

Addendum No. 01

Issue Date: 9/22/2026

SAUK COUNTY COURTHOUSE HVAC AND LIGHTING UPGRADES

515 Oak Street, Baraboo WI 53913

Project No.: 2025012

BID DATE: Thursday, October 29th, 2026 at 10:00am

This Addendum is issued to modify, explain or correct the original drawings and specifications and is hereby made a part of the Contract Documents. Please attach this Addendum to the Bid Documents in your possession. Insert the number and issue date of this Addendum on the Bid Form.

SPECIFICATIONS

DIVISION 26

Section 26 09 23 – Digital Modular Lighting Controls

1. Revised products to remove graphic wall stations.

DIVISION 28

Section 28 46 00 - Fire Detection and Alarm

2. Revised product manufacturer

DRAWINGS

None.

Attachments:

Specifications: As indicated above.

Drawings: As indicated above.

END OF ADDENDUM

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SECTION 26 09 23 - DIGITAL MODULAR LIGHTING CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Load controllers for lighting.
- C. Wall controllers.
- D. Conductors and cables.
- E. Daylight controls.
- F. Digital load controllers.

1.02 RELATED REQUIREMENTS

- A. Section 23 09 93 - Sequence of Operations for HVAC Controls.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables
- D. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- E. Section 26 05 29 - Hangers and Supports for Electrical Systems
- F. Section 26 05 33.16 - Boxes for Electrical Systems.
- G. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- H. Section 26 09 18 - Remote Control Switching Devices: Remotely controlled devices for lighting control, including networked lighting controls, programmable relay panels, and remote control switching relays.
- I. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches.
- J. Section 26 28 13 - Fuses.
- K. Section 26 51 00 - Interior Lighting.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction.
- C. NECA 130 - Standard for Installing and Maintaining Wiring Devices.
- D. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts.
- E. NFPA 70 - National Electrical Code.
- F. UL 924 - Emergency Lighting and Power Equipment.
- G. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces.

H. IECC - International Energy Conservation Code

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of wall controllers with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate placement of wall switch occupancy sensors with installed door swings.
3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.
5. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 51 00 and lighting fixture schedule.
6. Provide dimming system that is compatible with each light fixture's dimming method as shown on the approved light fixture submittals.
7. Notify Architect of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams for all proposed sensor types.

C. Shop Drawings:

1. Device Serial Numbers: Provide lighting plan(s) with lighting control device serial number stickers applied. Scan plans and submit digital copy. Submit hard copy and scanned digital copy to Owner.
2. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

3. Digital Load Controllers: Provide dimensioned plan views indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing factory and field connections. Include manufacturer product characteristics and application instructions for wired and wireless applications, including start-up and commissioning.
 4. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
 5. Wall Controllers: Provide lighting plan indicating location, and model number, of each wall controller and associated system component.
 6. Power Packs: Provide lighting plan indicating location, and model number of each power pack and associated system component,
- D. Field quality control reports.
1. Indicate that lighting control programming has been completed per the Lighting Control Sequence of Operation as listed on the Drawings.
 2. Indicate tested and approved lighting controls on a per-room/area basis.
- E. Operation and Maintenance Manual:
1. Product cut sheets of all items installed.
 2. Installation instructions.
 3. Include detailed information on device programming and setup.
 4. As-built shop drawings.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
- G. Project Record Documents: Record actual installed lighting control devices

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

- B. Provide five year manufacturer warranty for all lighting control devices and cabling included in this specification section.
- C. Provide five year manufacturer warranty for digital load controllers.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Wireless and wired digital lighting control system.
- B. Provide products listed, classified, and labeled as suitable for purpose intended.
- C. Provide all conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.
- D. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.
- E. Lighting control system components shall be capable of providing the functionality listed in the Lighting Control Sequence of Operations on the Drawings.
- F. Sensor locations shown on the Drawings are diagrammatic and indicate the general design intent. Contractor shall enlist the manufacturer to design a digital modular lighting control system that provides control of lighting through a proprietary system of sensors, control stations and room controllers.
- G. System shall provide programmable functions including the following:
 - 1. Occupancy and Vacancy Control.
 - a. Ability to program system to activate scenes or zones to preset levels based on occupancy or vacancy.
 - 2. Manual Control.
 - a. Scene Based dimming and switching.
 - b. Zone Based dimming and switching.
 - 3. Daylight Harvesting Control.
 - a. Provide dimming control to select luminaire zones based on availability of daylight sensed by one or more daylight sensors.
 - 4. Each room/area shall function as a standalone system.
 - 5. System shall have distributed intelligence that does not rely on a central controller.
 - 6. All equipment and software required to program the system shall be included with the system and turned over to the owner.
- H. Unless specifically noted, all wall control stations and cover plates shall match color requirements for Wiring Devices as noted in 26 27 26.

