

## SECTION 260943 SPECIFICATIONS

### Wireless Network Lighting Controls

#### PART 1 - GENERAL

##### 1.1 RELATED DOCUMENTS

##### 1.2 SUMMARY AND KEY SYSTEM DIFFERENTIATORS

- A. The lighting control system specified herein shall provide a wireless, distributed, secure, self organizing and self healing peer to peer mesh network of fixture control modules, motion sensors, daylight sensors and switch stations for outdoor lighting applications.
- B. The system shall be capable of turning lighting loads on/off as well as full range dimming of lights (if lighting load is capable of being dimmed).
- C. Wireless devices shall provide both Sink and Source 0-10V control within the module. Dimming shall not be done via a separate or external control module.
- D. All wireless devices shall communicate utilizing long range 2.4GHz or 900MHz ISM band. Systems which use other frequencies shall provide documentation insuring range and performances equal to that of the specified system. Wireless devices shall be capable of supporting distances up to 1000'.
- E. Wireless devices shall be capable of being installed inside of fixtures or externally. External wireless devices shall utilize the standardized ANSI C136.41-2013 (7 & 5 pin) receptacles. Receptacles that do not meet ANSI standards shall not be supported.
- F. Wireless devices shall have a programmable power-up state.
- G. Wireless devices shall be capable of supporting 3 digital inputs (e.g. Occupancy Sensor, Photocell, Luxmeter, and Low-voltage Switch) and 2 outputs.
- H. Device firmware shall be updateable securely from anywhere via an Internet connection. Firmware updates shall not require a serial or patch cable.
- I. System shall be accessible remotely from the local IP network or the Internet. If a wired network connection is not possible, system shall support the use of cellular modems for network connectivity.
- J. System shall support non-proprietary mapping services. System shall also support cartography using satellite imagery.
- K. Wireless device locations shall use Geographic Coordinates.
- L. System shall support enterprise multiple site control via a single user interface.

- M. System shall provide optional support for BACnet IP.
- N. System shall not require a third-party 24/7 manned network operations center for systems monitoring.
- O. The system shall provide a 5-year warranty for all components.

### 1.3 DEFINITIONS

- A. AES-128 – Advanced Encryption Standard 128 bit encryption key
- B. DHCP – Dynamic Host Configuration Protocol
- C. DNS – Domain Name Server
- D. FCC – Federal Communications Commission
- E. HTTPS – Hypertext Transfer Protocol Secure
- F. HBA – Hubbell Building Automation, Inc.
- G. IC – Industry Canada
- H. ISM Band – Industrial, Scientific and Medical radio frequency band
- I. RF – Radio Frequency
- J. SPST – Single Pole, Single Throw
- K. SSL – Secure Sockets Layer
- L. TCP/IP – Transmission Control Protocol / Internet Protocol

### 1.4 SUBMITTALS

- A. Manufacturer shall provide submittal drawings and data for approval prior to beginning manufacture of equipment in printed and/or electronic formats.
- B. Submittal package shall include, but not be limited to, the following. Submittals that do not contain all the information listed below will not be considered for approval.
  - 1. Bill of Materials: Provide as part of the submittal package a detailed itemized listing of all proposed equipment, including quantities and capacities for all major system components.
  - 2. Product Data Sheets: Provide as part of the submittal package detailed product data sheets for all major system components.
  - 3. Shop Drawings: Submittal shall include shop drawings that accurately represent the system or systems specified herein. Shop drawings shall include the name of the project,



quantity and physical dimensions of all major system components, wire sizes and counts for all required connections between system components.

4. Contractor/Commissioning Worksheet – must be completed prior to factory start-up.
5. Specifications Compliance: Submit a line-by-line comparison that describes the differences between each specifications requirement and the equipment / systems being proposed. Comparison shall include a complete listing of how the proposed equipment / systems differ from that specified with regard to size, quantity, quality, method of control, features and functions, control software functions and installation requirements.

