

PART 1 – GENERAL

- 1.1 SECTION INCLUDES .1 All equipment and devices required to install a complete Lighting Control System (LCS) which uses DALI as its only method of communication for the areas detailed in these specifications and drawings.
- 1.2 RELATED SECTIONS
- .1 SECTION 01000
 - .2 REFERENCES CSA C22.2 No. 184.1-96, Solid-State Dimming Controls (Bi-National Standard with UL 1472).
- 1.3 SYSTEM DESCRIPTION .1 Install Lighting Control System (LCS) based on DALI Protocol: DALI stands for Digital Addressable Lighting Interface and is an IEC 60929 (version 3.0) recognized Standard. DALI is an open protocol and is the only approved communications method to communicate between fixtures and lighting controllers. All input devices shall be 100% DALI compatible and this contractor shall use only non-proprietary techniques for the operation, function and execution of the DALI protocol.
- 1.4 SHOP DRAWINGS .1 Submit all drawings and product data in accordance with Section [01000].
- SPEC NOTE: All square bracketed items require site specific editing. Please ensure to check for and use appropriate wording while removing the brackets. Above: Use the following paragraph for private sector projects. Insert the appropriate broad scope, medium scope or narrow scope private sector Division 01 Section number and title to suit project requirements.**
- .2 Product data: for each of the products specified. Include data describing features, components, ratings, and certifiable performance. Include dimensioned drawings with isometric projections of all components and enclosures; include details of the DALI ballasts supplied.
 - .3 Provide a written line-by-line review of this specification showing any item the submission cannot fully comply with.
 - .4 Provide a complete list of all parts and components needed to install the Lighting and Control System.
 - .5 Shop drawings and wiring diagrams: Submit shop drawings detailing all mechanical and electrical

parameters and details of physical dimensions for each device including:

- .1 Floor Layout of equipment locations
- .2 Riser Diagram showing panel and wiring paths
- .3 Provide unique identification for each device on the drawing with unique label showing address and location in format approved by Engineer.

- .6 Wiring diagrams detailing internal and interconnecting wiring for line voltage power and control signals. Distinguish between field wiring and factory installed wiring.
- .7 Floor drawings with layout of device location and DALI assigned addresses. Include equipment riser diagrams.
- .8 Sample: submit sample of all devices to be located in finished space for approval of finish, colour and texture.
- .9 Provide operation and maintenance data for all materials and products specified in this Section.

1.11 Labelling

- .1 Contractor shall provide prepared Identification Labels to be placed on each Panel and DALI devices for this site. Provide a matrix - listing all DALI devices and Lighting Control Panels (LCP) requiring labels. Provide sufficient quantities of labels (as per sample text here-in provided). Provide to fixture manufacturer sufficient labels for placement on DALI ballasts before shipping fixtures to site. All Lighting Control Panels and DALI devices shall be labelled as per the sample label format below:

CONTROL PANEL-FLOOR-DALI-BUS-ADDRESS

Example:

05-05-03-23

Lighting Control Panel No. 5

Located on 5th Floor

Nocom-DALI-BUS No. 3

Short Address No. 23

Device Bar-Code

- .2 The matrix shall include three (3) or more address labels, on the fixture and device(s) and minimum two (2) spares.
 - .3 Place label on the fixtures or devices such that the label may be read from the fixture or device (in place) and does not impact aesthetics. Location
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- shall be approved by Owner prior to label application.
- .4 Coordinate Label ID for each fixture and device with the CAD installation drawings.
- 1.5 Scope of Work**
- .1 This specification details the minimum performance level and related criteria for DALI based Lighting Control System (LCS). Supply all materials, equipment and labour to install and make work, the DALI Protocol based Lighting Control System (LCS), as defined under this section. The system shall consist of; intelligent luminaries using DALI ballasts, transformers, communications wiring system, Lighting Control panels (LCP) housing DALI power supplies, power supply cabinets, DALI relays, DALI occupancy sensors and DALI switch packs.
- .2 Provide IBM compatible Personal Computer (PC) (for larger system provide full server) to support the functions of Central Server for lighting control complete with Operating System (OS) and control software installed on the server.
- .3 Site database and display graphics shall be generated on this server. Provide and install all software utilities for database modification, development and commissioning tools. This device shall backup all site lighting controller(S) data and downloadable code images and all device addresses and operating data images located in LCPs.
- .4 Furnish and connect all necessary equipment for proper installation and operation of the Lighting Control System as indicated on the drawings and specified herein.
- 1.6 Quality Assurance**
- .1 All products shall comply with IEC 60929 Annexes E and G. - Lighting devices to control electronic ballasts.
- .2 All materials must comply with CSA and UL and applicable local codes
- .3 The Provider of the DALI strategy shall supply all input devices (ballasts, relays, local controllers, group controllers, etc), hardware and software to meet the specification criteria.
- .4 LUMINARIE MANUFACTURER(S) premises to be ISO certified and that their factory follows a manufacturing standard of practice and test procedure for all families of intelligent light fixture products and devices leaving their premises. This certification will include verification of implemented
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wiring practice procedures and protocol. Specifically the following items shall be complied with:

