

Product Summary SCHX5

Description	Test Type	Test Number	Wattage (W)	LED Current ₃	Total Lumens	Efficacy (L/W)	L ₇₀ (Hours)
SCHX5, 55W, 45K&60K, T2	LM79 _{1,2}	18531	56.2	300mA	4901.98	87.1	>120,000
SCHX5, 55W, 45K&60K, T3	LM79 _{1,2}	18532	54.89	300mA	4923.41	89.7	>120,000
SCHX5, 80W, 45K&60K, T2	LM79 _{1,2}	18527	79.22	410mA	6447.68	81.4	>120,000
SCHX5, 80W, 45K&60K, T3	LM79 _{1,2}	18534	85.89	410mA	6981.33	81.3	>120,000
SCHX5, 100W, 45K&60K, T2	LM79 _{1,2}	17986	96.54	525mA	7655.23	79.3	>120,000
SCHX5, 100W, 45K&60K, T3	LM79 _{1,2}	18177	98.88	525mA	7499.69	75.8	>120,000
SCHX5, 120W, 45K&60K, T2	LM79 _{1,2}	18533	119.05	625mA	8590.47	72.2	>120,000
SCHX5, 120W, 45K&60K, T3	LM79 _{1,2}	18529	118.64	625mA	8563.51	72.2	>120,000

1. LM79 is completed at 45K CCT, however same minimum flux bins are used for 45K and 60K CCT products
2. LM79 is scaled for 60K CCT
3. Drive currents are typical and within +/- 3%

Summary of CCT / CRI Testing

	LM79 Test ₁	CCT	CRI
Integrating sphere (55W)	18678	4374	75.1
Integration sphere (80W)	18528	4440	75.9
Integrating sphere (120W)	18530	4560	77.1

1. Typical CCT is 4500K with a CRI >75

Power Supply:

The power supplies are UL1310/UL48 Class 2 and IP65 certified. They have a constant-current output, providing a DC voltage to the LEDs. Due to this there is no flicker. The power supplies can accept input voltages from 100 VAC to 277 VAC, and up to 480 VAC using an optional transformer. Power factor is better than 0.95 and THD <20%. The power supplies have protection circuits for over-voltage, over-current, over-power, and short-circuit built-in. In the event of a failure, they will automatically recover, so that the luminaire does not require the power to be cycled to clear a fault. They comply with EMC directives 47CFR, Part 2, Part 15, and Cisp PUB, 22 Class B. The MTBF is greater than 100,000 hours.

Surge protection:

The integrated surge suppressor protects against both common-mode and differential-mode surges. It is rated to suppress 335 j of energy on each possible surge path. (Line-Neutral, Line-Ground, Neutral-Ground) The device can suppress surges up to 9000 A. It is designed to exceed IEEE C 62.41-1991, Class A.

The “upgraded” surge protection is useful in areas that are prone to lightning (like Florida), or that have poor power quality. This upgrade provides an additional 372 j of protection across each path, bringing the total up over 700 j per path. The upgraded device is capable of surges to 10,000 A, bringing the total suppression up to 19,000 A.

Each of these surge protection devices is in addition to the power supply’s integrated surge protection.

Fitted Target Efficacy (FTE):

The FTE metric is an independent method that Energy Star has introduced to characterize the uniformity of the photometric data. See Appendix A for an explanation of the FTE metric and table describing EvoLucia’s performance with respect to competitors.

LM80 Lumen Maintenance and L₇₀ Lifetime Projections:

Component testing is conducted in accordance with the guidelines in LM-80-08, published by the Illuminating Engineering Society. These guidelines specify the conditions, measurement intervals, and minimum duration of the test. The test takes a minimum of 6000 hours to complete, but this is more feasible than a full lifetime test to L₇₀ – which takes years to complete. The result from the LM-80 test data is a tool that can be used to predict lumen maintenance over time. Appendix B provides the LM80 data and L₇₀ predictions for this product. Figure B1 is a schematic and photograph of the way that the thermal couples were attached at the manufacturer to measure the solder point of the LEDs. Our manufacturer has characterized their packaging so that we can predict junction temperature by knowing the temperature at these solder points. The data taken at 25C provides an accurate reference point for the manufacturers LM80 data and L70 predictions that are presented in Figure B2, the LED manufacturer data tables and charts. Figure B3 contains the insitu test points at 25C from an independent test lab that has been accredited through the UL data acceptance program.

