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SECTION 283111 - DIGITAL, ADDRESSABLE FIRE ALARM AND MASS NOTIFICATION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SYSTEM DESCRIPTION

- A. **[System is a new noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire alarm service only. The fire alarm contractor's work shall include system programming, modification of graphic interfaces, and creation of system as-built drawings.]**
- B. **[Work involves the modification of the existing building [Insert Make/Model of existing fire alarm system] fire alarm system dedicated to fire alarm service only. The fire alarm contractor's work shall include system programming, modification of graphic interfaces, and updating of system as-built drawings.]**
- C. [Bethesda campus only.] New fire alarm initiating devices, modifications to existing initiating devices, or any new node to the network will require programming of the Network Control Centers (NCCs). For the NIH Bethesda Campus, the NCCs are at the Emergency Communications Center (ECC) in Building 31, the Alternate ECC in Building 10, and the NIH Fire Department in Building 51.
- D. [Bethesda campus only.] The mass notification signal inputs shall be retransmitted simultaneously over all building fire alarm notification circuits, including the exterior notification circuit. The exterior notification circuit shall not be arranged to activate with the building fire alarm system. New mass notification nodes, as well as modifications to existing nodes, will require programming of the Network Voice Control Centers (NVCCs). For the NIH Bethesda Campus, the NVCCs are at the Emergency Communications Center (ECC) in Building 31, the Alternate ECC in Building 10, and the NIH Fire Department in Building 51.
- E. The mass notification signal inputs shall be retransmitted simultaneously over all building fire alarm notification circuits, including the exterior notification circuit. The exterior notification

circuit shall not be arranged to activate with the building fire alarm system. The mass notification shall be programmed with the following priorities (highest first):

1. Special suppression pre-discharge alert/warnings.
2. Building 31 ECC microphone.
3. Building 10 ECC microphone.
4. Building 51 microphone.
5. Building of incident local microphone.
6. Building of incident fire alarm evacuation message.
7. Public address transmissions over the building fire alarm speakers.

1.3 PERFORMANCE REQUIREMENTS

- A. **Voice Evacuation:** In order to ensure the ability to use the system for emergency notification in situations other than fire, the fire alarm system shall utilize voice evacuation.
- B. Any new fire alarm system shall be compatible with the base/campus fire alarm reporting system.
 1. For the Bethesda Campus the system shall be compatible with the Simplex reporting loop. The only acceptable manufacturer is Simplex.
 2. For the Poolesville Campus the system shall be compatible with the Simplex reporting loop. The only acceptable manufacturer is Simplex.
- C. Duct smoke detectors are not permitted.
Exception: Duct smoke detectors shall be installed where required for smoke control systems, including stair pressurization.
- D. Detectors shall not be installed in elevator shafts.
Exception: Detectors shall be installed in elevator shafts not served by a separate Elevator Machine Room in accordance with NFPA 13 and NFPA 72.
- E. Notification appliances shall not be installed in elevator cabs or stairwells.
- F. The fire alarm control panel shall be located at the building entrance or in the Fire Command Center (if provided). If the main building entrance cannot accommodate the FACP, audio controller, battery cabinets and amplifier panels, then a remote annunciator and audio controller shall be located at the main building entrance with the FACP and other components located in an electrical closet. Coordinate equipment locations with NIH Division of the Fire Marshal.
- G. Battery backup is required on all fire alarm systems. Battery capacity shall be based on 24 hours of standby operation followed by 30 minutes of alarm operation. For facilities with emergency generators the standby period of operation shall be decreased to 4 hours.

H. Wiring

1. All fire alarm circuits and pathways shall meet Class A requirements.
Exception: All panel-to-panel communication pathways shall meet Class X requirements.
2. All fire alarm wiring shall be solid copper sized in accordance with the manufacturer's recommendations.
3. The fire alarm wire for 120 V AC circuits shall be #12 AWG, solid copper, TFN insulation.
4. For modifications to existing systems, match building color code schemes. For new systems, the color code scheme shall be as follows:
 - a. SLC: Blue twisted shielded #18 AWG
 - b. Speakers: Yellow twisted shielded #16 AWG
 - c. Strobes: Red solid copper #14 AWG
5. Simplex Reporting Loop is a custom composite cable consisting of:
 - a. Two (2) Sets of 3-Pair 16 AWG, individually shielded, silicone insulation, FRPE jacket
 - b. Two (2) Sets of 3-Pair 18 AWG, individually shielded, silicone insulation, FRPE jacket
 - c. Four 62.5/125/900 distribution fiber cable, FRPE jacket
 - d. Overall Jacket, separator tape, LDPE jacket

