Proposal Summary

2022 California Energy Code (Title 24, Part 6)

Nonresidential Indoor Lighting – Networked Lighting Controls

Updated: Monday, September 7, 2019

Prepared by: Yao-Jung Wen, Energy Solutions

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 12th, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by September 26th, 2019.

Measure Description

This submeasure would provide power adjustment factors or allow a tradeoff to mandatory or prescriptive requirements to encourage the deployment of networked lighting controls. Networked lighting controls can readily be used to meet the current indoor lighting control requirements while providing advanced features for more efficient management and long-term energy benefits, including easier demand response integration, enabling granular controls, flexible control interactions, easily adapting to space usage and occupancy changes to ensure sustainable savings throughout the life of the system, and energy reporting for verifying energy usage, informing operation efficiency, and paving the way to the outcome-based code compliance pathways. The networked lighting controls requirements will be structured so designers are awarded for taking advantage of the advanced features of networked lighting controls.

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in yellow.

Standards

SECTION 100.1

NETWORKED LIGHTING CONTROL is a communication network of light points, sensors, control interfaces, and network interfaces that is established to exchange digital data for the purposes of changing lighting status, reporting current status, and setting commissioning and configuration parameters.

Addition of Section 110.9(e)

e. **Networked Lighting Controls (NLC).** Networked lighting controls that qualify for the power adjustment factors in Section 140.6(a)2L qualify only if they have all the following features.

1. The NLC system complies with all of the requirements in 110.9(a) and is capable of all the controls functions and complies with all the requirements in Section 110.9(b).

2. The NLC system is capable of being configured to perform all controls in Section 130.1 in all areas regardless of whether a control is required in Section 130.1.

3. The definition of a control zone as well as the association between a luminaire and a standalone sensor, a switch or a dimmer are capable of being altered via software-defined means and does not require physical re-configuration of mechanical or electrical installation details. The luminaire-sensor association is allowed to be permanently fixed if the sensor is an integral part of the luminaire and controls the luminaire directly.

Changes to Section 140.6(a)2

2. Reduction of wattage through controls. In calculating Adjusted Indoor Lighting Power, the installed watts of a luminaire providing general lighting in an area listed in TABLE 140.6-A may be reduced by the product of (i) the number of watts controlled as described in TABLE 140.6-A, times (ii) the applicable Power Adjustment Factor (PAF), if all of the following conditions are met:

…

[Insert the following test as Section 140.6(a)2L and renumber item L "PAFs for clerestory fenestration" as item M.]

L. To qualify for the PAF for Networked Lighting Controls (NLC), the control shall meet the requirements in Section 110.9(e) and either item i or ii:

i. To qualify for the PAF for *Networked Lighting Controls – Luminaires with Institutional Tuning* credit, the controlled luminaires taking the credit shall be controlled by the NLC and comply with Section 140.6(a)2J; or

ii. To qualify for the PAF for *Networked Lighting Controls – Luminaires in open plan offices with tuning and occupancy sensing controlling a zone no greater than 250 square feet*, the controlled luminaires taking the credit shall be controlled by the NLC, comply with Section 140.6(a)2J, comply with Section 140.6(a)2I and occupancy sensors shall not control a zone greater than 250 square feet.

TABLE 140.6-A LIGHTING POWER ADJUSTMENT FACTORS (PAF)

