



California Energy Commission

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Submitted via email: docket@energy.ca.gov

Mr. Andrew McAllister
Commissioner
California Energy Commission
1516 Ninth Street
Sacramento, California 95814

Philips Lighting Comments on the Proposed Revisions to the California Building Energy Efficiency Standards California Code of Regulations, Title 24, Part 6 and Appendices; 145-Day Language

Dear Commissioner McAllister,

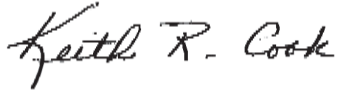
Philips Lighting appreciates the opportunity to provide the attached comments on the proposed revisions to the California Building energy Efficiency Standards California Code of Regulations, Title 24, Part 6 and Appendices.

As you may know, Philips North America is headquartered in Andover, Massachusetts. The U.S. Philips companies are affiliates of the Netherlands-based Royal Philips N.V., a diversified health and well-being company, focused on improving people's lives through meaningful innovations. Our long history in North America began in 1933, and today, it is the company's largest single market in the world, with approximately 22,000 employees and operations at 55 major facilities in 25 states and across 3 Canadian provinces. Sales for the region in 2013 was more than \$9.5 billion*, which accounts for more than 30% of Philips global revenue.

Philips is a diversified technology company, focused on improving people's lives through meaningful innovation in the areas of Healthcare, Consumer Lifestyle and Lighting. Innovation has been a cornerstone of the company's strategy for over 120 years, creating a strong and trusted Philips brand with market access all over the world. Philips is a leader in cardiac care, acute care and home healthcare, energy efficient lighting solutions and new lighting applications, as well as male shaving/grooming and oral healthcare. Philips lights 65% of the world's top airports, 30% of offices and hospitals and landmarks such as the Empire State Building, the Sydney Opera House, the New Year's Eve Times Square Ball and the Great Pyramids. Philips owns more than 64,000 patent rights, is one of the world's top-50 most valuable brands, one of the world's top-50 most innovative companies, and ranked as one of the Best Global Green Brands by Interbrand.

Please find our detailed comments below. We look forward to working with you further on this important effort. If you have any questions on these comments, please contact me.

Sincerely,



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Comments for Proposed Language for 2016 Title 24 Part 06 & 2016 Joint Appendices

2016 Title 24 Part 06

Philips applauds the continuing efforts of the CEC to simplify the code and align with other standards such as ASHRAE 90.1. We recognize a number of noteworthy steps such as removing the confusing term “luminaire medication in place” and the associated table as well as clarifying and reordering the provisions in section 141.0 and Table 141.0-E.

However, we have become increasingly concerned that a great many comments for proposed changes in the 2016 code presented to the CEC staff have not elicited any action nor generated any response to address these concerns. In addition, we are also concerned that there have been substantial changes made in the 15-day language without providing sufficient time for review. Therefore, we are providing these comments for consideration again, along with comments for the proposed 15-day language, in the hope that CEC staff will continue to work with industry to develop a workable 2016 code.

Screw base luminaires

We applaud the CEC’s proposal in Section 130.0 to allow screw base luminaires to qualify as high efficacy, however we do not support the provision added in Section 130.0(c)(5) that luminaires and luminaire housings manufactured with incandescent screw base sockets shall be classified only as incandescent unless such sockets are removed, as this unnecessarily limits the definition of high efficacy lighting applications.

The concern that people will purchase a high-efficacy luminaire, perhaps with a rebate, and then convert it to low-efficacy, by replacing the lamp with an incandescent, is fading, as LED Lamp prices decrease, acceptance and adoption increase, and incandescents are disappearing from the market. Also, as efficacy increases, the need for heat sinking with strong thermal contact from light source to luminaire, is decreasing. Allowing screw bases will reduce the multiplication of products, allowing higher volumes and lower cost for manufacturers and customers, and enable easy replacement of failed light sources without having to replace the entire luminaire.

As such, we do not believe that the CEC should exclude recessed screw-based luminaires. There are a number of LED lamps that exist~~ing~~ in the marketplace designed to handle elevated temperatures and function well in recessed luminaires. Some accomplish this with larger heat sinks or lower power, while others, such as the smaller MR16 lamps, accomplish it with integrated fans. In any case, efficacy will continue to increase and thermal concerns to decrease.

- **We propose that there is no need to exclude screw-base options, and we believe that removing this exclusion will allow greater flexibility and help to simplify the code.**

Luminaire Classification and Power

With regard to Section 130.0(c), considering the proliferation of field programmable/intelligent drivers, we believe the current language that only allows luminaires to be labeled in the factory is not in line with current technologies and industry practices.