- .1 Follow all installation instructions and recommendations specified in the manufacturer datasheet and wiring instructions for ballast type.
- .2 Make sure that the ballast fits with full contact with fixture housing and ballast and strike plane are properly grounded to earth to ensure proper dimming operation.
- .3 Internal fixture wiring; Run DALI and Power (Line, Neutral and Ground) wires on one side of the fixture channel, and the lamp socket wires down the opposite side. (The high frequency on the lamp wires during low-end dimming can cause interference with DALI communication if the DALI-BUS wires are touching or in very close proximity to the lamp holder wires).
- .4 Make the lamp leads as short as possible by removing excess wire, but the leads should be long enough to be practical and safe from damage by other fixture components. Avoid coiling or wrapping wires around each other and keep the red leads separated from the blue and/or yellow leads as much as possible. Follow the guidelines for maximum wire length in the ballast manufacturers wiring instructions.
- .5 Use only rapid-start, non-jumpered or non-shunted lamp holders. For linear lamps it is recommended to use lamp holders where the lamps are twisted in, rather than snapped in.
- .6 Use only a small flat-head screwdriver (about 1/8 size) to press the release button on the ballast wire terminals. Using a larger screwdriver to tool can damage the terminals and void the warranty.
- .7 Obtain DALI test software kit and testing procedures from system manufacturer. All fixtures in production run shall be tested prior to shipping to site. Document results and turn over test results to Commissioning Authority. Return DALI test software kit and testing procedures to system manufacturer along with printout verification of test results (alternatively CD containing all test results).

- .5 **INSTALLER QUALIFICATIONS:** Installer shall provide evidence of previous experience (subject to owners satisfaction) performing installation of individually addressed lighting control systems.

1.7 COMMISSIONING AUTHORITY QUALIFICATIONS:

- .1 Commissioning Authority shall provide evidence of minimum four years experience in the installation of
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- multiple DALI projects and provide a listing of these projects or other equivalent of equivalent training. Upon completion of the installation of all luminaries including 100 hour burn-in of the lamps, the Commissioning Authority will execute the final commissioning inspection.
- .2** The primary lighting system manufacturer of record shall retain the Commissioning Authority and this representative will execute the system commissioning according to approved procedures and manufacturers specification.
- .3** The Commissioning Authority shall include in their package four (4) site visits to complete the following:
- .1** First visit; train the Electrical Contractor's staff and other identified personnel in the proper installation and DALI-BUS testing procedures required for this site. Emphasise danger of applying line voltage to DALI-BUS.
 - .2** Second visit: Review of wiring and hardware; Review the wiring of hardware devices and respond to any contractor inquires.
 - .3** Third visit: DALI-BUS Testing Procedure Review: 80% review of DALI-BUS testing. Review balance of commissioning plan through completion of testing of all DALI-BUSes. Verify that dates are realistic and confirm date(s) for final commissioning.
 - .4** Final inspection: Fourth visit; The Contractor shall submit in writing, a date for Final inspection, to be completed in advance of tenant occupancy permitting free obstruction of work execution. For larger projects this work may be completed in phases of 3 or more floors per inspection. Final inspection will include review of all previous work.
- 1.8 On-site Training.** **.1** Training shall be considered a part of the commissioning process and will include a three (3) hour training with the Electrical Contractor at the start of the project, a three (3) hour training at the conclusion of the initial commissioning and a third three (3) hour on site training within six (6) months of final commissioning.
- 1.9 Warranty** **.1** **Warranty:** All manufactured equipment shall be warranted free of defects in materials and
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- workmanship for one (1) year from date of Final Acceptance.
- .2 Warranty Period: The manufacturer shall provide two (2) years Extended Warranty on Lighting Control System components from the date of acceptance. Extended limited five-year warranty on all dimming ballasts supplied from date of acceptance.
- .3 Warranty coverage shall commence on the date of Final Acceptance of the Lighting Control System equipment.
- 1.10 Maintenance
- .1 The manufacturer shall make available to the owner a source for ordering new equipment for expansions, upgrades, and a list of recommended spare parts.
- .2 The manufacturer shall make available factory service, new or remanufactured replacement parts and a service contract that extends the factory-limited warranty from [three (3) to five (5) years]. In addition, this shall allow owner to purchase this coverage on an annual basis for a minimum period of ten (10) years from the date of Final Commissioning.

