



### **ROADWAY LIGHTING**

presented by

Florida Transportation Engineering, Inc.



November 30, 2022



### Oliver Remy Rodrigues, P.E., PTOE

### Ryan Anloague, P.E.





# OLIVER REMY RODRIGUES, P.E., PTOE TRAFFIC DESIGN GROUP MANAGER

- 31 Years of Experience
- Lighting, Signalization, ITS, Signing & Pavement Marking & Traffic Studies
- New & Retrofit Street Lighting, Traffic Signals & ITS, Mid-block Pedestrian Crossings (RRFB/PHB)

#### Notable Projects:

- Miami-Dade Design Build South Corridor BRT
- Charlotte County, Countywide Lighting Retrofit
- District Four, Broward County, SR A1A Lighting Retrofit
- District Five, Seminole County, SR 46 Lighting Justification Report





## RYAN ANLOAGUE, P.E. TRAFFIC DESIGN ENGINEER

- 6 Years of Experience
- Light Analysis, Intersection Signal Design w/Pedestrian Features, Signing and Pavement Marking
- New & Retrofit Street Lighting, Traffic Signals (Mast Arms/Box Spans), Mid-block Pedestrian Crossings (RRFB/PHB), ITS

#### Notable Projects:

- Miami-Dade Design Build South Corridor BRT
- Charlotte County, Olean Boulevard, from US 41 to Easy Street
- Charlotte County, CR 771 (Gasparilla Rd.) at Marathon Blvd. Intersection Design
- District Seven/City of Tampa, Central Avenue Bikeway





### **DESIGN CONSIDERATIONS**

- Understanding the project
  - Segments, signalized intersections or midblock crossings
  - Conventional or decorative lighting
- Collect available information
  - As-built plans
  - Maintenance agreement (FDOT)
- Collect R/W and topo survey
- Aerials and GPS coordinates
  - Stand-alone lighting retrofit projects

Disclaimer





### **DESIGN CONSIDERATIONS**

- Utility Coordination
  - Allow time to collect green lines
  - Confirm clearance distance requirements (lateral and above)
  - Coordination during construction
- Budget for SUE where needed







## **DESIGN CONSIDERATIONS**

Conduct day/night field review

 Damage, obstructions, load
 center, power source, swales





### **CONVENTIONAL LIGHTING**

- Aluminum pole, concrete, or timber
- Single-arm or dual arm
- Shoulder mount, bridge mount, barrier wall
- T-base, cylindrical concrete foundation, spread footer, helical screw-in foundation
- Budget for structural design for special foundations









### **DECORATIVE LIGHTING**

- Various pole types
- Single-arm or dual arm
- Shoulder mount, bridge mount, barrier wall
- T-base, cylindrical concrete foundation, spread footer, helical screw-in foundation
- Budget for structural design for special foundations



### **ENVIRONMENTAL SENSITIVE LIGHTING**

- Refer to FWC criteria
- Refer to the FDOT criteria
- Amber color temp
- Types of species Hawk Moth, Sea Turtle, Florida Panther, Gray Fox



## **ENVIRONMENTAL SENSITIVE LIGHTING**

- Amber LED
- Types of Shielding skirt, louvers









### New Lighting or Retrofit

### New Lighting

- New circuits
- New power service
- Uniform mounting height and arm length
- Standard LED luminaire
- Lower power cost
- Less maintenance

#### Retrofit

- Existing circuits & power service
- Fixed mounting heights and arm lengths
- Lighting analysis iterative process
- Various luminaires
- Low implementation cost
- May require additional poles
- Installation by power provider





- Green Book criteria
- Local Agency Lighting Preferences
- Florida Design Manual
- FDOT Design Bulletins





• Green Book criteria

#### - Road Surface Classification

Topic # 625-000-015 Manual of Uniform Minimum Standards for Design, Construction and Maintenance for Streets and Highways 2018

Table 6 – 1	Road Surface Classifications

Class	Q0*	Description	Mode of Reflectance
R1	0.10	Portland cement concrete road surface. Asphalt road surface with a minimum of 12% of the aggregates composed of artificial brightener or aggregates.	Mostly diffuse
R2	0.07	Asphalt road surface with an aggregate composed of minimum 60% gravel (size greater than 0.4 in.). Asphalt road surface with 10 to 15% artificial brightener in aggregate mix. (Not normally used in North America).	Mixed (diffuse and specular)
R3	0.07	Asphalt road surface (regular and carpet seal) with dark aggregates (e.g., trap rock, blast furnace slag); rough texture after some months of use typical highways).	Slightly specular.
R4	0.08	Asphalt road surface with very smooth texture.	Mostly specular.

\* Q<sub>0</sub> = representative mean luminance coefficient.



