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2019 Nonresidential Lighting Indoor Light Sources

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Pre-Rulemaking Workshop

Hearing Room A

June 22, 2017

Acknowledgments

We appreciate the work of the Statewide Utility Codes and Standards Team (CASE Team) in developing these proposals.

Indoor Lighting Power Densities

- Update the lighting power density (LPD) values for indoor lighting
- Reflect the increased efficacy and increased optical control associated with LEDs
- Modify the allowed lighting power for all three calculation methods:
  - Complete Building Method
  - Area Category Method
  - Tailored Method

Indoor Lighting Power Densities

- Account for increases in LED efficacy mandated by the California Appliance Efficiency Standards (Title 20) adopted in 2016 and USDOE LED efficacy regulations that are being developed concurrently to the 2019 Title 24, Part 6 Standards.
- Builds upon efforts to update the LPD requirements in ASHRAE/IES/USGBC 189.1 Standard for the Design of High Performance Green Buildings.
- Coordinates with ASHRAE/IES 90.1-2016 and future.

Indoor Lighting Power Densities

Scope of Change Proposal

Measure Name	Type of Requirement	Modified Section(s) of Title 24, Part 6	Modified Title 24, Part 6 Appendices	Will Compliance Software Be Modified	Modified Compliance Form(s)
Modified LPDs	Prescriptive	Section 140.6(c)		Yes	None
Streamlined lighting power	Mandatory	Section 130.0(c), 110.9(c) & (d)	NA7.73		NRCC-LTI-01, NRCC-LTI-05, NRCI-LTI-01, NRCI-LTI-03

Indoor Lighting Power Densities

Energy Impact Statewide

First Year Electricity Savings (GWh/yr)	First Year Peak Electrical Demand Reduction (MW)	First Year Water Savings (million gallons/yr)	First Year Natural Gas Savings (million therms/yr)
82.4	12.1	N/A	N/A

Indoor Lighting Power Densities

Legacy Issues

- Track lighting power, power limiters, etc.
- Screw base LED lamps and generic luminaires
- Requiring recessed luminaires to be rated at 50 watts

Indoor Lighting Power Densities Summary of Changes

SECTION 110.9 – MANDATORY REQUIREMENTS FOR LIGHTING CONTROL DEVICES AND SYSTEMS, BALLASTS, AND LUMINAIRES

- **Section (c) Track Lighting Integral Current Limiter:** The proposed requirements will remove the certification requirements for integral current limiters.
- **Section (d) Track Lighting Supplementary Overcurrent Protection Panel:** The proposed requirements will remove the certification requirements for supplementary overcurrent protection panels.

Indoor Lighting Power Densities Summary of Changes

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

- **Section (c) Luminaire classification and power:** The proposed requirements will simplify the language and removes language prohibiting LED screw-base luminaires to be classified as high efficacy sources, and proposes new, lower watts per square foot with or without the use of current limiters

Indoor Lighting Power Densities Summary of Changes

SECTION 140.6 – PRESCRIPTIVE REQUIREMENTS FOR INDOOR LIGHTING

- **Table 140.6-B:** The proposed requirements will revise the LPD values for the complete building method. These new lower LPD values will reduce electricity use and replace incumbent lighting sources with LED as the baseline light source for calculations.
- **Table 140.6-C:** The proposed requirements will revise the LPD values for the area category method. These new lower LPD values will reduce electricity use and replace incumbent lighting sources with LED as the baseline light source for calculations.
- **Table 140.6-D:** The proposed requirements will revise the LPD values for the tailored method. These new lower LPD values will reduce electricity use and replace incumbent lighting sources with LED as the baseline light source for calculations.
- **Table 140.6-G:** The proposed requirements will revise the LPD values. These new lower LPD values will reduce electricity use and replace incumbent lighting sources with LED as the baseline light source for calculations.

