

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Standalone daylight-harvesting switching and dimming controls.
4. Indoor occupancy and vacancy sensors.
5. Switchbox-mounted occupancy sensors.
6. Digital timer light switches.
7. High-bay occupancy sensors.
8. Extreme temperature occupancy sensors.
9. Outdoor motion sensors.
10. Lighting contactors.
11. Emergency shunt relays.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
 - a. Occupancy sensors.
 - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which equipment will be attached.
 - 3. Items penetrating finished ceiling, including the following:
 - a. Luminaires.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Control modules.
- B. Field quality-control reports.
- C. Sample Warranty: For manufacturer's warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB media. Provide names, versions, and website addresses for locations of installed software.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty operation of lighting control software.
 - b. Faulty operation of lighting control devices.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 TIME SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Intermatic, Inc.; ET2000 Series or a comparable product by one of the following:
 - 1. Cooper Industries, Inc.
 - 2. Invensys Controls.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. NSi Industries LLC.
 - 5. TE Connectivity Ltd.
- B. Electronic Time Switches: Programmable, with alphanumeric display; complying with UL 917.
 - 1. Listed and labeled as defined in NFPA 70 and marked for intended location and application.
 - 2. Contact Configuration: SPST.
 - 3. Contact Rating: 10-A electronic ballast (LED) 120/277-V ac
 - 4. Programs: Ninety-six (96) on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 - 5. Programs: Ninety-six (96) on-off set points on a 24-hour schedule, allowing different set points for each day of the week and an annual holiday schedule that overrides the weekly operation on holidays.
 - 6. Programs: One to four channels; each channel is individually programmable with 96 on-off set points total on a 24-hour schedule.
 - 7. Programs: One to four channels; each channel is individually programmable with 96 on-off set points total on a 24-hour schedule with a skip-a-day weekly schedule.
 - 8. Programs: One to four channels; each channel is individually programmable with 96 on-off set points total on a 24-hour schedule, allowing different set points for each day of the week.
 - 9. Programs: One to four channels; each channel is individually programmable with 96 on-off operations per week total and an annual holiday schedule that overrides the weekly operation on holidays.
 - 10. Programs: One to four channels; each channel is individually programmable with 96 on-off operations per week total, and 50 annual holiday schedules that override the weekly operation on holidays.
 - 11. Programs: and an annual holiday schedule that overrides the weekly operation on holidays.
 - 12. Astronomic Time: All
 - 13. Astronomic Time, ET2800 Series: 1 4 channels.
 - 14. Automatic daylight savings time changeover.

15. Super Capacitor Backup: Not less than 100 hours reserve, to maintain schedules and time clock.

C. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Contact Configuration:
 - a. Model ET2x05 Series: SPST.
 - b. Model ET2x25 Series: Pulse ON, Pulse OFF.
 - c. Model ET2x45 Series: Pulse ON, Pulse OFF, Two SPST.
3. Contact Rating: 20-A ballast load, 120-/240-V ac.
4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
5. Astronomic Electronic Control ET2800 Series will automatically adjust for DUSK/DAWN settings.
6. Seven-Day Program: Uniquely programmable for each weekday and holidays.
7. Skip-a-day mode.
8. Super Capacitor to keep time during power failures, minimum of 100 hours.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Intermatic, Inc.; EK Series Fix Mount Electronic Photo Controls and EK Series, ELC Series, LED Series Twistlock Electronic Photo Controls or a comparable product by one of the following:
 1. Cooper Industries, Inc.
 2. NSi Industries LLC.
 3. TE Connectivity Ltd.
- B. Description: Fixed Mount Electronic Relay Based, SPST, with a non-drift silicon sensor and IR filter for human eye response. Rated for 1,000-W tungsten, or 1,800-VA ballast and 6-A electronic ballast/LED driver rating, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A, and compatible with ballasts and LED lamps.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Two- to five-seconds, to ANSI standard, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.