- Green Book criteria
  - Illuminance and Luminance





• Green Book criteria

#### - Illuminance and Luminance

	Off Deadway		ш	uminance Me	thod		ı	Additional Values (both Methods)		
Roadway and Walkway	Light Sources	Av	erage Maintai (Horiz	ined Illuminar contal)	nce	Illuminance Uniformity	Averag	Veiling Luminance		
Classification		R1	R2	R3	R4	Ratio	Lavg	Unifo	ormity	Rado
	General Land Use	(foot -candles) (min)	(foot- candles) (min)	(foot- candles) (min)	(foot- candles) (min)	avg/min (max) (6)	cd/m2 (min)	Lavg/Lmin (max)	Lmax/Lmin (max)	Lv(max)/Lavg (max) <sup>(3)</sup>
	Commercial	1.1	1.6	1.6	1.4	3:1	1.2	3:1	5:1	0.3:1
Principal Arterials (partial or no control	Intermediate	0.8	1.2	1.2	1.0	3:1	0.9	3:1	5:1	0.3:1
of access)	Residential	0.6	0.8	0.8	0.8	3:1	0.6	3.5:1	6:1	0.3:1
Minor	Commercial	0.9	1.4	1.4	1.0	4:1	1.2	3:1	5:1	0.3:1
Arterials	Intermediate	0.8	1.0	1.0	0.9	4:1	0.9	3:1	5:1	0.3:1
	Residential	0.5	0.7	0.7	0.7	4:1	0.6	3.5:1	6:1	0.3:1
0.1	Commercial	0.8	1.1	1.1	0.9	4:1	0.8	3:1	5:1	0.4:1
Collectors	Intermediate	0.6	0.8	0.8	0.8	4:1	0.6	3.5:1	6:1	0.4:1
	Residential	0.4	0.6	0.6	0.5	4:1	0.4	4:1	8:1	0.4:1
	Commercial	0.6	0.8	0.8	0.8	6:1	0.6	6:1	10:1	0.4:1
Local	Intermediate	0.5	0.7	0.7	0.6	6:1	0.5	6:1	10:1	0.4:1
	Residential	0.3	0.4	0.4	0.4	6;1	0.3	6:1	10:1	0.4:1
All	Commercial	0.4	0.6	0.6	0.5	6:1	0.4	6:1	10:1	0.4:1
Alleys	Intermediate	0.3	0.4	0.4	0.4	6:1	0.3	6:1	10:1	0.4:1
	Residential	0.2	0.3	0.3	0.3	6:1	0.2	6:1	10:1	0.4:1
				Co	ontinued next p	bage				

#### Table 6 – 2 Illuminance and Luminance Design Values

Lighting

6-9



• Green Book criteria

#### - Illuminance and Luminance

				Illun	T ninance and	able 6 – 2 d Luminand (Continued	e Design Va	lues						
C'1 "		Commercial	0.9	1.3	1.3	1.2	3:1							
Sidewalks		Intermediate	0.6	0.8	0.8	0.8	4:1	Use illuminance						
		Residential	0.3	0.4	0.4	0.4	6:1	requirements						
Pedestrian Ways nd Bicycle Ways <sup>(2)</sup>		All	1.4	2.0	2.0	1.8	3.1							
	1. 2.	Meet either the illuminance an Assumes a se walkway/bikey	e Illuminance o d Luminance o parate facility.	lesign method design method For Pedestria	requirements s. n Ways and B	or the Luminan	ce design metho jacent to roadwa	od requirements and meet veiling luminance requirements for both ay, use roadway design values. Use R3 requirements for						
Notes	3.	<ol> <li>Lv (max) refers to the maximum point along the pavement, not the maximum in lamp life. The Maintenance factor applies to both the Lv term and the Laviterm.</li> </ol>												
Notes	4.	There may be agency to mitig	situations whe gate off-roadw	en a higher leve ay sources.	el of illuminand	ce is justified. T	he higher values	s for freeways may be justified when deemed advantageous by th						
	5.	Physical road	way conditions	may require a	djustment of s	pacing determi	ned from the bas	se levels of illuminance indicated above.						
	1	<ol><li>Higher uniformity ratios are acceptable for elevated ramps near high-mast poles.</li></ol>												
	6.	right union		7. See AASHTO publication entitled. "A Policy on Geometric Design of Highways and Streets" for roadway and walkway classifications.										
	6. 7.	See AASHTO	publication en	titled, "A Policy	on Geometrie	c Design of Hig	hways and Stree	ets* for roadway and walkway classifications.						

Lighting

6-10



• Local Agency Lighting Preferences





- Florida Design Manual
- FDOT Design Bulletins







#### • Florida Design Manual 231.2.1 Table

Roadway Classification	Illumination L Foot 0	evel Average Candle	Illuminatior Rat	n Uniformity tios	Veiling Luminance Ratio							
Or Project Type	Horizontal (H.F.C.)	Vertical (V.F.C.)	Avg./Min.	Max./Min.	Lv(max)/Lavg							
	c	Conventional Lig	ghting									
Limited Access Facilities	1.5											
Major Arterials	1.5	N/A	4:1 or Less	10:1 or Less	0.3:1 or Less							
Other Roadways	1.0											
		High Mast Ligh	nting									
All Roadway Classifications	0.8 to 1.0	N/A	3:1 or Less	10:1 or Less	N/A							
Signalized Intersection Lighting												
New or Reconstruction	3.0 Std. 1.5 Min.	1.5 Std. 1.2 Min.	4:1 or Less	10:1 or Less	N/A							
Lighting Retrofit	1.5 Std. 1.0 Min.	1.5 Std. 1.0 Min.										
	Midk	olock Crosswall	< Lighting									
Low Ambient Luminance	N/A	2.3	N/A	N/A	N/A							
Medium & High Ambient Luminance		3.0										
	Sidew	alks and Shared	d Use Paths									
Facilities Separated from the Roadway	2.5	N/A	4:1 or Less	10:1 or Less	N/A							
		Sign Lightin	g									
Low Ambient Luminance	15-20			6:1	<b>N</b> 1/0							
Medium & High Ambient Luminance	25-35	N/A	N/A	6:1	N/A							
		Rest Area Ligh	nting									
All Roadways and Parking Areas	1.5	N/A	4:1 or Less	10:1 or Less	N/A							



