

**SECTION 260923
LIGHTING CONTROL DEVICES**

EATON'S LIGHTING SYSTEMS (FORMERLY COOPER CONTROLS) VACANCY/OCCUPANCY SENSORS

PART 1- GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall box mounted, wall/corner mounted, and ceiling mounted occupancy sensors including dual technology, ultrasonic, and passive infrared technologies. This includes self contained PIR sensors as well as low voltage sensors that work with Switchpacks.

B. Related Sections:

1. Section [260926 – Lighting Control Panelboards:] Lighting panels (switching) controlled by Central Dimming Control System.
2. Section [262726 - Wiring Devices:] Lighting Controls
3. Section [265113 – Interior Lighting Fixtures, Lamps and Ballasts:] Fluorescent lighting ballasts controlled by central dimming control system.

1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)**
1. C62.41-1991 – Recommended Practice for Surge Voltages in Low Voltage AC Power Circuits.
- B. ASTM International (ASTM)**
1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.
- C. Canadian Standards Association (CSA).**
1. CSA C22.2 # 14 Industrial Control Equipment
 2. CSA C22.2 # 184 Solid-State Lighting Controls
 3. CSA C22.2 # 156 Solid-State Speed Controls
- D. International Electrotechnical Commission .**
1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- E. International Organization for Standardization (ISO)**
1. 9001:2000 – Quality Management Systems.
- F. National Electrical Manufacturers Association (NEMA)**
1. WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. Norma Oficial Mexicana (NOM).**
1. NOM-003-SCFI Productos eléctricos - Especificaciones de seguridad (Electrical products - Safety Specifications)
- H. Underwriters Laboratories, Inc. (UL):**
1. 94 – Flammability Rating
 2. 916 – Energy Management Equipment.
 3. 508 (2005) - Standard for Industrial Control Equipment.
 4. 244A – Appliance Controls
 5. 935 (2005) - Fluorescent Ballasts

1.3 SYSTEM DESCRIPTION

A. Permanently installed

1. [Wall switch occupancy sensors]
2. [Ceiling mounted occupancy sensors]
3. [Switchpacks]

1.4 SUBMITTALS

- A. Submit under provisions of Section [013300.]**
- B. Specification Conformance Document: Indicate whether the submitted equipment:**

1. Meets specification exactly as stated.
 2. Meets specification via an alternate means and indicate the specific methodology used.
- C. Shop Drawings; include:
1. Load schedule indicating actual connected load, load type, and voltage per circuit, circuits and their respective control zones, circuits that are on emergency, and capacity, phase, and corresponding circuit numbers.
 2. Schematic of system.
 3. Lighting plan clearly marking product type, location and orientation of each sensor.
- D. Product Data: Catalog specification sheets with performance specifications demonstrating compliance with specified requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Minimum [20] years' experience in manufacture of occupancy sensor lighting controls.
- B. Manufacturer's Quality System: Registered to ISO 9001:2000 Quality Standards, including in-house engineering for product design activities.
- C. Occupancy Sensing Lighting Controls:
1. Listed by [CSA] [NOM] [UL] specifically for the required loads. Provide evidence of compliance upon request.
- D. Installer Qualifications: Installer shall be one who is experienced in performing the work of this section, and who has specialized in installation of work similar to that required for this project.
- E. Source Limitations: To assure compatibility, obtain occupancy sensors from a single source with complete responsibility over all lighting controls, including accessory products. The use of subcontracted component assemblers is not acceptable.

1.6 PROJECT CONDITIONS

- A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:
1. Ambient temperature: 0° to 40° C (32° to 104° F).
 2. Relative humidity: Maximum 90 percent, non-condensing.
 3. Occupancy Sensors must be protected from dust during installation.

1.7 WARRANTY

- A. [Provide manufacturer's 5-year parts warranty.]

1.8 MAINTENANCE

- A. Make ordering of new equipment for expansions, replacements, and spare parts available to end user.
- B. Make new replacement parts available for minimum of ten years from date of manufacture.
- C. Provide factory direct technical support.