- **We urge the CEC to reconsider the acceptability of field labeling of luminaires and/or wireless verification of wattage levels. In addition, we propose that the requirement in 130.0(c)(6)(B) for which ...”the maximum input wattage of the rated driver shall be published in driver’s manufacturer catalogs based on independent testing lab reports as specified by UL 8750”, take into account this existing technology for programmable drivers.**
- **We also urge the CEC to remove all declarations such as in 130.0(c)5: “...Field modifications, including, but not limited to hard wiring of an LED module, shall not be recognized as converting an incandescent luminaire or luminaire housing to a non-incandescent technology”. We believe it is very confusing to all involved to convert a luminaire from one technology to another and yet continue to treat it as if it were something else.**

Multi-Level Lighting Controls

The draft Section 130.1(b)(3) removed the options B-E, thereby only allowing control by a manual dimmer. We oppose this change in requirement as it reduces the number of options available for lighting designers.

- **We propose that the CEC also retain previous options B-D for dimmable luminaires and simply remove option E (Demand Response) to meet the Multi-Level control requirement.**

Shut-OFF Controls

There is a provision added to Section 130.1(c)(5) that all occupant sensing controls shall function either as a Partial ON occupancy Sensor or a Vacancy Sensor and that a Partial-ON Occupant Sensor shall be capable of automatically activating between 50-70 percent of controlled lighting power. There are already a number of a Partial ON occupancy Sensor products in the marketplace that dim to a lower level than 50% (for open office applications, for example).

- **We propose that the CEC not define a minimum level and change the wording to activating to a maximum of 70 percent of controlled lighting power.**
- **Furthermore, we find the wording in the exception added in the latest draft for this section is confusing, and urge the CEC staff to further clarify this exception, and to align with ASHRAE 90.1.**

Controls for Outdoor Lighting

Section 130.2(c)2 changed the requirement for control of outdoor lighting from automatic scheduling control to photocontrol or astronomical time-switch. We believe that this indicates that outdoor lighting may be controlled by such devices only.

- **We propose that a clarification such as included in 130.2(c)3B “...or other lighting control systems” be added to clarify that automatic lighting control systems may fulfill this requirement as well.**
- **In addition, as NA-7.8 indicates that there will be separate requirements for Outdoor Photocontrols; we propose that there will be separate categories for Indoor and Outdoor Photocontrols in the T20 database. Currently all photocontrols in the Title 20 database are listed as Indoor.**

Institutional Tuning PAF

Philips does not support the inclusion of a Power Adjustment Factor (PAF) for Institutional Tuning as described in Section 130.4(a)(7), as it increases complexity in the code, and the subsequent testing for this PAF as defined in NA7.7.6.2 increases the burden on building owners to show compliance.

- **We propose that the PAF and Institutional Tuning requirements be removed to simplify the code.**