2.02 MANUFACTURERS

- A. Manufacturers:
 - 1. Acuity Brands, Inc: www.acuitybrands.com/#sle. **(Basis of Design)**

- a. Where light fixtures have nLight AIR embedded components, provide nLight AIR wall controllers and related devices.
 - b. Where light fixtures do not have nLight AIR embedded components, provide nLight wired lighting control components.
2. Hubbell Incorporated: www.hubbell.com/#sle.
3. Legrand North America, Inc: www.legrand.us/#sle.
- B. Substitutions: See Section 01 60 00 - Product Requirements.
 1. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

2.03 INTERIOR OCCUPANCY SENSORS

- A. Layout Verification.
 1. Sensor layouts on drawings are provided to show general intent and coordination.
 2. Manufacturer-trained technicians shall review layout with their product offering and contractor shall provide additional sensors, as needed, to ensure reliable, trouble-free, and full coverage operation in all areas.
- B. Occupancy Sensors.
 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 2. Sensor Technology.
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
 - c. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and audible sound sensing technologies.
 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 4. Operation: Refer to Lighting Control Sequence of Operations on the Drawings.
 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.

7. Area of coverage: provide minor motion or major motion coverage as indicated by occupancy sensor symbol and legend description.
 8. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 9. Sensitivity: Field adjustable.
 10. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
 11. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above selected level.
 12. Load Rating for Line Voltage Occupancy Sensors: As required to control load indicated on drawings.
 13. Wireless Sensors:
 - a. RF Range: 30 feet through typical construction materials.
 - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
 - c. Power: Battery-operated with minimum ten-year battery life.
- C. Wall Switch Occupancy Sensors:
1. Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
 - b. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.
 - c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
 - d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
 - e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
 - f. Finish: White.
 - g. Provide vandal resistant lenses for wall switch occupancy sensors.
- D. Ceiling Mounted Occupancy Sensors:
1. General Requirements:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
 - c. Provide field selectable setting for disabling LED motion detector visual indicator.

- d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
- e. Finish: White unless otherwise indicated.

2.04 LOAD CONTROLLERS FOR DIGITAL LIGHTING CONTROLS

- A. Load controllers shall function as the hubs for each area or room and shall provide lighting zone switching and dimming as required. One or more room controller zones shall be provided in each area to provide the following functions.
 - 1. Plenum rated, self-contained low voltage class 2 transformer and relay(s) compatible with specified low voltage lighting control devices.
 - 2. Provide quantity and configuration of load controllers with all associated wiring and accessories as required to control the lighting loads indicated on drawings.
 - 3. Air gap contacts rated for 20A of LED driver or LED driver loads.
 - 4. Dimming control to each zone of luminaires which is indicated to be dimmed on the Lighting Control Sequence of Operations on the Drawings.
 - a. Dimmers shall provide smooth, silent dimming down to the lowest dimming percentage as specified on the Luminaire Schedule using the dimming method specified on the Luminaire Schedule.
 - 5. Separate load controller zones/outputs shall be provided:
 - a. For each lighting control zone, as indicated on drawings.
 - b. For each circuit, as indicated on drawings.
 - c. For each room or area.
 - d. As necessary to power the quantity of sensors/wall controllers provided in an area.
 - e. As necessary to control the quantity of luminaires provided in an area.
 - f. For each luminaire type within an area.
 - g. For each dimming or switching type within an area.
- B. Input Supply Voltage: Dual rated for 120/277 V ac.
- C. Provide separate load controller or isolated relay for light fixtures on Emergency power to comply with NEC requirements for emergency circuit isolation.
- D. Load Rating: As required to control load indicated on drawings.

2.05 WALL CONTROLLERS

- A. Wall control button control stations shall be fully programmable and shall be provided with the functionality and button quantity as indicated on the drawings.

~~Graphic touch screen stations~~

~~LCD touchscreen control interface that provides:~~

~~At least, 16 scene controls and 16 On/Off/Dim controls.~~

~~Password protection and screen saver~~

~~User Prompts and Helps screens~~

~~Basic setup and programming of associated zones/scenes.~~

~~USB input for local programming with an Owner provided computer.~~

2.06 UL924 EMERGENCY FUNCTIONALITY

- A. Unless specifically noted with an “NL” or “Night Light” designation, all luminaires shown connected to an NEC 700 branch shall be controlled in the same manner of adjacent luminaires under normal circumstances but shall be energized in the event of a power outage.
- B. Where luminaires are dimmed, UL924 control shall include functionality allow dimmed control in normal circumstances and drive the fixtures to full when activated in a way that is compatible with dimming method specified on the Luminaire Schedule.
- C. UL924 Control may be accomplished integral with UL924 Room Controllers or may be accomplished with the addition of standalone UL924 controllers.

2.07 DIGITAL LOAD CONTROLLERS

- A. System Description:
 - 1. Stand-alone system, including interconnected modules and accessories, for lighting load low-voltage control as indicated on drawings, schedules, written sequences of operation, and reviewed shop drawings.
 - 2. Product standard system configurations preconfigured out of box, plug-and-play, automatically self-addressing devices for communications, and without need to field configure or program features, or requiring device setting adjustments. LEDs on unit indicate operation and troubleshooting without software intervention.
 - 3. Provide quantity and configuration of power and slave packs, communication modules, and load expansion modules, including associated wiring, wired and wireless components, and accessories to control loads indicated.
 - 4. Also referred to as room, area, or architectural digital load controllers, as indicated, depending on space and functionality. Each controller includes one or more channels for load control, also referred to as zones.
 - 5. Provide networkable digital load controllers and system components for future integration of luminaires and devices.
- B. General Requirements:
 - 1. Listed for powering and controlling line-voltage loads, power packs, contactors, relays, and other lighting control devices.
 - a. Design Lighting Consortium (DLC) listed.
 - 2. Input Supply Voltage: Dual rated for 120/277 VAC.
 - 3. Cabling Terminations:
 - a. Provide field fabricated, and tested before installation, control wiring.