I. SEQUENCE OF OPERATIONS

1. Fire Alarm Signal
 - a. Fire alarm initiation shall be by the following devices **[and systems]**:
 - 1) Manual pull stations
 - 2) Heat detectors
 - 3) Smoke detectors
 - 4) Automatic sprinkler system water flow
 - 5) Fire-extinguishing system operation
 - 6) [Insert alarm-initiating devices and systems]
 - b. Fire alarm signal shall initiate the following actions:
 - 1) Continuously operate alarm notification appliances [throughout the building] [in the affected zones].
 - 2) Identify alarm at fire alarm control unit [and remote annunciators].
 - 3) Transmit an alarm signal to the campus fire alarm reporting system.
 - 4) Record event in the system memory.
 - 5) Unlock doors in accordance with NFPA 101.
 - 6) [Insert signal-initiating actions].
 - 7) [Release fire and smoke doors held open by magnetic door holders.]

- 8) Switch heating, ventilating, and air-conditioning equipment controls to fire alarm mode.]
- 9) [Activate smoke-control system (smoke management) at firefighter smoke-control system panel.]
- 10) [Activate stairwell pressurization systems.]
- 11) [Close smoke dampers in air ducts of designated air-conditioning duct systems.]
- 12) [Elevator machine/control room heat detector alarms shall shunt trip power to the elevator controllers in that room.]
- 13) [Elevator lobby and machine/control room smoke detectors shall recall elevators to primary or alternate recall floors.]

2. Supervisory Signal

- a. Supervisory signal initiation shall be by the following devices and actions:

- 1) Valve supervisory switch
- 2) Low air pressure switch of a dry-pipe or preaction sprinkler system
- 3) Fire pump running
- 4) Fire pump loss of power
- 5) Fire pump power phase reversal
- 6) Duct smoke detector
- 7) [Insert supervisory signal initiating devices and actions]

- b. Supervisory signal shall initiate the following actions:

- 1) Identify supervisory signal at the fire alarm control unit [**and remote annunciator**]
- 2) After a time delay of 120 seconds (as required by the NIH Division of the Fire Marshal), transmit the supervisory signal to the campus fire alarm reporting system if still active
- 3) Record event in the system memory

3. Trouble Signal

- a. Trouble signal initiation shall be by the following actions/conditions:

- 1) Open circuits, shorts, and grounds in designated circuits.
- 2) Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
- 3) Loss of primary power at fire alarm control unit.
- 4) Ground or a single break in fire alarm control unit internal circuits.
- 5) Abnormal ac voltage at fire alarm control unit.
- 6) Break in standby battery circuitry.
- 7) Failure of battery charging.
- 8) Abnormal position of any switch at fire alarm control unit or annunciator.
- 9) [Insert trouble signal-initiating devices and actions].

- b. Trouble signal shall initiate the following actions:

- 1) Identify trouble signal at the fire alarm control unit [**and remote annunciator**]
- 2) After a time delay of 120 seconds (as required by the NIH Division of the Fire Marshal), transmit the trouble signal to the campus fire alarm reporting system if still active
- 3) Record event in the system memory

