# Welcome!

AIA/CES Approved Seminar
1.0 LU/HSW

## RAB8: Specifying a Networked Lighting Control System

Shayna Bramley, PE, LC, LEED AP, CEM, CBCP
Director of Training

Updated July 2016

RAB LIGHTING

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

# Copyright Materials



RAB LIGHTING

# Learning Objective

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

What can it do?

# Learning Objective

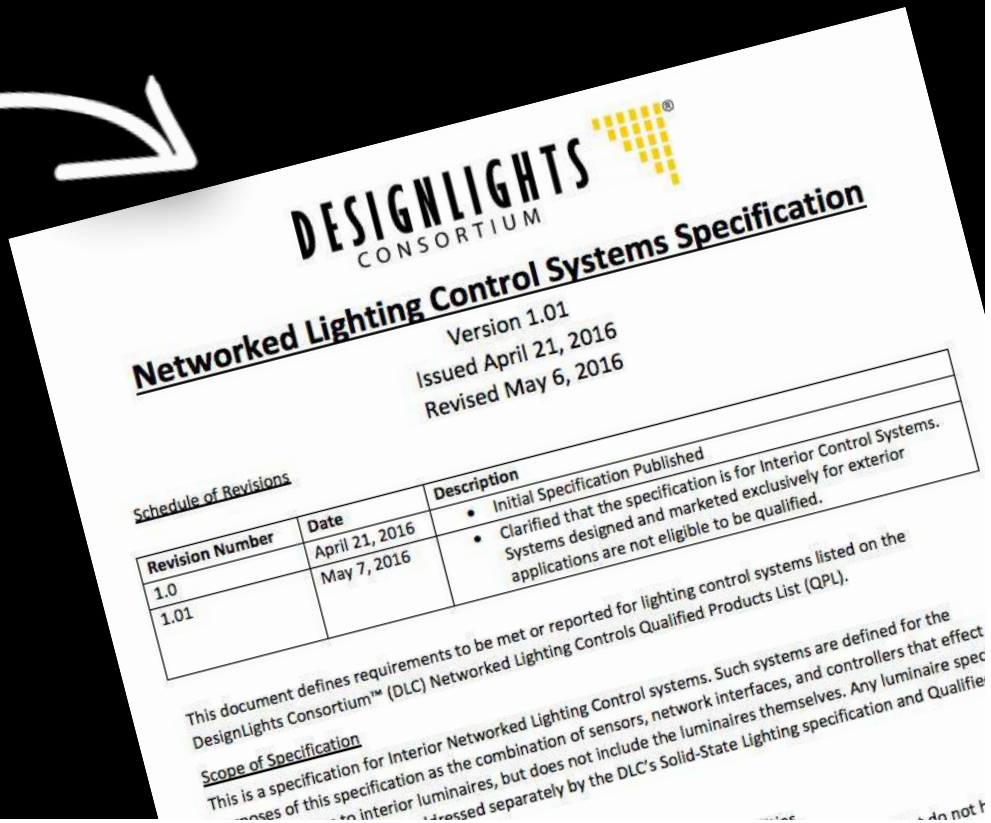
Review the quality features that should accompany a well designed networked lighting control system.


# 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



DESIGNLIGHTS CONSORTIUM

**Networked Lighting Control Systems Specification**

Version 1.01
Issued April 21, 2016
Revised May 6, 2016

Schedule of Revisions

| Revision Number | Date | Description |
|---|---|---|
| 1.0 | April 21, 2016 | • Initial Specification Published |
| 1.01 | May 7, 2016 | • Clarified that the specification is for Interior Control Systems. Systems designed and marketed exclusively for exterior applications are not eligible to be qualified. |

This document defines requirements to be met or reported for lighting control systems listed on the DesignLights Consortium™ (DLC) Networked Lighting Controls Qualified Products List (QPL).

Scope of Specification

This is a specification for Interior Networked Lighting Control systems. Such systems are defined for the purposes of this specification as the combination of sensors, network interfaces, and controllers that effect to interior luminaires, but does not include the luminaires themselves. Any luminaire spec addressed separately by the DLC's Solid-State Lighting specification and Qualifie

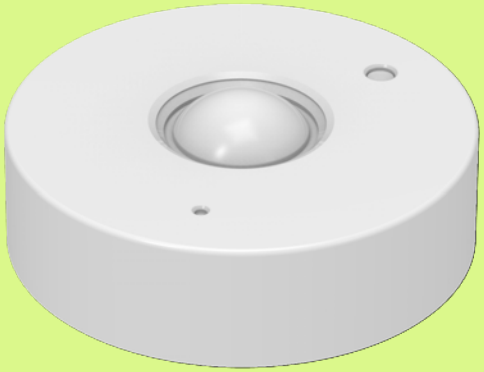
# Learning Objective

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?



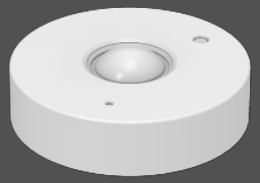
Any device that allows you to control your lights, that is not a simple switch.

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?

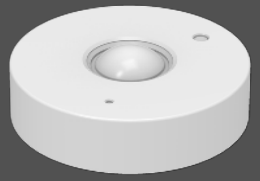
# Occupancy Sensing



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

(Auto On, Auto Off)

# Vacancy Sensing

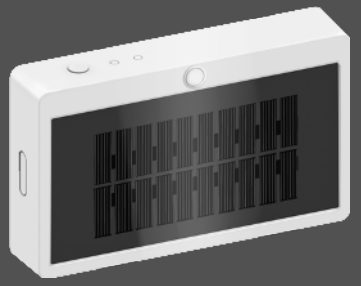


The ability to detect the absence of people in a space.

(Manual On, Auto Off)

# Daylight Harvesting

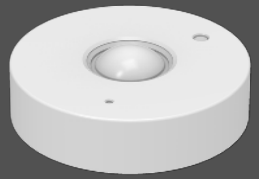
(Open Loop)



The ability to detect the amount of daylight that is present in a space.