- b. Include two RJ 45 or mechanical screw-based terminal block wiring connections.
- 4. Compatibility:
 - a. Compatible with luminaires specified with integral sensors; include auxiliary contact closure accessory components for controls indicated.
 - b. Compatible with wired and wireless sensors and communication protocols for controlling line-voltage loads.
 - 1) Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
- 5. Provide UL 2043 plenum rated control unit with self-contained relay(s) and low-voltage class 2 transformer, compatible with specified wired and wireless sensors, components, and ballasts/drivers.
 - a. Comply with NFPA 70 for use in plenum spaces.
 - b. Provide UL 2043 plenum rating for associated system control components for control indicated.
- 6. Surface Mounting: Standard junction box attachments.
- 7. Provide one auxiliary contact closure output where indicated.
- 8. Minimum Load Rating: As required to control load indicated on drawings.
- 9. Control Inputs:
 - a. Digital: Two.
 - b. Analog: One.
- 10. Output Control Capability:
 - a. Single Zone Switching Modules: One programmable channel.
 - b. Multi-Zone Switching Modules: Up to three separately programmable channels.
- 11. Emergency Branch Circuit Loads:
 - a. Comply with NFPA 70 for controlling or bypassing emergency branch circuits as indicated.
 - b. Provide UL 924 listed components.
- C. Additional Integrated Requirements for Digital Load Controllers:
 - 1. Central Monitoring and Management: Include programmable user interface for lighting system controllable features; control access locally by plugging into devices and LAN network via browser-based software with settings retained in nonvolatile memory.
 - 2. Provide additional auxiliary contact closure outputs where required for functions and operating modes indicated.
 - 3. Scheduling:
 - a. Include timer and clock configurator for full calendar year and daylight savings automatic adjustments based on time zone.

- b. Provide function for hold-on, designed within time limitations or other restrictions of presiding energy code.
 - c. Demand Response: Load shed or hold-off capability.
- 4. Occupancy Controls:
 - a. Scene Control: Occupant selections by lighting control devices for controls as indicated.
 - b. Bi-level Switching: Multi-level lighting for controls as indicated.
 - c. Dimming: Occupancy controlled dimming, including blink warning; see indicated controls for percent light-level after programmed delay time.
 - d. Shade Control: Interfacing capability.
- 5. Daylight Harvesting:
 - a. System Description:
 - 1) Control system with compatible control modules, power packs, contactors, or relays as required for automatic control of load indicated according to available natural light.
 - 2) System control responds to changes in measured light levels according to selected settings.
 - 3) Capable of integrating with daylighting sensors, occupancy sensors, and manual override controls.
 - b. Daylighting Control Photo Sensors: Low-voltage class 2 photo sensor units with output signal proportional to measured light level and provision for zero or offset based signal.
 - 1) Sensor Type: Filtered silicon photo diode.
 - 2) Sensor Range:
 - a) Indoor Photo Sensors: 5 to 100 footcandles.
 - 3) Finish: White unless otherwise indicated.
 - 4) Where wired sensors are indicated, wireless sensors are not acceptable without prior approval of Architect.
 - a) RF Range: 30 feet through typical construction materials.
 - b) Power: Battery-operated with minimum ten-year battery life.
 - c. Dimming Photo Sensors: Photo sensor units with integral controller compatible with specified dimming ballasts/drivers, for direct continuous dimming of up to 50 ballasts/drivers.
 - d. Input Delay: To prevent unwanted cycling due to intermittent light level fluctuations.

- e. Daylight Control Switching Modules: Unless otherwise indicated, load to be turned on when light level is below selected low set point and load to be turned off when light level is above selected high set point, with no-switching dead band between set points to prevent unwanted cycling.
- f. Daylight Control Dimming Module Operation:
 - 1) Unless otherwise indicated, specified load to be continuously brightened as not enough daylight becomes available and continuously dimmed as enough daylight becomes available.
 - 2) Load to be turned off when available daylight is sufficient to fully dim load, after selected time delay.
 - 3) Dimming and Fade Rates: Adjustable from 5 to 60 seconds.
 - 4) Cut-Off Delay: Selectable and adjustable from 0 to 20 minutes.
 - 5) Output Voltage: Compatible with specified dimming ballasts/drivers.
- 6. Accessories:
 - a. Where indicated, provide compatible accessory wall switches for manual override control.

