

# **Evaluation of Approaches to Crosswalk Lighting Design**

by

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## ABSTRACT

Despite the fact that there are multiple reasons for nighttime traffic accidents involving pedestrians (such as speeding, alcohol and so on), inadequate lighting at or adjacent to crosswalks might also increase risks for pedestrians crossing the road. The purpose of this study was to investigate a promising lighting solution, providing sufficient visibility of pedestrians as they are crossing the road while generating reduced glare and reducing the initial and operating costs.

Recommended light levels for crosswalks in North America are based on the magnitude of pedestrian flow. Previous studies have shown that vertical illuminance plays a more important role than horizontal illuminance in crosswalk lighting design, and further converge on a vertical illuminance recommendation of 20 lux as a design criterion. However, increasing vertical illuminance does not always provide better visibility of pedestrians. Therefore in this study, the relative visual performance (RVP) model was used as one of the criteria in addition to cost and glare.

A bollard-based crosswalk lighting design was proposed and also evaluated using photometric simulations compared with other existing lighting solutions. The results showed that the bollard-based lighting condition was superior to the other lighting conditions in providing a better visibility of pedestrians and in reducing the glare and cost.

A follow-up field experiment using identification time and accuracy as measures of visibility further confirmed that the bollard-based lighting condition resulted in significantly shorter identification times of pedestrian targets than under other lighting conditions. Although the bollard lighting also resulted in higher identification accuracy than the other lighting conditions, this difference was not statistically significant. It was also found that the RVP values calculated to predict visibility were significantly, and negatively correlated with the measured identification times. Therefore, the RVP model was shown to be a useful tool for evaluating any lighting condition during the design process.