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SECTION 26 09 43 13
DIGITAL NETWORK LIGHTING CONTROLS
Leviton GreenMAX DRC

This specification is dated **August 8, 2024**. It replaces any and all previous GreenMAX DRC specifications.

PART 1 – GENERAL

1.0 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 specification Sections.
- B. All contract documents and addenda.

1.1 SUMMARY

- A. Section Includes:
 - 1. Digital network lighting control system.
- B. Related Sections:
 - 1. Section [262726 — Wiring Devices].
 - 2. Section [265113 — Interior Lighting Fixtures, Lamps, and Ballasts:] LED and Fluorescent lighting ballasts controlled by lighting control system.
 - 3. Section [260923 — Lighting Control Devices:] Integrated Occupancy Sensors and Photocell and Digital Switches used in conjunction with lighting control system.
 - 4. Section [260943.16—Addressable Luminaire Level Lighting Controls:] Integrated Fixture Controls with Addressable Luminaires.
- C. Contractor responsibilities:
 - 1. Coordinate, receive, mount, connect, and place into operation all equipment. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning relay lighting control system as described herein and shown on the plans.

1.2 REFERENCES

- A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) C62.41-1991 — Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- B. ASTM International (ASTM) ()

1. D4674 -02a Standard Test Method for Accelerated Testing for Color Stability of Plastics Exposed to Indoor Fluorescent Lighting and Window-Filtered Daylight.
- C. Canadian Standards Association (CSA) ().
 1. CSA C22.2 # 14 Industrial Control Equipment
 2. CSA C22.2 # 184 Solid-State Lighting Controls
- D. International Electrotechnical Commission ().
 1. (IEC) 801-2 Electrostatic Discharge Testing Standard.
 2. IEC/EN 60669-2-1 Switches for household and similar fixed electrical installations - electronic switches.
- E. International Organization for Standardization (ISO)
 1. 9001:2000 — Quality Management Systems.
- F. National Electrical Manufacturers Association (NEMA) WD1 (R2005) - General Color Requirements for Wiring Devices.
- G. Norma Oficial Mexicana (NOM).
 1. NOM-003-SCFI Productos eléctricos - Especificaciones de seguridad (Electrical products - Safety Specifications)
- H. Underwriters Laboratories, Inc. (UL) ().
 1. 508 (1999) - Standard for Industrial Control Equipment.
 2. 924 – Standard for Safety of Emergency Lighting and Power Equipment
- I. International Energy Conservation Code (IECC).
 1. IECC
- J. American Society of Heating, Refrigerating and Air-Conditioning (ASHRAE).
 1. ASHRAE 90.1
- K. California Energy Commission (CEC).
 1. Title 24

1.3 SUBMITTALS

- A. Submit under provisions of Section [01 33 00] and in accordance with Conditions of the Contract. Submittal Set shall include the following:
 1. Bill of Materials: Complete list of all parts needed to fully install selected system components.
 2. System One-Line Diagram.
 3. Device detail drawings provide wiring details and dimensional data.
 4. Product Data Sheets.

1.4 CLOSEOUT SUBMITTALS

- A. To be provided within two weeks following system turn-on.
 1. Warranty documents specified herein.
 2. Operation and maintenance manuals in digital format (PDF format).
 3. As-built drawings in digital format (PDF format).

1.5 QUALITY ASSURANCE

A. Manufacturer Requirements

1. Continuously engaged in the manufacture of architectural lighting controls and relays for no less than ten years.
2. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
3. Maintain a quality system that is registered to the ISO 9001:2000 Quality Standard.

B. Lighting control system components:

1. Listed by [CE] [CSA] [UL] specifically for the required loads or certified by recognized independent testing organizations that test to [CE] [CSA] [UL] standards.

a. UL508

- i) UL916 listing not acceptable.

b. UL924

2. Comply with ASHRAE 90.1
3. Comply with CEC Title 24, Part 6
4. Comply with IECC

C. Installer Qualifications

1. Experienced in performing the work of this section.
2. Has specialized in installation work similar to that required for this project.

D. Source Limitations

1. To assure compatibility, obtain all system components from a single source with complete responsibility for all lighting controls and accessories specified in this Section and elsewhere in Division 26 Section 09 "Lighting Controls." The use of subcontracted component assemblers is not acceptable.

1.6 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. LED Drivers or Fluorescent Ballasts

1. Supply ballasts that are compatible with the network lighting control system.
2. Accept 0 – 10V dimming control, phase dimming, DMX or DALI.

B. All conduit, wire, connectors, hardware, and other incidental items necessary for the complete and properly functioning Network Lighting Control System as described herein and shown on the plans.

1.7 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery

1. Deliver materials in manufacturer's original, unopened, undamaged packages with intact identification labels.

2. Deliver to other trades in a timely manner.
- D. Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.8 PROJECT CONDITIONS

- A. Do not install equipment until the following conditions can be maintained in spaces to receive equipment:
 1. Ambient temperature: 0° to 50° C (32° to 122° F).
 2. Relative humidity: Maximum 90 percent, non-condensing.
 3. The lighting control system must be protected from dust during installation.

1.9 WARRANTY

- A. Manufacturer's Warranty
 1. Warrant all equipment free of defects in materials and workmanship.
 2. Warranty Period
 - a. Warrant all system components for 25 months from date of shipment, or two years from date of turn-on, whichever occurs first.
 - b. Make extended warranties available.
 3. Warrant relay modules for a period of 10 years.
 - a. Provide replacement modules at no cost to Owner.
 4. Owner's Rights: Manufacturer's warranty is in addition to, not a limitation of, other rights the Owner may have under contract documents.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Acceptable Manufacturer: Leviton Manufacturing Co. Inc.
- B. Basis of design product: Leviton Manufacturing Co. Inc. GreenMAX DRC or subject to compliance and prior approval with specified requirements of this section, one of the following:
 1. Leviton Manufacturing Co. Inc. GreenMAX DRC
 2. <<To specify an alternate manufacturer and product, insert the names here. Otherwise, delete this entire line.>>
- C. Substitutions: [Not permitted.] [Permitted.]
 1. Show all substitutions as an add or deduct from the base bid price.
 - a. All substitutions subject to provisions of [Section 00 26 00] [Section 01 25 00] [Section 01 62 00] [Division 1]
 2. Clearly delineate all proposed substitutions as such and submit in writing for approval by the design professional a minimum of 10 working days prior to the bid date.
 - a. Proposed substitutions must be made available to all bidders.