5. Mounting: 1/2-inch (13-mm) threaded male conduit. Fixed Mount meets or exceeds ANSI C136.24, UL 773A, and CSA Requirements with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
 6. Failure Mode: Luminaire stays ON.
- C. Description: Twistlock Electronic Photo Control with a non-drift silicon sensor and IR filter for human eye response. Rated for 1,000-W Tungsten, 1,800-VA ballast, and 2-A through 8-A electronic ballast/LED driver, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773, and compatible with ballasts and LED lamps.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of the photocell to prevent fixed light sources from causing turn-off.
 3. Time Delay: Fifteen-second minimum, to prevent false operation.
 4. Surge Protection: Metal-oxide varistor.
 5. Mounting: Twist lock complies with NEMA C136.10, and meets or exceeds ANSI C136.10-2010, UL 773, and CSA requirements.
 6. Failure Mode: Luminaire stays ON.
- D. Description: Relay Based, with SPST dry contacts rated for 1000-W tungsten or 1800-VA ballast, to operate connected load, complying with UL 773, and compatible with CFL and LED lamps.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 fc (16.14 lux) Instant ON and 2.25 fc (24.22 lux) time delayed OFF.
 3. Time Delay: Two- to five-seconds per ANSI guidelines, to prevent false operation.
 4. Lightning Arrester: Air-gap type.
 5. Mounting: Twist lock complying with NEMA C136.10, with base.
 6. Failure Mode: Luminaire stays ON.
- E. Description: Solid state; one set of NO dry contacts rated for 24 V dc at 1 A, to operate connected load, complying with UL 773, and compatible with power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 fc (16.14 lux) Instant ON and 2.25 fc (24.22 lux) time delayed OFF.
 3. Time Delay: Two- to five-seconds per ANSI guidelines, to prevent false operation.
 4. Mounting: 1/2-inch (13-mm) threaded male conduit.

5. Failure Mode: Luminaire stays ON.
6. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 - a. LED status lights to indicate load status.
 - b. Plenum rated.
7. Power Pack: Digital controller capable of accepting four RJ45 inputs with two outputs rated for 20-A incandescent or LED load at 120- and 277-V ac, for at 120- and 277-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc, Class 2 power source, as defined by NFPA 70.
 - a. With integral current monitoring
 - b. Compatible with digital addressable lighting interface.
 - c. Plenum rated.

2.3 DAYLIGHT-HARVESTING SWITCHING CONTROLS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Lithonia Lighting; Acuity Brands Lighting, Inc.
 4. Watt Stopper.
- B. System Description: System operates indoor lighting.
- C. Sequence of Operation: As daylight increases, the lights are turned off at a predetermined level. As daylight decreases, the lights are turned on at a predetermined level.
 1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present.
 - b. When significant daylight is present (target level).
 - c. System programming is done with two hand-held, remote-control tools.
- D. Ceiling-Mounted Switching Controls: Solid-state, light-level sensor unit, with **[integrated]** power pack, that detects changes in indoor lighting levels that are perceived by the eye.
- E. Ceiling-Mounted Switching Controls: Solid-state, light-level sensor unit, with separate power pack, that detects changes in indoor lighting levels that are perceived by the eye.
- F. Electrical Components, Devices, and Accessories:
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).

