Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 12 21 23 - Louvre Blinds.

.2 Section 26 05 00 - Common Work Results for Electrical.

.3 Section 26 50 00 - Lighting.

1.2 DEFINITIONS

.1 LCS: Lighting Control System: all interconnected components, hardware, and software which collectively serve to regulate the lighting levels of interior spaces and/or outside. The elements making up the LCS are under-classified into four groups:

.1 Input devices;

.2 Terminal devices;

.3 Control equipment;

.4 Software and integration.

.2 DALI: Digital Addressable Lighting Interface: interface used to transmit data between the input devices, terminal devices, and control equipment.

1.3 REFERENCES

.1 CSA International.

.1 CSA C22.1-09, Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.

.2 International Electrotechnical Commission (IEC).

.1 IEC 62386 (2009), Digital Addressable Lighting Interface.

.3 Underwriter Laboratories (UL).

.1 UL 916-2007, Standard for Energy Management Equipment.

.2 UL 924-2012, Emergency Lighting and Power Equipment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for network lighting controls and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Québec, Canada.

.2 Indicate on drawings:

.1 Complete assembly.

.2 Contact surfaces.

.3 Construction features.

.4 Floor drawings: indicate location, orientation, and each sensor coverage, group designations and other specific design symbols and descriptions needed to identify the facility, location and the configuration of all the control devices;

.5 Map address: reflected ceiling drawing and floor drawings showing the data bus connected devices, the address of each devices, and device groups. The drawings should be based on construction drawings, using the same legends, symbols, and tables;

.6 List of issues and data bus: summary of all the control devices, sensors, LED controllers, and other loads connected to each data bus, and the total load connected to each data bus;

.7 Wiring diagrams: include connection terminal blocks tables. Coordinate the nomenclature and presentation with drawings and flow diagrams. To distinguish between the wiring done by the manufacturer and the one installed on-site.

.4 Samples:

.1 Not used.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for network lighting controls for incorporation into manual.

.3 Software and Instructions:

.1 Software operation and upgrade manuals.

.2 Backup program: on magnetic media or CD, complete with data files.

.3 List of device addresses.

.4 Printing copy of software and graphic displays.

1.6 QUALITY ASSURANCE

.1 Manufacturer.

.1 The manufacturer to be a member of AG-DALI.

.2 Products.

.1 All products to be subjected to a complete functional test in factory before shipping.

.3 Installation and Commissioning.

.1 The installation and commissioning to be performed by technicians with at least 3 years of experience in the installation of DALI systems. References to be submitted on request.

.2 Support.

.1 A material and labor support shall be available on-site within 24 hours of a service call.

.2 Hotline: technical support shall be provided without charge.

.3 Internet support: it shall be possible to monitor and diagnose all components of the system remotely via Internet.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.

.2 Store and protect network lighting controls from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.8 ACCEPTABLE PRODUCTS AND MATERIALS

.1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Digital addressable lighting control system, designed to turn on or off, remotely, lighting systems, to modulate the light intensity, to control roller blinds, and including the following:

.1 Controllers:

.1 Lighting control group integrating a zone controller and DALI bus;

.2 CPU/server.

.2 Input devices:

.1 Presence/motion detectors DALI;

.2 Daylight sensors DALI;

.3 Multi-sensors DALI (combined daylight, presence, and temperature);

.4 DALI interface (switches and dimmers);

.5 Wall stations DALI;

.6 Control software for mobile devices and IP phones.

.3 Terminals devices:

.1 DALI drivers for LED lamps;

.2 DALI ballasts, dimmable, for fluorescent lamps and compact fluorescent lamps;

.3 Motorized blinds control;

.4 Digital-Analog converter (0-10 V driver);

.5 Remote addressable relay.

.4 Software and integration interfaces:

.1 Lighting management software;

.2 BACnet/IP integration interface for Building Management System;

.3 IP telephony system interface;

.4 XML integration interface;

.5 Shadow integration Interface.

2.2 PERFORMANCE REQUIREMENTS

.1 DALI Requirements.

.1 All input and terminal devices shall be individually addressable.

