



International Energy Conservation Code Electric Power, Lighting, and Renewables (PLR) Subcommittee

Meeting Agenda

February 14, 2022

11:00 AM EST to 1:00 PM EST (2 hours)

[Webex Link](#)

Committee Chair: Michael Jouaneh (mjouaneh@lutron.com); **Committee Vice Chair:** Jack Bailey (jbailey@oneluxstudio.com); **Note Taker:** Michael Myer (Michael.myer@pnnl.gov)

1. Call to order – Jouaneh [**start 11:02 am**]
2. Roll Call – Bailey (11 SC voting members needed for quorum)

First Name	Last Name	Category	Company
Ali	Alaswadi*	Gov. Regulator	DC
Jack	Bailey*	User	One Lux Studio/Int'l Assoc. of Lighting Designers
Bernard	Bauer	User	Integrated Lighting Concepts
Payam	Bozorgchami	Gov. Regulator	CA Energy Comm
Joe	Cain	Manufacturer	Solar Industries Assoc
Nick	Ferzacca	User	Architectural Engineers, Inc.
Anthony	Floyd*	Gov. Regulator	City of Scottsdale
Glenn	Heinmiller	User	Lam Partners/Int'l Assoc. of Lighting Designers
Bryan	Holland*	Standards Promulgator	NEMA
Harold	Jepsen	Manufacturer	Legrand
Michael	Jouaneh*	Manufacturer	Lutron
Joyce	Kelly	User	GLHN Arch
Andrew	Klein*	Consumer	BOMA
Mark	Lien	Standards Promulgator	IES
Jon	McHugh	Gov. Regulator	CA codes & standards
Hope	Medina*	Gov. Regulator	Cherry Hills Village
Melissa	Moseley*	User	HDR/American Society of Interior Designers
Susan	Musngi*	Consumer	Camden
Michael	Myer	Consultant	PNNL
Steven	Rosenstock*	Utility	Edison Electric Institute
Wayne	Stoppelmoor	Manufacturer	Schneider Electric
Mitchell	Tolbert	Gov. Regulator	City of Austin
Michael	Turns	Gov. Regulator	MA Program Administrator

*denotes member of EC4 consensus committee

3. Introduction of any guests -- Bailey (name/representation type into chat)
4. Review/approve agenda – Jouaneh
5. Meeting conduct -- Jouaneh
 - [Antitrust](#) Reminder
 - Identification of Representation / Conflict of Interest ([CP#7](#) Section 5.1.10)
 - [Code of Ethics](#)

6. Review key actions from last meeting and approve minutes – Jouaneh

7. New business.

- Proposal grouping update – Bailey **[end by 11:10 am]**
- Discuss proposal(s): -- Jouaneh **[end by 12:55 pm]**

Renewable WG	Consensus renewable proposal
CEPI-005-21	Renewable Energy (Mandatory Req. in C405)
CEPI-143-21	Renewable Energy (Mandatory Req. in C405)
CEPI-144-21	Renewable Energy (Mandatory Req. in C405)
	[end by 11:40 pm]
CEPI-148-21	Egress Lighting Shutoff
CEPI-152-21	Lighting Controls Safety Exception
	[end by 12:00 pm]
CEPI-175-21	Parking Garage Daylight Transition Zones and Egress Lighting
	[end by 12:20 pm]
CEPI-155-21	Multilevel Lighting Controls
CEPI-156-21	Multilevel Lighting Controls
CEPI-157-21	Multilevel Lighting Controls
CEPI-158-21	Multilevel Lighting Controls
	[end by 12:55 pm]
CEPI-160-21	High End Trim
CEPI-154-21	Multilevel Lighting Controls and DRC
	[may do these proposals if time permits]

8. Other business – Jouaneh **[end by 12:59 pm]**

9. Future meeting: 11:00 am – 2:00 pm ET on Feb. 28, 2022

10. Adjourn **[1:00 pm]**

FOR FURTHER INFORMATION BE SURE TO VISIT THE ICC WEBSITE:

[ICC Energy webpage](#)

[Code Change Monograph](#)

FOR ADDITIONAL INFORMATION, PLEASE CONTACT:

Subcommittee Chair

CEPI-175-21

IECC®: SECTION 202 (New), C405.2.8

Proponents: Mike Kennedy, Mike D. Kennedy Inc., representing Northwest Energy Efficiency Alliance; Kevin Rose, representing Northwest Energy Efficiency Alliance (NEEA) (krose@neea.org)

2021 International Energy Conservation Code

Add new definition as follows:

PARKING GARAGE DAYLIGHT TRANSITION ZONE. Covered vehicle entrances and exits from buildings and parking structures not exceeding a depth of 66 ft (20m) inside the structure or a depth determined in accordance with ANSI/IES RP-8, a width of 50 ft (15m). The width shall not exceed 30 ft (9.1 m) to either side of the drive aisle centerline and not extend beyond adjacent walls.