3. Sensor Output: Contacts rated to operate the associated power pack, complying with UL 773A. Sensor shall be powered by the power pack.
4. Sensor Output: Digital signal compatible with power pack.
5. Sensor type: Open loop.
6. Zone: Single.
7. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 - a. LED status lights to indicate load status.
 - b. Plenum rated.
8. Power Pack: Digital controller capable of accepting 4 RJ45 inputs with two outputs rated for 20-A incandescent LED load at 120- and 277-V ac, for 16-A or LED at 120- and 277-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc Class 2 power source, as defined by NFPA 70.
 - a. With integral current monitoring
 - b. Compatible with digital addressable lighting interface.
 - c. Plenum rated.
9. General Space Sensors Light-Level Monitoring Range: 10 to 200 fc (108 to 2152 lux), with an adjustment for turn-on and turn-off levels within that range.
10. Atrium Space Sensors Light-Level Monitoring Range: 100 to 1,000 fc (1080 to 10 800 lux), with an adjustment for turn-on and turn-off levels within that range.
11. Skylight Sensors Light-Level Monitoring Range: 1,000 to 10,000 fc (10 800 to 108 000 lux), with an adjustment for turn-on and turn-off levels within that range.
12. Time Delay: Adjustable from 5 to 300 seconds to prevent cycling.
13. Set-Point Adjustment: Equip with deadband adjustment of 25, 50, and 75 percent above the "on" set point, or provide with separate adjustable "on" and "off" set points.
14. Test Mode: User selectable, overriding programmed time delay to allow settings check.
15. Control Load Status: User selectable to confirm that load wiring is correct.
16. Indicator: Two digital displays to indicate the beginning of on-off cycles.

2.4 DAYLIGHT-HARVESTING DIMMING CONTROLS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Lithonia Lighting; Acuity Brands Lighting, Inc.

4. Watt Stopper.
- B. System Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
 1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present (target level).
 - b. When significant daylight is present.
 2. System programming is done with two hand-held, remote-control tools.
 - a. Initial setup tool.
 - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with **separate** power pack, to detect changes in indoor lighting levels that are perceived by the eye.
- D. Electrical Components, Devices, and Accessories:
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Sensor Output: 0- to 10-V dc to operate luminaires. Sensor is powered by controller unit.
 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lux).
- E. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-Atungsten at 120-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 1. LED status lights to indicate load status.
 2. Plenum rated.
- F. Power Pack: Digital controller capable of accepting 4 RJ45 inputs with two outputs rated for 20-A incandescent or LED load at 120- and 277-V ac, for 16-A LED at 120- and 277-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc Class 2 power source, as defined by NFPA 70.
 1. With integral current monitoring
 - a. Compatible with digital addressable lighting interface.
 - 1) Plenum rated.

2.5 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Intermatic, Inc.; **IOS-CMP** Series and **IOS-HB** Series or a comparable product by one of the following:
 1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Lithonia Lighting; Acuity Brands Lighting, Inc.

4. Lutron Electronics Co., Inc.
 5. Watt Stopper.
- B. General Requirements for Sensors:
1. Ceiling-mounted, relay based indoor occupancy and vacancy sensors.
 2. Dual technology.
 3. Separate IOS-CMP-LV and IOS-CMP-DT-LV models only, power pack model number IOS-PP24.
 4. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 5. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range.
 - 1) Models IOS-CMP-DT-LV, IOS-CMP-DT-U: 5 seconds to 30 minutes.
 - 2) Models IOS-CMP-LV, IOS-CMP-U, IOS-HB-U: 15 seconds to 30 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor shall be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 5 seconds to 30 minutes.
 6. Sensor Output: Sensor is powered from the power pack.
 7. Power: Line voltage.
 8. Power Pack:
 - a. Models IOS-CMP-DT-LV, IOS-CMP-LV: Dry contacts rated for 20-A inductive ballast, 15-A tungsten, and for 1 horsepower at 120/240-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 - b. Models IOS-CMP-U, IOS-HB-U: Dry contacts rated for 800-VA at 120-V ac, 1,600-VA at 277-V ac electronic ballast/LED, or 800-W at 120-V ac tungsten/incandescent.
 - c. Model IOS-CMP-DT-U: Dry contacts rated for 5-A electronic ballast/LED load at 120- and 277-V ac, or 800-W incandescent at 120-V ac.
 9. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.

- c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
- 10. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
- 11. Bypass Switch: Override the "on" function in case of sensor failure.
- 12. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.
- C. Dual-Technology Type: **Ceiling** mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.
 - 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 - 4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 360-degree pattern centered on the sensor over an area of 1,600 square feet (148.6 square meters) for Dual Technology.