#### 1.5 QUALITY ASSURANCE

- A. Factory Assembly: All devices shall be factory assembled and tested. All system components shall arrive at the job site complete and ready for installation, requiring only the connection of lighting circuits and network terminations.
- B. Component Testing: All system components and assemblies shall be individually tested prior to assembly. Once assembled, all finished products shall be tested for proper operation of all control functions per specifications prior to shipment.
- C. NEC Compliance: All system components shall comply with all applicable sections of the National Electrical Code (NEC) as required.
- D. NEMA Compliance: All system components shall comply with all applicable portions of NEMA standards pertaining to types of electrical equipment and enclosures.
- E. FCC Emissions: All applicable equipment shall comply with FCC emissions standards specified in Part 15, sub-part C for commercial and residential applications and shall bear labels indicating compliance testing. Equipment that does not meet these standards shall not be acceptable.
- F. All applicable products must be ETL or UL Listed or other acceptable national testing organization and conform to UL-733 & CAN/CSA C22.2 No. 182-2.
- G. Title 24: All applicable system components and the system as a whole shall be certified as complying with Title 24 requirements.
- H. Manufacturer must have a minimum of [10] years of experience manufacturing lighting controls.

#### 1.6 COORDINATION

#### 1.7 WARRANTY

- A. All devices in the lighting control system shall have a 5 year manufacturer's warranty.

- B. Warranty period shall begin after the completion of the installation and the system's start-up and training, the point at which the system owner receives beneficial use of the control system or 1 year after shipment from the manufacturer, whichever occurs first.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. Acceptable Manufacturer:

1. Hubbell Control Solutions
  - a. System: wiSCAPE® Wireless Outdoor Lighting Control System
2. Basis of design product: Hubbell Control Solutions wiSCAPE or subject to compliance and prior approval with specified requirements of this section, one of the following:
  - a. HCS wiSCAPE
  - b. <Insert manufacturer's name>

#### B. Substitutions: [Not Permitted]

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. Proposed substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.
2. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices and wiring. The contractor shall provide complete engineered shop drawings (including power and control wiring) with deviations from the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

### 2.2 SYSTEM/NETWORK REQUIREMENTS

- A. System shall consist of wireless, distributed and intelligent lighting control devices consisting of but not limited to control modules with ON/OFF and 0-10VDC full range dimming capabilities, and system input devices including but not limited to motion sensors, daylight sensors and manual switch stations.
- B. Control modules shall be capable of measuring and monitoring the loads they control and report alarms for out of range values.
- C. System shall have an architecture that creates a self organizing and self healing mesh network infrastructure.



- D. Device Firmware and radio firmware shall be upgradable over the air via the gateway without having to go physically on site and without human intervention. During the upgrade process, the device shall continue to operate normally.
- E. System shall use a gateway controller for proper system operation. Each gateway shall support up to 1000 nodes.
- F. System shall be self organizing. The mesh network of devices shall build automatically without the need to manually set device addresses via dials, DIP switches or other means.
- G. System shall be self healing. System shall be capable to accept a failed node without compromising message delivery.
- H. System nodes shall comprise user configurable fail safe and fault recovery mechanisms that will execute commands in case of lost communication such as default to photocell on/off control in case of failure or to the execution of internal schedules
- I. System nodes shall be able to maintain accurate date time while powered
- J. Each system nodes shall be capable of storing their Geographic Coordinates in nonvolatile memory
- K. System shall be capable of storing diagnostic logs for troubleshooting purposes
- L. System architecture shall facilitate data transmission between each wireless device over the 2.4GHz or 900MHz ISM radio frequency (RF) bands with a supported and outdoor unobstructed RF range of 1000ft between each radio module.
- M. System architecture shall allow for up to 32 hops (levels) of propagation in any direction and from any transmitter.
- N. System shall secure all messages. When transmitting over the air, each wireless device shall use the strong and secure AES-128 (Advanced Encryption Standard) security cipher to encrypt and decrypt messages. System input devices shall be to monitor and broadcast changes such as Motion, daylight levels and manual switch input.
- O. System shall be capable of being accessed from a local network or the Internet using wiSCAPE® Express or wiSCAPE Enterprise software.
- P. System shall have an intuitive and easy to use Graphical User Interface (GUI) to configure, control, monitor and schedule individual devices or groups of devices.
- Q. System shall remain fully functional during the programming process. Lighting control systems that must be taken “OFF LINE” for programming are not acceptable. All programming changes shall take effect immediately as they are programmed.
- R. System shall belong to the customer and installed on the customer’s own computer infrastructure or can be hosted by a cloud-based service.



