SECTION 260944 – DISTRIBUTED DIGITAL LIGHTING MANAGEMENT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Digital Occupancy and Daylighting Sensor Control
2. Emergency Lighting Control (if applicable)

B. Related Section

1. Section 260943 – Lighting Control System
2. Section 262726 - Wiring Devices
3. Section 270500 – Auxiliary System Cables, 0-50V
4. Section 265000 – Lighting Materials and Methods
5. Drawings and general provision of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section
6. Electrical Sections, including wiring devices, apply to the work of this Section.

C. Control Intent – Control Intent includes, but is not limited to:

1. Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
2. Initial sensor and switching zones
3. Initial time switch settings
4. Task lighting and receptacle controls
5. Emergency Lighting control (if applicable)

1.2 REFERENCES

A. American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE)

B. Underwriter Laboratories of Canada (ULC)

C. International Electrotechnical Commission

D. International Organization for Standardization (ISO)

E. National Electrical Manufacturers Association (NEMA)

F. WD1 (R2005) - General Color Requirements for Wiring Devices.

G. Underwriters Laboratories, Inc. (UL):

1. 916 – Energy Management Equipment.
2. 924 – Emergency Lighting
3. 2043 – Plenum Rating

1.3 SYSTEM DESCRIPTION & OPERATION

A. The Lighting Control and Automation system as defined under this section covers the following equipment:

1. Digital Room Controllers – Self configuring, digitally addressable one, two or three relays controllers with 0-10v control for ballasts (if applicable) and single relay application specific plug load controllers.
2. Digital Occupancy Sensors connected to Digital Room Controllers – Self configuring, digitally addressable and calibrated occupancy sensors with LCD screens and two way active Infra-Red (IR) communications.
3. Digital Switches connected to Digital Room Controllers – Self configuring, digitally addressable push button switches, dimmers, and scene switches with two way active Infra-Red (IR) communications.
4. Analog and digital closed loop daylighting sensors connected to Digital Room Controllers - self-calibrating daylighting sensors that provide closed loop control to Room Controllers. Sensors and Room Controllers can provide single or multi-zone, on/off or dimming control for daylight harvesting.
5. Hand held remotes for room configuration – provides two way infrared communications to digital devices and allows complete configuration and reconfiguration of the device / room from 30 feet away. Unit to have Organic LED display, simple pushbutton interface, and allow send / receive / store of room variables.
6. Hand held remotes for personal control – One, two, or four (scene) button remotes provide Infrared communications to a room. Remote controls will support ON/OFF, dimming, scene control and may be configured in the field to provide specific occupant requirements without special tools.
7. Digital Lighting Management (DLM) local network – Free topology, plug in wiring system (Cat 5e) for power and data to room devices.
8. Network Bridge - provides BACnet MS/TP compliant digital networked communication between rooms, panels and the Segment Manager or BAS.
9. Segment Manager - provides web browser based user interface for system control, scheduling, power monitoring, room device parameter administration and reporting.
10. Emergency Lighting Control Unit (ELCU)- allows any standard lighting control device to control emergency lighting in conjunction with normal lighting in any area within a building

1.4 LIGHTING CONTROL APPLICATIONS

A. Unless relevant provisions of the applicable local Energy Codes are more stringent, provide a minimum application of lighting controls as follows:

1. Space Control Requirements – Provide occupancy/vacancy sensors with manual-on functionality in all spaces except toilet rooms, storerooms, library stacks, or other applications where hands-free operation is desirable and automatic-on occupancy sensors are more appropriate. Provide manual ON occupancy/vacancy sensors for any enclosed office, conference room, meeting room, open plan system and training room. For spaces with multiple occupants or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors with manual-on switches.
2. Bi-Level Lighting – Provide multi –level switched dimming controls where indicated on plans.
3. Task Lighting / Plug Loads – Provide automatic shut off of non essential plug loads and task lighting where indicated on plans. Provide automatic ON of plug loads whenever spaces are occupied. For spaces with multiple occupants a single shut off consistent with the overhead lighting may be used for the area.
4. Daylighted Areas. Provide daylighting controls where indicated on plans. Daytime set points for total illumination (combined daylight and electric light) level that initiate dimming shall be programmed to be not less than 125% of the nighttime maintained designed illumination levels.
5. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.
6. Provide smooth and continuous daylight dimming for areas marked on drawings. Daylight system may be designed to turn off ambient lighting when daylight is at or

above required lighting levels, only if system functions to turn lamps back on at dimmed level, rather than turning full-on prior to dimming.