.2 A DALI compliant data bus shall send digital control signals received from input devices to the terminal devices, and the state of the terminal devices to input devices.

.3 Failure of a component shall be automatically isolated without affecting the overall system functions.

.2 System Requirements.

.1 Access.

.1 All LCS operating parameters shall be configured from a central access point via a secure Internet connection, and remotely from any computer with a web browser.

.2 User access: restrictions shall apply for access to the system requiring passwords.

.2 Defects.

.1 Power failure: the lighting system shall resume operation after a power failure to the state it would have been if the failure had not occurred.

.2 Communication failure: DALI terminal devices shall operate at a level specified by the user in the case the communication is lost with the control panel.

.3 System time: the LCS clock shall be synchronized to the Internet standard time.

.4 Daylight: the lighting system shall adjust the lighting levels depending on the ambient daylight to maintain a constant level of lighting specified by the user at desk height. Ambient daylight level to be read by daylight sensors that are distributed in areas where daylight harvesting is required.

.5 Personal control: users shall be able to customize the lighting levels in their workspace. The system can apply restrictions to the range of light levels that can be programmed by each occupant. Access is provided from any computer or a hand held device that is connected to the Internet. Lighting level of each device to be controlled from 0-100 % in increments of 1 %, for a specified period of time.

.1 Number of simultaneous users: 500 minimum.

.2 Access via web browser or mobile application.

.6 Presence/motion detection: the system shall reduce energy consumption in unoccupied areas by reading the state of a presence sensor network.

.7 Monitoring: the operating status of all components, hardware, and software of the system shall be checked regularly. Each fault shall be automatically detected and an email notification shall be distributed. Notifications shall clearly indicate the location of the device on the floor plan and the time the fault was detected.

.8 Reports: the energy consumption of the lighting system shall be viewed, monitored, and recorded. The data shall be compiled by area as defined by the user. The savings should be presented in terms of energy, dollars, and greenhouse gas emissions (if necessary).

.9 Connect off-hours: the system shall only activate the lights controlled by an occupier to carry out work in a time-out time. The system shall avoid turning on an entire floor when only an office, hallway, and bathroom are required.

.10 Zoning: the system shall be able to reconfigure zones via software and avoid the need to rewire circuits when configuration changes spaces.

.11 Priority management: the system shall be able to manage several different commands targeting a single unit in a way that makes sense, predefined, and acceptable to the user.

.12 Graphical user interface: the user interface shall use graphics showing floor plans and each of the components (lighting, input devices, etc.) on these plans.

2.3 CONTROLLER / GATEWAYS

.1 Lighting Control Panels with:

.1 Zone controller to host the application and data from the Web-based software.

.2 DALI bus controller acts as an interface between the software and the input and terminal devices.

.3 2-way communication to the software via Ethernet.

.4 2-way communication for input devices and terminals via the DALI protocol.

.5 Control equipment to provide a universal interface for analog inputs and digital outputs and low voltage.

.6 Enclosure NEMA 1, for wall mounting, with a hinged door a key/lock.

.7 Ability to perform remote diagnosis of the condition.

.2 Zone Controllers.

.1 Each lighting control panel shall have one or more zone controllers.

.1 Zone controllers can be installed remotely in dedicated standard boxes.

.2 Standard zone controller shall provide the interface between the software and the DALI bus controller.

.3 CPU Server / Operator Workstation: industrial grade computer to install in the audiovisual room as indicated.

.1 No moving parts, no processor fan or rotating hard disk drive.

.2 Processor: Core 2 CPU;

.3 RAM 8 GB;

.4 Solid state drive (SSD), 128 GB minimum;

.5 DVD player;

.6 2 Ethernet ports10/100 Mbit;

.7 2 USB ports;

.8 VGA DB15 connector;

.9 Power supply: 9 to 35 VDC;

.10 Operating temperature: -10°C to +50°C;

.11 Operating system: Windows 7 (64 bits);

.12 Database server: Microsoft SQL or other;

.13 Color screen IPS backlit, LED, 24 inches;

.14 Keyboard;

.15 Mouse;

.16 Workstation desk and a reporter type chair with rollers.

