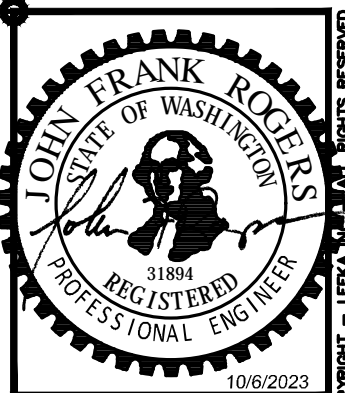


A	B	C	D	
<p>2.5 FITTINGS</p> <p>A. GRC, IMC AND ARC:</p> <ol style="list-style-type: none"> The conduit itself must be threaded, threaded couplings attached by any means are not allowed. Threaded locknuts. Threaded bushings: 1-1/4 inch and larger shall be of the insulated, grounding type as required under Section 26 05 26. Expansion fittings: O-Z/Gedney Electrical Mfg. Co. type Expansion coupling with bonding jumper for up to four inches of movement. <p>B. EMT:</p> <ol style="list-style-type: none"> Connectors: Steel compression ring type for conduit termination, with insulated throat, suitable for conditions used. Couplings: Steel compression ring type, concrete tight. Weatherproof Connectors: Threaded pipe connectors with waterproofing compound. <p>2.6 METALLIC BOXES</p> <p>A. Flush and Concealed Outlet Boxes: Galvanized stamped steel with screw ears, knock-out plugs, mounting holes, fixture studs if required, RACO or equal.</p> <p>B. Surface Outlet Boxes: Galvanized stamped steel same as above for use on ceilings; cast steel or aluminum with threaded hubs for use on walls.</p> <p>C. Large Boxes: Boxes exceeding 4-11/16 inches square when required shall be welded steel construction with screw cover and painted, steel gauge as required by physical size, Hoffman, Circle AW or equal.</p> <p>D. Floor Boxes:</p> <ol style="list-style-type: none"> Fully-adjustable, Walker 880 series, Hubbell or approved substitute. Equip all floor outlets with Lexan polycarbonate flanges, black finish, Walker 817, 827 or 837 series with cover plate, Hubbell or approved substitute. Verify floor type. <p>E. Floor Boxes (Power and Data):</p> <ol style="list-style-type: none"> Fully-adjustable flush concrete box, Walker "Resource RFB" series, model RFB4. Equip all floor outlets with recessed carpet trim plate with wire management blocks, Walker RAKMIL. Verify floor type. <p>2.7 NON-METALLIC BOXES</p> <p>A. PVC, molded enclosures, threaded hubs.</p> <p>2.8 OTHERS</p> <p>A. Any conduits, fittings, etc. specifically not mentioned above are not approved for use.</p> <p>PART 3 EXECUTION</p> <p>3.1 INSTALLATION</p> <p>A. Conceal all conduits in finished spaces and elsewhere so far as practicable. Concealed conduits shall run in a direct line with long sweep bends and offsets. GRC and IMC embedded in concrete below grade or in damp locations shall be made water-tight by painting the entire male thread with Rustleum metal primer, or equal, before assembly.</p> <p>B. Route exposed conduit parallel or at right angles to structural building lines, and neatly offset into boxes. Conduits attached directly to building surfaces shall closely follow the surfaces. Conduit fittings shall be used to "saddle" under beams.</p> <p>C. Conduits, whether exposed or concealed, shall be securely supported and fastened at intervals of nominally every 8 feet and within 18 inches of each outlet, ell, fitting, panel, etc.</p> <p>D. Keep conduit and raceways closed with suitable plugs or caps during construction to prevent entrance of dirt, moisture, concrete or foreign objects. Raceways shall be clean and dry before installation of wire and at the time of acceptance.</p> <p>E. Pack spaces around conduits with oakum and seal to prevent entrance of moisture where conduits are installed in sleeves or block-outs penetrating moisture barriers.</p> <p>F. Where conduits penetrate fire rated concrete walls or floors, provide non-combustible caulking or putty 3M fire barrier material of thickness required to equal or exceed the fire rating of wall or floor.</p> <p>3.2 CONDUIT</p> <p>A. Install GRC or IMC galvanized steel conduits for wiring underground, in-cast-concrete construction, in damp locations, in hazardous areas and where subject to mechanical injury, with threaded fittings made up tight.</p> <p>B. EMT may be employed in all other dry protected locations.</p> <p>C. ARC may be used wherever EMT is acceptable, with no restriction on size.</p> <p>D. Flex is required where flexibility is necessary as at motors, transformers and recessed lighting fixtures, etc. Flex shall be jacketed type, except where concealed in dry locations and spaces such as ceiling cavities.</p> <p>E. PVC may be used underground, under interior slabs or where scheduled or noted on the Drawings. Make connections with waterproof solvent cement. Provide GRC at 60 degree and larger bends and where penetrating slabs or filling up above grade in exterior locations. PVC conduit shall not be installed less than 30" under roadways or areas subject to heavy traffic. Provide a ground wire sized per code in all PVC conduits. Conductor quantities indicated in conduits do not include ground wires unless otherwise noted.</p> <p>F. Conduit stubbed from a concrete slab or wall to serve an outlet under a table or to supply a machine shall have a rigid conduit coupling flush with the surface of the slab. Provide plug where conduit is to be used in future.</p> <p>G. Conduits in above-grade slabs shall be located in the middle of the slab. The maximum size, spacing, and location of conduits in post-tensioned slabs shall be subject to approval by the structural engineer. Conduits larger than one inch shall not be run in slabs.