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

2.2 DESCRIPTION

- A. Wired digital network lighting control system comprised of the following components:
 1. GreenMAX DRC App
 2. GreenMAX DRC Line and Low Voltage Room Controllers
 3. Remote Load Control Smart Packs
 4. Phase Control Dimmer
 5. DALI Gateway
 6. Multi-Channel Relay
 7. Sapphire Touch Screen Room Controller
 8. Configurable Relay Cabinets
 9. Remote Low Voltage Input Cabinets
 10. Low Voltage Control Devices
 - a. Including but not limited to digital switches, analog switches, occupancy sensors, and daylight sensors.
 11. Network Equipment:
 - a. Hubs, Switches, and Repeaters for connection of LumaCAN and Ethernet cabling.
 - b. Network Protocol Converters (NPC) and Gateways used for system integration as required by specific project plans.
 - c. Power Supplies
 12. User Interfaces
 - a. Digital Keypads, Single Gang Touch Screen, Sapphire Touch Screen
- B. Wireless digital network lighting control system comprised of the following components:
 1. GreenMAX DRC Wireless Keypad Room Controllers
 2. GreenMAX DRC App
 3. Wireless Load Control Devices
 - a. Including but not limited to wireless power packs, digital switches, digital dimmers, and marked controlled receptacles.
 4. Wireless Sensor & Photocell
 - a. Including but not limited to integrated wireless sensor and photocells.
 5. Intellect-Enabled Fixtures
 - a. Including but not limited to fixtures provided by Leviton Lighting Brands and other manufacturers.

6. Intellect-Enabled Fixtures
 - a. Including but not limited to fixtures provided by Leviton Lighting Brands and other manufacturers.

2.3 PERFORMANCE CRITERIA

- A. [Occupancy/Vacancy Sensing] [0-10V Dimming] [Daylight Harvesting] [Partial-ON] [Partial-OFF] [Demand Response] [Receptacle Control] [Manual Switching] to control lighting with the following hierarchy:
 1. Emergency: Highest priority overrides all other inputs.
 2. Power failure: All RTC relays close upon loss of system power.
 3. Bypass Switches: Second priority, over-rides all other inputs except Emergency.
 4. Scheduled events and scenes: configured using the GreenMAX DRC App.
- B. Room Controller Operation
 1. Programmable from WiFi network using the GreenMAX DRC App on an Android or iOS smart device.
 2. Multi-location switching.
 3. Occupancy/vacancy detection.
 - a. Allow programming of each group with the following operational behaviors:
 - i. Auto ON / Auto OFF
 - ii. Auto ON /Auto OFF with light hold off
 - iii. Manual ON / Auto OFF with light hold off
 - iv. Manual ON / Auto OFF
 - v. Manual ON / Manual OFF
 - vi. Manual ON / Manual OFF with light hold off
 - b. Set Light Hold (delay) Times from thirty (30) seconds to thirty (30) minutes.
 4. Multi-zone Daylight Harvesting.
 - a. No limit to number of Zones.
 - b. Closed loop daylight harvesting.
 - c. Eight (8) independent pairs of rising and falling trigger point values per photocell input.
 - d. Delay times of thirty (30) seconds to thirty (30) minutes.
 - e. ON/OFF behavior.
 - f. Auto ON with Manual Override.
 - g. Blink Warn Sequence.
 5. Assign fixtures to a Group.
 - a. System shall have the ability to assign fixtures to Groups.
- C. Digital switches
 1. Assign each button to individual fixtures or Groups.
 - a. Programmable behaviors to include
 - i. Scene

- ii. Toggle
 - iii. Room ON
 - iv. Room OFF
 - v. Group Raise / Group Lower
 - vi. Raise
 - vii. Lower
2. Program delay time within each area or zone.
- a. Thirty (30) seconds to thirty (30) minutes.

2.4 NETWORK PROTOCOLS

A. WiFi

- 1. Connection to GreenMAX DRC App for wireless commissioning, configuration, control, monitoring and provisioning.
- 2. Connection to building network.

B. LumaCAN

- 1. Daisy chain topology.
- 2. Maximum branch length of 1600 feet.
 - a. Devices located at branch ends must have their termination jumpers in the ON position.

C. Ethernet

- 1. Command Modules only.
- 2. Can be configured as a bridge between LumaCAN branches.
- 3. Can be used as an Internet connection.
 - a. Remote firmware upgrades, monitoring and programming possible via Internet.
- 4. Ethernet switches can be used to extend system coverage area by linking Command Modules.

D. Wireless mesh network

- 1. Mesh network topology.
- 2. Wireless system connection to GreenMAX DRC, Wireless Devices, and Intellect-Enabled Fixtures.

E. BACnet IP

- 1. Read-only device description for Relay Cabinets.
 - a. For use with Building Management System (BMS) software that does not support writing of device descriptions.
- 2. Re-name groups and relays via the BMS network, if it supports this function.
- 3. Support all 16 BACnet priorities.
 - a. Separate Priority Array for each relay.
 - b. 1 is highest, 16 is lowest.
 - c. Higher priority maintains control until a “relinquish” command is issued.

- d. Top three priority levels permanently assigned to Internal Main Bypass, Emergency Power and Internal Relay Bypass.
 - e. Individual control of all other priorities.
4. Support 252 Analog / Binary Outputs.
 5. Support 240 Analog / Binary Inputs.

2.5 NETWORK CABLES AND CONNECTORS

- A. LumaCAN: CAT6
- B. Ethernet: CAT5 or better
- C. BACnet IP: CAT5 or better
- D. Terminations: RJ45 connectors

2.6 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) ROOM CONTROLLERS

- A. Coordinates all the energy management functions in a room as part of the GreenMAX DRC system.
- B. Auto Addressing System Requirements
 1. A GreenMAX DRC Room Controller must be on the network. For systems without the GreenMAX DRC Room Controller, addresses and configurations must be set manually
 2. All devices in the space must be LumaCAN digital devices and connected via LumaCAN CAT6 cabling
 3. All cables must be tested via a CAT6 cable tester, and confirmed sound prior to connection to any Leviton equipment
 4. Each end of the LumaCAN network must be terminated with the termination switch//jumper/plug installed
 5. For multiple room to work together, they must be connected via the WiFi network only
 6. If there is more than one Room Controller on the network, the switches will control all devices on the network. However, occupancy and daylighting controls will not operate until the system can be commissioned using the GreenMAX DRC App
- C. Performance Criteria
 1. GreenMAX DRC Room Controller shall be capable of the following applications:
 - a. Single room controller for GreenMAX DRC systems, coordinating all the energy management functions in a room.
 2. Line voltage models UL924 listed.
 3. Provide 0-10V control and power relay rated.
- D. Physical
 1. Available in low voltage and line voltage.
 - a. Low voltage model can be surface mounted or installed in a DIN rail enclosure.
 - b. Line voltage model provided in NEMA 1 enclosure with nipple mounting can install into a knockout or act as cover for a 4" square box.

