



**INITIAL COMMENTS FROM THE NATIONAL ELECTRICAL MANUFACTURERS
ASSOCIATION (NEMA) LIGHTING SYSTEMS DIVISION TO THE CALIFORNIA
ENERGY COMMISSION
JULY 12 & 13, 2006 WORKSHOP FOR PROPOSED
2008 CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS**

July 11, 2006

NEMA appreciates the opportunity to offer initial comments and recommendations at the California Energy Commission's 2-day workshop to address 2008 California Building Energy Efficiency Standards (Title 24) July 12-13, 2006. These comments address residential, indoor commercial lighting, outdoor lighting and lighting control proposals for the 2008 Title 24 rulemaking.

NEMA respectfully expresses a general concern regarding the development of the 2008 Title 24 Code. NEMA's members feel that the time provided to evaluate and comment on proposed amendments has been woefully inadequate. Moreover, the CEC recently reported that the July 12-13, 2006 workshop will be the last, and in NEMA's members' view, only public workshop before publishing 45-day language.

CEC staff was aware prior to scheduling the May workshop that lighting manufacturers were unable to participate in the May 17-18, 2006 workshop due to a conflict with a longstanding NEMA division meeting. NEMA was assured there would be ample opportunity for public participation beyond the May kickoff workshop. It has been very difficult to comment on proposed changes since the May workshop as input requested from CASE studies has included random distributions (often not including NEMA staff) and comments have not been posted for public comment/review in a timely manner. In addition, there has been conflicting language in some proposals.

In short, there has been limited opportunity for participation in public workshops, and insufficient time to comment on proposed 2008 code language, which was posted and is continuing to be posted, less than a week prior to the July 12-13 workshop.

NEMA's members make up an essential constituent in building energy efficiency standards and very much want to be involved. We respectfully request that the CEC make available the appropriate time for a lighting-specific forum prior to issuance of 45-day language.

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RESIDENTIAL LIGHTING

NEMA member companies have been actively engaged in promoting energy efficiency in residential lighting through the development of new light sources, as well as energy efficient and aesthetically pleasing light fixtures and controls. Further we have worked with sales channels to create market awareness and accessibility to these products.

NEMA has four primary concerns with the CEC proposed amendments offered in its June 23, 2006 draft, which we explain below:

1. CEC should allow more time to evaluate the energy impact, effectiveness and compliance with the 2005 Title 24 code revisions before proposing another significant amendment to the code. The latest code has been in effect only a few months, which in our opinion, is insufficient time to realistically assess the efficacy of the previous revisions. NEMA member companies do not advocate that the CEC proceed with significant residential revisions at this time, ahead of analyzing the previous code's impacts. Thus, we discourage the CEC from making major revisions to residential lighting standards until sufficient time has elapsed in order to analyze with greater scrutiny the energy efficiency impact of the 2005 code revisions.
2. NEMA Lighting Systems Division members do not support the use of GU-24 based integrally ballasted Compact Fluorescent Lamps (CFLs) in *recessed downlighting*. While we support using GU-24 based integrally ballasted CFLs for pendant and surface mounted products, recessed downlights most definitely favor pin-based CFL solutions over integrally ballasted CFL solutions because of the reduced efficacy associated with known thermal and optical conditions in this application. Allowing luminaires with permanently installed GU-24 bases to be regarded as "high efficacy" for recessed downlighting applications would be a major step backward in energy efficiency in California homes.

NEMA recommends the following revisions to the proposed amendments to the 2005 Residential Lighting language for "Low Efficacy Luminaires":

2. A. *Contains a line-voltage socket or lamp holder (i.e., screw-based socket). Exceptions to Section 150(k)(2)(A): Luminaires, **other than recessed downlights**, with factory installed GU-24 sockets or lamp holder may be classified as high-efficacy provided that the luminaires do not contain screw-base lamp holders.*

NEMA rationales for proposed change:

- Reduced light output due to optical losses: Lamps with GU-24 bases (integrally ballasted CFL) typically produce lower optical efficiency in recessed downlights than pin-based CFLs, due to inherent increased light absorption losses. This is because the ballast housing absorbs light before it leaves the luminaire. Additionally, the GU-24 based CFLs provide a lower optical center in the luminaire and reduce the visual cut-off, thereby, increases direct glare.