</p> <p>H. MC (Metal Clad) cable uses permitted:</p> <ol style="list-style-type: none"> Metal Clad cable shall only be used for branch circuit interior wiring where origination of MC cable is accessible and located above T-bar ceilings. Metal Clad cable shall not be used for branch circuit home runs. Home runs shall be installed using conduit and conductor method from the circuit breaker panel to a junction box in the accessible ceiling above the room served by the branch circuit or adjacent to the room if that room's ceiling space is inaccessible. From the accessible area junction box, Metal Clad cable may be used to each device or luminaires. <p>I. MC (Metal Clad) cable installation:</p> <ol style="list-style-type: none"> Metal Clad cable shall not be used for branch circuit home runs. Home runs shall be installed using conduit and conductor method from the circuit breaker panel to a junction box in the accessible ceiling above the room served by the branch circuit or adjacent to the room if that room's ceiling space is inaccessible. From the accessible area junction box, Metal Clad cable may be used to each device or luminaire. Support horizontal and vertical cable 6 feet on center (maximum) and within 6 inches of boxes with approved cable clamps. Support cable above accessible ceilings; do not rest cables on ceiling tiles. Attach cables with metal clips or plastic cable ties to support wires from structure on 6-foot centers maximum. Cable shall be cut with manufacturer approved devices. Splice conductors only in accessible junction boxes. Cable shall not be supported from, or come in contact with, mechanical ducts, water, sprinkler or gas piping; maintain 6-inch separation minimum. Provide junction box at all cable penetrations of wall, ceiling, or floor surfaces for equipment connections; cable shall not be run directly through finished surfaces. Voltage Drop: Conductors over 75 feet for 120 volt, and over 200 feet for 277 volt, for branch or individual circuit home runs from equipment connection, racepads or lighting fixture shall be No. 10 AWG minimum. Provide junction box at transition from concealed to exposed wiring. Exposed wiring shall conform to Section 26 05 33 - Conduits, Raceways, Boxes and Fittings. Where cable penetrates fire-rated walls or floors, provide mechanical fire stop fitting with UL listed fire rating equal to wall or floor rating. Provide junction box at transition from interior to exterior wiring. Exterior wiring shall conform to Section 26 05 33 - Conduits, Raceways, Boxes and Fittings. <p>3.3 RACEWAYS</p> <p>A. Surface metal raceway with snap-in cover may be used in finished spaces only as specified or shown on Drawings.</p> <p>B. Surface metal wireways may be installed at locations to serve motor starters or other control devices where required by a multitude of wiring interconnections or physical layout.</p> <p>C. Expansion Joints:</p> <ol style="list-style-type: none"> All conduits crossing expansion joints where cast in concrete shall be provided with expansion-deflection fittings, equivalent to OZ/Gedney AXDX, installed per manufacturer's recommendations. All conduits three inches and larger where not cast in concrete shall be rigidly secured to the building structure on opposite sides of a building expansion joint with an expansion-deflection fitting across the joint, equivalent to OZ/Gedney AXDX, installed per manufacturer's recommendations. All conduits less than three inches where not cast in concrete shall be provided with junction boxes securely fastened on both sides of the expansion joint, connected together with 15 inches of slack (a minimum of 15 inches longer than the straight-line length) flexible conduit with copper green ground bonding jumper. Prior to installation, verify with Architect that the 15 inches is adequate for the designed movement; and if not, increase this length as required. <p>D. Seismic Joints</p> <ol style="list-style-type: none"> No conduits cast in concrete shall be allowed to cross a seismic joint. All conduits shall be provided with junction boxes securely fastened on both sides of the expansion joint, connected together with 15 inches of slack (a minimum of 15 inches longer than the straight-line length) flexible conduit with copper green ground bonding jumper. Prior to installation, verify with Architect that the 15 inches is adequate for the designed movement; and if not, increase this length as required. <p>3.4 SURFACE RACEWAYS</p> <p>A. The raceway system shall provide a complete enclosure that protects the wires installed therein against damage.</p> <p>B. There shall not be any openings that exceed 1/16 inch (1.59 mm) in width on surfaces that are accessible following installation of the system.</p> <p>3.5 FITTINGS</p> <p>A. Metallic raceways and conduit shall be assembled continuously and secured to boxes, panels, etc., with appropriate fittings to maintain electrical continuity. All conduit joints shall be cut square, reamed smooth and all fittings drawn up tight.</p> <p>3.6 BOXES</p> <p>A. Outlet boxes shall be of code required size to accommodate all wires, fittings and devices. Provide multi-gang boxes as required to accept devices installed with no more than one device per gang. Equip all metallic boxes with grounding provisions.</p> <p>B. Flush wall switch and receptacle outlets used with conduit systems shall be 4 inches square, 1-1/2 inches or deeper, with one or two-gang plaster ring mounted vertically. Where three or more devices are at one location, use one-piece multiple gang file box or gang box with suitable device ring.