

# 2015 Design Training Expo

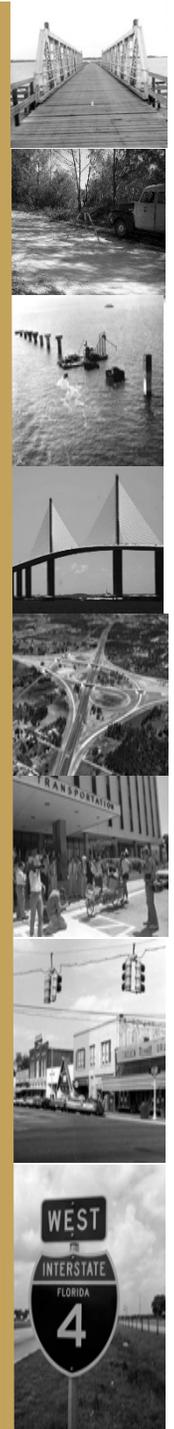
## Pedestrian Lighting



*Innovative Solutions for tomorrow's transportation needs*

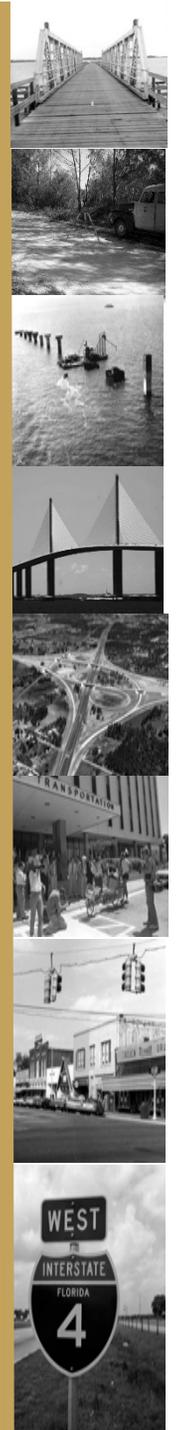
# Topics

- Proposed PPM Lighting Revisions to Chapter 7
  1. Methodology
  2. Intersection Criteria
- Intersection Pedestrian Lighting Design
- Pedestrian Lighting Challenges



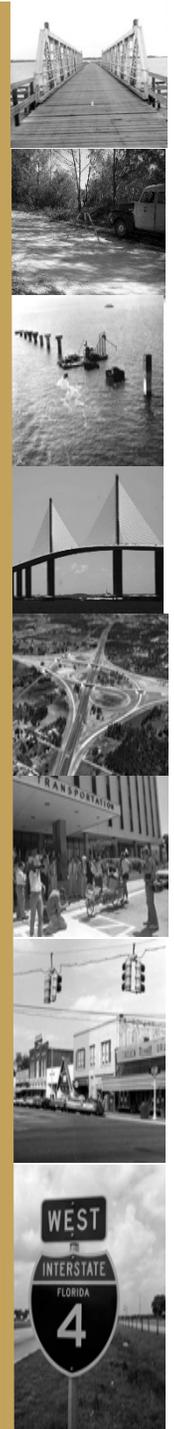
# Design Methodology

- Use the Illumination Method for all Calculations
- Analysis Zones
- Use Polygon Method for all Photometric Calculations
- Lighting Criteria



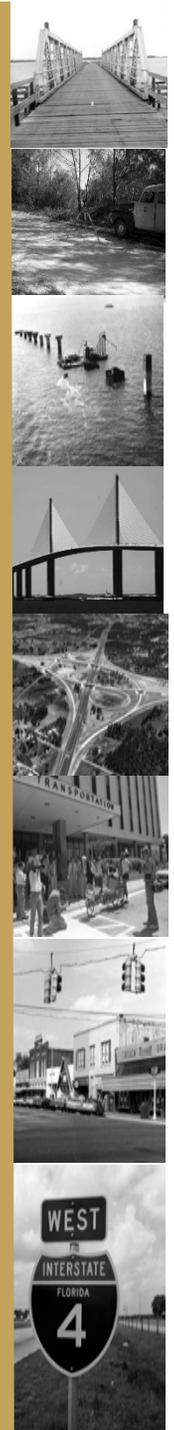
# Analysis Zones

- **Curb and Gutter Facilities**
  - a. Divided Roadway Segments
  - b. Undivided Roadway Segments
  - c. **Signalized Intersection Segments**
- **Freeway Facilities**
  - a. Divided Roadway Segments w/Grassed Medians
  - b. Divided Roadway Segments w/ Barrier Separated
  - c. Ramp Segments
  - d. Crossroad Segments



# Photometric Calculations – Polygon Method

- Roadway Segments
  - a. 15 Feet Longitudinally
  - b. 5 Feet Transversely
- Signalized Intersection Segments
  - a. 5 Feet Longitudinally
  - b. 5 Feet Transversely