- S. Available reports shall include, but are not limited to:
  - 1. List of devices for a given site
  - 2. List of scenarios for a given group
  - 3. List of current alarms in the last X hours (the number of hours is selectable). You can select the alarm types that will appear in the report otherwise all alarm types will be displayed by default
  - 4. List of alarms history in the last X period (the period is selectable with calendar fields). You can select the alarm types that will appear in the report otherwise all alarm types will be displayed by default
  - 5. Energy Log in Report Form
  - 6. Energy Log in Chart Form
  - 7. Energy log detailed in report form. This report provides a list of each device for a given site with their KWH, KVAH, BURN TIME. The period covered is selectable with calendar fields
  - 8. All reports may be generated in PDF, XLS or XLSX file formats.
- T. System shall provide client-based or web-based applications for accessing the lighting controls network.
- U. System shall offer installation tools allowing for automatic GPS location positioning (when outdoor) as well as installation validation while on site.
- V. System shall allow for additional metadata to be stored and associated to each relay
- W. System shall allow both map and architectural (images) views alternative with devices overlaid on either type of views. Maps shall be sourced from multiple free providers.

### 2.3 WIRELESS RELAY FIXTURE MODULES

- A. Internal and External Wireless Relay Modules shall provide universal voltage support from 110V to 480V.
- B. External Relay Modules shall utilize the standardized ANSI C136.41-2013 (7 & 5 pin) receptacles.
- C. Relay Modules shall be capable of controlling fluorescent ballasts (T8 – T5 – T5HO), induction, MH, HPS, LPS, and LED drivers.
- D. Relay Modules shall be fully programmable and capable of storing and autonomously execute commands and scenarios with the following minimum functionalities. The operating scenarios described below shall reside within each addressable intelligent relays even in case of power



outage. Systems which rely on the operator to develop these scenarios using a programming language will not be allowed.

E. Standard on all relay modules:

1. Definition of Groups structures (min.: 15 per module – out of 32000)
2. Definition of Scenarios structures (min.: 100 per module – out of 1000 per group)
3. A Scenario broadcasted to a group can represent different commands and setting to different relay modules, enabling complex controls scenarios with a single message
4. Each node status after returning from Black Out shall be user programmable: with the following options: On – Off – Last Level – user defined including a random delay to execute.
5. Variable Power Up delay, to smooth peak startup demand
6. Phase-angle and Analog 0-10V dimming relays
7. Ramping parameters (Brighten-Dim-Ramp up-Ramp Down-Night Mode – Ramp to Levels
8. Definition of preset levels (min.: 10) with user configurable transition speed
9. Minimum dimming level, in order to adapt to various brands of dimming ballasts (with the option to Stay On or turn off, below a set minimum level)
10. Monitoring, metering and reporting
11. Shall measure the following parameters:
  - 1) *Power monitoring*
    - a) Voltage
    - b) Amperage
    - c) Power
    - d) Power factor
  - 2) *Cumulative Energy with a 2% accuracy*
  - 3) *Cumulative Lamp burn time*
  - 4) *Cumulative Ballast/Driver burn time*

Energy and times shall be stored in nonvolatile memory on a regular frequency to prevent loss of information in the event of a loss of power

- 5) *Number of ON/OFF cycles*
12. Alarms (ex: overvoltage, under voltage, over current, under current, low power factor, etc.) Alarms logs shall be stored in nonvolatile memory to allow for on demand subsequent retrievals
13. Time delay functions:

- 1) (10) Generic timers with the ability to cascade up to (10) timers
  - 2) Selectable individually in each module covering 0-65534 seconds (18h).
- F. System shall provide repeat capabilities to extend the range beyond normal radio range.
- G. Relays shall provide 6 external connectors: 3 digital inputs (dry-contact) (e.g. connection to motion sensors), and 1 Analog input (ex: connection to lux sensors), 2 digital outputs and provide power to the accessories without requiring the use of an external power pack.
- H. On detection of Digital contact closed/open, the relay should trigger a programmable Command and/or Scenario.
- I. Relays shall provide acknowledgements to the reception of any configuration changes unless if broadcasted to many relays.
- J. Distributed Control and Distributed Relay Override
1. Each addressable intelligent relays and sensor-modules shall be capable of autonomous automatic operation. Operating scenarios discussed above shall not depend on the operation of a central panel or computer.
  2. Furthermore, the distributed relay override keypads and motion sensors shall continue to operate should a clock-module or Gateway fail.
  3. Automatic deactivation during scheduled occupancy.
  4. User may choose when to disable the time delay during the night through the relay's schedule.
- K. Full Relay Test Mode
1. The system shall have the capability to automatically exercise every relay in the entire system using a user-defined schedule, controlled from the front end Gateway. Each relay will be monitored for status, and the user shall have access to the results of this system-wide test from the computer's screen and/or an historical report.
- L. Wireless Relay Modules shall conform to UL-733 & CAN/CSA C22.2 No. 182-2.
- M. Wireless Relay Module shall be FCC Certified and IC Certified.
- N. Hubbell Control Solutions product number(s):