1.4 SUBMITTALS

- A. **Designer Qualifications:** Submit the name and documentation of certification of the proposed system designer for review and approval by NIH DFM no later than **[14]** [___] days after the Notice to Proceed.
- B. **Installer Qualifications:** Submit the name and documentation of certification of the proposed installer for review and approval by NIH DFM no later than **[14]** [___] days after the Notice to Proceed.
- C. **NIH DFM Working Plans:** Documentation, in accordance with the chapter of the same name in NFPA 72, shall be submitted for DFM review and approval. The following list shall represent the minimum documentation required for all fire alarm and emergency communications systems, including new systems and additions or alterations to existing systems:
 1. Written narrative providing scope, intent, and system description
 2. Riser diagram
 3. Floor plan layout showing location of all devices/appliances, control equipment, and conduit and conductor routing (point-to-point wiring diagram)
 - a. The person responsible for system design (layout) shall be identified on the system design documents.
 - b. All fire alarm drawings shall use symbols described in NFPA 170, Standard for Fire Safety and Emergency Symbols
 4. Sequence of operation in either an input/output matrix or narrative form
 5. Equipment technical data sheets
 - a. Fire alarm control panel/unit
 - b. Manual fire alarm pull stations
 - c. Detectors
 - d. Notification appliances
 - e. Wiring
 - f. Addressable interface device
 - g. Firefighters' two-way telephone communication service
 - h. Remote annunciator

- i. Weatherproofing
 - j. Any other fire protection related equipment not specifically mentioned here
 6. Battery calculations
 7. Voltage drop calculations for notification appliances
- D. **Testing Plan:** A testing plan shall be written and submitted to NIH DFM prior to requesting a final acceptance test. The plan shall clearly establish the scope of testing for the fire alarm or signaling system and shall include testing methods and all system interfaces.
- E. **Field Quality Control Report:** Prior to requesting a final acceptance test, contractor shall furnish a written statement to NIH DFM, through the Project Officer, stating that the system has been installed in accordance with approved plans and tested in accordance with the manufacturer's published instructions, the appropriate NFPA requirements, and the testing plan noted above. Provide completed and signed "System Record of Inspection and Testing" form found in NFPA 72.
- F. **Red-Line Drawings:** Prior to the scheduled date for the final acceptance test, contractor shall submit to the Project Officer hard copy red-line drawings reflecting actual installed conditions. These drawings shall be verified for accuracy by NIH DFM at the final acceptance test.
- G. **Record/As-Built Drawings:** After final acceptance of the system, record/as-built drawings shall be submitted for DFM review and approval as a hard copy and electronically, both as .pdf and .dwg files.
 1. Record drawings shall consist of updated shop drawings reflecting the actual installation of all system equipment, components, and conduit and conductors.
 2. A sequence of operations in input/output matrix or narrative form shall be provided with the record drawings to reflect actual programming at the time of completion.
 3. Calculations. Where necessary, revised calculations shall be provided depicting any changes due to installation conditions.
 4. Record drawings shall include approval documentation resulting from variances, performance-based designs, risk analyses, and other system evaluations or variations.
- H. **Owner's Manual:** After final acceptance of the system, an Owner's Manual containing the following items shall be provided for DFM review and approval:
 1. A detailed narrative description of the system inputs, evacuation signaling, ancillary functions, annunciation, intended sequence of operations, expansion capability, application considerations, and limitations.
 2. A written sequence of operation in matrix or narrative form.

3. Operator instructions for basic system operations, including alarm acknowledgment, system reset, interpretation of system output (LEDs, CRT display, and printout), and operation of manual evacuation signaling and ancillary function controls.
 4. A detailed description of routine maintenance and testing as required and recommended and as would be provided under a maintenance contract, including testing and maintenance instructions for each type of device installed. This information shall include the following:
 - a. Listing of the individual system components that require periodic testing and maintenance
 - b. Step-by-step instructions detailing the requisite testing and maintenance procedures, and the intervals at which these procedures shall be performed, for each type of device installed
 - c. A schedule that correlates the testing and maintenance procedures
 5. A service directory, including a list of names and telephone numbers of those who provide service for the system.
 6. Warranty Information
- I. **Record of Completion:** The record of completion documentation shall be completed by the installing contractor and submitted for DFM review and approval at the conclusion of the job in accordance with NFPA 72. The "System Record of Completion" form found in NFPA 72 shall be completed and signed by the installing contractor.
- J. **Warranty Information:** Provide one-year parts and labor warranty certificate. Include emergency contact information and commencement date of warranty.