# Daylight Harvesting

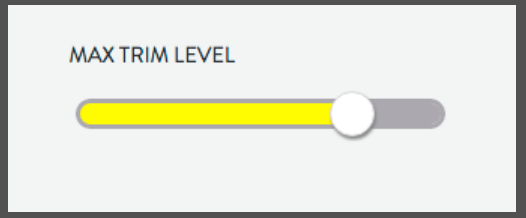
(Closed Loop)



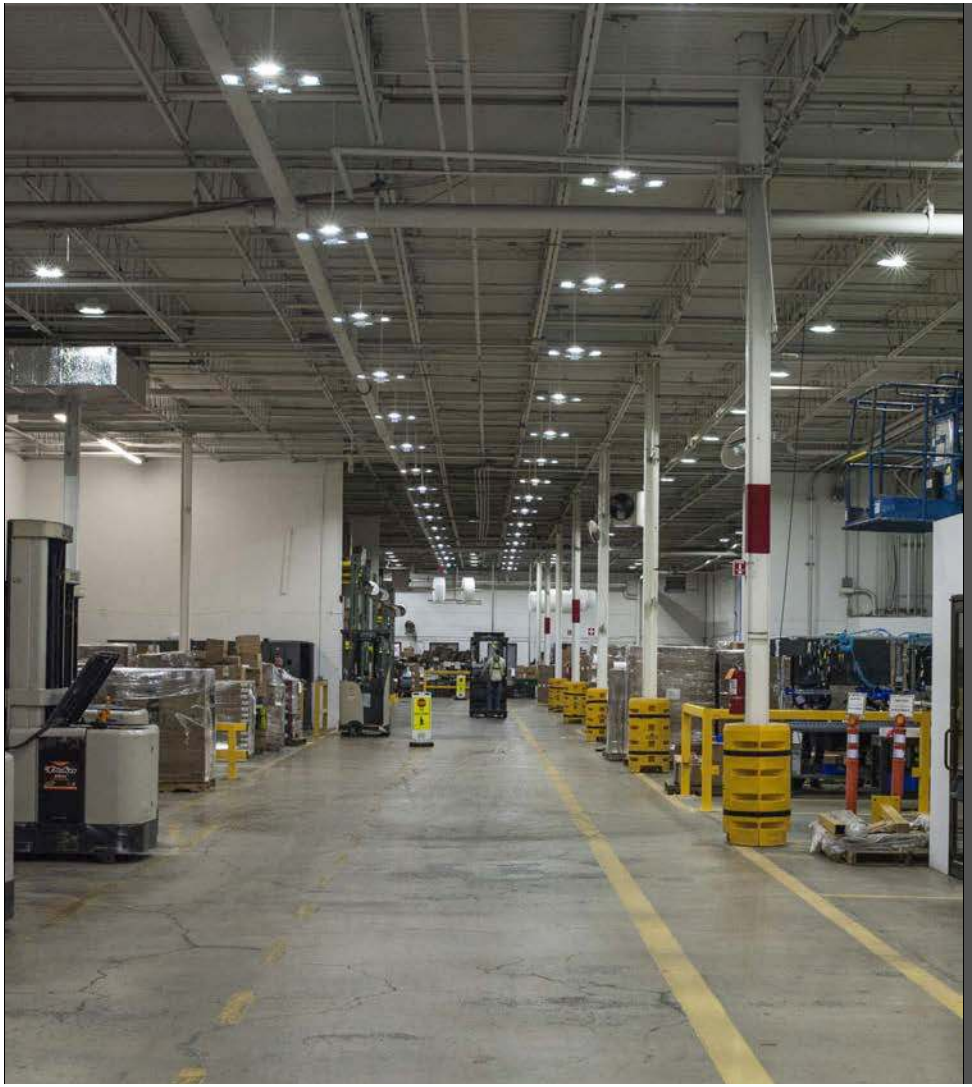
The ability to detect the amount of daylight and ambient light in a space.

# High End Trim

## (aka Task Tuning)

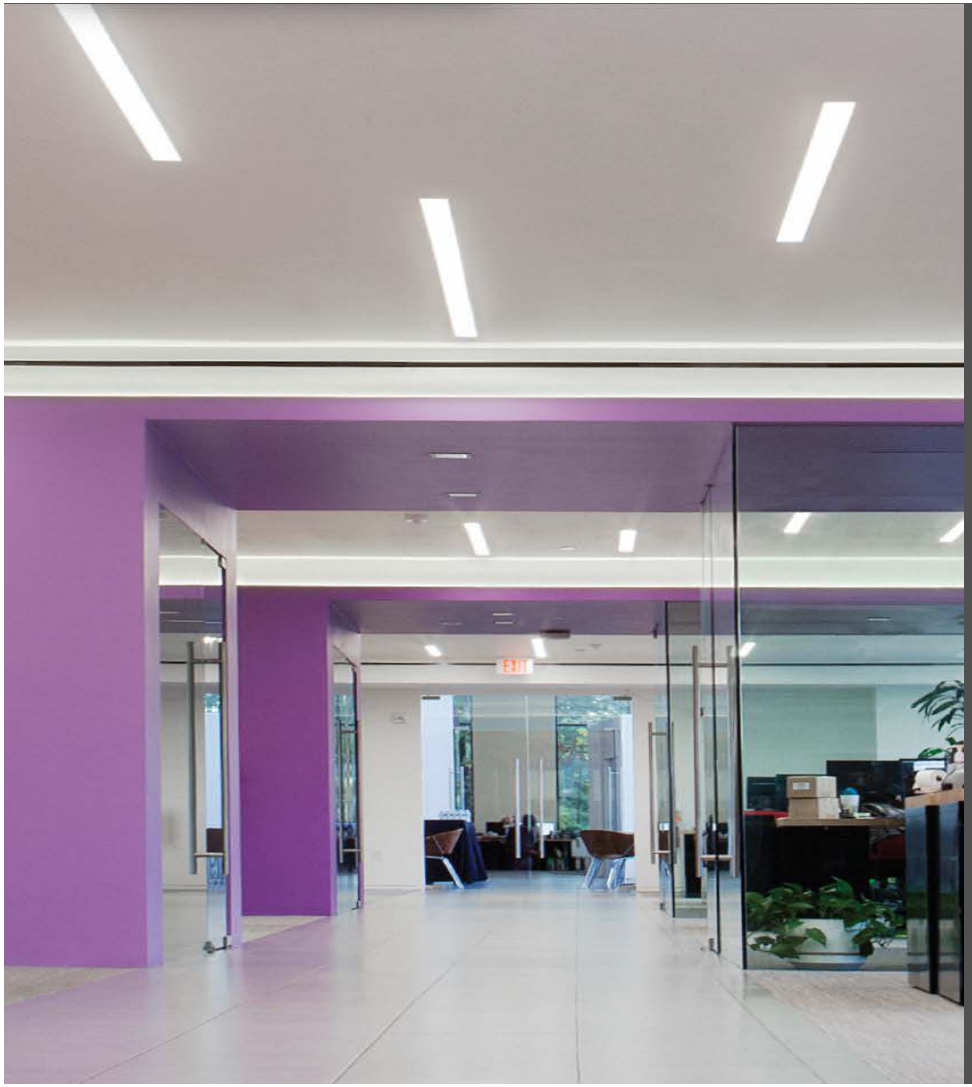



The ability to set a maximum light output that is lower than its true capability.

