC Construction Codes.
- J. UL 1971 and ADA Guidelines related to Strobe Synchronization.
- K. UL 864 - 9<sup>th</sup> Edition requirements for fire alarm control equipment. Contractor shall submit proof in writing from the proposed Fire Alarm System manufacturer that submitted Fire Alarm Control Panel has been UL listed based on the UL 864 9<sup>th</sup> Editions. UL listing based on the 8<sup>th</sup> Edition or earlier Editions is not acceptable.
- L. UL 2075-04 "Gas and Vapor detectors and sensors" for CO detectors.
- M. UL listings or FM Approvals for all fire alarm equipment shall be for its intended use.
- N. NYC Fire Department Certificate of Approval for the Fire Alarm Control Panel (FACP), based on UL 864 - 9<sup>th</sup> Edition.

**1.03 RELATED WORK**

A. The Contractor shall coordinate the work in this Section with all related trades. Work and/or equipment provided in other Sections and related to the fire alarm system shall include, but not be limited to:

1. Sprinkler water flow and tamper switches shall be provided by the Mechanical trade. See Division 15. The switches shall be wired and connected to the Fire Alarm System by this Contractor.
2. Air handling systems and Rooftop Heating and Cooling Units (RTU) fan and damper control circuits shall be furnished by the air handling system's control equipment. See Division 15. Interconnecting wiring to the Fire Alarm System shall be provided by this Contractor.
3. Elevator recall control circuits to be provided by the elevator control equipment. See Division 14. Interconnecting wiring to the Fire Alarm System shall be provided by this Contractor.
4. Emergency generator status contacts to be provided with the emergency generator control equipment to indicate:
  - a. Emergency generator running.
  - b. Emergency generator failure.

Interconnecting wiring to the Fire Alarm System shall be provided by this Contractor.

5. Fire pump/sprinkler booster pump status contacts to be provided with the fire pump control equipment and wired by this Contractor to indicate:
  - a. Fire pump/sprinkler booster pump running.
  - b. Fire pump/sprinkler booster pump power failure.
  - c. Fire pump phase/sprinkler booster pump reversal (if available).

Interconnecting wiring to the Fire Alarm System shall be provided by this Contractor.

6. Where a Kitchen Fire Suppression System (Ansul System) is provided in the building, activation of the system shall be indicated as an alarm on the Fire Alarm System.

Interconnecting wiring between the fire extinguishing system and the Fire Alarm System shall be provided by this Contractor.

7. Boiler and non-electric hot water heater control circuits shall be furnished by the equipment's control equipment for shut-down upon activation of Carbon Monoxide detectors.

Interconnecting wiring to the boilers and gas fired hot water heaters from the Fire Alarm Control Panel shall be provided by this contractor.

#### **1.04 SYSTEM DESCRIPTION**

- A. The system shall perform as described below. All equipment, components, and labor required shall be provided by the Contractor.
- B. Fire Alarm Initiation
  1. Fire alarm initiation shall be accomplished by:
    - a. Operation of a manual pull station.
    - b. Operation of a water flow switch in the Sprinkler System.
    - c. Operation of a duct mounted Smoke Detector in the HVAC ductwork.
    - d. Operation of an Area Smoke Detector.
    - e. Operation of a Heat Detector.
    - f. Operation of a kitchen Fire Extinguishing System (Ansul System).

5 g. Operation of a Flame Detector.

C. Alarm Indications

1. Operation of a manual pull station:

7 a. In New Schools, Leased Buildings and Fire Alarm System Replacements: Operation of a pull station shall immediately alarm the building audibly via the sounding an evacuation signal of continuous Temporal 3 tones over the horns and visibly with the flashing of strobe lights. The horns and strobes shall operate continuously until an acknowledge/silence button on the Fire Alarm Control Panel is pushed. In addition, manual pull station operation shall be communicated as a "manual alarm" to the central station through the DACT.

6 b. In existing schools where Fire Alarm Control Panel is not replaced, Alarms shall sound as originally programmed and central station notification is not required.

2. Activation of a waterflow switch in the sprinkler system:

7 a. In New Schools, Leased Buildings and Fire Alarm System Replacements: Activation of a waterflow switch in the sprinkler system shall immediately alarm the building audibly via the sounding an evacuation signal of continuous Temporal 3 tones over the horns and visibly with the flashing of strobe lights. The horns and strobes shall operate continuously until an acknowledge/silence button on the Fire Alarm Control Panel is pushed. In addition, waterflow switch operation shall be communicated as a "sprinkler alarm" to the central station through the DACT.

6 b. In existing schools where Fire Alarm Control Panel is not replaced: Activation of a waterflow switch in the sprinkler system shall sound four rounds of 10-1 and activate the exterior sprinkler alarm bell.

3. 5 Activation of the Kitchen Fire Suppression System (Ansul System), smoke detector, heat detector or flame detector:
- a. 7 In New Schools, Leased Buildings and Fire Alarm System Replacements: Activation of the Kitchen Fire Suppression System (Ansul System), smoke detector, heat detector or flame detector shall immediately alarm the building audibly via the sounding an evacuation signal of continuous Temporal 3 tones over the horns and visibly with the flashing of strobe lights. The horns and strobes shall operate continuously until an acknowledge/silence button on the Fire Alarm Control Panel is pushed. In addition, operation of the Kitchen Fire Suppression System (Ansul System), smoke detector, heat detector or flame detector shall be communicated as an "automatic alarm" to the central station through the DACT.
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- b. 6 In existing schools where Fire Alarm Control Panel is not replaced: Alarms shall sound four rounds of code 10-2, but central station notification is not required.
4. 8 Activation of a carbon monoxide detector:
- In New Schools, Leased Buildings, and Fire Alarm System replacements: Activated Carbon Monoxide Detector shall sound the integral horn (integral to the CO detector) in a Temporal 4 tone. No evacuation signal shall be sounded upon activation of a carbon monoxide detector. Activation of the carbon monoxide detectors shall send an alarm to the panel and be communicated as a "CO Alarm" to the central station through the DACT.
5. Other devices connected to the Fire Alarm system:
- a. 7 In New Schools, Leased Buildings and Fire Alarm System Replacements: Fire pump status contacts, sprinkler booster pump status contacts, emergency generator status contacts), sprinkler system tamper switches



and sprinkler tank water level and pressure switches shall be monitored by a central supervisory station as individual "Supervisory Signals" (per device type).

Trouble signals from the Fire Alarm Control Panel shall be monitored by a central supervisory station as a "General Trouble".

- 6 b. In existing schools where Fire Alarm Control Panel is not replaced:
1. When installing a new sprinkler booster pump or fire pump in an existing building, the pump controller shall be monitored for pump running, pump failure and phase reversal by the central supervisory station (individual supervisory signals).
  2. When there is no sprinkler booster pump/fire pump and there are more than 20 sprinkler heads per fire zone, the sprinkler water flow switches shall be monitored by the central supervisory station as a "sprinkler alarm".

D. Other Fire Alarm System Operations

1. Fan Shutdown:

- 7 a. In New Schools, Leased Buildings and Fire Alarm System Replacements: Operation of a pull station shall not shut down any fans in the building. Activation of any automatic fire alarm initiating device shall shut down all fans 2,000 CFM and larger (except direct exhaust fans), close all fire/smoke dampers and purge dampers, release magnetic door holders and immediately unlock all electromagnetically locked doors.
- 6 b. In existing schools where Fire Alarm Control Panel is not replaced: Operation of a manual pull station or activation of any automatic fire alarm initiating device shall shut down only the recirculating fans 2,000 CFM and larger. If provided, based on a

site-specific FDNY variance, a Bypass Key-Switch can be operated to bypass the circuits controlling the dampers and fan shut-down during daily testing of the fire alarm system by activation of a manual pull station.

