



Florida Department of Transportation

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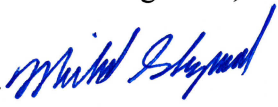
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ROADWAY DESIGN MEMORANDUM 16-02

DATE: August 4, 2016

TO: District Design Engineers, District Consultant Project Management Engineers,
District Roadway Design Engineers, District Traffic Operations Engineers,
District Safety Engineers

FROM: Michael Shepard, P.E., State Roadway Design Engineer 

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SUBJECT: **Design Methodology for Intersection Lighting Retrofit Projects**

As part of the FDOT vision of achieving a fatality free transportation system, the Department has approved the allocation of \$100 million over the next five years for targeted State Highway System (SHS) Intersection Lighting Retrofits to improve night-time visibility of pedestrians.

The State Roadway Design Office has developed design criteria specific to Intersection Lighting Retrofit projects which is provided in the "Requirements" section. In the "Commentary" section, the State Roadway Design Office has provided guidance for designers and project managers for use in the development of project scope of services.

REQUIREMENTS

General

Convert existing and proposed lighting fixtures to LED fixtures for each Intersection Lighting Retrofit project. Use the polygon method for all photometric calculations.

Horizontal Illumination

Establish an independent analysis zone for each signalized intersection. The analysis zone for the signalized intersection is bounded by the back of sidewalks and the stop bars on each approach. Establish illumination points within the polygon at 5 foot intervals longitudinally and 5 foot transversely for each signalized intersection. The design for the signalized analysis zone must meet the horizontal illumination values in Table 1.

Table 1: Signalized Intersection Lighting Retrofits

ROADWAY CLASSIFICATIONS	ILLUMINATION LEVEL AVERAGE INITIAL HORIZONTAL FOOT CANDLE (H.F.C.)	ILLUMINATION UNIFORMITY RATIOS		VEILING LUMINANCE RATIO
		AVG./MIN.	MAX./MIN.	$L_v(\text{max})/L_{\text{avg}}$
INTERSTATE, EXPRESSWAY, FREEWAY & MAJOR ARTERIALS	1.5	4:1 or Less	10:1 or Less	0.3:1 or Less
ALL OTHER ROADWAYS	1.0	4:1 or Less	10:1 or Less	0.3:1 or Less

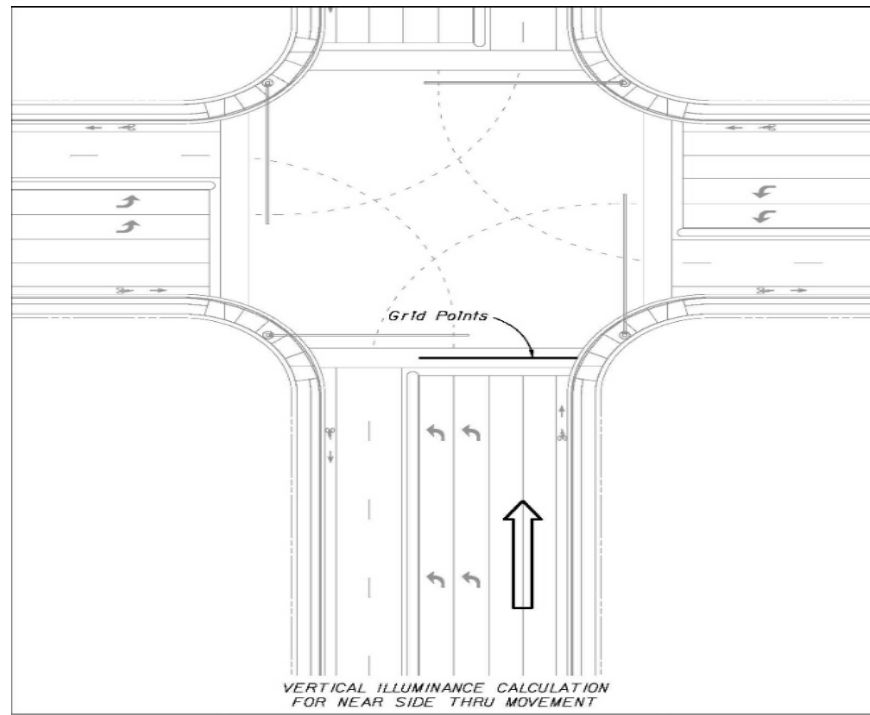
Vertical Illumination

The lighting design for all the near side approaches to the intersection must meet an average vertical illumination value of 1.5 foot candle. The vertical illuminance calculation method to be used at intersections will be the variable light meter aimed toward the driver’s location. This calculation provides the vertical illumination level of a pedestrian which the driver sees approaching the crosswalk, see Figure 1 below. This type of vertical illumination calculation is outlined in the *IESNA Design Guide for Roundabout Lighting (DG-19-08)*.

Establish the driver’s location from the center of the crosswalk using the stopping sight distance based on the posted speed of the near approach roadway.

Locate the vertical illuminance grid points on a line centered in the crosswalk with a horizontal spacing of 1.65 feet and a height of 5 feet above the pavement. The grid points are oriented toward the approaching driver, which is different from the vertical grids for sidewalks where the grids are parallel to the main pedestrian flow (See Figure 1).

Figure 1: Vertical Illuminance Calculation for Near Side Approach



COMMENTARY

The purpose of the Intersection Lighting Retrofit projects is to improve illumination levels at signalized intersections within corridors that have high frequency of nighttime pedestrian crashes. No non-lighting related improvements are to be included with these projects.

Anticipated scope of work may require installation of new poles, relocation of poles, installation of fixtures on existing poles, and ancillary work including installation of conduits, pull boxes, power connections, and minor sidewalk work. The estimated staff-hours for developing lighting calculations and reports for an intersection range from four to eight hours, according to the complexity of the intersection.

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