SECTION 260943 - NETWORK LIGHTING CONTROLS

PART 1 – GENERAL

1.01 SUMMARY

1. The contractor shall install the wireless network lighting controls as specified herein and as shown on applicable drawings.
2. Related sections:
3. 260923 – Occupancy Sensors
4. 260923 – Photocell
5. 265100 – Interior Lighting Fixtures

1.02 SYSTEM DESCRIPTION & OPERATION

1. The wireless lighting control system (WLCS) shall provide lighting and receptacle control. The WLCS shall provide control of individual fixtures or small groups of fixtures and report back to a building automation system (BAS) fixture or group status as well as be able to accept commands from the BAS to turn on/off, dim up/down and perform demand response.
2. The wireless lighting control network shall be a highly distributed control network. To ensure future flexibility and instantaneous functionality all control decisions shall be made in the control devices such as the light controllers. A system using a centralized controller or gateway to provide the control logic for the behavior of the controllers shall be prohibited.
3. The WLCS shall be capable of providing continuous dimming using industry-standard 0-10VDC or phase controlled dimming ballasts and drivers.
4. The WLCS shall provide a network or networks of wireless devices that communicate by radio frequency in a point to point network and communication conforming to an open standard. The WLCS shall be capable of working as a standalone system or integrate into a BAS or standalone web-based enterprise software for monitoring and managing the WLCS, including a graphical interface for viewing and maintaining schedules.

1.03 SUBMITTALS

* 1. Submit bill of material and product datasheets for all devices provided in the WLCS.
	2. Submit standard wiring diagrams for the typical lighting and receptacle controllers.
	3. Submit a sequence of operation for each typical space type describing the typical control functions and occupant interactions with the lighting and receptacle controls.
	4. Upon receipt of notice of proposal acceptance, the successful bidder shall create and submit floor plans showing the type and location of each network device and each controlled light fixture. Submitted floor plan(s) shall include a bill of material listing all control devices, model numbers and quantities for each floor or location. Drawings shall be created from the electronic files received from the building’s owner or representative.

1.04 APPROVALS

1. Prior approval from the owner’s representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.
2. Any alternate product or system that has not received prior approval from the owner’s representative at least 10 days prior to submission of a proposal package shall be rejected. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to the owner’s representative.
3. For any alternate system that requires wired communication between field controllers, bidders shall provide system riser diagrams detailing communication wiring and control wiring including wiring details of all typical light fixtures with the submitted proposal package. Bidders shall provide a total installed cost including itemized labor costs for installing a wired communication network.
4. Manufacturer of alternate wireless lighting control system shall have been manufacturing wireless lighting controls for minimum of 10 years.
	1. QUALITY ASSURANCE
	2. All hardware components shall be listed by a nationally recognized testing laboratory (NRTL) to UL standards specifically for the required application.
	3. All wireless network devices shall comply with FCC Part 15.
	4. The successful bidder shall install and configure the WLCS according to the manufacturer’s installation instructions, wiring diagrams, plans, specifications and project submittals.

1.06 WARRANTY

* 1. Hardware: The manufacturer shall provide a five (5) year warranty on all control devices supplied and installed. Warranty coverage shall begin on the date of shipment. The manufacturer will, at its discretion, repair or replace any defective products within the warranty period. The manufacturer is not liable for improper installation or incidental damages, and the warranty does not cover the cost of installation or removal of the equipment.

1.07 MAINTENANCE

* 1. The manufacturer shall make available to the End-User a method of ordering new equipment for expansions, replacements or parts to be used as spares. The manufacturer must make new or remanufactured parts available for a minimum period of 10 years from the system’s date of purchase.
	2. The manufacturer shall provide extended support that is billable at half or whole day rates.

PART 2 – EQUIPMENT

2.01 ACCEPTABLE MANUFACTURERS

* 1. Echoflex Solutions Inc.
	2. Unless otherwise noted, all basic components (wireless light controllers, sensor interfaces, wall controls, gateways and enterprise software) shall be provided by the same manufacturer.