1.5 SUBMITTALS

A. Submittals Package: Submit the shop drawings, and the product data specified below at the same time as a package.

1. Shop Drawings: Building floorplans showing all proposed devices and composite wiring and/or schematic diagram of each control circuit as proposed to be installed (standard diagrams will not be accepted).
2. Product Data: Catalog sheets, specifications and installation instructions.

1.6 QUALITY ASSURANCE

A. Manufacturer: Minimum [10] years experience in manufacture of lighting controls.

1.7 PROJECT CONDITIONS

A. Do not install equipment until following conditions can be maintained in spaces to receive equipment:

1. Ambient temperature: 0° to 40° C (32° to 104° F).
2. Relative humidity: Maximum 90 percent, non-condensing.

1.8 WARRANTY

A. Provide a five year complete manufacturer's warranty on all products to be free of manufacturers' defects.

1.9 MAINTENANCE

A. Spare Parts:

1. Provide two (2) of each product to be used for maintenance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer:

1. Watt Stopper Digital Lighting Management (DLM)
2. Equal by Acuity Lighting

B. Basis of design product: Watt Stopper Digital Lighting Management (DLM) or subject to compliance and prior approval with specified requirements of this section, one of the following:

1. Watt Stopper Digital Lighting Management (DLM)
2. Acuity
3. Substitutions:

a. All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 10 working days prior to the bid date and must be made available to all bidders. Proposed

substitutes must be accompanied by a review of the specification noting compliance on a line-by-line basis.

b. By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring. The contractor shall provide complete engineered shop drawings (including power wiring) with deviations for the original design highlighted in an alternate color to the engineer for review and approval prior to rough-in.

2.2 SINGLE / DUAL RELAY WALL SWITCH VACANCY SENSORS

A. Type PW: Manual ON, Automatic OFF Wall switch type passive infrared occupancy sensor with built-in override control (off-auto). Furnish the Company's model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled; Watt Stopper PW-100, PW-200 .

B. Type UW: Manual ON, Automatic OFF Wall switch type ultrasonic occupancy sensor with built-in override control (off-auto). Furnish the Company's model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled; Watt Stopper UW-100, UW-200.

C. Type DW: Manual ON, Automatic OFF Wall switch type dual technology, passive Infrared and ultrasonic occupancy sensor with built-in override control (off-auto). Furnish the Company's model which suits the electrical system parameters, and accommodates the square footage coverage and wattage requirement for each area (and type of lighting) controlled; Watt Stopper DW-100, DW-200.

2.3 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

A. Wall or ceiling mounted (to suit installation) passive infrared, ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square footage coverage requirements for each area controlled, utilizing Room Controller modules and accessories which suits the lighting and electrical system parameters.

B. Digital Occupancy Sensors shall provide graphic LCD display for digital calibration and electronic documentation . Features include the following:

1. Digital calibration and LCD entry for the following variables:

   a. Sensitivity 0-100% in 10% increments
   b. Time Delay – Fixed (1-30 minutes in 1 minute increments), and automatic
   c. Test mode – Five second time delay
   d. PIR, Ultrasonic or Dual Technology activation and/or re-activation.
   e. Walk-through mode
   f. Load parameters including auto/manual ON, blink warning, and daylight enable/disable.

2. RJ-45 digital connections for DLM local network.
3. Two-way infrared communications port to allow remote programming through hand held commissioning tool.
4. Self contained push buttons for programming and control of room devices.
5. Device Status LED's including:

   a. PIR Detection
   b. Ultrasonic detection
   c. Configuration mode

d. Load binding

6. Assignment of occupancy sensor to a specific load within the room without wiring or special tools.

C. Units will provide for digital calibration and commissioning and will not have any dip switches or potentiometers for field settings

D. Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required

E. Watt Stopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

2.4 DIGITAL WALL SWITCHES

A. Low voltage (RJ-45) momentary push button switches in 1,2,3,4 and 8 button configuration, decorator opening. Wall switches will include the following features:

1. Two way infrared communications port for use with personal and configuration remote controls.
2. Engraveable buttons
3. Dimming switches shall include seven LED's to indicate load levels.
4. Scene switches shall include pilot indication of scene selection.
5. Device Status LED's including:

a. One pilot LED for each button.
b. Power Indication
c. One locator LED per switch
d. Network status LED to indicate data transmission
e. Power LED to indicate the device has power
f. Configuration mode

