

CODES AND STANDARDS ENHANCEMENT INITIATIVE (CASE)

SCE Comments on Nonresidential Lighting Retrofit Requirements for 2016 Title 24 Standards and Suggested Interpretation of the 2013 Language

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Introduction

This document contains comments on the nonresidential lighting portions of the 2013 version of **Title 24, Section 141 - Additions, Alterations, and Repairs to Existing Buildings** and proposed language for inclusion in the 2016 version of the code. There has been much discussion of the impact of this code language and additionally on recent California Energy Commission (CEC) staff Building Efficiency Standards Title 24 code change proposals for 2016 related to this section

Southern California Edison (SCE) supports the CEC efforts in the clarification of the code and to minimize disruption to the retrofit industry while maintaining stringent energy efficiency standards in Title 24 to ensure that lighting retrofit projects continue to benefit the California public, particularly IOU ratepayers.

SCE believes that there is a viable method to interpret the lighting retrofit sections of the code in Section 141 to keep the stringency of the code for circumstances where it is appropriate, but allows a documented and straightforward option for projects and conditions that would not trigger the full set of code requirements, but would capture achievable savings without disrupting the market.

SCE's submits this proposal for interpreting the 2013 code and modifications for the 2016 code. SCE uses the following three categories to define the scope of lighting retrofit and renovation work in this proposal:

1. Luminaire Modification
2. Luminaire Replacement
3. Full Renovation; including electrical modifications, luminaire reconfiguration, etc.

Luminaire Modification

This Category includes the upgrade of the existing luminaire's lamps and ballast(s) or the installation of a new LED lighting retrofit fixture kit(s). Under these circumstances, the contractor is not modifying the original lighting reflective ceiling plan, existing controls (A/B switching, sensors, etc...) and does not include Lighting Alterations per Section 141.0-I-iv. Since this work is contained to the interior of the luminaire, it does not typically cause any impact outside the existing luminaire housing and is therefore unlikely to raise life-safety concerns in the building that would require an inspection.

Under SCE's proposed approach, the LPD of the retrofitted spaces and documentation of proposed lighting equipment (lamps, ballasts, LED drivers and arrays) are required to ensure that the lighting system wattage complies with the energy code requirements (Section 140.6 Tables) upon completion of the retrofit.

The permitting process for a Luminaire Modification retrofit project is often straightforward when minimal modification to the lighting system is defined and documented. Under these circumstances, Title 24 Part 6 permitting cost may vary between governing agencies or may be very low because the project is unlikely to involve any on-site inspections and where only minimal permitting documentation is required to be submitted and checked by the building department.

Luminaire Replacement

This Category involves the upgrade of existing luminaire(s) on a one for one luminaire replacement. Under these circumstances, the contractor is also not modifying the original lighting-reflective ceiling plan, existing controls (A/B switching, sensors, etc...) and does not include Lighting Alterations per Section 141.0-I-iv. Under SCE's proposed Replacement approach, the LPD of the retrofitted spaces and documentation of proposed lighting equipment are required to ensure that the lighting system wattage complies with the energy code requirements (Section 140.6 Tables) upon completion of the retrofit.

The permitting process for a Luminaire Replacement project is often straightforward when minimal modification to the lighting system is defined and documented. Under these circumstances, Title 24 Part 6 permitting cost may vary between governing agencies or may be very low because the project is unlikely to involve any on-site inspections and where only minimal permitting documentation is required to be submitted and checked by the building department.

A Luminaire Replacement project will typically penetrate the ceiling plane during the process of removing existing luminaires. Typically, the condition of the existing seismic restraints and its suitability for the new lighting system may need to be inspected by the local building department. The local building department may require a permit for this part of the project *even if the energy code does not explicitly call for it based on the criteria within Title 24 Part 6.*

Full Renovation

A Full Renovation project will trigger all of the lighting requirements in the code as they exist in Section 141. This work will include at least one of the following:

- wiring modifications in the branch circuiting or to the feeder panel
- removal and relocation of lighting equipment into different spaces
- addition of new luminaires

Under the 2013 code, any of these activities on a project will trigger all of the lighting requirements in the code. While the ceiling and possibly the walls are exposed and available for wiring, it is relatively easy to install control wiring and other controls infrastructure. These requirements are documented in IOU C&S Team CASE Reports, including "*Requirements for Controllable Lighting*" (2013 California IOU CASE Report, March 21, 2011), "*Indoor Lighting Controls*" (2013 California IOU CASE Report, October, 2011), and "*Lighting Alterations and Modifications in Place*" (2013 California IOU CASE Report, October, 2011).