TYPE OF CONTROL	TYPE OF AREA		FACTOR
a. To qualify for any of the Power Adjustment Factors in this table, the installation shall comply with the applicable requirements in Section 140.6(a)2 b. Only one PAF may be used for each qualifying luminaire unless combined below. c. Lighting controls that are required for compliance with Part 6 shall not be eligible for a PAF			
1. Daylight Dimming plus OFF Control	Luminaires in skylit daylit zone or primary sidelit daylit zone		0.10
2. Occupant Sensing Controls in Large Open Plan Offices	In open plan offices > 250 square feet: One sensor controlling an area that is:	No larger than 125 square feet	0.40
		From 126 to 250 square feet	0.30
		From 251 to 500 square feet	0.20
3.Institutional Tuning	Luminaires in non-daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.		0.10
	Luminaires in daylit areas. Luminaires that qualify for other PAFs in this table may also qualify for this tuning PAF.		0.05
4. Demand Responsive Control	All building types of 10,000 square feet or smaller. Luminaires that qualify for other PAFs in this table may also qualify for this demand responsive control PAF		0.05
5. Networked Lighting Controls	Luminaires with institutional tuning		TBD
	Luminaires in open plan offices with tuning and occupancy sensing controlling a zone no greater than 250 square feet		TBD
~~5~~6. Clerestory Fenestration	Luminaires in daylit areas adjacent to the clerestory. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.		0.05
~~6~~7. Horizontal Slats	Luminaires in daylit areas adjacent to vertical fenestration with interior or exterior horizontal slats. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF.		0.05
~~7~~8.Light Shelves	Luminaires in daylit areas adjacent to clerestory fenestration with interior or exterior light shelves. This PAF may be combined with the PAF for clerestory fenestration. Luminaires that qualify for daylight dimming plus OFF control may also qualify for this PAF		0.10

Proposal Summary

2022 California Energy Code (Title 24, Part 6)

Nonresidential Indoor Lighting – Update Lighting Power Densities

Updated: Wednesday, September 11, 2019

Prepared by: Christopher Uraine, Energy Solutions

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 12th, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by September 26th, 2019.

Measure Description

This measure updates indoor LPDs and wattage calculations. The updates to interior LPDs are driven by the following factors:

- Ongoing LED technology advancement and improved integration into luminaires, including efficacy degradation for high CRI sources, lower lamp lumen depreciation factors over the expected effective luminaire life and improved optical control and optical efficiency.
- Better integration of task/ambient lighting design approach. Confirm general lighting allowances are not also covered under use-it-or-lose-it adders.
- Careful review of the use-it-or-lose-it adders and how these are enforced in the forms and performance approach such as the Small Aperture Tunable-White and Dim-to-Warm Luminaires Lighting Power Adjustment.
- Update the LPD of spaces which are currently conservative. Examples include: classrooms, and the general lighting allowance for portions of the tailored lighting method.

Related to the development of the lighting wattage allowance LPDs, are the updates to the calculation of installed wattage in Section 130.0(c).

- What is the wattage of constant light output (CLO) drivers.
- Addressing modular systems, including PoE and DC systems that can be expanded at any time post-installation without requiring an electrician for adding luminaires.
- Clarify the 50 Watt minimum for downlights and what are the alternatives

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in yellow.

Standards

SECTION 130.0 – LIGHTING SYSTEMS AND EQUIPMENT, AND ELECTRICAL POWER DISTRIBUTION SYSTEMS —GENERAL

…

(c) **Luminaire classification and power.** Luminaires shall be classified and their wattage determined as follows:

1. Luminaire wattage shall be labeled as follows:

   A. The maximum rated wattage or relamping rated wattage of a luminaire shall be listed on a permanent, preprinted, factory-installed label, as specified by UL 1574, 1598, 2108, or 8750, as applicable; and

   B. The factory-installed maximum rated wattage or relamping rated wattage label shall not consist of peel-off or peel-down layers or other methods that allow the rated wattage to be changed after the luminaire has been shipped from the manufacturer.

   EXCEPTION to Section 130.0(c)1B: Peel-down labels may be used only for the following luminaires when they can accommodate a range of lamp wattages without changing the luminaire housing, ballast, transformer or wiring. Qualifying luminaires shall have a single lamp, and shall have integrated ballasts or transformers. Peel-down labels must be layered such that the rated wattage reduces as successive layers are removed.

   i. High intensity discharge luminaires, having an integral electronic ballast, with a maximum relamping rated wattage of 150 watts.

   ii. Low-voltage luminaires (except low voltage track systems), ≤ 24 volts, with a maximum relamping rated wattage of 50 watts.

   iii. Compact fluorescent luminaires, having an integral electronic ballast, with a maximum relamping rated wattage of 42 watts.