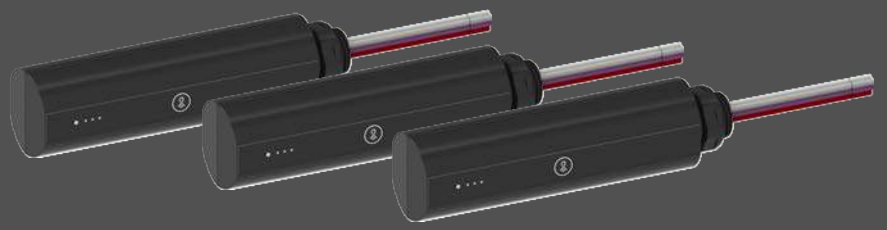


# Device Addressability

The ability to uniquely identify each luminaire and/or device in the lighting control system.



# Zoning

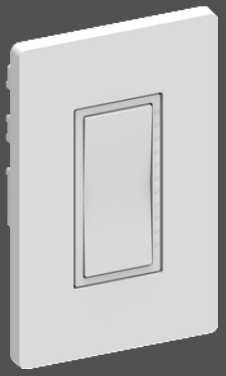


The ability to group luminaires and form unique control zones for a control strategy.

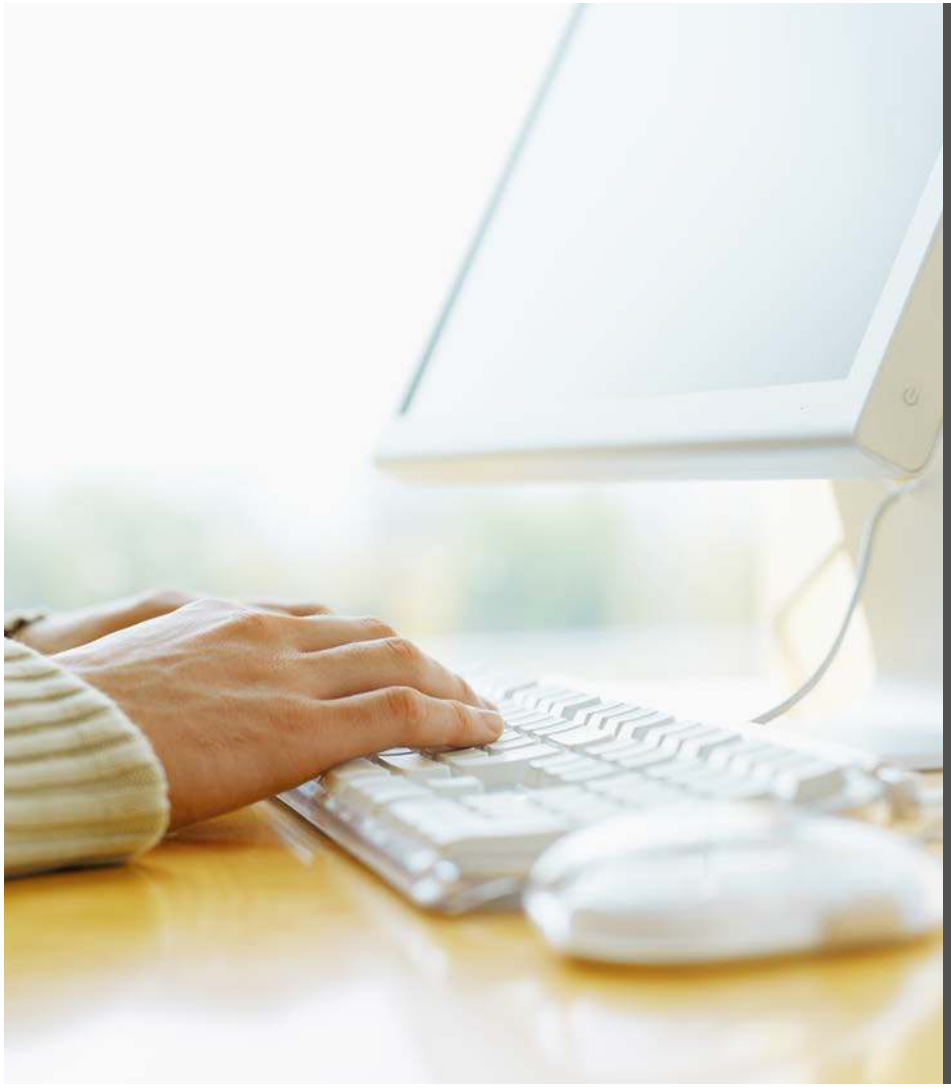
# Scene Control


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

# Continuous Dimming

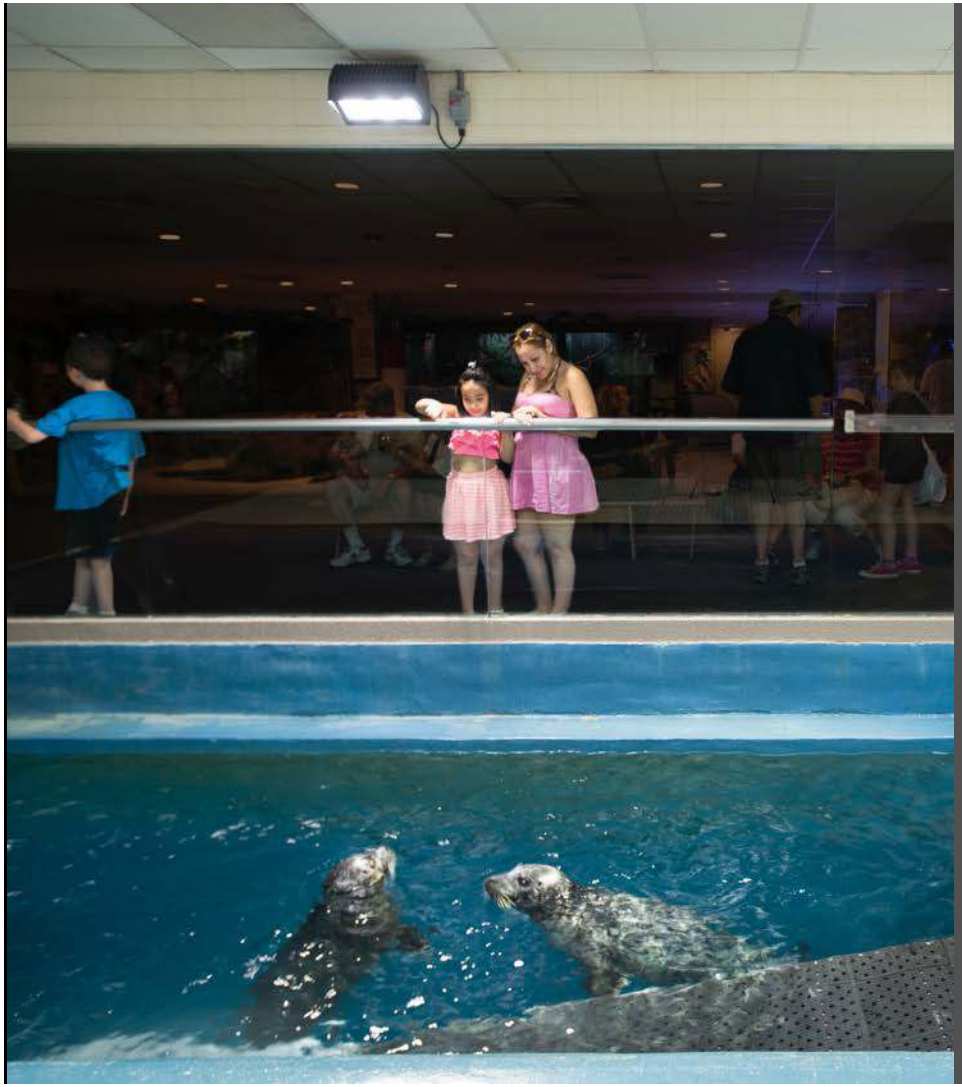


The ability to provide 100+ steps of dimming so that it is perceived as smooth.