Appendix A – Fitted Target Efficiency

The DOE’s ENERGY STAR® criteria for solid-state lighting (SSL) luminaries are updated on a regular basis to keep pace with SSL technology advances. Fitted Target Efficacy (FTE) evaluates the efficacy with which a luminaire delivers uniform illumination to a rectangular uniform area of coverage (the target area). FTE is calculated using standard absolute luminaire photometry (LM-79-08 test results in a LM-63-02 formatted .ies file). Minimum requirements are given in initial lumens per watt of a luminaire’s input power (lm/W).

For supporting materials and explanation of FTE criteria, please see the Department of Energy and ENERGY STAR® SSL Websites.

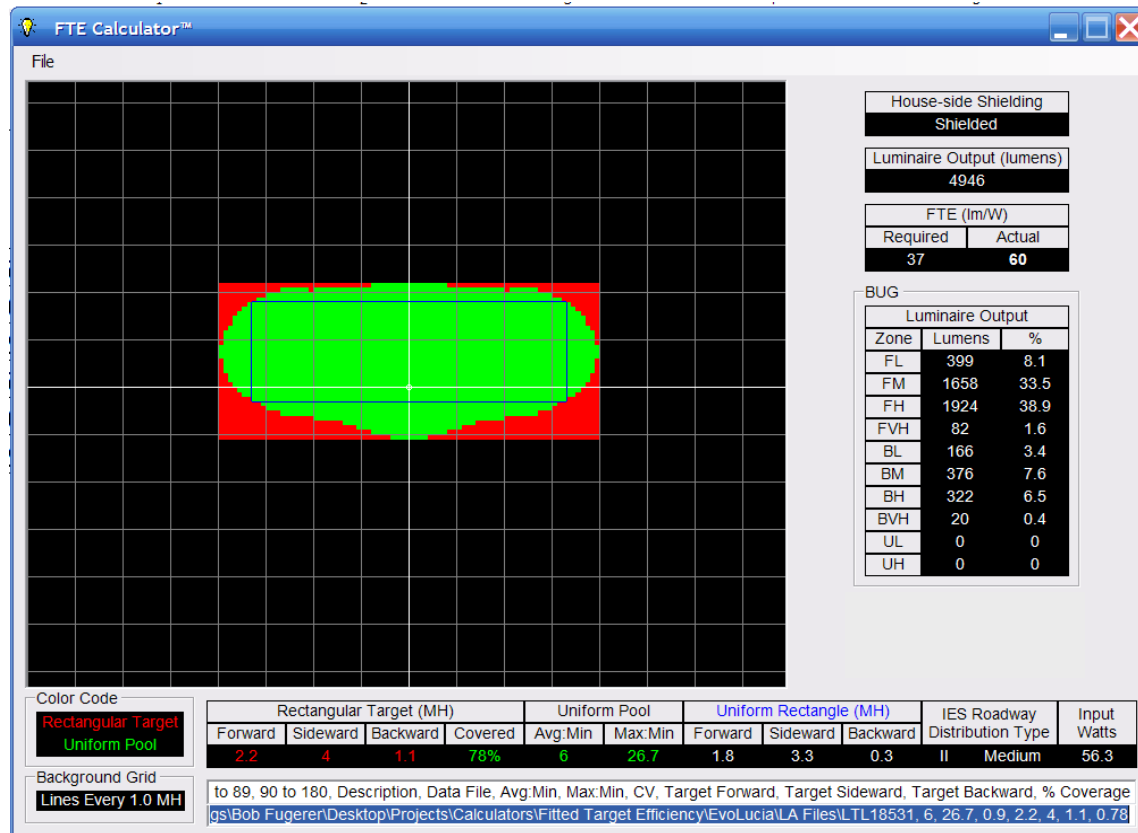
Below is Table A1 that illustrates EvoLucia’s pace-setting performance with respect to this emerging standard. Figure A1 identifies a typical FTE calculator output from EvoLucia™ standard product IES file and compares typical outputs with the competition.