2.02 WIRELESS NETWORK

* 1. All wireless network devices shall communicate via radio frequency using the EnOcean wireless protocol, using 902 MHz (an open standard in North America).
	2. The wireless lighting control network shall be a highly distributed control network. To ensure future flexibility and instantaneous response, all control decisions shall be made in the control devices such as the lighting and receptacle controllers. A system using a centralized controller or gateway to provide the control logic for the behavior of the end devices shall be prohibited. Similarly, a system which features a single point of failure, like a logic controlling gateway or a system repeater, shall be prohibited.
	3. All wireless network devices shall have their configuration programming stored in nonvolatile memory.
	4. The intent of the WLCS is to provide a flexible network that is configurable for present and future building requirements. The intent is that individual fixtures or small groups of fixtures respond to multiple local and global signals including occupancy control, daylighting, wall switching, automatic scheduling and automatic demand response.
	5. The WLCS shall be configured to work with wireless occupancy sensors and photocells that have employ standard EnOcean Engineering Profiles (EEPs). Proprietary occupancy sensors and photocells that are network specific shall not be allowed. If an occupancy sensor or photocell fails, the same device or equivalent replacement device shall be available for purchase from an electrical distributor.

2.03 EQUIPMENT

* 1. Wireless Controller
		+ 1. The Controller shall be manufactured by Echoflex Solutions, Inc., or approved equal
			2. Mechanical
				1. The Controller shall have learn and clear buttons for manual linking of switches and sensors

The buttons shall be accessible when the Controller is mounted

* + - * 1. The Controller shall have two LED indicators to display power/operational mode and linked device information
			1. Electrical
				1. The Controller shall use a 902 MHz EnOcean radio. Systems that use other radio frequencies shall not be acceptable
				2. The internal radio shall have a range of at least 80 feet through walls (laterally), up to 300 feet in open space
				3. The Controller shall be ETL listed, conform to UL 508, and certified to CAN/CSA Standard C22.2 No.14
				4. The Controller shall comply with FCC Part 15.231 and IC RSS-210
			2. Functional
				1. The Controller shall provide switching and/or dimming control for an individual light fixture or lighting zone
				2. The Controller shall support wireless Echoflex switches and sensors for relay or dimming control

###### The Controller shall support linking of at least 20 wireless devices in any combination of Echoflex stations and sensors. Systems that do not support at least 20 stations or sensors shall not be acceptable

##### The Controller shall provide the option of single or dual-hop wireless signal repeating to other controllers. Systems that do not provide signal repeating shall not be acceptable

##### The Controller shall support Central Command functions for use with integrated control systems

##### The Controller shall support commissioning and linking through software and/or mechanical means. Controllers that do not support both shall not be acceptable

##### The Controller shall provide configuration variables that allow customization of the controllers operation with linked sensors and switches

##### The Controller shall provide the option of reporting relay status wirelessly

##### The Controller shall save all configuration settings and linked device details in non-volatile memory

* + - * 1. The Controller shall provide the option of saving user-defined configuration settings as recoverable default settings
			1. Dimming
				1. ERDRC-FCU

20 Amp relay at 120/277V or 15 Amp at 347V

Up to 25mA of sinking or sourcing current for 0-10V dimming

Knockout mount

The controller shall be UL2043 plenum rated

* + - * 1. ER1S-FCU

8 Amp relay at 120-277V

Up to 25mA of sinking or sourcing current for 0-10V dimming

In fixture mount

* + - * 1. ER6CD-AU-\*\*\*

600 watt phase control dimming

Auto senses forward or reverse phase dimming and adjusts accordingly

Electronic low voltage dimming 120V version only

Knockout mount

The controller shall be UL2043 plenum rated

* + - 1. Switching
				1. ER1C-FLU

20 Amp relay at 120/277V or 15 Amp at 347V

Knockout mount

The controller shall be UL2043 plenum rated

* + - * 1. ERM-FLU

15 Amp relay at 120-277V

In junction box mount

* + - 1. Receptacle
				1. ERNR-AU

15 Amp split controlled receptacle at 120V

The Controller shall have a load wire to control other receptacles downstream

Controlled receptacle shall have embossed icon and arrows pointing to controlled side of receptacle

In junction box mount

1. Wireless Occupancy Sensor
	* + 1. The Occupancy sensor shall be manufactured by Echoflex Solutions, Inc., or approved equal.
			2. Mechanical
				1. The Sensor shall have a button for linking the sensor to a wireless controller

The button shall be accessible when the Sensor is mounted

* + - * 1. The Sensor shall have an LED indicator located behind a lens to show that PIR functionality is present
				2. The Sensor shall be constructed of ABS injection molded plastic that fully encloses all components
				3. The Sensor shall support a start-assist battery option
			1. Electrical
				1. The Sensor shall utilize photovoltaic energy harvesting for power. Sensors that require low voltage power input or batteries for normal operation shall not be acceptable