Joint Appendix 8

Over-specified Performance Parameters

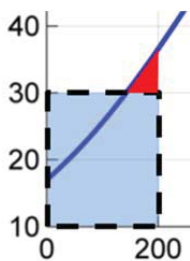
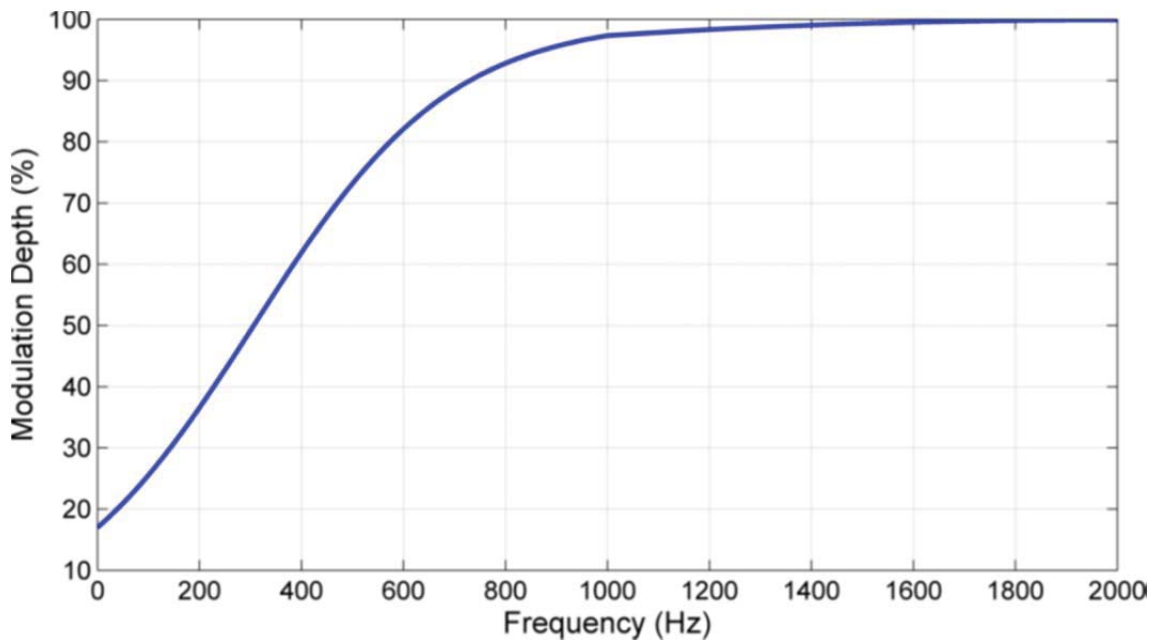
We continue to oppose over-specified performance parameters and requirements such as CRI >90, R9>50, SDCM<4 (or, in the case of JA8, $|Duv| < 0.0033$), CCT limited to <3000K, PF>0.9, minimum dim level <10%, , and a 5 year warranty, as minimum requirements in code. The 2016 proposal widens the requirement for these over-specified parameters, both by increasing the number of specifications from 2013, and by its extended reliance on Appendix JA8. Table 150.0-A states that only LED must meet JA8. We do not support the CEC’s stance to have different performance specifications for different lighting technologies. We believe that none of these parameters should be stricter than ENERGY STAR for a minimum State specification.

We continue to be concerned that the CEC has given no substantive reaction to our comments on flicker. We reiterate our comments below.

JA-8’s restrictions on flicker, as summarized in Table JA8, are overly restrictive for some frequencies and too lax for others. The human eye definitely does not have a flat response over the range from 0 to 200 Hz.

This specification makes no allowance for the dependence of human flicker sensitivity either on frequency or on wave shape. For sine wave modulation, the visibility threshold for stroboscopic

effects¹, expressed in terms of modulation depth, is shown in the figure below. At a particular frequency, modulation depths above the curve can be detected by most people. Below the curve, they are not detected by most people. The threshold changes for different wave shapes, in a way that depends on the Fourier components of the light output waveform. A full Fourier approach would take into account both frequency and wave shape effects.² Sensitivity to flicker also depends on the application. Flicker perceived in outdoor street lighting or in stairwells is better tolerated by occupants than flicker perceived in indoor office lighting, for instance. Therefore, a curve of acceptability may be above the visibility threshold curve. Different curves may be needed for different applications.



Zooming in on the region from 0 to 200 Hz in the figure above, the shaded rectangular region with dashed outline represents the conditions allowed by the Title 20 specification. The red triangle is forbidden by the Title 20 specification, but flicker in this region is not visible to most observers. Title 20, as a MINIMUM specification, should not exclude acceptable regions where flicker is not even be detected.

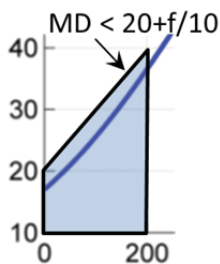
¹ The visibility curve is more complicated below about 80 Hz, where effects other than stroboscopic effects play a dominant role.

² Vogels, I. , Sekulovski, D. and Perz, M. (2011). Visible artefacts of LEDs, Proceedings of the 27th Session of the CIE, 42-51.

Sekulovski, D. , Perz, M. and Vogels, I. (2012). Modelling the visibility of the stroboscopic effect, Proceedings of CIE 2012 Lighting Quality & Energy Efficiency, September 2012, Hangzhou, China, 439-449.

It is our belief that Appendix JA8 does a poor job of defining acceptable flicker levels and the test procedure in appendix JA10 does a poor job of determining flicker acceptability.

- **We continue to oppose the over-specified performance parameters as defined in JA8, and strongly urge that any specifications on flicker and test procedures should wait until experts in this field (IEEE, NEMA and in IEC) conclude their work on this topic and produce a solid standard. It should be noted that ENERGY STAR is also collecting data on flicker and should complete their work and make recommendations to allow California to harmonize with the Energy Star specification.**
- **If the CEC is unwilling to remove the flicker specification and wait for alignment in standards organizations, then CEC should at the very least modify the present specification to allow use of the acceptable flicker region denoted by the red triangle in the figure above. We suggest modifying the specification to allow flicker in the region shown in the figure below:**



The specification would then be: “Dimmer controls that can directly control lamps shall provide electrical outputs to lamps for reduced flicker operation through the dimming range so that the light output has an amplitude modulation below the line, Modulation Depth = 20% + Frequency/10, for frequencies from 100 to 200 Hz, without causing premature lamp failure.”