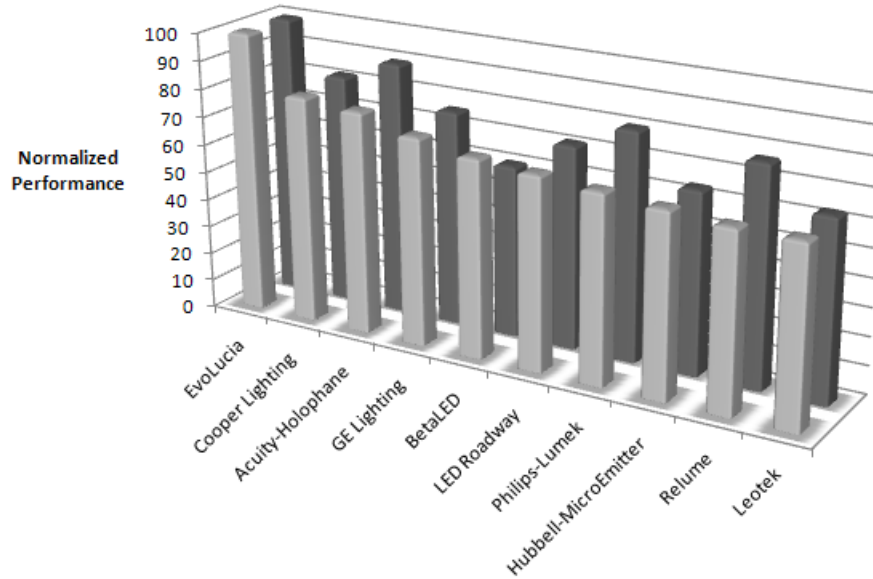
Table A1 - Calculated FTE Values

	LM 79 test number	Input wattage (W)	LED Drive Current (mA)	Power Factor	Total Lumens (Lm)	Required Fitted Target Efficiency ¹	EvoLucia Fitted Target Efficiency ^{2,3}
SCHX5, 55W, 45K & 60K, T2	18531	56.28	300mA	0.985	4901.98	37	60
SCHX5, 80W, 45K & 60K, T2	18527	79.22	410mA	0.983	6447.68	37	57
SCHX5, 120W, 45K & 60K, T2	18533	119.05	625mA	0.993	8590.47	37	50
SCHX5, 55W, 45K & 60K, T3	18532	54.89	300mA	0.986	4923.41	37	64
SCHX5, 80W, 45K & 60K, T3	18534	85.89	410mA	0.979	6981.33	37	59
SCHX5, 120W, 45K & 60K, T3	18529	118.64	625mA	0.986	8563.51	37	54

1. ENERGY STAR® Program Requirements for Solid State Lighting Luminaries - Proposed Category “A” Additions – Outdoor Area & Parking Garage
2. EvoLucia™ performance using LM-79 test data and DOE ENERGY STAR® calculator downloaded from the ENERGY STAR® SSL website
3. Fewer LEDs can be used to make cost-performance trade-offs, but the extended performance margin enables EvoLucia to meet or exceed the standard in multiple LED configurations

Figure A1 - Typical FTE Calculator Output & Comparison with Competitors





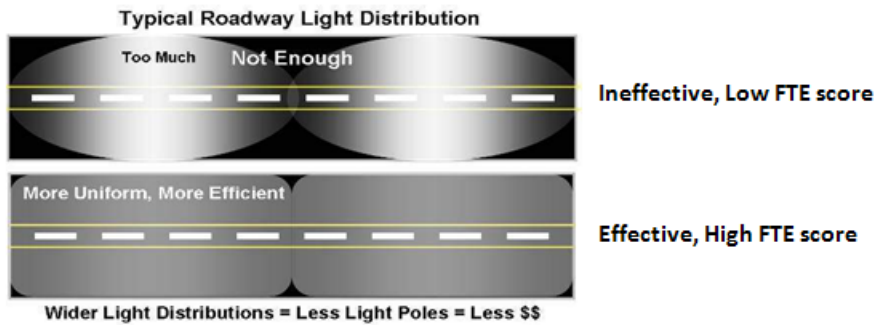
Energy Star's Fitted Target Efficacy (FTE)