For this type of renovation project, the local jurisdiction will likely require information on a variety of details, including seismic restraints, exit sign locations, ADA requirements, emergency lighting systems, and sprinkler systems in addition to the energy requirements. There will be on-site inspections of various systems, and likely full renovation plans with Title 24 compliance documentation submitted to the building department.

SCE Proposal for Lighting Alterations

SCE wishes to maintain the stringency of Title 24 Part 6 Section 141 under circumstances where it can be applied in a manner commensurate with the scope and scale of the work that is being performed and the potential energy savings opportunities. SCE proposes that all Luminaire modification, replacement and renovations activities be submitted to the local building department with documentation of the space-by-space Lighting Power Density (LPD) for both the existing lighting system and the proposed lighting system. All projects must meet the LPD limits of Section 140.6 regardless of the level of lighting retrofit in the space. A new code compliance form can be created that provides just the information necessary for these simple lighting retrofit projects and also facilitates the submission of the project to the local building department for permitting.

This proposal is to continue to encourage lighting retrofit projects in the state and increase the documentation of these projects to gain a better understanding of the lighting retrofit market impacts statewide. The size and impact of lighting retrofit projects that are not currently documented is unknown. It would be beneficial to obtain a better understanding of this portion of the energy efficiency market to produce a more complete picture of the lighting retrofit work that may aid in impact evaluations and also highlight future opportunities.

SCE proposes that this approach be adopted in the 2016 revisions of Title 24 and also use this approach to interpret the 2013 version of Title 24 so that there is consistency in the process moving forward. This will allow the lighting retrofit industry to build momentum toward improving the overall energy efficiency of the existing building stock in California.

Benefits of Adopting This Approach

There are a number of potential benefits to adopting this interpretation of the lighting portions of Section 141. For luminaire modification and replacement work, these include:

- The lighting retrofit and replacement industry has been negatively impacted by the adoption of the 2013 Title 24 code because of the perceived onerous lighting controls requirements that are triggered in the code. Many projects are being performed under the auspices of 'lighting maintenance' rather than as lighting retrofits, as they accurately should be categorized. Using SCE's proposed interpretation for the 2013 code will raise these retrofit projects to the local building department level where reasonable oversight can occur. This will allow additional information to be gathered regarding lighting retrofit project activity and energy savings.
- This approach will likely improve oversight of projects by the local building departments. The local building departments would be able to verify that the proposed work meets LPD limits; and, they would also be able to review and address any life-safety standards as well on Luminaire Replacements.
- The existing lighting retrofit industry is familiar with the process of area takeoffs, total load, and LPD calculations. Documentation of these values along with the proposed lighting equipment (ballast and lamp cut-sheets, etc.) can be submitted to the building department without much additional effort. Unless the Full Renovation threshold is passed, none of the normal code compliance documents will need to be submitted.
- The proposed approach will document the lighting system and resulting energy savings of the lighting retrofit project. This information is more useful than the partial information provided through the use of a "percent change" threshold for triggering the code requirements as the

current proposed language employs. Because many lighting retrofits involve de-lamping as part of the strategy, a “percent change” threshold may be met on a project while the LPD in the space still exceeds the maximum allowed under the current code, which should not occur.

- Some lighting retrofit projects are sequenced in phases by the owner or developer based on available annual facility/capital funding. While this approach is likely less cost effective than performing all the work in a single phase, it is the reality of budget-constrained organizations. A good long-term, multi-phased project may first retrofit the light source and then perform a controls upgrade retrofit in a later phase that leverages the improvements from the previous phase. Because the current code interpretation requires both fixture and controls to be upgraded at the same time, this does not allow for a phased approach. This may be causing some projects to not be undertaken.

The adoption of SCE’S proposed approach will streamline the code for most lighting retrofit contractors, bring much of that work into the realm of documented efforts, provide an appropriate level of local building department oversight, and enable a much more detailed understanding of the lighting retrofit impacts on the existing building stock.

Proposal Details

Below are two recommendations: an interpretation of the enacted 2013 Title 24 lighting portions of Section 141, and the recommendation for language modifications for the 2016 Title 24.

SCE Title 24-2013 Standard Code Language Proposed Interpretation

SCE proposes the following interpretation of the existing 2013 Standards.