1.5 QUALITY ASSURANCE

A. Qualifications

1. **Designer Qualifications:** Field survey, design, and preparation of the submittals required in this specification shall be performed and certified by an individual who is a registered fire protection professional engineer or who is certified as a Level III or IV Technician by the National Institute for Certification in Engineering Technologies (NICET) in Fire Alarm Systems. The individual shall have a minimum of 5 years of experience in the preparation of fire alarm shop drawings, battery and voltage drop calculations, and field surveying, and shall be regularly engaged in the design of the type and complexity of system specified in the contract documents. The system designer shall sign each drawing (with certification/license number) submitted for approval by the NIH DFM.
2. **Installer Qualifications:** Work shall be performed by a fire alarm contractor with the following qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project. Where applicable, the installing contractor shall be licensed by the state in which the work is performed. The installing contractor shall have on staff a registered fire protection professional engineer or individual who is certified as a Level III or IV Technician by the National Institute for Certification in

Engineering Technologies (NICET) in Fire Alarm Systems. The field superintendent shall have a minimum NICET I in Fire Alarm Systems.

- B. **Source Limitations for Fire Alarm System and Components:** Obtain fire alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- C. **Electrical Components, Devices, and Accessories:** Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 PROJECT CONDITIONS

- A. **Interruption of Existing Fire Alarm Service:** Do not interrupt fire alarm service to facilities occupied by NIH or others except as noted below:
 - 1. Notify NIH no fewer than 14 calendar days in advance of proposed interruption of fire alarm service.
 - 2. Do not proceed with interruption of fire alarm service without written permission from NIH.

1.7 SEQUENCING AND SCHEDULING

- A. **[Existing Fire Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire alarm equipment "NOT IN SERVICE" until removed from the building.]**
- B. **[Equipment Removal: After acceptance of new fire alarm system, remove existing disconnected fire alarm equipment and wiring.]**

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Equipment installed on an existing fire alarm system shall be the current make and model recommended by the manufacturer for that fire alarm system.
- B. For new fire alarm systems, the system installed shall be compatible with the campus central station reporting system.
 - 1. For the Bethesda Campus, the new system shall be compatible with the Simplex reporting loop. The only acceptable manufacturer is Simplex.
 - 2. For the Poolesville Campus, the new system shall be compatible with the Simplex reporting loop. The only acceptable manufacturer is Simplex.

2.2 FIRE ALARM CONTROL UNIT

A. General Requirements for Fire Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
 - a. Control unit shall be compatible with the existing Simplex Campus Loop without the addition of extra modules. It shall be capable of transmitting a detailed description of events to all three TrueSite Workstations (TSWs on campus).
 - b. Display shall have alphanumeric annunciation for up to 12,000 Network points and/or point lists and can be programmed to function as the network master controller for Alarm Silence, Trouble Acknowledge, and System Reset.
 - c. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
 - d. Include a real-time clock for time annotation of events on the event recorder.
2. Addressable initiation devices that communicate device identity and status.
 - a. Smoke sensors shall additionally communicate sensitivity setting [**and allow for adjustment of sensitivity at fire alarm control unit**].
 - b. Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
3. Addressable control circuits for operation of mechanical equipment.
4. Microphone shall have voice capability and shall be able to communicate with the existing Mass Notification System.
5. Housing shall have 3 bays (56 inches height by 24 inches width) and a glass door with a Simplex B key lock (CAT 30).

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

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. **Audio Controller (Voice/Alarm Signaling Service):** Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided [**in a separate cabinet located in the fire command center**] [**as a special module that is part of fire alarm control unit**].