A quantitative metric for distinguishing Inefficient versus Efficient Lighting

- Uniformity (Per FTE Metric)
- Lumens per Watt

Fitted Target Efficacy's Significance

- FTE provides an independent evaluation
- Hundreds of HID manufacturers were evaluated to establish a minimum FTE criteria that guarantees 20% energy savings when compared to top performing HID products
- EvoLucia roadway products exceed this minimum FTE criteria as much as 35%



Source: DOE and Energy Star SSL Website
http://www.energystar.gov/index.cfm?c=revisions.ssl_luminaires

Appendix B – Lumen Maintenance & L₇₀ Predictions

Figure B1 – Component Thermal Testing Solder Point

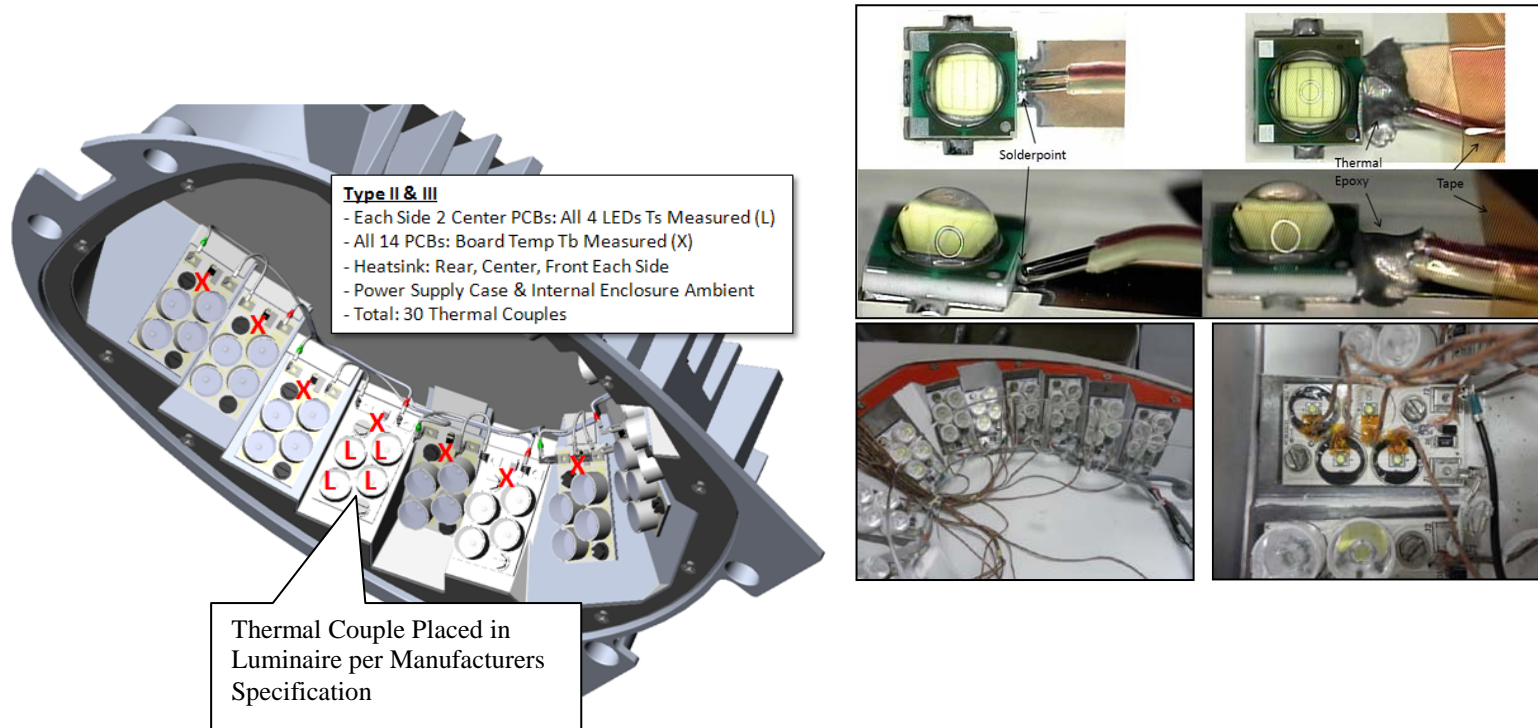
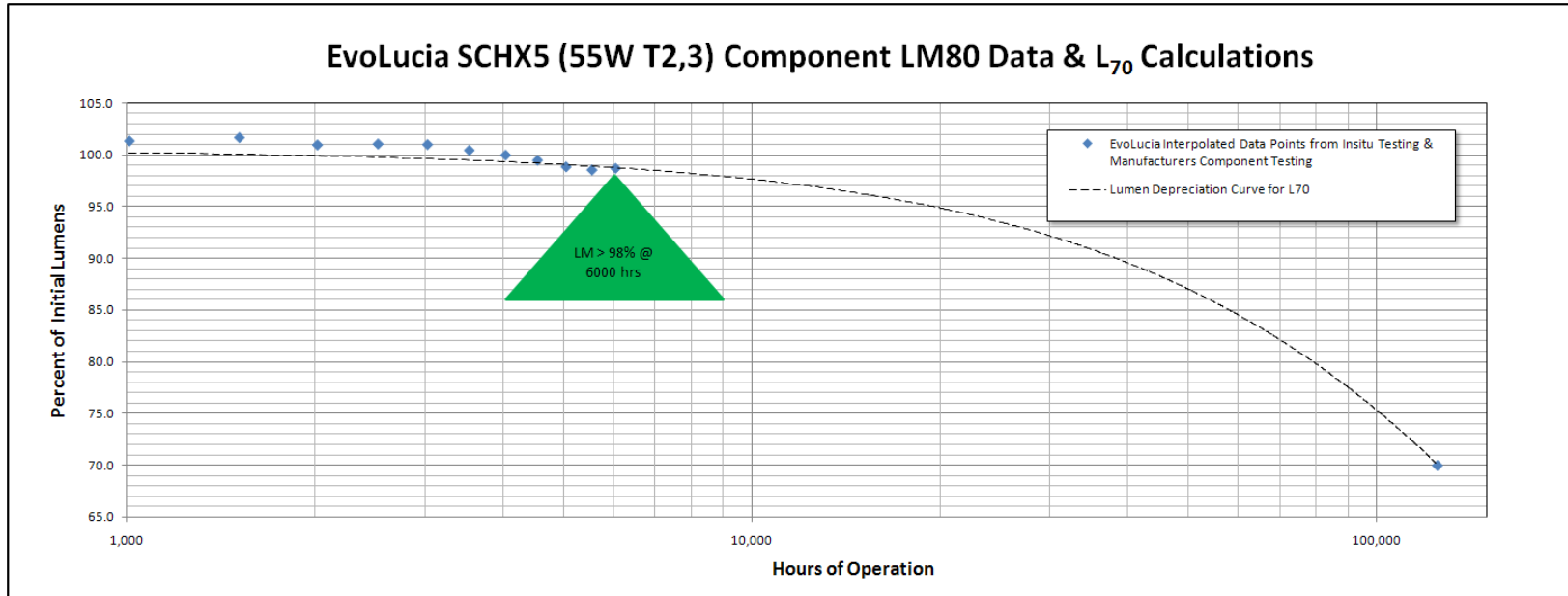