- Reduced efficacy due to thermal conditions: GU-24 based CFLs are typically produced as non-amalgam types for two reasons: (a) cost, and (b) they have quicker run-up times than amalgam types – a feature preferred by consumers. However, triple-tube pin-based CFLs typically use amalgam technology, primarily because they perform much better in the elevated temperature conditions found in recessed down-lighting. For example, at 60 degrees Celsius, non-amalgam integrally ballasted CFLs produce approximately 66% of their rated lumen output, while amalgam pin-based CFLs produce approximately 96% of rated lumens. The result is that GU-24 based CFLs would require nearly 50% higher wattage than their triple-tube pin-based counterparts to produce the same lumens at the temperatures found in recessed downlights.
 - Reduced lamp and ballast life: The life of integrally ballasted CFLs is normally 10,000 hours, and for pin-based CFLs it is normally 12,000 hours. Ballast life differences are far more dramatic, since the ballast life of a GU-24 based CFL is the same as the overall life rating of the lamp/ballast combination – the highest rating expected to be 10,000 hours. The electronic ballasts used for pin-based CFLs in the CA PIER recessed kitchen lighting project are of the high quality type, achieving 50,000 hours life.
 - No dimming option: GU-24 based integrally ballasted CFLs cannot be dimmed; whereas, the 4-pin CFLs that operate on separate electronic ballasts have dimming capability.
 - California PIER publicly acknowledges thermal and optical problems: PIER publishes on its website the following language regarding the use of screw-based integrally ballasted CFLs in recessed downlighting applications. These comments, of course, would apply to GU-24 based lamps, since they are also integrally ballasted.

“There is currently almost no market use for residential CFL downlights in these retrofits although a small fraction of the incandescent downlights that are being installed may use screw-based CFLs placed in them. Screw-based CFLs are often problematic in these fixtures for a variety of thermal and optical reasons. Major concerns arise with use of this technology in that they may not perform well in the harsh thermal environment typical in recessed cans.”
3. NEMA does not recommend alternative exemptions for kitchen lighting at this time. NEMA has promoted the requirement for 50% of kitchen lighting watts to be high efficacy luminaires. Our member companies have made significant investment in the development of new products to meet the market demands including cost effective, thermally enhanced compact fluorescent downlights and decorative surface/pendant mounted decorative products. Allowing additional exemptions will discourage the market transformation of these products. Further, we have actively engaged in promoting solutions to ensure ease of inspection through the use of labels, and we have conducted numerous training programs for builders and retailers.

NEMA's concerns primarily regard the addition of alternate approaches to meet the requirements for efficient kitchen lighting, which are listed below:

- a. The standard has not been in place for a sufficient period of time to fully evaluate. We believe the 50% requirement is reasonable and promotes the energy efficiency goals for California.
 - b. Alternatives that encourage the use of low efficacy lighting do not support the investments made by manufacturers, and shifts market demand for decorative energy efficient products.
 - c. Additional exemptions confuse the market place, which is just beginning to understand and accept the 2005 code language.
4. NEMA supports the inclusion of requirements for recessed luminaries in insulated ceilings to utilize ballasts that exhibit superior thermal system performance. The proposed language needs to be modified because the reference to UL 1598 does not relate to ballast life. NEMA will work with CEC to develop appropriate language to support new code revision (Section 11D).

Residential Lighting Summary:

Below is a summary list of NEMA's top four concerns with respect to the Title 24 2008 Code revisions to residential lighting:

- CEC should allow more time to evaluate the energy impact, effectiveness and compliance with the 2005 Title 24 code revisions before proposing another significant amendment to the code.
- NEMA does not support the use of GU-24 based integrally ballasted Compact Fluorescent Lamps (CFLs) in ***recessed downlighting***.
- NEMA does not support the addition exception 2 to the kitchen lighting requirements. Do not make any revisions to these requirements at this time.
- NEMA members want to work on new language that will promote product reliability through improved ballast thermal management.

INDOOR COMMERCIAL LIGHTING

1. CEC should strongly consider the input from the design community with regard to retail display lighting requirements. Lighting technologies such as ceramic metal halide are widely available and NEMA has no concerns regarding the ability to meet California market demand requirements. However, lighting designers have expressed concerns in meeting retail display design requirements based on the CEC proposed changes.