- c. UL2043 Plenum rated.
- 2. Environmental
 - a. Operating Temperature: 32° to 104° F (0° to 40° C)
 - b. Ambient Humidity 0% to 90% non-condensing
- E. Electrical
 - 1. Supported and listed loads
 - a. 120 – 277VAC, 16A LED Driver, Tungsten, Resistive, Electronic Ballast
 - b. 120 – 277VAC, 20A Ballast
 - c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
 - d. 120VAC, 20A General Purpose Plug Load Control.
 - 2. Input Voltage
 - a. Low Voltage: 12 – 24VDC
 - b. Line Voltage: 120 – 277VAC, 50/60Hz, 20A Max
 - c. Line Voltage: 347VAC, 60Hz, 20A Max.
 - 3. Control output
 - a. Class I or Class II 0-10V wiring. #18AWG stranded
 - b. 0-10V Sinking Control, 20A
 - 4. Network Connections via LumaCAN wiring using CAT6 cable with RJ45 connectors.
 - 5. Wireless Connections via wireless mesh networks to Leviton wireless devices and Intellect-enabled fixtures and WiFi to building networks.
- F. Product Components
 - 1. Leviton GreenMAX DRC Room Controller, DIN Rail Form Factor, model # DRC00-0L0
 - 2. Leviton GreenMAX DRC Room Controller, 120-277VAC, model # DRC07-ED0
 - 3. Leviton GreenMAX DRC Room Controller, 347VAC, model # DRC00-E30

2.7 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) SMART PACKS

- A. Remotely mounted network addressable load control relays allowing for a distributed system architecture.
- B. Performance Criteria
 - 1. DRC Smart Packs shall be capable of the following applications:
 - a. UL924 listed for use with Normal or Emergency loads
 - b. Standalone load control when used with a GreenMAX DRC or Sapphire Room Controller.
 - c. Remote relay when used with GreenMAX Lighting Control Panel
 - 2. Provide 0-10V dimming or switching control for all listed and compatible load types.
 - 3. Smart Pack relay shall be listed for use on Plug Load circuits.
 - 4. DRC Smart Pack shall provide two-way communication and metering relay capability and allow data to be collected over BACnet via connected devices.

C. Physical

1. Smart Pack provided in NEMA 1 enclosure with nipple mounting for use with standard junction box.
 - a. UL2043 Plenum rated.
 - b. Paintable for exposed ceiling installations
2. Environmental
 - a. Operating Temperature: 23° to 122° F (-5° to 50° C)
 - b. Ambient Humidity 0% to 90% non-condensing

D. Electrical

1. Supported and listed loads
 - a. 120 – 277VAC, 16A LED Driver, Tungsten, Resistive, Electronic Ballast
 - b. 120 – 277VAC, 20A Ballast
 - c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
 - d. 120VAC, 20A General Purpose Plug Load Control
2. Input Voltage
 - a. 120 – 277VAC, 50/60Hz, 20A Max.
 - b. 347VAC, 60Hz, 12A Max.
3. Control output
 - a. Class I or Class II 0-10V wiring. #18AWG stranded
 - b. 0-10V Sinking control, 100mA
4. Network Connections via LumaCAN wiring using CAT6 cable with RJ45 connectors.

E. Product Components:

1. Leviton DRC Smart Pack, 120-277VAC, model # DRD07-ED0
2. Leviton DRC Smart Pack, 347VAC, model #DRD07-E30

2.8 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) PHASE CONTROL DIMMER

- A. Incorporates switching and dimming of 2-wire phase control loads as part of a GreenMAX DRC system.
- B. Performance Criteria
 1. Provides 1-4 channels of forward or reverse phase control
 2. Shall provide amplify feature, allowing channels to be combined to increase output
- C. Physical
 1. DIN Rail mountable in Leviton DIN Rail Rack Mount Enclosures, series DINRK-XXX
 2. Environmental:
 - a. Operating Temperature: 32° to 140° F, (0° to 60° C)
 - b. Ambient Humidity: 0% to 90% non-condensing
- D. Electrical
 1. Input Voltage
 - a. 120 – 277VAC, 50/60Hz, 10A Max.

2. Load Ratings
 - a. Supports LED, CFL, electronic ballast, magnetic ballast, cold cathode, transformer
3. Network Connections via LumaCAN wiring using CAT6A cable with RJ45 connectors.
4. Topology:
 - a. Daisy chain, 1600' max between repeaters.
 - b. Homerun and networking length up to 10,000' can be achieved when using Leviton LumaCAN network repeaters, model # NPRPT.
 - c. Maximum 110 nodes between repeaters.
 - d. Maximum 250 nodes on a LumaCAN network.
- E. Product Components
 1. Leviton GreenMAX DRC 4-Channel Phase Control Dimmer, model # DRDDP-A40
 2. Leviton GreenMAX DRC 2-Channel Phase Control Dimmer, model # DRDDP-A20

2.9 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) DIGITAL OCCUPANCY SENSORS

- A. Provides digital occupancy/vacancy and daylight sensing as part of the GreenMAX DRC System.
- B. Performance Criteria
 1. Occupancy detection using PIR technology with a 450 sq. ft. field-of-view.
 2. Light level detection up to 0 to 100 footcandles.
 3. Configurable parameters for occupancy sensitivity, timeout, enable/disable and photocell range, enable/disable.
- C. Physical
 1. Sensor shall combine both a PIR occupancy/vacancy sensor with a daylight sensing photocell.
 2. Sensor shall be recess mounted into a 2" diameter hole.
 3. Environmental
 - a. Operating Temperature: 32° to 122° F, (0° to 50° C)
 - b. Ambient Humidity 0% to 90% non-condensing
- D. Electrical
 1. LumaCAN powered, +12-24VDC, 70-35mA
- E. Product Components
 1. Leviton GreenMAX DRC Occupancy Sensor and Photocell, model # OSR05-ICW

2.10 ANALOG SENSORS

- A. Comply with requirements in Section 260923 "Lighting Control Devices"
 1. Provide PIR, US, or multi-technology (PIR/US) occupancy or vacancy sensing or daylight sensing.
- B. Performance Criteria:
 1. Low voltage connected to GreenMAX DRC Analog Interface (AI), DRID0-A40 model.