#### • FDM 231.2.1 Table

Roadway Classification	Illumination L Foot (	.evel Average Candle	Illuminatior Rat	Veiling Luminance Ratio								
Or Project Type	Horizontal Vertical (H.F.C.) (V.F.C.)		Avg./Min.	Max./Min.	Lv(max)/Lavg							
Wildlife-Sensitive Conventional Lighting												
Limited Access Facilities	0.8-1.0	N/A	4.1	10:1	0.3:1 or Less							
Arterials and Collectors	1.0-1.5	N/A	4.1 OF Less	10:1 Of Less								
Signalized Intersection - New	1.5-3.0	1.0 Min.	4:4	10:1								
Signalized Intersection - Retrofit	1.0-1.5	1.0 Min.	4:1 of Less	10:1 OF Less	N/A							
N	ote: Illumination	Uniformity Ratio	os do not apply to	v.F.C								



• FDM Table 231.2.2

Minimum Mounting	Maximum Candela of Luminaire									
Height (ft.)	Long Distribution	Medium Distribution	Short Distribution							
20 or Less	5,000	10,000	15,000							
25	10,000	15,000	20,000							
30	15,000	20,000	25,000							
35	20,000	25,000	30,000							
40	25,000	30,000	35,000							
45	30,000	35,000	40,000							
50	35,000	40,000	45,000							
Note:										

Distribution refers to the longitudinal distribution of the luminaire.



- GE Atlas Software
- Visual Software
- AGi32 Software





- GE Atlas Software
  - Roadway Tool
  - Geometric Characteristics
  - Setback
  - Mounting Height
  - Arm Length
  - Fixture



- Visual Software
  - Roadway Tool
  - Geometric Characteristics
  - Setback
  - Mounting Height
  - Arm Length
  - Fixture



### • Visual Software



IEWS	
isual Lighting Software Update (2.11.0094)	
xing CAD Files in AutoCAD	
xing CAD Files in Visual	
ideo: Fix Dark Screen (Intel Video Card)	
ideo: View Manager	
ideo: Optimizing Graphics Performance	

#### PRODUCTS



SPX Available with NanoPrismatix™ (LUGR) Lens



New IOTA® IP-Rated Emergency Drivers for Damp, Wet, and NSF!



New Performance Packages Added to RSXF1 and RSXF2!



х

• Visual Software

#### - Fixture product selection





• Visual Software

#### - Geometric Characteristics





- Visual Software
  - Luminaire Schedule

SCHEDU	LE											
New	Copy Delete	Import Expor	t Columns Rows Row U	Row Down Labels	Templates Report LLF							
	Symbol	Label	Quantity Manufacturer	Catalog Number	Description	Lamp	Filename	Number Lamps	Lumens Per Lamp	Lumen Multiplier	Light Loss Factor	Wattage
1	0	EXIST1	0 American Electric Lighting	ATBS P10 XXXXX D3 3K	EXISTING: Autobahn ATBS, P10 Performance Package, Type III Drop Refractor, 3000K CCT, 70 CRI Min. (6' Arm)		ATBS_P10_XXXXX_D3_3K.ies	1	Absolute	1.00	1.00	40.0
2 {	в 3 •	TECO A	0 American Electric Lighting	ATEMIC 108LEDE15 XXXX R2 3K	X 47W MIC, Type 2, 3000K (Medium, 5283.0 Lum, 6' Arm)	LED Array	TSN 2129227.ies	1	Absolute	1.00	0.81	52.0
3	0	TECO 1	4 American Electric Lighting	ATEO 30BLEDE 10 XXXXX R 3K	2 ATB0 SERIES LED 1000MA TYPE 2 3000K CCT	LED Array	0_30BLEDE10_XXXXX_R2_3K	4	Absolute	1.00	1,00	105.0
	۵	TECO 2	ì				TSN 2129227,ies	1	Absolute	1.00	1.00	52.0
4 <		10.1									1	2



- Visual Software
  - Roadway Tool

- Cols	Visual	Roadway	Fool™	0	Acuit	<b>y</b> Bra	ands
Settings       Jinits     Feet - Footcandles       Precision     0.0       Standard     IESNA RP 8       Road Surface     R3 - Asphalt (typical)       Road Class     Local       Pedestrians     Low       Double     Double	۵			Display Till Spacing Quantity Roadway Lu Average Max Min Ave/Min Max/Min	218 10 Left uminance [-] 1.2 2.9 0.4 [-] 3.1 [-] 7.3 [-] 0.4	feet Right 1.2 2.9 0.4 3.1 7.3 0.4	cd/m <sup>2</sup> cd/m <sup>2</sup>
Lanes Left Median Right Width 12 10 12 Quantity 2 2 Sidewalk Width 5 5 Setback 4 Bikelane Width 5 5 Setback 4				STV Roadway III Average Max Min Ave/Min Sidewalk III Average Ave/Min Bikelane III Average Ave/Min Ev Min Ev Min	10.4] 0.4 4.4 luminance [0.4] 2.1 4 [-] 0.4 [6] 6 11.4 luminance 1.8 11.4 0.1 uminance 2.1 8.6 0.1	2.1 4 0.4 6 11.4 2.1 8.2 0.1 2.2 6.9 0.1	fc fc fc fc fc fc
A Configuration	ectric Lighting ATB2 P601 R3 3K Single V Light Lo Support	ss Factor 1 Length 1	Lamp Quantity Lumens Per Lamp	1 25200	0	ß	5



