SECTION 283111 – DIGITAL ADDRESSABLE FIRE ALARM

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes providing a non-coded microprocessor based, addressable, fire alarm system with voice control including a main fire alarm control panel with remote annunciator with master microphone module, manual stations, detectors, signal equipment, controls, accessories and devices.

B. This section also includes providing single and/or multiple station combination smoke and carbon monoxide alarm detectors with integral audible horns and separate visual strobe devices for hearing impaired for the resident apartment and all resident suites.

C. Scope shall also include connection of fiber optic data communication for fire alarm interface and all required programming and graphic annunciation modifications at the campus central fire alarm system monitoring location, for inclusion of this new building.

D. The fire alarm system shall be installed in accordance with Data Sheet 5-40, Fire Alarm Systems. FM Global Data Sheets are available at www.fmglobal.com/reasearch-and-resources/fm-global-data-sheets. Only fire detectors (heat, smoke, rate of rise) listed in the current Approval Guide, a publication of FM Approvals, shall be used in this installation. FM Global Approval Guide is available at www.fmapprovals.com/approval-guide.

1.2 DEFINITIONS

A. FACP: Fire alarm control panel.

B. LED: Light-emitting diode.

C. Definitions in NFPA 72 apply to fire alarm terms used in this Section.

1.3 SYSTEM DESCRIPTION

A. Zoned, noncoded, analog addressable, microprocessor-based fire detection and alarm system with manual and automatic alarm initiation, automatic sensitivity control and alarm verification of smoke detectors, and alarm tone generation with live microphone override.

B. Signal transmission using hardwired separate individual circuits for each zone or circuit of alarm indication and combination of hardwired and multiplex signal transmission for alarm, trouble and supervisory initiating, monitoring and control circuits.

C. Minimum of two evacuation circuits. Circuit one shall distribute a temporal code 3 pattern tone alarm signal to the audio amplifiers. Circuit two shall distribute a pre-recorded announcement to the amplifiers after three rounds of a temporal code 3-

pattern tone alarm signal. Microphone for live announcements shall override both circuits.

1.4 SUBMITTALS

A. Wiring diagrams, battery sizing calculations and floor plans shall be developed and signed by a technician having NICET Level 3 Fire Alarm Certification minimum and the proposed fire alarm system manufacturer's certification, and shall be submitted by the contractor to the state or local building code reviewing agency as well as to the Architect, Engineer and Authority Having Jurisdiction (AHJ). Proof of certification shall be included with the submittal.

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

C. Wiring Diagrams: Detail wiring and differentiate between manufacturer-installed and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Make all diagrams Project Specific and distinguish between existing and new wiring.

D. Battery: Sizing calculations.

E. Floor Plans: Indicate final outlet locations and routings of raceway connections.

F. Device Address List: Coordinate with final system programming.

G. 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.

H. Coordination Drawings: Plans, sections, and elevations drawn to scale and coordinating installation of smoke detectors in ducts and access to them. Show the following near each duct smoke provision of detector installation:

1. Size and location of ducts, including lining.
2. Size and location of piping.
3. Size and arrangement of structural elements.
4. Size and location of duct smoke detector, including air-sampling elements.

I. Product Certificates: Signed by manufacturers of system components certifying that products furnished comply with requirements.

J. Installer Certificates: Signed by manufacturer certifying that installers comply with requirements.

K. Field Test Reports: Indicate and interpret test results for compliance with performance requirements. Comply with NFPA 72.

L. Maintenance Data: For fire alarm systems to include in maintenance manuals specified in General Requirements Specification Sections. Comply with NFPA 72.

M. Submissions to Authorities Having Jurisdiction: In addition to distribution requirements for Submittals specified in General Requirements Specification Sections Section

"Submittals," make an identical submission to authorities having jurisdiction. Include copies of annotated Contract Drawings as needed to depict component locations to facilitate review. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review.

N. The following documents shall be submitted to the authority responsible for enforcing the International Building Code for review and approval prior to installation of the fire alarm system.