2. For luminaires with line voltage lamp holders not containing permanently installed ballasts or transformers, the wattage of such luminaires shall be determined as follows:

   A. The maximum rated wattage of the luminaire; and

   B. For recessed luminaires with line-voltage medium screw base sockets, wattage shall not be less than 50 watts per socket, or the rated wattage of the installed JA8 compliant lamps.

3. For luminaires with permanently installed or remotely installed ballasts, the wattage of such luminaires shall be the operating input wattage of the rated lamp/ballast combination published in the ballast manufacturer's catalogs based on independent testing lab reports as specified by UL 1598.

4. For inseparable SSL luminaires and SSL luminaires with remotely mounted drivers, the maximum rated wattage shall be the maximum rated input wattage of the SSL luminaire as specified in Section 130.0(c)1 when tested in accordance with UL 1598, 2108, 8750, or IES LM-79.

5. For LED tape lighting and LED linear lighting with LED tape lighting components, the maximum rated wattage shall be the sum of the installed length of the tape lighting times its rated linear power density in watts per linear feet, or the maximum rated input wattage of the driver or power supply providing power to the lighting system, with tape lighting tested in accordance with UL 2108, 8750, or IES LM-79,

6. For modular lighting systems that allow the addition or relocation of luminaires without altering the wiring of the system, shall be determined as follows:

   A. The wattage shall be the greater of:

i. 30 watts per linear foot of track or plug-in busway; or

ii. the rated wattage of all of the luminaires included in the system, where the luminaire wattage is determined as specified in Section 130.0(c)1; or

B. For line-voltage lighting track and plug-in busway served by a track lighting integral current limiter or a dedicated track lighting supplementary overcurrent protection panel, the wattage shall be determined as follows:

i. The volt-ampere rating of current limiter as specified by UL 1077;

ii. The sum of the ampere (A) rating of all of the current protection devices times the branch circuit voltages for track lighting supplementary overcurrent protection panel ; or

C. For other modular lighting systems with power supplied by a driver, power supply or transformer, including but not limited to low-voltage lighting systems, the wattage of the system shall be the maximum rated input wattage of the driver, power supply or transformer published in the manufacturer's catalogs, as specified by UL 2108 or 8750.

EXCEPTION to Section 130.0(c)6: For power-over-Ethernet lighting systems, power provided to installed non-lighting devices may be subtracted from the total power rating of the power-over-Ethernet system.

7. For all other lighting equipment not addressed by Sections 130.0(c)2 through 6, the wattage of the lighting equipment shall be the maximum rated wattage of the lighting equipment, or operating input wattage of the system, labeled in accordance with Section 130.0(c)1, or published in manufacturer's catalogs, based on independent testing lab reports as specified by UL 1574, 1598, 2108, 8750, or IES LM-79.

(d) **Lighting Controls**. All lighting controls and equipment shall comply with the applicable requirements in Sections 110.9, 130.1 and 130.2, and shall be installed in accordance with any applicable manufacturer instructions.

(e) **Energy Management Control System (EMCS)**. An EMCS may be installed to comply with the requirements of one or more lighting controls if it meets the following minimum requirements:

1. Provides all applicable functionality for each specific lighting control or system for which it is installed in accordance with Sections 110.9, 130.1 and 130.2; and

2. Complies with all applicable Lighting Control Installation Requirements in accordance with Section 130.4 for each specific lighting control or system for which it is installed; and

3. Complies with all applicable application requirements for each specific lighting control or system for which it is installed, in accordance with Part 6.

SECTION 140.6 – PRESCRIPTIVE REQUIREMENTS FOR INDOOR LIGHTING

A building complies with this section if:

i. The Calculation of Adjusted Indoor Lighting Power of all proposed building areas combined, calculated under Subsection (a) is no greater than the Calculation of Allowed Indoor Lighting Power, Specific Methodologies calculated under Subsection (c); and

ii. The Calculation of Allowed Indoor Lighting Power, General Rules comply with Subsection (b); and

iii. General lighting complies with the Automatic Daylighting Controls in Secondary Daylit Zone requirements in Subsection (d).

The prescriptive limits on indoor lighting power are the smaller of the Actual and Allowed Indoor Lighting Power values determined in accordance with item i.