Summary of Recommendations for Indoor Commercial Lighting

- CEC should further evaluate revisions to the retail display lighting requirements with strong consideration of the input from the lighting design community.

OUTDOOR LIGHTING

NEMA member companies have been actively engaged in promoting energy efficiency in outdoor lighting and have been dedicated to providing education for the Title 24-2005 outdoor requirements since outdoor lighting was not subject to energy standards in California prior to 2005.

NEMA would like to commend the authors of the PG&E CASE report on Outdoor Lighting for providing a thorough and detailed description of the supporting models with reference to the IESNA Guidelines and Recommended Practices.

NEMA has four primary concerns with the CEC proposed amendments offered in the May 15, 2006 PG&E CASE Draft Report on Outdoor Lighting

1. Since the energy standards have only been in effect for a few months, CEC should allow more time to evaluate the energy impact, effectiveness and compliance with the 2005 Title 24 code revisions before proposing another significant amendment to the outdoor lighting requirements. There has been insufficient time to realistically assess the efficacy of the 2005 requirements. Thus, we discourage the CEC from making major revisions to outdoor lighting standards **until sufficient time** has elapsed in order to analyze with greater scrutiny the energy efficiency impact of the 2005 code revisions.
2. Simulation models do not address real life conditions. While the simulation models provided in Appendix C of the CASE report are very extensive, they are theoretical models that do not address design criteria for actual sites.
 - a. None of the information in the CASE report provides an evaluation of existing site power density. During the 2005 proceedings for Title 24, the contractors had referenced a database being compiled of actual installations to be used as a baseline for power density evaluations. NEMA was expecting an opportunity to review this data before further revisions to power density limits were proposed.
 - b. Many of the simulations appear to be optimized with pole spacings that do not reflect constraints commonly found in outdoor sites. For instance, many of the pole spacings are atypical, such as 62.5, 65, 75 or 80 feet on center. For sites with driving lanes, poles are typically limited to 60 foot increments. Pole spacings in the simulations that do not account for this site restriction provide a lower power density than what would actually be achieved. This comment was also presented in the 2005 hearings and we had expected this issue to be addressed in the 2008 simulations.
 - c. The simulations for vehicular hardscapes are based on a uniform grid layout of poles using square optical distributions. Actual sites will utilize different optical distributions in different areas to direct light where it is intended or restrict light from areas that may be offending to neighboring properties. For instance the

interior of a parking lot would utilize a uniform grid of luminaires with a square optical distribution, while the perimeter of the site would likely use a forward throw optic and adjust the pole spacing according to the optical distribution. This would minimize light trespass and maintain uniform light along the perimeter of the site. Luminaires with a directional optical distribution, such as a forward throw distribution have a lower photometric efficiency and would likely increase the overall site power density. A NEMA evaluation of optics performance shows that there is commonly a 20-25% difference in photometric efficiency between a square distribution and a forward throw distribution. Therefore the models presented in the CASE report do not accurately reflect lighting design practice.

- d. The calculation area in the simulations is not representative of the site or the defined area for power density calculations in the Standard. The simulations calculate design parameters including average, maximum and minimum illuminance as well as uniformity ratios in the center of the site between four poles. This is not an accurate representation of the lighting performance or the power density. Many of the design parameters referenced are based on IESNA guidelines for minimum illuminance or maximum uniformity ratios. Property owners often specify a minimum illuminance for the overall site based on safety and liability considerations. Because the calculation area does not account for the lighting levels that include the perimeter of the site, they do not accurately reflect the design parameters and therefore underestimate the power density. This comment was also presented in the 2005 hearings and we had expected this issue to be addressed in the 2008 simulations.

3. Revisions to Security Multipliers (Table 147-D).

- a. NEMA accepts the revision eliminating the security multiplier for retail parking lots in lighting zone 1. However, we recommend adding the security multiplier for retail parking lots in lighting zone 4. Lighting zone 4 was not included in the 2005 standard because the power density limit was extremely conservative. The proposed revision in 2008 reduces the power density limit for an LZ4 parking lot by almost half; therefore including the security multiplier is reasonable and appropriate.
- b. NEMA endorses the inclusion of a security multiplier for parking lots and hardscape areas with special security requirements. However, special security requirements exist in all lighting zones. We recommend that these special security requirements be allowed for lighting zones 2, 3 and 4.
- c. CEC has requested input from stakeholders with regard to when these multipliers for special security requirements are allowed (Section 147 (c) 1 B). NEMA offers the following recommendation.