# Easy User Interface

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

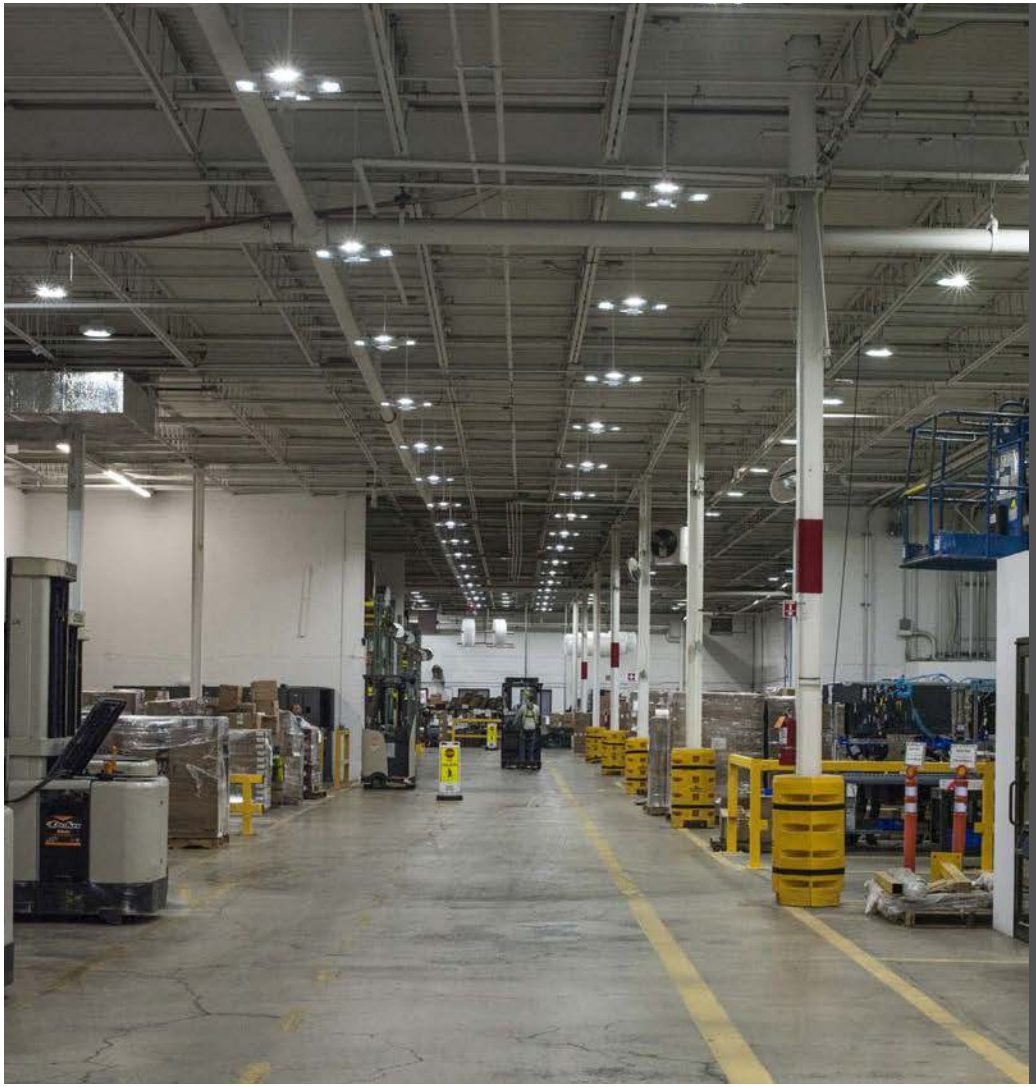


# Scheduling


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

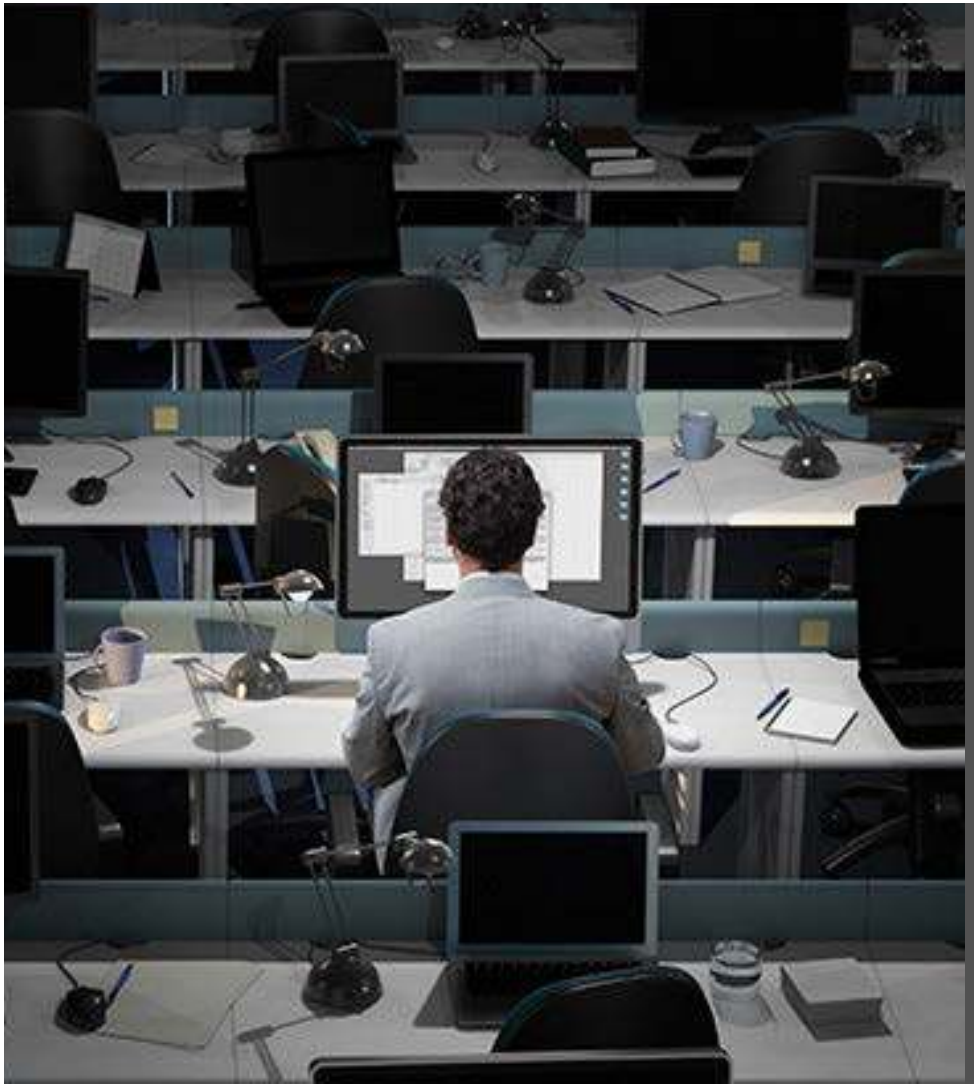

# Personal Control

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.



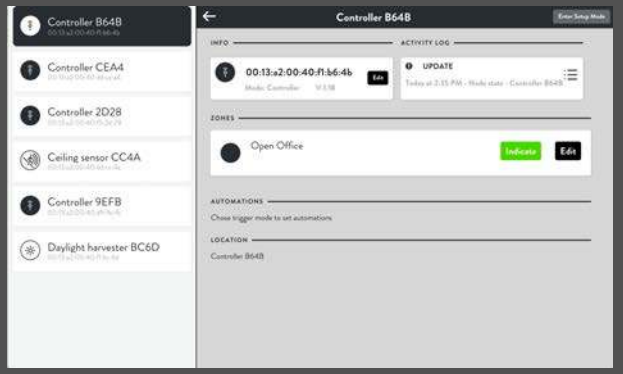
# Plug Load Control


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.