- For projects where **ONLY Luminaire Modifications** are taking place, the requirements in Sections 141.0(b)2li and iii apply. The requirements are met if:
 - the connected load of the proposed lighting system is under the limits as defined in *Table 140.6-C Area Category Method – Lighting Power Density Values* (complies with Section 141.0(b)2lvi) and multiplied by the area of the space **and**
 - the project is submitted to the local jurisdiction with documentation of both the existing and proposed wattage calculations and details of the proposed lighting system changes, including cutsheets and other documentation as required by the local jurisdiction, **and**
 - through documentation, Section 141.0(b)2lv is shown to not apply.
 - Sections 141.0(b)2lii and iv do not apply.
 - Section 141.0(b)2lvii is an exception for normal luminaire maintenance and does not normally apply.
- For projects where **Luminaire Replacements** are taking place, the requirements in Sections 141.0(b)2li and ii apply. The requirements are met if:
 - the connected load of the proposed lighting system is under the limits as defined in *Table 140.6-C Area Category Method – Lighting Power Density Values* (complies with Section 141.0(b)2lvi) and multiplied by the area of the space **and**
 - the project is submitted to the local jurisdiction with documentation of both the existing and proposed wattage calculations and details of the proposed lighting system changes, including cutsheets and other documentation as required by the local jurisdiction, **and**
 - through documentation, Section 141.0(b)2lv is shown to not apply.
 - Sections 141.0(b)2liii and iv do not apply.

- Section 141.0(b)2Ivii is an exception for normal luminaire maintenance and does not normally apply.
- For projects where **Full Renovation** is taking place, all of the requirements in Section 141.0(b)2I apply. The requirements would be met only if the relevant lighting documentation of the 2013 energy code is submitted showing compliance with the requirements of Section 141.0(b)2I and other sections that are referred to by that section.

Commentary on proposed interpretation to 2013 code language:

The above interpretation states that for simple lighting retrofit projects, the lighting portions of Section 141 are met if they meet several requirements:

- Meet the LPD requirements through calculations of the proposed wattage and floor area of the spaces affected
- Document that the wattage of the lighting system is not increasing
- Submit and obtain a permit

When a lighting retrofit project involves wiring alterations, an increase in wattage, or introduces any lighting in a space that wasn't there previously, the full language of Section 141 shall apply without modifications.

SCE Title 24-2016 Code Language Change Recommendations

Note that the proposed language changes found below are made to the existing 2013 code language. SCE acknowledges that other changes have been proposed, some of which may be non-substantive streamlining changes. Those changes are possible within the context of the recommendations of these code language changes but are not documented in these suggested revisions.

Section 141.0 – Additions, Alterations, and Repairs to Existing Buildings That Will be Nonresidential, High-Rise Residential, and Hotel/Motel Occupancies and to Existing Outdoor Lighting for These Occupancies and to Internally and Externally Illuminated Signs

- 2. Prescriptive approach.** The altered components of the envelope, or space conditioning, lighting and water heating systems, and any newly installed equipment serving the alteration, shall meet the applicable requirements of Sections 110.0 through 110.9, Sections 120.0 through 120.6, and Sections 120.8 through 130.5; and ...

Non-relevant Portions Removed

- F. Spaces with lighting systems installed for the first time shall meet the requirements of Sections 110.9, 130.0, 130.1, 130.2, 130.4, 130.5, 140.3(c), 140.6, and 140.7.
- G. When the requirements of Section 130.1(d) are triggered by the addition of skylights to an existing building and the lighting system is not recircuited, the daylighting control need not meet the multi-level requirements in Section 130.1(d).
- H. New internally and externally illuminated signs shall meet the requirements of Sections 110.9, 130.3 and 140.8.
- I. For each enclosed space, alterations to existing indoor lighting shall meet the following requirements:
 - i. **Luminaire Classification and Power** shall be determined in accordance with Section 130.0(c).

EXCEPTION to Section 141.0(b)2Ii: For only a Lighting System Alteration in accordance with Section 141.0(b)2Iii, or a Luminaire Modifications-in-Place in accordance with Section 141.0(b)2Iiii; an existing incandescent, fluorescent or HID luminaire may be modified and classified as a luminaire having a different number of, or type of light source(s), provided all of the following conditions are met:

 - a. The luminaire has been previously used and is in an existing installation; and,
 - b. The modified luminaire is listed with the different number or type of light source(s) under the installed conditions; and
 - c. The different light source(s) is not an LED lamp, integrated or nonintegrated type, as defined by ANI/IES RP-16-2010; and
 - d. The modified luminaire does not contain:
 - 1. Unused fluorescent or HID ballast(s); or
 - 2. Unused HID or fluorescent lamp sockets; or
 - 3. Sockets used only for lamp support; or
 - 4. Screw sockets of any kind or for any purpose; and
 - e. The wattage of the modified luminaire shall be published in the manufacturer's catalog based on accredited testing lab reports.

ii. **Lighting System Alterations** shall meet the applicable requirements in TABLE 141.0-E and the following:

- a. Lighting System Alterations include alterations where ~~an existing lighting system is modified, luminaires are replaced, or luminaires are disconnected from the circuit, removed and reinstalled, whether in the same location or installed elsewhere,~~ an existing lighting wiring system is modified, new luminaires are added to the existing lighting system, or existing luminaires are relocated.