PART 2- PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Eaton Lighting Systems (formerly Cooper Controls)
- B. Substitutions: [Not permitted.] [Under provisions of Division 1.]
1. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders.
 2. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
 3. Any substitutions provided by the contractor shall be reviewed at the contractor's expense by the electrical engineer at a rate of [\$200.00] per hour.
 4. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.
 5. Provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 SENSOR PERFORMANCE REQUIREMENTS

A. Sensing mechanism:

1. [Infrared]: Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
2. [Ultrasonic]:
 - a. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
 - b. Utilize Doppler shift ultrasonic detection technology.
3. [Dual technology]:
 - a. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - b. Utilize an operating frequency of 32 kHz or 40 kHz that shall be crystal controlled to operate within plus or minus 0.005% tolerance.
 - c. Incorporate Doppler shift ultrasonic and passive infrared motion detection technologies. Products that react to noise or ambient sound shall not be considered.

B. Power failure memory:

1. Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and parameters saved in protected memory shall not be lost.

C. Designed and tested to withstand discharges without impairment of performance when subjected to discharges of 15,000 volts per IEC 801-2.

D. Products tested in identical manner, complaint to NEMA WD 7 -2011 Occupancy Motion Sensors Standards.

E. Sensor shall have time delays from 10 to 30 min.

F. When specified, sensors shall automatically adjust time delay and sensitivity settings.

G. All sensors shall provide an LED as a visual means of indication at all times to verify that motion is being detected during both testing and normal operation.

H. All sensors shall have readily accessible, user adjustable settings for time delay and sensitivity. Settings shall be located on the sensor (not the control unit) and shall be recessed to limit tampering.

I. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.

2.3 LOW VOLTAGE CEILING MOUNTED VACANCY SENSORS

A. Product: [VAC-DT-2000-R],[VAC-DT-1000-R],[VAC-DT-0501-R],[VAC-U-2000-R],[VAC-U-1000-R],[VAC-U-0501-R],[VAC-P-0500-R],[VAC-P-1500-R]

B. Provide all necessary mounting hardware and instructions.

C. Sensors shall be Class 2 devices.

D. When requested, be able to provide customizable mask to block off unwanted viewing areas for all ceiling mounted sensors using infrared technology.

E. [Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.]

2.4 LOW VOLTAGE CEILING MOUNTED OCCUPANCY SENSORS

A. Product: [OAC-DT-2000-R],[OAC-DT-1000-R],[OAC-DT-0501-R],[OAC-DT-2000],[OAC-DT-1000],[OAC-DT-0501], [OAC-U-2000-R],[OAC-U-1000-R],[OAC-U-0501-R],[OAC-U-2000],[OAC-U-1000],[OAC-U-0501], [OAC-P-0500-R],[OAC-P-1500-R],[OAC-P-0500],[OAC-P-1500]

B. Provide all necessary mounting hardware and instructions.

C. Sensors shall be Class 2 devices.

D. When requested, be able to provide customizable mask to block off unwanted viewing areas for all ceiling mounted sensors using infrared technology.

E. [Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.]

2.5 LINE VOLTAGE CEILING MOUNTED OCCUPANCY SENSORS

A. Product: [OAC-DT-2000-MV], [OAC-DT-2000-DMV],[OAC-U-2000-MV],[OAC-U-2000-DMV],[OAC-P-

0500-MV],[OAC-P-1500-MV],[OAC-P-1500-DMV]

- B. Provide all necessary mounting hardware and instructions.
- C. [Provide a recessed bypass manual "override on" key on each sensor.]
- D. Provide a mechanical air-gap on/off function for all sensors.
- E. Capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet
- F. Shall accommodate loads from 0-800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degree coverage capability.
- G. Shall be able to have their visible plastic parts replaced, for color changes in the field, without removing the body of the control from the wall and without requiring special tools.
- H. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
- I. Shall have no leakage current to load, in manual or in Auto/Off Mode for safety purposes and shall have voltage drop protection.
- J. Where specified, sensors shall offer daylighting foot-candle adjustment control and be able to accommodate dual level lighting.
- K. Where specified, dual relay sensors shall offer daylighting foot-candle adjustment control for either or both relays.
- L. Where specified, dual relay sensors shall offer a Bathroom Mode which keeps the second relay ON for an addition 8 minutes after the first relay has been turned off.
- M. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].
- N. Sensors shall be RoHS compliant
- O. Where specified, sensors shall offer integral Bi-level Automatic On (just one lighting level comes on automatically when occupancy is detected)