2.08 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Class 2 and 3 Control Cable:
 - 1. As required by manufacturer.
 - 2. Plenum Rated.
 - 3. Cable Jacket Color:
 - a. Black.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

- F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 26 05 33.16.
- C. Maintain separation of remote-control, signaling, and power-limited circuits.
 - 1. See manufacturer instructions and Section 26 05 19 for control wiring conductors, wiring methods, and identification requirements.
- D. Install lighting control devices in accordance with manufacturer's instructions.
- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 27 26.
- H. Provide required supports; see Section 26 05 29.
- I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- J. Identify lighting control devices; see Section 26 05 53.
- K. Occupancy Sensor Locations:
 - 1. Sensor locations shown on the Drawings are diagrammatic and indicate the general design intent. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's approved shop drawings.
 - 2. Locate dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

3. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
 4. Install and aim sensors in locations to achieve not less than 90-percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- L. Load Controller Installation
1. Load Controllers shall be installed to the exterior of junction boxes where low voltage wiring is allowed to be installed without conduit.
 2. Where conduit is required for low voltage wiring, a separated junction box (or two boxes joined together) shall be provided.
 3. All Load Controllers shall be installed concealed in accessible areas or visible within electrical rooms.
 - a. Load Controllers should be located above a wall controller in the respective room above the suspended ceiling or at 10' AFF in rooms without suspended ceilings. For rooms with gypsum ceilings, Load Controllers should be installed as close as possible to the room served, with the Load Controllers being installed above a suspended ceiling or at 10' AFF in rooms without suspended ceilings.
 4. Identify each Load Controller's installed location on the As-Built Shop Drawings and within the manufacturer's produced lighting control layout drawings and floor plans for the Operations and Maintenance Manual.
- M. Daylighting Control Photo Sensor Locations:
1. Location Adjustments: Within design intent, reasonably minor adjustments to locations may be made in order to optimize control and avoid conflicts or problems affecting proper detection of light levels.
 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.
- N. Unless otherwise indicated, install Load Controllers for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- O. Support low voltage cables independent from suspended ceilings. Maximum support interval 4 feet.
- P. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

- Q. Where indicated or required, provide cabinet or enclosure for mounting of lighting control device system components; see Section 26 05 33.16.

3.04 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area.
- D. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.
- F. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
 - 1. Perform the following tests and inspections:
 - a. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 - 2. Lighting control devices will be considered defective if they do not pass tests and inspections.
 - 3. Prepare test and inspection reports.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated on the Lighting Control Sequences of Operation.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 PROGRAMMING

- A. Record all lighting control device identification tags and device locations as required by the manufacturer for startup.
- B. Program the system as required by the Lighting Control Sequences of Operation on the Drawings.
- C. System shall be programmed using the most comprehensive version of the software.
 - 1. Software designed for iOS or Android is acceptable only when it has all the features as the desktop/laptop version of the software.
 - 2. Lite or Trial versions of the software are not acceptable

3.07 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.08 CLOSEOUT ACTIVITIES

- A. See Section 01 78 00 - Closeout Submittals, for closeout submittals.
- B. See Section 01 79 00 - Demonstration and Training, for additional requirements.
- C. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed..
- D. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
 - 2. Provide minimum of four hours of training time to Owner.
 - 3. Instructor: Qualified contractor familiar with the project, with sufficient knowledge of the installed lighting control devices, and trained by the manufacturer on the software required to program the installed lighting control devices.
 - 4. Location and time: At project site. Coordinate Training time with Owner at least two weeks in advance.

END OF SECTION

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SECTION 28 46 00 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.

1.02 RELATED REQUIREMENTS

- A. Section 07 84 00 - Firestopping: Materials and methods for work to be performed by this installer.
- B. Designed using manufacturer's product-specific design software or based on manufacturer's pre-engineered design suitable for the application.
- C. Section 08 71 00 - Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.
- D. Section 14 21 00 - Electric Traction Elevators: Elevator systems monitored and controlled by fire alarm system.
- E. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Supervisory and alarm devices installed in sprinkler system.
- F. Section 23 33 00 - Air Duct Accessories: Smoke dampers controlled by fire alarm system.
- G. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- H. Section 26 05 33.13 - Conduit for Electrical Systems.
- I. Section 26 05 33.16 - Boxes for Electrical Systems.
- J. Section 26 05 53 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.
- B. ADA Standards - 2010 ADA Standards for Accessible Design.
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.
- D. NFPA 70 - National Electrical Code.
- E. NFPA 72 - National Fire Alarm and Signaling Code.