1. All new fire alarm systems on the Bethesda campus shall utilize a voice evacuation system.

- a. The prerecorded voice evacuation sequence for all buildings on the Bethesda Campus is the standard Montgomery County voice message with female voice only.
 - b. Notification appliance circuits for voice evacuation systems shall be zoned on a floor by floor basis.
 - c. Selector switches shall be provided to select each zone or any combination of zones to deliver manual voice messages to the building.
 - d. A separate exterior speaker circuit shall be provided. This circuit shall only be activated through an input from the campus mass notification system or by the building fire alarm audio controller.
2. The notification patterns for Poolesville shall meet NFPA 72 for systems not employing voice evacuation.
 3. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.
- D. **Amplifier:** 70 VRMS
- E. **Stairwell Pressurization:** Provide an output signal using an addressable relay to start the stairwell pressurization system. Signal shall remain on until alarm conditions are cleared and fire alarm system is reset. Signal shall not stop in response to alarm acknowledge or signal silence commands. Pressurization starts when any alarm is received at fire alarm control unit from a smoke detector outside a door to the given stairwell.
- F. **Notification Appliance and Speaker Circuits:** Operation shall sound in a “slow-whoop” signal, at 90 dB to 110 dB, for four cycles, followed by a voice evacuation message. Upon completion of the voice message, the slow-whoop shall resound and continue until the fire alarm control panel is reset or the “alarm silence” switch function is activated. Visual appliances shall remain activated upon “alarm silence”.
- G. **Elevator Recall:**
1. Smoke detectors at the following locations shall initiate automatic elevator recall to the primary floor level.
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
 3. System shall lock in the first recall function (i.e., a subsequent activation of the primary floor lobby detector shall not move the elevator(s) to the secondary floor).
 4. Activation of a heat detector in an elevator machine room shall shut down elevators associated with the location without time delay.
- H. **Door Controls:** Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall [be] [not be] connected to fire alarm system.

- I. **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 sensitivity-adjustment schedule changes in system memory. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- J. **Primary Power:** 24 V DC obtained from 120 V AC service and a power supply module. 120 V power shall be fed from the building's emergency power source.
- K. Initiating devices, notification appliances, signaling lines, trouble signals, and supervisory signals 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.
- L. **Secondary Power:** 24 V DC supply system with batteries, automatic battery charger, and automatic transfer switch.
 - 1. Batteries shall be sized based on battery load calculations. Sealed lead acid batteries shall be provided.

2.3 REMOTE ANNUNCIATOR

- A. **Description:** Annunciator functions shall match those of fire alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire alarm control unit, including acknowledging, silencing, resetting, and testing.
 - 1. Housing shall have 3 bays (56 inches height by 24 inches width) and a glass door with a Simplex B key lock (CAT 30).
 - 2. Microphone shall have voice capability and shall be able to communicate with the existing Mass Notification System.
- B. **Display Type and Functional Performance:** Alphanumeric display and LED indicating lights shall match those of fire alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.4 NETWORK CABLE

- A. The cable required for this project is a "Custom" manufacture. It will be built according to the specifications in the solicitation received from The National Institutes of Health.
 - 1. Two (2) Sets of 3-Pair 16 AWG, individually shielded, silicone insulation, FRPE jacket
 - a. Electrical Characteristics
 - 1) Nominal Capacitance, conductor to conductor 31 pf/ft
 - 2) Nominal Conductor DCR (@20C) 4.0 Ohms/1000ft

- 3) Nominal Shield DCR (@20C) 5.1 Ohms/1000ft
- b. Mechanical Characteristics
 - 1) Conductors 16 AWG Solid Bare Copper
 - 2) 0.0508" Nominal Diameter
 - 3) Insulation Silicone Rubber
 - 4) 0.030" Nominal Wall
 - 5) Individual Pair Shields A1/Poly Beldfoil ® Tape
 - 6) 18 (7x26) TC Drain Wire
 - 7) Color Code Black, Red
 - 8) Overall Jacket FRPE, .045" Nominal Wall
 - 9) 0.54" Nominal Diameter
 - 10) Color: Red
 - 11) Applicable Standards and Specifications UL/NEC: Approved
2. Two (2) Sets of 3-Pair 18 AWG, individually shielded, silicone insulation, FRPE jacket
 - a. Electrical Characteristics
 - 1) Nominal Capacitance, conductor to conductor 27 pf/ft
 - 2) Nominal Conductor DCR (@20C) 5.9 Ohms/1000ft
 - 3) Nominal Shield DCR (@20C) 9.0 Ohms/1000ft
 - b. Mechanical Characteristics
 - 1) Conductors 18 AWG Solid Bare Copper
 - 2) 0.0403" Nominal Diameter
 - 3) Insulation Silicone Rubber
 - 4) 0.030" Nominal Wall
 - 5) Individual Pair Shields A1/Poly Beldfoil ® Tape
 - 6) 20 (7x28) TC Drain Wire
 - 7) Color Code Black, Red
 - 8) Overall Jacket FRPE, .045" Nominal Wall
 - 9) 0.50" Nominal Diameter
 - 10) Color: Red
 - 11) Applicable Standards and Specifications UL/NEC: Approved
3. Four 62.5/125/900 distribution fiber cable, FRPE jacket
 - a. Optical Characteristics
 - 1) Maximum Attenuation @ 850nm 3.5 dB/km
 - 2) Maximum Attenuation @ 1300nm 1.0 dB/km
 - 3) Point Loss @ 850nm & @ 1300nm 0.2 dB
 - 4) Maximum Bandwidth @ 850nm 220 MHz-km
 - 5) Maximum Bandwidth @ 1300nm 600 MHz-km
 - 6) Refractive Index @ 850nm 1.496