2.6 WALL / CORNER MOUNTED SENSORS

- A. Product: [OAWC-P-120W], [OAWC-P-120W-R], [OAWC-P-009L-H], [OAWC-P-009L-H-R], [OAWC-DT-120W], [OAWC-DT-120W-R]
- B. Provide all necessary mounting hardware and instructions.
- C. Sensors shall be Class 2 devices.
- D. [Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.]
- E. Where specified, sensors shall offer daylighting footcandle adjustment control
- F. Where specified, sensor packaging shall be 100% recycled [made entirely from post consumer waste (100% post consumer fiber content) as well as, 100% recyclable].
- G. Sensors shall be RoHS compliant.
- H. Where specified, sensors shall offer integral Bi-level Automatic On (just one lighting level comes on automatically when occupancy is detected)

2.7 VACANCY WALL SWITCHES

- A. Product: [VNW-P-1001-MV-*], [VNW-P-1001-DMV-*], [VNW-D-1001-MV-*], [VNW-D-1001-DMV-*], [VNLW-P-1001-MV-*]
- B. [Provide vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0 mm thickness.]
- C. [Provide a recessed bypass manual "override on" key on each sensor.]
- D. Requires Manual On to activate lighting.
- E. Cannot be modified to provide Automatic ON capabilities.
- F. Provide a mechanical air-gap on/off function for all sensors.
- G. Capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet
- H. Shall accommodate loads from 0-800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degree coverage capability.
- I. Shall be able to have their visible plastic parts replaced, for color changes in the field, without removing the body of the control from the wall and without requiring special tools.

- J. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
- K. Shall have no leakage current to load, in manual or in Auto/Off Mode for safety purposes and shall have voltage drop protection.
- L. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from Automatic On to Manual On.
- M. Where specified, sensors shall offer daylighting foot-candle adjustment control and be able to accommodate dual level lighting.
- N. Where specified, dual relay sensors shall offer daylighting foot-candle adjustment control for either or both relays.
- O. Where specified, dual relay sensors shall offer a Bathroom Mode which keeps the second relay On for an addition 8 minutes after the first relay has been turned off.
- P. Where specified, sensors shall feature a universally recognized light bulb icon for end user ease of identification of use.
- Q. Where specified, dual relay sensors shall feature universally recognized light bulb and fan icons for end user ease of identification of use.
- R. Where specified, sensor packaging shall be 100% recycled [made entirely from post-consumer waste (100% post-consumer fiber content) as well as, 100% recyclable].
- S. Sensors shall be RoHS compliant.
- T. Where specified, sensors shall have an EcoMeter that provides a visual indicator of energy usage, increasing end user awareness and reminding individuals to take control of their lighting to maximize energy savings.
- U. Where specified, low voltage sensors shall have a Tracking/HVAC Mode that allows the load connected to the Form C BAS relay to remain on when the lights are turned off manually.
- V. Where specified, sensors shall have a tamper-proof Automatic Only Mode that automatically turns lighting ON and OFF without requiring a user to push a button.