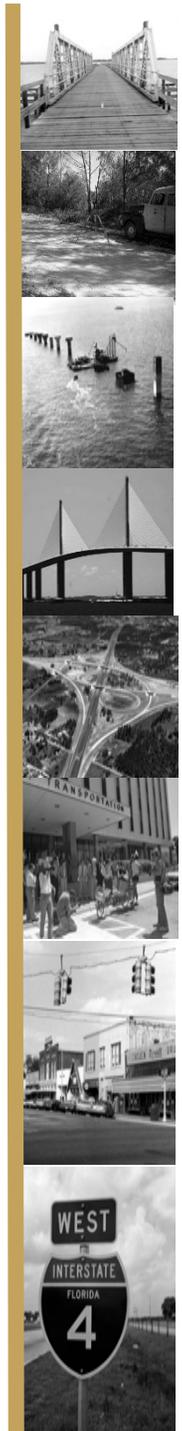


# Lighting Criteria

- Signalized Intersection Segments

Table 7.3.1 Conventional Lighting – Roadways  
Signalized Intersections

ROADWAY CLASSIFICATIONS	ILLUMINATION LEVEL AVERAGE INITIAL HORIZONTAL FOOT CANDLE (H.F.C.)	ILLUMINATION UNIFORMITY RATIOS		VEILING LUMINANCE RATIO
		AVG./MIN.	MAX./MIN.	<del><math>L_v(\text{max})/L_{\text{avg}}</math></del>
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



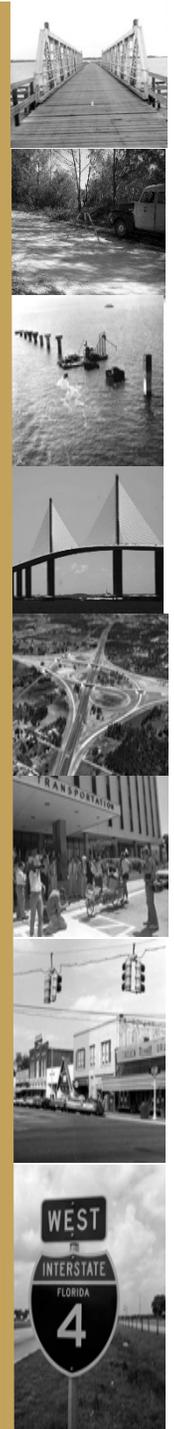
# Lighting

- Signalized Intersection Segments w/High Pedestrian Traffic

Table 7.3.3 Intersection Lighting With High Pedestrian Traffic

ROADWAY CLASSIFICATIONS	ILLUMINATION LEVEL AVERAGE INITIAL FOOT CANDLE		ILLUMINATION UNIFORMITY RATIOS		VEILING LUMINANCE RATIO
			AVG./MIN.	MAX./MIN.	$L_v(\max)/L_{avg}$
MAJOR ARTERIALS	Horizontal (H.F.C.)	3.0	4:1 or Less	10:1 or Less	0.3:1 or Less
	Vertical (V.F.C.)	2.3*	N.A.	N.A.	N.A.

**Note:** \* Vertical illumination value is only valid for new projects or where the intersection is being reconstructed. The vertical illumination is a target value and may not be achievable for all traffic movements.



# Signalized Intersection Design

## Illuminance Values

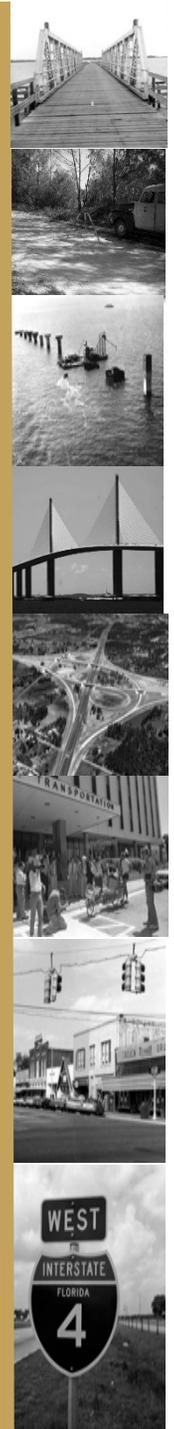
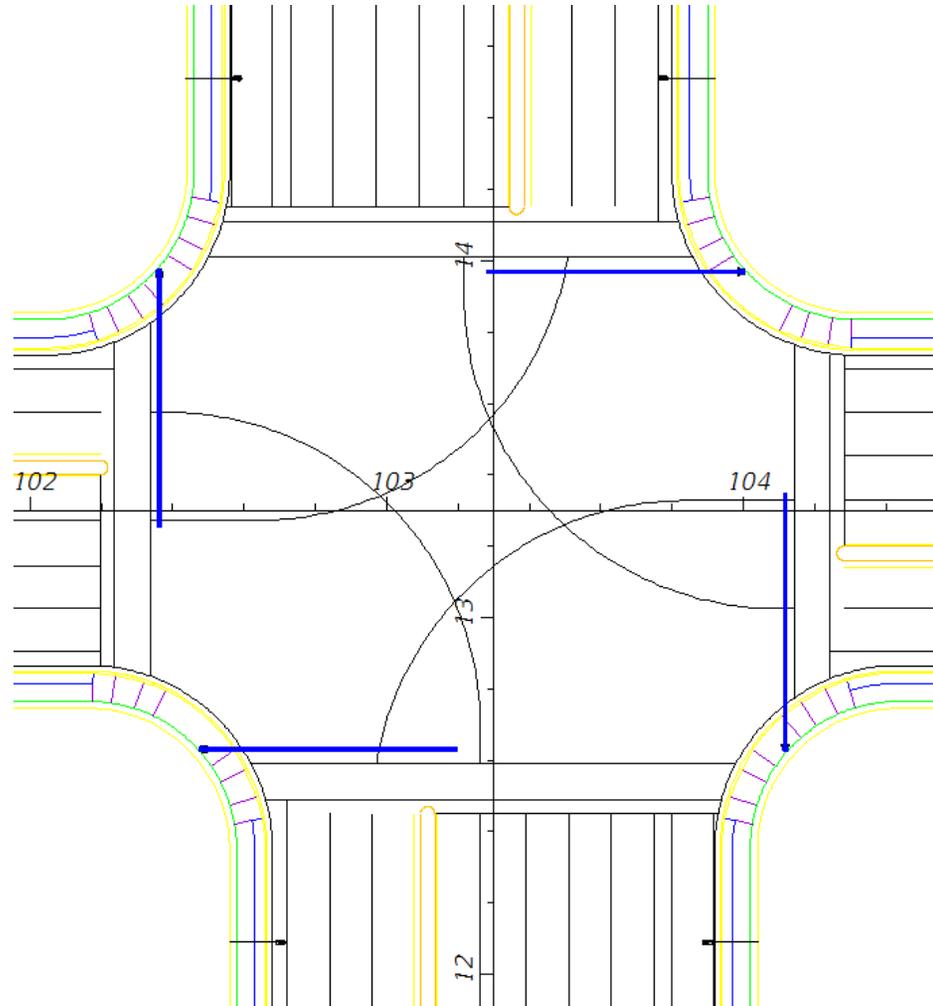
Avg. = 0.73 fc