EXCEPTION 1 to Section 141.0(b)2Iii: Alterations that qualify as a Luminaire Modification-in-Place.

EXCEPTION 2 to Section 141.0(b)2Iii: Portable luminaires, luminaires affixed to moveable partitions, and lighting excluded in accordance to Section 140.6(a)3.

Commentary on Section 141.0(b)2Iii:

The code currently provides a natural separation for Full Renovations (above) and the lower levels of lighting retrofits (below). The SCE proposal is to leave much of the language of the more intensive lighting renovations as they stand and to leave the infrastructure of Table 141.0-E intact.

iii. **Luminaire Modifications-in-Place** shall meet the ~~applicable requirements in TABLE 141.0 F the LPD allowance in Section 140.6 in the Area Category Method, Table 140.6-C or the Tailored Method, Tables 140.6-D, E, F, and G~~ and the following:

- a. To qualify as a Luminaire Modification-in-Place, luminaires shall only be modified by one or more of the following methods:
1. Replacing lamps and ballasts with like type or quantity in a manner that preserves the original luminaire listing.
 2. Changing the number or type of light source in a luminaire including: socket renewal, removal or relocation of sockets or lamp-holders, and/or related wiring internal to the luminaire including the addition of safety disconnecting devices.
 3. Changing the optical system of a luminaire in part or in whole.
 4. Replacement of whole luminaires one for one in which the only electrical modification involves disconnecting the existing luminaire and reconnecting the replacement luminaire.
- b. Luminaire Modifications-In-Place shall include only alterations to lighting system meeting the following conditions:
1. Luminaire Modifications-in-Place shall not be part of or the result of any general remodeling or renovation of the enclosed space in which they are located.
 2. Luminaire Modifications-in-Place shall not cause, be the result of, or involve any changes to the panelboard or branch circuit wiring, including line voltage switches, relays, contactors, dimmers and other control devices providing power to the lighting system.

EXCEPTION to Section 141.0(b)2Iiii2. Circuit modifications strictly limited to the addition of occupancy or vacancy sensors and wiring for the addition of class two, twisted-pair, or wireless lighting controls are permitted for Luminaire Modifications-in-Place

Commentary on Section 141.0(b)2Iiii:

This section deals with the two levels of retrofit that are being described in this paper as Luminaire Retrofit and Luminaire Replacement. Since they both have the same code requirements in this proposal, they can remain grouped together in the code. The specifics for how the code defines these do not need to change.

As stated, the intent is for the contractor to provide a calculation of existing and proposed LPD so that two specific details can be verified:

1. the LPD of the proposed lighting system in the space meets Table 140.6-C, and
2. the LPD is not increasing.

The best method to achieve this is a simplified code compliance form that permits the contractor to provide information on the project and specific information on each space type, LPDs for existing and proposed conditions, a comparison of the proposed to the maximum allowed wattage, and verification that the wattage is not increasing. This *"Off-Ramp Lighting Retrofit Compliance Form"* should also provide all the information typically required for building department review, so that it, along with accompanying cutsheets and other supplementary information can constitute the typical submission to the building department. Section *"C-2 Area Category Method General Lighting Power Allowance"* in *"Indoor Lighting Power Allowance, CEC-NRCC-LTI-03-E,"* may be used to produce a simplified form for the purpose of this verification.

Note that the existing language has a specific exception for the wiring associated with occupancy or daylight sensors and class 2 wiring (the 24-volt wiring that has been common in lighting controls in the past). An addition has been made to accommodate the current, more common methods for adding controls in a retrofit condition; wireless controls and a twisted-pair communication cable (commonly CAT5e or CAT6, but some proprietary systems exist). The wireless and CAT5e systems will typically require at least one location where a microprocessor and main node is introduced into the electrical system with a small amount of line voltage wiring.

- iv. **Lighting Wiring Alterations** shall meet the applicable requirements in Sections 110.9, 130.1, and 130.4.
 - a. Lighting Wiring Alterations include the following:
 1. Adding a circuit feeding luminaires.
 2. Modifying or relocating wiring to provide power to new or relocated luminaires.
 3. Replacing wiring between a switch or panelboard and luminaire(s).
 4. Replacing or installing a new panelboard feeding lighting systems.

