SECTION 28 31 12
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM - TKD

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Nonsystem smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Magnetic door holders.
8. Addressable interface device.
9. Graphics at fire alarm panels.
10. Interface with pre-action sprinkler system control panel.

B. Meet the following performance requirements:

1. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7 and Section 26 00 10 and 26 05 48.

C. System Description:

1. The building has an existing NRTL listed, FM placarded addressable networked fire alarm system with the main FACP and passive graphic display at the main lobby.
2. Modify the existing fire alarm control panel (FACP) system programming to reflect the work to be performed for this Suite. All alarms and information available at the local fire alarm panel (LFACP) for each Suite shall be available and visible from the FACP network annuciator at the main lobby.
3. Modify the building passive graphic display to indicate this Suite within the building footprint with all relevant information indicated per NFPA 170 and the Drawings.
4. Connect the Suite LFACP to the building network with a class A fire alarm loop.
5. This Suite's LFACP shall be of the same manufacturer as the building system and shall be FM placarded and NRTL listed as a releasing panel to control the pre-action sprinkler panel serving the Suite computer and infrastructure rooms. LFACP shall provide automatic sensitivity control of certain smoke detectors.

D. Service and maintenance in addition to warranty requirements:

1. Provide service and maintenance for the first year per NFPA 72 and the manufacturer's recommendations.
2. SOFTWARE SERVICE AGREEMENT
    a. Comply with UL 864.
    b. Technical Support: Beginning with Substantial Completion, provide software support for two years.
    c. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
        1) Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.2 RELATED SECTIONS

A. Section 26 00 10 – Basic electrical requirements, is an integral part of this section. Requirements and work indicated in 26 00 10 are not repeated in this Section.

1.3 COORDINATION

A. Coordinate work under provisions indicated in Section 26 00 10.

B. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard or fire watch service according to requirements indicated:

1. Notify Construction Manager, Contractor and Owner no fewer than five days in advance of proposed interruption of fire-alarm service.
2. Do not proceed with interruption of fire-alarm service without Construction Manager's, Contractor's and Owner's written permission.

C. Existing Fire-Alarm Equipment: Maintain existing equipment in areas of work 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.

D. Equipment Removal: After acceptance of new fire alarm system, remove existing, disconnected fire alarm equipment and wiring.

1.4 QUALIFICATIONS / QUALITY ASSURANCE

A. Conform to requirements indicated in Section 26 00 10.

1.5 REGULATORY REQUIREMENTS

A. Conform to requirements indicated in Section 26 00 10 in addition to following:

1. NFPA 72 - Installation, Maintenance, and Use of Protective Signaling Systems.
2. NFPA 101 - Life Safety Code.
3. ADAAG - Americans with Disabilities Act Application Guidelines.
4. Local Accessibility Requirements.
5. UL-Listed for pre-action sprinkler system release.
6. NFPA 170 standard for fire safety and emergency symbols.

1.6 SUBMITTALS

A. Submit as required here in and under Section 26 00 10.

B. Shop Drawings: Provide annunciator layout and system wiring diagram showing each device and wiring connection required.

C. Product Data: Provide electrical characteristics and connection requirements.

D. Test Reports: Indicate satisfactory completion of required tests and inspections.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

F. Documentation indicating all software and programming is licensed in the Owner's name. All rights and software belong to the Owner.

1.7 EXTRA MATERIALS

A. Furnish under provisions indicated in Section 26 00 10.

B. Provide the following additional materials:

1. Ten manual station break-glass rods.
2. Six keys of each type.
3. Three of each type of automatic smoke detector.

1.8 PROJECT RECORD DOCUMENTS

A. Submit under provisions indicated in Section 26 00 10.

B. Record actual locations of initiating devise, signaling devices, and end of line resistors.

1.9 OPERATION AND MAINTENANCE DATA

A. Submit under provisions indicated in Section 26 00 10.

1.10 WARRANTY

A. Provide under provisions indicated in Section 26 00 10.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design: Subject to compliance with requirements provide the product of the same manufacturer of the existing system.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors. Combination smoke/heat detectors not acceptable.
4. Duct smoke detectors.
5. Verified automatic alarm operation of smoke detectors.
6. Automatic sprinkler system water flow.
7. Fire-extinguishing system operation.
8. Fire standpipe system.
9. Sprinkler system devices.

B. Fire-alarm signal shall initiate the following actions:

1. Sequence of operation per the Drawings.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Sequence of operation per the Drawings.
2. Valve supervisory switch.
3. Low-air-pressure switch of a dry-pipe or pre-action sprinkler system.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Sequence of operations per the drawings.
2. Open circuits, shorts, and grounds in designated circuits.
3. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
4. Loss of primary power at fire-alarm control unit.

5. Ground or a single break in fire-alarm control unit internal circuits.
6. Abnormal ac voltage at fire-alarm control unit.
7. Break in standby battery circuitry.
8. Failure of battery charging.
9. Abnormal position of any switch at fire-alarm control unit or annunciator.
10. Fire-pump power failure, including a dead-phase or phase-reversal condition.
11. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit. Record the event on system printer.

F. Fire pump alarms per NFPA 20 for a NFPA 110 Level 1 system.

2.3 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. 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.
   b. Include a real-time clock for time annotation of events on the event recorder and printer.
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.

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, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type. 640 characters.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

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 7.
   d. Install no more than 50 addressable devices on each signaling line circuit.
2. Serial Interfaces: Two RS-232 ports for printers.

D. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Record events by the system printer.
4. Sound general alarm if the alarm is verified.
5. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

E. 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, and print out the final adjusted values on system printer.

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

G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals and 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.

H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed, valve-regulated, recombinant lead acid sized for 90 hours per FM 1-40 for pre-action systems.

I. Instructions: Computer printout 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.

2.4 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.

2.5 SYSTEM SMOKE DETECTORS – DO NOT PROVIDE ANY HEAT SENSING FUNCTION

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-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: LED type indicating detector has operated and power-on status.
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. Ionization Smoke Detector:

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.).

D. 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.

2.6 NONSYSTEM SMOKE DETECTORS

A. Not used.

2.7 HEAT DETECTORS – FIXED TEMPERATURE ONLY, NO RATE OF RISE

A. General Requirements for Heat Detectors: Comply with UL 521.

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

1. 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.

2.8 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections. Units shall be red and shall indicate “FIRE”.

B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. 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.

C. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

D. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce the sound-pressure level indicated, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol. Signal type shall be selectable (temporal, non-temporal, coded), set on temporal. Three audio levels – High, (88dB minimum reverberant) medium (86dB minimum reverberant) and Low (83dB minimum reverberant) set on “High” unless otherwise indicated.

F. 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 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:
   a. 15/30/75/110 cd, selectable in the field. Set at 75 unless otherwise indicated.
2. Mounting: Wall mounted unless otherwise indicated.
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.

2.9 FIREFIGHTERS' TWO-WAY TELEPHONE COMMUNICATION SERVICE (NOT USED)

2.10 MAGNETIC DOOR HOLDERS

2.11 REMOTE ANNUNCIATOR (NOT USED)

2.12 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 circuit-breaker shunt trip for power shutdown.

2.13 DIGITAL ALARM COMMUNICATOR TRANSMITTER (NOT USED)

2.14 RADIO ALARM TRANSMITTER (NOT USED)

2.15 SYSTEM PRINTER (NOT USED)

2.16 DEVICE GUARDS (NOT USED)

2.17 GRAPHIC DISPLAY

A. Adjacent to base building / common space fire alarm panels (FACP) – Provide an updated graphic floor plan of the entire building including the Suite work included in this contract. Show all exits, stairways, generators, fire alarm panels, pre-action sprinkler valve locations, fire pumps, north arrow, and room numbers. Outline pre-action sprinkler zones.

B. Graphic floor plan shall be easy to replace and upgrade as the building is renovated.

C. Adjacent to the Suite fire alarm control panel (LFACP) – Provide a graphic floor plan of the entire Suite including Infrastructure and adjacent areas. Include on the graphic the room coordinate scheme indicated on the Drawings (e.g. AA01, etc) identifying the raised floor tiles in the room.

D. Submit graphics for Owner, Architect, and fire department review. Make necessary chances required by the reviews.

E. Graphic floor plans shall be 18" x 24" or sized per quantities of floors and sizes of plans based on 1/16" scale, provide 3/4" aluminum frame with 45^0 miter corners, 0.125" thick clear non-glare plexi-glass cover protecting plan.

F. Additional features shall be "YOU ARE HERE" location text, legend, project and address, and bar scale. Comply with requirements of NFPA 170.

G. Text shall be typed, style Romans 1/16" high in floor plan, 1/8" high for notes and 1/4" high for titles and "YOU ARE HERE" description.

H. Refer to Drawings for additional information.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit recessed in wall with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

C. Smoke- or Heat-Detector Spacing:

1. Provide as indicated on drawings
2. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
3. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
4. Smooth ceiling spacing shall not exceed 30 feet (9 m).
5. Spacing of detectors for high air movement and irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
6. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening except in computer rooms.
7. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

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. Audible Alarm-Indicating Devices: Install 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.

G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

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

I. Fire-Alarm Control Unit: Recessed mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

J. LFACP Graphic: Install with top of panel not more than 72 inches (1830 mm) above the finished floor.

K. FACP Revised Graphic: Install in main lobby in the same location as the original, with top of panel not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Supervisory connections at valve supervisory switches.
2. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.

B. Mount end-of-line device in control panel.

C. Provide current surge protection for AC power and communication/addressable loops and lightning protection for telephone lines as follows:

1. AC power lines - Atlantic Scientific Model 41003 or approved equal.
2. Communications/Addressable loops - Atlantic Scientific Model 24544 or approved equal.
3. Telephone lines(DACT) – Atlantic Scientific Model 24504 or approved equal.
4. Provide required grounding accessories.

3.3 PROGRAMMING

A. Provide all programming required to provide the sequences and functions indicated herein and on the Drawings for the Suite LFACP and the building FACP.

B. All computer room devices shall include in their description the location in the room based on the room coordinates (e.g. under floor tile AC32, ceiling BH25, etc).

C. All point descriptions shall include standard english descriptions identifying type of device and location, as well as point identification number.

3.4 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.

C. Provide fire alarm circuit conductors with insulation color coded to match existing building standard, or using colored tape at each conductor termination and in each junction box.

3.5 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 and surge suppressor.

3.6 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction, General Contractor, and Commissioning Authority.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

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 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. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. 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.
4. Test and verify all sequence of operations.
5. Test all devices and verify the alarm printout at the annunciator. Readout shall indicated device name and location including room name and in the computer room it shall indicate location by access floor tile number (e.g. AA-12).

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 all tests and inspections.

G. Prepare test and inspection reports.

H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.7 DEMONSTRATION

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

END OF SECTION