SECTION 26 09 43

NETWORKED LIGHTING CONTROLS AND LIGHT MANAGEMENT SOFTWARE

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\*\* NOTE TO SPECIFIER \*\* Encelium; Light management system.  
This section is based on the products of Encelium, which is located at:2240 Campbell Creek Blvd., Suite 110Richardson, TX 75082Toll Free Tel: 888-531-7573Email: [request info (enceliumcustomerservice@osram.com)](https://arcat.com/rfi?action=email&company=Encelium&message=RE%253A%2520Spec%2520Question%2520(16575enc)%253A%2520&coid=47056&spec=16575enc&rep=&fax=)  
Web: <http://www.encelium.com>   
 [ [Click Here](https://arcat.com/company/encelium-47056) ] for additional information.  
Encelium brings you advanced lighting management where you work, collaborate, play, heal, learn, shop, and more. We are all about technology, but we focus on people first - listening to their problems and coming up with great solutions. We do not just make life better for tenants and occupants. We enhance the experience of anyone who designs, installs, controls, or uses interior lighting. That is the Encelium Experience.  
Encelium is part of Digital Lumens, Inc.  
At Digital Lumens, Inc., our sole focus is on helping people by improving the facilities where they work, learn, heal. We use our proven technology and deep expertise to transform the way our customers illuminate, monitor, and manage key facilities including offices, and other commercial buildings, higher education campuses, healthcare centers, and industrial facilities.  
 Encelium uses its proven solutions to help diverse applications achieve impressive results with respect to energy efficiency, health, safety, and welfare.

1. GENERAL
   1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project.

* + 1. Facility -wide networked light management system including scheduled and automated lighting control sequences for wired, wireless, and hybrid systems.
       1. User Interfaces.
       2. Sensors.
       3. Distributed load controllers.
       4. Managers.
       5. Panel solutions.
       6. System Infrastructure and accessories.
       7. Integrations.
       8. Lighting control system software.
  1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 26 27 16 - Electrical Cabinets and Enclosures
    2. Section 26 50 00 - Lighting.
    3. Section 26 52 00 - Safety Lighting.
  1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. National Fire Protection Association (NFPA)
    2. cULus Listing/Certification
       1. UL 916: Certified as Energy Management Equipment.
       2. UL 924: Certified as Emergency Lighting Equipment.
       3. UL 2043: Meet Heat and Smoke Release for Air-Handling Spaces.
    3. CSA Listing/Certification
       1. CSA C22.2 NO. 141-15: Emergency lighting equipment.
       2. CSA C22.2 No. 205: Signal equipment.
    4. Federal Communications Commission (FCC) / Industry Canada (IC).
    5. California Energy Commission (CEC).
    6. Local building codes.
  1. SUBMITTALS
     1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
     2. Product Data:
        1. Manufacturer's data sheets on each product to be used. Item dimensions.
        2. Preparation instructions and recommendations.
        3. Storage and handling requirements and recommendations.
        4. Installation instructions.
        5. Bill of Materials: Complete list of parts to fully install selected system components.
     3. Shop and Wiring Drawings: Control system details, as supplied, one-line diagrams, , coverage patterns, interconnection diagrams, field-installed wiring.
     4. Coordination Drawings: Show lighting controls are compatible with connected monitoring and control devices and systems specified.
        1. Compatibility Proof: Inputs and outputs of interconnecting signals, control wiring, and interfacing.
        2. Networked Controls: List network protocols and statements from manufacturers that input, and output devices meet interoperability requirements of network protocol.
     5. Software Operational Documentation:
        1. Software operating and upgrade manuals
        2. Printout of software application and graphic screens, or live demonstration of key functionality or a video demonstrating above stated system capabilities.
     6. Installation Instructions: Manufacturer's installation instructions.
     7. Warranty: Copy of applicable warranty.
     8. Additional information as required on a project specific basis.
  2. QUALITY ASSURANCE
     1. Installer Qualifications: Experienced in performing work of this section. Specialized in similar installations required for this project.
     2. Manufacturer Requirements: 15 years' experience manufacturing networked light management systems.
     3. Contractor: Ensure lighting system control devices and assemblies are compatible and can be integrated into systems operating as described in lighting control notes on drawings and in this specification. Resolve incompatibilities between devices, assemblies, and system controllers with the system provider, to ensure proper system operation and maintainability.
     4. Performance Requirements: Provide system components, assembled, and installed to maintain performance criteria without defects, damage, or failure.
        1. Testing Requirements: Manufacturer will 100 percent test equipment prior to shipment. Sample testing is not acceptable.
     5. Code Requirements
        1. System Control Unit and System Field Devices: cULus listed and certified.
        2. System Components: FCC /IC compliant. Installed in compliance with National Electrical Codes and Canadian Electrical Code.
        3. Building Codes: Install units in compliance with applicable, local building codes.
     6. Coordination: Coordinate lighting control components to form an integrated interconnection of compatible components.
        1. Match components and interconnections for optimum performance functions.
        2. Display graphics showing building areas controlled; include status of lighting controls.
  3. PROJECT CONDITIONS
     1. Operating Temperature: Minus 40 to 140 degrees F (Minus 40 to 60 degrees C)

\*\* NOTE TO SPECIFIER \*\* Delete relative humidity option not required.

* + 1. Relative Humidity for Wired Field Devices:
       1. Condensing: 0 to 100 percent RH rated for damp locations
       2. Non-Condensing: 0 to 95 percent RH rated
    2. Relative Humidity for Wireless Modules:
       1. Non-Condensing: 5 to 95 percent rated for indoor locations.
  1. PRE-INSTALLATION MEETINGS
     1. Convene two weeks prior to commencement of Work. Meeting Attendees:
        1. Contractor, Architect, system installer, factory authorized manufacturer's representative, and representatives of all trades related to the system installation.
     2. Review installation procedures, coordination required, and the following:
        1. Confirm device locations and mountings, with detailed focus on placement of switches, dimmers, and any sensors.
        2. Review specifications low voltage control wiring and termination requirements.
        3. Product Functionalities and Configurations: Discuss sequences of operation, per design requirements.
        4. Address requirements for integration with other trades
     3. Job Site Conditions Prior to Installation: Review, inspect and note job site conditions prior to installation:
        1. Record meeting minutes. Provide copies to meeting participants.
        2. Document in writing, identified issues and the parties responsible for action and resolution with timetable for completion.
        3. Installation shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.
  2. DELIVERY, STORAGE AND HANDLING
     1. Ordering: Comply with manufacturer's instructions and lead-time requirements.
     2. Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with intact identification labels.
     3. Storage and Protection: Store materials away from exposure to weather conditions and at temperature and humidity conditions recommended by manufacturer.
  3. WARRANTY
     1. On-going system expansion, service, and support: Available from factory certified vendors.
        1. Recommended Service Agreements: Submitted at time of bid complete with manufacturer's suggested inventory and pricing for parts and technical support labor.
     2. Manufacturer's Warranty: Equipment free of defects in materials and workmanship.
        1. Warranty Period: Hardware components, excluding third party components, will have full warranty, non-prorated, for sixty months. Software, excluding Open Source and third party operating systems, to perform in accordance with published specifications for twelve months from date of System Start-up.
     3. Special Warranty: Manufacturer's standard form. Manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship within warranty period.

1. PRODUCTS
   1. MANUFACTURERS
      1. Acceptable Manufacturer: Encelium, which is located at:2240 Campbell Creek Blvd., Suite 110Richardson, TX 75082Toll Free Tel: 888-531-7573Email: [request info (enceliumcustomerservice@osram.com)](https://arcat.com/rfi?action=email&company=Encelium&message=RE%253A%2520Spec%2520Question%2520(16575enc)%253A%2520&coid=47056&spec=16575enc&rep=&fax=);Web: <http://www.encelium.com>
         1. Controls: Encelium X Networked Light Management System
         2. Sensors: Encelium Sensors , Leviton Mfg. Co., Hubbell Building Automation, Inc., SensorSwitch, Inc., PLC Multipoint Inc., The Watt Stopper, Inc. Cooper Controls or equivalent.
         3. Sensors: Wireless Sensors, Leviton Mfg. Co., Hubbell Building Automation, Inc., Sensor Switch, Inc., PLC Multipoint Inc., The Watt Stopper, Inc. Cooper Controls or equivalent.
         4. 0-10V Dimming, Fixed Output Ballasts and/or 0-10V LED Drivers: Tridonic, Universal Lighting Technologies, Philips Lighting or equivalent.

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
    2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.
  1. SYSTEM PERFORMANCE REQUIREMENTS
     1. Light Management System: Distributed WAN/LAN network. Global controller/routers, individually addressable system field devices not integral to luminaires, sensors, switches, relays, and ancillary devices required for an operable system.
        1. WAN/LAN Start-Up: Control system manufacturer or certified contractors.
        2. System: Non-proprietary 0-10V dimming, DALI or fixed output ballasts and/or 0-10V LED drivers, occupancy sensors, daylight sensors, etc.
        3. UL 924 Listed Devices: Able to control 120 V, 277 V, and 347 V loads.
        4. System Software Interface: Able to notify communication failures to system users
     2. System Expansion, Service and Support: From multiple factory certified vendors.
        1. Recommended Service Agreements: Submitted with bid with manufacturers suggested inventory and pricing for system parts and technical support labor.
     3. Daylight Harvesting: In a photo sensor-equipped system.
        1. Central Controller Unit: Rationalizes natural light changes when available.
           1. Maintains light levels during fluctuating ambient conditions where 0 to 10 V, DALI dimming ballasts and/or drivers exist.
        2. Fixed output ballasts and/or drivers: Energize when natural light falls below foot-candle levels specified. Utilize light level inputs from common and/or remote sensor locations to minimize number of photo sensors required. Operate with multiple users in harmony and not react adversely to manual override inputs.
     4. Installation Mode: Test if devices are wired correctly by pressing any button on the Wallstation or sensor which triggers load controllers on the channel to change the dimming level by 25 percent. Every press triggers this function to enable testing of the AC line wiring, dimming wiring and communication integrity over GreenBus II lines.
     5. Manual Pairing: Pair room or zone devices to gain manual control (on, off and dimming) and occupancy time outs. Holding any button on a Wallstation or sensor for 10 seconds enters system into Manual Pairing mode. System then guides user by blinking the load controllers on the GreenBus II wiring scheme identifying and pairing them to the Wallstation or sensor.
     6. Vacancy Recovery: If sensor times out in manual-on, occupant can turn lights on using occ sensor. Vacancy Recovery Time: Configure during system programming.
     7. Fade Rates: Configurable fade rates for occupancy time-outs and/or manual control
     8. High end of individual lights can be tuned/trimmed.
     9. 2-Stage Off: Lights go to low-dim level before end of schedule or occupancy time out.
     10. Manager Recovery from Power Failure: When power is restored, in 3 seconds lights return to same levels (dimmed setting, full on, or full off) as prior to interruption.
     11. Time Clock Scheduling: Programmable for scheduling lights to a specific level.
         1. Programming: User friendly, Outlook style interface for schedules.
         2. Override: Manual adjustments via Wallstations temporarily override status imposed by time clock schedule.
         3. Response to Power Failure: Time clock will execute schedules that would still be in progress had they begun during the power outage.
         4. Flick Warning: Prior to a scheduled lights-off event or expiry of a temporary override, system provides 2 short light level drops warning affected occupants. Flick Warning Time: Programmable via software; between 1 and 5 minutes.
         5. Automatically turn on or wait for an input: A luminaire group can be turn on automatically in response to a scheduled event or a Wallstation signal to turn luminaire group on, and stay on, for remainder of scheduled event.
         6. Support BMS Schedules/Calendars
     12. Automatic Load Shed Mode: When activated, control unit reduces output to programmed electrical demand load. System will not shed more load than required. Load shedding Priority: Centrally configurable by control zone or by common uses with subsequent load shed priority groupings utilized until required defined load has been shed, for a defined period, or until demand response input has been removed.
         1. Not Acceptable: Systems selecting a "load shed scene" where there is no guarantee the defined required load will be shed.
     13. Emergency Mode: When activated, will immediately adjust to, and remain at full light output until mode is deactivated. Setting overrides other inputs. Interface with building emergency monitoring system and not require multiple connections.
     14. Addressing: Centrally addressable ballasts and drivers, on a per luminaire, multiple luminaire, or zone basis. Utilize 0-10V dimming, fixed output ballasts or 0-10V LED Drivers connected to an Output Module. System will not require manual recording of addresses for purpose of start-up or reconfiguration.
     15. Programmable Task Tuning:
         1. Light level programmability available by individual luminaire.
     16. Continuous Dimming: Over a continuous range; individual or group of luminaires in response to user initiated or system generated signals.
     17. Unoccupied State: When occupancy status is vacant per occupancy sensors.
         1. Lights turn off.
         2. Lights adjust to configurable dimmed light level.
     18. Occupied State: Create "comfort" or "support" zones ensuring occupants are not isolated by turning off lights in adjacent areas. Light paths to exit premises.
     19. Overlapping Zones: Create to ensure continuous lighting and safety of occupants as they move from one zone to another while minimizing energy use.
     20. Participation in Intelligent Building Framework: TCP/IP over Ethernet backbone.
         1. Control units.
         2. System server communications.