Max. = 2.17 fc

Min. = 0.05 fc

Avg./Min. = 14.6

Max./Min. = 43.4



# Signalized Intersection Design

## Illuminance Values

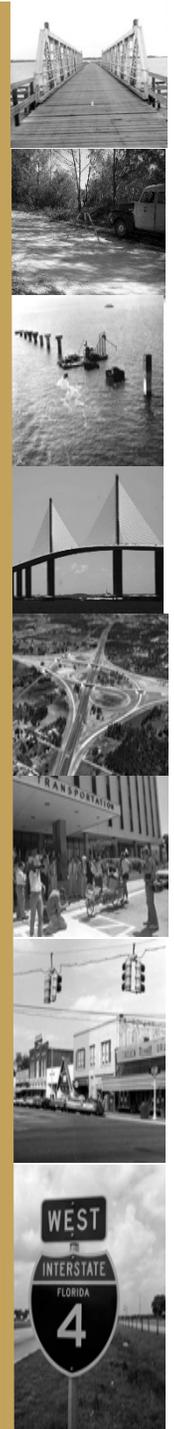
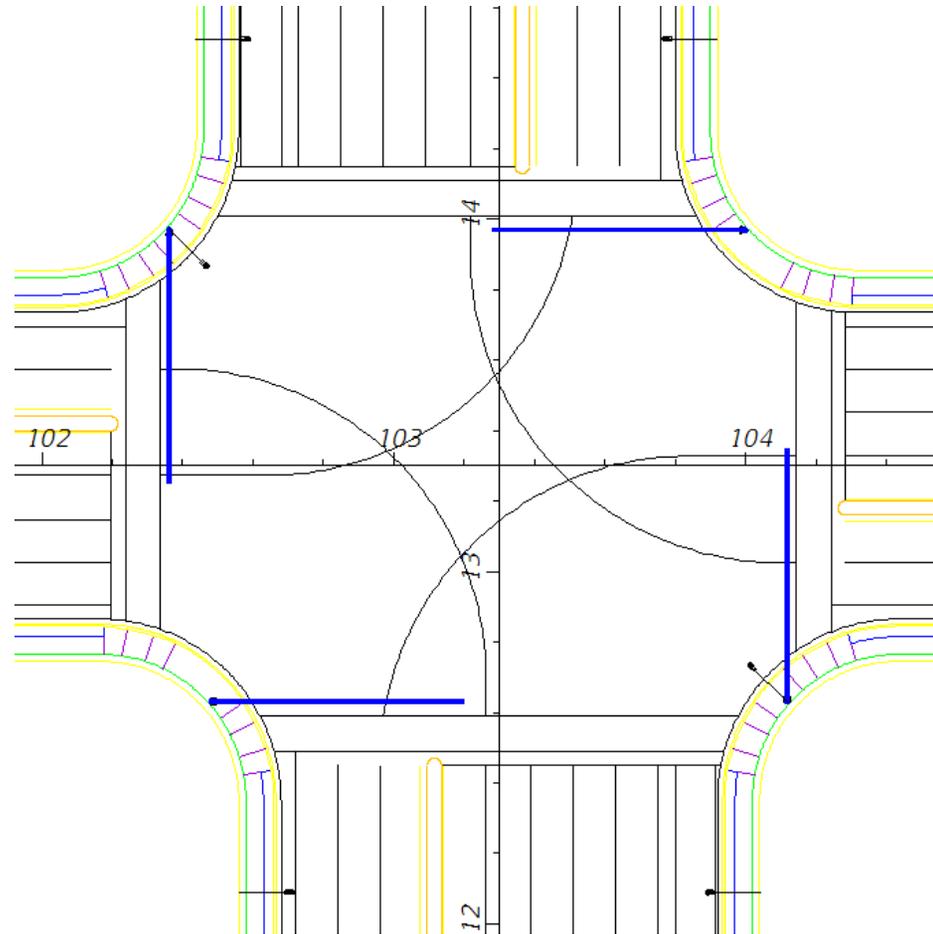
Avg. = 1.49 fc