.4 The DALI bus controller shall connect the distributed data bus to the zone controller.

2.4 APPLICATIONS FOR MOBILE PHONES AND TABLETS

.1 Application for Windows, iPhone, and Android, to equip a mobile phone or tablet all the control functions required for a touchscreen device.

2.5 SOFTWARE LIGHTING CONTROL

.1 Software for programming, configuration, control, and monitoring of all devices connected to all the LCS data bus. The software shall be user friendly with graphic screens designed for user interfaces.

.2 The software shall be a standard product manufactured by the manufacturer of the DALI controller.

.3 Software designed to enable:

.1 Acquisition of real-time data on a database for all the DALI control devices.

.2 Archiving of data and events in real time and recording it on a non-volatile memory.

.3 The addition of a minimum of 30% additional points to this Contract.

.4 Access to control pages using a Web browser (Explorer, Firefox, Chrome).

.5 Bilingual system with possibility of choice of language (English or French).

.6 The interaction and display of historical data and trends.

.7 Access to data through multiple user security levels.

.8 Access to the software by Web users and Web administrators multilevel security and access.

.4 Alarms:

.1 An alarm table to view events in the system.

.2 Alarm table shall also be able to disable alarms ("Acknowledge") and generate reports as well as send an email or text message after activating an alarm automatically.

.5 Reports: the software shall provide a reporting tool to display historical data. The software shall include a list of different preconfigured reports that the user can use:

.1 Report of alarms/events and confirmation;

.2 Operator's activities journal;

.3 Calculated energy consumption;

.4 Clock events;

.5 Average lighting level;

.6 Number of hours of use of the lamps.

2.6 DALI ADDRESSABLE SWITCHES

.1 DALI addressable unipolar switches, two-way momentary contact, heavy duty, nominal current of 3 A, 25 V, push-button with indicator lights.

.2 Switches operate two wires to perform the functions "ON/OFF" and dimming.

2.7 DALI WALL STATIONS

.1 DALI wall stations to ensure the continuous dimming control via a connection to a DALI lighting control panel.

.2 Groupings: all light fixtures controlled by a particular button shall be software configurable and shall not require any manual wiring. The system shall allow to add or remove fixtures by software.

.3 Parameters: all parameters of a wall station shall be configured from the web software and shall require no physical adjustment of the station itself.

.4 Features: DALI wall stations shall provide the feature "ON/OFF" one-touch and dimming functionality weighing and holding the button. The different lighting groups must be assigned to different buttons on each wall station.

2.8 DALI CONTROL FOR MOTORIZED BLINDS

.1 DALI converter for motorized blinds control panel provided by Section 12 21 23 - Louvre Blinds.

.2 Installation inside a box installed near the blinds control panel.

2.9 DAYLIGHT SENSORS

.1 Detection Range: 0-400 lux.

.2 Detection Coverage: 60° cone.

.3 Communication Protocol: DALI.

.4 Mounting: surface in a standard junction box or recessed in ceiling tiles.

.5 Groups: all light fixtures controlled by a daylight sensor shall be fully configurable by software and can span to multiple DALI communication bus.

2.10 PRESENCE DETECTORS

.1 Presence Detector, DALI addressable, dual technology: passive infrared and ultrasound.

.2 Coverage Area: 50 m² to 200 m².

.3 Detection Angle: 360° or linear.

.4 Communication Protocol: DALI.

.5 Mounting: surface in a standard junction box or recessed in ceiling tiles.

.6 Groups: all light fixtures controlled by a presence detector shall be fully configurable by software and can span multiple DALI communication bus.

2.11 DALI CONTROL RELAY

.1 Control Relay: single pole contact, electrically controlled mechanically held, 20 A, 120 V.

.1 Minimum capacity of the short-circuit 5 kA.

.2 Indicator light indicating when the relay is closed and locked.

.3 Control by DALI digital data bus.

.4 Relay status shall be displayed on a motion by the lighting control software.

.5 Mounting: surface in a standard junction box or recessed in ceiling tiles.

2.12 CABLES

.1 Power cable to Class 2 power sources: minimum 12 AWG, RW90, copper.