• Visual Software

#### - Roadway Tool Results

Visual - Roadw	ay Tool				www.Wesual-3D.com	
Design Informatio Project Name Project Description	n			Wed User Name Company Name Your Phone Your Email	nesday, November 23, 2022	
Roadway						
Calculation Method Road Surface	RP-8-2000 20 R3	07 errata	Median Width	10 ft		
Road Class Pedestrians Roadway Length	Local Low 1,000 (10 Pol	e Locations)	Sidewalk Width Setback	Left: 5 ft Left: 4 ft	Right: 5 ft Right: 0 ft	
Lane Quantity Lane Width	Left: 2 Left: 12 ft	Right: 2 Right: 12 ft	Bikelane Width Setback	Left: 5 ft Left: 0 ft	Right: 5 ft Right: 0 ft	
Luminaire Inform	mation					
Left Side - Americ	an Electric Lig	hting: ATB2 P60	01 R3 3K			
Cycle Spacing: Setback: Orientation: Mounting Height: Staggered: Light Loss Factor:	217,83 ft 15 ft 90 30 ft False 1	Configuration: Arm Length: Tilt: Lamp Lumens: Wattage: Lamp Count:	Single 1 ft 0 25200 175 1		0	
					<ul> <li>= - 0° H</li> <li>= - 90° H</li> <li>= - Max Cd: 60° H</li> </ul>	
Right Side - Ameri	can Electric L	ighting: ATB2 Pe	01 R3 3K			
Cycle Spacing: Setback: Orientation: Mounting Height: Staggered: Light Loss Factor:	217,83 ft 15 ft 270 30 ft True 1	Configuration: Arm Length: Tilt: Lamp Lumens: Wattage: Lamp Count:	Single 1 ft 0 25200 175 1			



- Visual Software
  - Roadway Tool Results

Visual -	- Roadway Tool												X
G Back	Print												
		Visual - Ro	adwa	ay To	ool					······ Wis	ual-30.com	A	^
						ш	uminance						
		Calculation	Resul	ts									
		Luminance	Left	Right		Illuminance	Left	Right	Sidewalk	Left	Right		
		Average: Max: Min	1.2 2.9 0.4	1.2 2.9 0.4	cd/m <sup>2</sup> cd/m <sup>2</sup> cd/m <sup>2</sup>	Average: Max: Min	2.1 4 0.4	2.1 4 0.4	fc Average: fc Min fc Ave/Min:	1.8 0.2 11.4	2.1 0.3 8.2	fc fc	
		Ave/Min: Max/Min:	3.1	3.1		Ave/Min: Max/Min:	6 11.4	6 11.4	Ev Min: Bikelane	0.1	0.1	fc	
		STV:	4.4	4.4					Average; Min Ave/Min:	2.1 0.2 8.6	2.2 0.3 6.9	fc fc	
									Ev Min:	0.1	0.1	fc	



- AGi32 Software
  - Roadway Tool
  - Geometric Characteristics
  - Setback
  - Mounting Height
  - Arm Length
  - Fixture
  - FDOT preferred software



• AGi32 Software

#### - Define luminaires

fine Luminaire				×
🕽 Instabase 🔹 🌍 Audit 👻 💱 Downloaded 🏾 🎒 Collection 👔	🕉 Select 👪 Find 🛛 ,	Smart Symbols	🖌 Auto Define	
Defined Luminaires - Drag-and-drop here! Use Alt+Arrows keys to reorder list				Close
Label Tag	Description	A 7	Le	Usis
	American Electric A ( B) American Electric ATB)	0, Type III, 16789Lum, 0 Tupe III, 19419Lum	3000K,105W,10 Am U 3000K 125W 10'Am 1	
ATB0_P453_R3_3K L3	American Electric ATB	0, Type III, 24088Lum,	3000K, 159W, 10' Arm 0	Relabel
ATB0_P305_R4_3K L4	American Electric ATB	0, Type IV, 20048Lum,	3000K, 145W, 10' Arm 7	Daluia
				Delete
<			>	Add/Redefine
General		Pole or	F Pendant Mounted	
abel ATBO P451 R3 3K 🗸 Tag L1		@ Dynam	ic: Attach to Z=	
Description American Electric ATB0. Type III. 16789Lum. 3000K. 105W. 10	)'Arm 👻 Default:	s., I C Static	length =	
Jofinition			Tonaor -	
umens Per Lamp N & Number Of Lamps 1	Arrangement	Symbols	- Anderson	
uminaire Lumens 10700 Efficiency (%)	SINGLE	SHOEBOX	Hender Mode	
unindic Lunchs [16763 Lunch cy (e) [N.A	••>		Housing	
			Luminous	
otal LLF 1.000 Specify	C. A	[SUDEBOY	Model Mode	
X Y Z	Arm Length 10	SHOEBOX	Model Mode	
Luminous Box: LLHC -0.495 -0.34 -0.01		<u></u>	Line Width/Color	
URHC 0.495 0.34 0			Pixel	
Photometric File		6.5	U. C. 100	
Description Classification LCS	1	un Lan	Jela ( LLS	
Filename: C:\ProgramData\AG132\PhotometricData_FilesFromJobFile\\AT & [TEST] CSA 700P42 [TESTLAB] CSA GROUP [ISSUEDATE] 3/4/2021 [MANUFAC] American Electric Lighting [LUMCAT] ATB0 P451 R3 3K [LUMINAIRE] Autobahn Small P451 Package Roadway Type III 3000K IESNA:LM-63-2002 [DISTRIBUTION]TYPE III, SHORT, BUG RATING: B2 - U0 - G3 LTOTALLUMINAIRELMENS]16789 [INPUTWATTAGE]105		1416 V	ß	
< >			More	



