CITY OF FORT WAYNE MASTER UPDATED: 11/16/18

SECTION 26 09 23

LIGHTING CONTROL DEVICES

1. GENERAL
	1. DESCRIPTION
		1. Scope:
			1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to furnish and install fuses with size and trip rating as shown or specified.

NTS: Retain applicable items and delete others as required.

* + - 1. Section Includes:
				1. Time switches.
				2. Outdoor Photoelectric Switches.
				3. Indoor Occupancy and Vacancy Sensors.
				4. Switchbox Mounted Occupancy and Vacancy Sensors.
				5. Digital Timer Light Switches.
				6. High Bay Occupancy Sensors.
				7. Extreme Temperature Occupancy Sensors.
				8. Outdoor Motion Sensors.
				9. Lighting Contactors.
		1. Coordination:
			1. Review installation procedures under other Sections and coordinate installation of items to be installed with or before Fuses.

NTS: List below only sections covering products, construction, and equipment specifically identified in this section and specified in another section and directly referenced in this specification. Do not list administrative and procedural division 01 sections.

* + 1. Related Sections:
			1. Section 26 05 05, General Provisions for Electrical Systems.
			2. Section 26 05 53, Identification for Electrical Systems.
			3. Section 26 27 26, Wiring Devices.
			4. Section 26 51 00, Interior Lighting.
			5. Section 26 56 00, Exterior Lighting.
	1. REFERENCES

NTS: Retain applicable standards and add others as required.

* + 1. Standards referenced in this Section are:
			1. NECA 1, Standard for Good Workmanship in Electrical Construction.
			2. NFPA 70, National Electrical Code.

NTS: Edit article “1.3” below to suit the Project. DO NOT DELETE (NOT USED) ITEMS.

* 1. SUBMITTALS
		1. Action Submittals: Submit the following:
			1. Product Data
				1. For each type of product.
			2. Shop Drawings
				1. Listing of each sensor to be furnished, including location, and rating for each type.
				2. Outline drawings with dimensions, materials of construction, installation details, accessories, and equipment ratings.
				3. Interconnection diagrams showing field-installed wiring.
				4. Include diagrams for power, signal, and control wiring.
			3. Samples (NOT USED)
		2. Informational Submittals: Submit the following:
			1. Certificates (NOT USED)
			2. Delegated Design Submittal (NOT USED)
			3. Test and Evaluation Reports (NOT USED)
			4. Manufacturers’ Instructions
				1. Include installation instructions for each type.
				2. Include programming instructions for each type.
			5. Source Quality Control Submittals
				1. Results of required source quality control tests and inspections.
			6. Field Quality Control Submittals
				1. Results of required field quality control tests and inspections.
			7. Manufacturer Reports (NOT USED)
			8. Sustainable Design Submittals (NOT USED)
			9. Special Procedure Submittals (NOT USED)
			10. Qualifications Statements
				1. Submit manufacturer qualifications when requested by Engineer.
		3. Closeout Submittals.
			1. Maintenance Contracts (NOT USED)
			2. Operation and Maintenance Data
				1. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, and description of operation.
				2. Comply with Section 01 78 23, Operations and Maintenance Data.
			3. Bonds (NOT USED)
			4. Warranty Documentation
				1. Include for each type.
			5. Record Documentation (NOT USED)
			6. Sustainable Design Closeout (NOT USED)
			7. Software (NOT USED)
		4. Maintenance Material Submittals. (NOT USED)
			1. Spare Parts (NOT USED)
			2. Extra Stock Materials (NOT USED)
			3. Tools (NOT USED)
	2. QUALITY ASSURANCE
		1. Items provided under this section shall be listed or labeled by UL or other Nationally Recognized Testing Laboratory (NRTL).
			1. Term "NRTL" shall be as defined in OSHA Regulation 1910.7.
			2. Terms "listed" and "labeled" shall be as defined in National Electrical Code, Article 100.
			3. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, underwater, and recessed in combustible construction that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for specific hazard.
		2. Regulatory Requirements:
			1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.
		3. Coordinate sensors, power packs, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.
	3. WARRANTY
		1. 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:
				1. Faulty operation of lighting control software.
				2. Faulty operation of lighting control devices.
			2. Warranty Period: Two year(s) from date of Substantial Completion.
1. – PRODUCTS
	1. MANUFACTURERS
		1. Subject to compliance with requirements, provide products by the following:
			1. Acuity Brands Lighting, Inc.
			2. Cooper Industries (Eaton Group)
			3. Hubbell Building Automation, Inc.
			4. Leviton Manufacturing Co., Inc.
			5. Lutron Electronics Co., Inc.
			6. Sensor Switch, Inc. (Acuity)
			7. Wattstopper (Legrand)
			8. Intermatic, Inc.
			9. NSi Industries, LLC
		2. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety.