# Your Functional Capability Checklist…

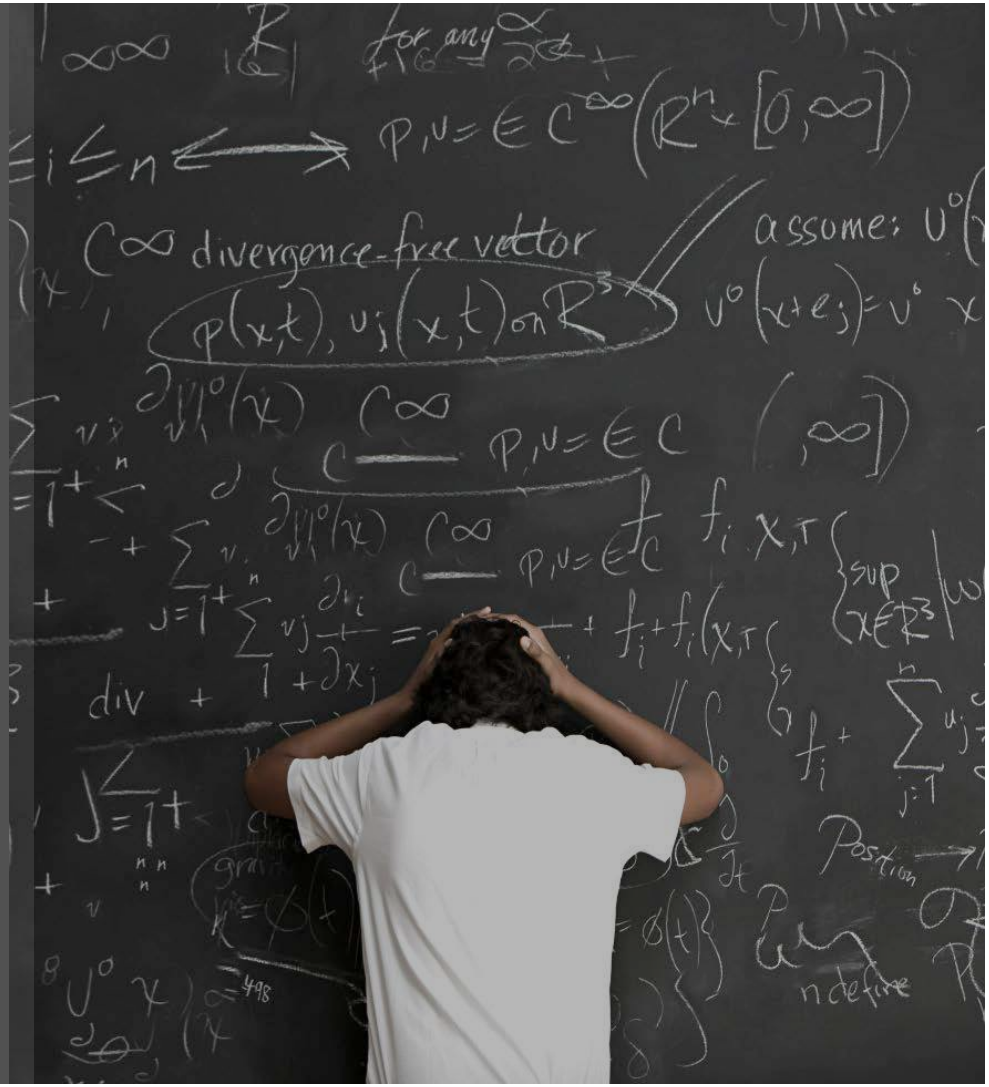
- Occupancy Sensing
- Vacancy Sensing
- Open Loop Daylight Harvesting
- Closed Loop Daylight Harvesting
- High End Trim (aka Task Tuning)
- Device Addressability
- Zoning
- Scene Control
- Easy User Interface
- Scheduling
- Personal Control
- Load Shedding
- Plug Load Control
- Energy Monitoring
- Remote Diagnostics