(a) **Calculation of Adjusted Indoor Lighting Power.** The adjusted indoor Lighting Power of all proposed building areas is the total watts of all planned permanent and portable lighting systems in all areas of the proposed building; subject to the applicable adjustments under Subdivisions 1 through 4 of this subsection.

…

4. **Luminaire Classification and Power Adjustment.**

A. Luminaire Classification and Power shall be determined in accordance with Section 130.0(c).

B. Small Aperture Tunable-White and Dim-to-Warm Luminaires Lighting Power Adjustment. For qualifying small aperture tunable-white and dim-to-warm LED luminaires, the adjusted indoor lighting power of these luminaires shall be calculated by multiplying their maximum rated wattage by 0.75. Qualifying luminaires shall meet all of the following:

i. Small Aperture. Qualifying luminaires longer than 18 inches shall be no wider than four inches. Qualifying luminaires with a length of 18 inches or less shall be no wider than eight inches.

ii. Color Changing. Qualifying tunable-white luminaires shall be capable of a color change greater than or equal to 2000 Kelvin correlated color temperature (CCT). Qualifying dim-to-warm luminaires shall be capable of color change greater than or equal to 500 Kelvin CCT.

iii. Controls. Qualifying luminaires shall be connected to controls that allows color changing of the luminaires.

C. Tailored Method Display Lighting Mounting Height Lighting Power Adjustment. For wall display luminaires or floor display luminaires meeting Tailored Method Section 140.6(c)3G and H and where the bottom of luminaires are 10 feet 7 inches and greater above the finished floor, the adjusted indoor lighting power of these luminaires shall be calculated by multiplying their maximum rated wattage and the appropriated mounting height adjustment factor from TABLE 140.6-E. Luminaire mounting height is the distance from the finished floor to the bottom of the luminaire. General lighting shall not qualify for a mounting height multiplier.

…

TABLE 140.6-B COMPLETE BUILDING METHOD LIGHTING POWER DENSITY VALUES

TYPE OF BUILDING	ALLOWED LIGHTING POWER DENSITY (WATTS PER SQUARE FOOT)
Assembly Building	0.70
Financial Institution Building	0.65
Industrial/Manufacturing Facility Building	0.60
Grocery Store Building	0.95
Gymnasium Building	0.65
Library Building	0.70
Healthcare Facility	0.90
Office Building	0.65
Parking Garage Building	0.13
Religious Facility Building	0.70
Restaurant Building	0.70
Retail Store Building	0.90
School Building	0.65
Sports Arena Building	0.75
Motion Picture Theater Building	0.70
Performing Arts Theater Building	0.80
All others buildings	0.40

TABLE 140.6-C AREA CATEGORY METHOD - LIGHTING POWER DENSITY VALUES (WATTS/FT²)

Primary Function Area		Allowed Lighting Power Density for General Lighting (W/ft²)	Additional Lighting Power[1]	
			Qualified Lighting Systems	Additional Allowance (W/ft², unless noted otherwise)
Auditorium Area		0.70	Ornamental	0.30
			Accent, display and feature[3]	0.20
Auto Repair / Maintenance Area		0.55	Detailed Task Work[7]	0.20
Audience Seating Area		0.60	Ornamental	0.30
Beauty Salon Area		0.80	Detailed Task Work[7]	0.20
			Ornamental	0.30
Civic Meeting Place Area		1.00	Ornamental	0.30
Classroom, Lecture, Training, Vocational Area		0.70	White or Chalk Board[1]	4.50 W/ft
Commercial/Industrial Storage	Warehouse	0.45	-	-
	Shipping & Handling	0.60	-	-
Convention, Conference, Multipurpose and Meeting Area		0.85	Ornamental	0.30
Copy Room		0.50	-	-
Corridor Area		0.60	-	-
Dining Area	Bar/Lounge and Fine Dining	0.55	Ornamental	0.30
	Cafeteria/Fast Food	0.40		
	Family and Leisure	0.50		
Electrical, Mechanical, Telephone Rooms		0.40	Detailed Task Work[7]	0.20
Exercise/Fitness Center and Gymnasium Area		0.50	-	-
Hotel Function Area		0.85	Ornamental	0.30
Museum Area	Exhibition/Display	0.60	Accent, display and feature[3]	0.50
	Restoration Room	0.75	Detailed Task Work[7]	0.20
Financial Transaction Area		0.80	Ornamental	0.30
General/Commercial & Industrial Work Area	Low Bay	0.60	Detailed Task Work[7]	0.20
	High Bay	0.65	Detailed Task Work[7]	0.20
	Precision	0.85	Precision Specialized Work[9]	0.70
Library	Reading Area	0.80	Ornamental	0.30
	Stacks Area	1.10	-	-
Main Entry Lobby		0.85	Ornamental	0.30
Locker Room		0.45	-	-
Lounge, Breakroom, or Waiting Area		0.65	Ornamental	0.30
Concourse and Atria Area		0.90	Ornamental	0.30
Office Area	> 250 square feet	0.65	Portable lighting for office areas[6]	0.20
	≤ 250 square feet	0.70		
	Open plan office	0.60		