1.11 MAINTENANCE ACTIVITIES DURING WARRANTY PERIOD:

- .1 Provide services, materials, equipment to maintain LCS for specified warranty period. Provide detailed preventative maintenance schedule for system components.
- .2 Perform as minimum (3) Three minor inspections and one major inspection (more often if required by manufacturer) per year. Provide detailed written report to Engineer
- Major inspections to include, but not limited to:
- .1 Minor inspections.
- .2 Clean OWS(s) peripheral equipment, LCP's, interface and other panels, micro-processor interior and exterior surfaces.
- .3 Check signal, voltage and system isolation of LCP's, peripherals, interface and other panels.
- .4 Alarm Printer(s) Provide mechanical adjustments, new cartridges, and necessary maintenance on printer(s).
- .5 Run system software diagnostics as required.
- .6 The following inspections will be considered minimum requirements, and shall not be interpreted to mean satisfactory performance. Calibrations will be performed
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- using test equipment having traceable, certifiable accuracy at minimum 50% greater than the accuracy of system displaying or logging the value. Check and/or calibrate each field input/output device. Provide dated, maintenance task lists to Engineer as proof of execution of complete system verification.
- .7 Maintenance task lists to include the following sensor and output point detail; point name, location, device type and range, measured value, system displayed value, required, and any other action taken or recommended.
- .8 **Emergency Service Calls:**
Service calls will be initiated when there is indication that LCS is not functioning correctly. Have qualified control personnel available during contract period to provide service to "CRITICAL" components whenever required at no extra cost. Furnish Engineer with telephone number where service personnel may be reached at any time. Service personnel to be on site ready to service LCS within 2 h next working day after receiving request for service. Perform work continuously until LCS restored to reliable operating condition.
- .9 **Operation:** foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of LCS based on original design conditions and to be as recommended by manufacturer.
- .10 **Records and logs:** maintain records and logs of each maintenance task. Organize cumulative records for each major component and for entire LCS chronologically. Complete forms and submit after inspection indicating that planned and systematic maintenance has been accomplished.
- .11 **Work requests:** record each service call request, when received separately on approved form. Form to include serial number identifying component involved, its location, date and time call received, nature of trouble, names of personnel assigned, instructions of work to be done, amount and nature of materials used, time and date work started, time and date of completion.
- .12 **System modifications:** provide in writing. No system modification, including operating
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parameters and control settings, to be made without prior written approval of Engineer.

- .13 Rectify deficiencies revealed by maintenance inspections and environmental checks.

SPEC NOTE: SERVICE CONTRACTS: [Separate Price to be included with Tender submission].

- .1 Provide in-depth technical expertise and assistance to Engineer and Commissioning Manager in preparation and implementation of service contracts and in-house preventive maintenance procedures.
- .2 Service Contracts to include:
Annual verification of field points for operation and calibration conducted during regular quarterly inspections. [For large systems work may be divided into Monthly (12) visits per year].
[Unlimited responses to emergency calls during day, per year].
[Twenty four (24) responses to emergency calls during silent hours per year].
Silent hours defined as 6 PM to 6 AM plus weekends and holidays.
- .3 Maintain complete spare components stock on site for installed system as recommended by factory and approved by Engineer.
[Contractor shall provide separate price at time of tender for maintenance service agreement in accordance with the above requirements. The price submitted shall be renewable subject to GNP index for a period not less than 5 consecutive years. (see Tender submission form)]

PART 2 – PRODUCTS

- 2.1 System Description .1 Lighting Control Server (LCS): The server shall be an IBM compatible PC computer to support:
- .1 lighting system database,
.2 all operational software including all configuration data information.
.3 Administrator to modify system configuration data,
.4 monitor system status
.5 perform energy management functions.

