

Tesla Awards

Special Award Category – Lighting Design to Promote Human Health and Well-being

Introduction

Lighting that promotes human health and well-being includes many factors such as visual acuity and comfort, energy-efficiency, and safety. These factors are already addressed in the existing criteria set for the Tesla awards. This special category for human health and well-being will therefore focus on additional (but not alternative) criteria to assess how well a lighting design promotes circadian entrainment of building occupants. Circadian entrainment promotes sleep at night and wakefulness during the day, important aspects of human health.

While daylight is a significant contributor to the health and well-being of people, it is often unavailable to building occupants and is largely out of the direct control of the lighting designer or specifier, especially in retrofit situations. Therefore, the criteria for this award will *only* consider those designs where the electric lighting supports circadian entrainment.

Submission Requirements

Lighting Design Goals

The applicant should describe and illustrate the completed lighting design. This description should include an overview of the goals and objectives of the lighting design related to the promotion of the circadian entrainment of building occupants.

Lighting Design Factors

The submission should discuss the ways in which the design addresses each of the factors listed below. As part of this description, the applicant should justify the lighting design decisions that were made in relation to each of these factors. To assist the judges in their assessment of the design, the applicant is encouraged to discuss other options that were considered, but not selected for the final design, and why.

Amount of Light

Applicants should quantify the amount of electric light provided by the design in various areas of the space in terms of both traditional photometric quantities (e.g., lux) and circadian metrics (e.g., circadian stimulus, effective melanopic lux); and explain why these quantities were selected and specified. For circadian entrainment, light entering the eyes of building occupants is the key factor; therefore, these quantities should be expressed in terms of the occupants' views at at least ten locations, while in positions they will most often use within the space (e.g., sitting at the desk or standing at a workstation). Appropriate graphical representation should be supplied (e.g., report from photometric software) from the design, and, if possible, actual measurements taken in the space following installation to validate the specifications.

Distribution of Light

The applicant should describe the distribution of electric light in occupied spaces in terms of photopic illuminance and circadian metrics. Values in both the vertical and horizontal planes should be documented. Information should be provided about why the distribution was selected. If possible, it would assist judges if these values could be provided for each layer of light (e.g., general and local lighting) in the space separately, in addition to the combined effect of all of the lighting in the space. Again, appropriate graphical representation should be supplied (e.g., report from photometric software) from the design, and if possible, actual measurements taken in the space following installation to validate the specifications.

Spectrum of Light

Because correlated color temperature (CCT) is not a sufficient metric when considering circadian-effective lighting, the applicant should submit information on the spectral power distribution (SPD) of the light sources used in each area of the building or space. The applicant should explain why these SPDs were selected and what analysis they undertook to select and specify these various SPDs. The applicant may choose to use the CS 2.0 calculator (<https://cscalculator.light-health.org/>) to perform an analysis of the SPDs used in the design. If a tunable system was selected for the design, the applicant should explain the reason for the selection, and should provide the SPDs at each CCT specified for use in the design.

Timing and Duration of Light

The applicant should describe the timing and duration of light provision throughout the various periods of the day that the space is being used (e.g., morning, afternoon, evening). This information should include the amount, distribution, and spectrum of light that are provided at each of these time periods in terms of both illuminance and circadian quantities. The applicant should provide information on why the schedule of light provision was selected.

Judging Criteria

Lighting Design Goals

Has the applicant appropriately described and articulated the various aspects of the design as they relate to health and well-being, specifically circadian entrainment of building users and occupants? Do the goals and objectives articulated appropriately fit the needs of the users of the space?

Amount of Light

Has the applicant provided the correct amount of light from the standpoint of circadian entrainment? Are measurements and design specifications appropriately articulated (e.g., light at the eye level of users of the space)? Were the selections of light levels appropriately justified in the submission?

Distribution of Light

Did the applicant consider the needs of various areas of the space and how those areas will be used (e.g., tasks and activities that will be undertaken in each area)? Did the applicant consider light as measured/specified at the eye level of building occupants needed for circadian entrainment as part of their design? Did the applicant provide and justify the ratio of vertical to horizontal illuminance? Did the applicant consider visual comfort as part of their design?

Spectrum of Light

Did the applicant select SPDs that support the goals they articulated for the design? Did they undertake appropriate analysis of the SPDs to quantify their effectiveness in terms of circadian entrainment? If tunable lighting was selected, did the designer appropriately justify and explain this selection?

Timing and Duration of Light

Is the applicant providing the necessary quantities of light during each period of the day to promote circadian entrainment? Was the lighting schedule appropriately justified and explained?

Helpful References

Applicants may wish to consult the references listed below for guidance when preparing their submission.

1. Jarboe C, Snyder J and Figueiro MG. The effectiveness of light-emitting diode lighting for providing circadian stimulus in office spaces while minimizing energy use. *Lighting research & technology (London, England : 2001)* 2020; 52: 167-188. DOI: 10.1177/1477153519834604.
2. Mariana GF, Kassandra G and David P. Designing with Circadian Stimulus. *Lighting design & application* 2016; 46: 30.