2. All adjustments with exception of sensor range shall be made via the App.
3. Indoor Occupancy Sensors: May be powered directly from the lighting control network or with a standalone power supply. Units powered with a standalone power supply shall interface with the lighting control system through an electrically isolated digital input.

2.11 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) ANALOG INTERFACE (AI)

- A. Provides interface to allow the integration of low voltage inputs such as analog occupancy and vacancy sensors, photocells, demand response, and emergency, into the GreenMAX DRC System.
- B. Performance Criteria:
 1. Connect using CAT6 cable and RJ-45 connectors.
 2. Provide power from control unit via LumaCAN network connection.
 3. All adjustments except for sensor range shall be made with the GreenMAX DRC App.
- C. Physical
 1. Inputs to include (2) contact closures, active high/low, 0-10V, 0-24V.
- D. Electrical
 1. LumaCAN powered, +12-24VDC, 35mA.
- E. Product Components
 1. Leviton GreenMAX DRC Analog Interface (AI), model # DRIDO-C02.

2.12 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) DIGITAL SWITCHES

- A. Network addressable control stations providing local control of digital lighting control system as part of a GreenMAX DRC system.
- B. Performance Criteria:
 1. Used as primary user interface
 2. Can be used for multi-location control
 3. Each button shall be individually programmed for ON, OFF, ON/OFF, dimmed raise/lower, scene on level, and other customizable scenes and settings using the GreenMAX DRC App
- C. Physical:
 1. Available in One (1), two (2), four (4), or (8) button configurations.
 2. Available in the following colors
 - a. White
 - b. Ivory
 - c. Light Almond
 - d. Gray
 - e. Red
 - f. Black
 3. Custom Engraving

- a. To be available for the following:
 - i. Individual buttons
 - ii. Wallplates
4. Digital switches shall mount into a standard depth wallbox.
5. Environmental
 - a. Operating Temperature: 32° to 122° F, (0° to 50° C)
 - b. Ambient Humidity: 0% to 90% non-condensing
- D. Electrical:
 1. Digital stations powered by LumaCAN network through CAT6 cable and RJ45 connectors.
- E. Product Components:
 1. Leviton GreenMAX DRC Digital Switches, model # DRKDN-CXW
 2. Leviton GreenMAX DRC Color Change Kit, model # CKDNK-X0Y
Leviton GreenMAX DRC Color Change Kit with Engraving, model # CKDNK-XEY

2.13 GREENMAX DRC TOUCH SCREEN

- A. Single-Gang touchscreen design as an integral component of a GreenMAX DRC System. It can replace multi-button keypads offering push-button style control, and on-the-fly labeling flexibility
- B. Performance Criteria:
 1. 4" capacitive LCD Touch Screen providing the following configurable user interface components:
 - a. Soft Buttons
 - b. Touch Screen
- C. Physical:
 1. Touch Screen shall be installed in a standard 1-gang backbox or low voltage mounting ring.
 2. Environmental:
 - a. Operating Temperature: 14° to 140° F (-10 to 60° C)
 - b. Storage Temperature: 32° to 104° F, (0° to 40° C)
- D. Electrical
 - a. ???
- E. Product Components
 1. Leviton GreenMAX DRC Touch Screens, model #s TS004-00x

2.14 SAPPHIRE TOUCH SCREEN ROOM CONTROLLER

- A. Provide a fully customizable touch screen-based user interface as a component of the GreenMAX DRC network lighting control system or as a standalone room control solution when used with GreenMAX DRC Smart Packs.
- B. Performance Criteria:

1. 7" capacitive LCD Touch Screen providing the following configurable user interface components:
 - a. Tabs / Pages
 - b. Buttons
 - c. Sliders
 2. Integral 7-day scheduler:
 - a. Astronomical time clock
 - b. (2) Custom user defined holiday exception calendars
 - c. Special event calendar
 3. Two-way communication allows touch screen to update based on actual device status.
 4. Online / Offline configuration and screen design through PC tool.
 5. Controller shall provide password protected administration.
 6. Touch screen shall provide local low-voltage inputs for connection of occupancy and daylight sensors.
 7. Touch screen shall allow software and configuration updates through front panel via USB memory stick.
- C. Physical:
1. Touch screen shall be installed in a standard 4-gang box with a 4-gang raised device cover.
 2. LCP panel shall be 7" diagonal, 16.9 form factor, 800x480 WVGA: 130° x 110° viewing angle with LED backlight and 24-bit color.
 3. Environmental:
 - a. Operating Temperature: 14° to 122° F, (-5° to 50° C)
 - b. Ambient Humidity: 0% to 90% non-condensing
 4. Color change kits are available in White, Black, and Light Almond.
- D. Electrical
1. Controller operates on +12-24VDC, Class II SELV on the digital LumaCAN network using CAT6 cable with RJ45 connectors.
 2. Power Supply
 - a. Power supplied to Touch Screen via the LumaCAN network or separate power supply. Device draws 1750mA, 200mA standby current.
- E. Product Components
1. Leviton Sapphire LCD Touch Screen Room Controller, model # TS007-XXX

2.15 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) LUMACAN TO DALI GATEWAY

- A. Allows Leviton lighting control systems based on LumaCAN architecture to be installed in facilities that use DALI communication protocols, allowing for full system compatibility and integration.
- B. Performance Criteria