1.04 PERFORMANCE REQUIREMENTS

- A. Manufacturer and contractor shall be responsible for the final system design per state and local AHJ, codes and ordinances. Contractor to confirm with local Fire Marshal that cellular monitoring of the fire alarm system is acceptable. Final system design subject to approval by AHJ. Bid and Contract documents are intended to show only general intent and coordination.
- B. Fire alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
 2. Heat detectors.
 3. Smoke detectors.
 4. Verified automatic alarm operation of smoke detectors.
 5. Automatic sprinkler system water flow.
 6. Fire extinguishing system operation.
 7. Fire standpipe system.
 8. Duct Smoke detectors shall NOT initiate alarm signal.
- C. Fire alarm signal shall initiate the following actions:
1. Alarm notification appliances shall operate continuously.
 2. Identify alarm at the FACP and remote annunciators.
 3. De-energize electromagnetic door holders.
 4. Transmit an alarm signal to the remote alarm receiving station.
 5. Unlock electric door locks in designated egress paths.
 6. Release fire and smoke doors held open by magnetic door holders.
 7. Activate voice/alarm communication system.
 8. Close smoke dampers in air ducts of system serving zone where alarm was initiated.
 9. Recall elevator. Send signal to turn off elevator power after cab has been recalled.
 10. Record events in the system memory.
- D. Supervisory signal initiation shall be by one or more of the following devices or actions:
1. Operation of a fire-protection system valve tamper.
 2. Activation of AHU shutdown by duct smoke detector. Send signal to shut down respective AHU.
- E. System trouble signal initiation shall be by one or more of the following devices or actions:
1. Open circuits, shorts and grounds of wiring for initiating device, signaling line, and notification-appliance circuits.
 2. Opening, tampering, or removal of alarm-initiating and supervisory signal-initiating devices.
 3. Loss of primary power at the FACP.
 4. Ground or a single break in FACP internal circuits.
 5. Abnormal ac voltage at the FACP.
 6. A break in standby battery circuitry.
 7. Failure of battery charging.
 8. Abnormal position of any switch at the FACP or annunciator.
- F. System Trouble and Supervisory Signal Actions: Ring trouble bell and annunciate at the FACP and remote annunciators.

1.05 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Proposal Documents: Submit the following with cost/time proposal:
 - 1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
 - 3. Certification by Contractor that the system design will comply with Contract Documents.
- C. Evidence of designer qualifications.
- D. Shop Drawings: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
 - 9. Description of power supplies; battery calculations demonstrating adequate battery power.
 - 10. Detailed drawing of graphic annunciator(s).
 - 11. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
 - 12. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
 - 13. Certification by Contractor that the system design complies with Contract Documents.
 - 14. Submit Shop Drawings to AHJ for review and approval. Submittal to AHJ to be done in a timely fashion. Do not start fire alarm system construction until approval is received from AHJ.
- E. Evidence of installer qualifications.
- F. Evidence of instructor qualifications; training lesson plan outline.
- G. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.
 2. Submit documentation of satisfactory inspections and tests.
 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- H. Operating and Maintenance Data: See Section 01 78 00 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
1. Complete set of shop drawings, as approved by authority having jurisdiction.
 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 3. Contact information for firm that will be providing warranty service.
 4. List of recommended spare parts, tools, and instruments for testing.
 5. Replacement parts list with current prices, and source of supply.
 6. Detailed troubleshooting guide and large scale input/output matrix.
 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- I. Project Record Documents: See Section 01 78 00 for additional requirements; have one set available during closeout demonstration:
1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- J. Closeout Documents:
1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
- K. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
 3. In addition to the items in quantities indicated in PART 2, furnish the following:

- a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
- b. One copy, on CD-ROM, of all software not resident in read-only-memory.

1.06 QUALITY ASSURANCE

- A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.
- B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- C. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
 4. Warranty maintenance office located within 50 miles of project site.
 5. Certified in the State in which the Project is located as fire alarm installer.
- D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- C. At the end of the project, the Contractor shall post the warranty period along with the company's name and telephone number inside the fire alarm panel.

- D. Any occupied facility shall not be without a UL and an NFPA approved and fully operational fire alarm system for a period longer than two (2) hours. Emergency response shall be provided within two (2) hours of the notification, to the contractor, of the failure of the system to perform operationally per UL and NFPA standards. Non-emergency service calls shall be responded to within twenty-four (24) hours of the notification to the contractor.
- E. Emergency situations may include, but not limited to:
 - 1. System can't be acknowledged or reset
 - 2. System is non-responsive to commands
 - 3. System in non-responsive to actuated alarm devices
 - 4. Malfunction of notification/initiating circuit(s)
 - 5. System going into alarm/trouble without indicating the source
 - 6. System is dead (no power), etc.
- F. Repairs and/or replacement arising from emergency situations shall be completed within twenty-four (24) hours of the time of notification. Other than emergency, actual repairs and /or replacement shall be provided within seventy-two (72) hours of the time of notification during normal working hours, Monday through Friday, excluding holidays. If the repairs involve parts that are not shelf items and require lead time, the contractor shall inform the Owner within twenty-four (24) hours from the time of notification of the exact time when the repairs will be completed.
- G. If repair and/or replacement cannot be made within the prescribed time, then other means and methods of protection shall be provided to ensure the safety of the building's occupants during which time the system is not in compliance with the standards. This may involve up to and include hiring Owner approved qualified personnel to stand a fire watch, all at the contractor's expense.
- H. Warranty service for the equipment shall be provided by the system supplier's factory trained representative. Further, Warranty shall include all parts, labor and necessary travel.