NTS: Retain sections 2.2 thru 2.10 as required. Delete sections not required.

* 1. Time Switches
		1. General Requirements for Electronic Time Switches: Solid State, 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: DPST
			3. Contact Rating: 30-A inductive or resistive load, 120/240-V ac.
			4. Programs: Minimum of sixteen on-off set points on a 24-hour schedule.
			5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of program on all channels.
			6. Astronomic Time: All channels.
			7. Automatic Daylight savings time changeover.
			8. Battery backup: Not less than seven days reserve to maintain schedules and time clock.
	2. OUTDOOR PHOTOELECTRIC SWITCHES
		1. General Requirements for Outdoor Photoelectric Switches: Solid state with DPST dry contacts rated for 1800 VA inductive, to operate connected relay, contactor coils, or microprocessor input, complying with UL 773A, and compatible with ballasts, drivers, and LED lamps.
			1. Listed and labeled as defined in NFPA 70 by qualified testing agency and marked for intended location and application.
			2. Light Level Monitoring Range: 1.5 fc to 10 fc with an adjustment for turn-on and turn-off levels within that range. Provide directional lens in front of the photocell to prevent fixed lighting 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, 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.
	3. Indoor Occupancy AND VACANCY Sensors
		1. General Requirements for Sensors: Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
			1. Separate power pack.
			2. Hardwired connection to switch.
			3. Listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.
			4. Operation:
				1. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied and turn off when unoccupied. Provide an adjustable time delay for turning the lights off with a minimum range of 1 to 15 minutes.
				2. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
			5. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
			6. Power Pack: Dry contacts rated for 20-A ballast or LED load at 120 and 277 volt ac and 1 hp at 120 volt ac. Sensor has 24 volt dc, 150 mA, Class 2 power source as defined by NFPA 70.
			7. Mounting:
				1. Sensor: Suitable for mounting in any position on a standard outlet box.
				2. Relay: Externally mounted through a 1/2-inch knockout on a standard electrical enclosure.
				3. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door, “off” time delay selector at up to 30 minutes.
			8. Indicator: Digital Display to show when motion is detected during testing and normal operation of sensor.
			9. Standard Range: 180° field of view, with a minimum coverage area of 900 sq. ft.
			10. Sensing Technology: Dual technology – PIR and ultrasonic.
			11. Field-selectable manual/automatic on.
			12. Adaptive technology: Self adjusting circuitry detects and memorized usage patterns of the space and helps eliminate false “off” switching.
			13. Bypass Switch: Override the “ON” function in case of sensor failure.
	4. switchbox-mounted occupancy and vacancy Sensors
		1. 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. Operation:
				1. Occupancy Sensor: 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 1 to 15 minutes.
				2. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
			3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
			4. Switch Rating: Not less than 800-VA ballast or LED load at 120 V, 1200-VA ballast or LED load at 277 V, and 800-W incandescent.
			5. Color: Color to be selected by Engineer.
			6. Faceplate: Shall match color of device unless a stainless steel faceplate is specified.
			7. Standard Range: 180° field of view, with a minimum coverage area of 900 sq. ft.
			8. Sensing Technology: Dual technology – PIR and ultrasonic.
			9. Switch Type: Refer to Drawings.
			10. Field-selectable manual/automatic on.
			11. Capable of controlling load in a three/four way application.
			12. Voltage: Dual voltage – 120 and 277 V.
			13. Concealed, field adjustable, “off” time delay selector at up to 30 minutes.
			14. Adaptive technology: Self adjusting circuitry detects and memorized usage patterns of the space and helps eliminate false “off” switching.
			15. Bypass Switch: Override the “on” function in case of sensor failure.
	5. DIGITAL TIMER LIGHT SWITCHES
		1. General Requirements for Timers: Combination digital timer and conventional switch lighting control unit. Switch box mounted with time intervals as scheduled.
			1. Rated for 10A at 120 V ac or 10 amps at 277V ac for ballast of LED.
			2. Integral Relay for connection to HVAC System.
			3. Voltage: Dual voltage – 120 and 277 V.
			4. Color: Color to be selected by Engineer.
			5. Faceplate: Shall match color of device unless a stainless steel faceplate is specified.
	6. High bay occupancy sensors
		1. General Requirements for High Bay Occupancy Sensors: Solid state unit. The unit is designed to operate with the LED driver and LED lamps indicated.
			1. Listed and labeled as defined in NFPA 70, by a qualified testing agency and marked for intended location and application.
			2. Operation: Turn lights on when coverage area is occupied and to half power when unoccupied with a time delay for turning lights to half power that is adjustable over a minimum range of 1 to 30 minutes.
			3. Voltage: Dual voltage – 120 and 277 V.
			4. Operating Ambient Conditions: 0° C to 65° C.
			5. Time Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
			6. Tested as a complete unit with LED driver and LED lamps.
			7. Mounting:
				1. Sensor: Suitable for mounting in any position to a standard 1/2-inch knockout in a standard electrical enclosure.
				2. Time Delay and Sensitivity Adjustments: Recessed and concealed behind a cover.
			8. Bypass Switch: Override the “on” function in case of sensor failure.
			9. Detector Technology: PIR.
		2. Detector Coverage: User selectable by interchangeable PIR lenses, suitable for mounting heights from 12 to 50 feet.
	7. EXTREME temperature occupancy sensors
		1. General Requirements for Extreme Temperature Occupancy Sensors: Self-Contained solid-state device.
			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 dim to a preset level when unoccupied with a time delay for dimming lights, adjustable over a minimum range of 1 to 30 minutes.
			3. Operating Ambient Conditions: -40° C to +50° C.
			4. Mounting:
				1. Sensor: Suitable for mounting in any position to a standard 1/2-inch knockout in a standard electrical enclosure.
				2. Time Delay and Sensitivity Adjustments: Recessed and concealed behind a cover.
			5. Bypass Switch: Override the “on” function in case of sensor failure.
			6. Automatic Light-Level Sensor: Adjustable from 2 fc to 10 fc; keep lighting off when selected lighting level is present.
		2. Detector Technology: PIR. Detect occupants in coverage area by their heat and movement.
			1. Detector Sensitivity: Detect occurances of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. Comply with UL 773A.
			2. Detector Coverage (Pole) Detect occupancy within 25 feet when mounted on a pole.
	8. Outdoor motion sensors
		1. General Requirements for Outdoor Motion Sensors: Solid-state outdoor rated device.
			1. Listed and labeled as defined in NFPA 70 by a qualified testing agency and marked for intended location and application.
			2. PIR type, weatherproof. Detect occurances of 6-inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. Comply with UL 773A.
			3. Tested as a complete unit with LED driver and LED lamps.
			4. Switch Rating:
				1. Luminaire Mounted Sensor: 500-VA LED.
				2. Separately Mounted Sensor: Dry contacts rated for a 20-A LED driver load at 120 and 277 V ac and for 1 hp at 120 V ac. Sensor has 24 V dc, 150mA, Class 2 power supply as defined by NFPA 70.
			5. Switch Type: SP, automatic “on”, automatic “off” with bypass switch to override the “on” function in case of sensor failure.
			6. Voltage: Dual voltage, 120 and 277 V.
			7. Detector Coverage:
				1. Standard Range: 210° field of view with a minimum coverage area of 1000 sq. ft.
				2. Long Range: 180° field of view and 110 foot detection range.
			8. Ambient Light Override: Concealed, field adjustable, light-level sensor from 2 fc to 10 fc. The switch prevents the lights from turning on when light level is higher than the set point of the sensor.
			9. Concealed, field adjustable “off” time delay selector from a minimum of 1 to 30 minutes.
			10. Operating Ambient Conditions: Suitable for operation in ambient temperatures ranging from -40° C to +55° C. Sensor shall be rated “raintight” according to UL 773A.
	9. LIGHTING CONTACTORS
		1. Manufacturers: Subject to compliance with requirements, provide products by the following:
			1. Allen-Bradley.
			2. Eaton.
			3. Siemens.
			4. Square D.
		2. General Requirements for Lighting Contactors: Electrically operated and mechanically held, combination type lighting contactors 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, high inrush ballast, and LED drivers.
			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.