2.6 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Intermatic, Inc.; IOS-DOV, IOS-DSR, IOS-DDR, OS-DPBIF, IOS-DSIF, and IOS-DPBIF2 (Vacancy Only), or a comparable product by one of the following:
 - 1. Cooper Industries, Inc.
 - 2. Hubbell Building Automation, Inc.
 - 3. Leviton Manufacturing Co., Inc.
 - 4. Lithonia Lighting; Acuity Brands Lighting, Inc.
 - 5. Lutron Electronics Co., Inc.
 - 6. Sensor Switch, Inc.
 - 7. Watt Stopper.
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 15 seconds to 30 minutes.

3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor Tag WS1:

1. Standard Range: 180-degree field of view.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Switch Type: field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage - 120 and 277 V.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 2.8 fc (30 lux) to daylight. The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Concealed, "off" time-delay selector at 15 seconds and 5, 10, and 20 minutes.
9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
10. Color per architect.
11. Faceplate: Color matched to switch.

D. Wall-Switch Sensor Tag WS2:

1. Standard Range: 180-degree field of view, with a minimum coverage area of 1,200 sq. ft. (111.5 sq. m). Models IOS-DPBIF2, IOS-DPBIF, IOS-DSIF have a standard range of 150-degree field of view, with a minimum coverage area of 980 sq. ft. (91.0 sq. m).
2. Sensing Technology: PIR.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.
5. Voltage: Dual voltage, 120 and 277
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
8. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
9. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
10. Color: per architect.

11. Faceplate: Color matched to switch.

2.7 DIGITAL TIMER LIGHT SWITCH

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Intermatic, Inc.; EI600 Series, EI500 Series, ST01 Series, and EJ600 Series, or a comparable product by one of the following:
 1. Cooper Industries, Inc.
 2. Leviton Manufacturing Co., Inc.
 3. Lutron.
- B. Description: Combination digital timer and conventional switch lighting control unit. Switchbox-mounted, LCD display, with selectable time interval in 1-minute increments.
 1. EI600 Ratings: 12-A resistive at 120-V ac for incandescent lighting, 6-A at 208/277-V ac incandescent lighting, 20-A resistive at 120/277-V ac, 16-amps at 120/277-V ac for **LED**, 1 horsepower at 120-V ac, and 2 horsepower at 240-V ac.
 2. EJ600 Ratings: 12-A resistive, 500-VA ballast, 15-A incandescent, and 1/2 horsepower at 120-V ac.
 3. ST01 Ratings: 15-A resistive at 120/277-V ac, 8-A inductive ballast/fluorescent at 120-V ac, 4-A inductive ballast/fluorescent at 208/277-V ac, 1 horsepower at 120-V ac, and 2 horsepower at 240-V ac.
 4. EI500 Ratings: 15-A resistive/general purpose at 120-V ac, 1000-VA inductive ballast/fluorescent, 500-VA electronic ballast/LED, 1000-W incandescent, and 1/4 horsepower at 125-V ac.
 5. Voltage: Dual voltage - 120 and 277 V.
 6. Color: per architect.
 7. Faceplate: Color matched to switch.

2.8 HIGH-BAY OCCUPANCY SENSORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Intermatic, Inc.; IOS-HB-U or a comparable product by one of the following:
 1. Hubbell Building Automation, Inc.
- B. General Description: Solid-state unit. The unit is designed to operate with the lamp and ballasts indicated.
 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 15 seconds to 30 minutes.
 3. Continuous Lamp Monitoring: When lamps are dimmed continuously for 24 hours, automatically turn lamps on to full power for 15 minutes for every 24 hours of continuous dimming.

4. Power: Line voltage.
 5. Power Pack: Dry contacts rated for 800-VA at 120-V ac, 1,600-VA at 277-V ac electronic ballast/LED, or 800-W at 120-V ac tungsten.
 6. Operating Ambient Conditions: 32 to 149 deg F (0 to 65 deg C).
 7. Mounting: Threaded pipe.
 8. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 9. Detector Technology: PIR.
- C. Detector Coverage: User selectable by interchangeable PIR lenses, suitable for mounting heights from 12 to 50 feet (3.7 to 15.2 m). Detect occupancy anywhere within a 360-degree pattern centered on the sensor over an area of 1,200 square feet (111.5 square meters) 2,800 square feet (260.1 square meters) for PIR Technology.
- D. Accessories: Obtain manufacturer's installation and maintenance kit with laser alignment tool for sensor positioning and power port connectors.