Max. = 5.78 fc

Min. = 0.46 fc

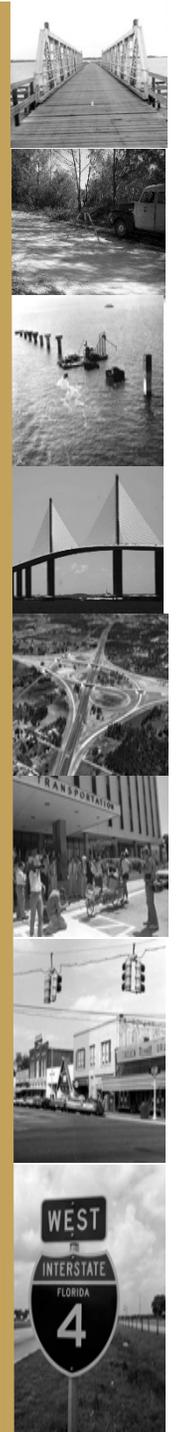
Avg./Min. = 3.2

Max./Min. = 12.6



# Signalized Intersection Design

[dsgnrd03 - Signalized Horiz Calcs2.AGI](#)

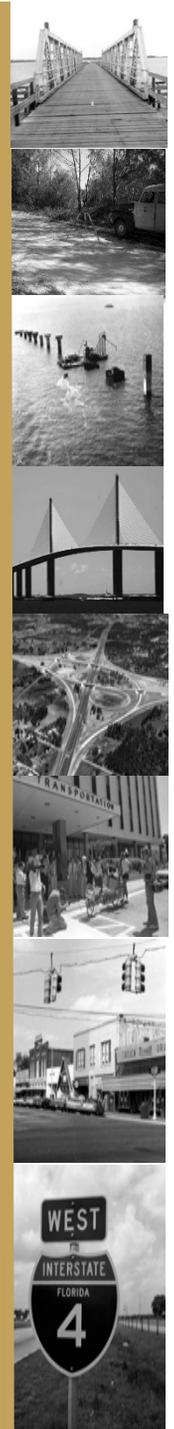


# Signalized Intersection Design w/High Pedestrian Traffic

Table 7.3.3 Intersection Lighting With High Pedestrian Traffic

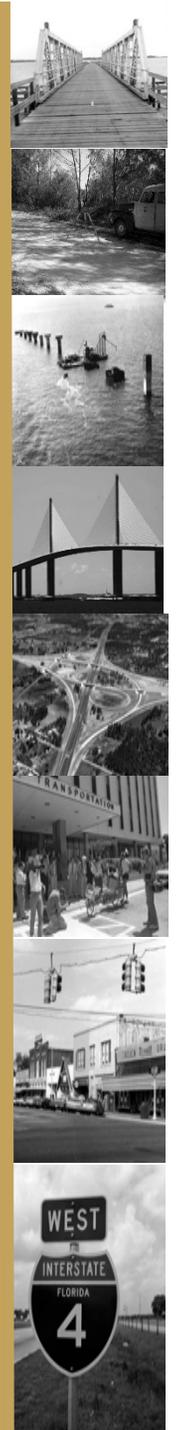
ROADWAY CLASSIFICATIONS	ILLUMINATION LEVEL AVERAGE INITIAL FOOT CANDLE		ILLUMINATION UNIFORMITY RATIOS		VEILING LUMINANCE RATIO
			AVG./MIN.	MAX./MIN.	$L_v(\text{max})/L_{\text{avg}}$
MAJOR ARTERIALS	Horizontal (H.F.C.)	3.0	4:1 or Less	10:1 or Less	0.3:1 or Less
	Vertical (V.F.C.)	2.3*	N.A.	N.A.	N.A.

**Note:** \* Vertical illumination value is only valid for new projects or where the intersection is being reconstructed. The vertical illumination is a target value and may not be achievable for all traffic movements.



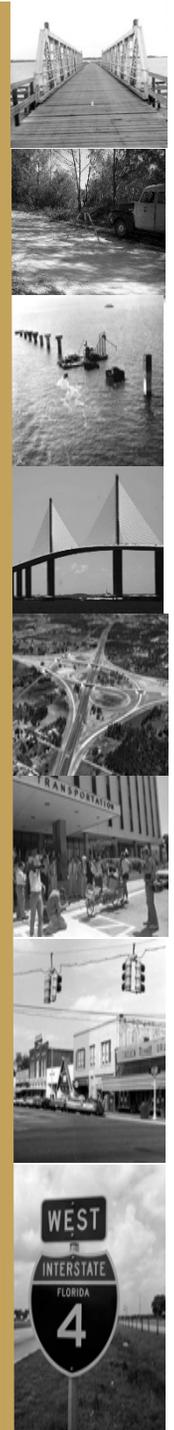
# Signalized Intersection Design w/High Pedestrian Traffic

The visibility of pedestrians in crosswalks is a function of the **background Illuminance**, **luminaire location** in relation to the approach vehicle, **luminaire mounting height**, the **distance from the luminaire to the crosswalk** and the **photometrics of the luminaire**.