EXCEPTION to Section 141.0(b)2Iiv. Lighting Wiring Alterations allowed for Luminaire Modifications-in-Place in accordance with Section 141.0(b)2Iiii.
- v. Any lighting alteration that increases the installed lighting power in an enclosed space shall meet the requirements of Sections 110.9, 130.0, 130.1, 130.4, 140.3(c) and 140.6.

- vi. Lighting Alterations and Luminaire Modifications-in-Place shall not exceed the lighting power allowance in Section 140.6.
 - vii. The following indoor lighting alterations are not required to comply with the lighting requirements in Title 24, Part 6:
 - a. Replacement in kind of parts of an existing luminaire that include only new lamps, lamp holders, or lenses, when replacement of those parts is not a Luminaire-Modification-in-Place in accordance with Section 141.0(b)2Iiii.
 - b. Lighting Alterations directly caused by the disturbance of asbestos.

EXCEPTION to Section 141.0(b)2Iviiib: Lighting alterations made in conjunction with asbestos abatement shall comply with the applicable requirements in Section 141.0(b)2I.
- J. Alterations to existing outdoor lighting systems shall meet the following requirements:
- i. Alterations that increase the connected lighting load in a lighting application listed in TABLE 140.7-A or 140.7-B shall meet the applicable requirements of Sections 130.0, 130.2, 130.4, and 140.7; and
 - ii. In alterations that replace 10 percent or more of the luminaires in a lighting application listed in TABLE 140.7-A or 140.7-B, the altered luminaires shall meet the applicable requirements of Sections 130.0, 130.2 and 130.4; and
 - iii. In alterations that replace more than 50 percent of the luminaires in a lighting application listed in TABLE 140.7-A or 140.7-B, the lighting in that application shall meet the applicable requirements of Sections 130.0, 130.2, 130.4 and 140.7.

Non-relevant Portions Removed

TABLE 141.0-E Requirements for Luminaire Alterations

Quantity of existing affected luminaires per Enclosed Space ¹	Resulting Lighting Power for Each Enclosed Space	Applicable Mandatory Control Provisions for Each Enclosed Space	Multi-level Lighting Control Requirements for Each Altered Luminaire
Alterations that do not change the area of the enclosed space or the space type			
Sum total < 10% of existing luminaires	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted
Sum total ≥ 10% of existing luminaires	≤ 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c)	Two level lighting control ² or §130.1(b)
	> 85% of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c), (d) ³	§130.1(b)
Alterations that change the area of the enclosed space or the space type or increase the lighting power in the enclosed space			
Any number	Comply with Section 140.6	§130.0(d) ³ §130.1(a), (c), (d) ³ , (e)	§130.1(b)
1. Affected luminaires include any luminaire that is changed, replaced, removed, relocated; or, connected to, altered or revised wiring, except as permitted by EXCEPTIONS 1 and 2 to Section 141.0(b)2Iii: 2. Two level lighting control shall have at least one control step between 30 percent and 70 percent of design lighting power in a manner providing reasonably uniform illuminations 3. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are altered.			

TABLE 141.0 F-Requirements for Luminaire Modifications in-Place

<p>For compliance with this Table, building space is defined as any of the following:</p> <ol style="list-style-type: none"> 1. A complete single story building 2. A complete floor of a multifloor building 3. The entire space in a building of a single tenant under a single lease 4. All of the common, not leasable space in single building 			
Quantity of affected luminaires per Building Space per annum	Resulting Lighting Power per Each Enclosed Space Where $\geq 10\%$ of Existing Luminaires are Luminaire Modifications in-Place	Applicable mandatory control provisions for each enclosed space. ³	Applicable multi-level lighting control requirements for each modified luminaire. ²
Sum total < 40 Luminaire Modifications in-Place	Existing lighting power is permitted	Existing provisions are permitted	Existing controls are permitted
Sum total ≥ 40 Luminaire Modifications in-Place	$\leq 85\%$ of allowed lighting power per Section 140.6 Area Category Method	§130.1(a), (c)	Two level lighting control. ³ Or §130.1(b)
	$> 85\%$ of allowed lighting power per Section 140.6 Area Category Method	§130.0(d) ⁴ §130.1(a), (c), (d) ⁴	§130.1(b)
<ol style="list-style-type: none"> 1. Control requirements only apply to enclosed spaces for which there are Luminaire Modifications in-Place. 2. Multi-level controls are required only for luminaires for which there are Luminaire Modifications in-Place. 3. Two level lighting control shall have at least one control step between 30 percent and 70 percent of design lighting power in a manner providing reasonably uniform illuminations. 4. Daylight controls in accordance with Section 130.0(d) are required only for luminaires that are modified in-place. 			