An area is deemed to have special security requirements when it meets any of the following conditions:

- i. *The area is within a school campus;*
- ii. *Public safety has been deemed an issue for the area by a local authority*
- iii. *A qualified third-party has deemed the area as a higher risk zone*

4. NEMA endorses the inclusion of an Initial Wattage Allowance (IWA) for non-uniform application requirements. However the allowance appears to allow the addition of only a single luminaire per site, which would address only small sites. While the majority of the area of a large site can be optimized, the perimeter of the site often has irregular geometry. When design specs are based on a minimum illuminance, lighting the perimeter of a large site would likely require the addition of more than one luminaire. Furthermore, the allowance does not seem to have any technical basis for the proposed wattages. The wattages proposed may not coincide with the standard products used throughout site. Finally, the allowance is not included for some applications that have unusual geometry or restrictions in locating the lighting equipment. NEMA proposes the following revisions for the IWA.
 - a. Include an IWA allowance for hardscape for driveways, site roads, sidewalks, walkways, bikeways and for facades.
 - b. The allowance should not be based on a subjective wattage. NEMA recommends an allowance of 5% to the power density limit, which is consistent with the ASHRAE / IESNA Standard 90.1 allowance.

Summary of Recommendations for Outdoor Lighting

- Since outdoor lighting standards have only been in effect for a few months in California, CEC should allow more time to evaluate the energy impact, effectiveness and compliance with the 2005 Title 24 code revisions before proposing another significant amendment.
- Simulations models do not address real life conditions. Lighting layouts utilize optimized spacings and do not account for different optical distributions commonly used on the perimeter of the site. The calculation area misrepresents the lighting performance since it does not include the effects of the perimeter lighting. These issues were presented in 2005 and we had expected them to be addressed in the 2008 simulations. Therefore the data upon which the proposed power density limits is based is inaccurate and underestimates the actual power density for a real life condition. We recommend that the models be revised to address these issues.
- NEMA endorses the multipliers for special security requirements and recommends that the retail parking lot multiplier be allowed for lighting zones 2, 3 and 4. Similarly, the parking lot and hardscape multipliers for special security requirements should also be allowed for lighting zones 2, 3 and 4. Finally, NEMA recommends that the parking lot and hardscape multipliers be allowed for sites on school campuses, areas where public security has been deemed an issue by a local authority or when a qualified third-party has deemed the area as a higher risk zone.
- NEMA endorses the concept of the Initial Wattage Allowance and recommends that the scope be expanded to include additional hardscape and façade applications. We further recommend that the allowance be based on an allowance of 5% over the power density limit to address unusual geometry or restrictions in locating luminaires for both small and large sites. This allowance is consistent with the ASHRAE / IESNA Standard 90.1.

CONTROLS

Requirements for track lighting integral current limiter. In many installations track lighting is a decorative element. Having labels on the outside would not be desirable. In addition, we do not understand the need for "tamper resistant hardware". Wiring connections need to be easily accessible to the electrical inspectors, therefore requiring tamper resistant hardware will discourage inspectors from performing adequate inspections. We recommend removing the language "*without opening coverplates, fixtures or panels*" from Section 119 (m) 2. In addition, we recommend removing the language "*Employ tamper resistant hardware for access to wiring connections...*" from Section 119 (m) 3.

4. Lighting Power. With regard to Section 130(c)2, there are a number of concerns regarding luminaires that can accept multiple wattages. NEMA would like to consider revisions to this section in order to promote maximum sustained energy efficiency without creating an administration burden for manufacturers or inspectors. We will work with CEC and other stakeholders to help craft new language for this section

In addition, the requirement for independent testing lab reports should be deleted as it will add additional burden on manufacturers that have their own laboratories with calibrated equipment.