2. Elevator Recall:

Activation of an elevator lobby, shaft or elevator machine room smoke detector, or activation of any sprinkler waterflow switch shall activate the elevator recall system and return all elevators serving the fire floor to the main lobby, for use by the Fire Department Personnel.

3. Release of smoke hatches:

a. Activation of an elevator shaft smoke detector shall release the associated hatch at the top of the elevator shaft.

12 b. Activation of a stage smoke detector shall release the associated hatches at the top of the stage.

13 c. Activation of a stairwell smoke detector shall release associated stairwell hatch opener.

13 d. Activation of smoke detectors located at the top of ductwork shaft shall open the associated smoke vent damper.

4. Boiler and hot water heater shut-down:

Activation of a carbon monoxide detector shall shut down boilers and non-electric hot water heaters.

5. Annunciation:

Activation of any fire alarm initiating device, supervisory device and trouble signals shall be recorded individually at the printer and indicated at the control panel and at the remote annunciator.

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## E. Post-Fire Smoke Purge System Operation

1. The Post-Fire Smoke Purge System shall use dedicated equipment or the normal HVAC system.
2. The Post-Fire Smoke Purge System shall be operated manual controls that are part of the Fire Alarm Panel.
3. City-wide 2642 key shall be used to manually enable the Post-Fire Smoke Purge System.
4. A separate switch shall be used to operate the Post-Fire Smoke Purge System for each floor (one floor at the time). Activation of such switch shall enable required smoke removal fan(s) and open the associated dampers to conduct smoke removal on that floor.

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## F. Smoke Control Systems Operation

1. System shall be both manual and automatic operation.
2. Activation of sprinkler water flow switch, smoke detector or manual control at the FACP location (Firefighter's Smoke Control Station (FSCS)) shall activate smoke control systems.
3. An alarm shall be sounded when any smoke control system is initiated. This alarm will notify the Central Station via the DACT, as well as being indicated at the FACP.
4. The Firefighter's Smoke Control Station (FSCS), located at the FACP location, can be used to override these automatic smoke control operations based on input from the firefighter controlling the system. A keyswitch at the FSCS puts the system into "Manual" mode, enabling the firefighter to control the system from the FSCS location.

## G. Display Module Operation/Indications

1. An alarm may be acknowledged by actuating the "ALARM/TROUBLE ACKNOWLEDGE" key/button. This

shall silence the audible device in the Fire Alarm Control Panel and change the "SYSTEM ALARM" LED from flashing to steadily lit.

2. If multiple alarm conditions are present, the first alarm must be shown on the LCD display. The LCD display can then be scrolled to show all other alarm conditions.
3. Failure of normal power, open or short circuits, disarrangement in system wiring, failure of microprocessor, failure of any addressable module or any ground fault condition shall activate the system trouble circuitry. Amber "SYSTEM TROUBLE" LED shall illuminate when any of these conditions exist. Along with the trouble LED, a steady trouble audible signal shall be sounded and an alphanumeric trouble error message shall be displayed on the LCD display.
4. All trouble conditions and error messages shall be indicated on the system printer, including the time and date of each occurrence.
5. A trouble signal may be acknowledged by actuating the "ALARM/TROUBLE ACKNOWLEDGE" key/button. This shall silence the trouble audible signal and change the display from flashing to steady. If multiple trouble conditions are present, the LED shall stay lit and the audible signal will sound until all troubles are acknowledged.
6. During an "alarm" condition, all "trouble" signals shall be suppressed with the exception of illumination of the "SYSTEM TROUBLE" LED.

#### **1.05 QUALITY ASSURANCE**

##### **A. Equipment/System**

1. All equipment furnished under these Specifications shall be **UL Listed or FM Approved** for its intended purpose.
2. All Fire Alarm Control Panels shall be UL listed in accordance with UL 864 - 9<sup>th</sup> Edition and listed in the UL Fire Protection Equipment Directory under product category "Control Units System

(UOJZ)". Use of equipment listed under UL 864 - 8<sup>th</sup> Edition or earlier is not permitted.

3. NYC Fire Department Certificate of Approval for the Fire Alarm Panel and Data Gathering Panels, based on UL 864 - 9<sup>th</sup> Edition.

B. Manufacturer

1. The manufacturer shall have been engaged in the production of this type of equipment for at least ten (10) years.
2. The manufacturer shall have at least three authorized and fully equipped service organizations (Fire Alarm Companies) located within fifty (50) miles of the installation.

C. Fire Alarm Company

1. The Fire Alarm Company providing the material and supervision shall be a manufacturer - authorized distributor for the equipment to be provided.
2. The Fire Alarm Company shall be located within fifty (50) miles of the installation.
3. If brand names other than those specified are proposed for use, the Fire Alarm Company shall pay all costs, including travel expenses to the test facility for the Authority's Representative to witness the tests demonstration.
4. The Fire Alarm Company shall be a manufacturer - trained and authorized repair and service organization capable of providing on-site supervision throughout the project and warranty/maintenance service after acceptance.
5. The Fire Alarm Company shall provide all technical support required for an operational system. All technicians shall provide **all** of the following qualifications in writing prior to bid award:

\* NICET Level 2 in Fire Alarm Systems,

- \* Factory Certificate for the proposed equipment,
- \* Fire Department Certificate of Fitness for smoke detector testing and maintenance, in accordance with NYC Fire Code Section 901.6.3.4.

D. Company Field Advisor

The Fire Alarm Company shall provide a Company Field Advisor to provide all technical supervision and installation support. That individual shall provide all of the following qualifications in writing prior to bid award: NICET Level 3 in Fire Alarm Systems, Factory Certificate for the proposed equipment and a Fire Department Certificate of Fitness in accordance with NYC Fire Code Section 901.6.3.4. Company Field Advisor shall be available for a minimum of 16 working hours for the following:

1. Render advice regarding the installation and final adjustment of the system.
2. Render advice on the suitability of each signal-initiating device for its particular application.
3. Witness final system tests and then certify with an affidavit that the system is installed in accordance with the Contract Documents and applicable codes, and is operating properly.
4. Train facility personnel in operation, programming, and routine maintenance of the system (minimum of 4 hours).
5. Explain available service programs to facility supervisory personnel for their consideration.

**1.06 SUPPLEMENTAL SUBMITTALS**

- A. Fire Alarm Contractor shall submit the following material for review by the Authority's Representative.
1. Provide a list (bill of materials) of all equipment and components to be used in the system.

2. Provide description of operation of the system, to include any and all exceptions, variances or substitutions. Include a copy of printer headings, reports, prompts, etc.
3. Provide system Ampere load (during both normal and alarm conditions) and time calculations to substantiate compliance (battery Ampere-Hour capacity) with battery back-up power requirements for a 24-hour standby followed by a 15-minute full alarm load, as required in NYC. Standard battery calculations based on NFPA 72 are not permitted, as NYC requirements exceed those of NFPA 72.
4. Provide manufacturer's printed product data, catalog pages and descriptions of any special installation procedures.
5. Provide Data from the Manufacturer proving that:
  - a. Fire alarm initiating devices that receive their power from the initiating circuit of a Fire Alarm Control Panel are multiple listed by the UL or FM for use with the control unit.
  - b. UL listings or FM approvals of all products and components.
  - c. NYC Fire Department Certificate of Approval for the Fire Alarm Control Panels and Data Gathering Panels (DGPs).
  - d. The batteries proposed for use are compatible with the battery charger.
6. Provide Shop Drawings as follows:
  - a. Large scale drawing, including actual dimensions, of the fire alarm control panel(s) (FACP), and all ancillary equipment.
  - b. Riser diagram showing all equipment and types, all connections and number and size of all conductors.