Figure B2 – Component LM80 Lumen Maintenance Table Summaries & L70 Prediction Curves

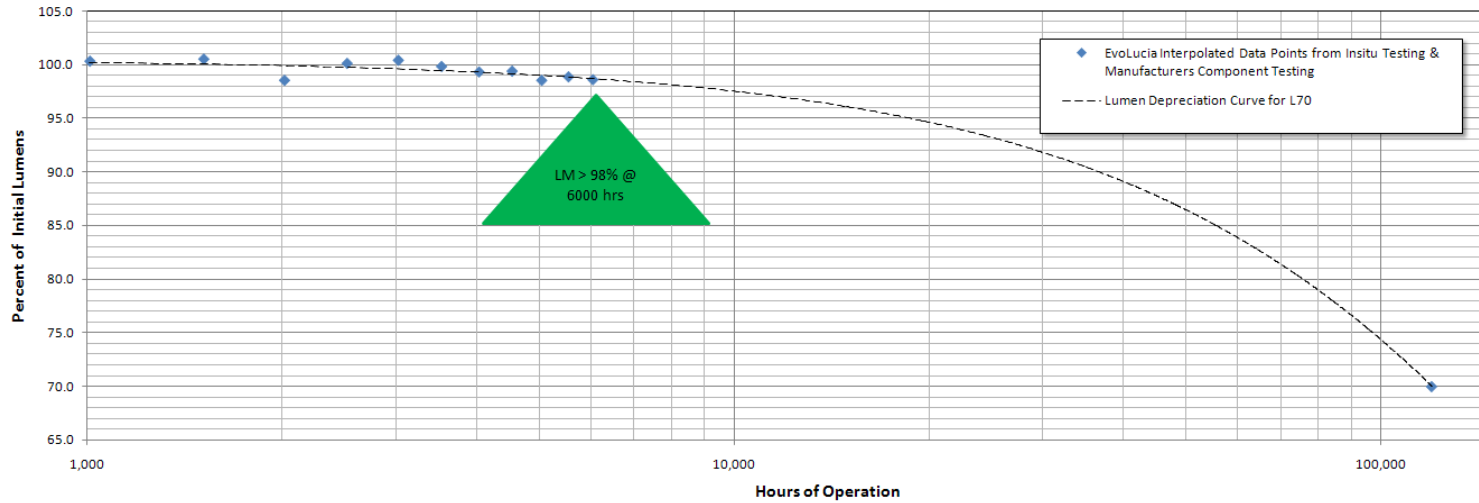


Manufacturers Component LM80 Data for White LEDs																					L ₇₀		
Comments	LM80 Test Conditions			Statistics				Initial Lumens, Vf		Mean Lumen Maintenance (%)											Greater Than 125,000		
	T _{s,a} (C)	T _j (C)	If (mA)	n	Sigma	Min	Max	Mean Values		t=0	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544		6048	
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7		
XPG WHT	85	95	350	28	4.9	114.5	131.9	125.10	3.11	100.0	99.0	98.4	97.9	97.8	98.2	98.8	98.4	98.4	98.7	98.4	98.4	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.4	98.8	98.6	
XPG WHT	55	61	350	30	11.2	94.4	124.0	112.90	3.10	100.0	98.1	98.6	98.6	99.1	99.2	98.6	98.3	98.7	97.6	99.3	99.1		
XPG WHT	45	65	1000	29	6.58	113.3	136.6	128.00	3.17	100.0	101.4	101.7	101.0	101.1	101.0	100.5	100.0	99.5	98.9	98.6	98.7		
EvoLucia Interpolated Data Points from Insitu Testing & Manufacturers Component Testing																							
XPG WHT																							
XPG WHT																							
SCHX5 55W T2,3	49	55	300				NA			100.0	101.4	101.7	101.0	101.1	101.0	100.5	100.0	99.5	98.9	98.6	98.7	70	

Notes:

- Interpolation was done using: $L_{T_{MP}} = L_{\text{Below}} + (L_{\text{Above}} - L_{\text{Below}}) / (T_{s,\text{Above}} - T_{s,\text{Below}}) * (T_{MP,\text{LED}} - T_{s,\text{Below}})$ per Energy Star Requirements
- L₇₀ is Predicted using an Exponential Degredation Curve Fit from Interpolated Insitu Data based on Mean Lumen Depreciation at 6000 Hrs Operation per Energy Star Requirements
- IES TM-21 will be used for L₇₀ calculations when it has been finalized and approved
- Thermal data has been scaled & calculated from insitu temperature measurements at max temp or nominal temp conditions (25C ambient typical) and stated LED drive currents