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- .2 **Lighting Central Control:** The Lighting Control System Server shall provide current status and enable configuration of all System zones including selected individual fixture or device availability, current light level, minimum/maximum level, on/off status and emergency mode status.
 - .3 **Time Synchronization Module:** System to provide Time Synchronization of real-time clocks in Controller's panels. System to perform this feature on a regular scheduled basis and on operator request. Time synchronization to use the International time synchronization service using the UDT format.
 - .4 **Reports:** Energy performance reports shall be printable in a printer friendly format and export to spreadsheet applications.
 - .5 **Personal Lighting Control (PLC):** A web server supporting Personal Lighting interfaces shall enable each user to use a standard browser to monitor lighting status of personal space to dim and brighten lights or turn them on or off. The web server interface shall offer user configurable light scenes which may be programmed and then selected via PC. Personal lighting control shall be available in open office environments.
 - .6 **Administration of Users:** Provision for Central Control Server to provide management of Users' Personal Light Control (PLC) on system Web server.
 - .7 **Light Scheduling:** The Lighting Central Control Server shall provide time of day scheduling for any single fixture, any group of fixtures, any floor or entire building fixtures on time of day basis. Each day of week to provide for multiple (minimum 4 time pairs On/Off or change of ballast setting) time pairs to initiate the sequence. The schedule shall also provide for scheduling ballast output based on time of day.
 - .8 **Override:** Manual adjustments and occupancy sensor detection shall temporarily override off status imposed by time clock schedule.
 - .9 **Power Failure:** On restoration from Power Failure, the time clock shall execute schedules that would still be in progress had they begun during the power outage.
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- mode
- .10 **Load Shed Module:** An automatic load shedding shall be available where, when activated through the EMS/BAS, the control unit will reduce its output to a programmable maximum electrical load. The tenant individual user shall retain the ability to override the system light levels as necessary.
 - .11 **Emergency Module:** There shall be an Emergency Mode, when activated from the Fire Alarm or BAS system, that will immediately adjust the Emergency lights to full light output and retain that level until the mode is deactivated by authorized Operator. This setting shall override all other inputs. The system shall interface with the building emergency monitoring system at a convenient point and not require multiple connections.
 - .12 **Daylight Harvesting:** In a photo sensor-equipped system, the Energy Control Unit shall rationalize changes to light levels when ambient (natural) light is available and shall maintain a steady light level to users workspace when ambient conditions experience fluctuating ambient light conditions. System shall utilize light level inputs from common and/or remote sensor locations to minimize the number of photosensors required. The system shall operate with multiple users in harmony and not react adversely to manual override inputs.
 - .13 **DALI Addresses:** Ballasts, Relay Modules and DALI Occupancy Sensors shall be individually addressable on a per Device/fixture basis via the NOCOM-DALI commissioning kit supplied to the installing Electrical Contractor.
 - .14 **Programmable Task Tuning:** Maximum light level programmability shall be available for each individual fixture or ballast.
 - .15 **Unoccupied State:** The system shall provide two states when occupancy status is vacant as per an occupancy sensor: Lights turn off or lights adjust to configurable light level.
 - .16 **Occupied State:** The system shall not isolate occupants by turning off lights that are still required for convenience and safety; Such as a hallway path to exit the premises.
 - .17 **Re-configurability.** The assignment of individual fixtures to zones shall be centrally configurable through the Lighting Central Control Server such that physical rewiring will not be necessary when workspace
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reconfiguration is performed. Removal of covers, faceplates, ceiling tiles, etc... shall not be required.

- .18 Lamp Fault Diagnostics. The Lighting Central Control Server shall provide lamp/ballast fault diagnostics with report generating capabilities for lamp maintenance, including export function to Excel spreadsheet or text files capabilities.
 - .19 The Lighting Central Control Server to include tools for integration with other building automation systems software. It shall include an OPC server and the OPC Client for owner use.
 - .20 Standard of acceptance. DALI based, Nocom Lighting Control System.
- 2.2 Equipment**
- .1 General. The manufacturer will provide and commission the project as per plans and specifications utilizing products that comply with the system requirements.
 - .2 Provide Lighting Control System Network Server: All software specifications and hardware to meet site requirements to Support Lighting Control System operation and to be connected via Ethernet dedicated CAT5e network cable connected to each Lighting Control Panel.
 - .3 Nocom-Lighting Control Panels: LCP's shall offer Class I/II NEC power separation and will include one (1) Ethernet RJ45 socket per gateway, one (1) fused line voltage receptacle for hardware operation. LCP's shall be 'pre-wired' and factory certified complete with all load labels and field termination points clearly identified.
 - .4 NOCOM-Relay Panels: RP's shall offer Class I/II NEC separation. RP's shall be 'pre-wired' complete with all load labels and field termination points clearly identified.
 - .5 Group Controllers – GC-A. Group controllers shall be capable of Class I wiring strategies, controlling 2 groups, on/off group preset functions, dim up/down interface through momentary switches. Group controllers will fit inside standard switch box behind the switch plate.
 - .6 Scene Controllers – SC-A. Scene controllers shall be fully DALI compatible, capable of Class I wiring strategies, controlling four (4) scene preset on/off functions and dimming levels through momentary
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switches. Scene controllers will fit inside standard switch box behind the switch plate.