Part Number	Description
WIR-RME-L	wiSCAPE® External Fixture Module with Metering, Long Range Radio (1000'), 120-480 VAC
WIR-RMI-IO	wiSCAPE® Internal Fixture Module with Metering, 1000' Range, 120-480 VAC, I/O Terminals
WIR-RMI-IO-N4	wiSCAPE® Internal Fixture Module with Metering, 1000' Range, 120-480 VAC, I/O Terminals, NEMA 4X Enclosure
WIR-RME9	wiSCAPE® External Fixture Module with Metering, 900MHz Radio, 120-480VAC
WIR-RMI9-IO	wiSCAPE® Internal Fixture Module with Metering, 900MHz Radio, I/O Terminals, 120-480 VAC
WIR-RMI9-IO-N4	wiSCAPE® Internal Fixture Module with Metering, 900MHz Radio, I/O Terminals,



	NEMA 4X Enclosure, 120-480 VAC
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## 2.4 Wireless Gateway

- A. The Wireless Gateway specific capabilities shall meet or exceed the following.
- Power loss memory and clock holdup time: minimum of 6 months
    - Clock: Digital with time, day of week, and date.
    - Automatic leap year compensation.
    - Programmable Daylight Savings Time and Standard Time adjustment.
  - Remote Communications
    - Each Gateway shall support a minimum of two communications ports: a USB port for PLC and/or RF (802.15.4) and an Ethernet port. Either or both may be used for programming, monitoring, and control. The Ethernet port shall allow simultaneous operation of multiple communications access points (Client sessions, Remote Ethernet-PLC modems) to support multiple operator terminals and communications with other building automation systems.
    - All relay changes of state and programmable switch actions shall be communicated over both the local USB/XB network and the Ethernet to support interactive graphics and online status monitoring.
- B. Gateway must be fanless, 1GHz or faster processor, WIFI and Ethernet connectors, autoboot on power up, 1 GB RAM, 500M storage.
- C. The Gateway shall be powered by 120VAC 50/60Hz.
- D. Gateway shall provide automatic recovery in case of power failure.
- E. Gateway shall be remotely configurable and upgradable without any on site intervention
- F. Gateway shall accept a Cellular Modem Option.
- G. Gateway shall utilize Linux Debian 8.5.
- H. Gateway shall be available in a version that supports BACnet IP.
- I. Hubbell Control Solutions product number(s):

Part Number	Description
WIR-GATEWAY3	wiSCAPE® Gateway Gen3, 2.4GHz, GPS, wiSCAPE-Express, 120/208/240VAC

WIR-GATEWAY3-CM	wiSCAPE® Gateway Gen3, 2.4GHz, GPS, wiSCAPE-Express, Cell Modem, 120/208/240VAC
WIR-GATEWAY3-9	wiSCAPE® Gateway Gen3, 900MHz, GPS, wiSCAPE-Express, 120/208/240VAC
WIR-GATEWAY3-9-CM	wiSCAPE® Gateway Gen3, 900MHz, GPS, wiSCAPE-Express, Cell Modem, 120/208/240VAC

## 2.5 Operators Software

### A. Graphical User Interface (GUI)

1. Data shall be entered through a simple Graphical User Interface and Multi-lingual software package, independently of the language of the operating system. The operating system shall be Windows 7 or more recent.