- 7) Refractive Index @ 1300nm 1.491
- 8) Numerical Aperture 0.275
- b. Mechanical Characteristics
 - 1) Fiber Type 62.5/125/900 Micron
 - 2) Number of Fibers Four (4)
 - 3) Core Diameter 62.5 +/- 2.5 microns
 - 4) Core Non-Circularity 5% maximum
 - 5) Clad Diameter 125 +/- 2 microns
 - 6) Clad Non-Circularity 1% maximum
 - 7) Core Clad Offset 1.5 microns maximum
 - 8) Primary Coating Material Acrylate
 - 9) 245 +/- 10 microns
 - 10) Secondary Coating Material Engineering Thermoplastic
 - 11) 900 +/- 50 microns
 - 12) Color Code Blue, Orange, Green, Brown
 - 13) Strength Member Aramid Yarn
 - 14) Outer Jacket FRPE, 0.035" Nominal Wall
 - 15) 0.197" Nominal Diameter
 - 16) Color: Orange
 - 17) Applicable Standards and Specifications UL/NEC: Approved
- 4. Overall Jacket, separator tape, LDPE jacket
 - a. Overall Cable Characteristics
 - 1) Fillers Non-Hygroscopic Polypropylene
 - 2) Core Wrap/Separator Water Swellable Tape
 - 3) Color: White
 - 4) Outer Jacket LDPE, 0.065" Nominal Wall
 - 5) Color: Black
 - 6) Footage Mark @ 2 Feet
 - 7) Cable Dimensions 1.4" Nominal
 - 8) Operating Temperature -20 to+70 C
 - 9) Maximum Pulling Tension 650 lbs.
 - 10) Minimum Bend Radius 14.0"

2.5 NETWORK INTERFACE PANEL AND TERMINAL PANEL

- A. All new network panels shall match existing installations. Network interface panels are only required in buildings without a Simplex control unit.

2.6 NAC EXTENDER PANELS

- A. Shall be compatible with the installed system and capable of communicating on the existing SLC circuit.

2.7 CONDUIT

- A. All fire alarm wiring shall be installed in 19.05 mm (0.75 inch) minimum conduit or electrical metallic tubing (EMT). All fire alarm conduit, fittings, appliances and devices that are subject to the elements, high humidity, or wash-down (e.g. parking garages, interior areas of vivariums, cagewashes, areas where steam valves discharge inside the room) shall be weatherproof/weather resistant. All fire alarm wiring in damp locations (e.g. fire pump and valve rooms, at flow and tamper switches) shall be installed in liquid-tight flexible metal conduit and liquid-tight device boxes. Flexible metal conduit is limited to 1.83 m (6 ft) and shall be secured per *National Electrical Code*®. All fire alarm wiring installed underground shall comply with NFPA 70®.
- B. All concealed fire alarm conduit and conduit located in stairwells, storage rooms, mechanical rooms, garages, and utility rooms shall be painted red enamel. All other exposed fire alarm conduit (outside the stairwells) shall be painted to match the existing adjacent wall surface, and red enamel bands 0.10 m (4 in.) wide shall be painted at 3.0 m (10 ft) intervals. This painting requirement also applies to the pull boxes, junction boxes, mounting boxes, and extensions. Red enamel bands shall not be painted on the pull boxes, junction boxes, mounting boxes, and extensions.

