



Traffic Engineering, Operations & Safety Manual

Chapter 11 Lighting/Electrical/Electronic Systems

Section 5 Signalized Intersection Lighting

11-5-1 Policy and Design Guidelines

May 2015

APPLICATION

This policy and the related information apply to all State maintained signalized intersections on the Wisconsin State Trunk Highway System.

POLICY

All WisDOT maintained signalized intersections **shall** include lighting in accordance with this document.

Luminaires **shall** be LED.

Power for the lighting of WisDOT maintained signalized intersections *should* be fed from circuits from the signal cabinet. If the amperage of the proposed intersection lighting exceeds the capacity of the traffic signal cabinet, a separate lighting cabinet **shall** be evaluated.

When slotted left turn lanes are illuminated, these *should* be part of the intersection, subject to coordination with locally maintained continuous lighting where applicable.

DESIGN CONSIDERATIONS

Several factors affect the design of lighting for Signalized Intersections. The desired illumination level and the constraints of pole locations are the important factors, and are sometimes incompatible.

Illumination

The decision to signalize an intersection is based on the results of a signal investigation study of safety and operational factors.

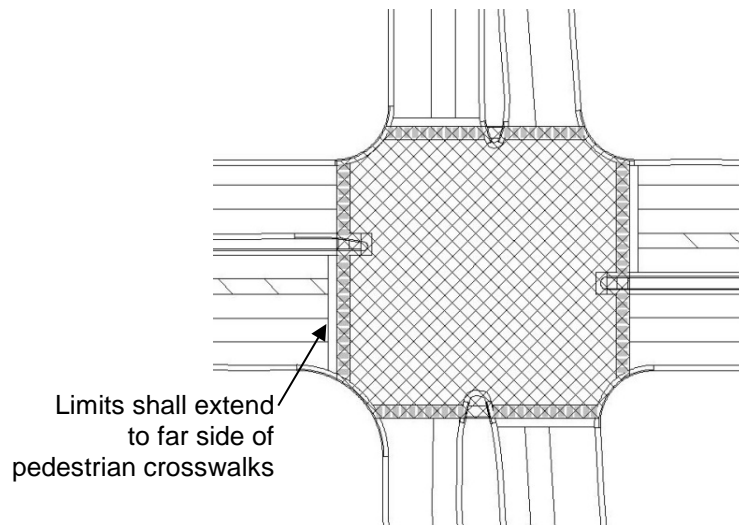
These factors typically relate to important visual tasks, and to conflicts with other vehicles and with pedestrians. These are important when considering lighting. These are discussed in IESNA RP-8-00, which is a reference for this document.

Generally, signalized intersections are located in urban areas along continuously lighted streets. The IESNA Recommended Illuminance Levels for the Intersections of continuously illuminated urban streets is, essentially, the sum of the recommended values for the intersecting roadways. The table below, based on Roadway and Pedestrian Classifications, for R2 and R3 pavement, summarizes these values. "Minor" is used to identify Minor Arterial.

Note: AASHTO refers to the Pedestrian Area Classifications as Commercial, Intermediate, and Residential Land Uses.

Roadway Classification	Average Maintained Illumination At Pavement by Pedestrian Area Classification in FC			avg/min
	High	Medium	Low	
Major/Major	3.16	2.42	1.67	3:1
Major/Minor	2.97	2.23	1.49	3:1
Major/Collector	2.70	2.04	1.39	3:1
Major/Local	2.42	1.86	1.21	3:1
Minor/Minor	2.79	2.04	1.30	4:1
Minor/Collector	2.51	1.86	1.21	4:1
Minor/Local	2.23	1.67	1.02	4:1
Collector/Collector	2.23	1.67	1.12	4:1
Collector/Local	1.95	1.49	0.93	4:1
Local/Local	1.67	1.30	0.74	6:1

The calculation boundary shown in Figure 1 below is the area to which the illumination levels in the Table apply. This boundary area includes the area bound by the far side of the pedestrian crosswalks on all approaching roadways. If a pedestrian crosswalk is not present, the calculation area **shall** be similar to that identified in the figure.

Figure 1. Intersection Illumination Calculation Boundary

Pole Placement

History has illustrated the importance of minimizing poles within the intersection boundary. For this reason, the lighting designer **shall** install luminaires on traffic signal poles whenever possible. The designer **shall not** begin the lighting layout before obtaining the signal plan.

Particularly for large or otherwise complex intersections, it *may* be difficult to achieve the illumination and uniformity levels identified in Table 1 without additional poles. In such cases, it may be necessary to make an engineering judgment and not meet recommended uniformity. In such cases, the designer **shall** consider and prioritize the design considerations:

- Illuminate the far right of the intersection to help clearly identify fixed elements in the path of the vehicle, whether turning or going straight.
- Pedestrians in crosswalks are dark objects, difficult to see, particularly when the vehicle is making a right turn. Illuminating the crosswalk is high priority.
- It is unlikely that the driver will encounter any dark objects in the very center of the intersection or within straight driving lanes, where headlights illuminate the area. If the uniformity is not met, having the low points here *may* be acceptable.

Where illumination of slotted left turn lanes is included, the poles *should* be located in the raised median on the driver's side. The intersection calculations **shall not** include these overlapping luminaires.

DESIGN PROCEDURAL REQUIREMENTS

The designer **shall** contact the Region Lighting Engineer to verify roadway and pedestrian/land use classifications prior to beginning the design for signalized intersection illumination.

A Signalized Intersection Illumination Form is included to assist in identifying the appropriate roadway and pedestrian/land use classifications and subsequent light levels.

The designer *should* prepare intersection illumination calculations using AGI32 software using the calculation boundaries described in this document.

The designer *should* submit the completed illumination design to the Region Lighting Engineer for review and approval. The illumination design **shall** include:

- Copy of approved illumination form
- design layout
- photometric calculations with summary information showing and uniformity
- voltage drop calculations

SIGNALIZED INTERSECTION LUMINAIRES

LED luminaires **shall** be used for all WisDOT owned and maintained intersection and roadway lighting systems. WisDOT's Qualified Electrical Products List outlines the specific LED luminaires that are permitted to be installed within these systems.

SIGNALIZED INTERSECTION ILLUMINATION FORM

(To be completed prior to design)

GENERAL INFORMATION:
Location: _____
Street 1: _____ ADT: _____
Street 2: _____ ADT: _____
Pedestrian Count (1Hr): _____

ROADWAY AND AREA CLASSIFICATION:
Street 1: _____
Street 2: _____

DETERMINATION OF ILLUMINATION VALUES:
<i>Use values from Illuminance Levels for Intersections Table in 11-5-1</i>
Illuminance Value: _____ Avg/Min Value: _____