Revise as follows:

C405.2.8 Parking garage lighting control. Parking garage lighting shall be controlled by an *occupant sensor* complying with Section C405.2.1.1 or a *time-switch control* complying with Section C405.2.2.1. Additional lighting controls shall be provided as follows:

1. Lighting power of each luminaire shall be automatically reduced by not less than 50 percent when there is no activity detected within a lighting zone for 10 minutes. Lighting zones for this requirement shall be not larger than 3,600 square feet (334.5 m²).

~~Exception: Lighting zones provided with less than 1.5 footcandles of illumination on the floor at the darkest point with all lights on are not required to have automatic light reduction controls.~~

Exception: The percent reduction may be adjusted so the lighting power during reduced operation is not less than or equal to 0.05W/sf.

- ~~2. Where lighting for eye adaptation is provided at covered vehicle entrances and exits from buildings and parking structures, such lighting~~ Lighting in parking garage daylight transition zones shall be separately controlled by a device that automatically reduces lighting power by at least 50 percent to no more than the general lighting level of the surrounding parking area from sunset to sunrise.

3. The power to luminaires within 20 feet (6096 mm) of perimeter wall openings shall automatically reduce in response to daylight by at least 50 percent.

Exceptions:

1. Where the opening-to-wall ratio is less than 40 percent as viewed from the interior and encompassing the vertical distance from the driving surface to the lowest structural element.
2. Where the distance from the opening to any exterior daylight blocking obstruction is less than one-half the height from the bottom of the opening or fenestration to the top of the obstruction.
3. Where openings are obstructed by permanent screens or architectural elements restricting daylight entering the interior space.
4. Lighting in parking garage daylight transition zones.

Reason: The proposal here is to adopt the ASHRAE 90.1-2019 lighting reduction requirements for parking garages, clarify the application of the exceptions, and remove the exception related to foot candles.

ASHRAE 90.1-2019 requires 50% reduction in garage lighting after 10 minutes based upon OS control whereas current IECC requires 30%. The 30% value was based upon HID technology. With the advent of LED lighting 50% is technically feasible in garage lighting equipment.

The lighting transition zone control definition and exemption from the daylight control item are changed to align with that in ASHRAE 90.1. The 66 foot depth is based on the adaptation transition areas near entrances to parking garages described in ANSI/IES RP-8-18 Recommended Practice For Design And Maintenance Of Roadway And Parking Facility Lighting. This recommended practice also recommends that near the entrance that illuminance should be around 500 lux (46 footcandles). See discussion page 17-13. This standard also notes that the illuminance in the general area in a parking garage can be 10 lux (0.9 fc). More typical average illuminance values for the general area of parking garages, accounting for the perception of safety are around 5 fc. This is 10 times lower than the transition illuminance recommended near entrances and exits. At night time, the daylight transition zone daytime illuminance value 500 lux near the exit would hinder adaptation either entering or exiting the parking garage.

Thus this proposal requires that the designer provide sufficient lighting reduction to reduce adaptation visibility issues and in most cases would result in a design that reduces lighting power substantially greater than 50%. Selecting a higher power reduction does not add cost but saves on energy and operating cost. Additionally this proposal aligns closely with the requirements in ASHRAE 90.1.

This proposal also removes the exception from OS control when the darkest spot is less than 1.5 footcandles. This exception is difficult from the perspective of enforcement as it puts all the power in the hands of the lighting designer. Code officials will be unable to check or verify this. This exception is not included in 90.1. It is the lighting designer's responsibility to meet the design objectives, and this potentially rewards bad lighting

designs. If the concern is that designers may choose very low lighting power designs where this might be an issue even with good design, an exception based upon a low LPD would be preferable as it is the metric generally used and easily enforced by code officials. Assuming garage activity controls are active 8 hours a day the equivalent lpd would be 66% of the code space maximum allowance. However since excess garage lighting power allowances can be used to offset lighting in other areas and often contributes to C406 compliance, true energy equivalence is difficult. Therefore some discount would be appropriate. Perhaps garages with proposed lighting below 0.05W/sf or something of the like. This would keep very low light garages from having to implement this control but make it possible for code officials to enforce.

Cost Impact: The code change proposal will neither increase nor decrease the cost of construction. Configuring fixtures to a different control sequence will not cost more.