\*\* NOTE TO SPECIFIER \*\* Paragraph below applies to wireless systems only. Delete if not required.

* + - 1. Wireless managers.
    1. LAN Operations: Capable of operating independent of building's existing network infrastructure and not rely on tenant supplied PCs for operation.

\*\* NOTE TO SPECIFIER \*\* Paragraph applies to GreenBus II systems. Delete if not required.

* + 1. Network Security: Use firewall technologies and VLAN configuration methods to separate tenants from and ensure integrity of light management network.
    2. Group (Zone) Configuration: Assign individual or group system components to zones via the Software. Rewiring is not needed when reconfiguring or re-zoning. Removal of covers, faceplates, ceiling tiles, etc. is not required.
    3. Sensor Control Parameters: Occupancy sensor time delays and light level sensor parameters are to be configurable through software.
    4. Automatic Time Adjustment: For leap year, daylight savings time, weekly routine, and holiday scheduling.

\*\* NOTE TO SPECIFIER \*\* Paragraph applies to wireless systems. Delete if not required.

* + 1. A web based dashboard showing real time energy savings data.
    2. Contact Closure Input: System capable of receiving a momentary and sustained contact closure input from third party sources to control lighting zones.
    3. Astronomical Clock: Luminaires switch ON/OFF with sunset and sunrise (option to select offset, depending on geographic location of building. An offset option available to turn schedule ON/OFF up to 12 hours before or after dusk or dawn.
    4. Auto-configure lighting controls for spaces that have been combined or divided temporarily by moving wall or similar systems.
    5. White Light Color Tuning: The system is to be capable of the following.
       1. Control correlated color temperature (CCT) individually or by zone for compatible luminaires.
       2. Manual color tuning through software, User adjusts CCTs through a digital slider.
          1. CCT adjustment in increment/decrements of 100K using digital slider on GUI.
       3. OSRAM 2CH DALI 2.0, Type 8 LED driver able to convert CCT value from software to accurate color temperature.
       4. Recall specific CCT values and raise and lower CCT from a single gang Wallstation based on configurable increments.
       5. Independent Wallstation for intensity and color temperature control for manual recall.
       6. Schedule specific CCTs with fade time (in seconds). If system loses power during an active schedule, fixtures will resume scheduled CCT upon power restoration.
       7. Color schedules to begin or end using sunrise or sunset options based on an astronomical clock.
       8. A maximum of 64 compatible color tunable fixtures per Manager channel.
       9. When used with OSRAM Tunable White drives and LED engines, system provides 2700K- 6500K tunability. White lighting dimming to reduce intensity to 1 percent.
    6. Shade Integration: The system provides the following capabilities:
       1. Set shades position to 11 equal points across height of window.
       2. From a Single Wallstation or Encelium Touchscreen
          1. Control scenes for lighting and shade position with single press of a button.
          2. Manual dimming of light levels or manual change of shade position (up, down)
       3. Schedules for lighting and shading zones to begin or end using sunrise or sunset options based on an astronomical clock
       4. Set shade scenes for multiple zones in a floor or building from the GUI.
       5. Unoccupied State: Provide two states when occupancy status is vacant as per an occupancy sensor; shades close or shades adjust to configurable level.
       6. Capable of recalling scenes for lighting levels and shade positions when interfacing with audio-visual system (e.g., LCD Touch Screen Panel) via TCP/IP interface.
       7. Allow Building Automation System (BAS) to set shade position of up to 11 points for shading zones via BACnet/IP
       8. The above capabilities are available with shades systems meeting the following conditions:
          1. Shade system includes Somfy Digital Network (SDN) motors suitable for indoor applications with roller shades, blinds, curtains, and drapes.
          2. SDN Motors: Building Control Systems 0-10 V Integration Interface: Provides integration between Encelium Wireless Control module (WCM) and/or wired Luminaire Control Module (LCM) 0-10 V analog output and motorized shading systems, operating individual motors or groups up to 20 motors per interface.
          3. Basis of Design: Somfy; SDN 0-10V INTERFACE 11-Position Version.
       9. Tubular asynchronous motors available in 24 V Dc or 120 V ac (60 Hz), with an integral capacitor and thermally protected, permanently lubricated, maintenance-free gearbox. Audible Noise: 38 to 60 dBA in accordance with standards of ISO 3741 NF 31022 in dBA ref. 1pW at nominal torque without end product. Controller to be embedded microprocessor type or bus connection using RJ9/RJ45.
    7. Automatically lock Wallstations and/or disable sensors based on one of the following inputs: Contact closure, a time schedule, or status of a monitored space.

\*\* NOTE TO SPECIFIER \*\* Paragraph applies to GreenBus II and wireless systems. Delete if not required.

* + 1. BAS Interface: Light management system to be capable of the following:
       1. Interface digitally with building automation system via BACnet or IP.
       2. Communicate status of output and input devices to the Building Automation System which utilizes light management system input device data to determine status of mechanical control zones and perform adjustments accordingly.
    2. AV Interface: Light management system capable of interfacing with audio-visual system (e.g., LCD Touch Screen Panel) via TCP/IP interface.
       1. Enables preset or customized audio and video settings that can be stored, recalled, and modified as needed via and interactive touch screen interface
    3. AC Phase Cut Dimming Circuit Integration: System to have ability to control Incandescent, Fluorescent or LED lighting load otherwise controlled by manual AC Phase Cut Dimmers.

\*\* NOTE TO SPECIFIER \*\* The following two paragraphs apply to GreenBus II systems. Delete if not required.

* + 1. Minimized system down time: Communication bus shall be able to self-diagnose and display communication shorts or open loops resulting in minimum system down time.

\*\* NOTE TO SPECIFIER \*\* The following two paragraph applies to Wireless systems. Delete if not required.

* + 1. Wireless Networks: Reliable (mesh topology), self-configuring (discovery) and self-healing. Interruptions in network are automatically compensated for by re-directing communication.
       1. High level of security by employing logically unbreakable secure encryption methods (e.g., 128-bit encryption).
    2. Wireless Device (Wallstations and Sensors) Integration: Seamless communication among devices when hybrid wired/wireless control systems are implemented. Hybrid control system refers to devices that communicate over a field bus carrying low voltage control signals and/or wireless medium using non-proprietary open protocol (e.g., ZigBee) for communication. Devices in hybrid control system communicate with devices in the system regardless of the native protocol they are designed to work with.

\*\* NOTE TO SPECIFIER \*\* The following paragraph Applies to wireless systems. Delete if not required.

* + - 1. Luminaires enable wireless communication either via add-on or integrated modules
    1. Lighting Control System software:
       1. Central Lighting Control Software: Interactive, Web-based graphical user interface (GUI) showing floor plans and lighting
          1. Navigational features listed below allow user's orientation within the controlled space, geographic heading and/or landmarks:

Interactive, Vector based, Zoom, Rotate, Pan, and Tilt.

* + - * 1. Building operator to navigate through facility in two dimensional views, allowing fast and easy navigation.
        2. Display single floor views for easier system performance visualization of entire site as well as individual zones or spaces.
        3. Software Settings and Properties: Selectable per individual device, room based, floor based, or global building based.

Lighting Control Software Interface: Provide status and enable configuration of system zones including selected individual luminaire availability, current light level, maximum light level, on/off status, occupancy status, and emergency mode (response to an emergency signal) status.

* + - * 1. Display lighting system parameters such as Lighting Status (ON/OFF); Lighting Levels, Load Shedding Status, or Lighting Energy Consumption, Occupancy status in a colorized gradient ("weather" map) type of graphical representation.
        2. Energy Analysis Data: Exportable in CSV file formats.
        3. Allow import of native AutoCAD files.
      1. Reporting Feature: Native to lighting control software. Reports to be printable in printer friendly format and downloadable for use in spreadsheet applications, etc.
         1. Report the following parameters for each device and zone individually.

Energy consumption broken down by energy management strategy.

Energy demand broken down by energy management strategy.

Occupancy data by zone.

Building wide occupancy status.

Time Schedule configuration status.

Lighting energy consumption in color gradient "weather map" type view.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete paragraphs not required.

* 1. USER INTERFACES
     1. LCD Touch Screen Panels: Displays light level, status, and recalls multiple lighting scenes.

\*\* NOTE TO SPECIFIER \*\* Delete model option not required.

* + - 1. Model KX3: 3 inch (76 mm) touch screen.
         1. Integrated High-Resolution Resistive Touch Screen: Bright TFT LCD, WVGA (400x800 pixels) with 16.7M colors.
      2. Model KX7S: 7 inch (178 mm) touch screen.
         1. Integrated High-Resolution Capacitive Touch Screen: Full color TFT LCD, Full VGA (400x800 pixels) with 65K colors.
         2. Flexible configurations for custom buttons, text, and graphics.

\*\* NOTE TO SPECIFIER \*\* Model XP-6s is only required when using the KX7S design. Delete if not required.

* + - * 1. Remote Control Processor: Model XP-6s

CPU: 32-bit, 533 MHz

Flash Memory: 128 MB of non-volatile

Interface: Integrated 10/100Base-T Ethernet port

Power: 12 VDC, 1A. Wall-plug supply included.

Wall surface mount.

* + - 1. Control multiple lighting scenes for multi-purpose spaces.
      2. Page Navigation: Screen swiping
      3. Appearance: May be personalized for every space.
      4. CPU: 32 bit, 533 MHz
      5. Memory: 128 non-volatile flash memory.
      6. Configuration: Flexible for custom buttons, text, and graphics
      7. Electrical Input Voltage: Power over Ethernet or 9 to16 VDC, 1A max.
      8. Communication: Ethernet connection employing TCP/IP protocol.
      9. Operating Temperature Range: Minus 32 to 122 degrees F(0 to 50 degrees C)
      10. Relative Humidity: 0 to 95 percent non-condensing. Rated for indoor locations.
      11. Mechanical: Wall mountable
    1. Zone Control (ZC) Wallstations: Multi-Zone Controller Wallstation Series.
       1. Used to activate or de-activate a lighting zone.
       2. Software configurable lighting control.
       3. ON/OFF switching for multiple lighting zones.
       4. Zone Status: Integrated LED indicators. White: ON. Blue: OFF.
       5. Available in a range of configurations for customized light level control.

\*\* NOTE TO SPECIFIER \*\* Delete wallstation options not required.

* + - 1. Wireless Wallstations: Enables convenient control and desired lighting levels by communicating user inputs to an Encelium Wireless Manager or Controller over a mesh network based on Zigbee standards.
         1. Operating Power: Two AA or four AAA alkaline batteries.
         2. Intended to be installed onto a wall surface or electrical box with functionality options dependent on the model installed.
      2. Wired Wallstations: Low-voltage and connect to Encelium X Lighting Management System through a GreenBus cable with 2-pin connectors.
    1. Scene Control (SC) Wallstations: Scene Dimming Wallstation. Multi-scene, single-zone dimming wallstations providing customized light level control in areas requiring architectural dimming. Works with Encelium X.

\*\* NOTE TO SPECIFIER \*\* Delete wallstation, scene, and model options not required.

* + - 1. Wired WallStations:
         1. 3 Scene. Communication Network: GreenBus.