1. Connect up to 64 devices.
 2. Convert LumaCAN channels to DALI driver control.
 3. Work with short address assignment to DALI devices.
 4. Provide fixed fade time for each device.
 5. Configure system with GreenMAX DRC App.
- C. Physical:
1. Network Topology: maximum run length to DALI is 984 ft. (300 m)
 2. Environmental
 - a. Operating Temperature: 32° to 113° F, (0° to 45° C)
 - b. Ambient Humidity: 0% to 95% non-condensing
- D. Electrical:
1. Power Input, Gateway: 24VDC, 60mA.
 2. Power Input, DALI: 23 to 30VDC, 250mA per DALI channel, 2 DALI channels, maximum.
- E. Product Components:
1. Leviton GreenMAX DRC LumaCAN to DALI Gateway, model # DRCDD-0L0
 2. Leviton DIN Rail Cabinet, model # DINRK-XXX
 3. Leviton DIN Rail Mount Power Supply, model # PST24-I10

2.16 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) MULTI-CHANNEL RELAY

- A. Provides multiple channels of switching with optional 0-10V control for both dimming and switching of loads. Allows Leviton lighting control systems based on LumaCAN architecture, for full system compatibility and integration.
- B. Performance Criteria
1. Utilizes Leviton High Inrush Stability (H.I.S.) circuitry
 2. Connects via the LumaCAN network via RJ45 connectors and CAT6 wiring
 3. Configure system with GreenMAX DRC App.
- C. Physical:
1. Environmental
 - a. Operating Temperature: 32° to 149° F, (0° to 65° C)
 - b. Storage Temperature: 14° to 185°F, (-10° to 85° C)
- D. Electrical:
1. Power Input:
- E. Product Components:
1. Leviton GreenMAX DRC LumaCAN DIN Rail Relays, model #s DRDD7-D2U, DRDD7-A4U, DRDDS-A4L
 2. Leviton DIN Rail Cabinet, model # DINRK-XXX

2.17 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) LUMACAN GATEWAY

- A. Allows Leviton lighting control systems based on LumaCAN architecture to be installed in facilities that use Luma-Net communication protocols, allowing for full system compatibility and integration.
- B. Performance Criteria
 - 1. Process channel, group, and dimmer status messages.
 - 2. Convert LumaCAN2 and LumaCAN3 protocols.
 - 3. Provide LCD front display panel.
 - 4. Provide LED indicator for Luma-Net, LumaCAN, and Ethernet activity.
 - 5. Provide rack ears for installation in 19-inch (483 mm) rack.
- C. Physical:
 - 1. Subnet Quantity: 254, maximum.
 - 2. Node Quantity: 250 per subnet.
 - 3. Environmental
 - a. Operating Temperature: 32° to 104° F, (0° to 40° C)
 - b. Ambient Humidity: 0% to 95% non-condensing
- D. Electrical:
 - 1. Power Input, Gateway: 12-24 VDC, 0.6A.
 - 2. Power Input, DALI: 23 to 30VDC, 250mA per DALI channel, 2 DALI channels, maximum.
- E. Product Components:
 - 1. Leviton GreenMAX DRC LUMACAN Gateway, model # NP00G

2.18 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) POWER SUPPLY

- A. Provides power to the LumaCAN devices in a GreenMAX DRC system.
- B. Performance Criteria
 - 1. Power LumaCAN devices.
- C. Physical:
 - 1. Connects using RJ45 connectors and CAT6 wiring
 - 2. UL2043 Plenum Rated for use in Chicago Plenum applications
 - 3. Environmental
 - a. Operating Temperature: 23° to 122° F (-5° to 50° C)
 - b. Ambient Humidity: 0-90% non-condensing
- D. Electrical:
 - 1. Power Input: 120-277VAC, 50/60 Hz
 - 2. Input Power: Max 17.5W for 120V, 16.5W for 277V
 - 3. LumaCAN Power: 500mA, 24VDC
- E. Product Components:

1. Leviton GreenMAX DRC Power Supply, model # DRC00-0D0

2.19 GREENMAX RELAY CABINETS

- A. Digital Lighting Control panel consisting of Enclosure, Command Module, Relay Insert Panels, and Modular Relays capable of being field assembled without voiding UL listing.
- B. Performance Criteria
 1. Capacities
 - a. Eight (8), sixteen (16), thirty-two (32) or forty-eight (48) single- or dual-pole relays.
 - b. Optional Factory Installed Low Voltage Input cards
 - i. Eight (8) or sixteen (16) inputs
 2. Command Module
 - a. Field-installable and/or replaceable self-contained units with Emergency input.
 - i. Integral overload and short circuit protection provide separate overload protection for system processor and connected LumaCAN devices including Low Voltage Input Card.
 - b. Supplies power to all electronics in the Relay Cabinet
 - c. Supplies power to digital switches and Handheld Display Unit via LumaCAN
 - d. Can supply +24VDC to other low-voltage inputs
 - e. Can contain an optional Low Voltage Input (+24VDC) card suitable for termination of eight (8) or sixteen (16) low voltage inputs.
 - f. Emergency Signal Input
 - i. Input for a hardwired emergency override signal
 - ii. Requires external contacts
 - iii. Activates Emergency status when a signal of +24VDC is present
 - iv. Releases Emergency status when signal falls to zero (0VDC).
 - g. Controls all relays as assigned by the user regardless of processor operation.
 - h. Provides +24VDC to external contacts
 - i. Low Voltage Input Card Option allows user to configure inputs as:
 - i. 0 to 10VDC analog
 - ii. +24VDC switched
 - iii. Contact closure.
 - j. +24VDC power supply
 - i. 70W (2.9 amperes) capacity
 - ii. Input devices can use external power supplies
 - k. Compatible with the following devices
 - i. Occupancy sensors
 - ii. Photocells
 - iii. GE switches
 - iv. External Contacts
 - v. Multi-button low voltage switches