.2 Class 2 Control Cable: multicore cables with a minimum size of 18 AWG copper conductors.

.3 Class 1 Control Cable: multicore cables with minimum size of 14 AWG copper conductors.

.4 Cables for transmission of digital and multiplexed signals: cable with copper conductors, twisted pair, in compliance with TIA / EIA-568-B.2 Category 5E for horizontal copper cables.

.5 Telecommunication Cable: Plenum cable, 2-conductor 18 AWG.

2.13 ACCEPTABLE PRODUCTS

.1 Cristal Control.

.2 Fifth Light of Cooper Lighting (Eaton).

.3 Encelium of Osram.

.4 Replacement materials or products: approved by addendum according to Instructions to bidders.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for network lighting controls installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Install system and components in accordance with manufacturer's instructions.

.2 Install starter cables to circuit outlet boxes and connect to power circuit and energize.

.3 Connect joiner cables to each of power-out receptacles to first luminaire of controlled circuit as shown.

.4 Install joiner cables between interceptors in fixtures or equipment. Allow extra cable to facilitate removal and relocation of fixtures or equipment.

.5 Install blanking plugs in unconnected receptacles.

.6 Integrally moulded thermoplastic components to match colour identification system (i.e. black for normal power, red for emergency power).

.7 Install low voltage switch kits and low voltage cables as shown on drawings and connect to control ports of controlled circuits.

.8 Install sensor kits and low voltage cables as shown on drawings and connect to control ports of controlled circuits.

.9 Perform configuration of the lighting control software as indicated.

.1 Provide an additional 50 hours of programming for integration of the Departmental Representative requirements.

3.3 FIELD QUALITY CONTROL

.1 On completion of installation, manufacturer representative shall be notified to carry out site inspection and report any inconsistencies to the Departmental Representative. Corrections are to be implemented to comply with manufacturer's report.

.1 The manufacturer's representative shall make at least three visits to the site during the installation phases of the system to ensure compliance with the manufacturer's installation requirements.

.2 Preparation for provisional acceptance tests.

.1 Check the continuity of each circuit.

.2 Check the voltage on DALI lines is within the range specified in the DALI protocol.

.3 Ensure that there is no continuity of a DALI communication line to another.

.4 Ensure that there is no continuity of the DALI loop to ground.

.3 Perform the following tests and inspections with the help of a manufacturer's representative:

.1 Test each bus controller using a laptop.

.2 Perform all visual and mechanical inspections and all electrical tests required in NETA acceptance test requirements. Confirm compliance with test parameters.

.3 Correct malfunctioning units on site if possible and repeat the tests to demonstrate compliance; if not, replace with new units and redo the tests.

.4 Field Test Reports.

.1 Submit field test report to Departmental Representative.

.2 The test report shall include:

.1 Event log to verify the performance of all input and terminal devices;

.2 A printed list of all the tested points, including input and terminal devices.

.3 Provide a record of events in order to verify the performance of all input and terminal devices.

.5 Lighting control devices will be considered defective if they do not pass the tests and inspections.

3.4 COMMISSIONING

.1 Provide the services of the manufacturer's representative for the commissioning of the lighting control system.

.1 Perform audits on completed installation and control devices in accordance with manufacturer's written instructions.

.2 Turn all lights and check that all lamps operate at 100%.

.3 Ensure that the communication wiring is correct: initiate communications between different input devices and terminals and software.

.2 Commissioning includes the following activities on the site:

.1 Commissioning agent shall perform site visits on a scheduled basis;

.2 Wiring and equipment all wiring connections and electrical equipment included in the scope of the CHA shall be checked;

.3 Field Trial: all loop communication connections DALI sensor connections and Ethernet connections shall be checked according to a specified test procedure.

3.5 TRAINING

.1 Provide the services of the manufacturer's representative to provide on-site training for the operation and maintenance staff.

.2 Training shall include operation and maintenance of equipment, as well as the correction of minor defects. Training shall be recorded digitally and sent to the Departmental Representative.

.1 Training to be 8 hours minimum.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by network lighting controls installation.

END OF SECTION