Model EN-WS-SC3-GB2-WH. Modifiers: White - WH

Model EN-WS-SC3-GB2-IV SC. Modifiers: Ivory - IV

Model EN-WS-SC3-GB2-GR SC. Modifiers: Gray - GR

Model EN-WS-SC3-GB2-BL SC. Modifiers: Black - BL

* + - * 1. 5 Scene. Communication Network: GreenBus.

Model EN-WS-SC5-GB2-WH SC. Modifiers: White - WH

Model EN-WS-SC5-GB2-IV SC. Modifiers: Ivory - IV

Model EN-WS-SC5-GB2-GR SC. Modifiers: Gray - GR

Model EN-WS-SC5-GB2-BL SC. Modifiers: Black - BL

* + - 1. Wireless WallStations:
         1. 3 Scene. Communication Network: Zigbee

Model EN-WS-SC3-ZB-WH SC. Modifiers: White - WH

Model EN-WS-SC3-ZB-IV SC. Modifiers: Ivory - IV

Model EN-WS-SC3-ZB-GR SC. Modifiers: Gray - GR

Model EN-WS-SC3-ZB-BL SC. Modifiers: Black - BL

* + - * 1. 5 Scene. Communication Network: Zigbee

Model EN-WS-SC5-ZB-WH SC. Modifiers: White - WH

Model EN-WS-SC5-ZB-IV SC. Modifiers: Ivory - IV

Model EN-WS-SC5-ZB-GR SC. Modifiers: Gray - GR

Model EN-WS-SC5-ZB-BL SC. Modifiers: Black - BL.

* + - 1. Standards Compliance:
         1. Listed: cUL and UL 916.
         2. FCC Part 15/ICES-003
         3. RoHS Compliant
         4. Complies with Electromagnetic Compatibility (EMC) Standards: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
         5. Nema: Meets WD5 and WD1
      2. Features and Characteristics:
         1. Rated for dry locations.
         2. Pre-programmed light levels or "scenes": Chosen by pushing a button.

Scene Configuration: Changed via Polaris Software.

Application of custom commands to individual Wallstation buttons.

Combined scene and zone in one Wallstation.

* + - * 1. Simple installation with tool-less mounting.

Setup and configuration via Polaris software.

* + - * 1. Ambient Temperature: Ta maximum 140 degrees F (60 degrees C).
        2. Operating Temperature: 14 to 104 degrees F (Minus 10 to 40 degrees C).
        3. Relative Humidity: 5 to 95 percent non-condensing, for indoor locations.
        4. Dimensions (H x W x D):

J-Box Mounted: 4.5 x 2.8 x 0.9 inch (114 x 70 x 24 mm).

Surface-Mount: 4.5 x 2.8 x 0.5 inch (114 x 70 x 13 mm).

* + - * 1. Color: White, Ivory, Gray, or Black.
        2. Mounting: Standard size wall box mount
        3. Mounting: On mounting brackets for low voltage devices
        4. Mounting: Support for "Decorator" style wall plate installation
    1. Standard Series (WS) Wallstations: WS Standard Wallstation. Enable essential lighting control.

\*\* NOTE TO SPECIFIER \*\* Delete configuration option not required.

* + - 1. Two-Button Configuration: A single zone manual controller ideal for conference rooms, private office, classrooms, and other similar spaces. A short press of the upper/ lower buttons turns lighting ON/OFF, while a "press and hold" dim lighting up or down.
      2. Four-Button Configuration: A single zone manual controller ideal for conference rooms, libraries, and other similar spaces. It has a dedicated button for ON, OFF and for raise/lower functionality with intuitive button engraving.

\*\* NOTE TO SPECIFIER \*\* Delete wallstation and model options not required.

* + - 1. Wired Wallstations: Communication Network: GreenBus.
         1. Model EN-WS-2B-GB2-WH, 2 Button. Modifiers: White - WH
         2. Model EN-WS-2B-GB2-IV, 2 Button. Modifiers: Ivory - IV
         3. Model EN-WS-2B-GB2-GR, 2 Button. Modifiers: Gray - GR
         4. Model EN-WS-2B-GB2-BL, 2 Button. Modifiers: Black - BL
         5. Model EN-WS-4B-GB2-WH, 4 Button. Modifiers: White - WH
         6. Model EN-WS-4B-GB2-IV, 4 Button. Modifiers: Ivory - IV
         7. Model EN-WS-4B-GB2-GR, 4 Button. Modifiers: Gray - GR
         8. Model EN-WS-4B-GB2-BL, 4 Button. Modifiers: Black - BL
      2. Wireless Wallstations: Communication Network: Zigbee.
         1. Model EN-WS-2B-ZB-WH, 2 Button. Modifiers: White - WH
         2. Model EN-WS-2B-ZB-IV, 2 Button. Modifiers: Ivory - IV
         3. Model EN-WS-2B-ZB-GR, 2 Button. Modifiers: Gray - GR
         4. Model EN-WS-2B-ZB-BL, 2 Button. Modifiers: Black - BL
         5. Model EN-WS-4B-ZB-WH, 4 Button. Modifiers: White - WH
         6. Model EN-WS-4B-ZB-IV, 4 Button. Modifiers: Ivory - IV
         7. Model EN-WS-4B-ZB-GR, 4 Button. Modifiers: Gray - GR
         8. Model EN-WS-4B-ZB-BL, 4 Button. Modifiers: Black - BL
      3. Standards Compliance:
         1. Listed: cUL and UL 916.
         2. FCC Part 15/ICES-003
         3. RoHS Compliant
         4. Complies with Electromagnetic Compatibility (EMC) Standards: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
         5. Nema: Meets WD5 and WD1
      4. Features and Characteristics:
         1. Rated for dry locations.
         2. Simple installation with tool-less mounting.

Setup and configuration via Polaris software.

* + - * 1. Ambient Temperature: Ta maximum 140 degrees F (60 degrees C).
        2. Operating Temperature: 14 to 104 degrees F (Minus 10 to 40 degrees C).
        3. Relative Humidity: 5 to 95 percent non-condensing, for indoor locations.
        4. Dimensions (H x W x D):

J-Box Mounted: 4.5 x 2.8 x 0.9 inch (114 x 70 x 24 mm).

Surface-Mount: 4.5 x 2.8 x 0.5 inch (114 x 70 x 13 mm).

* + - * 1. Color: White, Ivory, Gray, or Black.
        2. Mounting: Standard size wall box mount.
        3. Mounting: On mounting brackets for low voltage devices.
        4. Mounting: Support for "Decorator" style wall plate installation.
    1. Shade Control Series (SHS) Wallstation: Shade Control Wallstation. Allows lighting and shades adjustments from a single wallstation. Scene buttons allow recalling pre-defined lighting levels and shade position based on user aesthetics and requirements.

\*\* NOTE TO SPECIFIER \*\* Delete wallstation option not required.

* + - 1. Wired Wallstations: 3 Scene. Communication Network: GreenBus.
         1. Model EN-WS-SHSC3-GB2-WH. Modifiers: White - WH
      2. Wireless Wallstations: 3 Scene. Communication Network: Zigbee.
         1. Model EN-WS-SHSC3-ZB-WH. Modifiers: White - WH
      3. Standards Compliance:
         1. Listed: cUL and UL 916.
         2. FCC Part 15/ICES-003
         3. RoHS Compliant
         4. Complies with Electromagnetic Compatibility (EMC) Standards: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
         5. Nema: Meets WD5 and WD1
      4. Features and Characteristics:
         1. Rated for dry locations.
         2. Pre-programmed light levels or "scenes": Chosen by pushing a button.

Scene Configuration: Changed via Polaris Software.

Application of custom commands to individual Wallstation buttons.

Combined scene and zone in one Wallstation.

* + - * 1. Simple installation with tool-less mounting.

Setup and configuration via Polaris software.

* + - * 1. Ambient Temperature: Ta maximum 140 degrees F (60 degrees C).
        2. Operating Temperature: 14 to 104 degrees F (Minus 10 to 40 degrees C).
        3. Relative Humidity: 5 to 95 percent non-condensing, for indoor locations.
        4. Dimensions (H x W x D):

J-Box Mounted: 4.5 x 2.8 x 0.9 inch (114 x 70 x 24 mm).

Surface-Mount: 4.5 x 2.8 x 0.5 inch (114 x 70 x 13 mm).

* + - * 1. Color: White, Ivory, Gray, or Black.
        2. Mounting: Standard size wall box mount
        3. Mounting: On mounting brackets for low voltage devices
        4. Mounting: Support for "Decorator" style wall plate installation
    1. Tunable White (TW) Wallstation: Tunable-White Wallstation. Single zone low voltage wall mounted controllers providing local ON/OFF control over a lighting zone or multiple zones.

\*\* NOTE TO SPECIFIER \*\* Delete model options not required.

* + - 1. Model EN-WS-TWSC3-GB2-WH. TW Wallstation, 3 Button: Greenbus II.
      2. Model EN-WS-TWSC3-ZB-WH, TW Wallstation, 3 Button: Zigbee.
      3. Model KSW-EN-SMK-ZB-WH. Surface-mount kit.
      4. Standards Compliance:
         1. Electromagnetic: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5.
         2. FCC Part 15/ICES-003.
         3. Listed: cULus. Energy Management Equipment: UL 916.
         4. RoHS Compliant.
         5. Meets Nema WD 6 and WD 1.
      5. Single-gang form factor in stainless steel housing.
      6. Connects to Encelium X Network Light Management System (LMS).
      7. Polaris Software:
         1. Combined scene & zone in one Wallstation.
         2. Application of custom commands to individual Wallstation buttons.
      8. Location: Entry points. Used to "activate" or "de-activate" a lighting zone.
      9. Class 2 low voltage device.
      10. Power: External DC power supply.
      11. Operating Temperature: 14 to 104 degrees F (Minus 10 to 40 degrees C).
      12. Maximum Ambient Temperature: 140 degrees F (60 degrees C).
      13. Relative Humidity: 5 to 95 percent non-condensingf for indoor locations.
      14. Dimensions (HxWxD):
          1. J-Box Mounted: 4.5 x 2.8 x 0.9 inch (114 x 70.1 x 24 mm).
          2. Surface Mount: 4.5 x 2.8 x 0.5 inch (114 x 70.1 x 13 mm).
      15. Mounting: In Standard size wall box of 2.4 inches (61 mm) minimum.
      16. Mounting: On mounting brackets for low voltage devices.
      17. Mounting: Support for "Decorator" style wall plate installation
    1. Industrial Push Button Wall Station (INDPB) and Key Switch Station (KSW). Single zone low voltage wall mounted controllers providing local ON/OFF control over a lighting zone.

\*\* NOTE TO SPECIFIER \*\* Delete model options not required.

* + - 1. Model EN-WS-INDPB-GB2. Field Bus: Greenbus II.
      2. Model EN-WS-INDPB-GB2-DR, Damp-Rated. Field Bus: Greenbus II.
      3. Model KSW-300 GB2. Field Bus: Greenbus II.
      4. Standards Compliance:
         1. Electromagnetic: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5.
         2. FCC Part 15/ICES-003.
         3. Listed: cULus. Energy Management Equipment: UL 916.
      5. Single-gang form factor in stainless steel housing.
      6. Connects to Encelium X Network Light Management System (LMS) through a GreenBus II cable or standard 2-pin connectors for the Industrial Push Button or Sensor Interface Module (SIM) for the Key Switch Controller.
      7. Location: Entry points. Used to "activate" or "de-activate" a lighting zone.
      8. Industrial Push Button (IBDPB):
         1. Zone Status: LED display. White: ON. Blue: OFF.
         2. Manually overrides the time schedule by re-activating the desired zone.
         3. Two ports that accept 18 AWG Class 2 Communication Bus for connection to the Encelium X Networked Light Management System.
      9. Key Switch Station (KSW):
         1. Can be used as an emergency override with programmable responses.
         2. KSW-SIMs: Two ports accepting pre-terminated GreenBus II communication cable.
      10. Class 2 low voltage device.
      11. Power: Interconnected 18 AWG GreenBus II cable.
      12. Maximum Ambient Temperature: 104 degrees F (40 degrees C).
      13. Dimensions (HxWxD): 4.09 x 1.3 x 0.91 inch (104 x 33 x 23 mm).
      14. Mounting: In Standard size wall box of 2.4 inches minimum.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete paragraphs if not required.