- vi. ON/OFF dedicated button low voltage switches
- 3. Handheld Display Unit used for system configuration and monitoring.
 - a. Current Operating Status
 - b. Errors
 - c. Current Time
 - d. Alarms
 - e. Astronomical Time Clock settings
 - f. Monitor Menus
 - g. Control Menus
 - h. Configuration Menus
 - i. Remote Manual operation of all system relays
 - j. Inspection of both digital and low voltage inputs
 - i. State
 - ii. Status
 - iii. Current value
 - k. Schedule monitoring and adjustment
 - l. Temporary override of schedule on a day by day basis
- C. Physical
 - 1. Material
 - a. Steel
 - 2. Finishes
 - 3. Removable locking hinged door.
 - a. Removing the door from its hinges shall not defeat the locking mechanism.
 - b. Able to be delivered empty of electronics
 - 4. Relay Insert Panel
 - a. Allow relays modules to be installed, removed and relocated without internal rewiring or mounting screws
- D. Electrical
 - 1. Grounding point provided in left wire-way
 - 2. Relays shall be rated to switch voltages from 24 to 277VAC and +24VDC.
 - 3. Short Circuit Current Rating (SCCR) of the assembled cabinet, regardless of its specific configuration, to be 25,000 Amperes at 277VAC.
 - 4. Command Module requires single-phase power supply, 120 / 277VAC.
- E. Product Components:
 - 1. GreenMAX enclosure with lockable hinged door.
 - 2. Command Module.
 - 3. Relay Insert Panels
 - 4. Modular Relays, type per panel schedule

2.20 GREENMAX REMOTE LOW VOLTAGE INPUT CABINETS

- A. Remotely mounted network node providing additional Network power and local connection point for low voltage control devices.
- B. Performance Criteria:
 - 1. Fully functional as independent LumaCAN network nodes
 - a. Can be connect to network at any location: direct dedicated connection to a Relay Cabinet is not required
 - b. Eight (8) or sixteen (16) Low Voltage inputs
 - c. Provides power to LumaCAN digital devices
 - d. Provides a connection point for the HDU
- C. Physical:
 - 1. Surface mount enclosure
 - a. #16 US gage Steel
 - 2. Finishes
 - a. Leviton Standard Green.
 - 3. Removable locking hinged door.
 - a. Removing the door from its hinges shall not defeat the locking mechanism
- D. Electrical
 - 1. Integrated power supply
 - a. Supply 100 – 277VAC
 - b. Rated output at 70W of +24VDC power via LumaCAN
 - c. Connected devices can be self-powered.
- E. Product Components
 - 1. GreenMAX Remote Low Voltage Input Cabinet
 - a. RLV08-110 with (8) low voltage inputs
 - b. RLV16-110 with (16) low voltage inputs

2.21 GREENMAX DIGITAL SWITCHES

- A. Network addressable control stations providing local control of digital lighting control system.
- B. Performance Criteria:
 - 1. GreenMAX Digital Switches shall be capable of the following applications:
 - a. ON, OFF, Raise, Lower of 0-10V loads
- C. Physical:
 - 1. Button Stations available in One (1), two (2), four (4), or (8) button configurations.
 - 2. Key station available in single-operator stainless steel configuration.
 - 3. Button stations available in the following colors
 - a. White
 - b. Ivory

- c. Light Almond
- d. Gray
- 4. Custom Engraving
 - a. To be available for the following:
 - i. Individual buttons
 - ii. Station wallplates
 - b. Engraved characters to be of a contrasting color as shown on drawings
- D. Electrical:
 - 1. Digital stations powered by LumaCAN network through CAT6 cable and RJ45 connectors.
 - 2. RJ45 connections available on each device:
 - a. LumaCAN input
 - b. LumaCAN throughput
 - c. Handheld Display Unit access to entire network
- E. Product Components:
 - 1. GreenMAX Digital Switches, model # RLVSW-XXX

2.22 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) WIRELESS KEYPAD ROOM CONTROLLERS

- A. Coordinates all the energy management functions in a room as part of the GreenMAX DRC wireless system.
- B. Automatic System Configuration – DRC Room Controller Required
 - 1. The GreenMAX DRC system automatically addresses and configures itself with the following functionalities:
 - a. Works with the GreenMAX DRC Wireless Keypad Room Controller only
 - b. All switches will have the functionalities per their labels
 - c. Occupancy sensors turn lights partially ON to 45% when occupancy is detected the turn lights OFF when vacancy is detected
 - d. Vacancy time out is set to 30 minutes to occur in two stages:
 - i. Light output reduction to 30% after 15 minutes
 - ii. Lights OFF after another 15 minutes
 - e. All lights daylight harvest to a pre-determined set point and minimum output set at 35%
 - f. Customized configurations can be made any time using the GreenMAX DRC App
- C. Performance Criteria
 - 1. GreenMAX DRC Wireless Keypad Room Controller shall be capable of the following applications:
 - a. Single room controller for GreenMAX DRC wireless system, coordinating all the energy management functions in a room
- D. Physical

1. Button Stations available in One (1), two (2), four (4), or (8) button configurations.
2. Button stations available in the following colors
 - a. White
 - b. Ivory
 - c. Light Almond
 - d. Gray
 - e. Red
 - f. Black
3. Custom Engraving
 - a. To be available for the following:
 - iii. Individual buttons
 - iv. Station wallplates
 - b. Engraved characters to be of a contrasting color as shown on drawings
4. Environmental
 - a. Operating Temperature: 32° to 122° F (0° to 50° C)
 - b. Ambient Humidity 0% to 90% non-condensing
- E. Electrical
 1. Supported and listed loads
 - a. 120 – 277VAC, 16A LED Driver, Tungsten, Resistive, Electronic Ballast
 - b. 120 – 277VAC, 20A Ballast
 - c. 120VAC 1/2HP Motor, 277VAC 1HP Motor, 240VAC 1HP Motor
 - d. 120VAC, 20A General Purpose Plug Load Control.
 2. Input Voltage
 - a. Line Voltage: 120 – 277VAC, 50/60Hz, 30mA
 3. Wireless mesh network connectivity to Leviton wireless devices and Intellect-enabled fixtures and WiFi to building networks
- F. Product Components
Leviton GreenMAX DRC Wireless Keypad Room Controller, 120-277VAC, model # DRKDN-UXW

2.23 WIRELESS POWER PACKS

- A. Remotely mounted network addressable load control relays allowing for a wireless distributed system architecture.
- B. Performance Criteria
 1. Wireless Power Packs shall be capable of the following applications:
 - a. Standalone load control when used with a GreenMAX DRC Wireless Keypad Room Controller.
 2. Provide 0-10V dimming, phase cut dimming, or switching control for all listed and compatible load types.
 3. 20A relay shall be listed for general purpose use on Plug Load circuits.