2.8 MANUAL FIRE ALARM BOXES

- A. **General Requirements for Manual Fire Alarm Boxes:** Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
 - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire alarm control unit.
 - 2. Station Reset: Key- or wrench-operated switch.
 - 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.

2.9 SYSTEM SMOKE DETECTORS**A. General Requirements for System Smoke Detectors:**

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be [**four**] [**two**]-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light:
 - a. Red flashing LED for power status and communication to control panel
 - b. Red solid/steady LED for alarm condition
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire alarm control unit.
 - a. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.10 HEAT DETECTORS

- A. **General Requirements for Heat Detectors:** Comply with UL 521.
- B. **Heat Detector, Combination Type:** Heat sensors shall be self-restoring and provide rate compensated, fixed temperature sensing, selectable with or without rate-of-rise temperature sensing. Rate-of-rise temperature detection shall be selectable at the control panel for either 15° F (8.3° C) or 20° F (11.1° C) per minute. Fixed temperature sensing is independent of rate-of-rise sensing and programmable to operate at 135° F (57.2° C) or 155° F (68° C)
 1. Mounting: [**Adapter plate for outlet box mounting**] [**Twist-lock base interchangeable with smoke-detector bases**].
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire alarm control unit.
- C. **Heat Detector, Fixed-Temperature Type:** Fixed temperature sensing shall be programmable to operate at 135° F (57.2° C) or 155° F (68° C)
 1. Mounting: [**Adapter plate for outlet box mounting**] [**Twist-lock base interchangeable with smoke-detector bases**].
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire alarm control unit.
- D. **Rate comp requirements:** Rate-of-rise temperature detection shall be selectable at the control panel for either 15° F (8.3° C) or 20° F (11.1° C) per minute. Fixed temperature sensing is independent of rate-of-rise sensing and programmable to operate at 135° F (57.2° C) or 155° F (68° C)

2.11 NOTIFICATION APPLIANCES**A. General Requirements for Notification Appliances:**

1. Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
2. All audible devices shall have adjustable sound levels.
3. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
4. All fire alarm conduit, fittings, appliances and devices that are subject to the elements, high humidity, or wash-down (e.g. parking garages, interior areas of vivariums, cagewashes, areas where steam valves discharge inside the room) shall be weatherproof/weather resistant. Freezer boxes subject to routine occupancy shall be provided with weatherproof devices and back boxes.
 - a. Where fire alarm devices are installed in environmentally controlled rooms (warm or cold rooms), the conduit shall have a seal-off fitting installed in accordance with NFPA 70.

B. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 25-mm (1-inch) high letters on the device.

1. Rated Light Output:
 - a. 15, 30, 75, 110, or 177 cd as necessary to meet NFPA 72 requirements.
 - b. 15/30/75/110 cd, selectable in the field.
2. Mounting: Wall mounted or ceiling mounted in accordance with spacing requirements of NFPA 72.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, [red] [white].

C. Voice/Tone Notification Appliances:

1. Voice notification appliances shall operate on a 70 V RMS signal.
2. Adjustable Units: Adjustable from ¼ W to 2 W.

3. Mounting: [**Flush**] [**semi-recessed**] [**or**] [**surface mounted and bidirectional**]. Devices located outdoors or exposed to the elements shall be weatherproof devices and back boxes with seal-off fittings installed in accordance with NFPA 70. Matching Transformers: Tap range matched to acoustical environment of speaker location.
4. Exterior speakers shall be capable of delivering 4 watts of output and housing shall be weatherproof.