* 1. SENSORS
     1. SensiLUM: Wireless Integrated Sensor. Enables occupancy detection, daylighting harvesting, and individual or group control of luminaires.
        1. EN-CLM-PIR-DD-ZB. Communication Network: Wireless mesh. Dimming Protocol: 0 to 10V / DEXAL.
        2. Compatible with Encelium X Light Management System (LMS).
        3. Allows luminaires to be wirelessly controlled. The Encelium X Wireless Manager sends dedicated commands wirelessly to SensiLUM Sensors enabling individually controlled luminaires.
        4. Standards Compliance:
           1. UL 924 Listed for Control of Emergency Lighting.
           2. UL 2043 Listed, Class 2, Plenum Rated.
           3. IP Rating: IP20
           4. FCC part 15 Class A
           5. Sensing: PIR, Photo sensor.
           6. Dimming: 0 to 10 V. DEXAL (Data Exchange for Advanced Lighting) enabling bi-directional communication and power between driver and sensor for smart building applications requiring exact luminaire specific data, including power consumption, temperature profile, operating hours, and diagnostics.

Control Output: Controls 4 DALI, DEXAL or 10, 0 to 10 V drivers.

* + - * 1. Luminaire Integrated Wireless Sensors:

Monitor real-time occupancy via PIR.

Photo sensor daylight harvesting.

Driver data extraction; power consumption, operating time, and thermals.

* + - * 1. Seamlessly enables tunable white applications with luminaire integrated control for 2-CH DALI 2.0, Type 8 LED driver.
        2. Adjustable dual-axis shutter Allows fine tuning of the field of view.
        3. Operating Voltage: 12 to 20 V.
        4. Operating Power: Less than 0.3 W in all operation.
        5. Operating Temperature: 140 degrees F (60 degrees C).
        6. Control Output: 0-10 V, DALI, DEXAL.
        7. Wireless Range: 150 ft (45.7 m) line of sight.
        8. Application Height: Up to 20 ft (6.1 m).
        9. Field View: 100 degrees field view coverage.
        10. Mounting: Fits in a standard 0.5 inch (Pg-7) knockout.
    1. Wireless Ceiling Mount Sensor: Wireless Passive Infrared (PIR) and Photo Sensors
       1. Wireless Passive Infrared Occupancy (PIR) and Integrated Photo Sensors: The Wireless PIR/Photo Sensors collect occupancy and daylight information from a lighted space and works over a wireless mesh network.
          1. Integrated Photo Sensor: For daylight harvesting applications.

\*\* NOTE TO SPECIFIER \*\* Delete model options not required.

* + - 1. Model EN-SCPPH-0450-ZB.
         1. Mounting Height: 8 to 12 ft (2.4 to 3.7 m). Coverage: 450 sq ft (42 sq m) range.
      2. Model EN-SCPPH-1500-ZB.
         1. Mounting Height: 8 to 12 ft (2.4 to 3.7 m). Coverage: 1500 sq ft (140 sq m) range.
      3. Model EN-SCPPH-HB-ZB. High bay; mounting height up to 40 ft (12 m):
         1. Mounting Height: 20 ft (6 m). Coverage: 1,100 sq. ft. (102 sq m).
         2. Mounting Height: 30 ft (9 m). Coverage: 1,800 sq. ft. (167 sq m).
         3. Mounting Height: 40 ft (12 m). Coverage: 2,800 sq. ft. (260 sq m).
      4. Regulatory:
         1. Energy Management Equipment: UL916 Listed. RoHS Compliant.
         2. Meets ASHRAE Standard 90.1 and CEC Title 24 requirements
         3. FCC Part 15/ICES-003
      5. Light Sensor: 0 to 1,000 Lux. Shields included. No opening of sensor required.
      6. Batteries: 2-AA Alkaline batteries. Exchangeable and readily accessible.
      7. Configurability via Polaris Software
         1. Any number of sensors can be mapped to any number of zones.
         2. Walk-test functionality without opening covers.
      8. Timeout settings fully configurable.
      9. Setup and Configuration: Via Polaris software.
      10. Monitoring: Mapping/remapping. Time-out settings.
      11. Operating Temperature Range:
          1. Standard and Extended Range Sensors: 32 to 104 degrees F (0 to 40 degrees C).
          2. High Bay (HB) Sensors: 32 to 140 degrees F (0 to 60 degrees C).
      12. Relative Humidity: 0 to 95 percent non-condensing, for indoor use only.
      13. Housing: UV plastic. Color: Matte White.
          1. Base Diameter: 3.37 inches (86 mm).
          2. Height: SR sensor; 1.13 inches (29 mm).
          3. Height: LR and HB sensors 1.03 inches (26 mm).
      14. Weight: 3.88 oz. (110 g).
      15. Reposition sensor with no noticeable marks
      16. Tool-less mounting: 360 degree directional flexibility.
      17. Mounting Height:
          1. SR and LR Sensors: 8 to 12 feet (2.4 to 3.7 m)
          2. HB Sensors: Up to 40 feet (12 m)
    1. GreenBus Sensor (GBS): Ceiling / surface mount sensors providing a range of networked sensor solutions for applications with finished ceilings (e.g., ceiling tiles, sheetrock, plaster). They combine passive infrared (PIR) and photocell sensing in a single compact form factor.
       1. GreenBus Sensors: Technology: PIR/Photo. Sensing Angle: 360 degrees.

\*\* NOTE TO SPECIFIER \*\* Delete model options not required.

* + - * 1. Model: EN-SCPPH-0450-ZB. Mounting Height: 8 to 12 ft (2.4 to 3.7 m). Coverage: 450 sq ft (42 sq m).
        2. Model: EN-SCPPH-1500-ZB. Mounting Height: 8 to 12 ft (2.4 to 3.7 m). Coverage: 1500 sq ft (140 sq m)
        3. Model: EN-SCPPH-HB-ZB.

Mounting Height: 20 ft (6 m). Coverage: 1100 sq ft (102 sq m)

Mounting Height: 30 ft (9 m). Coverage: 1800 sq ft (167 sq m)

Mounting Height: 40 ft (12 m). Coverage: 2800 sq ft (260 sq m)

* + - 1. Regulatory:
         1. Listed: cULus and UL 916.
         2. Meets ASHRAE Standard 90.1 and CEC Title 24 requirements.
         3. Meets FCC Part 15/ICES-003
      2. Tool-less mounting options for a variety of applications.
         1. Quickly test installation of entire floor by pressing a single button on the sensor.
         2. Enables local pairing of load controllers to enable occupancy.
      3. Masking options to maximize control flexibility.
      4. Features and Characteristics
         1. Light Sensor: 0 to 1,000 Lux. Shields included. No opening of sensor required.
         2. Coverage Options:

Micro-Motion Sensitivity Range: 450 sq ft (42 sq m).

High Sensitivity Core Range: 1,500 sq ft (140 sq m).

* + - * 1. LED status indicator.
        2. Configurability via Polaris Software:

Any number of sensors can be mapped to any number of zones.

Timeout settings fully configurable.

Occupancy time delays, photocell set-points

Remotely upgradable firmware

Association of single sensor to multiple zones/spaces

* + - * 1. Power Supply: Operating voltage: 12 to 24V from GreenBus bus.
        2. Operating Temperature Range:

Standard and Extended Range Sensors: 32 to 104 degrees F (0 to 40 degrees C).

High Bay (HB) Sensors: 32 to 140 degrees F (0 to 60 degrees C).

* + - * 1. Relative Humidity: 0 to 95 percent non-condensing. For indoor use only.
      1. Physical:
         1. Base Diameter: 3.37 inch (86 mm).
         2. SR Sensor Height: 1.13 inch (28.6 mm).
         3. ER Sensor Height: 1.03 inch (26.2 mm).
         4. Weight: 2.86 oz (81 g)
         5. Color: Matte White.
         6. Housing: UV stabilized plastic.
         7. Mounting: Magnetic.
         8. Mounting: Surface.
         9. Mounting: Ceiling tile.
         10. Mounting: Ring.
    1. Low-Voltage Sensors: Low Voltage Occupancy and Daylight Sensor. Single and multi-technology sensors in various configurations and application types.
       1. Single-Technology Passive Infra-Red (PIR) Sensors: For small and large spaces when major motion is available.
       2. Multi-Technology: Adds active Ultrasonic (U/S) sensor to PIR sensor increasing minor motion sensitivity in applications like offices and restrooms.
       3. Collect occupancy data from a lighted space and works with Encelium X Networked and Encelium Edge Standalone Wireless Light Management Systems via GreenBus II wire and/or ZigBee standards based mesh network.

\*\* NOTE TO SPECIFIER \*\* Delete model options not required.

* + - 1. Model SCP-0450 PIR: Sensing Angle: 360. Coverage Area: 450 sq ft (42 sq m). Application: Ceiling. Current Required: 20 mA.
      2. Model SCP-1500 PIR: Sensing Angle: 360. Coverage Area: 1500 sq ft (140 sq m). Application: Ceiling. Current Required: 20 mA.
      3. Model SCM-0500 PIR and U/S: Sensing Angle: 180. Coverage Area: 500 sq ft (47 sq m). Application: Ceiling. Current Required: 20 mA.
      4. Model SCM-1000 PIR and U/S: Sensing Angle: 360. Coverage Area: 1,000 sq ft (93 sq m). Application: Ceiling. Current Required: 35 mA.
      5. Model SCM-2000 PIR and U/S: Sensing Angle: 360. Coverage Area: 2,000 sq ft (186 sq m). Application: Ceiling. Current Required: 30 mA.
      6. Model SWP-WV00 PIR: Sensing Angle: 110. Coverage Area: 2,500 sq ft (232 sq m). Application: Ceiling. Current Required: 15 mA.
         1. Large Motion Ranges: 68 ft (21 m). Small Motion Ranges: 31 ft (9 m)
      7. Model SWM-1200 PIR and U/S: Sensing Angle: 110. Coverage Area: 1,200 sq ft (112 sq m). Application: Wall and Ceiling. Current Required: 25 mA.
         1. Large Motion Ranges: 68 ft (21 m). Small Motion Ranges: 31 ft (9 m)
      8. Model SWP-LRNG PIR: Sensing Angle: 26. Coverage Area: 100 x 33 sq ft (31 x 10 sq m). Application: Long range. Current Required: 15 mA.
         1. Large Motion Ranges: 100 ft (31 m).
      9. Model SWP-HBAY PIR: Sensing Angle: 73. Coverage Area: 55 x 7 sq ft (17 x 2 sq m). Application: High Bay Aisle. Current Required: 15 mA.
         1. Large Motion Ranges: 55 ft (17 m).
      10. Regulatory: cULus Certified. Meets ASHRAE Standard 90.1 and CEC Title 24.
      11. Allow timeouts configurable via system software.
      12. Allow occupancy and vacancy sensor configurations via system software.
      13. Depending on software configuration will switch or dim luminaires.
      14. Allow overlapping and comfort zone configurations via system software.
      15. Operating Power: From system controller or the devices they are attached to.
      16. Communication: Shall be via Class 2 communication bus
      17. Wireless Communication: Wireless Control Module/Area Lighting Controller.
      18. Any number of sensors can be mapped to any number of zones.
      19. Timeout settings fully configurable.
      20. Able to self-calibrate and retain settings during power interruptions.
      21. Automatically analyze and adjust sensitivity and time delay
      22. Mechanically Wired: Sensors for ceiling and wall mounts, including corners.
      23. Operating Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
      24. Relative Humidity: 0 to 95 percent, non-condensing. Indoor use only
      25. Control:
          1. Ultrasonic Sensitivity: 0 to 100 percent; green knob.
          2. Passive Infra-Red Sensitivity: 0 to 100 percent; red knob.
          3. Time Delay: 30 seconds to 30 minutes; black knob.
      26. Indicator:
          1. Red LED: Motion detected with PIR sensor.
          2. Green LED: Motion detected with U/S sensor (U/S models only).
      27. Base Diameter: 4.2 inch (107 mm) ceiling and wall mounted sensors.
      28. Ceiling Sensors Height: 1.57 inch (40 mm).
      29. Overall Length of Wall Sensors: 6.43 inch (163 mm).
      30. Mounting Height of Ceiling-Mounted Sensors: 8 to 12 ft (2.4 to 3.7 m)
      31. Mounting Height of Wall-Mounted Sensors: 8 to 10 ft (2.4 to 3 m)
      32. SWP-HBAY Sensors: 10 to 40 ft (3 to 12.2 m)
    1. Sensor Interface Module (SIM): Field Bus: GB2. A key component of the Encelium X Networked Light Management System (LMS). Connects via two ports that accept pre-terminated GreenBus II Communication Cable.