</p> <p>C. Wall bracket and ceiling surface mounted lighting fixture outlets shall be 4-inch octagon, 1-1/2-inches deep with 3/8-inch fixture stud where required. Wall bracket outlets to have single gang opening where required to accommodate future canopy. Provide larger boxes or extension rings where quantity of wires installed requires more cubic capacity.</p> <p>D. Boxes for the special systems shall be suitable for the equipment installed. Coordinate size and type with the system supplier.</p> <p>E. Provide pull boxes where shown, or in conduit runs greater than 100 feet, or where required to limit the number of bends in any conduit to not more than three 90 degree bends or equivalent. Use galvanized boxes of code required size with removable covers installed so that covers will be accessible after work is completed. Do not locate pull boxes or junction boxes in finished areas unless specifically shown or special permission is obtained from Architect.</p> <p>F. Boxes shall be flush with finished surfaces or not more than 1/8-inch below surface and be level and plumb. Long screws with spacers or shims for mounting covers will not be acceptable. No combustible material shall be exposed to wiring at outlets.</p>	<p>SECTION 26 05 53 - IDENTIFICATION</p> <p>PART 1 GENERAL</p> <p>1.1 WORK INCLUDED</p> <p>A. Clearly and properly identify the complete electrical system to indicate the loads served or the function of each item of equipment connected under this work.</p> <p>1.2 CONTRACT CONDITIONS</p> <p>A. Work of this Section is bound by the Contract Conditions and Division 1, bound herewith. In addition to this Specification and accompanying Drawings.</p> <p>1.3 PRODUCT SUBSTITUTIONS</p> <p>A. Follow requirements specified in Section 01 25 00.</p> <p>PART 2 PRODUCTS</p> <p>2.1 LABELS</p> <p>A. Panels: Typed or pre-printed white permanent materials labels with adhesive backing. Specified Products, Inc. or equal.</p> <p>B. Equipment: Dymo-Tape, plastic tape with adhesive backing, field printed with proper tool.</p> <p>PART 3 EXECUTION</p> <p>3.1 SWITCHGEAR</p> <p>A. Label the main and feeder protective devices in all distribution panels with laminated plastic labels indicating the function or the load served.</p> <p>B. Provide labels for all busused spaces indicating size of future breaker or switch that may be installed in the space reserved.</p> <p>3.2 BRANCH CIRCUIT PANELBOARDS</p> <p>A. Indicate panel number with laminated plastic labels. Indicate voltage phase and feeder source, feeder wire size, and feeder breaker or fuse size with white permanent labels on the inside of the panel door.</p> <p>B. Provide machine-printed panel directories with protective, clear transparent covers, accurately accounting for every breaker installed, including spares. Schedules shall use the actual room designations assigned by name or number near completion of the work and not the space designation on the Construction Drawings.</p> <p>3.3 EQUIPMENT</p> <p>A. Label all disconnect switches, motor starters, relays, contactors, time switches indicating voltage, amperage, circuit number and equipment served with white permanent labels.</p> <p>B. Label all transformers and busways with black and yellow 4-1/2 inch high pre-printed adhesive backed materials.</p> <p>3.4 SYSTEMS</p> <p>A. Complex control circuits may utilize any combination of colors with each conductor identified throughout, using wraparound numbers or letters. Use the number or letters shown where the Drawings or operation and maintenance data indicate wiring identification.</p> <p>B. Label the fire alarm and communication equipment zones, controls, indicators, etc. with machine printed labels or indicators appropriate for the equipment installed, as supplied or recommended by the equipment manufacturer.</p> <p style="text-align: center;">END OF SECTION</p> <p>SECTION 26 09 43 - NETWORK LIGHTING CONTROLS</p> <p>PART 1 GENERAL</p> <p>1.1 Summary</p> <p>A. Section includes a networked lighting control system comprised of the following components:</p> <ol style="list-style-type: none"> [rLWand]Wireless Networked Devices <ol style="list-style-type: none"> [rLWand]Wireless Networked Wall Switches, Dimmers [rLops]Wireless Networked Indoor Occupancy and Photosensors [rLp]Wireless Networked Power Packs The networked lighting control system shall meet all the characteristics and performance requirements specified herein. The contractor shall provide, install and verify proper operation of all equipment necessary for proper operation of the system as specified herein and as shown on applicable drawings. <p>1.2 Related Documents</p> <p>A. Section 26 27 26 Writing Devices</p> <p>B. Section 26 09 43 Digital-Network Lighting Controls</p> <p>C. Section 26 50 00 Interior Lighting Fixtures</p> <p>1.3 Submittals</p> <p>A. Submittal shall be provided including the following items:</p> <ol style="list-style-type: none"> Bill of Materials necessary to install the networked lighting control system. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature. Riser Diagrams showing device wiring connections of system backbones and typical per room/area type. Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems. Other Diagrams and Operational Descriptors (as needed to indicate system operation or interaction with other systems). Contractor Startup/Commissioning Worksheet (must be completed prior to factory start-up). Service Specification Sheets indicating general service descriptions, including startup, training, post-startup support, and service contract terms. Hardware and Software Operation Manuals. <p>1.4 Approvals</p> <p>A. Prior approval from owner's representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.</p> <p>B. Any alternate product or system that has not received prior approval from the owner's representative at least 10 days prior to submission of a proposal package shall be rejected.</p> <p>C. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to owner's representative.</p> <p>D. For any alternate system that does not support any form of wireless communication to networked luminaires, networked control devices, networked sensors, or networked input devices, bidders shall provide a total installed cost including licensed labor costs for installing network wiring to luminaires, control devices, sensors, input devices and other required system peripherals.</p> <p>1.5 Quality Assurance</p> <p>A. Product Qualifications</p> <ol style="list-style-type: none"> System electrical components shall be listed or recognized by a nationally recognized testing laboratory (e.g., UL, ETL, or CSA) and shall be labeled with required markings as applicable. System shall be listed as qualified under DesignLights Consortium Networked Lighting Control System Specification V2.0. System luminaires and controls are certified by manufacturer to have been designed, manufactured and tested for interoperability. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation. All components and the manufacturing facility where product is manufactured must be RoHS compliant. <p>B. Installation and Startup Qualifications</p> <ol style="list-style-type: none"> System startup shall be performed by qualified personnel approved or certified by the manufacturer. Service and Support Requirements <ol style="list-style-type: none"> Phone Support: Toll free technical support shall be available. Remote Support: The bidder shall offer a remote support capability. Onsite Support: The bidder shall offer onsite support that is billable at whole day rates. Service Contract: The bidder shall offer a Service Contract that packages phone, remote, and onsite support calls for the project. Response times for each type of support call shall be indicated in the terms of the service contract included in the bid package. <p>1.6 Project Conditions</p> <p>A. Only install indoor equipment after the following site conditions are maintained:</p> <ol style="list-style-type: none"> Ambient Temperature: 14 to 105 degrees F (-10 to 40 degrees C) Relative Humidity: less than 90% non-condensing <p>B. Equipment shall not be subjected to dust, debris, moisture, or temperature and humidity conditions exceeding the requirements indicated above or as marked on the product, at any point prior to installation.</p> <p>C. Only properly rated equipment and enclosures, installed per the manufacturer's instructions, may be subjected to dust and moisture following installation.</p> <p>1.7 Warranty</p> <p>A. The manufacturer shall provide a minimum five-year warranty on all hardware devices supplied and installed. Warranty coverage shall begin on the date of shipment.</p> <p>B. The hardware warranty shall cover repair or replacement any defective products within the warranty period.</p> <p>1.8 Maintenance & Sustainability</p> <p>A. The manufacturer shall make available to the owner new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.</p> <p>PART 2 EQUIPMENT</p> <p>2.1 Manufacturers</p> <p>A. Acceptable Manufacturers</p> <ol style="list-style-type: none"> Acuity Brands Lighting, Inc. Or Approved Equivalent. <p>B. Basis of Design System: Acuity Controls nLight</p> <p>2.2 System Compliance</p> <p>A. System components shall comply with UL 916 and UL 924 standards where applicable.</p> <p>B. System components shall comply with CFR Title 47, Part 15 standards where applicable.</p>	<p>C. All equipment shall be installed and connected in compliance with NFPA 70.</p> <p>2.3 System Performance Requirements</p> <p>A. System Architecture</p> <ol style="list-style-type: none"> System shall have an architecture that is based upon three main concepts: (1) networkable intelligent lighting control devices, (2) standalone lighting control zones using distributed intelligence, (3) optional system backbone for remote, line based and global operation. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of initiating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system. System must be capable of interfacing directly with networked luminaires such that either low voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches and system backbone (see Control Zone Characteristics sections for each type of network connection, wired or wireless). Networked luminaires and intelligent lighting control devices shall support individual (unique) configuration of device settings and properties, with such configuration residing within the networked luminaires and intelligent control devices. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices and shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wall stations without requiring connection to a higher-level system backbone; this capability is referred to as "distributed intelligence." <ol style="list-style-type: none"> Lighting control zones (wired and wireless) of at least 128 devices per zone shall be supported. Networked luminaires and intelligent lighting control devices shall have distributed intelligence programming stored in non-volatile memory, such that following any loss of power the lighting control zones shall operate according to their defined default settings and sequence of operations. Lighting control zones shall be capable of being networked with a higher-level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software interface. The system may include one or more system controllers that provide time-based control. The system controller also provides a means of connecting the lighting control system to a system software interface and building management systems via BACnet/IP or BACnet MS/TP protocol. All system devices shall support firmware update, either remotely or from within the applications space, for purposes of upgrading functionality at a later date. <p>B. [rLWand]Wireless Networked Control Zone Characteristics</p> <ol style="list-style-type: none"> [rLWand]No wired connections between networked devices shall be required for the purposes of system communications. [rLWand]Multiple wireless networking protocols shall be supported: <ol style="list-style-type: none"> [rLWand] standards based, distributed star topology type of protocol for 900 MHz communication, so as to support lighting control applications and IoT applications. [rLWand] Bluetooth standard protocol for 2.4 GHz communication that supports direct connection to a smartphone and tablet device, so as to support device configuration, control applications, and IoT without requiring the use of a system backbone. [rLWand]Wireless network shall be self-healing, such that the loss of backbone or local communication between devices does not result in the loss of control of the lights in the space. [rLWand]Wireless network communication shall support uniform and instant response such that all luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wall station signal. [rLWand]To support the system architecture requirement for distributed intelligence, wireless network communication shall support communication of control signals from sensors and wall stations to networked luminaires and wireless local control devices, without requiring any communication, interpretation, or translation of information through a backbone device such as a wireless access point, communication bridge or gateway. [rLWand]All wireless communication between lighting control components shall support the following five tiers of security measures. <ol style="list-style-type: none"> [rLWand]Data Encryption [rLWand]Firmware Protection [rLWand]Tamper-Proof Hardware [rLWand]Authenticated User Access [rLWand]Mutual Device Authentication [rLWand]Accounting for typical environmental conditions and building construction materials encountered within commercial indoor lighting environments, wireless networked devices shall be capable of communicating to at least 150' spacing between devices with embedded wireless transceivers under typical site conditions. [rLWand]Wireless networked devices shall have a line-of-sight communication range of at least 1000' under ideal environmental conditions. <p>C. System Integration Capabilities</p> <ol style="list-style-type: none"> The system shall interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet MS/TP protocols. The following system integration capabilities shall be available via BACnet/IP and BACnet MS/TP protocols: <ol style="list-style-type: none"> The system shall support control of individual devices, including, but not limited to, control of relay and dimming output. The system shall support reading of individual device status information. The available status will depend on the individual device type and capabilities, which may include but not be limited to, relay state, dimming output, power measurement, occupancy sensor status, and photo cell sensor states or readings. All system devices shall be available for polling for device status. The system shall support activation of pre-defined system Global Profiles (see Supported Sequence of Operations for further definition of Global Profile capabilities). The system shall support activation of Global Profiles from third party systems by receiving dry contact closure output signals or digital commands via RS-232RS-485. (See Supported Sequence of Operations for further definition of Profile and Scene Preset capabilities.) The system shall support activation of demand response levels from Demand Response Automation Servers (DRAS) via the OpenADR 2.0a protocol. <p>D. Supported Sequence of Operations</p> <ol style="list-style-type: none"> Control Zones <ol style="list-style-type: none"> Networked luminaires and intelligent lighting control devices installed in an area (also referred to as a group of devices) shall be capable of transmitting and tracking occupancy sensor, photo cell sensor, and manual switch information within at least 48 unique control zones to support different and reconfigurable sequences of operation within the area. These shall also be referred to as local control zones. Wall station Capabilities <ol style="list-style-type: none"> Wall stations shall be provided to support the following