Florida Department of Transportation Research

Quality Assurance Review of Intersection Lighting Retrofits

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Current Situation

Driving is primarily a visual activity, and anything that interferes with a clear view of the road can increase the potential for crashes. Although the roads are most heavily traveled during daylight hours, the majority of serious crashes occur at night. Many of these crashes also take place at intersections, where lighting plays a critical role. The Florida Department of Transportation (FDOT) has placed proper intersection lighting on a priority list of improvements that can improve road safety and reduce crashes. Over 2,000 lighting retrofits are underway at signalized intersections across the state and are expected to be completed by 2021. Because the geometry and environment of intersections differ widely, it is essential to have a quality control program that assures that lighting performs in the field as intended.

Improved lighting at intersections can improve safety.

Research Objectives

University of South Florida researchers measured nighttime illumination in crosswalks at intersections with retrofitted lighting. Their method employed a novel combination of devices to improve efficiency and safety.

Project Activities

The research team reviewed the equipment and procedures used to measure both vertical and horizontal light levels on roadways. There are different standards and setups for measuring horizontal illumination and vertical illumination, primarily headlights and streetlights, respectively, but there can be other sources of ambient light. The team developed a set of tripod-mounted sensors 63 inches above the ground that measure horizontal and vertical lighting at the same time, improving efficiency and data quality. They also developed a correlation to match their horizontal illumination readings with those taken at 6 inches from the ground, the FDOT standard height for such measurements. The measuring system was fitted with wireless communications to allow workers to take measurements from a computer in a safe location.

Data were collected at 23 signalized intersections in six FDOT districts. For each intersection, horizontal-vertical data pairs were collected at up to 50 points that ranged across the width and length of all crosswalks at the intersection. Values from these measurements were compared with theoretical values based on the lighting designs to produce a quality assurance value. All measurements were made at midnight in clear weather.

Field-measured illumination was expected to vary from theoretical values because of the specific geometric and environmental details of each intersection, and the researchers found that to be the case for almost all intersections. Many retrofitted lighting configurations yielded more than 10% of the theoretical value, and a fair number were measured at more than 50%, indicating that the lighting retrofits could assure road users of much improved visibility. Very few intersections showed lower illumination than intended.

Project Benefits

Improved nighttime illuminations at intersections can reduce crashes at these intersections.

For more information, please see www.fdot.gov/research/.