2.12 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE

- A. Dedicated, two-way, supervised, telephone voice communication links between fire alarm control unit [, **the fire command center,**] and remote firefighters' telephone stations. Supervised telephone lines shall be connected to talk circuits by controls in a control module. Provide the following:
 1. Common-talk type for firefighter use only.
 2. Controls to disconnect phones from talk circuits if too many phones are in use simultaneously.
 3. Audible Pulse and Tone Generator, and High-Intensity Lamp: When a remote telephone is activated, it causes audible signal to sound and high-intensity lamp to flash.
 4. Selector panel controls shall provide for simultaneous operation of up to six telephones in selected zones. Indicate ground faults and open or shorted telephone lines on the panel front by individual LEDs.
 5. Display: [**Graphic**] [**Liquid-crystal digital**] to indicate location of caller.
 6. Remote Telephone Cabinet: Flush- or surface-mounted cabinet as indicated, factory-standard red finish, with handset.
 - a. Install one-piece handset to cabinet with vandal-resistant armored cord. Silk-screened or engraved label on cabinet door, designating [**"Fire Warden Phone"** **or**] "Fire Emergency Phone."
 - b. With "break-glass" type door access lock.
 7. Remote Telephone Jack Stations: Single-gang, stainless-steel-plate mounted plug, engraved "Fire Emergency Phone."
 8. Handsets: [**Insert number**] [**push-to-talk-type**] sets [**with noise-canceling microphone**] stored in a cabinet [**adjacent to fire alarm control unit**] [**in the fire command center**].

2.13 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 111-N (25-lbf) 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.

2.14 ADDRESSABLE INTERFACE DEVICE

- A. **Description:** Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. **Integral Relay:** Capable of providing a direct signal [**to elevator controller to initiate elevator recall**] [**to circuit-breaker shunt trip for power shutdown**] [**Insert functions**].

2.15 BASE/CAMPUS FIRE ALARM REPORTING LOOP

- A. Provide all equipment, cabling, and programming necessary to interface between the building fire alarm system and the base/campus fire alarm reporting loop.

2.16 DEVICE GUARDS

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

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire alarm equipment.
- B. **Shutdown Procedures:** Shutdowns are required for all fire alarm work and are performed by the Government Maintenance Contractor.
 1. Shutdown requests shall be made by the Project Officer a minimum of 14 calendar days prior to desired date.
 2. Fire alarm system cannot be modified without an approved shutdown.

- C. **Connecting to Existing Equipment:** Verify that existing fire alarm system is operational before making changes or connections.
 - 1. Connect new equipment to existing control panel in existing part of the building.
 - 2. Connect new equipment to existing monitoring equipment at the supervising station.
 - 3. Expand, modify, and supplement existing [**control**] [**monitoring**] equipment as necessary to extend existing [**control**] [**monitoring**] functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- D. **Duct Smoke Detectors:** Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- E. **Remote Status and Alarm Indicators:** Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- F. **Device Location-Indicating Lights:** Locate in public space near the device they monitor.
- G. **Fire Alarm Control Unit:** Surface mounted, with tops of cabinets not more than 1830 mm (72 in.) above the finished floor.
- H. **Annunciator:** Install with top of panel not more than 1830 mm (72 in.) above the finished floor.
- I. **Exterior speakers:** Shall be mounted 3.6 m (12 ft.) above grade and 12.2 m (40 ft.) on center unless permitted otherwise by the DFM. All conduit shall be run internally within the building wherever feasible.

3.2 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire alarm system.
 - 1. Verify that hardware and devices are NRTL listed for use with fire alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 1 m (3 ft.) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
 - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
 - 2. Alarm-initiating connection to stairwell and elevator-shaft pressurization systems.

3. Smoke dampers in air ducts of designated air-conditioning duct systems.
4. Alarm-initiating connection to elevator recall system and components.
5. Supervisory connections at valve supervisory switches.
6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
7. At elevator shunt trip breaker.
8. Supervisory connections at fire-pump controller for: pump running, power failure and phase-reversal conditions.
9. Supervisory connections at fire-pump engine control panel for diesel fire pumps.
10. **[Insert connections]**.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire alarm control unit.

3.4 GROUNDING

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

3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by the Project Officer or representative. The final system acceptance test shall be witnessed by the NIH Division of the Fire Marshal.
- B. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections before requesting a final acceptance test.
- C. Perform preliminary tests and inspections and deliver as-built drawings to the NIH Division of the Fire Marshal before requesting a final acceptance test.
 1. **Manufacturer's Field Service:** Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. **Tests and Inspections:**
 1. **Visual Inspection:** Conduct visual inspection prior to requesting final acceptance testing.

- a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
 - b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. Final Acceptance System Testing shall be performed under the direction and observation of the NIH Division of the Fire Marshal, however all work shall be performed by the Contractor. Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. **Reacceptance Testing:** Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.

3.6 DEMONSTRATION

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

END OF SECTION 283111