

0-6641: Assessment of the Impact of Nighttime Work Zone Lighting on Motorists

Background

Work zone lighting affects motorist and worker safety, quality of work, productivity, and worker morale. Currently, Texas Department of Transportation (TxDOT) specifications only require that contractors provide “adequate lighting during nighttime work activities to ensure the quality of work and that inspection can occur.” Details as to what constitutes “adequate” are not currently defined.

Standard roadway lighting is generally inadequate to properly light the area where nighttime highway construction and maintenance work is performed. While work zone illumination guidelines for nighttime highway work do exist in the literature, most of them only consider the visual needs of workers. Meanwhile, conventional vehicle headlights, used by some work crews to illuminate a work area at night, do not produce adequate task lighting and can produce glare for drivers when the vehicle headlights are facing oncoming traffic. This project assessed the impact of work zone lighting on motorists and developed work zone lighting guidelines for nighttime operations, considering both worker and motorist needs.

What the Researchers Did

Researchers conducted a literature review regarding the design, selection, application, and measurement of work zone lighting. Field studies were conducted to provide insight into how drivers’ eyes react to typical temporary

work zone lighting configurations in Texas compared to standard lighting situations (i.e., no lighting and standard fixed lighting). Figure 1 shows a nighttime paving operation. Researchers also conducted closed-course studies to evaluate the impact of various work zone lighting scenarios upon the ability of drivers to detect low-contrast objects (e.g., debris) and workers.



**Figure 1. Paving Operation
in Bryan/College Station, Texas.**

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What They Found

Researchers concluded from the field studies that nighttime work zone environments do indeed increase driver pupil size changes above that normally experienced while driving at night. Furthermore, the researchers found that the continuous process of the driver's eyes focusing back and forth on both near and far-away illumination sources causes pupil size variations that cannot be predicted through simple illumination measurements. However, the variability in illumination along a roadway section does appear to be somewhat correlated to driver pupil size variation. Unfortunately, the correlation is not strong enough to establish a measurement standard for use in the field by project inspectors when evaluating the adequacy of lighting of the work space.

The results of the closed-course study showed that properly installed temporary work zone lighting can increase worker and low-contrast object detection distances beyond that of normal nighttime driving. The results also confirmed a negative impact on worker and low-contrast object detection distances from improper positioning of portable light towers, and supported the theory that workers can be washed out visually when directly illuminated by portable light towers. Improperly implemented lighting that produces glare conditions for motorists can also severely limit the ability of drivers to detect low-contrast objects immediately after the light source.

What This Means

Based on the review of previous literature and state agency nighttime work zone lighting policies, field study findings, and closed-course study findings, researchers recommended that TxDOT develop nighttime work zone lighting specifications to be included in their construction standards and/or barricade and construction standard sheets. The specifications should address minimum lighting levels, glare control, light trespass, and provision of a light meter. Researchers also developed guidelines for the on-site TxDOT personnel that will be checking the adequacy of the nighttime operation illumination. More details are discussed in the research report for this project (Report 0-6641-1).

For More Information

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