- c. Floor plans showing all equipment and types, all connections and number and size of all conductors.
7. Provide a schedule, for review and approval, of the proposed label for each auxiliary control switch at the fire alarm control panel.
  8. Provide a schedule, for review and approval, of the proposed label and color for each LED/lamp indicator at the remote annunciator.
  9. Provide samples of equipment, as requested by the Authority.
  10. If the new system is a replacement of an existing system, the Contractor shall provide an outline of detailed migration path describing how existing system will be replaced while providing full Fire Protection during the process. Failure to secure approval or submit this migration path will require contractor to accept all required Fire Watches to maintain full fire protection of the building at all times.
- B. Close-out submittals as listed in Part 3 of this specification.

#### **1.07 MAINTENANCE**

- A. Service Availability of the Fire Alarm Company

It shall be a fully equipped service organization, capable of guaranteeing response time within 8 hours to service calls, shall be available 24 hours a day, 7 days a week to service the complete Fire Alarm System.

#### **1.08 WARRANTY**

- A. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace materials or workmanship for a period of one (1) year from the date of Substantial Completion (successful 100% acceptance testing by a Company Field Advisor).



**PART 2 - PRODUCTS****2.01 MANUFACTURERS**

- A. The following manufacturers are approved for the furnishing of the specified items of Fire Detection and Signaling Equipment: FCI, Honeywell/Notifier, EST (UTCFS), Faraday, Siemens, Wheelock and System Sensor, Firecom and Mircom. **NOT SIMPLEX-tm**
- B. Each item of equipment offered by these manufacturers must meet the full requirements of the Specification for that item, and shall be UL listed in accordance with UL 864 - 9<sup>th</sup> Edition and listed in the UL Fire Protection Equipment Directory under product category "Control Units System (UOJZ)". Use of equipment listed under UL 864 - 8<sup>th</sup> Edition or earlier is not permitted.

**2.02 APPROVALS**

- A. The fire alarm system, as installed, shall be approved by the Bureau of Fire Prevention of the New York City Fire Department. A Fire Department Letter of Approval shall be obtained by the contractor and delivered to the Authority as a prerequisite for final acceptance. Refer to Article 3.02.

**2.03 EQUIPMENT**

- A. General
1. The following equipment where shown on the Drawings or called for in the Specifications shall be furnished and installed by the Contractor at locations where shown on the Drawings, called for in the Specifications or as otherwise directed in writing by the Authority.
- B. Manual Pull Station
1. Provide an addressable manual pull station at each location indicated on the Drawings or called for in the Specifications.
  2. Each pull station shall be addressable manual pull lever single-action type. When operated, the handle shall be locked in the operated position until the station is reset with a key.

3. Each pull station shall have hinged inner and outer doors with the inner door locked. A common key shall be required to gain access for resetting the station. Instructions for operating station shall appear on front of the outer door.
  4. The pull station shall be interfaced into the addressable system by means of an internal addressable interface module. Separately mounted addressable modules are not acceptable, except for pull stations to be exposed to the outside environment (one module shall be provided for each outdoor pull station).
  5. For surface or semi-flush mounting, the mechanism shall be set into a separate stamped steel box with one 3/4" knockout. All parts shall have a baked enamel red finish and exposed edges shall be rounded. Steel box shall be EST (UTCFS) model #27193-11 or RSG/Aames Security model #RMS-DBB-1K. Pull stations with internal module shall be UL listed for use with the FACP.
  6. Pull stations shall be set so that the top of the operating lever of station shall be 3'-6" to 4'-0" above the finished floor. The Contractor shall report to the Authority's Representative any interference with wainscot, or other construction or mechanical equipment.
  7. False Fire Alarm Stopper Cover: provide false fire alarm stopper cover to fit every pull station shown on the drawings. False fire alarm stopper shall be Safety Technology International Stopper II P/N - STI 1100 with 9 volts dc battery.
- C. Audible Notification Appliances (Horns) **NOT VOICE-tm**
1. The Contractor shall provide fire alarm horns wherever the Drawings require.
  2. Each horn shall be installed on a standard 4" galvanized electrical box, either flush or surface mounted, as indicated on Drawings. Provide weatherproof box and gasket in damp, wet or exterior locations.

3. Horns shall be electrically polarized and include a blocking network to allow for connection to a supervised fire alarm signal circuit.
4. Each horn shall have a high volume setting between 82 and 91 dBA at 10'-0". Each horn shall have adjustable Hi-Lo dBA setting.
5. Horns shall be 24 VDC and shall have a selectable Temporal 3 setting to allow one pair of wires to power both horn and strobe.
6. All horns shall be by single supplier. Horns shall be EST (UTCFS) Genesis Series GIRF-HD or approved equal.

D. Visual Notification Appliances (Strobes)

1. The rating of the strobe unit shall be a minimum of 75 candela and shall deliver all characteristics and requirements called for in NFPA 72/2002 as accepted by Appendix Q of the NYC Building Code and the American With Disabilities Act (ADA), including the "Equivalent Facilitation" rule, and UL 1971.
2. In corridors, places of assembly and common areas, the strobes shall be synchronized when 3 or more strobes are in line of sight. Strobes to be synchronized shall be UL listed for use with the FACP/power source to ensure synchronization.
3. Strobes shall be listed for wall-mounted application.
4. Strobes shall be listed for 24 volt DC.
5. Fixture assembly shall be mounted on a painted steel plate. A translucent dome of hi-impact plastic, with the work "Fire" silk-screened red in 1/2" high letters, shall be provided to provide readability from both sides of the unit. The dome shall be screw-fastened or epoxied to plate so as to prevent dome from being removed.
6. Strobes and their wiring shall be 100% supervised by the Fire Alarm Control Panel.

7. In new construction, the indicator shall be mounted to a flush 2-gang outlet box with suitably placed threaded holes to accept mounting of the indicator plate. In existing construction, surface mounted boxes shall be a finished cast type box with no knockouts, Type FS or FD.
8. Strobes installed in damp, wet or exterior locations shall be provided with a weatherproof box and gasket listed for such application.
9. Strobes shall be EST (UTCFS) Genesis Series GIRF-VM, Wheelock #RSS-241575W-FR, System Sensor SR or approved equal.

E. Audible/Visual Notification Appliances (Horns/Strobes)

1. Where indicated on Drawings horns shall come equipped with a strobe unit that mounts directly to basic horn mechanism.
2. The strobe section and horn section shall be separate and can be connected to either separate signal circuit loops or to the same signal circuit loop.
3. Horn and strobe components of a horn/strobe unit shall meet all criteria listed above.
4. Horns/strobe units shall be EST (UTCFS) Genesis Series GIRF-HDVM, Wheelock HS4-241575W-FR, System Sensor Horn/Strobe P2R or P4R, or approved equal. Strobes to be synchronized shall be UL listed for use with the FACP/power source to ensure synchronization.

F. Area Type Smoke Detectors

1. The Contractor shall provide intelligent analog addressable photoelectric smoke detectors with bases at locations shown on the Drawings or called for in the Specifications. Ionization type smoke detectors are not permitted.

2. Smoke detectors shall operate on 24V D.C. received from the Fire Alarm Control Panel. Smoke detectors shall be analog type supervised by the panel for sensitivity rating within acceptable thresholds. Deviations shall be annunciated at the Fire Alarm Control Panel & Remote Annunciator(s).
3. All smoke detectors shall be supplied with an LED indicator lamp, which shall give indication that the smoke detector is active (flash) and latch (on steady) when the detector has tripped into alarm.
4. Area type photoelectric smoke detector shall be EST (UTCFS) SIGA-PS, Honeywell/Notifier FSP-851, or approved equal. Detectors shall be UL listed for use with the FACP.