The Sensor shall begin operation within 3 minutes from a discharged state when charged at minimum 200 lux (19 FC)

The photovoltaic solar cells shall produce energy from natural or artificial light sources

* + - * 1. The Sensor shall use a 902 MHz EnOcean radio. Systems that use other radio frequencies shall not be acceptable
				2. The Sensor shall have a radio range of at least 80 feet laterally through walls and up to 300 feet in open space
				3. The Sensor shall comply with FCC Part 15.231, IC RSS-210 and CEC Title 24
			1. Functional
				1. The Sensor shall wirelessly transmit occupancy state and stored energy level when there is sufficient stored energy or sufficient solar energy for operation
				2. The Sensor shall have the ability to provide for either occupancy or vacancy operation based on the configuration settings of the compatible linked wireless lighting controllers
				3. The Sensor shall transmit minimum every 120 seconds when the PIR is activated
				4. The Sensor shall support Simple Tap programming for configuration of compatible wireless lighting controllers
				5. The Sensor shall support a radio-range confirmation test mode

The Sensor shall provide visual indication of the communication signal strength with compatible lighting controllers when in this mode

* + - * 1. The Sensor shall support a light-level evaluation test mode
1. The Sensor shall provide visual indication of the ambient light level where the sensor is mounted when operating in this mode
	* + - 1. The Sensor shall support a walk-test test mode
2. The Sensor shall provide immediate visual indication of PIR activity when operating in this mode
	* + - 1. The Sensor shall support a PIR sensitivity adjustment test mode
3. The Sensor shall provide three levels of PIR sensitivity selectable when operating in this mode
	* + - 1. The Sensor shall have the ability to disable the LED indication of PIR activity
			1. Wireless Ceiling Occupancy Sensor
				1. MOS-21U\*
4. Lens options for 1000 ft2, 1900 ft2, and 6300 ft2 high bay
5. Performs occupancy, vacancy or both occupancy and vacancy functions
6. Mounts using two screws or double sided tape
	* + - 1. RVS-\*-UW
7. Lens options for 1000 ft2 or 1900 ft2
8. Performs vacancy, occupancy (requires battery) or both occupancy and vacancy (requires battery)
9. Mounts using two screws, double sided tape, wire straps or integrated magnets
	* + 1. Wall/Corner Mount Occupancy Sensor
				1. ROS-\*\*-UW
10. Lens options for hallway 20’ x 100’, corner mount at 85O 2600 ft2 and wide angle at 140O 2700 ft2
11. Performs occupancy, vacancy or both occupancy and vacancy
12. Mounts using two screws, double sided tape or optional brackets
13. Occupancy Wall Switch Sensor
14. The Occupancy Wall Switch Sensor shall be the Echoflex OWS-DT-120/277 Series by Echoflex Solutions, Inc., or equal.
15. Mechanical
	* + - 1. The Wall Switch Sensor shall mount to a single gang ring using screws
				2. The Sensor shall fit standard decorator style switch plates. The Wall Switch Sensor shall be available in white
				3. The Wall Switch Sensor shall have a button for linking the sensor to a wireless controller
16. The button shall be accessible when the Wall Switch Sensor is mounted
17. The button shall be covered by the face plate.
18. There shall be separate linking capabilities for the switch and the sensor portion of the Wall Switch Sensor
	* + - 1. The Wall Switch Sensor shall have a red LED indicator located behind a lens to show that PIR and/or acoustic functionality is present

The LED indicator may be disabled.

* + - * 1. The Wall Switch Sensor shall be constructed of ABS injection molded plastic that fully encloses all components
				2. The Wall Switch Sensor shall provide 180 degree PIR coverage from the sensor mounting location
1. Electrical
2. The Wall Switch Sensor shall utilize 120 or 277 VAC for power.
3. The Wall Switch Sensor shall have a no-neutral conductor design
4. The Wall Switch Sensor shall use a 902 MHz EnOcean radio. Systems that use other radio frequencies shall not be acceptable
5. The Wall Switch Sensor shall have a radio range of at least 80 feet laterally through walls and up to 300 feet in open space
6. The Wall Switch Sensor shall comply with FCC Part 15.231, IC RSS-210 and CEC Title 24
7. The Wall Switch Sensor shall be ETL listed, conforming to UL and CSA standards for Photo Electric Lighting Control
8. Functional
9. The Wall Switch Sensor shall wirelessly transmit occupancy state
10. PIR Coverage Area