1. A floor plan.
2. Locations of alarm-initiating and notification appliances.
3. Alarm control and trouble signaling equipment.
4. Annunciation.
5. Power connection.
6. Battery calculations.
7. Conductor type and sizes.
8. Voltage drop calculations.
9. Manufacturers, model numbers and listing information for equipment, devices and materials.
10. Details of ceiling height and construction.
11. The interface of fire safety control functions.

O. Certificate of Completion: Obtain certification according to NFPA 72 in the form of a placecard by an FM global approved alarm company.

P. NICET and Manufacturer's Certification: Indicating the names and technical level of achievement awarded to the personnel responsible for the layout and installation of the system.

Q. Provide programming manuals and diskette copies in ASCII or RTF format of the software for microprocessor or computer based systems for the Owner's use in modifying, upgrading or expanding the system.

R. Before receiving final payment and after the system has been tested, inspected, and approved by the Authority Having Jurisdiction, the Authorized System vendor shall turn over a disc copy and hard copy of the approved program for the specific project directly to the Owner. The information shall be complete in all respects and contain all actions, rules, and other information needed to change, alter, or add to the system at a future date by a licensed Factory Certified vendor of the installed system. This information shall not be distributed to anyone not certified by the Manufacturer and proof of Certification shall be presented to the Owner, in writing, before the information is exchanged.

S. The Owner, as well as the system vendor, shall maintain a copy of the latest database. As changes are made, the Owner shall receive the latest database and the vendor of record shall maintain a copy.

T. The disc copy of the program shall be turned over to the Owner in a sealed envelope with the following or similar verbiage:

1. COMPANY NAME acknowledges that all data included on the enveloped disc is 100% complete. Data enclosed contains all software required to provide a

100% functioning system as required by the contract specifications and as tested and approved by the Authority Having Jurisdiction on DATE.

2. The Owner shall not distribute the enclosed software disc to any company or individual not Authorized and Certified by the System Manufacturer. The enclosed software is licensed and protected by copyright of the SYSTEM MANUFACTURER.

1.5 QUALITY ASSURANCE

A. Equipment, materials and system engineering shall be provided by a direct Factory Authorized Systems Distributor. The on site management of the fire alarm portion of the project shall be the responsibility of a Factory Trained and Authorized Engineered Systems Distributor to ensure proper specification adherence, installation, final connection, test, turnover, warranty compliance, and service.

B. Manufacturer Qualifications: A firm experienced in manufacturing systems similar to those indicated for this Project and with a record of successful in-service performance.

C. Source Limitations: Obtain fire alarm system components through one source from a single manufacturer.

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

E. Comply with NFPA 72.

F. UL Compliance and Labeling: Comply with provisions of UL Standards for Safety pertaining to fire alarm systems and provide products that are UL listed and labeled.

G. Comply with the following:

1. 268 Smoke Detectors for Fire Protective Signaling Systems.
2. 268A Smoke Detectors for Duct Application.
3. 464 Audible Signal Appliances.
4. 521 Heat Detectors for Fire Protective Signaling Systems.
5. 864 Control Units for Fire Protective Signaling Systems.
6. 1481 Power Supplies for Fire Protective Signaling Systems.
7. 1638 Visual Signaling Appliances.

1.6 EXTRA MATERIALS

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

1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of the amount installed, but in no case less than two (2) units or more than ten (10) units.
2. Lamps for Strobe Units: Quantity equal to 10 percent of the amount installed, but in no case less than two (2) units or more than ten (10) units.
3. Manual Pull Stations: Quantity equal to 10 percent of the amount installed, but in no case less than one (1) unit or more than ten (10) units.