Parking Garage Area	Parking Zone	0.10	First ATM	100 W
			Additional ATM	50 W each
	Dedicated Ramps	0.25	-	-
	Daylight Adaptation Zones[2]	0.50	-	-
Pharmacy Area		1.10	Specialized Task Work[8]	0.35
Retail Sales Area	Grocery Sales	1.05	Accent, display and feature[3]	0.20
			Decorative	0.15
	Retail Merchandise Sales	1.00	Accent, display and feature[3]	0.20
			Decorative	0.15
	Fitting Room	0.60	External Illuminated Mirror[5]	40 W/ea
			Internal Illuminated Mirror[5]	120 W/ea
Theater Area	Motion picture	0.60	Ornamental	0.30
	Performance	1.00		
Kitchen/Food Preparation Area		0.95	-	-
Scientific Laboratory Area		1.00	Specialized Task Work[8]	0.35
Healthcare Facility and Hospitals	Exam/Treatment Room	1.15	-	-
	Imaging Room	1.00	-	-
	Medical Supply Room	0.55	-	-
	Nursery	0.95	Tunable white or dim-to-warm[10]	0.10
	Nurse’s Station	0.75	Tunable white or dim-to-warm[10]	0.10
	Operating Room	1.90	-	-
	Patient Room	0.55	Decorative	0.15
			Tunable white or dim-to-warm[10]	0.10
	Physical Therapy Room	0.85	Tunable white or dim-to-warm[10]	0.10
	Recovery Room	0.90	Tunable white or dim-to-warm[10]	0.10
Laundry Area		0.45	-	-
Religious Worship Area		0.95	Ornamental	0.30
Restrooms		0.65	Accent, display and feature[3]	0.20
			Decorative[4]	0.15
Transportation Function	Baggage Area	0.40	-	-
	Ticketing Area	0.45	Accent, display and feature[3]	0.20
Sports Arena – Playing Area	Class I Facility[13]	2.25	-	-
	Class II Facility[13]	1.45	-	-
	Class III Facility[13]	1.10	-	-
	Class IV Facility[13]	0.75	-	-

Stairwell		0.50	Accent, display and feature[3]	0.20
			Decorative[4]	0.15
Videoconferencing Studio		0.90	Videoconferencing	1.00
All other		0.40	-	-
Aging Eye/Low-vision[11]	Main Entry Lobby	0.85	Ornamental	0.30
			Transition Lighting OFF at night[12]	0.95
	Stairwell	0.80	-	-
	Corridor Area	0.80	Decorative[4]	0.15
	Lounge/Waiting Area	0.75	Ornamental	0.30
	Multipurpose Room	0.95	Ornamental	0.30
	Religious Worship Area	1.00	Ornamental	0.30
	Dining	0.80	Ornamental	0.30
	Restroom	0.80	Accent, display and feature[3]	0.20

Footnotes for this table are listed below.