• AGi32 Software

#### - Geometric Characteristics





- AGi323 Software
  - Roadway Optimizer Tool

	Layout	Comparison
Layout: 🖲 1 🔗	2 C 3 C 4 C 5 Reset Description	Optimization Criteria Calculate Spacing To Achieve
Roadway Standard RTable Roadway Layout Type [One Row, No Builden of Lanes: In Suciadation Areas: G Luminaise Layout Row 4: [ATB0_P45 Row 2: [ATB0_P45 Row 2: [ATB0_P45 Row 1: [ATB0_P45]	IES RP-8-14	Inc Criteria     Value     Valu
2011 Rate Coverage	Uvende. Uvende.	Floadwy Luminance     Illuminance     Viability Level (STV)     Veiling Luminance





**Reporting and Documentation** 

• Memorandum – minor project; existing

circuit; single crosswalk

• Lighting Design Analysis Report (LDAR)

New circuit; roadway segment; full
intersection and all crosswalks; evaluate

various luminaires



**Reporting and Documentation** 

- Memorandum (example)
  - Summary; existing circuit;
    photometric analysis; and
    luminaire cutsheets attached

		FTE					
PROPATE OFFICE	MEMO.	<u>RANDUM</u>					
mita Gorda, FL	DATE:	November 3, 2022					
ORIDA OFFICES	TO: Liyanage Ratnayake, P.E. – FDOT FROM: Ryan C. Anloague, P.E.						
1 Myers xsonvite							
Mami Punta Gewa Talandseee Tampa	COPY:	COPY: Fernando Cano, P.E. – VIA Engineering Group, Inc. Enrique Vicent Perez, E.I.T. – Duke Energy Oliver Remy Rodrigues, P.E., P.T.O.E. – FTE					
	SUBJECT:	FPID 441653-1-56-01 SR 699 (Guif Blvd) from N of W 183 <sup>rd</sup> Ten to N of 192 <sup>nd</sup> Ave Photometric Analysis Pinellas County					
	FTE is please was prepared intersection I Manual, Secti the possible g Below is a p	Id to submit the attached photometric analysis for the subject project. The analysis is consistent with wildlife-sensitive conventional lighting criteria for signalized ighting retrofit and midblock crosswalk, which is presented in the FDOT Design ion 231.2. This criterion was utilized due to the project's proximity to the coast and presence of nesting sea turflet shotometric summary of the locations included within this project. The standard					

Intersection	Horizontal Illuminance	Vertical Illuminance	
Proposed RRFB Crossing at CR 694 on-ramp	Avg. Not applicable	Crosswalk: 1.0vfc (Satisfied)	
SR 699 (Gulf Blvd) at W 190 <sup>th</sup> Ave, & N Park Ave,	Avg: 1.4hfc (Satisfied)	NB Thru: 1.2vfc (Satisfied)	
	Avg/Min: 2,3:1 (Satisfied)	SB Thru: 1.0vfc (Satisfied)	
	Max/Min: 3.3:1 (Satisfied)	WB Left: 1.0vfc (Satisfied)	
	and the second second second second	WB Right: 1 Avfc (Satisfied)	

The lighting criteria from the FDOT Design Manual, Part 2, Table 231.2.1 Lighting Initial Values along with the Minimum Mounting Heights Based on Maximum Candela, Table 231.2.2, are attached. The proposed huminaires are LED. Details of the luminaires are attached.

IES false were provided by Duke Energy for the AGI32 analysis. Droke Energy mantains the lighting along the project and will be responsible for installing new homanizes and poles based on the proposed design. Per coordination with the FDOT District 7 Unlity Project Manager, funds have been encombered for a separate FPID for the lighting work to be executed. The proposed design michides 8 new light poles, 4 pole retrofits, and 4 pole removals. No new load centers are proposed smeatenew humanizes and poles are to be installed on Duke Energy's existing circuit

Should you have any questions relating to our analysis, please feel free to contact me at (\$13) 989-0729, ext. 113. I look forward to serving you further on this project.