# Signalized Intersection Design w/High Pedestrian Traffic

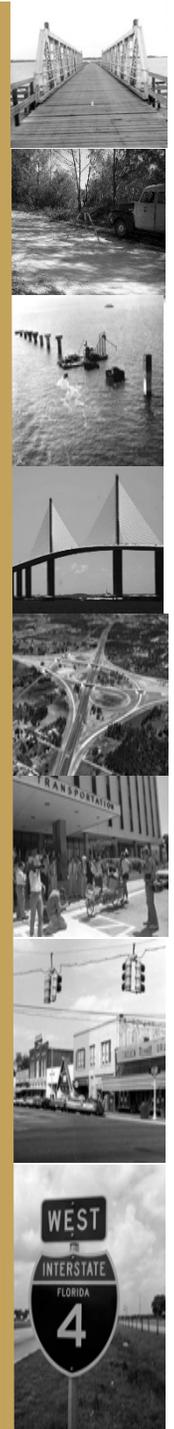
Vertical Illuminance is the primary design value to be used to measure pedestrian visibility.



# Signalized Intersection Design w/High Pedestrian Traffic

The vertical illuminance calculation method to be used at intersections will be the variable light meter aimed toward the driver's location.

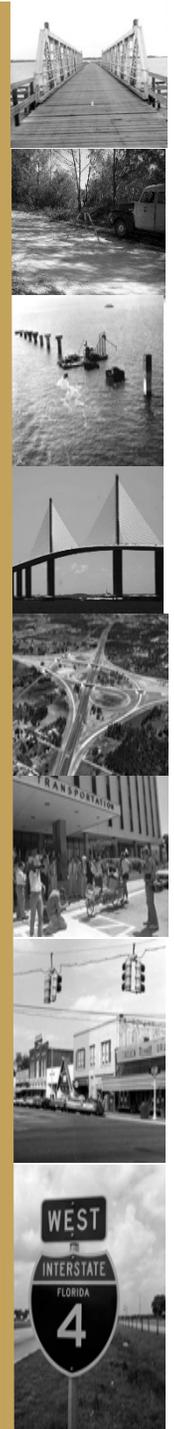
The driver's location from the approach to the crosswalk is established based on the stopping sight distance for the posted approach speed.



# Signalized Intersection Design w/High Pedestrian Traffic

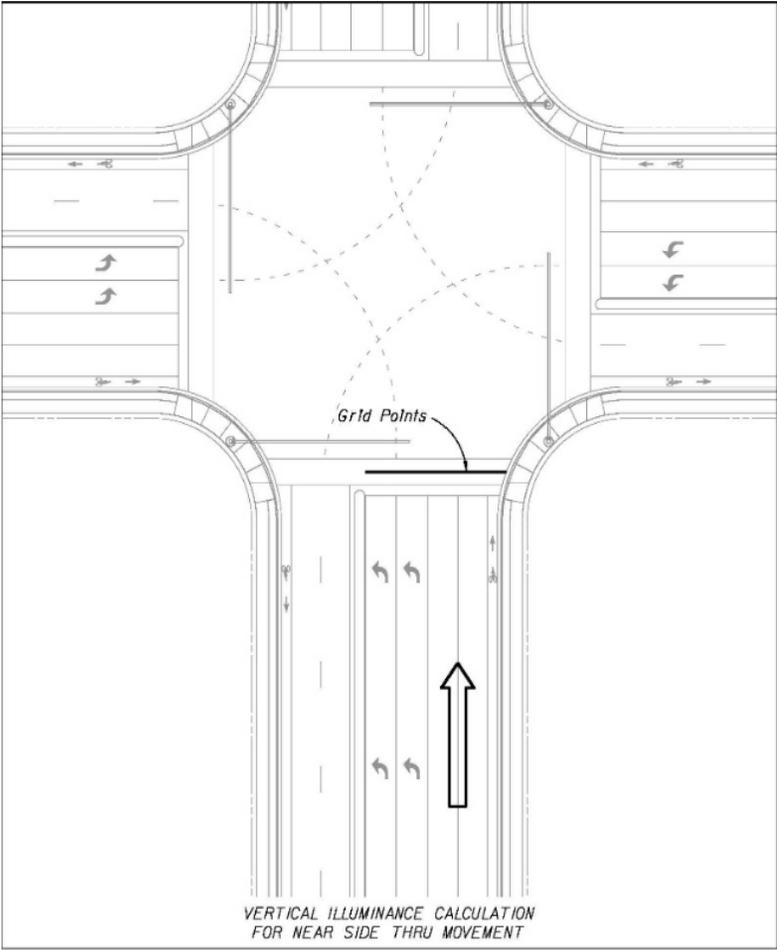
The vertical illuminance method must be calculated for three movements at the intersection.