Conductors and cables

* + 1. Power Wiring to Supply Side of Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
		2. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
		3. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables."
1. PART 3 - EXECUTION
	1. EXAMINATION
		1. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
		2. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
		3. Proceed with installation only after unsatisfactory conditions have been corrected.
	2. SENSOR INSTALLATION
		1. Comply with NECA 1.
		2. 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.
		3. 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. CONTACTOR INSTALLATION
		1. Comply with NECA 1.
		2. 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.
	4. WIRING INSTALLATION
		1. Comply with NECA 1.
		2. Wiring Method: Comply with Section 26 0519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
		3. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
		4. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
		5. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
	5. IDENTIFICATION
		1. Identify components and power and control wiring according to Section 26 05 53, Identification for Electrical Systems.
		2. Identify controlled circuits in lighting contactors.
		3. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
		4. Label time switches and contactors with a unique designation.
	6. FIELD QUALITY CONTROL
		1. Perform the following tests and inspections:
			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.
		2. Lighting control devices will be considered defective if they do not pass tests and inspections.
		3. Prepare test and inspection reports.
	7. ADJUSTING
		1. 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.

For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

For daylighting controls, adjust set points and deadband controls to suit Owner's operations.

Align high-bay occupancy sensors using manufacturer's laser aiming tool.

* 1. DEMONSTRATION
		1. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

+ + END OF SECTION + +