\*\* NOTE TO SPECIFIER \*\* Delete model options not required.

* + - 1. Model: EN-SIM-AI/SPS-GB2-BK. Modifiers: Black (BK).
      2. Model: EN-SIM-AI/SPS-GB2-BK-DR. Modifiers: Black/Damp-Rated (BK/DR).
      3. Standards Compliance:
         1. FCC Part 15/ICES-003.
         2. Listed: cULus.
         3. UL 916: Energy Management Equipment.
         4. UL 2043: Heat and Smoke Release for Air-Handling Spaces.
         5. Complies with the following electromagnetic requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5.
      4. Sensor Agnostic: Provides interface between most low voltage occupancy or photo sensors and the LMS.
      5. Automatically addressed as soon as it is connected to an Encelium X LMS via the GreenBus II Network.
      6. Automatically detects and adjusts to sensor it is wired to and establishes two-way communication.
      7. Individually Addressable. Enables each sensor to be independently configured to best meet facility needs.
      8. No Batteries Required: Provides power to connected sensors.
      9. Operating Temperature: Minus 40 to 131 degrees F (Minus 40 to 55 degrees C
      10. Dimensions (WxLxH): 1.18 x 2.38 x 0.62 inches (30 x 61 x 15.7 mm)
      11. Mounting: Fixture or junction box in standard 1/2 inch knockout (7/8 inch) dia.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. DISTRIBUTED LOAD CONTROLLERS

\*\* NOTE TO SPECIFIER \*\* Works with Encelium X. Delete paragraphs not required.

* + 1. Connected Lighting Modules (CLM) Wireless: For individual luminaire control to spaces delivering flexibility to building managers for the life of the space. With controls inherently integrated, it significantly reduces electrical contractor labor hours. For the lighting OEM, it reduces component count and streamlines assembly.
       1. Product: ZBHA-CLM-DIM-ENC. Description: CLM DIM.
          1. Communication Network: Zigbee Wireless Encelium Network.
          2. Dimming Protocol: 0-10V, DALI, DEXAL, DALI Type 8 LED driver.
       2. Regulatory:
          1. UL916 (Energy Management Equipment)
          2. UL924 cUL US Listed (Emergency Lighting Equipment)
          3. UL2043 Plenum Rated Environmental Protection: Rated for damp location (IP54); RoHS compliant.
          4. Radio Interference: FCC Part 15
          5. RoHS compliant.
          6. Complies with Electromagnetic Requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
       3. Performance:
          1. Control Options: Continuous 0 to 10V dimming
          2. Group Control: 0 to 10V ballasts and LED drivers.
          3. Used to extend wireless network capability.
          4. Memory: Retains system settings in non-volatile memory.
       4. Enable wireless connectivity to individual or group of luminaires with 0-10V Dimming ballasts and/or 0-10V LED Drivers.
       5. Wireless Network Communication: Via protocol based on ZigBee standard
          1. Reliable (mesh topology), self-configuring (discovery) and self-healing. Compensates interruptions in network by re-directing communication.
          2. High security level employing secure encryption (128 bit) methods.
       6. Addresses to Luminaire Integrated Modules: Assigned during system start-up.
          1. Upon establishing two way communication with the Wireless Manager, these individually addressable modules enable individual or group control and configuration of lighting components.

Addressing: Connected Lighting Modules to be individually addressable.

System automatically addresses individual modules during start-up eliminating need to pre-address devices or record serial numbers during installation.

* + - 1. Wireless Range: 150 ft (45.7 m) line of sight, 50 ft (15.2 m) standard walls.
      2. LED Drivers: Each CLM is capable of handling 4 DEXAL drivers in parallel connection.
      3. Dimming Output: Single 0 to 10 V dimming output per IEC 60929 Annex E. Capable of sinking 3 mA (Equivalent to 10 typical dimming ballasts/drivers).
         1. DALI and DALI Type 8 for Tunable White./
      4. Input Voltage: 12 VDC. Power: Delivered by OPTOTRONIC LED drivers with DEXAL Technology
         1. Input Current: Typically, Less than 40 mA
         2. Radio Frequency: 2.4 GHz
      5. Material: Plenum rated plastic (UL2043)
      6. Operating Temperature: Minus 40 to 140 degrees F (Minus 40 to 60 degrees C).
      7. Relative Humidity: 5 to 95 percent non-condensing. Rated for indoor locations.
      8. Dimensions (HxWxD): 5.47 x 3.34 x 1.77 inch (135 x 85 x 45 mm)
      9. Mounting: In standard 1/2 inch knockout present on virtually every luminaire.
    1. Encelium X Wireless Control Modules (WCM): A key component of the Encelium X Networked Light Management System (LMS)

\*\* NOTE TO SPECIFIER \*\* Delete model option not required.

* + - 1. Model EN-WCM2-ZB-DR: Encelium X Damp Rated
      2. Model EN-WCM2-ZB: Encelium X
      3. Individually Addressable: Enables ballasts or LED drivers to be independently controlled and configured to best meet the needs of the facility.
      4. Switches a fixture ON or OFF via a relay contained in the module and delivers a low voltage dimming signal to any 0-10V dimming ballast/driver.
      5. When connected to the Encelium X LMS:
         1. Enables low-voltage products via the GreenBus II port on the device.
         2. Enhances flexibility of Encelium X System to include phase-cut dimming, area lighting control, low voltage wallstations, key switches, Sensor Interface Module (SIM) and relay panel control.
      6. Standards Compliance:
         1. Energy Management Equipment: UL 916 Listed.
         2. Emergency Lighting Equipment: UL 924 Listed.
         3. Heat and Smoke Release for Air Handling Spaces: UL 2043 Listed.
         4. Radio Interference: FCC Part 15/ICES-003.
         5. Meets or exceeds the following electromagnetic requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
      7. Electrical: Maximum Ratings. Voltage tolerance is plus or minus 10 percent.
         1. Ballast/LED Driver (max. 2 LED driver/fixtures): 4.5A 120-347 Vac.
         2. Tungsten: 5.8A 120-347 Vac
         3. General Purpose: 9.0A 120-347 Vac.
      8. Control Options:
         1. Single 0-10V dimming output (IEC 60929 Annex E). Capable of sinking 10 mA (Equivalent to 10 typical dimming ballasts/drivers).
         2. 0-10V or DALI connectivity.
         3. Occupancy sensors.
         4. GreenBus II connection port for GreenBus II devices.

Area Lighting Control (ALC) Module.

Phase Cut Dimming Module.

Relay Panel.

* + - 1. Wireless: Radio Frequency: 2.4 GHz.
         1. Range: 100 ft (30480 mm) line of sight, 50 ft (15240 mm) through standard walls when mounted outside of the junction box. Range decreases 50 percent when mounted inside luminaire.
      2. Operating temperature range: Minus 40 to 140 degrees F (Minus 40 to 60 degrees C)
      3. Relative Humidity: 5 to 95 percent non-condensing rated for indoor locations.
      4. Mechanical:
         1. Dimensions: 3.2 x 1.7 x 1.7 inches (83 x 43 x 43 mm).
         2. Standard Units are for indoor use only or for mounting inside waterproof enclosure.
         3. Damp-rated units may be used in damp locations.
         4. Dual mounting: Mounts inside a standard, 4 x 4 inch (102 x 102 mm) junction box-in standard 1/2 inch knockout.
         5. Material: Plenum rated black plastic (UL2043).
    1. Wireless Area Lighting Controller (WALC): Allows a group of luminaires to work with the Encelium X Networked over a mesh network based on ZigBee standards.

\*\* NOTE TO SPECIFIER \*\* Delete model option not required.

* + - 1. Model EN-ALC-ZB-BK: Indoor
      2. Model EN- ALC-ZB-BK-DR: Damp Rated.
      3. Individually addressable devices. Can switch an electrical load up to 20 A or a wired zone of multiple luminaires ON or OFF via an integrated high current relay while setting the zone's overall light level with a 0 to 10 V dimming output wired to the luminaires' LED drivers or dimming ballasts.
      4. 0-10V dimming output is isolated and suitable for installation as a NEC Class 2 or Class 1 wiring.
      5. Standards Compliance:
         1. Energy Management Equipment: UL 916 cULus Listed.
         2. Emergency Lighting Equipment: UL 924 cULus Listed.
         3. Heat and Smoke Release for Air-Handling Spaces: UL 2043 cULus Listed.
         4. Radio Interference: FCC Part 15/ICES-003
         5. Environmental protection: Rated for damp location; RoHS compliant.
         6. Shall comply or exceed the following electromagnetic requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5.
      6. Electrical: Maximum Load Ratings:
         1. 20A 120-347 Vac Ballast
         2. 20A 120-347 Vac Resistive
         3. 20A 120-347 Vac Tungsten
         4. 20A 120-347 Vac General Purpose
         5. 1.5 HP 120-277 Vac Motor
      7. Control Options
         1. ON/OFF Switching
         2. Continuous 0-10 V dimming output, IEC 60929 Annex E); capable of sinking 30 mA; corresponding to 30 typical ballasts/LED drivers.
      8. Wireless Communication: Via wireless medium using non-proprietary open protocol (e.g., ZigBee).
         1. Radio Frequency: 2.4 GHz
         2. Range: 100 ft ( mm) line of sight, 50 ft () through standard walls when mounted outside of the junction box.
      9. Operating Temperature Range
         1. 10 Amp: Minus 40 to 149 degrees deg F (Minus 40 to 65 degrees C)
         2. 20 Amp: Minus 40 to 131 degrees deg F (Minus 40 to 55 degrees C)
      10. Relative Humidity: 5 to 95 percent non-condensing rated for indoor locations.
      11. Mechanical:
          1. Dimensions (LxWxH): 3.5 x 2.7 x 1.6 (90 x 68 x 40 mm).
          2. Mounting: Standard 1/2 inch (13 mm) electrical box knockout.
          3. Material: Plenum rated black plastic (UL2043).
          4. Port to connect GreenBus II devices.
          5. Terminal block for direct sensor connection.

\*\* NOTE TO SPECIFIER \*\* The Luminaire Control Module (LCM) is a key component of the Encelium X Networked Light Management System (LMS). This device provides an interface between ballasts and the GreenBus II® communication network. Delete if not required.

* + 1. Luminaire Control Module (LCM):

\*\* NOTE TO SPECIFIER \*\* Delete model option not required.

* + - 1. Model: EN-ILCM-1R10V-GB2-BK. Field Bus: GB2. Modifiers: Black Housing.
      2. Model: EN-ILCM-1R10V-GB2-BKDR. Field Bus: GB2. Modifiers: Black Housing, Damp-Rated.
      3. Regulatory:
         1. Energy Management Equipment: Listed UL 916 and cULus.
         2. Emergency Lighting Equipment: Listed UL 924 and cULus.
         3. Heat and Smoke Release for Air-Handling Spaces: UL 2043.
         4. FCC Part 15/ICES-003 Complies with the following electromagnetic requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
         5. Install in accordance with applicable national and local electrical and building codes.
      4. Features and Characteristics:
         1. Adjust light levels to respond to variable lighting requirements
         2. Customize lighting scenes for tailored experiences/tasks
         3. Schedule Luminaire operation to low energy use during off-peak occupancy.
         4. Individually Addressable: Control ballasts independently. Configure to best meet facility needs.
         5. Switches a fixture ON or OFF via a relay contained in the module.
         6. Low voltage dimming signal to any 0-10V dimming ballast/driver.
         7. Connects to LED drivers without isolation between the dimming section and electrical output for added flexibility in LED driver options.
         8. Operating Temperature: Minus 40 to 131 degrees F (Minus 40 to 55 degrees C).
      5. Electrical: Maximum Ratings. Voltage Tolerance: Plus or minus 10 percent.
         1. Electronic Ballast: 2.5A 120-480 Vac
         2. Ballast: 4.5A 120-480 Vac
         3. Resistive: 4.5A 120-480 Vac
         4. Tungsten: 4.5A 120-480 Vac
         5. General Purpose: 4.5A 120-480 Vac
      6. Control Options:
         1. Single 0-10V dimming output (IEC 60929 Annex E). Capable of sinking 25 mA Equivalent to 10 typical dimming ballasts/drivers.
         2. Connects to Encelium X Networked Light Management System via two ports that accept pre-terminated GreenBus II Communication Cable.
      7. Dimensions (WxLxH): 1.18 x 2.38 x 0.62 inches (30 x 61 x 16 mm).
         1. For luminaire or junction box mounting in 1/2 inch knockout (0.875 inch / 0.034 mm diameter)

\*\* NOTE TO SPECIFIER \*\* Works with Encelium X Networked Light Management System.