capabilities: <ol style="list-style-type: none"> On/Off of a local control zone. Continuous dimming control of light level of a local control zone. 3-way / multi-way control multiple wall stations shall be capable of controlling the same local control zones, so as to support "multi-way" switching and/or dimming control. Occupancy Sensing Capabilities <ol style="list-style-type: none"> Occupancy sensors shall be configurable to control a local zone. Multiple occupancy sensors shall be capable of controlling the same local zones. This capability combines occupancy sensing coverage from multiple sensors without consuming multiple control zones. System shall support the following types of occupancy sensing sequence of operations: <ol style="list-style-type: none"> On/Off Occupancy Sensing Partial-On Occupancy Sensing Partial-Off Occupancy Sensing Vacancy Sensing (Manual-On / Automatic-Off) On/Off, Partial-On, and Partial-Off Occupancy Sensing modes shall function according to the following sequence of operation: <ol style="list-style-type: none"> Occupancy sensors shall automatically turn lights on to a designated level when occupancy is detected. To support fine tuning of Partial-On sequences the designated occupancy light level shall support at least 100 dimming levels. Occupancy sensors shall automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. To support fine tuning of Partial-Off sequences the designated unoccupied dim level shall support at least 100 dimming levels. To provide additional energy savings the system shall also be capable of combining Partial-Off and Full-Off operation by dimming the lights to a designated level when vacant and then turning the lights off completely after an additional amount of time. Photo cell readings, if enabled in the Occupancy Sensing control zone, shall be capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary to further reduce energy usage. Additional requirements and details for photo cell sensing capabilities are indicated under Photo cell Sensing Capabilities. The use of a wall station shall change the dimming level or turn lights off as selected by the occupant. The lights shall optionally remain in this manually-specified light level until the zone becomes vacant, upon vacancy the normal sequence of operation, as defined above, shall proceed. Vacancy Sensing mode (also referred to as Manual-On / Automatic-Off) shall function according to the following sequence of operation: <ol style="list-style-type: none"> The use of a wall station is required turn lights on. The system shall be capable of programming the zone to turn on to either to a designated light level or the previous user light level. Initially occupying the space without using a wall station shall not result in lights turning on. Occupancy sensors shall automatically turn lights off or to a dimmed state (Partial-Off) when vacancy occurs or if sufficient daylight is detected. To support fine tuning of Partial-Off sequences the designated unoccupied dim level shall support at least 100 dimming levels. To provide additional energy savings and an enhanced occupant experience, the system shall also be capable of dimming the lights when vacant and then turning the lights off completely after an additional amount of time. To minimize occupant impact in case the area or zone is still physically occupied following dimming or shutoff of the lights due to detection of vacancy, the system shall support an "automatic grace period" immediately following detection of vacancy, during which time any detected occupancy shall result in the lights reverting to the previous level. After the grace period has expired, the use of a wall station is required to turn lights on. Protocol readings, if enabled in the Occupancy Sensing control zone, shall be capable of automatically adjusting the light level during occupied or unoccupied conditions as necessary to further reduce energy usage. Additional requirements and details for photo cell sensing capabilities are indicated under Photo cell Sensing Capabilities. At any time, the use of a wall station shall change the dimming level or turn lights off as selected by the occupant. The lights shall optionally remain in this manually-specified light level until the zone becomes vacant, upon vacancy the normal sequence of operation, as defined above, shall proceed. To accommodate diverse types of environments, occupancy time delays before dimming or shutting off lights shall be specifiable for control zones between 15 seconds to 2 hours. Photo cell Sensing Capabilities (Automatic Daylight Sensing) <ol style="list-style-type: none"> Photo cell sensing devices shall be configurable to control a local zone. The system shall support the following type of photo cell-based control: <ol style="list-style-type: none"> Continuous Dimming: The control zone automatically adjusts its dimming output in response to photo cell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photo cell response shall be configurable to adjust the photo cell setpoint and dimming rates. Global Profile Capabilities <ol style="list-style-type: none"> The system shall be capable of automatically modifying the sequence of operation for selected devices in response to any of the following: a time-of-day schedule, contact closure input state, manually triggered wired wall station input, RS-232RS-485 command to wired input device, and BACnet input command. This capability is defined as supporting "Global Profiles" and is used to dynamically optimize the occupant experience and lighting energy usage. 	