- C. Physical
 - 1. Environmental
 - a. Operating Temperature: 30° to 122° F (0° to 50° C)
 - b. Ambient Humidity 0% to 90% non-condensing
- D. Electrical
 - 1. Supported and listed loads
 - a. 120 – 277VAC, 16A LED Driver, Tungsten, Resistive, Electronic Ballast
 - b. 120 – 277VAC, 20A Ballast
 - c. 120VAC 1/4HP Motor, 277VAC 1/3HP Motor, 240VAC 1/3HP Motor
 - d. 120VAC, 20A General Purpose Plug Load Control
 - e. 800W Incandescent
 - 2. Input Voltage
 - a. 120VAC, 60Hz.
 - b. 120 – 277VAC, 50/60Hz, 20A Max.
 - 3. Network and device connections via wireless mesh network.
- E. Product Components:
 - 1. Leviton Wireless 20A ON/OFF Switching Power Pack, model # LU20S-DNW
 - 2. Leviton Wireless 10A 0-10V Dimming Power Pack, model # LU107-DNW
 - 3. Leviton Wireless 800W Phase Cut Dimming Power Pack, model # LU04P-1NW

2.24 WIRELESS DIGITAL SWITCHES AND DIMMERS

- A. Network addressable control stations providing wireless local control of digital lighting control system as part of a GreenMAX DRC wireless system.
- B. Performance Criteria:
 - 1. Used as secondary user interface
 - 2. Can be used for multi-location control
 - 3. Configurable using the GreenMAX DRC App
- C. Physical:
 - 1. Available as an ON/OFF switch or 0-10V dimmer
 - 2. Digital switches shall mount into a standard depth wallbox.
 - 3. Environmental
 - a. Operating Temperature: 32° to 104° F, (0° to 40° C)
 - b. Ambient Humidity: 0% to 90% non-condensing
- D. Electrical
 - 1. Supported and listed loads
 - a. 120 – 277VAC, 16A LED Driver, Tungsten, Resistive, Electronic Ballast
 - b. 120 – 277VAC, 20A Ballast
 - c. 120VAC 1/4HP Motor, 277VAC 1/3HP Motor, 347VAC 1/4HP Motor
 - d. 120VAC, 20A General Purpose Plug Load Control

- e. 1000W Incandescent
- 2. Input Voltage
 - a. 120VAC, 60Hz.
 - b. 120 – 277VAC, 50/60Hz, 20A Max.
 - c. 347VAC, 60Hz.
 - d. 24VDC.
- 3. Network and device connections via wireless mesh network.
- E. Product Components:
 - 1. Leviton 10A ON/OFF Decora Wall Switch, model # ZS10S-D0Z
 - 2. Leviton 0-10V Decora Wall Dimmer, 120-277VAC, model # ZS057-D0Z
 - 3. Leviton 0-10V Decora Wall Dimmer, 347V, model # ZS057-30Z
 - 4. Leviton 0-10V Low Voltage Decora Wall Dimmer, model # ZS057-ALZ
 - 5. Leviton 1000W Dimmer, model # DL1KD-1BZ

2.25 WIRELESS INTEGRATED OCCUPANCY SENSORS & PHOTOCCELL

- A. Provides digital occupancy/vacancy and daylight harvesting as part of the GreenMAX DRC Wireless System.
- B. Performance Criteria
 - 1. Occupancy detection using PIR technology with a 1000-2000 sq. ft. field-of-view
 - 2. Configurable parameters for occupancy sensitivity, timeout, enable/disable and photocell range, enable/disable with the GreenMAX DRC App.
- C. Physical
 - 1. Environmental
 - a. Operating Temperature: 32° to 104° F, (0° to 40° C)
 - b. Ambient Humidity 0% to 95% non-condensing
- D. Electrical
 - 1. Lithium 3.6V non-rechargeable battery (Jauch ER14505J-S, EVE ER14505, or SAFT LS14500)
 - 2. Network and device connections via wireless mesh network.
- E. Product Components
 - 1. Zigbee PIR Occupancy Sensor and Photocell, 1500 sq. ft., model # ZC015-BIW
 - 2. Optional 24VDC Power Adapter: SLI24-000

2.26 INTELLECT-ENABLED FIXTURES

- A. Intelligent fixture with integrated Solo or Wireless controls, fully compatible with Leviton GreenMAX DRC Wireless Room Control System. All controls pre-installed and fully integrated within the fixture, requiring the contractor to land only hot/neutral/ground to the fixture. On emergency fixtures, an additional EM Hot/Neutral will be allowed.
- B. Performance Criteria
 - 1. Full range dimming.

2. Occupancy detection over coverage area of fixture and within recommended mounting heights.
 3. Provides 3% accurate or better energy metering to include the following points.
 - a. KWH
 - b. KW
 - c. Voltage
 - d. Power Vactor
 - e. kVAR
 - f. kVARH
 4. Upon initial power-up, and, until commissioned, fixture shall support default out-of-the box functionality to include:
 - a. Occupancy Detection
 - i) Fixture Turns off on vacancy
 - ii) Fixture Turn on upon occupancy
 - b. Automatically calibrated Daylighting Harvesting
 5. Reports product failure and status to the network.
 6. Detects and reports ambient light level to network for use by daylight harvesting controllers.
 7. Wireless communicates with all other devices in a room.
 8. Daylight Harvesting capabilities:
 - a. Closed loop daylight harvesting.
 - b. Configurable dead band.
 - c. Override of the daylighting target level may be enabled or disabled in the configuration App.
 9. Fully digital with the following configurable attributes:
 - a. Time Out
 - b. Sensitivity
 - c. Target Light Level
 - d. Occupancy / Vacancy mode
 - e. Exclude sensor.
 10. Physical Test Switch allows manual control, restore factory defaults, and pushbutton pairing.
- C. Product Components:
1. Viscor Intellect-Enabled LED ALLURA Linear Pendant Type M, model # ALRM
 2. Viscor Intellect-Enabled LED ALLURA Linear Pendant Type A, model # ALRA
 3. Viscor Intellect-Enabled LED ALLURA Linear Pendant Type B, model # ALRB
 4. Viscor Intellect-Enabled LED Troffer Dish Lensed, model # LRTH
 5. Viscor Intellect-Enabled LED Commercial Type N Square, model # LCOMN SQ L
 6. ConTech Lighting Intellect-Enabled 4" Integrated LED Universal New Construction Downlight, model # R4NCIE

7. ConTech Lighting Intellect-Enabled 4" Square Integrated LED Universal New Construction Downlight, model # R4SQNCIE
8. ConTech Lighting Intellect-Enabled 6" LED Recessed Downlight; Universal New Construction Downlight, model # R6NCIE
9. Birchwood Lighting Intellect-Enabled Jake Recessed Linear Luminaire, model # JAK-LED
10. Intense Lighting Intellect-Enabled 4" LED Round Downlight, model # SS4G4DR
11. Additional Intellect-Enabled Fixtures available from other manufacturers.

