Overview: Building Wide Control – With DALI Emergency testing

The lighting control solution will accommodate DALI or switched luminaires as indicated on the drawings. Emergency luminaires will also be supplied with DALI control gear to allow for central monitoring, testing and maintenance.

The lighting control solution must allow for flexible and unrestricted configuration of the space. Provide the ability through software for sections of a floor, complete floors or multiple floors to be assigned to a single tenant and/or sub-divided as required to allow for multiple tenants.

The proposed solution will allow for all luminaires to be individually addressed via DALI (IEC Standard), in turn providing the flexibility to re-configure the system for a new layout with minimal physical intervention to the fixed wiring installation.

The solution shall include a wired backbone, either physical or utilising the building LAN to allow for seamless building wide communication. The backbone will also support central control and monitoring, via a Head end PC, of all connected control devices, luminaires and DALI Emergency luminaires/inverters.

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# Distributed Intelligence

The system should employ truly distributed intelligence, eradicating the reliance on any single item of hardware or remote central processor for reliable operation. Each device should use its own non-volatile memory to store programming data pertaining to operation of its inputs, outputs and control functions.

# Dimming Protocols

To accommodate modern office design and aspirations of tenants the control system must allow for the simple addition and control of luminaires of different protocols. The lighting controls manufacturer should have standard modules within their range to provide seamless dimming control, including but not limited to:

* DALI, addressable and broadcast control
* 1-10V, sink and source
* 230V Switched load control
* Adaptive phase dimming – leading edge, trailing edge and self-adapting dimming to accommodate a wide array of phase dimmable LED loads.

# Timed Events

To minimise energy consumption and promote the efficient running of the building the control system must include a timeclock that supports standard IANA time zones, longitude, latitude, daylight saving and NTP settings.

This will allow for pre-set scenes to be automatically triggered throughout the day, week or year, on specific days or at specific times before or after sunrise and or sunset.

Programmed events (at a minimum) shall include:

* External lighting – On and Off
* Circulation space - security (night) and normal operating (day) levels

# User Interfaces

The supplier of the control system must offer a wide range of user interfaces for future tenant fit-outs, for manual control of cellular offices, collaborative meeting spaces and bookable meeting rooms.

Touchscreen user interfaces will include:

* Capacitive touch screens for single or multi-room control, for central control from the reception desk or locally in a meeting room. The functionality will include the following.
  + Modify and save changes to existing scenes to suit the needs of the space or users, without engineering attendance
  + Astronomical timed events for scene recall (day, evening & night security)
  + Choice of skins/appearance
  + First in and last out global control
  + Ability to display a company logo or livery

Control Plate user interfaces will include:

* A choice of button layouts.
* The option for personalised engraving for user identification, making clear the function of each button,
* A wide range of faceplate finishes and colours, allowing for different interior design aesthetics.

Plate finishes to include:

* Brushed stainless steel
* Polished brass
* Bright chrome
* White
* Black

# Lighting Control Modules – Networked Pluggable

For ease and speed of installation, pluggable LCMs shall be employed and shall provide the following:

* 10 ports (GST-18 type) each with DALI, relay switched output and maintained supply
* Automatic addressing of DALI without engineering intervention
* 30 DALI luminaires (or short addresses) per LCM, distributed at will across the 10 ports.
* Each port also supports
  + 1x DALI Emergency Luminaire
  + 1x DALI Input module (four potential free inputs) or DALI Scene control plate
  + 1x DALI Sensor
* Supports DALI type 8 Tunable white
* Full DALI feedback for lamp status, driver, ballast etc.
* Emergency testing of DALI and conventional luminaires
* Qty 4 – Volt free inputs
* A wired bus/network connection for communication with other Lighting control modules and/or head end PC

It should be possible to connect any luminaire to any of the LCM’s 10 ports. All luminaires should be addressed automatically without engineering intervention, DALI conflicts or addressing issues resolved automatically.

To provide complete flexibility each port will also support the connection of:

* 1x DALI Emergency Luminaire
* 1x DALI Input module (4x volt-free inputs) or DALI Scene control plate
* 1x DALI Sensor

All luminaires connected to a specific LCM shall automatically switch/dim together as a group by default.

Each volt-free input will be pre-configured to allow the installer/contractor to test the installation without the need for commissioning software tools or engineering intervention.

Input 1&2

* On/Raise and Off/Lower – Dual position retractive switch to allow the control of all luminaires connected to the LCM. Momentary press-release will switch the connected luminaires on and off. Press and hold will dim (raise and lower) all connected luminaries.

Input 3

* Will provide bus/network-wide emergency test – Single latching fish-key. Emergency test mode can be set or released.

Input 4

* Will provide a whole bus/network test function – Single retractive switch – to enable a dim up – dim down cycle allowing the installer/contractor to walk a floor or area and validate;
* a) the bus/network is intact
* b) all connected luminaires are dimming or switching as desired.

The proposed controller must employ fully distributed intelligence and should have no reliance on a remote central processor or area controller.

# Lighting Control Modules – Standalone Pluggable

The lighting connection center/marshalling box shall accommodate two control channels. Each channel should support five outputs, or both channels linked to create one channel of 10 outputs.