In Section 130 (c) 5, change "*lighting*" to "*light*". In addition it is unclear what "UL 1598 testing apparatus" refers to. We recommend that this language be revised to "*...as specified by UL 1598.*"

2. Automatic occupancy sensors for Area Controls - Section 131 (a). NEMA respectfully requests an explanation regarding why automatically controlled occupancy sensors have been removed as an accepted area control solution. NEMA members believe this is an effective control strategy for many applications and this principle is upheld by studies conducted by the U.S. DOE and EPA. Areas controlled with occupant based automatic controls should be exempt to ensure greatest level of energy savings for specific applications such as warehouses or manufacturing. NEMA's concern is with regard to very large areas such as warehouses or manufacturing. Common control strategies utilizing automatic motion sensors in aisles or zone switching over manufacturing cells will not incorporate multiple steps and will not maintain uniform lighting – but represent the greatest energy savings solution for those applications. We recommend that automatically controlled occupancy sensors remain as an accepted technology for area controls.
3. NEMA agrees with the inclusion of multi-level controls for areas that have mixed visual tasks or daylight integration – Section 131 (b). We support the inclusion of multi-level controls, but levels of power should not be specifically defined. NEMA recommends language similar to the 2005 EPAct bi-level control requirement: *two or more levels of power within the space not to including "off" as a level.*
4. Control requirements for parking garages. NEMA members are unclear about the intent in the proposal for removing parking garages from the exemption in Section 132 (c). 1. This

appears to conflict with the proposal to add parking garages to the exemption in Section 131 (d) 1. NEMA would be interested in working to develop code language that encourages the use of effective controls in parking garages based on occupancy or for areas within a parking garage where adequate daylight is available and agree that parking garages should be exempt from automatic shut-off requirements. We have not seen any technical justification for removing parking garages from the exemption in Section 132 (c) 1. to require parking garages to automatically turn off lights in parking garages when daylight is available, and we contend that considerable safety and liability concerns exists.

5. Revisions to luminaire cutoff requirements are not justified and the IESNA cutoff metric will become obsolete in 2006. No technical justification exists for revising the wattage for the luminaire cutoff requirement and this revision will not result in any additional energy savings. The testimony from the May workshop suggests that this requirement is consistent with Title 20-2008, however NEMA has not seen any proposals regarding outdoor luminaires and will oppose optical restrictions in an energy standard since various optics are designed for specific application characteristics that cannot be regulated by an appliance standard.

Summary of Recommendations for Controls

- For track lighting integral current limiter, we recommend that the label should not be required to be on the outside of the fixture and the fixture should not be required to utilize tamper resistant hardware which would limit accessibility for inspectors.
- With regard to Section 130(c)2, there are a number of concerns regarding luminaires that can accept multiple wattages. NEMA would like to consider revisions to this section in order to promote maximum sustained energy efficiency without creating an administration burden for manufacturers or inspectors. We will work with CEC and other stakeholders to help craft new language for this section
- Areas controlled with occupant based automatic controls including zone switching should be exempt from the multi-level control requirement to ensure greatest level of energy savings for specific applications such as warehouses or manufacturing
- Power levels for multi-level controls should not be specifically defined. NEMA recommends language similar to the EAct bi-level control requirement: *two or more levels of power within the space – not including off.*
- NEMA encourages the incorporation of controls requirements for parking garages, but the code must support safety and liability concerns. NEMA agrees that parking garages should be exempt from automatic shut-off requirements. Currently, there are inconsistencies in the proposals for the 2008 standards that need to be addressed. NEMA is interested in assisting CEC in revising the code language for controls in parking garages.

- NEMA does not support the recommended revision to luminaire cutoff requirements because there is no energy saving justification for the measure and because the IESNA cutoff classifications will be obsolete by the time the 2008 code goes into effect. .

We appreciate the opportunity to comment on the proposed lighting requirements for the Title 24 2008 Standard. As you can see from our comments, there are a number of areas regarding the proposed lighting standards that require much more discussion. Therefore, we recommend that the CEC host a public workshop specific for the lighting issues prior to the 45-day code language so that all lighting stakeholders can discuss these issues in more detail.

If you have any questions, please direct them to Petra Smeltzer, Manager Environment and Energy, at NEMA. She can be reached at (703) 841-3221, or at pet_smeltzer@nema.org.

Thank you for considering our views and recommendations. We look forward to working with you on the 2008 Title 24 code revisions.

Sincerely,



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