G. Heat Detectors

1. Contractor shall provide heat detectors in boiler room and in other locations as shown on plans.
2. Heat detectors shall be EST (UTCFS) model 284BPL 194°F fixed temperature and shall be monitored with an EST (UTCFS) monitor module SIGA-CT1, Honeywell/Notifier FST-851 or approved equal. Detectors shall be UL listed for use with the FACP. NOT ANALOG-tm

H. Guards

1. Guards shall be 9-gauge minimum wire that will provide protection without interfering with the operation and maintenance of the unit. The guard shall have a heavy duty corrosion-resistant polyester coating to protect against rust and corrosion. Guards for audible and visual notification devices shall be UL listed.

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2. Horns, strobes, and combination horn/strobe units in gymnasiums, playrooms, corridors, locker rooms and toilets shall be equipped with guards.

## I. Duct Smoke Detectors

1. The Contractor shall provide intelligent addressable photoelectric duct smoke detectors at locations shown on the Drawings.
2. Duct detectors shall be designed for mounting on the outside of ducts with air sampling tubes extending into the air stream within the duct.
3. Duct detectors shall be provided complete with outlet box, photoelectric detector chamber, sampling tubes, sensitivity control.
4. Ducts detectors shall be analog addressable, operate on 24 volts D.C. received from the Fire Alarm Control Panel and shall be 100% supervised by that panel. 110 VAC duct smoke detectors are not permitted.
5. The Contractor shall arrange for the sheet metal trades to drill holes in the ductwork for mounting the smoke detectors and its sampling tubes. That trade shall perform the actual mounting of these items on and within the ductwork.
6. All sampling tubes shall be sized to fit the interior dimensions of the ductwork being penetrated and in a manner that meets the NFPA 72/2002 and manufacturer's specifications.
7. The Contractor shall consult the Fire Alarm and HVAC Drawings for the exact locations of all duct detectors and sampling tube sizes.
8. In areas where the ducts are very small in interior dimensions (e.g. 12"-36"), spot-type smoke detectors may be installed within those ducts. These detectors shall be UL listed for this application and air velocity.
9. All duct type smoke detectors and spot-type smoke detectors inside the ducts, when not clearly visible from the floor area, shall be provided with a remote L.E.D. indicator lamp, at readily visible location, which shall give a local indication that the detector has been activated.

10. Duct detector shall be Honeywell/Notifier FSD-751PL, EST (UTCFS) SIGA-DH with SIGA -PS, SIGA-SD, System Sensor DNR or approved equal. Detectors shall be UL listed for use with the FACP.

J. Carbon Monoxide Detectors.

1. The Contractor shall provide carbon monoxide detectors where shown on the drawings.
2. Carbon monoxide detectors shall be designed to detect the presence of carbon monoxide.
3. Carbon Monoxide detectors shall installed and operational be in accordance with NYC Building Code Section BC 908.7.2.
4. Carbon monoxide detectors shall be listed in accordance with UL 2075-04 (revised 7/20/05) and have, at a minimum the response times as follows:

At 70 +/- 5 ppm, unit must alarm within 60-240 minutes.

At 150 +/- 5 ppm, unit must alarm within 10-50 minutes.

At 400 +/- 10 ppm, unit must alarm within 4-15 minutes. NOT ANALOG-tm

5. Carbon Monoxide detectors shall operate on 24 VDC received from the Fire Alarm Control Panel, and have an integral trouble relay that will send trouble / supervisory signals to the control panel for conditions including sensor failure, sensor missing, or end-of-life signal. They shall be capable of being system-monitored.
6. Carbon monoxide detector shall have an operating temperature of 32°F (or less) to 104°F (or more).
7. Carbon monoxide detector must be wired for supervised operation, and shall send a trouble condition to the panel when sensor supervision is in a trouble condition.

8. Carbon Monoxide detectors shall be EST (UTCFS) 250-CO, System Sensor model CO1224T, Notifier model CO1224T or approved equal.
9. Use of Carbon Monoxide Alarms (Stand-alone) is not permitted.

K. Alarm Interface Modules

1. Alarm interface Modules shall interface normally open contacts of sprinkler water flow switches, tamper switches and other supervisory devices to the addressable Fire Alarm System.
2. Each Interface Module shall provide selector switches to set an individual address to identify the module to the fire alarm control panel. These switches shall be field adjustable. Interface Modules that require an external programmer or PROM burner shall not be acceptable.
3. Alarm Interface module shall be EST (UTCFS) model SIGA-CT1 (single input) or SIGA-CT2 (double input), Honeywell/Notifier FMM-1 or FMM-101 (Mini Version) or approved equal. Modules shall be UL listed for use with the FACP.

L. Control Relay Interface Module

1. Control Relay Interface Modules shall interface auxiliary equipment such as door holders, electromagnetic locks, smoke hatches, fire/smoke dampers, fan shut down control points and elevator recall control points to the addressable Fire Alarm System.
2. Each Interface Module shall provide selector switches to set an individual address to identify the module to the fire alarm control panel. These switches shall be field adjustable. Interface Modules that require an external programmer or PROM burner shall not be acceptable. Interface module shall be Honeywell/Notifier FCM-1 or approved equal. Modules shall be UL listed for use with the FACP.



## M. Magnetic Door Holder/Wall Type

1. Wall-mounted type door holder assemblies shall be provided where shown on engineering plans. They shall consist of an electromagnet unit (mounted on the wall) and an armature unit (mounted on the door). The assembly shall be fail-safe (release the self-closing door when power is removed from the magnet by a fire alarm interface module mounted within 5' for the magnet).
2. The electromagnet unit shall be mounted on the wall about 6'-6" above the finished floor at a point where the edge of the open door would normally strike the wall. The armature shall be mounted on the door at a point where the contact plate would be centered on the center of the electromagnet.
3. The armature unit shall be adjustable and shall be set so that the contact plate meets the electro-magnet unit flush and not at an angle. This is dependent on the angle that the open door makes when fully opened.
4. The item shall be the approved equal of Notifier FM996-24 (Surface Wall Mount) or FM998-24 (Flush Wall Mount) with control module #CMX-2 or EST (UTCFS) model 1508 (surface wall-mount) or EST (UTCFS) model 1504 (flush wall-mount).

## N. Alphanumeric Printer

1. A UL Listed or FM approved alphanumeric printer shall be provided, capable of printing the appropriate addressable device number and customized location message for any active device.
2. Any device status message shall be printed with date and time of occurrence.
3. The Contractor shall provide a printed list of the addresses for all manual pull stations with respect to exits, stairs (not column numbers) or adjacent room numbers. Included in this list shall also be addresses for all other initiating devices.

This list shall be mounted on the wall of the Custodian's office, where directed, behind a transparent non-breakable; non-inflammable plastic face set in aluminum frame. Submit list for approval before installation.

4. Printer shall be Honeywell/Notifier PRN-6, EST (UTCFS) PT-1S or approved equal. Laser printer may be allowed, provided they are listed for use with the Fire Alarm Control Panel.

O. Liquid Crystal Display Remote Annunciator

1. Contractor shall provide in General Office and where shown on drawings a Remote Annunciator with a 4-line / 80-character per line LCD display.
2. The Remote Annunciator shall be Notifier LCD-80 or approved equal.

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P. Flame Detectors

1. Contractor shall provide flame detectors in room with gas pressure of 15 psi or greater.
2. Flame detector shall be explosion proof and be capable of connection to any standard monitoring module. Detector shall be Fire Sentry Corporation FS18X, Detronics Model# U5005, or General Monitors #FL3100. Monitoring module must be placed outside the explosion proof area.

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Q. Exterior Sprinkler Alarm Bell

1. For schools that do not have central station monitoring, the Contractor shall furnish and install a 10" water flow alarm bell on the exterior of the building where shown on the Drawings or where directed.
2. Exterior sprinkler alarm bell shall be a weather-resistant type, designed for exterior mounting and painted red.
3. Bell shall be mounted at the height as required by the Building Code of the City of New York. The Contractor shall furnish and install a plaque

beneath this bell inscribed as directed by the Building Code of the City of New York. The plaque should be worded as follows: "SPRINKLER FIRE ALARM - WHEN BELL RINGS - CALL FIRE DEPARTMENT".