4. Area Smoke Detectors, Photoelectric or Ionization Type: Quantity equal to 10 percent of the amount installed, but in no case less than one (1) unit or more than ten (10) units.
5. Heat Detectors, Combination Type: Quantity equal to 10 percent of the amount installed, but in no case less than one (1) unit or more than ten (10) units.
6. Detector Bases: Quantity equal to 2 percent of the amount installed, but in no case less than two (2) units or more than ten (10) units.
7. Standard Detector Sounder Basis: Quantity equal to 2 percent of the amount installed, but in no case less than two (2) units for more than ten (10) units.
8. Low Frequency (520 HZ) Detector Sounder Basis: Quantity equal to 2 percent of the amount installed, but in no case less than two (2) units or more than ten (10) units.
9. Combination Audible and Visible Fire Alarm Signals: Quantity equal to 10 percent of amount of each type installed but in no case less than two (2) units or more than ten (10) units.
10. Visible Fire Alarm Signals: Quantity equal to 10 percent of amount installed but in no case less than two (2) units or more than ten (10) units.
11. Addressable Interface devices: Quantity equal to 10 percent of amount installed but in no case less than two (2) units or more than ten (10) units
12. Printer Ribbons: Six (6) spares.
13. Keys and Tools: One (1) extra set for access to locked or tamper-proofed components.

B. Provide all labor, materials and programming to furnish and install the following additional devices where directed by the Owner, Architect, Engineer or Authority Having Jurisdiction during construction and prior to final acceptance. Include 50 feet of wiring, connection to the addressable loop, and programming. The unused devices shall be turned over to the owner and the owner credited the amount of labor for their installation.

1. Manual Fire Alarm Pull Stations: Quantity equal to 10 percent of amount of each type installed but in no case less than five (5) units or more than ten (10) units.
2. Combination rate-of-rise and fixed 135 degree F. heat detectors: Quantity equal to 10 percent of amount of each type installed but in no case less than five (5) units or more than ten (10) units.
3. Photoelectric Area Smoke Detectors: Quantity equal to 10 percent of amount of each type installed but in no case less than five (5) units or more than ten (10) units.
4. Detector Bases: Quantity equal to 10 percent of the amount installed, but in no case less than five (5) units or more than ten (10) units.
5. Standard and Low Frequency (520 HZ) Detectors Basis: Quantity equal to 10 percent of the amount installed, but in no case less than five (5) units or more than ten (10) units.
6. Combination Audible and Visible Fire Alarm Signals: Quantity equal to 10 percent of amount of each type installed but in no case less than five (5) units or more than ten (10) units.
7. Visible Fire Alarm Signals: Quantity equal to 10 percent of amount of each type installed but in no case less than five (5) units or more than ten (10) units.
8. Addressable Interface devices: Quantity equal to 10 percent of amount installed but in no case less than five (5) units or more than ten (10) units. Include connection to device being monitored or controlled.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-Of-Design Products: Subject to compliance with requirements, provide Simplex Grinnell 4100U Voice Evacuation Fire Alarm System to conform with campus wide system manufacturer. No substitutions.

B. Existing System Service Agency: Simplex Grinnell
200 Forge Way
Rockaway, N.J. 07866
Mr. Humberto Bringas
Office Phone: 973-664-2523

2.2 FUNCTIONAL DESCRIPTION OF SYSTEM

A. Control of System: By the FACP.

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

F. 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, receiver, and two separate telephone lines.

G. System Alarm Capability during Circuit Fault Conditions: Class A. System wiring and circuit arrangement prevent alarm capability reduction when a single ground or open circuit occurs in an initiating device circuit, signal line circuit, or notification-appliance circuit.

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

a. Initiating Device Circuits: Style D.
b. Notification Appliance Circuits: Style Z.
c. Signaling Line Circuits: Style 6.
d. Install no more than 70% of the maximum allowed quantity of addressable devices on each signaling line circuit.

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. Identification at the FACP and the remote annunciator of the device originating the alarm.
3. Transmission of an alarm signal to the remote alarm receiving station.
4. Unlocking of electric door locks in designated egress paths.
5. Release of fire and smoke doors held open by magnetic door holders.
6. Recall of elevators, chairlifts and stairlifts.
7. Shutdown of fans and other air-handling equipment serving zone where alarm was initiated.
8. Transmit a signal to a local standalone automatic temperature control panel for fan shutdown.
9. Closing of smoke dampers in air ducts of system serving zone where alarm was initiated.
10. Recording of the event in the system memory.
11. Recording of the event by the system printer.

