



SECTION 26 09 43

DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Distributed Digital Lighting Control System: System includes
 - 1. Wireless Lighting Controls
 - 2. Emergency Lighting Controls.

1.2 RELATED SECTIONS

- A. Section 26 50 00 - Lighting.
- B. Section 26 52 00 - Emergency Lighting.
- C. Section 25 55 00 - Integrated Automation Control of HVAC- Integrated Automation, Building integrator shall provide integration of the lighting control system with Building Automation Systems.

1.3 REFERENCES

- A. FCC emission standards
- B. UL - Underwriters Laboratories, Inc. Listings
- C. UL 2043 - Standard for Fire Test for Heat and Visible Smoke Release for Discrete Products Installed in Air-Handling Spaces.
- D. UL 924 - Standard for Emergency Lighting and Power Equipment
- E. ULC - Underwriter Laboratories of Canada Listings

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Wireless lighting system shall include integrated lighting fixture control, occupancy sensors, wall switches, daylighting sensors and accessories.
- B. System shall comply with FCC emission standards specified in part 15, sub-part J for commercial and residential application.
- C. System shall be listed under UL sections 916 and/or 508.

1.5 SUBMITTALS

- A. Submit manufacturer's data sheets on each hardware device to be used, including:
 - 1. Ratings, certifications, standard wiring diagrams, dimensions, configurations and installed features.
 - 2. Installation instructions.
- B. Shop Drawings: Wiring diagrams for the various components of the System specified including:
 - 1. Typical mounting and wiring diagram of each control device proposed to be installed.
 - 2. Show location of all control devices for each area on reflected ceiling plans.
 - 3. Provide room/area details including products and sequence of operation for each room or area.
- C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- D. Closeout Submittals:
 - 1. Project Record Documents: Record actual installed locations and settings for lighting control devices.
 - 2. Operation and Maintenance Manual:
 - a. Include approved Shop Drawings and Product Data.
 - b. Include Sequence of Operation, identifying operation for each room or space.
 - c. Include startup and test reports.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing of wireless lighting control systems with a minimum of 5 years documented experience.
- B. Installer Qualifications: Company certified by the manufacturer and specializing in installation of networked lighting control products with minimum three years documented experience.

1.7 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to commencing Work of this section. Meeting to be attended by Contractor, system installer, factory authorized manufacturer's representative, and representative of all trades related to the system installation.
- B. Review installation procedures and coordination required with related Work and the following:
 - 1. Confirm the location and mounting of all devices, with special attention to placement of switches, dimmers, and any sensors.
 - 2. Review the specifications for low voltage control wiring and termination.
 - 3. Discuss the functionality and configuration of all products
 - 4. Discuss requirements for integration with other trades
- C. Inspect and make notes of job conditions prior to installation:
 - 1. Record minutes of the conference and provide copies to all parties present.
 - 2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in a clean, dry space in original manufacturer's packaging in

accordance with manufacturer's written instructions until ready for installation

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

- A. Products Warranty: Manufacturer shall provide a 5 year limited warranty on products within this installation, except where otherwise noted, and consisting of a one for one device replacement.

1.11 MAINTENANCE AND OPERATIONAL SERVICES

- A. Remote Access and Enhanced Warranty for Networked Lighting Controls: Provide Manufacturer's Remote Access and Enhanced Warranty for Networked Lighting Controls as follows:
 - 1. Configure to allow the manufacturer remote access to the lighting control system. Configuration includes at a minimum gateway connected to the internet via the building network or cellular.
 - 2. Manufacturer's Remote Access capability shall provide at a minimum the following features:
 - a. Ability to provide diagnostics to detect fault conditions in hardware or connected devices.
 - b. Access to all devices allowing for programmability of device features.
 - c. Additional client training and tuning on the Lighting Control System after building occupancy can be performed while remotely connected to the site.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Casambi Technologies, Inc. www.casambi.com 1-800-674-3548
- A. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 DISTRIBUTED DIGITAL LIGHTING CONTROL SYSTEM

- A. The lighting control solution shall be wireless. The system topology shall be a mesh network where all the nodes connect to each other directly and non-hierarchically.
- B. The lighting control solution shall not have a single point of failure. All the intelligence shall be replicated in each node. If any device goes offline, the rest of the system shall continue to operate. Systems that require a gateway or hub to provide local lighting control shall not be considered.
- C. All wireless communication shall be encrypted using 128 bit AES encryption. The security key shall never be passed unencrypted.