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.


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.

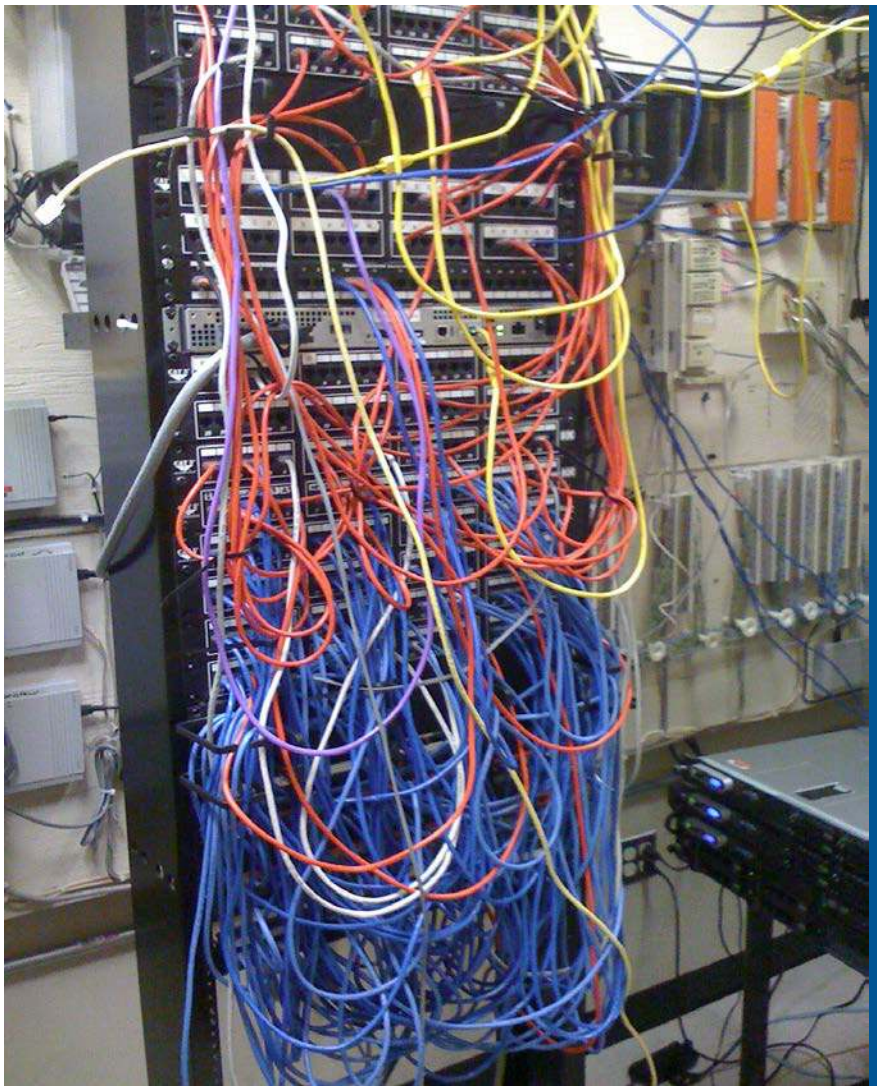
Fighting with vendors to understand the various component costs and what service is included in the overall price…

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.

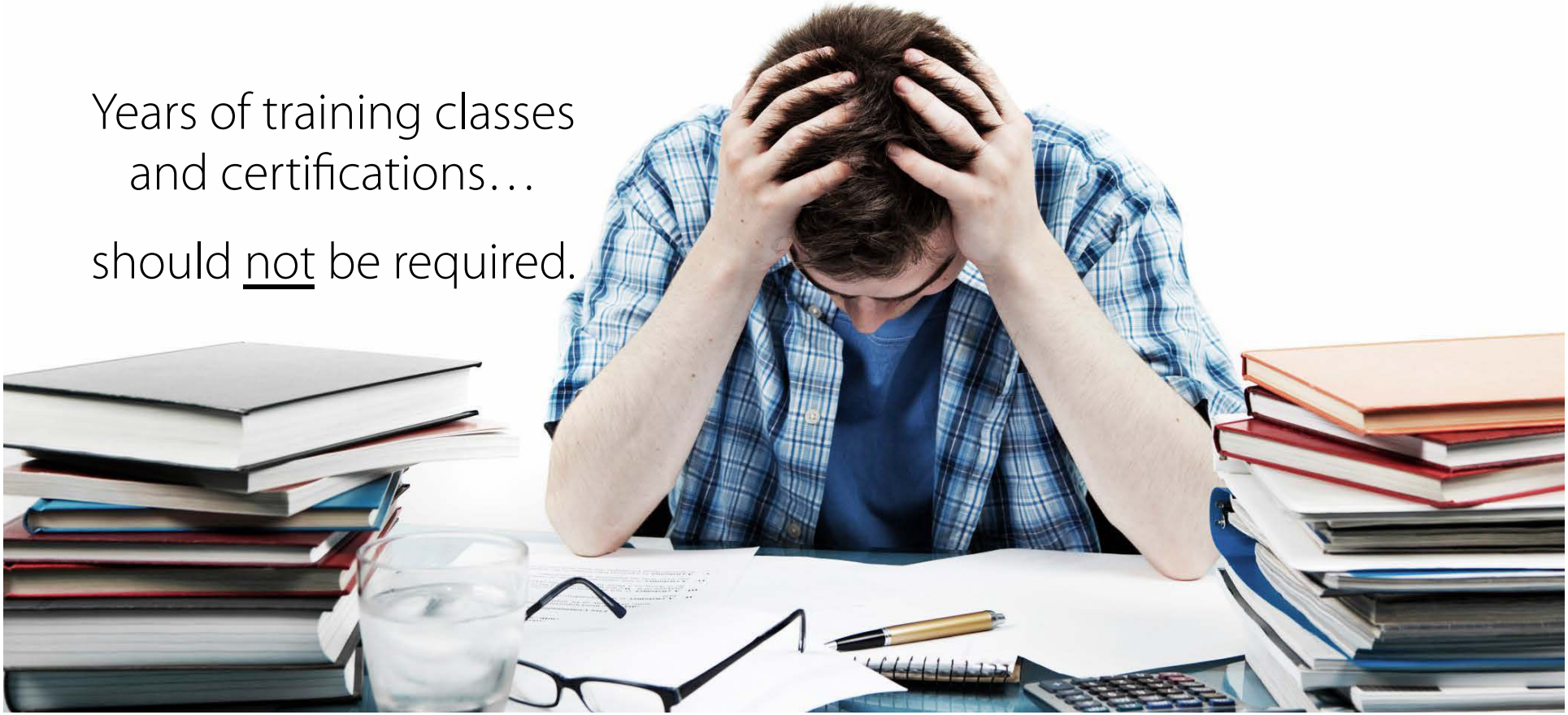
Complex coding languages and algorithms…