J. Alarm Silencing, System Reset and Indication: Controlled by switches in the FACP.

1. 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.
2. Subsequent alarm signals from other devices or zones reactivate notification appliances until silencing switch is operated again.
3. When alarm-initiating devices return to normal and system reset switch is operated, notification appliances operate again until alarm silence switch is reset.

K. Operation of the City Disconnect / Drill Switch initiates a trouble signal at the FACP and annunciator and records the event in the system memory.

L. Water-flow alarm switch operation initiates the following:

1. Notification-appliance operation.
2. Flashing of the device location-indicating light for the device that has operated.

M. Operating a heat detector in the elevator shaft shuts down elevator power by operating a shunt trip in a circuit breaker feeding the elevator.

N. Water-flow alarm for connection to sprinkler in an elevator shaft and elevator machine room shuts down elevators associated with the location without time delay.

1. A field-mounted relay actuated by the fire detector or the FACP closes the shunt trip circuit and operates building notification appliances and annunciator.

O. Smoke detection for zones or detectors with alarm verification initiates the following:

1. Audible and visible indication of an "alarm verification" signal at the FACP.
2. Activation of a listed and approved "alarm verification" sequence at the FACP and the detector.
3. Recording of the event by the system printer.
4. General alarm if the alarm is verified.
5. Cancellation of the FACP indication and system reset if the alarm is not verified.

P. Smoke detector operation for a duct mounted smoke detector in a supply or return duct of an air handling unit causes the following:

1. Audible and visible indication of an “alarm verification” signal at the FACP.
2. Activation of a listed and approved “alarm verification” sequence at the FACP and the detector.
3. Recording of the event on the system printer.
4. General alarm initiation if the alarm is verified.
5. FACP indication cancellation and reset if alarm if the alarm is not verified.
6. Stops the supply and return fan if the alarm is verified.

Q. Sprinkler valve-tamper switch operation initiates the following:

1. A supervisory, audible, and visible "valve-tamper" signal indication at the FACP and the annunciator.
2. Flashing of the device location-indicating light for the device that has operated.
3. Recording of the event by the system printer.
4. Transmission of supervisory signal to remote alarm receiving station.

R. Remote Detector Sensitivity Adjustment: Manipulation of controls at the FACP causes the selection of specific addressable smoke detectors for adjustment, display of their current status and sensitivity settings, and control of changes in those settings. Same controls can be used to program repetitive, scheduled, automated changes in sensitivity of specific detectors. Sensitivity adjustments and sensitivity-adjustment schedule changes are recorded in system memory and are printed out by the system printer.

S. Removal of an alarm-initiating device or a notification appliance initiates the following:

1. A "trouble" signal indication at the FACP and the annunciator for the device or zone involved.
2. Recording of the event by the system printer.
3. Transmission of trouble signal to remote alarm receiving station.

T. Printout of Events: On receipt of the signal, print alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble), and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including the same information for device, location, date, and time. Commands initiate the printout of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

U. 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.

V. The capacity of the existing fire alarm system will not be diminished below that which exists at the present time.

W. The fire alarm system in portions of the existing building that are not being renovated, altered or remodeled is not required to meet current codes.

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 initiates an alarm.
2. Station Reset: Key or wrench operated; double pole, double throw; switch rated for the voltage and current at which it operates.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure, hinged at the top to permit lifting for access to initiate an alarm.
5. Integral Addressable Module: Arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.

2.4 SMOKE DETECTORS

A. General: Include the following features:

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. Remote Controllability: Unless otherwise indicated, detectors are analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

B. Photoelectric Smoke Detectors: Include the following features:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.
2. 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.
3. Integral Thermal Detector: Fixed-temperature type with 135 deg F (57 deg C) setting.

C. Ionization Detector: Include the following features:

1. Responsive to both visible and invisible products of combustion.
2. Self-compensating for changes in environmental conditions.