1. The lighting control solution shall have a pairing functionality, where luminaires and control components can be added to the lighting control solution's networks without any addressing procedure, any special tools or any specific programming interfaces.
 - D. All control system functions shall be configurable in the network firmware including determining which fixtures are in which occupancy or daylight zones, time delays, transition times, etc. All system configurations shall be stored in non-volatile memory.
 - E. All devices on the lighting control network shall be able to have their firmware updated over the air without requiring any special devices or software. Firmware upgrades shall be performed in parallel for all devices in a network.
 - F. Manufacturer shall certify that all control devices in a network are fully interoperable and can be accessed, configured and controlled from a single app.
 - G. Manufacturer shall make configuration and monitoring software readily available for free for iOS and Android devices.
 1. Space Control Requirements: Provide occupancy/vacancy sensors with Manual- or Partial-ON functionality as indicated in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. Provide Manual-ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors and Manual-ON switches.
 2. Daylit Areas: Provide daylight-responsive automatic control in all spaces (conditioned or unconditioned) where daylight contribution is available as defined by relevant local building energy code:
 - a. All luminaires within code-defined daylight zones shall be controlled separately from luminaires outside of daylit zones.
 - b. Daytime setpoints for total ambient illumination (combined daylight and electric light) levels that initiate dimming shall be programmed in compliance with relevant local building energy codes.
 - c. Multiple-level switched daylight harvesting controls may be utilized for areas marked on drawings.
 - d. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylighting control system may be designed to turn off electric lighting when daylight is at or above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.
 3. Conference, meeting, training, auditoriums, and multipurpose rooms shall have controls that allow for independent control of each local control zone. Rooms larger than 300 square feet shall instead have at least four preset lighting scenes unless otherwise specified. Occupancy / vacancy sensors shall be provided to turn off all lighting in the space. Spaces with up to four moveable walls shall include controls that can be reconfigured when the room is partitioned.

2.3 DIGITAL LOAD CONTROLLERS (ROOM AND FIXTURE CONTROLLERS)

- A. Digital Load Controllers:
 1. Each load be configurable to operate in the following sequences based on occupancy:
 - a. Auto-on/Auto-off (Follow on and off)
 - b. Manual-on/Auto-off (Follow off only)

2. UL 2043 plenum rated
3. All digital parameter data programmed into an individual room controller or plug load controller shall be retained in non-volatile FLASH memory within the controller itself. Memory shall have an expected life of no less than 10 years.
4. Dimming Room Controllers shall share the following features:
 - a.
 - b. Calibration and trim levels must be set per output channel. Devices that set calibration or trim levels per controller (as opposed to per load) are not acceptable.
 - c. All configuration shall be digital. Devices that set calibration or trim levels per output channel via trim pots or dip-switches are not acceptable.
- B. On/Off/0-10V Dimming KO Mount Room Controllers shall include:
 1. Dual voltage (120/277 VAC, 60 Hz) capable rated for 10A total load
 2.
 - a. 0-10V Dimming - LED drivers.
- C. On/Off/ Forward Phase Dimming Room Controllers shall include:
- D. Fixture Controllers shall include
 1. A form factor and product ratings to allow various OEM fixture manufacturers to mount the device inside the driver cavity of LED fixtures.

2.4 DIGITAL DAYLIGHTING SENSORS

- A. Digital daylighting sensors shall work with controllers to provide automatic switching or dimming daylight harvesting capabilities for any load type connected to the controller.

2.5 PREPARATION

- A. Verify that required pre-installation meeting specified in Part 1 of this specification has been completed, recorded meeting minutes have been distributed and all outstanding issues noted have been resolved prior to the start of installation.

2.6 INSTALLATION

- A. Install system in accordance with the approved system shop drawings and manufacturer's instructions.
- B. Test all devices to ensure proper communication.
- C. Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.

- D. Provide written or computer-generated documentation on the configuration of the system including room by room description including:
 - 1. Sensor parameters, time delays, sensitivities, and daylighting setpoints.
 - 2. Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
- E. All Class II cabling shall enter enclosures from within low-voltage wiring areas and shall remain within those areas. No Class I conductors shall enter a low-voltage area.
- F. Remote Access for Network Systems

2.7 FIELD QUALITY CONTROL

- A. Tests and Inspections: Manufacturer's service representative shall perform the following inspections and prepare reports.
 - 1. Verify / complete task programming for all switches, dimmers, time clocks, and sensors.
 - 2. Verify that the control of each space complies with the Sequence of Operation.
 - 3. Correct any system issues and retest.
 - 4.

2.8 DEMONSTRATION AND TRAINING

- A. Before Substantial Completion, arrange and provide a 2 hour Owner instruction period to designated Owner personnel:
 - 1. Overview of the technology.
 - 2. Overview of the installation.
 - 3. Use of Casambi's app to view status, create scenes, adjust schedules and configure wall switch behavior and occupancy sensor behavior

2.9 PRODUCT SUPPORT AND SERVICE

- A. Telephone support shall be available at no cost to the Owner for the duration of the warranty period. Factory assistance shall consist of assistance in solving application issues pertaining to the control equipment.

END OF SECTION