should not be required.

# Controls should have quick commissioning.

Years of training classes and certifications…

should not be required.



# Controls should have uncomplicated maintenance.

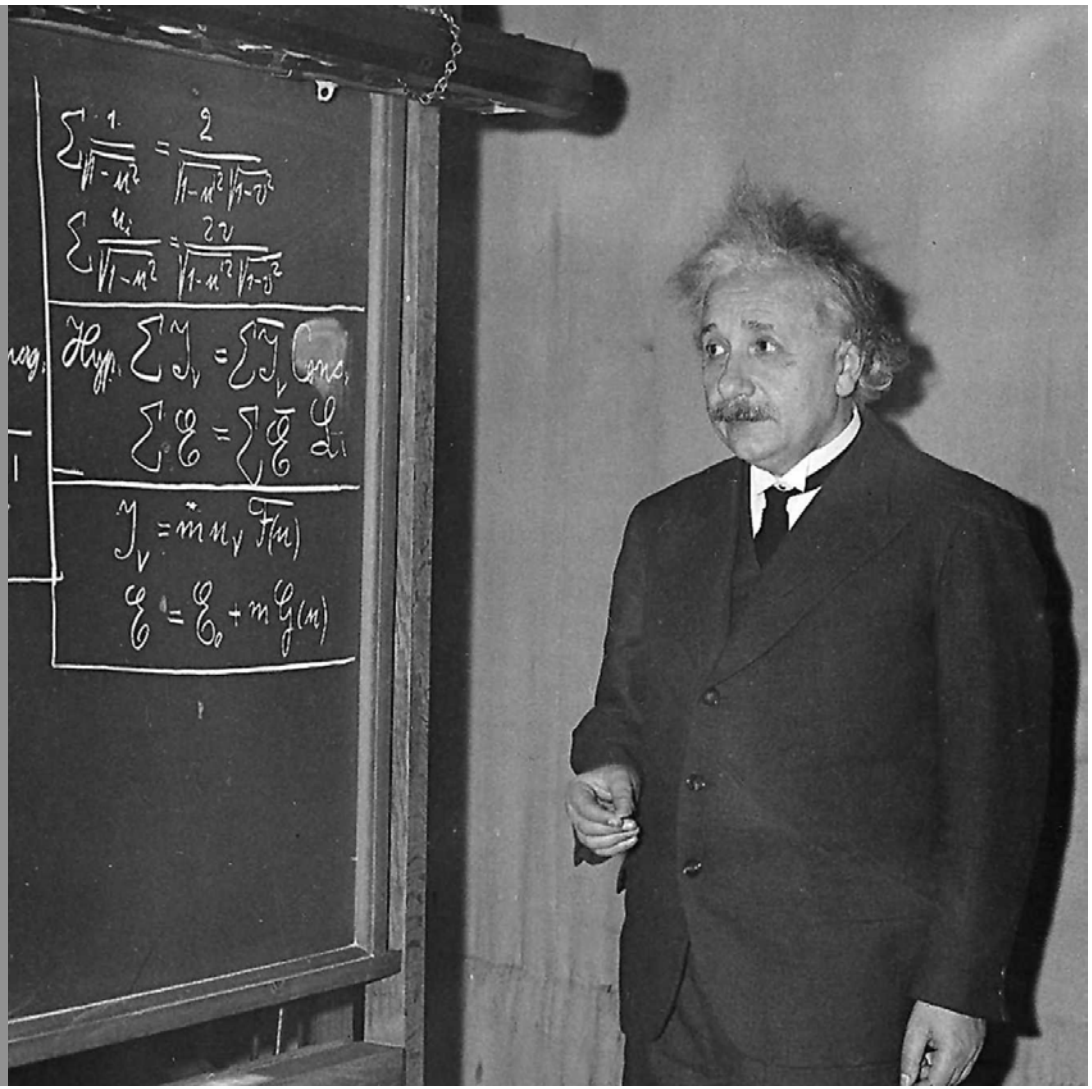
Frantically searching for someone who is close by and qualified to make simple changes to the system…

should not be required.

# Controls should offer reliable energy savings.

Fancy calculations, interpolations or guesses in order to estimate the possible energy savings…

should <u>not</u> 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 <u>not</u> 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…


DESIGNLIGHTS CONSORTIUM®

# Networked Lighting Control Systems Specification

(for Interior Controls Systems only)

Version 1.01
May 7, 2016

# '**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%

# Layering Techniques.

Networking enables individual control techniques to be layered, which can increase energy savings from 38%* to 60%**.