2.9 EXTREME-TEMPERATURE OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Industries, Inc.
 2. Sensor Switch, Inc.
- B. Description: Ceiling-mounted, solid-state, extreme-temperature occupancy sensors with a separate power pack.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended application in damp locations.
 2. Operation: Turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
 3. Operating Ambient Conditions: From minus 40 to plus 125 deg F (minus 40 to plus 52 deg C).
 4. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
 5. Power Pack: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 6. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind cover.

7. Bypass Switch: Override the "on" function in case of sensor failure.
 8. Automatic Light-Level Sensor: Adjustable from 2 to 10 fc (21.5 to 108 lux); keep lighting off when selected lighting level is present.
- C. Detector Technology: PIR. Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1500 sq. ft. (139 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 3. Detection Coverage (High Bay): Detect occupancy within 25 feet (7.6 m) when mounted on a 25-foot- (7.6-m-) high ceiling.

2.10 OUTDOOR MOTION SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper Industries, Inc.
 2. Hubbell Building Automation, Inc.
 3. Lithonia Lighting; Acuity Brands Lighting, Inc.
 4. Watt Stopper.
- B. General Requirements for Sensors: Solid-state outdoor motion sensors.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Dual-technology (PIR and infrared) type, weatherproof. Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm). Comply with UL 773A.
 3. Switch Rating:
 - a. Luminaire-Mounted Sensor: 500-VA fluorescent/LED.
 - b. Separately Mounted Sensor: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 horsepower at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
 4. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off." With bypass switch to override the "on" function in case of sensor failure.
 5. Voltage: Dual voltage, 120- and 277-V type.
 6. Detector Coverage:
 - a. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft. (84 sq. m).
 - b. Long Range: 180-degree field of view and 110-foot (34-m) detection range.

c. 2000 sq ft.

7. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
8. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
9. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
10. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and help eliminate false "off" switching.
11. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from minus 40 to plus 130 deg F (minus 40 to plus 54 deg C), rated as "raintight" according to UL 773A.

2.11 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Allen-Bradley/Rockwell Automation.
 2. ASCO Power Technologies, LP; a business of Emerson Network Power.
 3. Eaton.
 4. General Electric Company.
 5. Square D.
- B. Description: Electrically operated and mechanically held, combination-type lighting contactors with nonfused disconnect, complying with NEMA ICS 2 and UL 508.
 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.
 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.
- C. Interface with DDC System for HVAC: Provide hardware interface to enable the DDC system for HVAC to monitor and control lighting contactors.
 1. Monitoring: On-off status, coordinate with mechanical.
 2. Control: On-off operation, coordinate with mechanical.

2.12 EMERGENCY SHUNT RELAY

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Lighting Control and Design.
 2. Watt Stopper.
- B. Description: NC, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.
1. Coil Rating: 120V.

2.13 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. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SENSOR INSTALLATION

- A. Comply with NECA 1.
- B. 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.
- C. 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.

3.3 CONTACTOR INSTALLATION

- A. Comply with NECA 1.
- B. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.4 WIRING INSTALLATION

- A. Comply with NECA 1.

- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- D. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 IDENTIFICATION

- A. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.6 FIELD QUALITY CONTROL

- A. Retain "Testing Agency," "Manufacturer's Field Service," and "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" Paragraph or if retaining "Manufacturer's Field Service" or "Perform the following tests and inspections" Paragraph, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.
- B. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- D. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Lighting control devices will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within **12** months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.8 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 1. Upgrade Notice: At least 30 days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.9 DEMONSTRATION

- A. Coordinate demonstration of products specified in this Section with demonstration requirements for low-voltage, programmable lighting control systems.
- B. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923