<p>b. Global profiles may be scheduled with the following capabilities:</p> <ol style="list-style-type: none"> Global Profiles shall be stored within and executed from the system controller (via internal timeclock) such that a dedicated software host or server is not required to be online to support automatic scheduling and/or operation of Global Profiles. Global Profile time-of-day schedules shall be capable of being given the following recurrence settings: daily, specific days of week, every "n" number of days, weekly, monthly, and yearly. Lighting control profile schedules shall support definition of start date, end date, and end after "n" recurrences, or never ending. Daylight savings time adjustments shall be capable of being performed automatically, if desired. Global Profile Holiday Schedules should follow recurrent settings for specific US holiday dates regardless if they always occur on a specific date or are determined by the day/week of the month. Global Profiles shall be capable of being scheduled to run according to timed offsets relative to sunrise or sunset. Sunrise/sunset times shall be automatically derived from location information using an astronomical clock. Software management interface shall be capable of displaying a graphic calendar view of profile schedules for each control zone. <p>c. System Global Profiles shall have the following additional capabilities:</p> <ol style="list-style-type: none"> Global Profiles shall be capable of being manually activated directly from the system controller, specially programmed wired input devices, scene capable wired wall stations, and the software management interface. Global Profiles shall be selectable to apply to a single device, zone of devices, or customized group of devices. Parameters that shall be configurable and assigned to a Global Profile shall include, but not be limited to, future light level, occupancy time delay, response to occupancy sensors (including enabling/disabling response), response to daylight sensors (including enabling/disabling response), and enabling/disabling of wall stations. A backup of Local and Global Profiles shall be stored on the software's host server such that the Profile backup can be applied to a replacement system controller or wired wall station. <p>2.4 [rLWand]Wireless Networked Devices</p> <p>A. [rLWand]Wireless Networked Wall Switches, Dimmers</p> <ol style="list-style-type: none"> [rLWand]Products: rPODS, rPODS xS, rPODL, rPODL xS [rLWand]Devices shall access into single-gang switch box and fit a standard GFI opening. [rLWand]Communication shall be provided by wireless BLE connection and 900MHz link to other devices. [rLWand]Devices shall have options to be powered by battery or line voltage. If powered by battery, expected battery life shall be no less than 10 years. [rLWand]Devices with mechanical push-buttons shall provide tactile and LED user feedback during button press. [rLWand]Devices with mechanical push-buttons shall be made available with custom button labeling. [rLWand]Wall switches & dimmers shall support the following device options: <ol style="list-style-type: none"> [rLWand]Number of control zones: 1, 2 [rLWand]Control Types Supported: On/Off or On/Off/Dimming [rLWand]Colors: Ivory, White, Light Almond, Gray, Red [rLWand]Scene switches shall support the following device options: <ol style="list-style-type: none"> [rLWand]Number of Scenes: 2, 4 [rLWand]Control types supported <ol style="list-style-type: none"> [rLWand]On/Off [rLWand]On/Off/Dimming [rLWand]Preset Level Scene Type <p>B. [rLops]Wireless Networked Indoor Occupancy and Photosensors</p> <ol style="list-style-type: none"> [rLops]Products: rCMS, rCMS PDT, rLSXR, rSBOR [rLops]Communication shall be provided by wireless BLE connection and 900MHz link to other devices. [rLops]Occupancy sensors shall sense the presence of human activity within the desired space and fully control the on/off function of the lights. [rLops]Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state, thus preventing false on conditions. Ultrasonic or Microwave based sensing technologies shall not be accepted. [rLops]For applications where a second method of sensing is necessary to adequately detect occupancy (such as in rooms with obstructions), a sensor with an additional "dual" technology shall be used. [rLops]Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphones (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect motion (PIR/Ultrasonic) shall not be accepted. [rLops]All sensors shall have the ability to detect when it is not receiving valid communication and blink its LED in a pattern to visually indicate a potential issue. [rLops]Power shall be delivered to each device via standard low voltage wiring from a local power pack or by line voltage for devices with available nipple mount. [rLops]Sensor programming parameter shall be available and configurable remotely from the software [rLops]Network system shall have ceiling and future mounted sensors available, with multiple lens options available customized for specific applications. [rLops]Sensors shall be available with zero or one integrated dry contact switching relays, capable of switching 1 amp