Large Motion ~ 2000 sq. feet

Small motion ~ 300 sq. feet

Acoustic Coverage Area > 900 square feet – Dual Tech only

1. The Wall Switch Sensor shall have the ability to provide for either occupancy or vacancy operation based on the configuration settings of the compatible linked wireless lighting controllers
2. The Wall Switch Sensor shall be able to manually turn loads on and off when used with compatible wireless controllers
3. The Wall Switch Sensor shall be able to manually dim loads up and down when used with a compatible wireless dimming controller
4. The Wall Switch Sensor shall transmit minimum every 120 seconds when the PIR or acoustic detection is activated
5. The Wall Switch Sensor shall support Simple Tap and Smart Click programming for configuration of compatible wireless lighting controllers
6. The Wall Switch Sensor shall support a radio-range confirmation test mode

The Wall Switch Sensor shall provide visual indication of the communication signal strength with compatible lighting controllers when in this mode

1. The Wall Switch Sensor shall support a walk-test test mode

The Wall Switch Sensor shall provide immediate visual indication of PIR and Acoustic activity (Dual Tech only) when operating in this mode

1. The Wall Switch Sensor shall support a PIR and acoustic sensitivity adjustment

The Wall Switch Sensor shall provide 3 levels of PIR sensitivity adjustment

1. The Wall Switch Sensor shall have the ability to disable the LED indication of PIR and acoustic activity
2. Wireless Daylight Sensor
3. The Light sensor shall be manufactured by Echoflex Solutions, Inc., or approved equal.
4. Mechanical
5. The Sensor shall support optional mounting to an electrical box or low voltage trim
6. The Sensor shall be available in white
7. The Sensor shall use a frosted cover over the photovoltaic panels
8. The Sensor shall have a button for linking the sensor to a wireless controller

The button shall be accessible when the Sensor is mounted

1. The Sensor shall be constructed of ABS injection molded plastic that fully encloses all components
2. The Sensor shall support a start-assist battery option
3. Electrical
4. The Sensor shall utilize photovoltaic energy harvesting for power. Sensors that require low voltage power input or batteries for normal operation shall not be acceptable
5. The Sensor shall be capable of storing sufficient energy to provide normal operation for at least eighty hours without light when charged in 1000 lux (93 FC) for a minimum of 7.5 hours
6. The Sensor shall begin operation within 5 minutes from a discharged state when charged at minimum 50 lux (5 FC)
7. The photovoltaic solar cells shall produce energy from natural or artificial light sources
8. The Sensor shall use a 902 MHz EnOcean radio. Systems that use other frequencies radios shall not be acceptable
9. The Sensor shall have a range of at least 80 feet laterally through walls and up to 300 feet in open space
10. The Sensor shall comply with FCC Part 15.231, IC RSS-210, and CEC Title 24
11. Functional
12. The Sensor shall wirelessly transmit the measured ambient light level and stored voltage level when there is sufficient stored energy or sufficient solar energy for operation

The Sensor shall transmit at minimum every 130 seconds

When the measured ambient light level drops by 20% or greater of the selected light range, the sensor shall transmit at minimum every 11 seconds for 10 cycles

1. The Sensor shall support two ranges of light value selectable by slide switch: 0-510 lux (0-50 FC) or 0-1020 (0-100 FC) lux
2. The Sensor shall support Simple Tap programming for configuration of compatible wireless lighting controllers
3. The Sensor shall support a radio-range confirmation test mode

The Sensor shall provide visual indication of the communication signal strength with compatible lighting controllers

1. The Sensor shall support a light-level evaluation test mode

The Sensor shall provide visual indication of the ambient light level where the sensor is mounted

1. Ceiling Mount
2. TAP-21U

Performs switching, open or closed loop dimming

Mounts using two screws or double sided tape.

