Welcome!

AIA/CES Approved Seminar
1.0 LU/HSW

RAB8: Specifying a Networked Lighting Control System

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Director of Training

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Learning Objective

Review the functional capabilities of a well designed networked lighting control system.
Learning Objective

Review the quality features that should accompany a well designed networked lighting control system.

How easy is it?
Learning Objective

Create a detailed specification checklist for both the functional and quality features of a well designed networked lighting control system.
Learning Objective

Understand the new DLC requirements for Networked Lighting Control System Specifications
Learning Objective

Gain a better understanding of the Energy Savings available by utilizing Networked Lighting Control Systems.
What are lighting controls?
Any device that allows you to control your lights.
What are **smart** lighting controls?
Any device that allows you to control your lights, that is not a simple switch.
What are networked lighting controls?
Smart devices that communicate digitally and can be layered in a space to maximize energy savings.
What are the **functional capabilities** of a well designed networked lighting control system?
Occupancy Sensing

The ability to detect the presence or absence of people in a space.

(Auto On, Auto Off)
Vacancy Sensing

The ability to detect the absence of people in a space.

(Manual On, Auto Off)
The ability to detect the amount of daylight that is present in a space.

Daylight Harvesting (Open Loop)
Daylight Harvesting (Closed Loop)

The ability to detect the amount of daylight and ambient light in a space.
High End Trim (aka Task Tuning)

The ability to set a maximum light output that is lower than its true capability.
Device Addressability

The ability to uniquely identify each luminaire and/or device in the lighting control system.
The ability to group luminaires and form unique control zones for a control strategy.
Scene Control

The ability to adjust the light levels in more than one zone and then group them to create unique aesthetic effects.
Continuous Dimming

The ability to provide 100+ steps of dimming so that it is perceived as smooth.
Easy User Interface

The tool used to easily read and adjust the system settings during start-up, commissioning, and or ongoing operation.
Scheduling

The ability to set custom on/off/dim levels for lighting based upon the time of day, day of week, day of year, etc.
Personal Control

The ability for individual users to adjust the light level to their personal preference within a space.
Load Shedding
(aka Demand Response)

The ability for a utility to contact a building manager and easily put the facility into a demand response scene for a set period of time.
Plug Load Control

The ability to control the power delivered to receptacles through occupancy sensing or scheduling.
Energy Monitoring

The ability to measure the power consumption of a lighting system accurately over a specific period of time.
Remote Diagnostics

The ability to monitor, diagnose and report operational performance.
<table>
<thead>
<tr>
<th>Your Functional Capability Checklist…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupancy Sensing</td>
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<td>Vacancy Sensing</td>
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</table>
Now let’s go over the **quality** features of a well designed networked lighting control system...
Controls should be straightforward.

A doctorate in Electrical Engineering in order to understand how the system works... should not be required.
Controls should be easy to design.

Yes

No

...maybe

An overwhelming amount of design options, components, work-arounds, people and attempts to figure out if it can actually work... should **not** be required.
Controls should have an easy cost breakdown.

Fighting with vendors to understand the various component costs and what service is included in the overall price… should not be required.
Controls should have inexpensive installation.

Complicated pages of instructions and hours of frustration…

should not be required.
Controls should have simple wiring.

2-wire, 3-wire, 4-wire, Ethernet, twisted-shielded pair, DALI, DMX and complicated protocol interfaces to make one system work... should not be required.
Controls should not require downloaded software.
Controls should not require Programming.

Complex coding languages and algorithms... should not be required.
Controls should have quick commissioning.

Years of training classes and certifications… should not be required.
Controls should have uncomplicated maintenance.

Frantically searching for someone who is close by and qualified to make simple changes to the system… should not be required.
Controls should offer reliable energy savings.

Fancy calculations, interpolations or guesses in order to estimate the possible energy savings… should not be required.
Controls should be Future Proof.

Endlessly searching to find the original designer to upgrade or make changes to the system for a new tenant… should not be required.
Controls should have a trouble-free warranty.