1. Near Side Crosswalk Approach
2. Right Turn Movement
3. Left Turn Movement



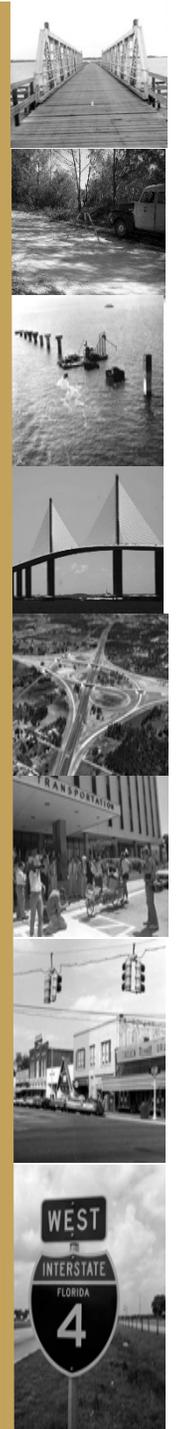
# Analysis Zones

- Near Side Approach



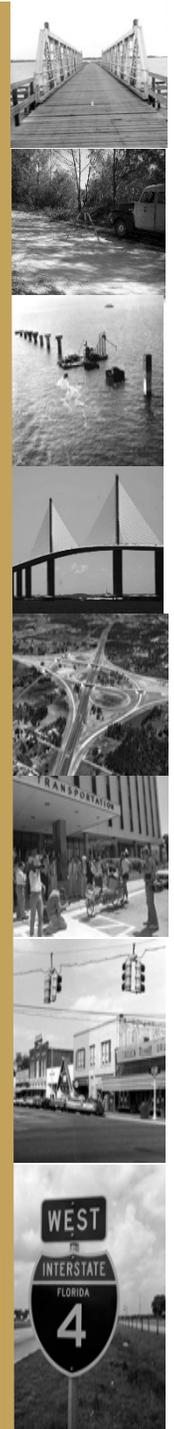
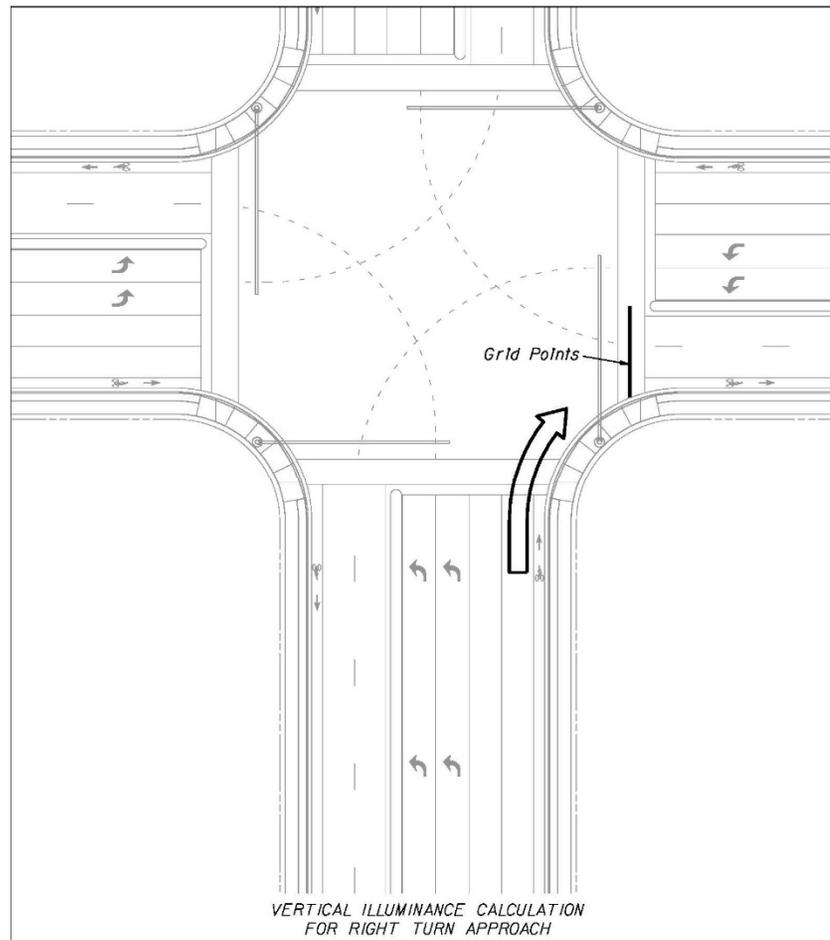
# Signalized Intersection Design

[dsgnrd03 - Vertical Cals - Near Crosswalk.AGI](#)