1.08 EXTRA MATERIALS

- A. Provide the extra materials to the Owner at the completion of the project:
 - 1. Two (2) fire alarm cabinet keys.
 - 2. Two (2) manual pull station reset keys.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories:
 - ~~Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.~~
 - 1. [Edwards EST, a Carrier brand.](#)
 - 2. [Fike Fire Alarm: https://www.fike.com/](https://www.fike.com/)

B. Initiating Devices and Notification Appliances:

1. Honeywell Security & Fire Solutions/Fire-Lite; _____: www.firelite.com/#sle.
2. Same manufacturer as control units.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new addressable / intelligent voice fire detection and alarm system:

1. Provide all components necessary for a complete and functioning system.
2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the State Fire Marshal.
 - c. The requirements of the local authority having jurisdiction .
 - d. Applicable local codes.
 - e. Contract Documents (drawings and specifications).
 - f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: general audible (voice) and visual notification of entire premises.
5. Fire Alarm Control Panel: New, located as shown on the Drawings.
6. Do not combine fire alarm system with other non-fire systems.

B. Supervising Stations and Fire Department Connections:

1. Public Fire Department Notification: By on-premises supervising station.

C. Circuits:

1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:

1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Speaker Amplifiers: Minimum 25 percent spare capacity.
4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

2.03 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
 - 1. Sprinkler water control valves.
 - 2. Dry-pipe sprinkler system pressure.
 - 3. Dry-pipe sprinkler valve room low temperature.
 - 4. Elevator shut-down control circuits.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 - 1. Sprinkler water flow.
 - 2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
- C. Elevators:
 - 1. Elevator lobby, hoistway, and elevator control room smoke detectors: Elevator recall for fire fighters' service.
 - 2. Elevator Control Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
 - 3. Elevator Hoistway Heat Detector(s): Shut down elevator power prior to hoistway sprinkler activation.
 - 4. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.
- D. HVAC:
 - 1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.
- E. Doors:
 - 1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 71 00.
 - 2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 71 00.

2.04 COMPONENTS

- A. General:
 - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted units are acceptable.
 - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Main Fire Alarm Control Panel:
 - 1. General Description:
 - a. Modular, power-limited design with electronic modules, UL 864 listed.

- b. Addressable initiation devices that communicate device identity and status.
 - 1) Smoke sensors shall additionally communicate sensitivity setting and allow for adjustment of sensitivity at the FACP.
 - 2) Temperature sensors shall additionally test for and communicate the sensitivity range of the device.
 - c. Addressable control circuits for operation of mechanical equipment.
 - d. Actuation of alarm notification appliances, emergency voice communications, annunciation, smoke control, and elevator recall shall occur within 10 seconds after the activation of an initiating device.
2. Alphanumeric Display and System Controls: Arranged for interface between human operator at the FACP and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
- a. Annunciator and Display: Liquid-crystal type,
 - b. 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.
3. Circuits:
- a. Signaling Line Circuits: Style and Class as required by the AHJ and codes for the building occupancy and construction type.
 - b. Notification Appliance Circuits: Style and Class as required by the AHJ and codes for the building occupancy and construction type.
 - c. Electrical monitoring for the integrity of wiring external to the FACP for mechanical equipment shutdown and magnetic door-holding circuits is not required, provided a break in the circuit will cause doors to close and mechanical equipment to shut down.
4. Smoke-Alarm Verification:
- a. Initiate audible and visible indication of an "alarm verification" signal at the FACP.
 - b. Activate a listed and approved "alarm verification" sequence at the FACP and the detector.
 - c. Sound general alarm if the alarm is verified.
 - d. Cancel FACP indication and system reset if the alarm is not verified.
5. Transmission to Remote Alarm Receiving Station:
- a. Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a cellular digital alarm communicator transmitter.
6. Notification-Appliance Circuit: Operation shall sound in a temporal pattern, complying with ANSI S3.41.
7. Walk Test:

- a. A test mode to allow one person to test alarm and supervisory features of initiating devices.
 - b. Enabling of this mode shall require the entry of a password.
 - c. The FACP and annunciators shall display a test indication while the test is underway.
 - d. If testing ceases while in walk-test mode, after a preset delay, the system shall automatically return to normal.
8. Remote Smoke-Detector Sensitivity Adjustment:
 - a. Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and control of changes in those settings.
 - b. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups.
 - c. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory.
9. Transmission to Remote Alarm Receiving Station:
 - a. Automatically transmit alarm, trouble, and supervisory signals to a remote alarm station through a digital alarm communicator transmitter and telephone lines.
10. Voice/Alarm Signaling Service:
 - a. A central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of the FACP.
 - 1) Allow the application of and evacuation signal to indicated number of zones and, at the same time, allow voice paging to the other zones selectively or in any combination.
 - 2) Programmable tone and message sequence selection.
 - 3) Standard digitally recorded messages for "Evacuation" and "All Clear."
 - 4) Generate tones to be sequenced with audio messages of the type recommended by NFPA 72 and that are compatible with tone patterns of the notification-appliance circuits of the FACP.
11. Status Annunciator:
 - a. Indicate the status of voice/alarm speaker and the status of one-way all call communication system.
12. Primary Power:
 - a. 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signal, supervisory and digital alarm communicator transmitter shall be powered by the 24-V dc source.