D. Duct Smoke Detector: Photoelectric Type.

1. Utilizing a light scattering type photoelectric sensor to sense changes in air samples from its surroundings and suitable for direct insertion into ducts up to 36” x 36” with air velocities up to 5000 feet per minute.
2. Provide duct housing assemblies for ducts exceeding 36” x 36”. Provide air sampling inlet tubes and air exhaust tubes. Protect sensing chamber from damage and insects. Support both ends of tubes.
3. Include relay with contacts rated to interrupt fan motor control circuit or smoke damper power circuit.

2.5 OTHER DETECTORS

A. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate of rise of temperature that exceeds 15 deg F (8.3 deg C) per minute, unless otherwise indicated.

1. Mounting: Adapter plate for outlet box mounting.
2. Mounting: Plug-in base for outlet box mounting, interchangeable with smoke detector bases.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

B. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 135 deg F for normal operation or 190 deg F (88 deg C) for high temperature operation.

1. Mounting: Adapter plate for outlet box mounting.
2. Mounting: Plug-in base for outlet box mounting, interchangeable with smoke detector bases.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

C. Remote Addressable Modules: High temperature, waterproof and explosion proof units may be provided with remotely mounted external addressable interface units.

2.6 NOTIFICATION APPLIANCES

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

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.

B. Visible Alarm Devices: Xenon strobe lights listed under UL 1971 with clear or nominal white polycarbonate lens. Mount lens on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: Generally, 15 candela in corridors; 110 candela elsewhere unless otherwise indicated. Comply with the minimum intensities indicated in

the CABO/ANSI A117.1-1998 “Room spacing allocation” and “Corridor spacing allocation” tables for the quantity and locations on devices indicated on the drawings. Where the required intensities cannot be obtained from the indicated devices, provide additional devices evenly distributed to meet the required intensities.

C. Voice/Tone Speakers:

1. Speakers: Low profile, low inrush, UL 1480 or UL 1971 listed, with 1/8, 1/4, 1/2, 1, 2, 4 and 8 watt taps producing 96 dBA @ 10 ft. for speakers and 93 dBA @ 10 ft. for combination speaker/strobes.
2. Horn Loudspeakers: Red, surface mounted, adjustable mounting bracket, UL 1480 listed, producing 102 dBA at 15 watts at 10 ft. with minimum of three power taps in 3 dB decreasing increments.
3. Mounting: Flush, semirecessed, surface, or surface-mounted; bidirectional as indicated.
4. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

2.7 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 wall 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.

2.8 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf (111-N) holding force.
2. Wall-Mounted Units: Flush mounted, unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.9 CENTRAL FACP

A. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. If more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels.

1. Identify each enclosure with an engraved, red, laminated, phenolic-resin nameplate with lettering not less than 1 inch (25 mm) high. Identify individual components and modules within cabinets with permanent labels.
2. Mounting: Surface.

B. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.

C. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.

D. Indications: Local, visible, and audible signals announce alarm, supervisory, and trouble conditions. Each type of audible alarm has a different sound.

E. Indicating Lights and System Controls: Individual LED devices identify zones transmitting signals. Zone lights distinguish between alarm and trouble signals, and indicate the type of device originating the signal. Manual switches and push-to-test buttons do not require a key to operate. Controls include the following:

1. Alarm acknowledge switch.
2. Alarm silence switch.
3. System reset switch.
4. LED test switch.

F. Smoke-Alarm Verification:
1. Initiate audible and visible indication of an “alarm-verification” signal at fire alarm control unit.
2. Activate an approved “alarm-verification” sequence at fire-alarm control unit and detector.
3. Record events by the system printer
4. Sounds general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

G. Notification-Appliance Circuit:
1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 db above the average ambient sound level or 5 dB above the maximum sound level, or at lest 75dBA, whichever is greater, mesured at the pillow
3. Visual alarm appliances shall flash in sychronization where multiple appliance are in the same field of view, as defined in NFPA 72.