4. Exterior Water Flow Alarm Bell shall be EST (UTCFS) model 439D-10AW, Notifier KMS1024, System Sensor SSM24-10 or approved equal.

## 2.04 CONTROL PANELS

### A. Fire Alarm Control Panel

1. Fire Alarm Control Panel shall be EST (UTCFS) model EST3, or Honeywell/Notifier (NFC-640 for less than 636 points, NFS-3030 for more than 636 points), FCI E3 series, Faraday MPC-7000, Firecom 2000 or Mircom FX-2000 and Siemens XLS.
2. The Fire Alarm Control Panel and associated Data Gathering Panels (DGPs) must be listed in accordance with UL 864 9<sup>th</sup> Edition. Contractor must provide proof of such listing.
3. The Fire Alarm Control Panel and associated Data Gathering Panels (DGPs) must have a NYC Fire Department Certificate of Approval based on UL 864 - 9<sup>th</sup> Edition. Contractor must provide proof of such listing. UL listing based on the 8<sup>th</sup> Edition or earlier Editions is not acceptable.

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4. For modifications of the existing Fire Alarm Control Panels only, they shall be provided with a key switch to bypass the circuits controlling the dampers and fan shutdown during the daily testing of the Fire Alarm System (if a site-specific variance is granted for this location). The damper and fan shutdown bypass function shall be automatically restored to the normal unshunted condition within forty-five minutes, if not done so manually before the forty-five minutes.

### B. System Power Supply

1. The system power supply shall operate on 120 VAC main power. This power shall be transformer converted to low voltage providing rectified and

filtered 24 VDC for system operation. This 24 VDC shall be rated @ 4 Amps and shall comply with U.L. Standard 864 9<sup>th</sup> Edition for power limited operation.

2. The power supply shall provide power for all system and auxiliary control functions, including the charging of the back-up batteries.
4. The charger output shall be supervised and fused.
5. The battery charger shall be capable of charging nickel-cadmium (Ni-Cad) or lead acid batteries.
6. The batteries shall be sized to provide 24 hours of standby operation in the supervision mode, with 15 minutes of full general evacuation operation of all notification appliances at the end of the 24 hour standby.
7. System power supply shall be Notifier PS12250 or approved equal.

C. Microprocessor Module

1. The microprocessor module shall contain the microprocessor, memory, system operating software, configuration memory and the circuits necessary to support the fire control system.
2. The microprocessor module shall function as the system's information and control center, processing all messages from the field devices (supervisory, trouble, alarm).
3. Microprocessor Functions:
  - a. The microprocessor shall execute all supervisory programming to detect and report the failure or disconnection of any module or peripheral device. An isolated circuit shall be incorporated, which will monitor the microprocessor, if a failure were to occur, this circuitry would provide audible and visual indication of this abnormal condition.

- b. The microprocessor shall access the system program for all control-by-event (CBE) functions. No system memory shall be lost due to failure of the primary and secondary power. Volatile memory shall not be acceptable.
- c. All job specific system programming, as to device monitoring and control functions, shall be field programmable.

4. Real-Time Clock:

- a. The microprocessor module shall have a real-time clock capable of monitoring all real-time programming and all time control functions.

D. Display & Switch Module

- 1. These modules shall provide display, annunciation and control for the complete Fire Alarm Control System.
- 2. An alphanumeric, true English, display shall be an integral part of the module. This display shall be back - lighted for ease of reading in the dark or bright ambient light conditions.
- 3. The Module shall provide a keypad permitting selection of system functions. Also incorporated with the keypad shall be three (3) control keys: ALARM/TROUBLE ACKNOWLEDGE, RESET and ALARM SILENCE.

E. Notification Appliance Circuits

- 1. Provide a Notification Appliance Circuit Module in the Fire Alarm Control Panel to supervise the audible and visual notification appliance circuit wiring for open conditions, grounds and shorts.
- 2. Field - located modules shall be housed in Transponders or other approved enclosures.
- 3. The use of Control Modules for signal circuits will not be accepted.

## F. Coder Module

1. The coder module, if provided, shall be solid state located at the Fire Alarm Control Panel. The coder shall be 100% field programmable for a "Temporal 3" code, as described elsewhere in the specifications.  
2
2. For modification of the existing fire alarm panels required to add Carbon Monoxide detection, coder module shall be capable of providing continuous operation of Temporal Code 4 (4-4-4-4...) until silenced at the Fire Alarm Panel, to indicate CO detection.  
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## G. Addressable Loop Module.

1. An addressable loop module shall be provided for communications with all addressable devices (initiation/control) connected to the system.
2. Each addressable loop module shall contain one loop, capable of communicating with a minimum of 160 addressable devices. Each system shall be capable of monitoring multiple loop modules. Provide a minimum of 25% spare capacity on each loop.
3. Communication loops shall be capable of being wired either Class "A" (Style 6), a ground fault on either conductor or a break shall not prevent a device from operating on either side of the break or Class "B" (Style 4), a break or ground fault in any conductor shall be reported as a trouble condition.
4. Each communication loop shall be electrically supervised for opens, shorts, and ground fault conditions.
5. The system shall be capable of a minimum capacity of 160 addressable smoke detectors, 160 addressable control modules and additional capacities for full point annunciation without decreasing the aforementioned capacities.

H. Monitoring of Fire/Smoke Damper End-Switches and damper activation

1. The mechanical contractor shall provide Smoke Dampers (SD) and Combination Fire/Smoke Dampers (FSD) with actuators and proof-of-open end-switches. The FACP shall command all dampers open/closed and shall monitor all damper end-switches for proof-of-open using distributed, addressable monitoring modules.

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2. Post-Fire Smoke Purge System related SD(s) and FSD(s). These dampers shall be individually commanded open/closed and monitored through addressable dedicated control modules, one per each damper. The end switch shall be wired to the addressable monitoring module input to provide proof-of-open status. When the SD or FSD fails to prove open, a LED on the FACP shall illuminate, indicating the failure condition and a specific damper shall be identified on the alphanumeric display.

3. Smoke Dampers and Fire/Smoke Dampers not associated with the Post-Fire Smoke Purge System.

These dampers shall be commanded open/closed and monitored through addressable control modules, grouping together up to five dampers. The end-switches of these groups shall be wired together as a common input to the addressable monitoring module to provide proof-of-open status. When any one member of a SD or FSD group fails to prove open, a common trouble condition shall be annunciated at the FACP by lighting a single, common LED which shall be labeled "SD/FSD Status". This LED shall indicate that there are one or more SD/FSD groups which have failed to prove open. This shall be provided by programming within the FACP. The FACP alphanumeric visual display shall indicate the individual addresses of the SD/FSD groups which failed to prove open.

I. Fans Restart

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1. In New Schools and Leased Buildings: Fans shut down due to alarm activation shall not automatically restart upon fire alarm system

reset. After fire alarm system reset, activation of a separate switch on the fire alarm panel is required before the fans can be re-started. To eliminate the possibility of all fans turning on simultaneously, restarting the fans shall be accomplished by turning them back on individually in a sequential fashion controlled through software timers at the Fire Alarm Control Panel.

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2. In existing schools undergoing a minor fire alarm system upgrade that does not require replacement of the fire alarm panel: Only fans that have H-O-A (Hand-Off-Automatic) switches shall be sequentially turned on after a system reset. Fans with manual starters shall not be required to be automatically restarted through a command from the FACP.

