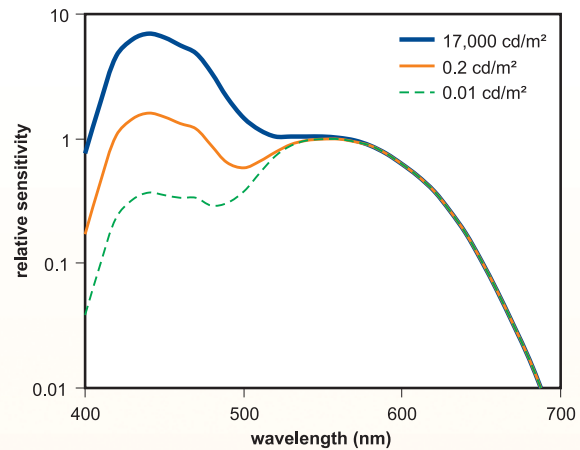


Perceptions of Brightness and Safety with Outdoor Lighting

Pedestrians walking through a parking lot should feel safe, and one of the main factors related to perceptions of safety is the apparent brightness provided by outdoor lighting. Depending on the spectral distribution of the lighting system, pedestrians can perceive a lighting installation to be brighter than another, even at the same measured light level. LRC scientists have developed a provisional model for quantifying brightness from different types of lighting systems in outdoor installations. This model predicts that it might be possible to both reduce energy use and provide greater perceived brightness.



Provisional spectral sensitivity functions for scene brightness at three different adaptation levels, based on published psychophysical data.

Method

LRC scientists asked subjects to view scale model outdoor scenes lighted by different types of lamps and to judge the brightness of each scene. Each scene used a plywood box painted matte black inside and simulated the view of a lighted parking lot. Study participants identified the side that appeared brighter.



Photograph of the side-by-side scale model scenes under different lighting conditions.

Results

The results of the LRC study yielded two important findings. First, for the range of light levels commonly used for outdoor lighting, short-wavelength spectral content will contribute to increased brightness. Second, the relative impact of short-wavelength spectral content increases as the overall light level increases. For example, a metal halide-lighted scene would be perceived as 20% brighter than a high pressure sodium-lighted scene at a light level of 0.1 cd/m^2 , and would be perceived as 25% brighter at 1 cd/m^2 . These findings can translate to substantial savings in installation and energy costs if lighting designers utilize the perceptions of brightness as a design criterion.

Further details

Rea, M. S., L. C. Radetsky and J. D. Bullough. 2010. Toward a model of outdoor lighting scene brightness. *Lighting Research and Technology*.

Project Sponsor

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