1. Wireless Switches
2. The Self-Powered Wireless Wall Switches shall be manufactured by Echoflex Solutions, Inc., or approved equal.
3. Mechanical
4. Switches shall be available in single and dual paddle rocker switch configurations with the exception of the key card switch
5. Switches shall have a fully enclosed electronics assembly
6. Switches shall be constructed of ABS plastic
7. Electrical
8. Switches shall use 902 MHz EnOcean radios. Systems that use other frequencies radios shall not be acceptable
9. Switches shall utilize kinetic energy harvesting that does not require any batteries or external power input
10. Switches shall have a range of at least 80 feet laterally through walls and up to 300 feet in open space
11. Switches shall comply with FCC Part 15.231 and IC RSS- 210
12. Functional
13. Switches shall be able to switch loads on and off when used with compatible wireless load controllers
14. Switches shall be able to dim loads up and down when used with compatible wireless dimming controllers
15. Switches shall support DMX scene recall when used with compatible DMX Scene Controllers. Systems that do not support DMX Scene Controllers shall not be acceptable
16. Switches shall support Smart Click programming for configuration of compatible wireless lighting controllers
17. Decorator Style
18. PTM265\*U\*

Available in single or two button configuration

Fits standard decorator plates

Mounts using two screws to standard rings

Available in white, black, brown, ivory and almond

Single gang surface mounting plate included with switch, two and three gang mounting plates available

PTM265 switches can be mounted in multi gang rings and fit multi gang plates

1. Surface Mount
2. ETRS\*U-\*

Available in single or two button configuration

Mounts using double sided sticky tape

Available in white, black or cream

1. Hand Held
2. ETRH\*U-\*

Available in single or two button configuration

Mounts to standard lanyard J-Hook

Available in white

1. Key Card Switch
2. PTM265KCAU

ISO/IEC7810 ID-1 3.37” x 2.125” x .03” (85.6mm x 53.98mm x .76mm)

Mounts to standard decorator rings

Comes with surface mounting plate

Available in white

1. Demand Response
2. The WLCS shall provide a method of automatically responding to a utility signal to reduce the electrical demand from the controlled lighting.
3. The WLCS shall be programmed to dim the lighting between 50-85%. The WLCS features additional levels of lighting reduction as necessary.
4. When the utility signal to reduce demand is removed, the WLCS shall automatically restore lighting to their appropriate levels.
5. Quiet Time
6. The WLCS shall provide a method of bypassing the room occupancy sensor for a period of no more than two hours.
7. Quiet time shall be activated by a manual button press and not automatically activated.

Part 3 – EXECUTION

* 1. INSTALLATION

1. The successful bidder may schedule a pre-installation coordination meeting on site with the manufacturer’s representative and the owner’s representative. The pre-installation coordination meeting shall review the project plans and specifications, the project submittals, installation methods, jobsite conditions and the installation schedule. The manufacturer’s representative shall provide the name and telephone number for a technical support person available to answer questions and provide additional information throughout the project.
2. The successful bidder shall coordinate the system installation and start-up to occur in a timely manner.
3. If new lighting fixtures are being installed, the successful bidder may coordinate with the lighting fixture manufacturer to factory install the wireless lighting controllers and for the lighting fixture manufacturer to provide compatible ballasts or drivers.
4. The successful bidder shall coordinate with the owner to secure a connection to the building network and Internet access if required.
5. Installation of the specified equipment and system components shall be in accordance with the manufacturer’s instructions and all electrical codes.
6. System installation in occupied spaces shall be performed in a manner that is not disruptive to occupants during normal working hours. Prior to the beginning of the next business day, the contractor is responsible for cleanup of all construction materials and debris. All lighting fixtures shall be fully reassembled.
7. Provisions shall be made so that all required lighting shall be on during normal working hours and during and following the system installation.

3.03 SYSTEM START-UP AND PROGRAMMING

1. The system shall be capable of being programmed, configured and tested through a factory commissioning service prior to shipment or programmed in the field by an authorized representative of the manufacturer during start up.
2. System start-up and programming shall include:
3. Identifying the physical location for each WLCS device.
4. Identifying the lights controlled by each wireless light controller.
5. Ensuring that each device is functioning properly.
6. Organizing the controlled lighting into functional groups for automatic time scheduling, occupancy control, daylight-responsive dimming, wall switch control, task tuning and demand response.
7. Creating and verifying automatic time schedules.
8. Programming may occur on-site or remotely via an Ethernet or hotspot connection if required.

3.04 SYSTEM COMPLETION AND ACCEPTANCE

1. Once the system is operational, the manufacturer may schedule and complete an optional system and software training with the owner’s representative. Training shall provide an overview of the system's key components including hardware and Web application. Training shall focus on the appropriate, available management tools.

END OF SECTION

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