3

J. Post-Fire Smoke Purge Control Panel

1. A post-fire smoke purge control panel shall be provided at the main entrance of the building, adjacent to the FACP. Access to the post-fire smoke purge system shall be via New York City 2642 Lock Only. The post fire smoke purge panel may be incorporated into the fire alarm control panel performing the same functions as a separate panel.
2. Post-Fire Smoke purge control panel shall be UUKL listed for smoke control operation if not part of the FACP and include the following:
  - a. Control switches to permit the Fire Department to purge each floor in one operation by sequencing the appropriate fire smoke purge fans to turn on/off and open/close the motorized post fire smoke purge dampers. If the central air handling units are used for the normal and purge operation, during post-fire smoke purge the normally open recirculation damper shall be commanded closed. In addition, the normally closed exhaust damper shall be commanded open.
  - b. LED displays shall be provided to indicate the status of each post fire smoke purge fan



(ON/OFF) and each motorized post fire smoke purge damper zone (OPEN/CLOSE).

- c. Motorized dampers in fire rescue area shall be displayed as one zone at the post fire smoke purge control panel.
- d. A separate lamp test switch shall be provided.
- e. Activation of the post-fire smoke purge fan shall have status indication at the FACP that the fan is running. This indication shall be based on an airflow switch, NOT on the auxiliary starter contact.
- f. Post-fire smoke purge related dampers shall be individually monitored to provide proof of open status at the FACP through the damper end switch.

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K. Smoke Control Systems

- 1. When an automatic smoke control system is in operation, A Firefighter's Smoke Control Station (FSCS) complying with UL 864 shall be provided at the FACP location to allow manual control over the automatic operation of the smoke control strategy. This control shall override any manual or automatic operations initiated by the HVAC system controls.
- 2. The status of any smoke control fans and the position of all smoke control system related fire smoke dampers shall be indicated at the FSCS.
- 3. The FSCS shall be equipped with a keyswitch to enable the manual override mode to allow a firefighter at the FSCS to control the smoke control operations.
- 4. LED displays shall be provided to indicate the status of each smoke control fan (ON/OFF) and each motorized smoke control damper zone (OPEN/CLOSED).

## L. Elevator Recall

1. Smoke detectors shall be provided for each elevator on each floor landing/elevator lobby, elevator shaft and elevator machine room. Activation of any of these smoke detectors shall deliver a signal to the Fire Alarm Panel, which shall then send a signal to the Elevator Control Panel to direct all elevators serving the floor in alarm to return to the main lobby and to activate the alarm notification appliances throughout the building.
2. Activation of the sprinkler water flow switch shall deliver a signal to the Fire Alarm Panel, which shall then send a signal to the Elevator Control Panel to direct all elevators serving the floor in alarm to return to the main lobby and to activate the alarm notification appliances throughout the building.
3. Control module shall be Notifier #CMX-2, EST (UTCFS) SIGA-CR, or approved equal.

## M. Digital Alarm Communicator System (DACT).

1. A Digital Alarm Communicator System shall be installed to send alarm, supervisory and trouble signals to a NYC Fire Department approved Central Station.
2. For existing schools undergoing minor fire alarm system upgrades that do not require a new fire alarm panel, External DACT shall be connected to the fire alarm system and shall be labeled to indicate central station monitoring. The external Digital Alarm Communicator System shall consist of:
  - a. Digital Alarm Communicator Transmitter (DACT). The Digital Alarm Communicator Transmitter (DACT) shall be ADEMCO CO. Model #5110-XM or approved equal of Firelite or Silent Knight.
  - b. Two (2) RJ-31X telephone jacks with two (2) dedicated telephone lines upstream of any

telephone system in the school. The RJ-31X jacks shall be mounted next to the DACT.

3. For New Schools, Leased Buildings and Major Modernizations that require a new fire alarm panel, the DACT shall be integral to the fire alarm control panel (FACP) and shall be labeled to indicate the central station monitoring.

N. BMS Notification Module

Provide a notification module with dry contact and associated programming in relation to the fan shut down that will allow the Temperature Controls Contractor to connect a control wire from the BMS system to the module that will notify the BMS system when the fans are shut down by the FACP, thereby allowing the BMS system to shut down other operating portions of the mechanical unit.

**2.05 FIRE ALARM FUSED DISCONNECT SWITCH.**

- A. The Contractor shall provide an individual fused disconnect switch with 4 poles, and a removable solid neutral bar in fuse gap for each fire alarm system indicated on the Engineering Drawings, in accordance with Art. 4000 (new NEC/NFPA 70 - 2008 Art. 760 as modified for use in NYC).
- B. Rating of the fused disconnect switch shall be as required by the connected load. The fusible disconnect switch shall be heavy-duty type, UL listed for use as Service Entrance Equipment.
- C. Each fused disconnect switch shall be painted RED and bear a white-core bakelite identification nameplate to identify its use by the phrase "FIRE ALARM SYSTEM DISCONNECT" and control equipment served.
- D. Power connection to fused disconnect switch shall be provided per code.
- E. The circuits for the Fire Alarm Systems shall be as follows:
  1. One (1) circuit for fire alarm panels.
  2. One (1) circuit for custodial printer.

3. One (1) circuit for the Digital Alarm Communicator Transmitter (where applicable).

F. The complete assembly shall meet N.Y.C. Electrical & Fire code requirements.

## **2.06 MARKERS AND RISER DIAGRAM**

### **A. Markers**

Premarked self-adhesive; W.H. Brady Co.'s B940, Thomas and Betts Co.'s E-Z Code WSL self-laminating, Ideal Industries' Mylar/Cloth wire markers, or Markwick Corp.'s permanent wire markers.

### **B. Riser Diagram**

Contractor shall provide a readable riser diagram in a frame with glass cover. Riser shall be mounted where indicated by the Authority's Representative and properly secured to the wall. All Fire Alarm devices shall be clearly indicated on riser diagram.

## **2.07 WIRING**

### **A. Power Conductors (Above 75 volts) shall be:**

1. Copper, THHN, minimum 600 volts, 90°C and shall be installed in electric metallic tubing (EMT)
2. Cable type MI, U.L. listed for 2-hour fire resistance rating.
3. Minimum wire size shall be No. 12 AWG.

### **B. Low Voltage Conductors (75 volts and less) shall be:**

1. Copper, THHN, minimum 600 volts, 90°C and shall be installed in electric metallic tubing (EMT) or rigid steel metallic conduit in accordance with Art. 4000 (new NEC/NFPA 70 - 2008 Art. 760 as modified for use in NYC). Minimum wire size shall be No.14 AWG.
2. Multi-conductor cables run in raceways or exposed as described hereinafter, shall meet the following additional requirements:

- a. Type FPLP (plenum type), minimum insulation thickness of 15 mils, minimum temperature 150°C.
- b. Type FPLP (plenum type) red colored jacket overall with minimum thickness of 25 mils.
- c. Cable printing as per UL 1424 and additionally shall be marked "ALSO CLASSIFIED NYC CERT. FIRE ALARM CABLE" legible without removing jacket.
- d. Minimum conductor size in a multi-conductor cable shall be No. 14 AWG.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. The entire system shall be installed in a workmanlike manner, in accordance with approved manufacturers' wiring diagram. The Contractor shall provide all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation.
- B. All penetrations of floor slabs and fire walls shall be fire stopped in accordance with the 2008 NYC Building Code and the NYC Electrical Code.
- C. End of Line Devices (Resistors/Diodes/Capacitors) shall be provided as directed by the manufacturer and installed to provide proper circuit supervision, as required by the NYC Building Code Appendix Q (NFPA 72/2002 with NYC modifications) and Art. 4000 (new NEC/NFPA 70 - 2008 Art. 760 as modified for use in NYC).
- D. Installation of conductors and raceway shall be in accordance with the following:
  1. Power conductors shall not be installed in common raceways with low voltage conductors.
  2. Conductors other than M.I. cable shall be run in raceway, except as specifically described below.