Labeling

We continue to disagree with the IOU proposals that State-specific label or labeling requirements be established, as described in JA8.5. The additional costs and difficulty of assuring proper distribution are not justified in the intangible benefits pursued by the proposals. The CEC has routinely stated their intent to set a trend for other States to follow, and should keep in mind that a State-specific label is not in keeping with their attempts to set a standard that can be adopted at the national level. This also respects manufacturers’ tendencies to produce and label products for sale in multiple regions. It is costly to produce lamp packaging for sale in a single State and challenging to assure proper distribution therein.

As agency labeling requirements continue to grow, and as the advances in technology allow light sources and luminaires to be more compact and smaller in size, there is less and less real estate available for markings. Existing labeling is already challenged to meet Federal and other disclosure and marking requirements while being simple to read and understand. It is becoming impossible to accommodate all the markings required to be on a specific location for the given product. Furthermore, the obstructions made by labels on a luminaire’s optical system may impact energy efficiency.

- **We strongly urge the CEC to align with other existing agency marking requirements and simplify formats to consolidate and reduce required marking text. We feel that the proposed two label options described in the 15-day language will be confusing to consumers and add unneeded complexity for manufacturers.**

Joint Appendix 10

Flicker

We firmly oppose the entire draft language in Section JA10 regarding flicker measurements. While equipment pairing requirements for testing/listing purposes have been clarified, for non-incandescent lamp sources, the testing is proposed to be repeated for every dimmer, driver & lamp combination. This is a recipe for near-infinite testing, if manufacturers want their products to be usable with multiple dimmers. The number of lamps has been clarified to be one or the minimum number required by the dimmer, but this does not provide any assurance of compatibility with larger loads. Data is still required for multiple frequency cutoffs, with no rationale given. It is unclear from the draft language what the intended usage of the data is and what the benefit is for such a large amount of testing per lamp. A huge amount of testing could be done, at great expense and increased cost of products, but the proposed testing does not assure compatibility.³

We believe the number of measurements as defined in JA10.5 and the subsequent data analysis and reporting as defined in JA10.6 and JA10.7, respectively, are overly prescriptive and complex and, as such, will impose an undue burden on manufacturers. In addition, under the current proposal, it will be difficult if not impossible to determine in the field which combinations have been tested and are allowed to be installed, potentially increasing the confusion of and burden on building inspectors.

The proposed test method and requirements are not well-substantiated: JA10.5 requires a frequency measurement rate of 20 kHz (JA10.5). This is a factor of 50 times more data than necessary to characterize the specified flicker. A sampling frequency of at least double the highest frequency within the signal to be measured is normally considered sufficient. We propose, since the maximum flicker frequency of concern to the CEC is 200 Hz, the sampling frequency should therefore be a minimum of 400 Hz.

JA10's methodology extends to a frequency of 0 Hz, which is physically impossible to characterize. The measurement time of 2 seconds is one full wavelength at 0.5 Hz. A

³ <http://www.ledsmagazine.com/articles/print/volume-11/issue-3/features/programs/led-lighting-progresses-driven-by-lessons-learned.html> DOE article in LEDs Magazine: "Lesson 1: Rigorous testing requirements adopted in the early days of SSL industry development were necessary to counter exaggerated claims of performance by some manufacturers, but they eventually led to unreasonably high testing costs."

measurement time of several wavelengths is generally necessary to characterize behavior at a particular frequency.

- **We firmly oppose the entire draft language in Section JA10 regarding flicker measurements, and propose that JA10 be removed.**
- **We propose that CEC staff should simply require manufacturers to maintain compatibility lists for dimmer/lamp combinations (as is now required in the ENERGY STAR specification).**
- **We propose that the test procedure, if CEC insists on adding it, should be no more complicated than the procedure presently in use by ENERGY STAR. We see no reason to require testing and subsequent calculations with 5 different frequency cutoffs (1000, 400, 200, 90, 50 Hz), when the specification only requires one value (200 Hz), and see no reason to complicate testing by requiring additional dimmer set points as compared to the ENERGY STAR requirements. In addition, we propose that CEC staff raise the lower frequency limit to 10 Hz to allow some measure of reasonable correlation with the specified data collection time.**