* + 1. Area Lighting Control (ALC): High power switching and dimming interface between a group of luminaires and the Encelium X Networked Light Management System (LMS).

\*\* NOTE TO SPECIFIER \*\* Delete model option not required.

* + - 1. Model: EN-ALC-1R10V-GB2-BK. Field Bus: GB2. Modifiers: Black.
      2. Model: EN-ALC-1R10V-GB2-BK-DR. Field Bus: GB2. Modifiers: Black/Damp Rated.
      3. Standard Compliance:
         1. Energy Management Equipment: UL 916 cULus Listed.
         2. Emergency Lighting Equipment: UL 924 cULus Listed.
         3. Heat and Smoke Release for Air-Handling Spaces: UL 2043
         4. Environmental protection: Rated for damp location; RoHS compliant.
         5. Radio Interference: FCC Part 15/ICES-003.
         6. Meets or Exceeds the Following Electromagnetic Requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5.
      4. Individually Addressable: Switches single wired zone of multiple luminaires ON or OFF via integral high current relay while setting the zone's overall light level with 0-10V dimming output wired to fixtures' dimming ballasts or LED drivers.
      5. Dimming Output: Fully isolated. Suitable for installation as a NEC Class 2 or Class 1 circuit.
         1. Able to switch and dim many LED luminaires with 0-10V drivers compliant to the lighting industry's open standard IEC 60929 Annex E.
      6. Can switch entire circuit of electrical loads. Suitable for general plug load control.
      7. Electrical: Maximum load ratings.
         1. 20A 120-347 Vac Ballast.
         2. 20A 120-347 Vac Resistive.
         3. 20A 120-347 Vac Tungsten.
         4. 20A 120-347 Vac General Purpose.
         5. 1.5 HP 120-277 Vac Motor.
      8. Communication: Via NEC/CEC Class 2 communication wire.
      9. Control Options.
         1. ON/OFF Switching
         2. Continuous 0-10V dimming output, IEC 60929 Annex E); capable of sinking 30mA; corresponding to 30 typical ballasts/LED drivers.
      10. Air Gap Off: Enforce physical disconnection of AC power to ballast or driver when "OFF" is selected either automatically or manually.
      11. Memory: Retain system settings in non-volatile memory.
      12. Connects to the Encelium X Networked Light Management System via two ports that accept pre-terminated GreenBus II Communication Cable.
      13. Operating Temperature Range: 32 to 131 degrees F (0 to 55 degrees C)
      14. Relative Humidity: 5 to 95 percent non-condensing rated for indoor locations
      15. Mechanical:
          1. Dimensions (WxLxH): 1.9 x 2.4 x 1.75 inch (48 x 61 x 44 mm)
          2. Suitable for luminaire or junction box mounting in standard
          3. Mounting: Standard 1/2 inch (13 mm) electrical box knockout.
          4. Material: Plenum rated black plastic (UL2043)
    1. Encelium X Phase Cut Dimming Module (PCDM): Provides an interface between the phase cut dimmable, forward, and reverse phase, ballasts / LED drivers and the Encelium X Networked
       1. Model EN-PCDM-GB2. Field Bus: GB2
       2. Automatically addressed once connected to the GreenBus II network.
          1. Individually addressable. Enables each group or zone of fixtures to be independently controlled and configured to best meet needs of facility.
       3. Controlled Load Types: Incandescent/Halogen lamps, Fluorescent ballasts, LED fixtures, and LED/CF lamps.
       4. Fixtures Driven by a PCDM: When connected to Encelium X Networked , can be controlled via wallstations allowed in these systems.
       5. Connected Loads: When connected to the Encelium X LMS can be controlled by Touch Screen Panels or from the Polaris software
       6. Built-in Relay: Provides ON/ OFF switching control
       7. Standard Compliance:
          1. Energy Management Equipment: UL 916 cULus Listed.
          2. Emergency Lighting Equipment: UL 924 cULus Listed.
          3. Electromagnetic Requirements: Meets IEC 61000-4-2.
          4. Transient protection: ANSI C62.41 Category A
          5. Radio Interference: FCC 47 CFR Part 18
       8. Electrical:
          1. Input Voltage: 120-277 VAC 50/60Hz
          2. Maximum Output Load Rating: 120 VAC: 450W, 3.8 A MAX
          3. Maximum Output Load Rating: 277 VAC: 900W, 3.3 A MAX
          4. ANSI C62.41 Category A Transient protection
       9. Connection: Via 2 ports that accept GreenBus II network connections.
       10. Dimming Type: Phase Cut Forward, Reverse and Ballast.
       11. Controllable Load Types: Incandescent / Halogen, Fluorescent ballasts, LED fixtures, and compatible LED/CFL lamps.
       12. Store configuration in non-volatile flash memory.
           1. Adjust light levels to respond to variable lighting requirements.
           2. Schedule luminaire group to lower energy use during off-peak occupancy.
           3. Customize lighting scenes for tailored experiences and tasks.
           4. Adjust luminaire group assignments for adjusted space layouts.
       13. Operating Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
       14. Case Temperature: Up to 158 degrees F (70 degrees C).
       15. Suitable for indoor dry locations only.
       16. Dimensions (WxLxH): 4.75 x 5.0 x 2.24 inch (121 x 127 X 57 mm).
       17. Installation on top of a square 4-11/16 inch (119 mm) junction box.
    2. WSLC: Wireless Site Lighting Control Module. Extends Encelium X Networked Light Management System's controls capability to building's surroundings or site such as parking lots and short pathways, via a wireless mesh network based on ZigBee standards.
       1. Model EN-OC-SLC-ZB. Onboard photo sensor and input for external sensor.
       2. Standards Compliance:
          1. UL/916/773 cULus listed
          2. Meets ASHRAE Standard 90.1 and CEC Title 24 requirements
          3. FCC Part 15/ICES-003
       3. Electrical:
          1. Operating Voltage: 120 to 347 V
          2. Power Consumption at no Load: Less than 1.0 W
          3. Surge Protection: 6kV, 3kA
          4. Load Rating: 10A: Electronic driver/ballast, magnetic ballast, resistive load
       4. Power Metering: V, I, P, Energy
          1. Accuracy: Less than 2 percent from 0.5 to 10A load.
          2. Accuracy: Less than 5 percent below 0.5 A
       5. Interface:
          1. Single Dimming Output: 0-10V (IEC 60929 Annex E), DALI or DEXAL compatible
          2. Sink / Source: 10 mA
          3. Sensor Input: Maximum 20 mA; minimum 18 V; nominal 19.5 V
          4. Input for external occupancy sensor.
       6. Software:
          1. Time schedule based control.
          2. Daylight based control.
          3. Astronomical schedule based control.
          4. Occupancy based control.
       7. Communication:
          1. Radio Frequency: 2.4 GHz.
          2. Transmit Power: 20 dBm.
          3. Line of sight between modules: Up to 1,000 ft ().
       8. Operating Temp: Minus 40 to 150 degrees F (Minus 40 to 65 degrees C).
       9. Relative humidity: 0 to 95 percent.
       10. Ingress protection: IP66.
       11. Base Diameter: 3.31 inches (84 mm). Height: 2.61 inches (66.4 mm).
       12. Color: Black.
       13. Housing: UV stabilized PC.
       14. Installs on top of a luminaire via an ANSI C136.41 compliant 3, 5 or 7-pin twist-lock connector.

\*\* NOTE TO SPECIFIER \*\* Delete article not required or delete paragraphs not required.

* 1. MANAGERS
     1. Wireless Manager (WM): Collects, processes, and distributes lighting control information to control modules, wallstations and sensors over a wireless mesh network. Can control up to 100 nodes.
        1. Model EN-WM-ZB-X. Communication Network: ZigBee Wireless. System: Encelium X. The central intelligence point in system for wireless devices.
           1. Collects signal information from photo sensors (light levels), occupancy sensors (occupancy status) and wallstations (wall-mounted lighting controllers).

Photo / occupancy sensors do not control light levels but are connected to the wireless network and provide data to the WM.

* + - * 1. The WM determines action to take based on status signals from sensors.

Determines brightness levels or ON/OFF status for fixtures and zones.

* + - 1. Standards Compliance:
         1. Safety: cULus Listed. Energy Management Equipment: UL916 listed.
         2. Environmental Protection: Rated for dry location; RoHS compliant
         3. Radio Interference: FCC Part 15/ICES-003, Class A
         4. Complies with the following electromagnetic requirements:

EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5

* + - 1. Electrical: Input voltage via Power over Ethernet (PoE).
         1. PoE Port: Dual PoE ports for daisy-chain of up to 3 Wireless Managers.
      2. Communication: Via wireless medium using non-proprietary open protocol. AES 128-bit encryption. Communication Status: LED.
         1. Detects devices during start-up and addresses compatible sensors, Wallstations and system field devices it is connected to and establishes two-way communication.

Communicates with server over Ethernet connection employing TCP/IP protocol.

Connects with a facility's or tenant's Local Area Network (LAN) via Ethernet connection.

* + - 1. Wireless Networks: Reliable mesh topology, self-configuring (discovery) and self-healing. Network interruptions are compensated for by re-directing communication.
         1. High security level employing logically unbreakable secure encryption.
         2. Wireless Network Port: Ethernet 1-/100BaseTx Cat-5 RJ45 port
         3. Wireless Range: Line of Sight: 100 ft (30.5 m). Through Standard Walls: 50 ft (15.2 m)
      2. Ambient Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
      3. Relative Humidity: 5 to 95 percent non-condensing.
      4. Dimensions (HxWxD): 4.63 x 2.81 X 0.78 inch (118 x 71 X 20 mm)
      5. Material: Plastic material
      6. Mounting: Ceiling or wall mount via j-box.
    1. Wired Manager: Collects, processes, and distributes lighting control data to sensors, wallstations and control modules over network based on GreenBus II wiring protocol.
       1. Model EN-M-GB2-X.
          1. Collects signal information from photo sensors (light levels), occupancy sensors (occupancy status) and wall mounted lighting controllers.
          2. Manager determines what action to take based on sensor status signals.

Determines brightness or ON/OFF status for fixtures and zones.

* + - 1. Standards Compliance:
         1. Safety: cULus Listed. Energy Management Equipment: UL916 listed.
         2. Radio Interference: FCC Part 15/ICES-003, Class A
         3. Complies with the following electromagnetic requirements:

EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5

* + - 1. External Power Supply: 100 to 240 Vac, 50 to 60 Hz, 1.8 A.
      2. Non-emergency circuit only. Do not connect to UPS or emergency power.
      3. Communication: Eight GreenBus II communication channel ports, 22.5Vdc, Class II. Typically controls 100 nodes per channel, 800 nodes in total.
         1. 8 channel communication status LEDs on the front of the unit.
         2. Each Manager has an Ethernet and USB port for Network connections.

Ethernet Port: Ethernet 1-/100BaseTx Cat. 5 RJ45 port. For communication with other Managers and SSU on the Encelium X Ethernet Network.

USB 2.0 Port (using a USB to Ethernet adapter): For communication with a facility or tenant's Local Area Network (LAN) allowing secure communication with Encelium X

* + - 1. Configuration: Stored in non-volatile flash memory.
      2. Scale system up for applications of any size combined with Encelium X Wireless Manager for combined wired and wireless solution.
      3. Operating Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
      4. Dimensions (WxLxH): 4.75 x 9.0 x 1.5 inch (121 x 229 x 38 mm).
      5. Mounting: On standard 19 inch rack (1U width), individual wall mount or optional 4U wall mounted rack.
         1. Locate in electrical room or communication closet on each floor of a building. Connection to Network Switch: Standard Ethernet connections.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete paragraphs not required.