1. White board or chalk board. – Directional lighting dedicated to a white board or chalk board.

2. Daylight Adaptation Zones shall be no longer than 66 feet from the entrance to the parking garage.

3. Accent, display and feature lighting – luminaires shall be adjustable or directional.

4. Decorative lighting – primary function shall be decorative and not to provide general lighting.

5. Illuminated mirrors. Lighting shall be dedicated to the mirror.

6. Portable lighting in office areas includes under shelf or furniture-mounted supplemental task lighting qualifies when controlled by a time clock or an occupancy sensor.

7. Detailed task work – Lighting provides high level of visual acuity required for activities with close attention to small elements and/or extreme close up work.

8. Specialized task work – Lighting provides for small-scale, cognitive or fast performance visual tasks; lighting required for operating specialized equipment associated with pharmaceutical/laboratorial activities.

9. Precision specialized work – Lighting for work performed within a commercial or industrial environment that entails working with low contrast, finely detailed, or fast moving objects.

10. Tunable white luminaires capable of color change greater than or equal to 2000K CCT, or dim-to-warm luminaires capable of color change greater than or equal to 500K CCT, connected to controls that allows color changing of the luminaires.

11. Aging Eye/Low-vision areas can be documented as being designed to comply with the light levels in ANSI/IES RP-28 and are or will be licensed by local or state authorities for either senior long-term care, adult day care, senior support, and/or people with special visual needs.

12. Transition lighting OFF at night. Lighting power controlled by astronomical time clock or other control to shut off lighting at night. Additional LPD only applies to area within 30 feet of an exit. Not applicable to lighting in daylit zones.

13. Class I Facility is used for competition play for 5000 or more spectators. Class II Facility is used for competition play for up to 5000 spectators. Class III Facility is used for competition play for up to 2000 spectators. Class IV Facility is normally used for recreational play and there is limited or no provision for spectators.

TABLE 140.6-D TAILORED METHOD LIGHTING POWER ALLOWANCES

1	2	3	4	5
Primary Function Area	**General Illumination Level (Lux)**	**Wall Display Lighting Power Density (W/ft)**	**Allowed Combined Floor Display Power and Task Lighting Power Density (W/ft²)**	**Allowed Ornamental/ Special Effect Lighting Power Density (W/ft²)**
Auditorium Area	300	3.00	0.20	0.40
Convention, Conference, Multipurpose, and Meeting Center Areas	300	2.00	0.35	0.40
Dining Areas	200	1.25	0.50	0.40
Exhibit, Museum Areas	150	11.50	0.80	0.40
Hotel Area:				
Ballroom/Events	400	1.80	0.12	0.40
Lobby	200	3.50	0.20	0.40
Main entry lobby	200	3.50	0.20	0.40
Religious Worship Area	300	1.30	0.40	0.40
Retail Sales				
Grocery	600	6.80	0.70	0.40
Merchandise Sales, and Showroom Areas	500	11.80	0.80	0.40
Theater Area:				
Motion picture	200	2.00	0.20	0.40
Performance Arts	200	7.50	0.20	0.40

TABLE 140.6-E TAILORED WALL AND FLOOR DISPLAY MOUNTING HEIGHT ADJUSTMENT FACTORS

Height in feet above finished floor and bottom of luminaire(s)	**Floor Display or Wall Display Mounting Height Adjustment Factor**
< 10’-7”	1.00
10’-7” to 14’-0”	0.85
>14’-0” to 18’-0”	0.75
> 18’-0”	0.70

TABLE 140.6-F ROOM CAVITY RATIO (RCR) EQUATIONS

Determine the Room Cavity Ratio for TABLE 140.6-G using one of the following equations.
Room cavity ratio for rectangular rooms $$RCR = \frac{5 \times H \times (L + W)}{L \times W}$$
Room cavity ratio for irregular-shaped rooms $$RCR = \frac{2.5 \times H \times P}{A}$$
Where: L =Length of room; W = Width of room; H =Vertical distance from the work plane to the centerline of the lighting fixture; P = Perimeter of room, and A = Area of room

TABLE 140.6-G TAILORED METHOD GENERAL LIGHTING POWER ALLOWED – BY ILLUMANCE AND ROOM CAVITY RATIO

	General Lighting Power Density (W/ft²) for the following RCR values[b]values[b]			
General Illuminance Level (lux)[a]	**RCR ≤ 2.0**	**RCR > 2.0 and ≤ 3.5**	**RCR > 3.5 and ≤ 7.0**	**RCR > 7.0**
150	0.40	0.45	0.60	00.75
200	0.45	0.55	0.75	1.00
300	0.65	0.80	1.00	1.40
400	0.75	0.95	1.25	1.50
500	0.90	1.05	1.45	1.85
600	1.08	1.24	1.64	2.38

[a] Illuminance values from Column 2 of TABLE 140.6-D.