- b. The alarm current draw of the entire fire alarm system shall not exceed 80 percent of the power-supply module rating.
 - c. Power supply shall have a dedicated fused safety switch for this connection at the service entrance equipment. Paint the switch box red and identify it with "FIRE ALARM SYSTEM POWER."
 - 13. Secondary Power: 24-V dc supply system with batteries and automatic battery charger and an automatic transfer switch.
 - a. Batteries: Sealed lead calcium.
 - b. Battery and Charger Capacity: Comply with NFPA 72.
 - 14. Surge Protection:
 - a. Install surge protection on normal ac power for the FACP and its accessories.
 - b. Install surge protectors recommended by FACP manufacturer.
 - 15. Instructions:
 - a. Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame.
 - b. Include interpretation and describe appropriate response for displays and signals.
 - c. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.
- C. Remote Annunciator(s):
 - 1. Description:
 - a. Duplicate annunciator monitoring and control functions of the FACP for alarm, supervisory, and trouble indications. Also duplicate manual switching functions of the FACP, including acknowledging, silencing, resetting, and testing.
 - b. Voice paging handset.
 - c. Mounting: Flush cabinet, NEMA 250, Class 1.
 - 2. Display Type and Functional Performance:
 - a. 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.
- D. Addressable Modules:
 - 1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
 - 2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
 - 3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.

4. Control Modules: Provide as indicated or as required for selective control of notification appliances.
 5. Relay Modules: Provide as indicated or as required to perform necessary functions via dry-contact interface. Where load exceeds module contact rating, provide accessory power isolation relays suitable for load as required.
 6. Signaling Line Circuit (SLC) Isolating Modules: Provide as indicated or as required to automatically isolate short circuits on connected sections of SLC loops and allow other sections to continue to function normally. Provide automatic reset upon correction of short circuit.
- E. Initiating Devices:
1. Manual Fire Alarm Boxes
 - a. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. 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 the FACP.
 - 2) Station Reset: Key- or wrench-operated switch.
 2. Fire Alarm System Detectors:
 - a. General Description:
 - 1) UL 268 listed, operating at 24-V dc, nominal.
 - 2) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - 3) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - 4) Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection of 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 digital-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.

- a) Rate-of-rise temperature characteristic shall be selectable at the FACP for 15 or 20 deg per minute.
 - b) Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at the FACP to operate at 135 or 155 deg F.
 - c) Provide multiple levels of detection sensitivity for each sensor.
- b. Photoelectric Smoke Detectors:
 - 1) Sensor: LED or infrared light source with matching silicon-cell receiver.
 - 2) Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.
- c. Duct Smoke Detectors:
 - 1) Photoelectric Smoke Detectors:
 - a) Sensor: LED or infrared light source with matching silicon-cell receiver.
 - b) Detector Sensitivity: Between 2.5 and 3.5 percent/foot smoke obscuration when tested according to UL 268A.
 - 2) UL 268A listed, operating at 24-V dc, nominal.
 - 3) Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
 - 4) Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
 - 5) Self-Restoring: Detectors shall 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. Provide remote status and alarm indicator and test station.
 - 7) Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at the FACP for calibration, sensitivity, and alarm condition, and individually adjustable for sensitivity from the FACP.
 - 8) Each sensor shall have multiple levels of detection sensitivity.
 - 9) Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
 - 10) Remote test/indicator station:
 - a) Keyed test switch with LED indicators.
- 3. Heat Detectors:

FIRE DETECTION AND ALARM

- a. Elevator hoistway, elevator control room; fixed temperature sensor. Lower temperature actuation than adjacent fire protection sprinkler head temperature.
 - b. Rate-of-rise temperature sensor. Lower temperature actuation than adjacent fire protection sprinkler head temperature.
- F. Notification Appliances:
- 1. Description: Equipped for mounting as indicated and with screw terminals for system connections.
 - a. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly.
 - 2. Voice/Tone Speakers:
 - a. UL 1480 listed.
 - b. Mounting: Flush, semi-recessed, or surface mounted; bidirectional as indicated.
 - c. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.
 - d. Finish: as selected by the Architect.
 - e. Fire alarm speakers shall be labeled "FIRE".
 - f. Vandal resistant metal or Lexan housing or grills.
 - g. Sealed backs to protect the phenolic impregnated cone.
 - h. Field adjustable output taps ranging from 1/4 watt to 2 watts.
 - i. Speakers selected for this project shall produce a Sound Pressure Level, at the 1 watt tap of at least 82 dBA at 10 feet – as tested per UL Standard 1480.
 - 3. Strobes:
 - a. ALL strobes, and the strobe portion of audible/strobe combination units, shall be of the Xenon type.
 - b. Rated Light Output: as noted on the drawings unless a higher rating is .
 - c. Fire alarm strobes shall have clear lenses and labeled "FIRE".
 - d. Designed for synchronized flash operation at one flash per second (1 Hz) minimum over the device's listed input voltage range. Strobes shall be synchronized such that all strobe units within the building shall flash simultaneously (As a minimum, all devices on each floor shall flash simultaneously, with flash timing within the limits established by current UL standards.).
 - e. Synchronized such that all strobe units within the building shall flash simultaneously
 - 1) As a minimum, all devices on each floor shall flash simultaneously, with flash timing within the limits established by current UL standards.
 - 4. Exterior horn/strobe:
 - a. Weatherproof
 - b. Locate above the sprinkler system Siamese connection.