* 1. PANEL SOLUTIONS
     1. Relay Panel and Relay Panel Module:
        1. Standards Compliance: Rated for indoor use.
           1. Energy Management Equipment: UL916 Listed.
           2. Emergency Lighting and Power Equipment: UL924 Listed
           3. Radio Interference: FCC Part 15, Class A /ICES-003
           4. Shall comply or exceed the following electromagnetic requirements: EN 61000-4-2, EN 61000-4-4, and EN 61000-4-5
        2. Data Specification: Connects to the polarity independent Encelium X Networked Light Management System via two ports that accept GreenBus II Communication Bus.
        3. Ambient Temperature: 140 degrees F (60 degrees C) maximum.
        4. Relay Panel:
           1. Addressable lighting control panel that fully integrates with the Encelium X Networked Light Management System (LMS).
           2. Relays: Up to 24 relays in a panel.

Individually controlled and configured to meet facility needs.

Addressed as individual zones or as part of a larger zone.

* + - * 1. Light management strategies: Deployed using of the relay panel; smart time scheduling, occupancy control, and daylight harvesting.
        2. Navigation: A floor plan based three-dimensional graphical interface.
        3. Daisy Chain Multiple Panels: As part of overall Encelium X architecture through the GreenBus II communication network.
        4. Enclosure Dimensions (HxWxD): 19.5 x 18.5 x 4.0 inches (495 x 470 x 102 mm).
        5. Relay Dimensions (HxWxD): 3.8 x 2.4 x 1.0 inch (97 x 60 x 25 mm),
      1. Relay Panel Module:
         1. Electronic retrofit module that enables existing relay panels/boxes to be integrated with the Encelium X Networked Light Management System.
         2. Relays per Relay Panel Module: 24. Panel modules may be connected to accommodate requirements above 24 relays. Install in accordance with applicable national and local electrical and building codes.
         3. Installation: In most standard relay panels utilizing existing electrical wiring and relays.

Mounts in center of existing panel (replaces old circuiting) and wired to existing relays in the panel. This allows each relay to be addressed individually.

* + - * 1. Relay panel module controls 2-wire relays (NAED 45349: RLY-700).

Other relays are available . controllable.

* + - * 1. Input Power Supply: 24 Vac, 50/60 Hz, 1.6 A (40 VA)
        2. Suitable for 35 mm DIN rail mounting.
        3. Dimensions (LxHxW): 4.5 x 1.6 x 1.8 inches (368 x 41 x 46 mm)
    1. DALI Panel:
       1. DALI Panel Lighting Controls: Simplifies deploying DALI-based lighting controls using Encelium X Networked Light Management System. Consists of 1 Encelium X Wired Manager and 8 DALI bridges that enable control of 512 DALI based LED drivers and 288 GreenBus devices. Contains a Sensor Interface Module (SIM) that can be used for fire alarm contact.
       2. Model ECU-DALI-ENC. DALI enclosure. Field Bus: GB2.
       3. Standards Compliance:
          1. FCC Part 15/ICES-003, Class A.
          2. Complies with Electromagnetic Compatibility (EMC) Standards: EN 61000-4-2, EN 61000-4-4, EN 61000-4-5.
       4. Rated for dry, indoor locations only.
       5. Power Supply: 100 to 240 VAC, 50/60 Hz, 1.8A. Hardwire connection.
       6. The DALI Enclosure Panel Includes:
          1. Wired Manager with Power Supply: 1.
          2. 8 DALI Bridges: 8.
          3. DALI Bridge Power Supplies: 2.
          4. Sensor Interface Module for Fire Alarm Contact: 1.
          5. Terminal Block for Hardwire Connection: 1.
       7. Flexibility:
          1. Enables Encelium system to communicate with DALI devices.
          2. Each channel can control 64 DALI Drivers and 36 GreenBus devices.
          3. Works with Encelium X and Encelium X.
       8. DALI Output: 24V, 250 mA maximum.
       9. Maximum Number of Drivers: 64 DALI LED Drivers per DALI Bridge.
       10. Control Compatibilities: Compatible with DALI-compliant LED Drivers.
       11. Operating Temperature: 32 to 122 degrees F (0 to 50 degrees C).
       12. Dimensions (H x W x D): 24 x 18 x 6 inch (610 x 457 x 152 mm).
       13. Weight: 52 lbs (23.6 kg).

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete paragraphs not required.

* 1. SYSTEM INFRASTRUCTURE AND ACCESSORIES
     1. System Support Unit (SSU): A key component in an Encelium X Networked Light Management System. It hosts the Polaris software giving Facility Managers and Building Operators ability to monitor and maintain their Encelium system.
        1. Model EN-SSU-WIN10-X. SSU Database Server Encelium X
        2. Encelium X Standards Compliance:
           1. UL 60950.
           2. FCC (U.S. Only) Class A, DOC (Canada) Class A.
           3. CAN/CSA-C22.2 No. 60950.
        3. Enables operators to change or modify light settings, schedules, system settings and maintain the system.
        4. A typical building or campus requires one SSU per site.
        5. Stores historical data relating to system performance like energy savings, occupancy usage.
        6. Allows remote access for support.
        7. Allows the end user to add additional functionality inherently built-in like BACnet demand response and AV interface.
        8. Stores backup of the system on a regular basis.
        9. Processor: Multi-Core Server.
        10. Power Consumption: 1 x 400 W (non-redundant).
        11. Input Ratings: 110/220V auto-ranging.
        12. Operating Temperature: 50 to 95 degrees F (10 to 35 degrees C).
        13. Operating Humidity: 10 to 90 percent, non-condensing.
        14. Wert Build Temperature: 82.4 degrees F (28 degrees C) maximum.
        15. Operating Vibration: 3 to 200 Hz at 0.25 G maximum.
        16. Operating Shock: 31 G at 2.6 ms maximum.
        17. Mounting: Standard 19 inch (482.6 mm).
        18. Mounting: Individual Wall Mount.
        19. Mounting: Optional 4U Wall Mounted Rack.
     2. System Support Unit - Virtual (SSU): To support client IT requirements, the Encelium Light Management system can enable a virtual server. All functionalities of a standard hardware System Support Unit (SSU) can reside on a client server. This eliminates the need for dedicated server hardware.
        1. Model EN-SW-SSUVIRT. SSU Virtual Server.
        2. Acts as database for data related to an Encelium X system installed in a facility.
        3. Stores system settings and parameters, including attributes for zones, luminaires, sensors, zone controllers, and scene controllers.
        4. Logs historical data regarding system's operational and energy savings results.
        5. Encelium X Wireless Managers: Must be assigned static IP addresses to communication with the Virtual SSU.
        6. The Virtual SSU provides the ability to remotely access a system to change system settings or configuration, analyze system performance or energy data or troubleshoot thereby providing quick and seamless customer support.
        7. Building automation interfaces such as BACnet and A/V Interface are available upon request.
        8. Minimum Requirements:
           1. Processor: Intel Xeon E-2124 3.3 GHz 4 Core.
           2. Hard Drive: 1 TB.
           3. RAM: 8 GB or higher.
        9. Supported Operating Systems:
           1. Windows 10.
           2. Windows Server 2019.
           3. Other operating systems subject to approval by Encelium Light Management System Specialist.
     3. Dry Contact Input Interface (DCII):
        1. Model EN-DCII-GB2. Enhances occupant experience by enabling integrations between Encelium Light Management System and third-party systems i.e., room booking systems in offices, AV in lecture halls, or bedside controls in patient rooms.
        2. Based on the dry contact signal, the Encelium system sets lighting scenes that can include intensity or color temperature.
        3. Can use momentary hold signals to enable raise / lower functionality.
        4. Standards Compliance:
           1. UL Listed. UL 916.
           2. Plenum Rated UL 2043
           3. FCC Part 15 Subpart B, ICES003
        5. Consists of 6 isolated dry input contacts.
        6. Receive single event signal to turn on, turn off, recall scene, change CCT, change shade position.
        7. Receive momentary hold to raise/lower lighting intensity or color temperature (CCT), change shade position.
        8. Push-in terminal blocks enable quick wiring and install.
        9. Electrical Supply Voltage: 12-24 V from GreenBus. Maximum Current: 5 mA.
        10. Multiple mounting options for variety of applications.
        11. Status LED for monitoring operation.
        12. Operating Temperature Range: 32 to 104 degrees F (0 to 40 degrees C).
        13. Relative Humidity: 0 to 95 percent non-condensing, for indoor use only.
        14. Housing: ABS plastic. Color: Black.
        15. Dimensions (H x W x D): 0.9 x 3.86 x 2.1 inch (23 x 98 x 53 mm)
     4. GreenBus Cable and GreenBus Connector. The GreenBus II bus system is a communication technology designed specifically for controlling lighting to achieve maximum energy savings and optimum lighting comfort.

\*\* NOTE TO SPECIFIER \*\* Delete model option not required.

* + - 1. Model: EN-PTC-20FT-GB2. Field Bus: GB2. Cable Length: 20 ft
      2. Model: EN-BC-1000FT-GB2. Field Bus: GB2. Cable Length: 1000 ft
      3. Standards Compliance:
         1. Flame rated jacket for plenum use; NFPA 262 (UL: FT6, CSA: CMP).
      4. Class 2 communication bus pre-terminated with connectors.
      5. Topology independent connection.
      6. Typical number of devices (nodes) per channel: 100.
      7. GreenBus II Communication Network:
         1. Cabling: Two pre-terminated 18 AWG conductors. GreenBus II is a Class 2, polarity independent communication bus that connects to the Encelium X Networked Light Management System. The maximum connected length of wiring is 2500 ft. per channel.
         2. Enables, individual dimming control of fixtures in a building. Integrates peripheral devices; occupancy and photo sensors, relay based controls, switch packs, and low voltage wall controls, into a programmable lighting control system.
         3. Each Channel: Originates at an Encelium X Manager and propagates in a daisy-chain fashion from device to device.

Topology free and "T" connections are acceptable.

* + - * 1. A Class 2 network. Provides low voltage power to devices on the network eliminating need for external power supplies and power packs for devices.
        2. Allows flexible daisy chain wiring topologies and the ability to add fixtures or control devices in-circuit at any time.

Different devices may be connected randomly on the network and special termination of each network channel is not required.

* + - * 1. Automatic addressing of individual nodes during system commissioning simplifies installation by eliminating the need to pre-address devices or record serial numbers during the process.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required or delete paragraphs not required.

* 1. INTEGRATIONS
     1. AV Interface: Resides in the SSU. Allows integration of audio-visual systems (e.g., Crestron system) to Encelium X Networked Light Management System (LMS).
        1. Model; EN-SW-AVINT.
        2. Allows various scenarios for a given space by changing lighting, to achieve a desired atmosphere.
           1. Scenarios can be recalled through an interactive touch screen.

Preset or customized audio and video settings can be saved, recalled, and modified via an interactive touch screen interface

* + - 1. The Encelium X LMS accepts commands for the following tasks via Telnet protocol on a per zone basis:
         1. Recalling, saving, and querying scenes
         2. Switching zones "ON" and "OFF".
         3. Setting brightness levels and dimming.
      2. Telnet Communication Settings: Telnet server is hosted on the SSU and accessed via TCP/IP port 23. A port other than 23 can also be used.
      3. Connections: Communication between the Encelium X LMS system and the AV system requires on the following:
         1. Encelium XAV system and Encelium system must exist on the same network.
    1. BACnet Interface: Enables integration of Encelium X Networked Light Management System (LMS) with any BACnet compatible building automation system. The system operates autonomously while lighting status, lighting levels and energy usage are shared and may be controlled via BACnet. Connection between the two systems is established via BACnet/IP.
       1. Model EN-SW-BACNET. Communication Network: Wireless/GBI
       2. BACnet Interface:
          1. Reports daylight readings by photo sensors.
          2. Enables BACnet switching and dimming control.
          3. Provides load shedding control over lighting load, including for demand response.

Provides information about estimated amount of lighting load available for reduction, by selected groups (Group Sheddable Load) or in total (Sheddable Load).

Load Shedding requests can be made for each selected group individually or the Encelium X LMS can initiate prioritized load shedding by predefined zones through a single request to reduce the total lighting load.