- .7 Relay Modules – RM. Relay modules shall be group specific devices rated at 3.5A, fully DALI compatible.
- .8 Addressable Relays – DRM. Addressable relays shall be group specific devices rated at 20A, fully DALI compatible.
- .9 DALI-Passive Infra Red Occupancy Sensors. Occupancy sensor shall allow adding or deleting of specific fixtures to the assigned sensor through software, not through hardwiring.
- .10 DALI-Power Supplies: Power supplies shall be fully DALI compatible, capable of Class I wiring with high voltage surge protection.
- .11 Nocom-Lighting Control Panels: LCP's shall offer Class I/II NEC power separation and will include one (1) Ethernet RJ45 socket per gateway, one (1) fused line voltage receptacle for hardware operation. LCP's shall be 'pre-wired' and factory certified complete with all load labels and field termination points clearly identified.
- .12 NOCOM-Relay Panels: RP's shall offer Class I/II NEC separation. RP's shall be 'pre-wired' complete with all load labels and field termination points clearly identified.
- .13 Daylight Photo-Sensor: Daylight photo-sensors shall be group and scene specific and shall allow the adding or deleting of specific fixtures to the assigned sensor through the software, not through hardwiring.
- .14 Weather Sensor: The weather sensor shall be provided and installed on the roof. The weather sensor shall be incorporated into the system via the closest Lighting Control Panel. [Using the weather sensor shall eliminate most of the daylight photo-sensors].
 - .1 Temperature Range [-30 +70c]
 - .2 Enclosure IP 65
 - .3 Measurement range 0-99 Klux with 1 Klux Resolution

2.3 DALI Dimming Ballast Physical Characteristics

- .1 Ballast for linear fluorescent lamps cross section shall not exceed 1.18" x 1.18".
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- .2 Ballast shall be supplied with reinsertable quick connectors for wire size 16~18 AWG.
- .3 All DALI ballasts shall be supplied as part of the Lighting Controls System Manufacturer' package.

2.4 DALI Dimming Ballast Performance Requirements

- .1 Ballast shall provide continuous, flicker free dimming from 1% ~ 100% (TC-L W: 3% ~ 100%) Eye sensitivity optimized dimming curve.
- .2 Ballast shall conform fully with the DALI (Digital Addressable Lighting Interface) IEC 60929 specifications and support the following specific list of features:
 - 64 addresses
 - 16 groups
 - 16 light scenes with adjustable fading time
 - Return status feedback signal and programmable parameters
 - Standby mode
 - Digital bi-directional communication
 - Status feedback
 - Individually addressable
 - Programmable parameters
 - Minimum dimming level
 - Maximum dimming level
 - Individual ballast status feedback
 - Fade time and rate
 - System failure level
 - Power failure level
- .3 Ballast control wiring shall be polarity free and capable of utilizing standard electrical wiring as used for the ballast power circuits. No special wire types such as twisted or shielded shall be necessary.
- .4 Ballast control wiring shall be capable of being run in same electrical conduits as power wires.
- .5 Ballast control input shall be protected against accidental connection with line voltage.
- .6 Ballast shall provide true two-way ballast/control communication that is immune to noise and power disturbances.
- .7 Ballast shall be [120] or [277].