Reference:

ANSI/IES RP-8-18 Lighting Roadway and Parking Facilities. Section 17.5

CEPI-148-21

Proposed Modification

C405.2

Exceptions: Lighting controls are not required for the following:

1. Areas designated as security or emergency areas that are required to be continuously lighted.
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency lighting that is normally automatically off during normal operations. (previously approved in CEPI-187)
4. Emergency lighting required by the International Building Code in the exit access components ~~which are not in buildings not~~ provided with fire alarm systems.
5. Up to 0.02 watts per square foot (0.06 W/m²) of lighting in the exit access components ~~which are in~~ buildings provided with fire alarm systems.

CEPI-152-21

Proposed Modification

C405.2

Exceptions: Lighting controls are not required for the following:

- ~~1. Spaces where an automatic shutoff could endanger occupant safety or security.~~
2. Interior exit stairways, interior exit ramps and exit passageways.
3. Emergency lighting that is normally automatically off during normal operations. (previously approved in CEPI-187)

C405.2.1 Occupant sensor controls

Exceptions:

1. Luminaires that are required to have specific application controls in accordance with Section C405.2.5.
2. Spaces where an automatic shutoff could endanger occupant safety or security

C405.2.2 Time-switch controls

Exceptions:

1. Luminaires that are required to have specific application controls in accordance with Section C405.2.5.
2. Spaces where patient care is directly provided.
3. Spaces where an automatic shutoff could endanger occupant safety or security.

CEPI-156

Proposed Modification

C405.2.3 Dimming controls.

Dimming controls complying with Section C405.2.3.1 are required for the following space types:

1. Classroom / lecture hall / training room.
2. Conference / multipurpose / meeting room.
3. In a dining area for bar/lounge or leisure, family dining.
4. Laboratory.
5. Lobby.
6. Lounge / Break Room.
7. Offices.
8. Gymnasium / fitness center.
9. Library reading room.
10. In a health care facility for imaging rooms, exam rooms, nursery, and nurses' station.
11. Spaces not provided with occupant sensor controls complying with Section C405.2.1.1.

Exception: Luminaires controlled by special application controls complying with Section C405.2.5.

C405.2.3.1 Dimming control function.

Spaces required to have dimming control shall be provided with *manual* controls that allow lights to be dimmed from full output to less than ~~20~~ 10 percent of full power with continuous dimming, as well as turning lights off. *Manual* control shall be provided within each room to dim lights.

~~Exception: *Manual* control is not required where lights are controlled by a programmable dimming system which allows lights to be set to one or more pre-programmed (dimmed) levels.~~

Exception: *Manual* dimming control is not required where lighting controls have a *high-end trim* setting and have undergone functional testing in accordance with C408.3.1.4.

C202 HIGH-END TRIM. A setting which limits the maximum power that dimming controls will provide to a lighting system.

C408.3.1.4 High-end trim.

Where lighting controls are configured for *high end trim*, verify the following:

1. That a setpoint has been established which satisfies the needs of the users.
2. That the calibration adjustment equipment is located for *ready access* only by authorized personnel.
3. That lighting controls with *ready access* for users cannot increase the lighting power above the maximum level established by the *high-end trim* controls.

Topic: (for internal use)

Institutional tuning

Summary Purpose/Reason/Background (for internal use)

Adding tuning to additional efficiency options and mandating it for certain projects

ICC Code or Standard: (list the code the change applies to, ex. IECC, IRC, IEBC)

IECC

Affected Code Section: (list code sections to be revised or added)

C405.2.3; C406.1

Proposed Change: (paste in code text, underline new text, ~~strikethrough deleted text~~. Use one of the following at the beginning of each proposed section of code text as appropriate)

1. Add new definition as follows:
2. Revise as follows:
3. Add new text as follows:

Add new definition as follows:

high-end trim: the process of setting the maximum light output of individual luminaires or groups of luminaires to support visual needs of a *space*, task, or area. *High-end trim* is also known as “institutional tuning”.

Add new text as follows:

C405.2.3.2 High-end trim of luminaires. *General lighting* in spaces that must comply with C405.2.3 light-reduction controls, shall ~~have~~ be the capability to be controlled such that the luminaires can have a maximum high-end trim ~~of no greater than 85% of full light output or power.~~ Adjustment of the high-end trim shall be available only to authorized personnel via controlled access software. ~~Only authorized personal shall be permitted to access the means of setting the high-end trim limit; and the construction documents shall specify that the maximum light output or maximum power draw set to no greater than 85% of full light output or full power draw.~~

Exceptions:

1. Projects having a total installed interior *general lighting* power of less than 4,000 watts in spaces that must comply with C405.2.3 light-reduction controls.
2. ~~Spaces where the designed lighting power density is more than 15% lower than the interior lighting power allowance per Table C405.3.2(2) space-by-space method.~~
3. ~~Buildings where the designed lighting power density is more than 15% lower than the interior lighting power allowance per Table C405.3.2(1) building area method.~~

Revise as follows:

C406.1 Additional energy efficiency credit requirements.