### B. Complete SQL database of System's Programming

1. All system's module programming shall be done online or offline on an SQL database system, with localized description of all loads, windows, and functions. System software shall provide clear procedures for creating complete backup copies, including all modules descriptions, settings, programming, and all historical data communication elements, including Sent-Received commands from-to the Gateway and modules (relays & sensors if applicable)

### C. Activity Logs

1. Store the last 2 years events including the time and scenarios, commands or values, indicating which user executed the event or modification

### D. Schedules

1. An unlimited number of schedules may be assigned to individual relays or groups of relays.
2. Each schedule shall allow an unlimited number of events per day, cloning of schedules shall be possible.
3. Applicable period for individual schedules shall be user-defined, and include concepts of holidays, and special exclusion/inclusion periods
4. Schedules shall individually be specified to supersede or not Holidays and Special periods.
5. Unlimited number of Holidays may be defined
6. "Spring Ahead" and "Fall Back" Dates for daylight savings time changes shall be automatic.

## 7. Conditional Scheduling & Execution Engine

- System shall be capable of building Conditional Scheduling & Execution rules, based on time of day, occupancy statuses, override keypads triggering Scenarios, etc.
- Such Conditional Scheduling & Execution Engine enables the user-definition of flexible rules such as:
  - Blink Warning
  - Time delay Overrides
  - Preemptive Override
  - Master Control
  - Cleaning Scenarios
  - Automatic Daylight with Occupant Override
- System Parameters
- Multiple sites may be programmed from a single software interface.
- Allow an unlimited number of different user/passwords per site or per system
- User defines functions accessible for each password (Add-Edit-Remove – Control – Access rights – Guest/Administrator).
- Software shall automatically connect to Remote sites.

### 2.6 SWITCH STATIONS

- A. System shall support switch stations for manual switching of lighting load(s) within a site.
- B. Switches shall be low voltage, momentary switches and shall be available in 1-button, 2-button, and 3-button configurations.
- C. Switch shall be available in White, Ivory, Light Almond and Gray.
- D. Hubbell Control Solutions product number(s):

Part Number	Description
LVSM1NP[cc]	Low Voltage Switch, Momentary, 1 Button, No Pilot, [cc]
LVSM2NP[cc]	Low Voltage Switch, Momentary, 2 Buttons, No Pilot, [cc]
LVSM3NP[cc]	Low Voltage Switch, Momentary, 3 Buttons, No Pilot, [cc]

Note [cc] = color = WH (White), IV (Ivory), LA (Light Almond), GY (Gray)

### 2.7 MOTION SENSORS

- A. Motion Sensors shall provide automatic switching of lighting load(s) within an area/zone based on the presence of human activity.
- B. Motion Sensors shall not require any manual adjustment at the time of installation or during operation.
- C. Motion Sensors shall utilize passive infrared to detect motion.
- D. Motion Sensors with passive infrared technology shall monitor PIR background levels and automatically make corresponding adjustments.
- E. Motion Sensors with passive infrared technology shall incorporate a dual element pyrometer and 144-element cylindrical Fresnel lens
- F. Motion Sensors shall be end or surface mounted (depending on model).
- G. Hubbell Control Solutions product number(s):

Part Number	Description
WSPLWOEM24V[cc]	HCS WASP Motion Sensor with Daylighting, End Mount, 24VDC , Low Temp, Water Tight, Indoor-Outdoor
WSPLWOSM24V[cc]	HBA WASP Motion Sensor with Daylighting, Surface Mount, 24VDC , Low Temp, Water Tight, Indoor-Outdoor

Note [cc] = color = blank (White), BK (Black), GY (Gray)

## 2.8 DAYLIGHT SENSOR

- A. Daylight Sensor shall provide automatic daylight harvesting dimming of lighting load(s) within a Group.
- B. Daylight Sensor shall support a light level range of 0-250fc.
- C. Daylight Sensor's configuration settings shall be programmed remotely over the air.
- D. Hubbell Control Solutions product number(s):

Part Number	Description
DLCPCO	Photocell Sensor, Outdoor

## PART 3 - EXECUTION

### 3.1 INSTALLATION



- A. All equipment shall be installed in accordance with manufacturer's installation instructions and in compliance with all applicable local and national codes and requirements.
- B. All wireless devices come with Serial Number labels. These labels should be affixed to the exterior of the fixture/device that contains the wireless module and in a log book or on as-builds where the location of the wireless device can be recorded.
- C. Provide complete installation of system in accordance with Contract Documents.
- D. Provide documentation on the commissioning of the system including by not limited to the following:
  - 1. Sequence of operations
  - 2. Device settings
  - 3. Load parameters
  - 4. Schedules

### 3.2 FACTORY COMMISSIONING (OPTIONAL)

- A. Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.
- B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.
- C. Upon completion of the system commissioning, the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.