H. Elevator Recall:
1. Elevator recall shall be initiated only by one of the following alarm-initiating devices :
   a. Elevator lobby detectors except the lobby detector on the designated floor.
   b. Smoke detector in elevator machine room.
   c. Smoke detectors in elevator hoistway.
2. Elevator controller shall be programmed to move the cars to the alternate recall floor if lobby detectors located n the designated recall floors are activiated.
3. Water flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

I. Door Controls : Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire –alarm system.

J. Remote Smoke-Detector Sensitivity Adjustment : Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and adjustment schedule chantes in system memory and print out the final adjusted values on system printer.

K. Transmission to Remote Alarm Receiving Station : Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

L. Printout of Events : On receipt of signal, print alarm, supervisory, and trouble events, Identify zone, device and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other printed indications. Also print system reset event, including same information for device, location, date and item. Commands initiate the printing of a list of existing alarm, supervisory, and trouble conditions in the system and a historical log of events.

M. Primary Power: 24V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power supply module rating.

N. Secondary Power: 24-Vdc supply system with batteries, automatic battery charger, and automatic transfer switch.
1. Batteries sealed lead calcium.

O. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.

P. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components, including annunciation, supervision, and control. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Display: A minimum of 80 characters; alarm, supervisory, and component status messages; and indicate control commands to be entered into the system for control of smoke detector sensitivity and other parameters.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

Q. Instructions: Printed or typewritten instruction card mounted behind a plastic or glass cover in a stainless steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

R. Location: Second Floor IDF.

2.10 REMOTE ANNUNCIATOR

A. Description: Duplicate annunciator functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate voice communication capability, handset and manual switching functions of the FACP, including acknowledging, silencing, reset, and test.

1. Mounting: Flush cabinet, NEMA 250, Class 1 indoors; Class 3R outdoors.

B. Display Type and Functional Performance: Alphanumeric display same as the FACP. Controls with associated LEDs permit acknowledging, silencing, resetting, and testing functions for alarm, supervisory, and trouble signals identical to those in the FACP.

C. Location: Main Entry Vestibule, Second Floor.

2.11 EMERGENCY POWER SUPPLY

A. General: Components include valve-regulated, recombinant lead acid battery; charger; and an automatic transfer switch.

1. Battery Nominal Life Expectancy: 10 years, minimum.

B. Battery Capacity: Comply with NFPA 72.

1. Magnetic door holders are not served by emergency power. Magnetic door holders are released when normal power fails.

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

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

2.12 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module listed for use in providing a multiplex system address for listed fire and sprinkler alarm-initiating devices with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to the elevator controller to initiate elevator recall or to a circuit breaker shunt trip for power shutdown.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Listed and labeled under UL 864 and NFPA 72.

B. Functional Performance: Unit receives an alarm, supervisory, or trouble signal from the FACP panel, and automatically captures one or two telephone lines and dials a preset number for a remote central station. When contact is made with the central station(s), the signal is transmitted. The unit supervises up to two telephone lines. Where

supervising two lines, if service on either line is interrupted for longer than 45 seconds, the unit initiates a local trouble signal and transmits a signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. When telephone service is restored, unit automatically reports that event to the central station. If service is lost on both telephone lines, the local trouble signal is initiated.

C. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

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

E. Location: Central FACP in Second Floor IDF.

2.14 SYSTEM PRINTER

A. Description: Listed and labeled as an integral part of the fire alarm system.

B. Location: Second Floor IDF Room.

2.15 GUARDS FOR PHYSICAL PROTECTION

A. Guards shall be heavy gauge welded wire mesh painted to match the device or clear perforated or slotted ultraviolet stabilized, high impact, injection molded virgin polycarbonate.

B. Guards shall not impair the normal viewing, audibility, physical operation or testing of the equipment.

C. Pull Station Protective Covers shall be Mini Stopper Model STI-6600 Protective Lexan Covers or approved equal. Covers shall contain an integral battery and battery operated horn. The horn shall sound whenever the cover is lifted to access the pull station. Where Stopper covers are indicated as weatherproof, provide a Model SUB-317 weatherproof gasket or provide Models STI-6525 or 6535 outdoor rated covers.