2.27 GREENMAX DISTRIBUTED ROOM CONTROL (DRC) APP

- A. Used to configure and provide app-based control in a GreenMAX DRC System.
- B. Performance Criteria
 1. For Android and iOS smart devices.
 2. Wirelessly communicates with GreenMAX DRC system components via Wi-Fi.
 3. Provide secure administrative settings for communications.
 4. Manage devices, create groups, configure daylighting zones, edit scenes, program digital keypads, and program schedules.

Provide User Access Control to allow users to adjust individual space lighting using their personal smart device determined by user privileges authenticated by the administrator.
- C. Product Components:
 1. Leviton GreenMAX DRC App, download at Google Play or Apple Store

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Coordinate, receive, mount, connect, [and place into operation] all equipment.
- B. Install equipment in accordance with manufacturer's installation instructions.
- C. Provide complete installation of system in accordance with Contract Documents.
- D. Maintain performance criteria stated by the manufacturer without defects, damage, or failure.
- E. Provide equipment at locations and in quantities indicated on Drawings. Provide any additional equipment required to provide control intent.
- F. Ensure that daylight sensor placement minimizes sensors view of electric light sources; ceiling mounted, and fixture-mounted daylight sensors shall not have direct view of luminaries.
- G. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for a properly functioning lighting control and relay system as described herein and shown on the plans. The Electrical Contractor shall maintain performance criteria stated by the manufacturer without defects, damage, or failure.

- H. Compliance: Contractor shall comply with manufacturer's product data, including shop drawings, technical bulletins, product catalog installation instructions, and product carton instructions for installation.
- I. Circuit Testing: The contractor shall test that all branch load circuits are operational before connecting loads to system load terminals, and then de-energize all circuits before installation.
- J. Application of Power: Power shall not be applied to the relay system during construction and prior to turn-on unless specifically authorized by written instructions from the manufacturer.
- K. [Programming: Program [low voltage] [and] [digital switch] functionality remotely from the GreenMAX DRC App.]
 - 1. Terminate and test all network cable assemblies. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to factory-certified service engineer prior to scheduling commissioning activity.

3.2 SITE VERIFICATION

- A. Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.

3.3 FIELD MEASUREMENTS

- A. The electrical contractor shall be responsible for field measurements and coordinating the physical size of all equipment with the architectural requirements of the spaces into which it is to be installed.

3.4 INSPECTION

- A. Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

3.5 SITE PROTECTION

- A. Contractor shall protect installed product and finished surfaces from damage during all phases of installation including storage, preparation, testing, and cleanup.

3.6 COMMISSIONING

- A. Provide factory-certified field service engineer to ensure proper system installation and operation under following parameters:
 - 1. Certified by the equipment manufacturer on the system installed.
 - 2. Site visit activities:
 - a. Verify connection of power feeds and load circuits.
 - b. Verify connection of controls.

- c. Verify system operation control by control, circuit by circuit.
 - d. Obtain sign-off on system functions.
 - e. Demonstrate system capabilities, operation and maintenance and educate Owner's representative on the foregoing.
3. At least three site visits to accomplish the following tasks:
- a. Prior to wiring
 - i. Review and provide installer with instructions to correct any errors in the following areas:
 - a) Low voltage wiring requirements
 - b) Separation of high and low voltage wiring runs
 - c) Wire labeling
 - d) Load schedule information
 - e) Switching cabinet locations and installation
 - f) Physical locations and network addresses of controls
 - g) Ethernet connectivity
 - h) Computer-to-network connections
 - i) Load circuit wiring
 - j) Connections to other systems and equipment
 - k) Placement and adjustment of Occupancy Sensors
 - l) Placement and adjustment of Photocells
 - b. After system installation
 - i. Check and approve or provide correction instructions on the following:
 - a) Connections of power feeds and load circuits
 - b) Connections and locations of controls
 - c) Connections of low voltage inputs
 - d) Connections of the data network
 - ii. Turn on system control processor and upload any pre-programmed system configuration
 - iii. Verify cabinet address(es)
 - iv. Upload pre-programmed system configuration and information to switching and/or dimming cabinets
 - v. Check load currents and remove bypass jumpers
 - vi. Verify that each system control is operating to specification
 - vii. Verify that each system circuit is operational according to specification
 - viii. Verify that manufacturers' interfacing equipment is operating to specification
 - ix. Verify that any computers and software supplied by the manufacturer are performing to specifications
 - x. Verify that any remote WAN (Wide Area Network) connections are operating properly
 - xi. Have an owner's representative sign off on the above-listed system functions

- c. Before project completion and hand-off
 - i. Demonstrate system capabilities and functions to owner's representative
 - ii. Train owner's representative on the proper operation, adjustment, and maintenance of the system.
- B. Notification: Upon completion of the installation, the contractor shall notify the manufacturer that the system is ready for formal checkout. Notification shall be given in writing a minimum of 21 days prior to the time factory-trained personnel are required on site. Each field installed RJ45 connection must be tested prior to system interconnection. A test report must be furnished to manufacturer prior to scheduling commissioning activity. Manufacturer shall have the option to waive formal turn-on.
- C. Turn-On: Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, Manufacturer's Rep or, if waived, Contractor shall completely check the installation prior to energizing the system. Each installed relay system shall be tested for proper ON/OFF operations, and proper LED illumination. Each installed control cabinet shall be tested verifying that each controlled load adjusts to the selected setting and that all switch LED's illuminate properly.
- D. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

3.7 MAINTENANCE

- A. Enable the end user to order new equipment for system expansion, replacements, and spare parts.
- B. Make new replacement parts available for a minimum of ten years from the date of manufacture.
- C. Provide factory-direct technical support hotline 24 hours per day, 7 days per week.
- D. Offer renewable annual service contracts, to include parts, factory labor, and annual training visits. Make service contracts available up to ten years after date of system commissioning.

END OF SECTION