Indoor Lighting Power Densities Summary of Changes

NA7.7.3 – Track Lighting Integral Current Limiter: The proposed requirements will delete NA7.7.3 Track Lighting Integral Current Limiter. The primary data to be collected is whether claimed wattages listed in NRCC-LTI-01 are installed. With high efficacy display lighting, this approach is no longer required.

NA8 – Luminaire Power: The proposed requirements will modify Nonresidential Appendix NA8 "Luminaire Power" to account for default LED luminaire wattages.

Indoor Lighting Power Densities Summary of Changes

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Indoor Lighting Power Densities Practical Impact of Changes

- **Design Phase**: The new lower LPDs may result in designers having less wattage to trade-off with HVAC and envelope measures. This may result in designers (and others) needing to ensure their HVAC and envelope design are more efficient as they will not be able to easily exceed compliance with the lighting systems. No additional changes to the design phase are expected.
- **Permit Application Phase**: No changes are expected.
- **Construction Phase**: No changes are expected.
- **Inspection Phase**: The proposed code change will result in a simplified compliance and enforcement process as current limiters will no longer need to be inspected.

Indoor Lighting Power Densities

Methodology

- Method co-developed by ASHRAE/IES 90.1 committee in 1990's with input from CEC
- Lighting power density based on lumen method and including all layers of lighting (ambient, task, decorative, display, etc.)
- Updated to reflect trends in products and IES recommendations
- Used in Title 24 development since 2001

Indoor Lighting Power Densities

- Illuminance targets based on guidance from ASHRAE 90.1, ASHRAE 189.1, and the Illuminating Engineering Society (IES) handbook, modified to align with the building and space/area types in the current Title 24, Part 6 Standards.
- Hours of operation were based upon operating schedules in the 2016 Nonresidential ACM Reference Manual.
- Useful life based on the 15-year period of analysis used to evaluate proposed changes to Title 24, Part 6.
- 2016 Standards LPDs were assumed to be met using a mix of linear and compact fluorescent, metal halide and infrared (IR) halogen incandescent sources. 2019 LPDs for all space/area types were assumed to be met using LEDs:

Indoor Lighting Power Densities

- Models for hospitality, museums, liturgical, some retail, dining, and some specialized office spaces include options for LEDs employing dim-to-warm and color tuning technologies.
- Models for retail, hospitality, museums, theatrical, and liturgical include options for High color rendering index (reduced efficacy) LED luminaires.
- HVAC interaction effects are small compared to the primary effect of saving lighting energy and cost.

Indoor Lighting Power Densities

Application	Base Case 2016 (W/ft^2)	Proposed 2019 (W/ft^2)	Savings (W/ft^2)
Auditorium: Audience/Seating Area	1.40	1.14	0.26
Corridor/Transition	0.60	0.60	0.00
Classroom/Lecture/Training	1.20	0.72	0.48
Court House: Audience/Seating Area	1.30	1.01	0.29
Court House: Courtroom	1.30	0.72	0.58
Electrical/Mechanical	0.55	0.39	0.16
Dining Area	1.00	0.40	0.60
Lounge/Leisure Dining: Dining Area	1.00	0.52	0.48
Family Dining: Dining Area	1.00	0.48	0.52

Indoor Lighting Power Densities

Staff and Consultant Initial Comments

- Extremely thorough and thoughtful of all levels of lighting design.
- Still questioning individual values but overall well done.
- Will reduce cost and complexity of design, documentation, inspection and acceptance testing.
- Eliminates almost 40 years of worry about cheating and abuse of incandescent lamp technology
- Round all values to nearest 5/100th of watts per sf.

Indoor Lighting Power Densities

Questions for Stakeholders

1. There may be some specific space LPD's or other allowances?
2. Is lighting design ability protected as well as in past Standards?
3. What about the special issues (seniors, warm dimming, color tuning, etc.)?

Submitting Comments

- By COB July 14, 2017
- Contact Information

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Questions or comments?