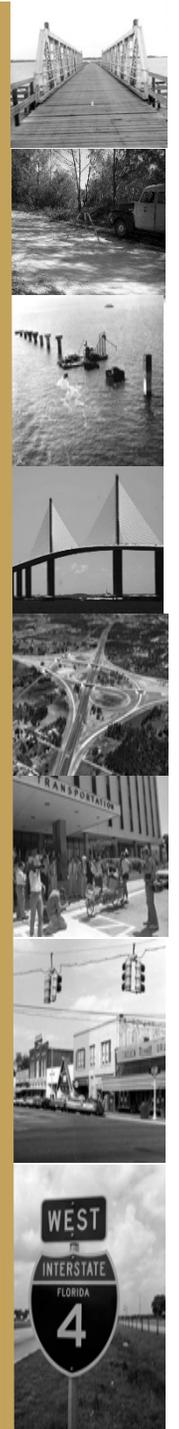
# Analysis Zones

- Right Turn Movement



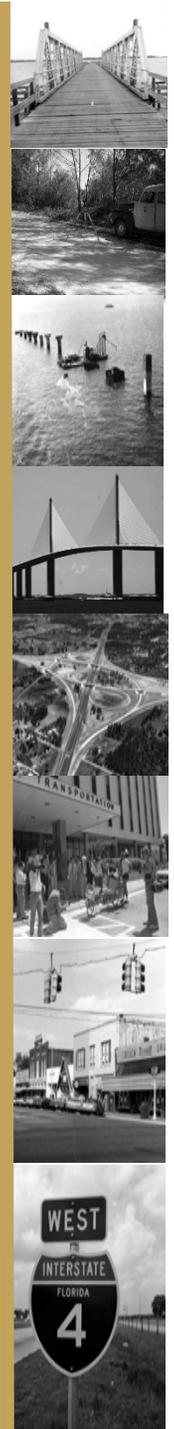
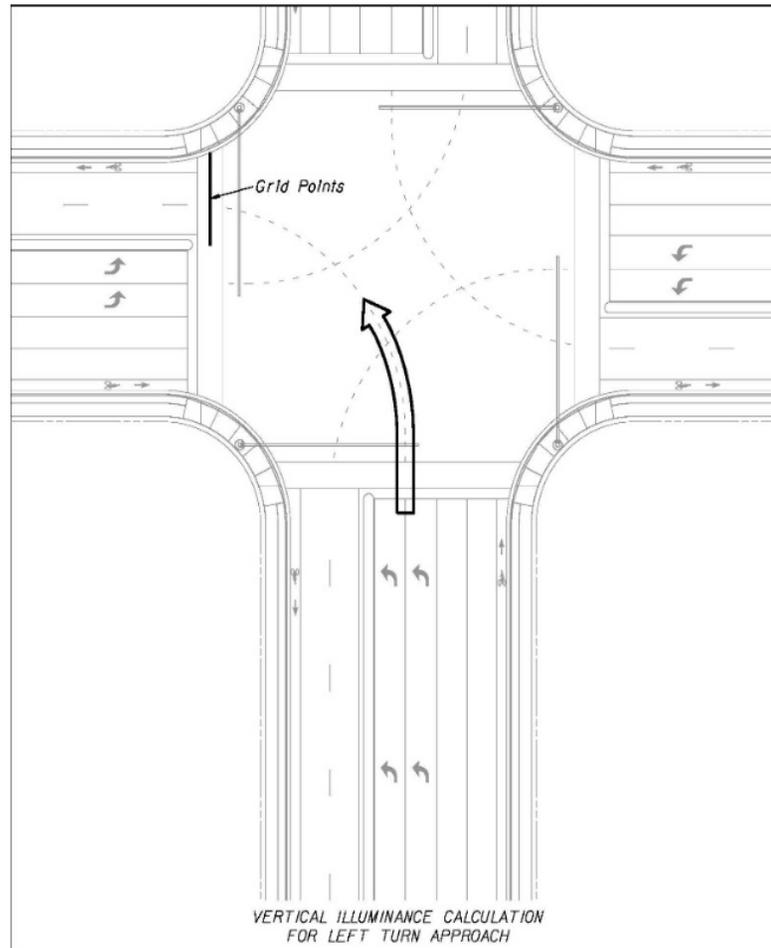
# Signalized Intersection Design

[dsgnrd03 - Vertical Cals - Right Turn  
Crosswalk.AGI](#)



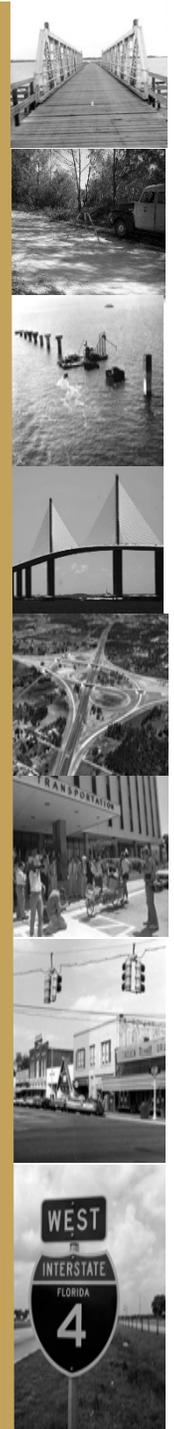
# Analysis Zones

- Left Turn Movement



# Signalized Intersection Design

[dsgnrd03 - Vertical Cals - Left Turn  
Crosswalk.AGI](#)