2.8 OCCUPANCY WALL SWITCHES

- A. Product: [OSW-P-0451-MV-*], [ONW-P-1001-MV-*], [ONW-P-1001-347-*], [ONW-P-1001-DMV-*], [ONW-P-1001-D347-*], [ONW-P-1001-SP-*], [ONW-P-1001-RR7-*], [ONW-U-0401-MV-*], [ONW-U-0401-DMV-*], [ONW-U-0401-GMV-*], [ONW-U-0401-SP-*], [ONW-U-0401-RR7-*], [ONW-D-1001-MV-*], [ONW-D-1001-DMV-*], [ONW-D-1001-GMV-*], [ONW-D-1001-GDMV-*]
- B. [Provide vandal resistant wall switch sensors shall utilize a hard lens with a minimum 1.0 mm thickness.]
- C. [Provide a recessed bypass manual "override on" key on each sensor.]
- D. Provide a mechanical air-gap on/off function for all sensors.
- E. Capable of detection of occupancy at desktop level up to 300 square feet, and gross motion up to 1000 square feet
- F. Shall accommodate loads from 0-800 watts at 120 volts; 0 to 1200 watts at 277 volts and shall have 180 degree coverage capability.
- G. Shall be able to have their visible plastic parts replaced, for color changes in the field, without removing the body of the control from the wall and without requiring special tools.
- H. Shall utilize Zero Crossing Circuitry which increases relay life, protects from the effects of inrush current, and increases sensor's longevity.
- I. Shall have no leakage current to load, in manual or in Auto/Off Mode for safety purposes and shall have voltage drop protection.
- J. Where specified, wall switch sensors shall provide a field selectable option to convert sensor operation from Automatic On to Manual On.
- K. Where specified, sensors shall offer daylighting footcandle adjustment control and be able to accommodate dual level lighting.
- L. Where specified, dual relay sensors shall offer daylighting footcandle adjustment control for either or both relays.
- M. Where specified, dual relay sensors shall offer a Bathroom Mode which keeps the second relay On for an addition 8 minutes after the first relay has been turned off.
- N. Where specified, sensors shall feature a universally recognized light bulb icon for end user ease of

identification of use.

- O. Where specified, dual relay sensors shall feature universally recognized light bulb and fan icons for end user ease of identification of use.
- P. Where specified, sensor packaging shall be 100% recycled [made entirely from post consumer waste (100% post consumer fiber content) as well as, 100% recyclable].
- Q. Sensors shall be RoHS compliant.
- R. Where specified, sensors shall have an EcoMeter that provides a visual indicator of energy usage, increasing end user awareness and reminding individuals to take control of their lighting to maximize energy savings.
- S. Where specified, low voltage sensors shall have a Tracking/HVAC Mode that allows the load connected to the Form C BAS relay to remain on when the lights are turned off manually.
- T. Where specified, sensors shall have a tamper-proof Automatic Only Mode that automatically turns lighting on and off without requiring a user to push a button.

2.9 SENSOR SWITCHPACKS

- A. Product: [SP20-MV], [SP15-347], [SP20-240], [SPD20-MV-NO], [SPRC-R-20-120], [SP-R-20-120]
- B. [Plenum rated]
- C. Control wiring between sensors and control units shall be Class 2, 18-24 AWG, stranded U.L. Classified, [PVC insulated] [TEFLON jacketed cable suitable for use in plenums].
- D. Integrated, self-contained unit consisting internally of an isolated load switching control relay [and a power supply to provide low voltage power].
- E. Shall be compatible with incandescent, magnetic or electronic low voltage, and magnetic or electronic fluorescent, as well as motor loads.
- F. Shall be capable of controlling receptacle or plug loads. [SPRC-R-20-120], [SP-R-20-120]

2.10 LOW TEMPERATURE SENSORS

- A. Product: [OXC-P-1500-R]. [OXC-2MHO-R]
- B. Provide all necessary mounting hardware and instructions.
- C. Sensors shall be Class 2 devices.
- D. Provide customizable mask to block off unwanted viewing areas for all ceiling mounted sensors using infrared technology.
- E. [Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.]

2.11 DIGITAL TIME SWITCHES

- A. Product: [TSW-MV]
- B. Provide all necessary mounting hardware and instructions.

2.12 SOURCE QUALITY CONTROL

- A. Perform full-function testing on 100% of all system components and panel assemblies at the factory.

PART 3- EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions.
- B. Provide complete installation of system in accordance with Contract Documents.
- C. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.

3.2 TESTING

- A. Upon completion of all wiring and after all fixtures are installed and lamped, a representative shall check the installation prior to energizing the system. Each installed occupancy sensor shall be tested in the Test Mode to see that lights turn OFF and on based on occupancy.
- B. At the time testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

END OF SECTION