B. Switches shall have two RJ-45 ports to allow connection to any other digital room device.

C. Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching

D. Watt Stopper product numbers: LMSW-101 / LMSW-102 / LMSW-103 / LMSW-104 / LMSW-108.

2.5 ROOM CONTROLLERS

A. Room Controllers automatically bind the room loads to the connected devices in the space without any tools or configuration requirements. Room Controllers shall be provided to match the room lighting load and control requirements and sequences. The controllers will be simple to install and will not have screw type connections, dip switches, potentiometers or require special mounting or configuration. The control units will include the following features:

1. Automatic room configuration to the most energy efficient sequence of operation based upon the devices in the room.
2. One or two relay configuration
3. Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an Off-the-Shelf unit without requiring any configuration or setup.
4. Device Status LED's to indicate:

a. Data transmission
b. Device has power
c. Status for each load
d. Configuration status

5. Quick installation features including:

a. Standard junction box mounting (inside or outside)
b. Quick low voltage connections using standard RJ-45 patch cable

6. Plenum rated
7. Manual override and LED indication for each load
8. Universal voltage (120/230/277 VAC, 50-60 Hz)
9. Zero cross circuitry for each load.
10. Efficient 150 ma switching power supply
11. Three RJ-45 DLM local network ports
12. Watt Stopper product numbers: LMRC-101 / LMRC-102

B. 0-10 Volt enhanced Room Controllers shall include all the features of the Room Controller plus the following enhancements:

1. One, two or three relay configuration
2. Efficient 250 ma switching power supply
3. Four RJ-45 DLM local network ports.
4. One zero to 10 volt analog output per relay for control of dimmable ballasts.
5. Optional BACnet MS/TP communications port.
6. Current monitoring
7. Watt Stopper product numbers: LMRC-301 / LMRC302 / LMRC303.

C. Plug Load Room Controllers provide dedicated control of plug loads within the space. The controllers plug into the DLM local network using the RJ-45 free topology network. The room controllers include the following features

1. One relay configuration only
2. Automatic ON/OFF configuration
3. Default 30 minute (adjustable) time delay from lighting shut off to allow for electronic component use after an area is vacant
4. Watt Stopper product number: LMPL-101.

2.6 DIGITAL PHOTOSENSORS

A. Provide automatic daylight harvesting capabilities to the Room Controllers. The photo sensor / room controller configuration automatically configures the daylighting set points for ON/OFF or Dimming control. Using the automatic configuration replacing a photo sensor or room controller can be done without any special tools, programming or configuration. Photosensors include the following features:

1. The digital photosensor shall utilize an internal photodiode that measures light in a 100 degree angle cutting the unwanted light from bright sources outside of this cone
2. The digital photosensor shall be capable of turning lighting on and off or Raise / Lower depending on the type of Room Controller (on/off or dimming). Sensor range shall be from 1 - 1400fc.
3. For ON/OFF daylight harvesting the controller provides a “hold on while occupied” feature that prohibits high levels from turning OFF the controlled lights as long as the space remains occupied.

4. The sensor has a threaded nipple that mounts on a ceiling tile and for more challenging applications such as a side wall or hard rock ceiling the nipple pops off and the unit can be screwed down

B. Watt Stopper Product Numbers: LMLS-400 or equivalent.

2.7 ROOM NETWORK

A. The DLM local network is a free topology lighting control network and protocol designed to control a small area of a building. Digital room devices connect to the network using RJ-45 patch cords which provide both data and power to room devices. Features of the DLM local network include

1. Automatic configuration and binding of sensors, switches and lighting loads to the most energy efficient sequence of operation based upon the device attached.
2. Simple replacement of any device in the network with a standard off the shelf unit without requiring commissioning, configuration or setup.
3. Push and Learn configuration that can change the automatic binding process and load parameters by using only the digital devices in the room.
4. Two way infrared communications that allow load parameters, sensor configuration and binding operations to be configured through a hand held configuration tool up to 30 feet from any device

2.8 NETWORK BRIDGE

A. Each local network shall include a network bridge component to provide a connection between the room devices and the segment network. The network bridge shall use industry standard BACnet MS/TP network communication and allow direct connection to the Segment Manager or BAS where required.