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- .8 Ballast shall have end-of-lamp-life protection and inrush current limiting circuitry.
 - .9 Ballast shall have limited 5 year warranty.
 - .10 Ballast shall have the following electrical characteristics:
 - Dimming Range 100%~ 1%
 - Ballast Factor 1.0
 - Power Factor > 0.98
 - THD < 10% (3rd harmonic < 8%)
 - Inrush Current Peak < 7 Amps
 - Lamp Operating Frequency > 40 kHz
 - Lamp Current Crest Factor < 1.7
 - Max. Housing Temperature 167 degrees F (75 degrees C)
 - Max. Output Voltage < 600 rms
 - Power consumption in sleep mode: < 1 W (120v), < 2 W (277v)
 - .11 Ballast(s) shall have the following lamp starting characteristics:
 - Programmed rapid start
 - Starting time 1.5 s
 - Start at any dimming level, without initial flash to higher level
 - Number of starts: > 50,000
 - .12 Ballast manufacturer shall offer ballast in Linear one (1) and two (2) lamp T5, Linear one (1) and two (2) lamp T8, 40W Biax, 18, 26, 32, 42 Single or Double Tube CFL.

2.5 DALI Dimming Ballast Regulatory Requirements:

- .1 Designed with a ballast factor of 1.0.
 - .2 UL Listed #935.
 - .3 Suitable for Class I or Class II (Control) installations.
 - .4 Meets FCC 47CFR Part 18 EMI/RFI emission requirements for Class A (non-consumer) equipment.
 - .5 Meets ANSI C62.41 Category A surge protection standards.
 - .6 Manufactured in ISO 9001 and 9002 certified facility.
 - .7 CELMA Energy Classification EEI = A1.
 - .8 Standard of Acceptance: Nocom Inc.
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2.6 Local Switches

- .1 Provide momentary pushbutton switches as shown on the plans for control of DALI-Group Controllers and DALI-Scene Controllers.
- .2 DALI-Switches to operate on three (3) wires to perform all 'ON/OFF' and dimming functions.
- .3 Switches shall be mounted in groups as indicated on drawings.
- .4 Switches shall be white, single push operation. Switch plates shall be white.

2.7 Override Switches (Master Switches)

- .1 Override switches similar to local switches.
- .2 Switches shall connect to programmable inputs in any Lighting Control Panel (LCP) in the system.
- .3 Switches shall be programmed from central computer to control any lighting fixture(s) or group(s) circuits connected to the system.

PART 3 – EXECUTION

3.1 Installation

- .1 Install the following system hardware according to project Drawings and Specifications and to comply with all national and local electrical and building codes:
 - .1 Install all luminaries c/w line voltage wiring and DALI communication DALI-BUSES as per Drawings and Specifications. Ensure all connections are connected, tested for grounds and continuity.
 - .1 **DO NOT** connect the DALI-BUSES to the DALI modules until Item 3.1.4 below has been completed.
 - .2 All fixtures shall be addressed (using DALI test kit) and affix associated address label to the fixture housing in an aesthetically pleasing, Owner approved location.
 - .2 Nocom-DALI LCP's, RP's and all Nocom-DALI devices complete with any mechanical settings as per CAD installation drawings (IE: Motion Sensors, Switches, Group Controllers, Scene Controllers, Touch Panels, Weather Sensors, Photosensors, etc...).
 - .3 Install all DALI based Nocom Lighting Control System Network cables complete with labels and RJ-45 jacks at each end. Dedicated runs from each LCP to the Server network Switch is required.

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- .2 DALI-BUSes shall be wired [Class I utilizing building power Raceways] [Class II separate from building power Raceways].
 - .3 DALI BUS wire shall be [Class I 600 volt, No. 14 AWG to meet National Electrical Code requirements]. [Class II shall use minimum 600 volt, No. 16 -18 AWG., stranded, with purple and grey jackets for quick identification of wires]... The maximum connected length of wiring shall not exceed 305 metres (1,000 feet) per DALI-BUS. Do not leave unnecessary spare lengths of wire. Make DALI-BUSes short and follow the drawings provided. Minimize splices and follow manufacturers instructions for all splices. All splices must be in accessible and identified locations. Use device terminals to start DALI-BUS extensions.
 - .4 Provide necessary power as required from local 120 V emergency power branch circuit panels for Lighting Central Control Server and peripheral equipment. Install tamper locks on breakers of circuit panels.
 - .5 Upon completion of installation of all lighting fixtures and wiring, for all fluorescent lamps, line voltage shall be applied for an uninterrupted 100 hour burn-in,. This is mandatory unless changed by Change Order.
 - .6 Installation shall be considered complete when the final commissioning is executed and completed by the Commissioning Authority and signed off by the Owner.

3.2 Field Quality Control

- .1 Manufacturer shall be available to provide on-site support within 24 hours of a service call in Canada.
- .2 Manufacturer shall provide toll-free technical support 24 hours per day, 7 days a week, 365 days per year.

END of SECTION