ENGINEERS PLANNERS SURVEYORS LANDSCAPE ARCHITECTS (1458 N 53<sup>rd</sup> Street, Tampa, FL 33617, Ph (813) 989-0729 www.fleinc.net



**Reporting and Documentation** 

 Lighting Design Analysis Report (example)

- New circuits; photometric analysis;

luminaire cutsheets; load analysis;

voltage drop analysis;

new power service;

evaluate various

luminaires

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5.0	COORDINATION	3







-	CN COLTES!	DECT		1									
	GN CRITERIA	DESIG	PAY ITEM	PAY IT	BASE	FOUNDATION TYPE	POLE SETBACK	MOUNT ING HEIGHT	LUMINAIRE WATTAGE	DIST. OR ARM	STATION	CIRCUIT	POLE NO.
1.0	L INTENSITY (H.F.C)	ERAGE INITIAL	715-4-23 AVE	715-4-	FRANGIBLE	TYPE 1	30.50' RT.	40'	255W	0'	1+60.00	A-2	1
10:	MAX./MIN.	an one and a near	15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	2+19.00	A-2	2
			15-511-122	715-511	FRANGIBLE	TYPE 2	46.00' LT.	22'	60W	2.25'	3+15.00	A-1	3
	60 MPH	ND SPEED = 16	15-512-122 WII	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	3+34.00	A-2	4
			15-511-122	715-511	FRANGIBLE	TYPE 2	36.00' LT.	22	60W	2.25	4+20.00	A-2	<u>,</u>
	LECEND		15-512-122	715-512	FRANGIBLE	TYPE 2	31.70° KL.	22' 12'	60W 20W	2.25 3.5	4+42.00	A-1	7
_	LEGEND		15-512-122	715-517	EDANCIDLE	TYPE 2	21 22' BT	22/ 12/	600 200	2.25	5+60.00	A-2	
1.154			15-511-122	715-512	EDANGIBLE	TYPE 2	37 00' 17	22 12	6000	2 251	6+45.00	A-2	,
D		MBOLS	15-512-122 SY	715.512	FRANGIBLE	TYPE 2	31 00' BT	221 121	608 208	2 251 3 51	6475.00	4.2	0
			15-511-122	715-511	FRANGIBLE	TYPE 2	37.00' 17.	22'	60W	2.25'	7+67.00	A-1	1
POLE	LED LUMINAIRE	-	15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' BT.	22' 12'	60W 20W	2.25' 3.5'	7+90.00	A-2	2
			15-511-122	715-511	FRANGIBLE	TYPE 2	37.00' LT.	22'	60W	2.25'	8+65.00	A-1	
GHT P	DECORATIVE LI		15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' BT.	22' 12'	60W 20W	2.25' 3.5'	9+00.00	A-2	4
NG CY	ANALYZED USIN	$\sim$	15-511-122	715-511	FRANGIBLE	TYPE 2	37.00' LT.	22'	60W	2.25'	9+65.00	A-1	
GHT A	DECORATIVE II		15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' BT.	22' 12'	60W 20W	2.25' 3.5'	10+00.00	A-2	-
FGC-	DOMIA-CY55PIB	0-00	15-511-122	715-511	FRANGIBLE	TYPE 2	37.00' 17	22'	60W	2.25'	10+60.00	A-1	_
		0.000	15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT	22' 12'	60W 20W	2.25' 3.5'	11+00.00	A-2	i.
D CEA	PROPOSED LOA	dl.	15-511-122	715-511	FRANGIBLE	TYPE 2	37.00' LT.	22'	60W	2.25'	11+45.00	A-1	,
er cen	PROPOSED LOAD	<u>ч</u>	15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT	22' 12'	60W 20W	2.25' 3.5'	11+95.00	A-2	2
	PULL BOX		15-511-122	715-511	FRANGIBLE	TYPE 2	37.00' LT.	22'	60W	2.25'	12+50.00	A-1	1
u con	DULL BOX WITH		15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	12+88.00	A-2	8
1 LON	FULL BOX WITH		15-511-122	715-511	FRANGIBLE	TYPE 2	80.50' LT.	22'	60W	2.25'	13+38.42	A-1	-
st:	PROPOSED 2" &		15-511-122	715-511	FRANGIBLE	TYPE 2	58.00' RT.	22'	60W	2.25'	13+94.00	A-4	0
ONDUC	(NUMBER OF CO	- •	15-511-122	715-511	FRANGIBLE	TYPE 2	39.50' LT.	22'	60W	2.25'	14+49.00	A-3	5
			15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	15+00.00	A-4	5
ECTIO	PROPOSED DIRE		15-511-122	715-511	FRANGIBLE	TYPE 2	39.50' LT.	22'	60W	2.25'	15+50.00	A-3	7
NUMB	CONDUCTORS ()		15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	16+00.00	A-4	3
c 1 4 H	PROPOSED 2" &	127	15-511-122	715-511	FRANGIBLE	TYPE 2	39.50' LT.	22'	60W	2.25'	16+30.00	A-3	3
N CON	#6 THHN/THWN		15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	16+95.00	A-4	)
			15-511-122	715-511	FRANGIBLE	TYPE 2	34.00' LT.	22'	60W	2.25'	17+50.00	A-3	
			15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	17+75.00	A-4	2
	AIRE DESCRIPTION:	LE TOP LUMINA	15-511-122 POL	715-511	FRANGIBLE	TYPE 2	39.50' LT.	22'	60W	2.25'	18+25.00	A-3	3
			15-512-122	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	18+54.31	A-4	
		MINAIRE	15-512-122 LUM	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	19+05.00	A-4	
IV DIS	OPERATION	RED FOR 240V	15-511-122 HOL	715-511	FRANGIBLE	TYPE 2	39.50' LT.	22' 12'	60W 20W	2.25' 3.5'	19+12.00	A-3	5
	or provident	LE: VALMONT	15-512-122 POL	715-512	FRANGIBLE	TYPE 2	31.00' RT.	22' 12'	60W 20W	2.25' 3.5'	19+86.00	A-4	7
1	EXTURED RAL9005TX	LOR: BLACK TE.	15-511-122 COL	715-511	FRANGIBLE	TYPE 2	39.50' LT.	22'	60W	2.25'	20+09.50	A-3	8
			15-512-122	715-512	FRANGIBLE	TYPE 2	32.23' RT.	22' 12'	60W 20W	2.25' 3.5'	20+77.00	A-4	
	munar accounts		15-511-122	715-511	FRANGIBLE	TYPE 2	37.43' LT.	22'	60W	2.25'	21+25.00	A-3	0
N:	INAIRE DESCRIPTION	CORATIVE LUMI	15-512-122 DEC	715-512	FRANGIBLE	TYPE 2	34.00' RT.	22' 12'	60W 20W	2.25' 3.5'	21+83.00	A-4	6
	<u>E</u>	PER LUMINAIRE	15-512-122 UPP	715-512	FRANGIBLE	TYPE 2	69.50' LT.	22' 12'	60W 20W	2.25' 3.5'	22+39.00	A-3	
E IIIM	CYPPIB (LED) TYPE	CLONE "DOMIA"	15-512-122 CYC	715-512	FRANGIBLE	TYPE 2	34.00' RT.	22' 12'	60W 20W	2.25' 3.5'	23+60.00	B-2	
	E CYPPIR (IED) TYPE	VER LUMINAIRE	15-512-122 LOW	715-512	FRANGIBLE	TYPE 2	34.00' LT.	22' 12'	60W 20W	2.25' 3.5'	23+73.00	B - 1	1
	OPERATION	RED FOR 240V	15-512-122 WIR	715-512	FRANGIBLE	TYPE 2	34.00' RT.	22' 12'	60W 20W	2.25' 3.5'	24+35.00	B-2	5
2-C1-T	TICAL CYCLONE M20.	PER ARM: NAUT	15-512-122 UPP	715-512	FRANGIBLE	TYPE 2	34.00' LT.	22' 12'	60W 20W	2.25' 3.5'	24+80.00	B - 1	б
	A PEDESTRIAN ARM	WER ARM: NOVA	15-512-122 LOW	715-512	FRANGIBLE	TYPE 2	34.00' RT.	22' 12'	60W 20W	2.25' 3.5'	25+35.00	B-2	17
BRIDG	ION DAMPER "STOCK	MPER: VIBRATIC	15-512-122 POL DAM	715-512	FRANGIBLE	TYPE 2	34.00' LT.	22' 12'	50W 20W	2.25' 3.5'	25+70.00	B-1	8
1	EXTURED RAL9005TX	LOR: BLACK TE.	15-512-122 COL	715-512	FRANGIBLE	TYPE 2	34.00' RT.	22' 12'	60W 20W	2.25' 3.5'	26+35.00	B-2	9
ED FO	ES: RECEPTACLE WIR	ECIAL FEATURE:	15-512-122 SPE	/15-512	FRANGIBLE	TYPE 2	34.00' LT.	22' 12'	60W 20W	2.25 3.5	26+80.00	B-1	0
in INS	LOMINAIRE DRIVE		15-512-122	715-512	FRANGIBLE	TYPE 2	32.00' RT.	22' 12'	60W 20W	2.25' 3.5'	27+35.00	B-2	1
			15-512-122	/15-512	FRANGIBLE	TYPE 2	34.00' LT.	22' 12'	60W 20W	2.25' 3.5'	27+80.00	B-1	2
			15-512-122	715-512	FRANGIBLE	TYPE 2	32.00' RT.	22' 12'	GOW ZOW	2.25' 3.5'	28+30.00	B-2	5
			15-512-122	/15-512	FRANGIBLE	TYPE 2	40.00' LT.	22' 12'	60W 20W	2.25' 3.5'	28+85.00	B-1	4
			15-512-122	/15-512	FRANGIBLE	TYPE 2	30.15' RT.	22' 12'	60W 20W	2.25' 3.5'	29+35.00	8-2	5
			15-512-122	715-512	FRANGIBLE	TYPE 2	40.50° LT.	22' 12'	60W 20W	2.25' 3.5'	29+85.00	B-1	6
			15-512-122	/15-512-	FRANGIBLE	TYPE 2	25.00' RT.	22' 12'	60W ZOW	2.25 3.5	30+35.00	8-2	/
			15-512-122	715-512	FRANGIBLE	TYPE 2	38.00° LT.	22' 12'	60W 20W	2.25 3.5	30+85.00	B-1 D-2	0
			15-512-122	/15-512	FRANGIBLE	ITPE 2	20.00 RT.	22' 12'	0.0W 20W	2.25 3.5	31+30.00	B-2	9
			RTATION ENGINEERING. INC.	SPORTATION	FLORIDA TRANS	6			NS	REVISIC			-
Th Parts	CHARLOWER COL		N 53RD STREET	58 N 53RD	114		DESCRIPTION	l	DATE		DESCRIPTION		+
ARTMI	BLIC WORKS DEPA	PU	FAUTHORIZATION: 7924	E OF AUTHO	CERTIFICAT								