B. The network bridge may be incorporated directly into the room controller hardware or be provided as a separate module connected on the local network through an available RJ local network port

C. Provide Plug and Go operation to automatically discover all room devices connected to the local network and make all device parameters visible to the segment manager via the segment network. No commissioning shall be required for set up of the network bridge on the local network.

D. The network bridge shall automatically create standard BACnet objects for selected room device parameters to allow any BACnet compliant BAS to include lighting control and power monitoring features as provided by the DLM room devices on each local network. Standard BACnet objects shall be provided .

2.9 SEGMENT MANAGER

A. The Digital Lighting Management system shall include at least one segment manager to manage network communication. It shall be capable of serving up a graphical user interface via a standard web browser. Each segment manager shall have support for one, two or three segment networks as required and allow for control of a maximum of 127 local networks (rooms) and or lighting control panels per segment network.

B. Operational features of the Segment Manager shall include the following:

1. Connection to PC or LAN via standard Ethernet TCP/IP

2. Easy to learn and use Adobe Flex based GUI compatible with Internet Explorer 8 or equal browser
3. Log in security capable of restricting some users to view-only or other limited operations
4. Automatic discovery of all DLM devices on the segment network(s). Commissioning beyond activation of the discovery function shall not be required.
5. After discovery all rooms and panels shall be presented in a standard navigation tree format
6. View and modify room device operational parameters. It shall be possible to set device parameters independently for normal hours and after hours operation.
7. Set up schedules for rooms and panels. Schedules shall automatically set controlled zones or areas to either a normal hours or after hours mode of operation.
8. Group rooms and loads for common control by schedules, switches or network commands. Monitor connected load current for rooms or zones equipped with room controllers incorporating the current monitoring feature
9. Provide seamless integration with the BAS via BACnet IP

2.10 EMERGENCY LIGHTING

A. Emergency Lighting Control Unit – A UL 924 listed device that monitors a switched circuit providing normal lighting to an area. The unit provides normal ON/OFF control of emergency lighting along with the normal lighting. Upon normal power failure the emergency lighting circuit will close, forcing the emergency lighting ON until normal power is restored. Features include

1. 120 - 277 volts, 50/60 Hz., 20 amp ballast rating
2. Push to test button
3. Auxiliary contract for test / Fire Alarm system

2.11 WIRING

A. Refer to Specification Section 270500 for additional requirements.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION COORDINATION

A. Exact occupancy sensor and daylight sensor types and locations shall be determined by the lighting control system supplier for a fully-functional system with adequate coverage throughout areas controlled by occupancy sensors. Exact locations shall be coordinated with actual HVAC register locations, furniture/casework/etc. locations, sensor coverage patterns, etc. for proper coverage in all areas. In no case may fewer devices or lower-quality devices be used in each area than indicated on contract documents.

3.2 INSTALLATION

A. When using wire other than RJ-45 connections provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements

B. Install the work of this Section in accordance with manufacturer’s printed instructions unless otherwise indicated.

C. Provide all connections between system components and network connections to building LAN (via Ethernet cabling) as directed by system supplier for a fully functional networked system.

D. Calibrate all sensor time delays and sensitivity to guarantee proper coverage of occupants and energy savings.

E. Provide written or computer generated documentation on the commissioning of the system including room by room description including:

1. Sensor parameters, time delays, sensitivities, daylighting set points.
2. Sequence of operation, manual ON, Auto OFF. Etc.
3. Load Parameters - blink warning, etc.

F. Refer to Specification Section 270500 for additional installation requirements.

3.3 SUPPORT SERVICES

A. System Start Up and Commissioning

1. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.
2. Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of all lighting control system components. The startup requirement is intended to verify:

a. That all occupancy and daylighting sensors are located, installed, and adjusted as intended by the factory and the contract documents.
b. The occupancy sensors and daylighting sensors are operating within the manufacturers specifications.
c. The sensors and relay panels interact as a complete and operational system to meet the design intent.

3. Manufacturer to provide a written statement verifying that the system meets the above requirements.

B. Re-commissioning – After 30 days from occupancy re-calibrate all preset times, sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Design Team and Owner of re-commissioning activity.

C. System Training

1. Manufacturer shall provide factory authorized technician to train owner personnel in the operation, programming and maintenance of the lighting control system including all occupancy sensors and daylighting controls.

D. System Programming

1. Manufacturer shall provide system programming including:

a. Wiring documentation.
b. Switch operation.
c. Telephone overrides.
d. Operating schedules.

END OF SECTION 260944