New buildings shall achieve a total of 10 credits from Tables C406.1(1) through C406.1(5) where the table is selected based on the use group of the building and from credit calculations as specified in relevant subsections of Section C406. Where a building contains multiple-use groups, credits from each use group shall be weighted by floor area of each group to determine the weighted average building credit. Credits from the tables or calculation shall be achieved where a building complies with one or more of the following:

13. ~~When not required to comply with C405.2.3.2~~ High-end trim of luminaires, all *general lighting* in spaces that must comply with C405.2.3 light-reduction controls shall be controlled using high-end trim in accordance with C406.13.

C406.13. High-end trim of luminaires. High-end trimmed luminaires shall comply with all of the following requirements:

- a. The lighting controls shall limit the maximum output or maximum power draw of the controlled lighting to 85 percent or less of full light output or full power draw, or to meet the target light level documented in project Sequence of Operations using the least amount of power; and
- b. The means of setting the limit is accessible only to authorized personnel; and
- c. The construction documents specify which lighting systems shall have their maximum light output or maximum power draw set to no greater than 85% of full light output or full power draw.

[Propose using the same credits/points as C406.3 Reduced Lighting Power.]

C408.3.1.4 High end trim.

Where lighting controls are configured for *high end trim*, verify the following:

4. A maximum lighting setpoint has been established which satisfies the needs of the users. For compliance with C406.13, that setpoint must be 85% or less of full light output.
5. That the calibration adjustment equipment is located for *ready access* only by authorized personnel.
6. That lighting controls with *ready access* for users cannot increase the lighting power above the maximum level established by the *high-end trim* controls.

Reason: (provide substantiation reason statements for the proposal)

High-end trim (also known as institutional tuning) of lighting is a key energy saving measure that should be included in the additional efficiency credits. Essentially this strategy saves energy by using a lighting control system which is setup to cap the maximum light output lower than the full lighting power for various areas in a building (the proposal conservatively caps it at 85% of full lighting power, however, most projects cap the lighting at 80% or lower). Some spaces or floors

can have a high-end trim set to 60% while others can be set to 80% depending the tasks to be performed in the space(s).

The strategy essentially provides energy savings for free. First, LED lighting is well suited for this strategy since LEDs are inherently controllable, adjustable, and dimmable. And most lighting control systems have this capability built in, no additional equipment is needed. Second, light fixtures are usually over lit (too bright) to begin to account for lumen depreciation overtime of the fixture. So, tuning the fixtures down to begin with helps to compensate for this lumen depreciation. Lastly, occupants don't even notice the reduced lighting levels as the human eye can't detect the first 20-25% of lights dimming from 100% yet providing a high-end trim of 20% savings about 20% in lighting energy.

The Lawrence Berkeley Lab Meta-Analysis of Energy Savings from Lighting Controls shows an average 38% energy savings from institutional tuning.

This energy efficiency measure has been including as lighting power adjustment factor in CA Title 24 2019, whereby projects can get additional lighting power to use when intuitional tuning is done. ASHRAE 90.1-2022 has added institutional tuning to the energy credits options. So, adding this proposal will better align IECC with what's in Title 24 and 90.1. Additionally, the state of WA is looking at adding high-end trim for their 2021 energy code.

Bibliography: (cite sources, studies, reports and supporting information)

See section D.2.5.2 L02 Lighting Dimming & Tuning.

https://www.energycodes.gov/sites/default/files/2021-07/TechBrief_EnergyCredits_July2021.pdf

LBNL Meta Analysis of Energy Savings from Lighting Controls in Commercial Buildings. [https://eta-publications.lbl.gov/sites/default/files/a meta-analysis of energy savings from lighting controls in commercial buildings_lbnl-5095e.pdf](https://eta-publications.lbl.gov/sites/default/files/a_meta-analysis_of_energy_savings_from_lighting_controls_in_commercial_buildings_lbnl-5095e.pdf)

State of WA 2021 energy code with high-end trim: https://sbcc.wa.gov/sites/default/files/2021-07/126etal_TRev_LLC_124_126_178combo_070921.pdf

Cost Impact: (select one of the following statements. Where desired, add supporting information)

1. The code change proposal will not increase or decrease the cost of construction
2. The code change proposal will decrease the cost of construction
3. The code change proposal will increase the cost of construction

The code change proposal will not increase or decrease the cost of construction.