*LBNL 2011
**Federal Times, Feb.2015


U.S. DEPARTMENT OF
ENERGY

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

**Additional ILPA** = ILPA x CF (Control Factor)

# ASHRAE 90.1 - 2013

**TABLE 9.6.3 Control Factors Used in Calculating Additional Interior Lighting Power Allowance**

| Additional Control Method (in Addition to Mandatory Requirements) | Space Type | | | | |
|---|---|---|---|---|---|
| | Open Office | Private Office | Conference Room, Meeting Room, Classroom (Lecture/ Training) | Retail Sales Area | Lobby, Atrium, Dining Area, Corridors/ Stairways, Gym/ Pool, Mall Concourse, Parking Garage |
| Manual, continuous dimming control or programmable multilevel dimming control | 0.05 | 0.05 | 0.10 | 0.10 | 0 |
| Programmable multilevel dimming control using programmable time scheduling | 0.05 | 0.05 | 0.10 | 0.10 | 0.10 |
| Occupancy sensors controlling the downlight component of workstation specific luminaires with continuous dimming to off capabilities | 0.25[a] | 0 | 0 | 0 | 0 |
| Occupancy sensors controlling the downlight component of workstation specific luminaires with continuous dimming to off operation, in combination with personal continuous dimming control of downlight illumination by workstation occupant | 0.30[a,b] | 0 | 0 | 0 | 0 |
| Automatic continuous daylight dimming in secondary sidelighted areas | 0.10[c] | 0.10[c] | 0.10[c] | 0.10[c] | 0.10[c] |

# ASHRAE 90.1 - 2013

**TABLE 9.6.3 Control Factors Used in Calculating Additional Interior Lighting Power Allowance**

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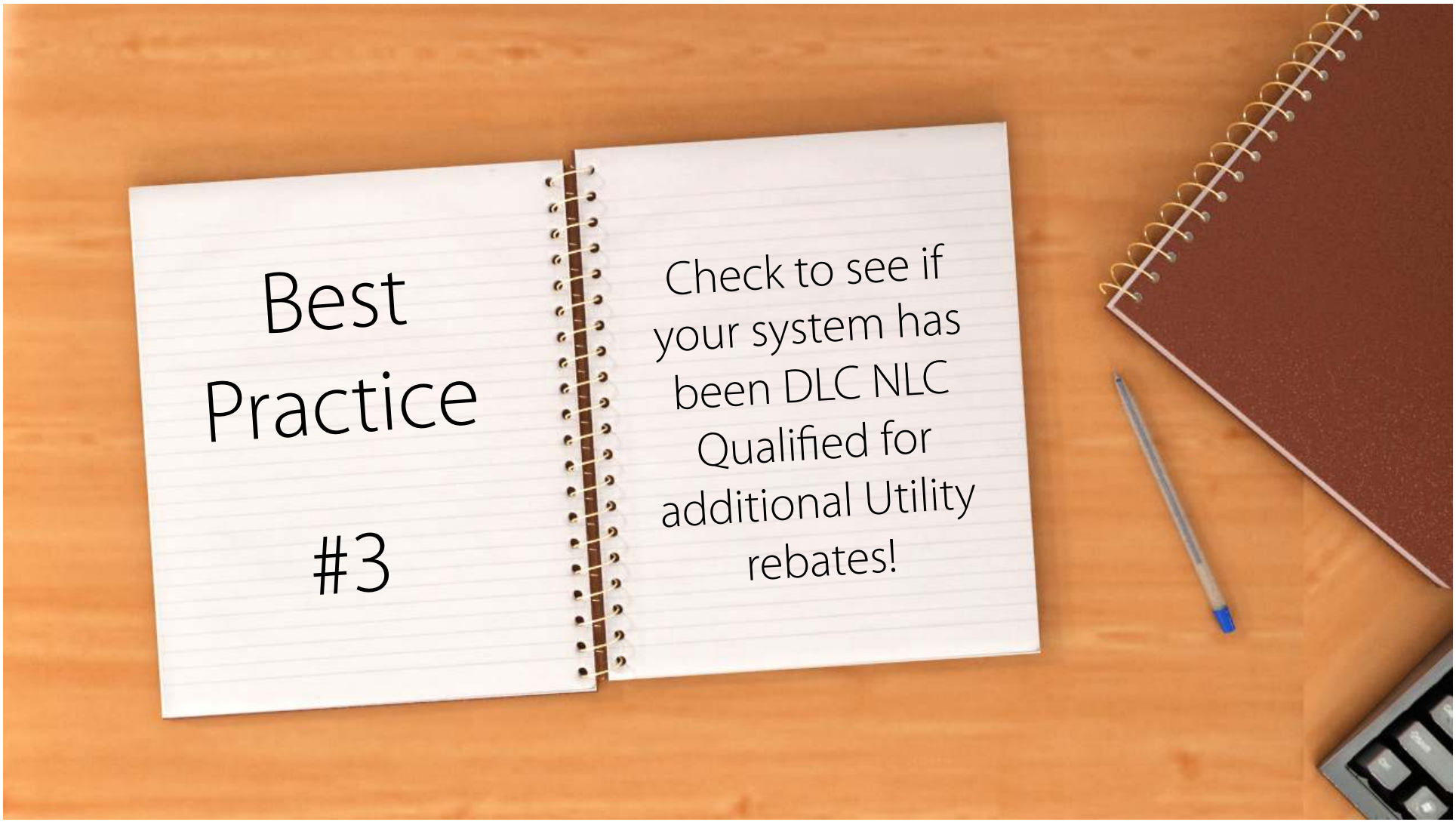
| Manual, continuous dimming control or programmable multilevel dimming control | 0.05 | 0.05 | 0.10 | 0.10 | 0 |
| | | | 0.10 | 0.10 | 0.10 |
| | | | 0 | 0 | 0 |
| Occupancy sensors controlling the downlight component of workstation specific luminaires with continuous dimming to off operation, in combination with personal continuous dimming control of downlight illumination by workstation occupant | 0.30[a,b] | 0 | 0 | 0 | 0 |
| Automatic continuous daylight dimming in secondary sidelighted areas | 0.10[c] | 0.10[c] | 0.10[c] | 0.10[c] | 0.10[c] |

Personal Dimming 31%

Look similar?


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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July 2016

Presenter Notes

# Example: Open Office Space

**Open Office Space (Total)** = 1000 $ft^2$ , Workstation Space = 600 $ft^2$

**Open Office Space LPD** = 0.98 $W/ft^2$

**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