# Signalized Intersection Design w/High Pedestrian Traffic

## Illuminance Values

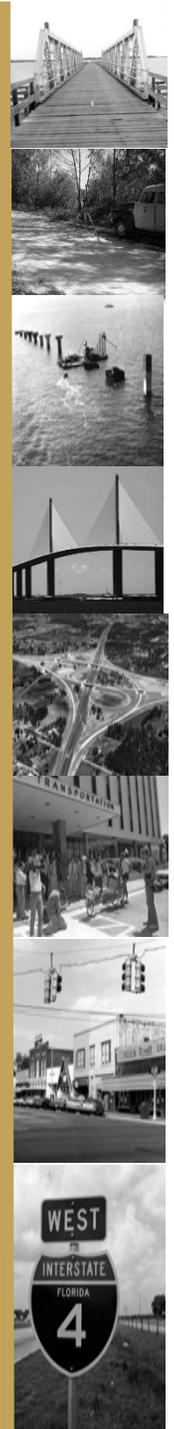
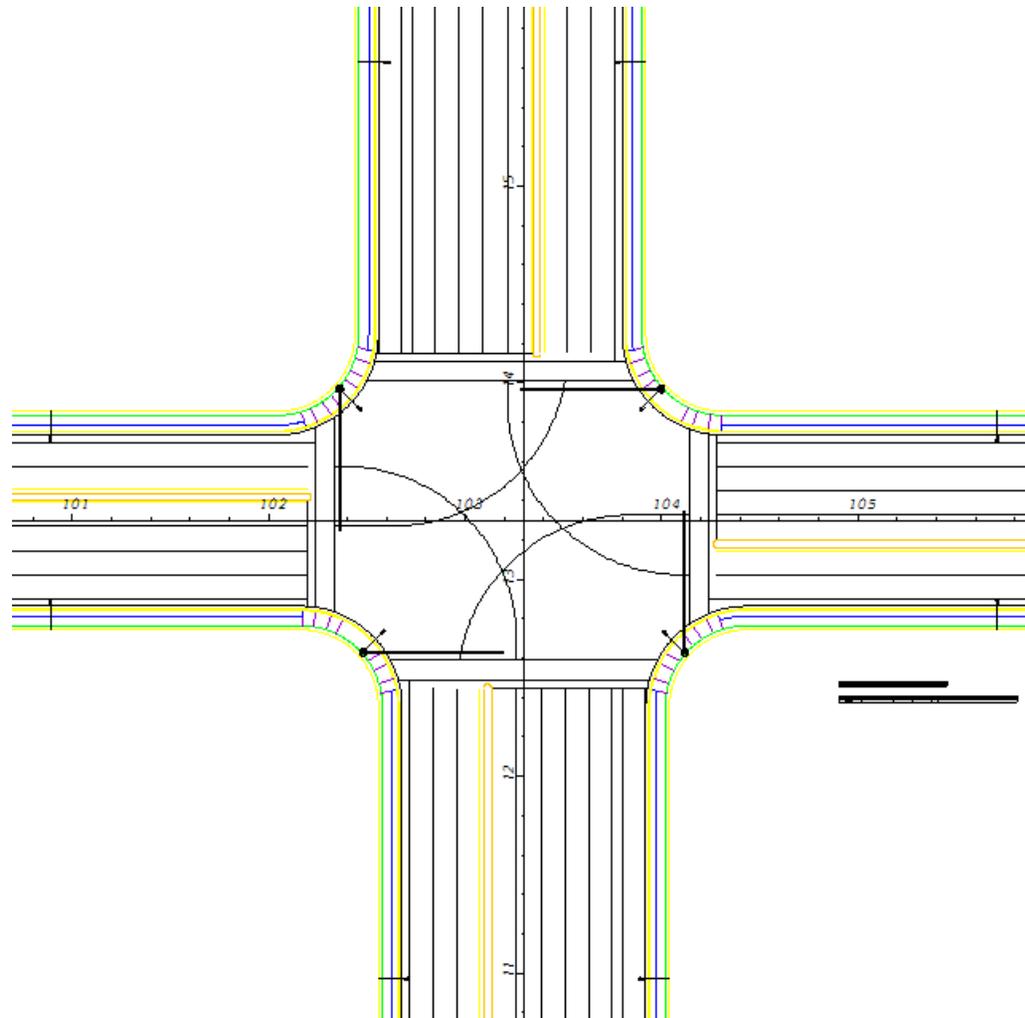
Avg. = 2.74 fc

Max. = 6.04 fc

Min. = 0.73 fc

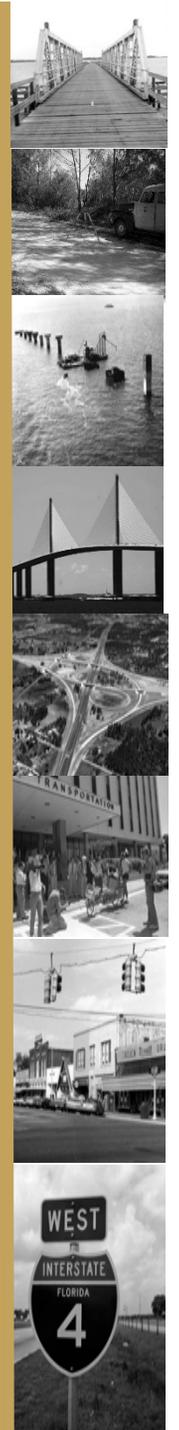
Avg./Min. = 3.8

Max./Min. = 8.3



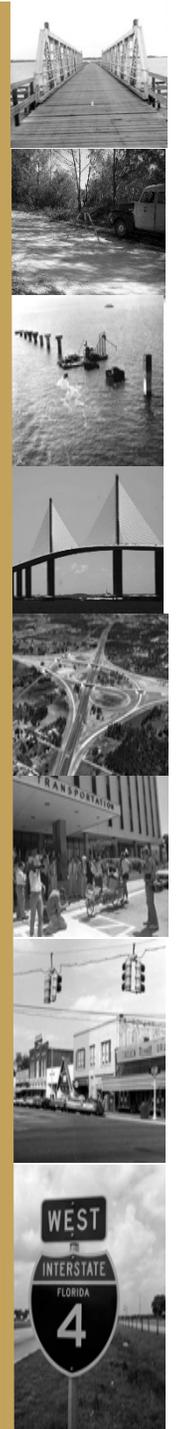
# Signalized Intersection Design w/High Pedestrian Traffic

[dsgnrd03 - Pedestrian Horiz.AGI](#)



# Pedestrian Lighting Challenges

- Intersection Luminaire Photometrics
- High Overall Lighting Levels
- Transition Lighting Requirements



# Questions

Chester A. Henson, P.E.  
State Traffic Standards Engineer  
[Chester.Henson@dot.state.fl.us](mailto:Chester.Henson@dot.state.fl.us)  
(850) 414-4117