[b] RCR values are calculated using applicable equations in TABLE 140.6-F.

Proposal Summary

2022 California Energy Code (Title 24, Part 6)

Nonresidential Indoor Lighting – Occupant Sensor Control in Open Offices

Updated: Wednesday August 14, 2019

Prepared by: Jon McHugh, McHugh Energy Consultants Inc.

Introduction

The document summarizes proposed revisions to the California Energy Code (Title 24, Part 6) that will be discussed during a utility-sponsored stakeholder meeting on September 12th, 2019. The Statewide Utility Codes and Standards Enhancement (CASE) Team is seeking input and feedback. To provide your comments, email info@title24stakeholders.com by September 26th, 2019.

Measure Description

This proposal would harmonize with the 2018 IECC and require multi-zone occupancy sensing of general lighting in open plan offices. This would require that open plan offices are divided up into relatively small subzones controlled by occupancy sensors (maximum subzone size is 600 sf in the IECC but could be a smaller size when evaluated for T-24). When the subzones are unoccupied, each subzone must dim lights to no greater than 20% of power or light, and when all subzones or unoccupied in an enclosed space, the lights must be completely shut off. The benefits of this control include:

- Saves more energy than the current minimally compliant shut-off control (timeclock).
- Less disruptive to occupants that might stay after hours and have to walk over to enable the override control
- Enables the occupied standby HVAC controls that resets the thermostat and shuts off ventilation to the space when the entire space is unoccupied. Less ventilation air is required to be conditioned.
- Simplifies the standard. Depending upon the occupancy control subzone maximum size selected for the mandatory control this would displace the PAFs for Occupant Sensing Controls in Large Open Plan Offices

Draft Code Language

The proposed changes to the Standards and Reference Appendices are provided below. Changes to the 2019 documents are marked with red underlining (new language) and ~~strikethroughs~~ (deletions). Expected sections or tables of the proposed code (but not specific changes at this time) are highlighted in yellow.

Standards

Modify Section 130.1(c)6 as follows:

c) **Shut-OFF Controls.** All installed indoor lighting shall be equipped with controls able to automatically reduce lighting power when the space is typically unoccupied.
…
6. **Areas where full or partial OFF occupant sensing controls are required.** Lighting installed in the following areas shall meet the following requirements in addition to complying with Section 130.1(c)1.
A. In aisle ways and open areas in warehouses…
B. In library book stack aisles 10 feet or longer…
C. Lighting installed in corridors and stairwells…
D. General lighting in open offices shall be controlled by occupancy sensing controls that comply with all of the following:

i. The occupancy sensing controls shall be configured so that general lighting shall be controlled separately in control zones with floor areas not greater than xxx square feet.
ii. The occupancy sensing controls shall tum off or uniformly reduce lighting power to no more than 20 percent of full power when the control zone is unoccupied.
iii. The occupancy sensing controls shall automatically turn off general lighting in all control zones in the space within 20 minutes when the entire open plan office space is unoccupied.

Modify Section 130.1(f) as follows:

(f) **Control Interactions.** Each lighting control installed to comply with Section 130.1 shall permit or incorporate the functions of the other lighting controls required by this Section.
…
8. For lighting controlled by automatic daylighting controls and by occupant sensing controls, the controls shall be configured so that power does not exceed the lesser of the allowed power by either control.

Reference Appendices

Update the acceptance test ***NA7.6.2.3 Occupancy Sensing Lighting Control Functional testing***, to confirm lighting is reduced to no greater than 20% of full light or power when the controls zones are unoccupied and that all lights are off when the entire room is unoccupied.