A hard to find & understand warranty, with varying time lengths for different components… should not be required.
Your Quality Checklist…

Easy to Explain
Intuitive to Design
Simple Cost Breakdown
Quick Installation
Wireless Communication
No Software Installation
No Programming
Quick Commissioning
Uncomplicated Maintenance
Reliable Energy Savings
Future Proof
Trouble Free Warranty
Now let’s go over the DLC’s specification of a well designed networked lighting control system...
‘Required’ System Capabilities

Networking of Luminaire & Devices
Occupancy Sensing
Daylight Harvesting
High End Trim
Zoning
Luminaire Device Addressability
Continuous Dimming
What else about the system would be good to know?

(but does not effect DLC Listing)
‘Reported’ System Capabilities

Type of User Interface
- Luminaire Level Control (non-integrated)
- Luminaire Level Control (integrated)

Localized Processing / Distributed Intelligence

Scheduling

Personal Control

Load Shedding (Demand Response)

Plug Load Control

BMS/EMS/HVAC Integration

Energy Monitoring

Device Monitoring / Remote Diagnostics

Operational and Standby-Power
In addition to Utility Rebates...

how much energy can really be saved by incorporating Networked Lighting Controls?
In 2011, Lawrence Berkeley National Laboratory decided to find out...
2011 LBNL Study

Reviewed 240 energy savings studies from 88 papers & case studies, which focused on actual field installations as opposed to simulations.
2011 LBNL Study…

- Occupancy Sensing: 24%
- Time Scheduling: 24%
- Personal Dimming: 31%
- Daylight Harvesting: 28%
- Group Controls: 36%
Networking enables individual control techniques to be layered, which can increase energy savings from 38%* to 60%**.

*LBNL 2011
**Federal Times, Feb. 2015
As of 2016, the DOE estimates that the use of Lighting Controls in commercial buildings will save $10.4 billion annually!
In addition …

Several Energy Codes (like ASHRAE 90.1 & Title 24) now offer Lighting Power Adjustment Factors for using controls in spaces!

(above and beyond their mandatory code requirements)
ASHRAE 90.1 – 2013

Sec. 9.6.3 – Additional Lighting Power Allowance Using Non-Mandatory Controls

\[ \text{Additional ILPA} = \text{ILPA} \times \text{CF} \text{ (Control Factor)} \]
<table>
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<th>Open Office</th>
<th>Private Office</th>
<th>Conference Room, Meeting Room, Classroom (Lecture/Training)</th>
<th>Retail Sales Area</th>
<th>Lobby, Atrium, Dining Area, Corridors/Stairways, Gym/Pool, Mall Concourse, Parking Garage</th>
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<td>Manual, continuous dimming control or programmable multilevel dimming control</td>
<td>0.05</td>
<td>0.05</td>
<td>0.10</td>
<td>0.10</td>
<td>0</td>
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<tr>
<td>Programmable multilevel dimming control using programmable time scheduling</td>
<td>0.05</td>
<td>0.05</td>
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<td>Occupancy sensors controlling the downlight component of workstation specific luminaires with continuous dimming to off capabilities</td>
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<td>0</td>
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<td>0</td>
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<td>0.10&lt;sup&gt;c&lt;/sup&gt;</td>
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**TABLE 9.6.3 Control Factors Used in Calculating Additional Interior Lighting Power Allowance**

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**Personal Dimming** 31%
Best Practice #1

Ensure your system has the functional capability to comply with all local energy code requirements and your customer’s needs.
Best Practice #2

Also, ensure your system meets the quality expectations of everyone involved.
Best Practice #3

Check to see if your system has been DLC NLC Qualified for additional Utility rebates!
The ultimate goal…

Save energy!

(and it doesn’t hurt to save a little money while doing it!)
Thank You.

This concludes The American Institute of Architects Continuing Education Systems Course

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Example: Open Office Space

**Open Office Space (Total)** = 1000 ft², **Workstation Space** = 600 ft²

**Open Office Space LPD** = 0.98 W/ft²

**ILPA** = 1000 x .98 = 980 Watts

**Mandatory Controls (per 9.4.1.1)** = Local Control, Manual On, Bi-Level, Daylight, Scheduled Shutoff

**Additional Controls (per 9.6.3)** = Occupancy Sensing, Continuous Dim., & Personal Control of Workstations (0.3 CF)

**Total ILPA** = (400 * .98) + [(600 * .98) + (600 * .98 * .3)] = 1156.4 Watts