- c. Strobe per requirements above.
 - d. Horn
 - 1) Configured for either temporal three output or steady output.
 - 2) Produce a sound-pressure level of 90 dBA measured 10 feet from the horn with a multiple-frequency tone.
 - 3) Selectable high or low dB output with a reduction of approximately 6 dBA.
 - 4) Fire alarm horns shall be labeled "FIRE".
 - e. Coordinate required color with Architect.
- G. Cellular Digital Alarm Communicator Transmitter
- 1. Listed and labeled according to UL 632.
 - 2. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
 - 3. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.
 - 4. Contractor to confirm that the proposed cellular digital transmitter is compatible with the monitoring company selected by the Owner.
- H. Power/Audio Booster panels
- 1. Where they are used, "NAC Power Booster Panels" shall be individually supervised. Interconnecting NAC Booster Panels in a manner, which prevents identification of individual panel TROUBLE conditions, shall not be approved.
 - 2. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.
- I. Digital Alarm Communicator Transmitter
- 1. Listed and labeled according to UL 632.
 - 2. Functional Performance
 - a. Unit receives an alarm, supervisory, or trouble signal from the FACP, 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 2 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.
 - 3. Secondary Power: Integral rechargeable battery and automatic charger. Battery capacity is adequate to comply with NFPA 72 requirements.

4. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.
- J. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.
- K. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
 1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
 2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
 3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.
- L. Locks and Keys: Deliver keys to Owner.
 1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type
- M. Storage Cabinet for System Record Documents: Steel with baked enamel finish, size appropriate for record documents.
 1. Desk type door held open at 90 degrees for use as a working surface. Stainless steel piano hinge.
 2. Two key ring hooks to hold system keys, accommodations for 8 1/2" x 11" manuals and document records, and area for business cards for key contact personnel.
 3. Access door shall be locked with a 3/4" barrel lock.
 4. RED Finish with 1" high lettering "SYSTEM RECORD DOCUMENTS" with white indelible ink.
 5. Locate as directed by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the approved shop drawings.
- B. Install all wiring in conduit.
- C. Connect the FACP and NAC Booster Panels to dedicated Emergency Power Branch Circuits where available.
- D. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- E. Install instruction cards and labels.
- F. Duct detectors:

1. Duct smoke detector installation to be by this contractor and should be installed in the locations shown on the mechanical and electrical plans. Ensure that the duct smoke detectors are in serviceable locations. Consult with the mechanical designer for alternate locations if these are shown in non-serviceable locations. When locations on mechanical plans are not available, install in locations called for that provide accessibility for service. For duct smoke detectors that are associated with shaft smoke dampers, ensure the sampling tubes protruding into the duct are located within five feet of the smoke damper and there are no air inlets or outlets between the sampling tubes and the damper. Do not install within four feet of a fan discharge.
 2. Install Remote Test/Indicator Stations as shown on drawings. Where location not shown on drawings, locate in accessible location near the respective duct detector.
- G. Addressable Modules:
1. Install fire alarm addressable modules within 3 feet of the device controlled or monitored.
- H. Initiating Device Protection:
1. Install dust protection covers on all initiating devices until project area is free from construction dust.
 2. Ensure that all dust protection covers are removed at project completion.
- I. Indicating appliances:
1. Where ceiling mounted type indicating appliances are installed in areas without a ceiling, pendant mount the bottom of the indicating appliance at the same level as the bottom of the adjacent light fixtures.
 2. Exterior horn/light: coordinate with the fire protection contractor that a separate exterior bell is not installed over the Siamese connection as the fire alarm system horn/strobe will be installed in that location.
- J. Power/audio Booster Panels
1. If NAC Booster Panels are needed at locations other than those identified on the construction drawings, the Electrical Contractor shall obtain approval for their proposed installation locations. At such locations, the EC shall provide any required circuit breakers, associated power wiring, and local smoke detection at the approved location. Power shall be obtained from the nearest available emergency panel. The cost of such equipment and installation shall be included within the base Electrical Bid.
 2. Provide smoke detection at all proposed NAC booster panels and fire alarm audio amplifiers.
- K. Elevators:
1. Install heat detectors within 2 feet of sprinkler heads in elevator hoistways and elevator control rooms.
 2. Install smoke detectors at elevator landings, top of hoistway and in elevator control room.

3.02 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
 - 1. Hands-On Instruction: On-site, using operational system.
- B. Basic Operation: One 2-hour session for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 - 1. Initial Training: 1 session pre-closeout.
- C. Detailed Operation: One 2-hour session for Owner facility personnel.
 - 1. Initial Training: 1 session pre-closeout.
 - 2. Set day/time of training in writing with Owner at least 2 weeks in advance of the training session.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 - 1. Be prepared to conduct any of the required tests.
 - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.

5. Repeat demonstration until successful.

END OF SECTION

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