The lighting connection centre/marshalling box should support multi-room applications, where two cellular offices or meeting rooms can be controlled independently.

Control functions and settings shall be stored in memory on the PIR, independent to the lighting connection center/marshalling box and should provide the following capabilities:

* DALI dimming
* Relay switching
* Adjustable on/off levels
* Adjustable maintained levels
* Presence/absence detection
* IR programming

# Lighting Control Modules – Hardwired DALI

Hardwired control modules shall include the following:

* 2 Universe – Addressable DALI Controller
* 4 Universe – Addressable DALI Controller

DALI-2 compliant controller delivering dimming and control of 128 or 256 individually addressed DALI devices.

It must be possible to add DALI sensors, control plates and input modules to the DALI universes creating a complete DALI solution without the need for additional field wiring.

Each DALI universe must support 16 native DALI groups and have the ability to control extended groups, up to a maximum of 64 groups per DALI universe.

To enable future re-configuration and expansion of the system. Spare capacity (10%) on each universe should be allowed for when determining which luminaires will be served by a universe

In addition, the proposed controller shall accommodate:

* DT8 Tuneable white DALI luminaires
* DALI Emergency luminaires
* DALI Sensors, DALI input units or control plates
* Contractor/Installer test function to prove installation
* A wired bus/network connection for communication with other Lighting control modules and/or head end PC

The controller must employ fully distributed intelligence and should have no reliance on a remote central processor or area controller.

# Occupancy Detection

Occupancy sensors shall connect to an LCM (hardwired or pluggable) via a DALI line or direct connection and provide presence, absence and light level monitoring.

The system shall be capable of calling different scenes throughout the day, enabling different levels to be called based upon building schedules or routines. This is essential to conserve energy through management of presence, absence and daylight operations in certain areas.

Daytime, Night-time (security) and other pre-determined scenes should be configurable, and their timings programmed via the system timeclock.

The sensors shall call a pre-configured ‘Daytime’ scene during normal working hours however where applicable the same sensors should be able to measure maintained illuminance light levels.

During the evening the lighting will switch on via the occupancy sensors to a lower level, ‘Night-time’ Scene, reducing light pollution and conserving energy whilst providing suitable illuminance to carry out security checks.

# System Configuration & Control Features

Must include

* The facility to program a notional corridor for a safe exit route, for future tenant requirements.
* Automated PIR occupancy scene recalls, for day evening and night security requirements.
* Configurable occupancy sensors, definable timeout periods and lux on/lux off levels
* Graduated dimming (for daylight linking) three rows from the window.
* Mains failure recovery - the system must re-instate the lighting to the previous level prior to the mains failure (in some cases this is dependant on the behaviour of the DALI drivers).
* Fire/Emergency input – a volt free input for the connection of a fire or security alarm. When activated all lighting shall be commanded to 100% output and all local controls will be disabled for the duration of the alarm condition.
* DALI EM Emergency monitoring
* DALI luminaire driver monitoring

# System Expansion and Onward Integration

The system manufacturer shall accommodate the following features/modules to allow for integration and/or expansion.

* BMS Integration via BACnet/IP
* HVAC heating/cooling control with dedicated Fan Coil Controller
* App based software for lighting, heating, cooling, ventilation, and shading control.
* Multi-room app control via Android or iOS devices
* Bespoke control panel layouts with option for custom engraved buttons

# Emergency Testing

The lighting control infrastructure will provide for DALI luminaires throughout, with a backbone for building wide communication, managed from a front-end PC located in the facilities office or other appropriate location.

DALI inverters for reporting purposes will be incorporated within the emergency luminaires, in accordance with the luminaire schedule.

It shall be possible to carry out the following emergency testing functions from the head-end.

* Emergency test schedule to include
  + Manual Function Test
  + Manual Duration Test
  + Scheduled Function Test of EM luminaires by address, group, controller or group of controllers.
  + Scheduled Duration Test of EM luminaires by address, group, controller or group of controllers.
  + Fully configurable schedule intervals, set as standard as monthly function testing and 12 monthly Duration.
* Automatic creation of EM test log book
* Individually Date/time stamped results with luminaire by luminaire detail
* Battery level reporting (where the DALI driver supports the function) and option to include failure/status registers in the report.
* E-mail reporting (via local mail client)
* Fault reporting can be reviewed in report or imported to floor plan graphic.

# On Premis Head End PC

The system shall be able to be expanded, with the following features from the head end.

* DALI emergency error feedback
* DALI lamp and communication fault reporting
* E-mail reporting
* Multi-room APP controls via a smart phone or tablet for lighting, HVAC and shading controls
* A wide range of bespoke engraved scene plates
* Virtual scene controllers
* Schedule for emergency test events
* Schedule for lighting events
* Global events
* Log in hierarchy
* Remote access
* Luminaire dimmed status
* Back up facility

# Commissioning – Lighting System Manufacturer

The electrical contractor/installer shall supply and install all elements of the lighting control system and shall appoint the lighting control system manufacturer to commission and test the installation.

The electrical contractor/installer shall allow for attendance by the lighting system manufacturer to commission, set-to-work and adequately demonstrate the completed installation. Supporting documentation will include a completion certificate, product O&M manuals, product datasheets and all other relevant information for the on site management of the lighting control system.