Both types of load shed requests can be defined in watts to achieve precise load reduction or by the common method of shed shedding by a percentage of the current lighting load.

* + - * 1. Notifies the system of an emergency through a BACnet connected fire alarm input to turn all lights on.
        2. Shares occupancy information obtained with a BACnet client to integrate HVAC with occupancy.
        3. Allows schedules defined through BACnet devices.
        4. Supports both centralized & distributed architectures.
      1. To ensure smooth and user-friendly integration, the BACnet Interface creates objects with names and descriptions that can be customized to accommodate any BACnet client's naming scheme. It also exports standard BACnet object properties in a clear, structured manner and can define an unlimited number of groups of luminaires.
      2. The BACnet Interface adheres to the ANSI/ASHRAE standard 135-2004 "BACnet" (ISSN 1041-2336).
      3. Encelium X LMS BACnet Interface Module shares the following information with BACnet Clients:
         1. Light Zone State: State of defined lighting zone; ON or OFF.

BACnet Type: Binary Value.

* + - * 1. Light Zone Dimming: Light output level of defined lighting zone, from 100 (maximum light output) to 0 percent (minimum light output).

BACnet Type: Analog Value.

* + - * 1. Fire Alarm State: State of fire alarm system; activated or not activated.

BACnet Type: Binary Input.

* + - * 1. Occupancy State: State of defined occupancy sensor; occupancy detected or not detected.

BACnet Type: Binary Output.

* + - * 1. Photo Sensor Daylight Readings: Reports daylight readings by photosensors.

BACnet Type: Analog Output.

* + - * 1. Sheddable Load: Reports total lighting load available for load reduction according to Encelium X LMS, defined in watts.

BACnet Type: Analog Output.

* + - * 1. Shed Status: Reports total current load reduction achieved according to Encelium X LMS defined prioritization, defined in watts.

BACnet Type: Analog Output.

* + - * 1. Shed Request: Requested total amount of load reduction, defined in watts or as a percentage of sheddable load.

BACnet Type: Analog Input.

* + - * 1. Sheddable Load (Group): Requested total amount of load reduction, defined in watts or as a percentage of sheddable load.

BACnet Type: Analog Output.

* + - * 1. Shed Status (Group): Requested total amount of load reduction, defined in watts or as a percentage of sheddable load.

BACnet Type: Analog Output.

* + - * 1. Shed Request (Group): Requested total amount of load reduction, defined in watts or as a percentage of sheddable load.

BACnet Type: Analog Input.

* + - * 1. Load Shedding Total Demand: Reports the total lighting demand of all devices in a load shedding group (in Watts).

BACnet Type: Analog Output.

* + - * 1. Schedules: A periodic schedule that may recur during a range of dates, with optional exceptions at arbitrary times on arbitrary dates.

BACnet Type: Schedule.

* + - 1. Connections: A connection from the BACnet network to the Encelium X network switch is required to communicate between the Encelium X Networked Light Management System and the BACnet system.
    1. Shade Integration with Somfy: Automated shading solutions.
       1. Manual Control: Encelium wallstations or touchscreen.
       2. Centralized Control: From Polaris software for simple or advanced scheduling functions.
       3. SDN 0-10V Interface: Somfy Digital Network (SDN) device.
          1. Inputs: Industry standard 0-10 V lighting controls
          2. Outputs: A percentage command to operate Somfy RS485 motors.
          3. Plug and Play: Operating as a group device controlling all motors in a group without having to program the interface.
       4. Encelium X Networked Light Management System (LMS):
          1. Enables Facility Managers to maintain, monitor and analyze the performance of their building. The Encelium XX system's breadth of product line allows for a wired, wireless or hybrid installation and can easily integrate with other systems within a building.
    2. Security Systems Interface:
       1. Encelium Security Integration: Monitors and takes pre-defined actions when a security event is triggered.
       2. Utilizing a sensing device like a wired SIM, or wireless WALC, the Encelium system detects a dry contact closure and can respond in a variety of ways.
       3. Features:
          1. Key Functions Include:

Overriding luminaires to a configurable brightness level.

Locking wallstations.

Disabling sensor inputs.

* + - * 1. Security Event Status: Displayed in Polaris for the facility manager.
        2. At End of Event: Lights return to previous state.
    1. Fire Alarm System Interface:
       1. Encelium Fire Alarm Integration: Monitors and takes a pre-defined action when a fire alarm is triggered.
       2. Utilizing a sensing device like a wired SIM or wireless WALC, the Encelium system detects a dry contact closure and overrides specified lights to 100 percent.
       3. Features:
          1. Choose exact luminaires (floor, building, campus) to override in an alarm state.
          2. Fire Alarm Status: Display in Polaris for facility manager.
          3. Allows for normally open or normally closed contact.
          4. At End of Alarm: Lights return to pre-alarm state.

\*\* NOTE TO SPECIFIER \*\* Delete article if not required.

* 1. ENCELIUM SYSTEMS AND SOFTWARE
     1. Polaris Software:
        1. Polaris Monitor Software:
           1. For facilities managers. Software is intuitive and easy to use due to new workflows, multi-device access, and other enhancements.

Serves as the day-to-day window into all aspects of your Encelium X system.

Enables user to monitor conditions, get insights, and make any necessary changes quickly and easily.

* + - * 1. Web-based: Runs on HTML5 compatible browsers; Microsoft Edge, Google Chrome, Mozilla Firefox, and Safari.
        2. Supports Multiple Platforms and Devices: Runs from tablet, desktop, laptop, or smartphone.
        3. User Interface: Touch gestures; pinch to zoom, drag to pan, etc.
        4. HTTPS. Industry-standard certificate-based encryption and authentication for security.
        5. Functionality listed below must be available via a single application.

System Navigation and Status Reporting:

Using graphical floor plan view.

Graphical Floor Plan View: Pan and zoom allows easy navigation; dynamically adjust details presented based on zoom level.

Individual Light Adjustment:

Monitored for on/off status.

Turned on/off or set to a specific level.

Zone/Area Light Adjustments:

Monitored for on/off status.

Turned on/off or set to specific level.

Areas may be set to predefined lighting scenes.

Scenes can be renamed and modified in real-time,

Area Occupancy:

Can be monitored or disabled to override occupancy control or in case of occupancy sensor problems.

Daylighting:

Enabled or disable. Used to override control currently taking place in the space.

Daylight calibration can be adjusted for each daylit area.

Daylight status can be monitored.

Monitor energy savings due to daylight harvesting down to an individual area.

Scheduling: Using time of day and astronomic time clock events.

Adjust or disable occurrence of repeating scheduled event.

Monitor and adjust scheduled events with weekly calendar view.

Reporting Capability: Allow building manager to gather real-time and historical information about the system as follows:

Energy Reports: Compare cumulative energy used over a period of time for one or more areas. Capable of displaying:

Current savings in percent and kW.

Historic energy savings in kWh saved.

Historical Views and Period Comparison: In days, weeks, months, and years.

Power Reports: Show power usage trend over a period of time for one or more areas.

Energy Savings by Strategy Report: Show for any area broken down by strategy (tuning, occupancy, daylighting, scheduled events, , and load shedding).

Sensor Level Report: Shows light level in footcandles of any photosensor in the system.

Alert Activity Report: Capable of generating historical reports of alert activity within the system.

Diagnostics: Allow building manager to check the status of equipment in the lighting control system.

Wallstation Lock/Unlock: Allow building manager to lock Wallstations preventing building occupants from activating their programming (button presses), until they are unlocked.

Keypads: Lockable, ensuring occupants cannot alter light and shade levels in a space during specific events or business hours.

Keypads: Unlock after events and after hours for maintenance, cleaning, security, and others.

* + - 1. Polaris Config Software:
         1. Manages system configuration of Encelium X light management system.

Allows installer or user to:

Implement System Design:

Create floor plan layout. Define control zone. Locate luminaires. Define Daylighting zones. Assign sensor positions.

Define Configuration for the Following in Each Area:

Lighting scenes. System Integrations. Occupancy timeouts Scheduling. Partitioning. Emergency lighting.

Startup: Map field devices to floorplan, deploy configuration and verify system operation

* + - * 1. Manages changes, enhancements, or expansion of Encelium X system.
        2. Navigation: Floor plan views are used to navigate an entire building.

Monitor conditions and adjust as needed.

* + - * 1. Runs on any windows 10 based workstation.
        2. Automatic and/or manual back-Up of Project Database: Retain configuration information for system, including keypad programming, area scenes, daylighting, occupancy programming, emergency levels, night lights, and time schedules.
        3. Troubleshooting: Multi-device access lets you troubleshoot from laptop or mobile device.
        4. Insights: Provides advanced reporting capabilities giving you deeper insights into power consumption, savings, occupancy.

1. EXECUTION (ENCELIUM X)
   1. EXAMINATION
      1. Site Verification: Verify wiring conditions, installed under other sections or at a previous time, are acceptable for product installation according to manufacturer's instructions.
      2. Inspection: All materials included in this contract prior to installation. Manufacturer to be notified of unacceptable material prior to installation.
   2. INSTALLATION
      1. Electrical Contractor: As part of this section's Work, coordinate, receive, mount, connect, and place into operation all equipment. Furnish conduit, wire, connectors, hardware, and incidental items for properly functioning lighting control as described herein and shown on the plans, including but not limited to system field devices, 0-10 V dimming ballasts, fixed output ballasts, 0-10 V LED drivers and communication wire. Maintain performance criteria stated by manufacturer without defects, damage, or failure.
      2. Power: Contractor must test and confirm branch load circuits are operational before connecting loads to sensor system load terminals. De-energize circuits before installation.
      3. Related Product Installation: Refer to other sections listed in Related Sections for related products' installation.
   3. SENSOR INSTALLATION
      1. Adjust sensitivity to cover area required.
      2. Occupancy Sensors: Set time delays for the light management system. Time delays to be controlled via Central Control Software.
      3. Vacancy Sensor Configurations: Via System Control Software.
      4. Sensors to be Powered through:
         1. Input Module.
         2. Input Module, Wireless Control Module, Kinetic energy, or batteries.
      5. Install occupancy sensors on vibration free stable surface.
      6. Install atrium and skylight light sensor facing toward window or skylight.
      7. Install interior light sensor in ceiling facing the floor.
   4. WIRING INSTALLATION
      1. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum Conduit Size: 3/4 inch (19 mm).
      2. Wiring within Enclosures: Comply with NEC and CEC. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
      3. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
      4. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
   5. SOFTWARE INSTALLATION
      1. Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current site licenses for software.
   6. FIELD QUALITY CONTROL
      1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
      2. Perform the following field tests and inspections with the assistance of a factory-authorized service representative:
         1. Operational Test: After installing Wallstations 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.
      3. Lighting control devices will be considered defective if they do not pass tests and inspections.
      4. Prepare test and inspection reports.
   7. SYSTEM START-UP REQUIREMENTS AND SUPPORT SERVICES
      1. System Start-up Service: Manufacturer will supply factory trained representatives to start-up the light management system.
         1. Training: Service provider will train the facility staff, or end users, responsible for changing lighting characteristics in a building in the system operation.
         2. Provide owner's representatives with system operating manuals.
      2. Extended Service Coverage: Maintenance agreements available from manufacturer to provide service for the system during and after warranty period.
      3. Requests for Start-Up or Technical Services: 15 business days prior to date for service.
      4. Electrical Contractor: Perform functional testing under guidance of technical service agent, in accordance with factory specified guidelines.
      5. Technical Service Provider: Provide technical services for light management system.
         1. Verify proper communication over control wires.
         2. Map addresses of light management system devices.
         3. Verify communication to control units and system server.
         4. Software configuration of occupancy sensors, light level sensors, Wallstations and other contacts to design specifications.
         5. Configure and program lighting controls as described on contract documents.
         6. Demonstrate to Owner and Engineer proper operation of installed system.
   8. TESTING
      1. Upon completion of line, load, and interconnection wiring, and after luminaires are installed and lamped, a qualified factory representative will completely configure and test the system.
      2. At time of checkout and testing, Owner's representative will be instructed in proper operation of the system.
   9. DEMONSTRATION AND TRAINING
      1. Service Provider: Train end users, responsible for changing lighting characteristics in a building to adjust, operate, utilize, troubleshoot, conduct software installation, and maintain lighting controls and software training for PC-based control systems.

END OF SECTION