at 24 VAC/VDC (resistive only). [rLops]Sensors shall have standard daylight photosensor for programmable daylight harvesting [rLops]Photosensor shall provide foot-candle setpoint and a deadband to prevent the artificial light from cycling. Set-point and deadband shall be capable of automatically calibrating through an "Automatic Set-Point Programming" procedure. Min and max dim settings as well as setpoint may be manually entered. [rLops]Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lighting depression, or lamp outages). [rLops]Nipple mounted devices shall include option for power interruption detection, where unit powers and controls the emergency circuit, and an interruption of power to this circuit for >30 ms forces unit to shut closed, go to full bright, and ignore all system commands for 90 minutes <p>C. [rLp]Wireless Networked Power Packs</p> <ol style="list-style-type: none"> [rLp]Products: rPP20, rPP20 ER, rPP20 EM [rLp]Communication shall be provided by wireless BLE connection and 900MHz link to other devices. [rLp]Power Packs shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output [rLp]Power Packs shall accept 120 through 277 VAC and carry a plenum rating. [rLp]Power Packs shall be available with optional 24VDC, 100mA output for use with ceiling mount sensors or other DC powered products. [rLp]Power Packs shall be available with options for integrated and remote capable antenna such that devices can be optionally installed in a sealed container without detriment to wireless strength. [rLp]Power Pack programming parameters shall be available and configurable remotely from the software [rLp]Power Pack shall securely mount to junction location through a threaded 1/2 inch chase nipple or be capable of being secured within a luminaire ballast/driver channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement. [rLp]When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads. [rLp]Power Packs shall be available with the following options: <ol style="list-style-type: none"> [rLp]Power Pack capable of full 20-Amp switching of all normal power lighting load types, with optional 0-10V dimming output capable of up to 100mA of sink current. [rLp]Power Pack capable of full 20-Amp switching of general purpose receptacle (plug-load) control. [rLp]Power Packs with UL224 listing capable of full 20-Amp switching of all emergency power lighting load types, with optional 0-10V dimming output capable of up to 100mA of sink current. These shall be two methods of achieving the UL224 operation: <ol style="list-style-type: none"> [rLp]Power sense of normal power feed, where unit powers and controls emergency circuit, and loss of the normal power sense circuit forces the power pack to shut closed, go to full bright, and ignore all system commands until normal power is restored. [rLp]Power interruption detection, where unit powers and controls the emergency circuit, and an interruption of power to this circuit for >30 ms forces unit to shut closed, go to full bright, and ignore all system commands for 90 minutes. [rLp]Power Packs shall have the option of mounting inside a sealed metal enclosure, with a plenum rated antenna protruding from said enclosure to allow for an IP 67 rated application. 	<p>PART 3 EXECUTION</p> <p>3.1 Installation Requirements</p> <p>A. Installation Procedures and Verification</p> <ol style="list-style-type: none"> The successful bidder shall review all required installation and pre-startup procedures with the manufacturer's representative through pre-construction meetings. The successful bidder shall install and connect the networked lighting control system components according to the manufacturer's installation instructions, wiring diagrams, the project submittals and plans specifications. <ol style="list-style-type: none"> Bidder shall provide all labor and material required for a complete and operational system including but not be limited to control devices, conduit, conductors, Cat 5 cable, LV conductors, junction boxes, and supports. The successful bidder shall be responsible for providing and testing of all low voltage network cable included in the bid. Bidder is responsible for verification of the following minimum parameters: <ol style="list-style-type: none"> Wire Map (continuity, pin termination, shorts and open connections, etc.) Length Insulation Loss <p>B. Coordination with Owner's IT Network Infrastructure</p> <ol style="list-style-type: none"> The successful bidder is required to coordinate with the owner's representative to secure all required network connections to the owner's IT network infrastructure. <ol style="list-style-type: none"> The bidder shall provide to the owner's representative all network infrastructure requirements of the networked lighting control system. The bidder shall provide to the manufacturer's representative all necessary contracts pertaining to the owner's IT infrastructure, to ensure that the system is properly connected and started up. <p>C. Documentation and Deliverables</p> <ol style="list-style-type: none"> The installing contractor shall be responsible for documenting installed location of all networked devices, including networked luminaires. The responsibility to provide as-built plan drawing showing device address barcodes corresponding to locations of installed equipment.
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