3. Multi-conductor cables shall be installed without raceway protection only in the following locations: above the hung ceiling in the cable tray, under the raised floors, in shafts, in telephone and communication equipment rooms and closets, and rooms used exclusively for fire alarm system equipment.
4. Telephone lines shall be installed in conduit (not raceway or cable tray) from the DACT to the Telephone Demarcation point.
5. Raceways run within 8 feet of the finished floor in garage areas, loading docks, mechanical rooms, and elsewhere where subject to mechanical damage, shall be rigid galvanized steel conduit only.
6. Raceways run above 8 feet of the finished floor in garage areas, loading docks, mechanical rooms, and elsewhere where subject to mechanical damage, shall be electrical metallic tubing (EMT).
7. Conductors for other electrical systems shall not be installed in raceways containing fire alarm conductors. Power-limited wiring shall not be run in the same raceways with non-power limited wiring.
8. Where allowed to be run without raceway protection, multi-conductor cables shall be installed as follows:
  - a. Cables shall not depend on ceiling media, pipes, ducts, conduits, or equipment for support. Cables shall be supported independently from the building structure.
  - b. Cables shall be secured by cable ties, straps or similar fittings, so designed and installed as not to damage the cable. Cables shall not be secured to threaded rods unless anti-chafe protection is provided in addition to the cable jacket.
  - c. Cable shall be secured in place at intervals not exceeding 5'-0" on centers and within 12" of every associated cabinet, box or fitting.

9. Installation of raceways, boxes and cabinets shall comply with the following general requirements.
  - a. Covers of boxes and cabinets shall be painted red and permanently identified as to their use.
  - b. Penetrations of fire-rated walls, floors or ceilings shall be fire stopped.
  - c. Raceways or cables shall not penetrate top of any equipment box or cabinet.
10. Splices and terminations of wires and cables shall be as follows:
  - a. Permitted only in boxes or cabinets specifically approved for the purpose.
  - b. Utilize mechanical connections specifically approved by UL 486 A & C for the conductors, or if soldered, first joined so as to be mechanically and electrically secure prior to soldering and insulating. Temperature rating of completed splices shall equal or exceed the temperature rating of the highest rated conductor.
11. All wiring shall be color coded throughout to New York City Electrical Code standards and shall be of the type recommended by the manufacturer.

E. Wiring for Elevator Emergency Recall Operation

1. Provide wiring to and including a terminal strip cabinet in elevator machine room.
2. The Contractor shall provide all elevator control equipment for elevator emergency recall operation and final electrical connections between terminal strip cabinet and the elevator controllers.

F. Circuits from the fire alarm control panel to the system peripheral equipment shall be a minimum of as follows:

1. Each alarm initiating or supervisory circuit: Two (2) No. 14 AWG conductors.
2. Each alarm signaling/notification appliance circuit: Two (2) No. 14 AWG conductors.
3. Each control circuit: Two (2) No. 14 AWG conductors.

G. Identification, Labeling, Marking

1. Procedure Sign: Install adjacent to FACP and remote annunciator.
2. Zone Locator: Install adjacent to FACP and remote annunciator.
3. Power-Limited Circuits: Mark circuits at terminations, indicating that circuit is a power-limited fire protective signaling circuit.
4. Labeling Circuit Disconnects: Label the device used as the circuit disconnecting means for the dedicated branch circuits serving the system "FIRE ALARM SYSTEM POWER".
5. Identification of Circuits: Identify wires and cables in interconnection cabinets, and FACP with premarked, self-adhesive, wraparound type markers. Designations shall correspond with point to point wiring diagrams.
6. Battery Data: Insert a copy of the battery warranty in each battery compartment and mark on batteries the date placed in service.
7. Fire alarm system terminal and junction locations shall be identified in accordance with Art. 4000 (new NEC/NFPA 70 - 2008 Art. 760 as modified for use in NYC).
8. Terminal and junction boxes shall be painted red.

- H. The system shall be arranged to receive power from 120 volt, 60-cycle alternating current supply through a fused disconnect switch. All low voltage operation shall be provided from the fire alarm control panel(s).



- I. All final connections shall be made under the supervision of a trained technical representative to be provided by the Fire Alarm Company.
- J. Do not install smoke detector until the Work (including cleaning) of all trades in the area has been completed. Protect installed smoke detectors from airborne dust and debris with covers provided by the manufacturer for this purpose.
- K. The Contractor shall arrange for the sheet metal trades to drill holes in the ductwork for mounting the duct smoke detectors and its sampling tubes. That trade shall perform the actual mounting of these items on and within the ductwork. The duct detectors shall be wired and connected to the Fire Alarm System by the Electrical contractor.
- L. Guards
  - 1. Attach guards directly to the surface with vandal resistant fasteners.
  - 2. Where detectors are installed on suspended ceiling provide additional supports in the ceiling, such as channel support system, angel iron or additional runner bars. Fasten the additional supports rigidly to the ceiling runner bar system. Attach frame of resistant fasteners. Install metal spacers between the vandal guard frame and the supports so that the ceiling tiles will not be a part of the support system.
  - 3. Use finishing collar between ceiling and vandal guard where vandal guard cannot be mounted tight against ceiling due to job conditions.
- N. Grounding
  - 1. All conduits supplying power to the fire alarm control panel and control cabinets shall contain a green insulated grounding conductor sized in accordance with Art. 4000 (new NEC/NFPA 70 - 2008 Art. 760 as modified for use in NYC). Ground wiring shall be No.8 AWG minimum).

2. The contractor shall connect the grounding conductor to the ground bus or other suitable grounding terminal in each panel and cabinet in which it enters. At the fused disconnect switch supplying the fire alarm system, the contractor shall provide a grounding electrode conductor sized and installed in accordance with the New York City Electrical Code, Table 250.66 (No. 8 AWG minimum). The grounding electrode conductor shall be connected to the water main ground bus of the building. Ground connection at water pipe shall be by means of Thomas and Betts 3670 line, Appleton, Crouse-Hinds or other approved ground fitting.
3. When replacing an existing fire alarm system, the Contractor shall securely cover all the new devices being installed until the new Fire Alarm System is completely tested and found free of defects by the Fire Alarm Company Field Advisor and the old system is removed. The cover shall be labeled "Not in Use."

### 3.02 TESTS

- A. Prior to the final acceptance test, the Contractor and a trained representative of the Fire Alarm Company shall test the completed system for proper operation in the presence of the Authority. The entire system shall be demonstrated to perform all of the functions as below listed in these Specifications. Any system, equipment device or wiring failure discovered during said test shall be repaired or replaced before requesting scheduling of the final acceptance test. All repairs shall be retested in the presence of the Authority prior to the final acceptance test.
- B. The Contractor shall obtain and file Form A-433R, "Application for Electrical Inspection and Summary of Contract Equipment to be Installed" signed and sealed by a Master Electrician, "as-built" drawings in 11" x 17" format, prepared, signed and sealed by the Engineer-of-Record and Form B-45 "Request for Inspection" with the NYC Fire Department - Bureau of Fire Prevention. On the "as-built" drawing, the Contractor shall provide the operational statement certifying the installation and testing of the system in the wording required in FDNY Technology Management

Bulletin #3-1/2010, which shall be signed and sealed by a master electrician or licensed fire alarm installer. The Contractor shall then submit the above-mentioned documents to the Fire Department and schedule their inspection. This shall be done in preparation for the final tests of the system.