DESIGN CRITERIA (H.F.C) DR LESS OR LESS AVERAGE INITIAL INTENSITY (H.F.C) 3.0 (H.F.C) UNIFORMITY RATIO-AVG./MIN. MAX./MIN. 4:1 OR LESS 10:1 OR LESS AVERAGE INITIAL INTENSITY IN CROSSWALK FOR APPROACH, LEFT TURN & 3.2 (V.F.C) (TARGET) 1.0 (V.F.C) (MINIMUM) RIGHT TURN MOVEMENTS (V.F.C) SCRIPTION OP. ANALYZED USING HOLOPHANE FIXTURE MGLED-6-4-5K-AX-F-L-X-US.IES. LE, SINGLE ARM CONFIGURATION, WITH 22' MOUNTING HEIGHT. ONE LIGHTING FIXTURE DOMIA-CY55P1B-FGC-3M-60W-4K-IES. LE, DOUBLE ARM CONFIGURATION. ANALYZED USING CYCLONE LIGHTING FIXTURES -60W-4K.IES & DOMIA-CY55PIB-FGC-3M-20W-4K.IES. ER W/ P-II POLE RETE APRON. HEDULE 40 PVC CONDUIT WITH #6 THHN/THWN CONDUCTORS. DIRECT BURIED. ORS & CONDUIT RUNS AS SHOWN ON PLAN SHEETS). AL BORE 2" & WHOPE, SDR 13.5, COLORED GREY CONDUIT WITH #6 THHN/THWN OF CONDUCTORS & CONDUIT RUNS AS SHOWN ON PLAN SHEETS). PE, SDR 13.5, COLORED GREY CONDUIT WITHIN SIGNAL DIRECTIONAL BORE WITH UCTORS (NUMBER OF CONDUCTORS & CONDUIT RUNS AS SHOWN ON PLAN SHEETS).