2.16 FIRE ALARM WIRE AND CABLE

A. Basis-of-Design Product: Subject to compliance with requirements, provide products recommended by Simplex Grinnell.

B. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

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

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray

installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

D. Fire-Rated Fire Alarm Cables: 2-hour fire rated cable listed by Underwriters Laboratories UL 2196.

1. "Two copper twisted conductors, 2-hour fire rated, mineral insulated, copper-sheathed and copper-shielded fire alarm and voice communication cable with termination kits in compliance with UL 2196 for a 2-hour fire rating for use as audible alarm tone signal/speaker voice evacuation circuits as manufactured by Tyco Thermal Controls, Pyrotenax System 1850 Twisted Pair cable reference numbers 2/18-324TS and 2/16-364TS for #18 AWG and #16 AWG shielded twisted pair cables respectively".

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Connect the FACP with a disconnect switch with lockable handle or cover.

B. Manual Pull Stations: Mount semiflush in recessed back boxes.

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

D. Ceiling-Mounted Smoke Detectors: Not less than 4 inches (100 mm) from a side wall to the near edge. For exposed solid-joist construction, mount detectors on the bottom of joists. On smooth ceilings, install not more than 30 feet (9 m) apart in any direction.

E. Wall-Mounted Smoke Detectors: At least 4 inches (100 mm), but not more than 12 inches (300 mm), below the ceiling.

F. Smoke Detectors near Air Registers: Install no closer than 60 inches (1520 mm).

G. Duct Mounted Smoke Detectors: Securely installed in ductwork in accordance with manufacturer's instructions and in such a manner as to obtain a representative sample of the air stream. Wherever possible locate just after a bend or air inlet to avoid stratification and a minimum of 6 duct widths downstream from the bend or inlet. Smoke detectors in classroom A/C units will be provided by others and shall be wired into the fire alarm system by the electrical contractor [through an interface module].

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

I. Audible Alarm-Indicating Devices: Where ceiling heights permit, install top of appliance not less than 90 inches above the finished floor and not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Combine audible and visible alarms at the same location into a single unit.

J. Voice / Tone Speakers: Generally audible signals shall be flush mounted multi-tap voice/tone speakers.

1. In boiler rooms, mechanical equipment rooms, etc. and outdoors audible signals shall be surface mounted supervised horn speakers.

K. Visual Alarm Indicating Devices: Install with bottom of appliance not less than 80 inches (2030 mm) and no greater than 96 inches (2440 mm) above the finished floor.

L. Combination Audible/Visual Indicating Devices: Install with top of appliance not less than 90 inches (2280 mm) and bottom of appliance not greater than 96 inches (2440 mm) above the finished floor.

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

N. The fire alarm system shall be installed in accordance with Data Sheet 5-40, Fire Alarm Systems. FM Global Data Sheets are available at www.fmglobal.com/reasearch-and-resources/fm-global-data-sheets. Only fire detectors (heat, smoke, rate of rise) listed in the current Approval Guide, a publication of FM Approvals, shall be used in this installation. FM Global Approval Guide is available at www.fmapprovals.com/approval-guide.

3.2 WIRING INSTALLATION

A. Wiring Method: Install line voltage wiring in metal raceway according to Electrical Specifcation Sections Sections. Conceal raceway except in unfinished spaces and as indicated.

B. Install low voltage fire alarm cables concealed within building spaces; run cables in metal raceway where run exposed less than eight feet from finished floor.

C. Do not install conductors, wires or cables of any other system in the same raceway or cable with fire alarm power supply circuits, non-power limited fire alarm circuits or power limited fire alarm circuits.

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

E. Make splices and connections in low voltage fire alarm cables in metal boxes with covers.

F. Make cable connections to fire alarm devices using metal boxes and cable connectors so there is no strain on the wiring termination.