1. To facilitate the inspection process, the Contractor shall notify the Authority in sufficient time as to when the system is completed and ready for the Engineer of Record to be able to inspect and make the "as-built" drawings so they may be filed and approved to allow the Fire Department inspection.
- C. Upon completion of above, the Contractor shall perform final acceptance in the presence of the Authority's Representative, DOE personnel, the Inspector from the New York City Fire Department - Bureau of Fire Prevention, Contractor's representative and the Fire Alarm Company's representative. Notify the Authority at least 5 working days prior to the test so arrangements can be made to have a facility representative witness the test. The Contractor shall then accompany the Fire Department inspector during his/her inspection of the system, make all adjustments required by the inspector and re-file for additional inspections until a non-conditional approval is received from the Fire Department.
- D. During the tests indicated above and during the final acceptance test, the following shall be conducted in accordance with NFPA 72/2002 - Chapter 10, as adopted by the 2008 NYC Fire Code.
1. Every manual fire alarm station shall be tested.
  2. Every smoke detector, heat detector and carbon monoxide detector shall be tested using a UL approved method.
  3. Every sprinkler system waterflow alarm switch shall be tested by flowing water.
  4. Every sprinkler system valve tamper switch shall be tested by closing the sprinkler valve. On dry type sprinkler systems, the air pressure shall be measured.

5. Every audible notification appliance shall be sounded. Audibility of the notification appliances shall be verified throughout the entire premises for compliance with NFPA 72/2002 as adopted by the NYC Building Code, Appendix Q, using the sound pressure meters set for A-scale.
  6. Every visual notification appliance shall be activated. Visibility of the notification appliances shall be verified throughout the entire premises for compliance with NFPA 72/2002 as adopted by the NYC Building Code, Appendix Q.
  7. Every system control function shall be tested for its proper operation by activating each type of the initiating device that shall cause such function, including fan shutdown, boiler and gas-fired hot water heater shutdown, magnetic door release, electromagnetic door lock release, Central Station Transmitter operation and elevator recall.
  8. All circuits shall be opened at two (2) locations to test for proper supervision.
  9. Any and all other tests which the inspector from the NYC Fire Department - Bureau of Fire Prevention shall request.
- E. If any of the tests shall fail to indicate proper operation or if the Fire Department inspector issues a list of defects for the system, the Contractor shall immediately correct all defects and improper functioning as part of his Contract obligation. The Contractor shall furnish and install all labor and materials that is necessary to accomplish this. The Contractor shall then reschedule the final acceptance test, file a new A-433R and B-45 form, and redo all tests until the system is accepted by the Fire Department without qualification.
- F. Upon successful completion of all pre-testing, the Contractor and the Fire Alarm Company shall co-sign certificate attesting to the completion of testing and the updated and completed operational matrix, forward one (1) copy of said certificate to the Authority's Representative and one (1) copy to the Fire Department

as part of the inspection scheduling process. The Contractor is responsible for creating the as-built input-output matrix meeting the requirements of NFPA 72 to permit the filing.

- G. All final acceptance testing shall be done at a time convenient to the Bureau of Fire Prevention official and the Authority's Representative. All FDNY testing, re-testing and audit costs shall be paid by the Contractor as part of this Contract.

### **3.03 DOCUMENTATION TO DOE - DIVISION OF SCHOOL FACILITIES**

- A. Immediately after receiving the Letter of Approval by the Bureau of Fire Prevention of the New York City Fire Department, the contractor shall deliver to the DOE - Division of School Facilities the following documentation:
1. Copy of the Fire Department Letter of Approval.
  2. Copy of the updated form A-433R, "Application for Electrical Inspection and Summary of Contract Equipment to be Installed" filed with the Bureau of Fire Prevention.
  3. Compact Disk (CD) with the site specific software as described in paragraph 3.05.B of this specifications.

### **3.04 CLOSEOUT DOCUMENTATION AND TRAINING.**

- A. Contractor shall compile and provide to the Owner manuals on the finished system to include: operating and maintenance instructions, manufacturer's catalog pages of all equipment and components, detailed as-built floor plans and riser diagrams showing all installed devices and point-to-point wiring diagrams (this is separate from the Engineer-of-Record "as-built" drawings), and a manufacturer's suggested spare parts list.
- B. As required by NFPA 72-2002 as adopted by the NYC Building Code Appendix Q and NYC Fire Code, the Contractor shall provide two Compact Disks (CDs) and four (4) hard copies of the System Data Base, including all system data files as programmed (as built) and all information to allow alternate

authorized Fire Alarm Company to access, modify, alter, add to, or maintain the installed system. Manufacturers that do not comply with this provision of the specification shall not be considered "as equal".

- C. Contractor shall arrange with the manufacturer to provide Two (2) four-hour training sessions. Both four-hour training sessions shall be conducted during normal business hours to instruct school personnel on the operation and maintenance of the entire system. The first shall be conducted after final acceptance; the second shall take place after six (6) months as a retraining course. The Contractor may schedule this session in conjunction with the first semi-annual maintenance as required under this Contract.

Training shall be videotaped by the trainer (or contractor). Tapes shall be labeled and turned over to the Authority's Representative within forty-eight (48) hours of training completion

- D. Contractor shall provide Sensitivity Reports for all smoke detectors (Ionization and photoelectric types).
- E. Contractor shall provide the Letter of Approval by the Bureau of Fire Prevention of the New York City Fire Department.

**END OF SECTION**

Notes to Specifier (Delete from Specifications)

1. This Section is to be used for low rise schools
2. Modify paragraph regarding coding if work is to an existing system where panel is not being replaced, since existing master coding is to be followed.
3. As per DR 6.2.10, the preferred system is a dedicated system. Delete paragraph regarding post-fire smoke purge system if post-fire smoke purge is not required for project.
4. Edit for applicable system, if any. Refer to DR 6.2.10. Delete for extensions to existing fire alarm systems.

5. Delete flame detector if none are required, as they typically apply to locations where there is high pressure gas of 15 psi or greater. Refer to DR 7.3.1.
6. Delete paragraph for new installations.
7. Delete paragraph for work on existing systems where panel is not being replaced.
8. Delete paragraph for work on existing systems where panel is not being replaced. New CO detection system, if required by a project where Fire Alarm panel is not being replaced, is to be by a stand-alone CO detection system as per Section 16722. Refer to DR 7.3.13.
9. Delete paragraph for new installation and replacement projects, as new systems have central station monitoring and thus the alarm bell is not required.
10. Delete items not applicable to project. Electromagnetic door locks would likely only be applicable to mixed-use site where schools are part of a residential building.
11. Guards are to be provided in all gymnasiums and playrooms. Guards for the other locations are only required in high schools if they are placed below the 8'-0" height or can be accessed from a window sill or similar item.
12. Delete if smoke control system is utilized for venting stage.
13. Typically only the elevator shaft shall have a smoke detector that will open the smoke vent. If natural ventilation can be used for the other spaces, fusible links are the preferred method of operation rather than installation of smoke detectors and tie in to the fire alarm system. Verify with the architect and mechanical engineer as to the method of venting and modify to suit project.

LIST OF SUBMITTALS

<u>SUBMITTAL</u>	<u>DATE SUBMITTED</u>	<u>DATE APPROVED</u>
List of equipment	_____	_____
Sequence of operation Matrix (I/O Matrix)	_____	_____
System Ampere load and battery calculations	_____	_____
Product data	_____	_____
Shop Drawings with point-to- point wiring floor plans	_____	_____
Schedule of the proposed labels	_____	_____
Samples of equipment	_____	_____
NICET certificates for Company Field Advisor and all technicians	_____	_____
Warranty Certificate	_____	_____
Videotape of the personnel training	_____	_____
Operation and Maintenance Manuals, including Riser diagram in a frame with glass cover	_____	_____
Site-specific software (CDs and hard copies), including manufacturers' access codes and instructions, as per NFPA 72-2002 Edition	_____	_____
Bureau of Fire Prevention of the New York City Fire Department Letter of Approval	_____	_____



09/14/10

DESIGN NO. \_\_\_\_\_

Test results and certificate  
of completion of testing \_\_\_\_\_