INTERSECTION LIGHTING

RIBUTION , 255W, 4000K, MGLED-6-4-5K-AX-F-L-X-US.IES.

ISTRIBUTION . 60W, 4000K, CY55P1B-FGC-3M-60W-4K,IES ISTRIBUTION , 20W, 4000K, CY55P1B-FGC-3M-20W-4K.IES BK-TX-CP3923 STYLE 120V OPERATION MOUNTED AT 15 ALLED IN POLE BASE

- SHEET POLE DATA AND NO. T LEGEND SHEET 1-4 P.E. NO.: 50646 S/\Projects\2016\115022-03 Olean Bird Design\lighting\PLDTLT01.DGN 3 55:34 PM
- Pole Data and Legend Sheet •





• Plan Sheet



FILE FOR A WORLD IN MOTION

• Plan Sheet



• Load Center Schedules





• Lighting Details



### **PAY ITEMS**

- FDOT Pay Items
  - FDM 231 (Lighting)
- List of Typical Pay Items
  - 630-2-11 (Open Trench Conduit)
  - 630-2-12 (Directional Bore Conduit)
  - 635-2-11 (Pull Box)
  - 639-1-111 (Electrical Power Service, Overhead, Meter-Power Co.)
  - 639-2-1 (Electrical Service Wire)
  - 641-2-12 (Type P-II Service Pole)
  - 715-1-12 (Lighting Conductors, No. 8-6)
  - 715-7-11 (Load Center, Secondary Voltage)
  - 715-11-ABC (Light Pole Retrofits)
  - 715-6A-BCD (Light Pole Complete)
  - 715-500-1 (Conventional PCDS)
- Local Agency Pay Items
  - 715-001 715-002 715-003



### **SPECS AND PPC**

- For Local Projects refer to local supplemental specs for preferences
- Specify in the plans and bid documents
- FDOT Projects/ Federal Funds
- Propriety Product Certification
  - Used for lighting synchronicity/consistency on the roadway
  - No other equivalent lighting product/brand



# **ENGINEERS ESTIMATES OF CONSTRUCTION COST**

- County Historical Prices
- Review Recent Bid Prices
- FDOT Historical Prices
- Changes in Unit Prices
  - Materials
  - Labor
  - Fuel





- Retrofitting at the existing mount heights and pole spacing
- Light trespassing outside R/W
- Utility conflicts
- Defective LED luminaires







• Retrofitting at existing mount heights – Candela limits

Minimum Mounting	Maximum Candela of Luminaire						
Height (ft.)	Long Distribution	Medium Distribution	Short Distribution				
20 or Less	5,000	10,000	15,000				
25	10,000	15,000	20,000				
30	15,000	20,000	25,000				
35	20,000	25,000	30,000				
40	25,000	30,000	35,000				
45	30,000	35,000	40,000				
50	35,000	40,000	45,000				
Note:							
Distribution refers to the lon	gitudinal distribution of the	e luminaire.					



**CHALLENGES** 

- Light trespassing outside R/W
  - Shielding, fixture housing; louvres









### **CHALLENGES**

- Utility conflicts and clearances
   Conflict poles, spread footer
- Power Overhead = Based on kV (e.g. <50kV = Min. 10ft)</li>
- Power Buried = 3ft 6ft clearance.
- Fiber comm = Typ. 3ft clearance
- Gas = Typ. 4.5ft clearance. May vary
  No structures above
- Water/Sewer = Min. 3ft clearance
- Reclaimed Water = Min. 3ft clearance







- Utility conflicts
  - Spread footer foundation for underground conflicts









• Defective LED Luminaires





# THANK YOU