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

H. Do not make taps or splices in supervised, hard-wired nonaddressable circuits.

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

3.3 GUARDS FOR PHYSICAL PROTECTION

A. Provide protective guards on all fire alarm devices in boiler rooms, mechanical rooms, loading docks, receiving areas, storage rooms on the building exterior, and other spaces and areas where devices are subject to damage or accidental operation from sports, physical activities, general housekeeping, maintenance, or the movement of supplies, materials, furniture and equipment.

B. Provide pull station protective covers on all fire alarm pull stations that are located in common areas or otherwise subject to false alarm.

C. Guards are not required where the physical construction of the equipment provides adequate protection against damage.

D. Install guards after finish painting is completed.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals according to Division 26 Sections Section "Basic Electrical Materials and Methods."

B. Identify system components, wiring, cabling, and terminals according to Division 26 Sections Section "Electrical Identification."

3.5 GROUNDING

A. Ground cable shields and equipment according to system manufacturer's written instructions to eliminate shock hazard and to minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

B. Signal Ground Terminal: Locate at main equipment rack or cabinet. Isolate from power system and equipment grounding.

C. Install grounding electrodes of type, size, location, and quantity as indicated. Comply with installation requirements in Electrical Specification Sections Section "Grounding."

D. Ground equipment and conductor and cable shields. For audio circuits, minimize, to the greatest extent possible, ground loops, common-mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and connections and to supervise pretesting, testing, and adjustment of the system. Report results in writing.

B. Pretesting: After installation, align, adjust, and balance the system and perform complete pretesting. Determine, through pretesting, the compliance of the system with requirements of Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones, and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.

C. Report of Pretesting: After pretesting is complete, provide a letter certifying the installation is complete and fully operable, including the names and titles of witnesses to preliminary tests.

D. System Reacceptance Testing: After all existing circuits have been extended and connected to the existing FACP all components, circuits and system operations known to be affected by the work shall be 100 percent tested; 10 percent of the remaining initiating devices shall also be tested up to a maximum of 50 devices.

E. Final Test Notice: Provide a minimum of 10 days' notice in writing when the system is ready for final acceptance testing.

F. Minimum System Tests: Test the system according to procedures outlined in NFPA 72. Test the fire alarm control panels, annunciators, and each new or relocated alarm initiating, indicating or interfacing device in the presence of the Contractor, Owner's Architect's and Engineer's Representative, and the Local Fire Subcode Official. Minimum required tests are as follows:

1. Verify the absence of unwanted voltages between circuit conductors and ground.
2. Test all conductors for short circuits using an insulation-testing device.
3. With each circuit pair, short circuit at the far end of the circuit and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on record drawings.
4. Verify that the control unit is in the normal condition as detailed in the manufacturer's operation and maintenance manual.
5. Test initiating and indicating circuits for proper signal transmission under open circuit conditions. One connection each should be opened at not less than 10 percent of initiating and indicating devices. Observe proper signal transmission according to class of wiring used.
6. Test each initiating and indicating device for alarm operation and proper response at the control unit. Test smoke detectors with actual products of combustion.
7. Test the system for all specified functions according to the approved operation and maintenance manual. Systematically initiate specified functional performance items at each station, including making all possible alarm and monitoring initiations and using all communications options. For each item, observe related performance at all devices required to be affected by the item under all system sequences. Observe indicating lights, displays, signal tones, and annunciator indications. Observe all voice audio for routing, clarity, quality, freedom from noise and distortion, and proper volume level.
8. Test Both Primary and Secondary Power: Verify by test that the secondary power system is capable of operating the system for the period and in the manner specified.

G. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets Specifications and complies with applicable standards.

H. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log. Submit log on the satisfactory completion of tests.

I. Tag all equipment, stations, and other components at which tests have been satisfactorily completed.

3.7 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Touch up scratches and marred finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.8 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, adjusting, and maintaining equipment and schedules. Provide a minimum of 8 hours' training.
2. Training Aid: Use the approved final version of the operation and maintenance manual as a training aid.
3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

3.9 ON-SITE ASSISTANCE

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

END OF SECTION 283111