EvoLucia SCHX5 (80W T2,3) Component LM80 Data & L₇₀ Calculations

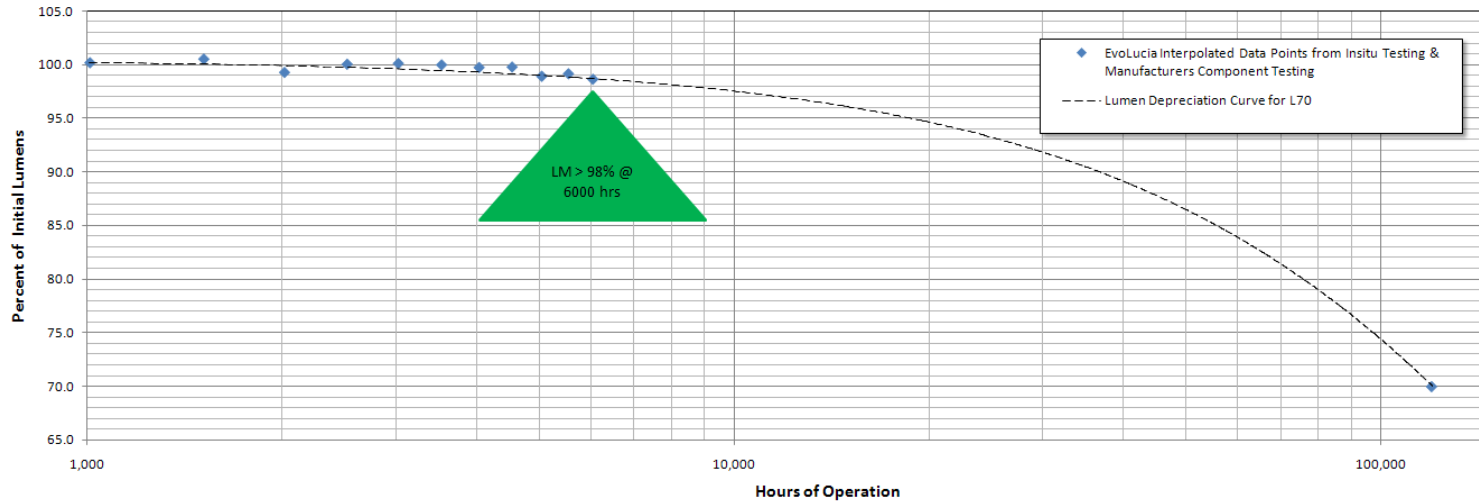


Manufacturers Component LM80 Data for White LEDs																				L ₇₀		
Comments	LM80 Test Conditions			Statistics				Initial Lumens, Vf		Mean Lumen Maintenance (%)											Greater Than 120,000	
	T _{s,a} (C)	T _j (C)	I _f (mA)	n	Sigma	Min	Max	Mean Values		t=0	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544		6048
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7	
XPG WHT	85	95	350	28	4.9	114.5	131.9	125.10	3.11	100.0	99.0	98.4	97.9	97.8	98.2	98.8	98.4	98.4	98.7	98.4	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.8	98.6	
XPG WHT	55	61	350	30	11.2	94.4	124.0	112.90	3.10	100.0	98.1	98.6	98.6	99.1	99.2	98.6	98.3	98.7	97.6	99.3	99.1	
XPG WHT	45	65	1000	29	6.58	113.3	136.6	128.00	3.17	100.0	101.4	101.7	101.0	101.1	101.0	100.5	100.0	99.5	98.9	98.6	98.7	
EvoLucia Interpolated Data Points from Insitu Testing & Manufacturers Component Testing																						
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.8	98.6	
SCHX5 80W T2,3	70	78	425							100.0	100.3	100.5	98.5	100.1	100.4	99.8	99.3	99.4	98.5	98.9	98.6	70

Notes:

- Interpolation was done using: $L_{T_{MP}} = L_{Below} + (L_{Above} - L_{below} / T_{s,Above} - T_{s,Below}) (T_{MP,LED} - T_{s,Below})$ per Energy Star Requirements
- L₇₀ is Predicted using an Exponential Degredation Curve Fit from Interpolated Insitu Data based on Mean Lumen Depreciation at 6000 Hrs Operation per Energy Star Requirements
- IES TM-21 will be used for L₇₀ calculations when it has been finalized and approved
- Thermal data has been scaled & calculated from insitu temperature measurements at max temp or nominal temp conditions (25C ambient typical) and stated LED drive currents

EvoLucia SCHX5 (100W T2,3) Component LM80 Data & L₇₀ Calculations

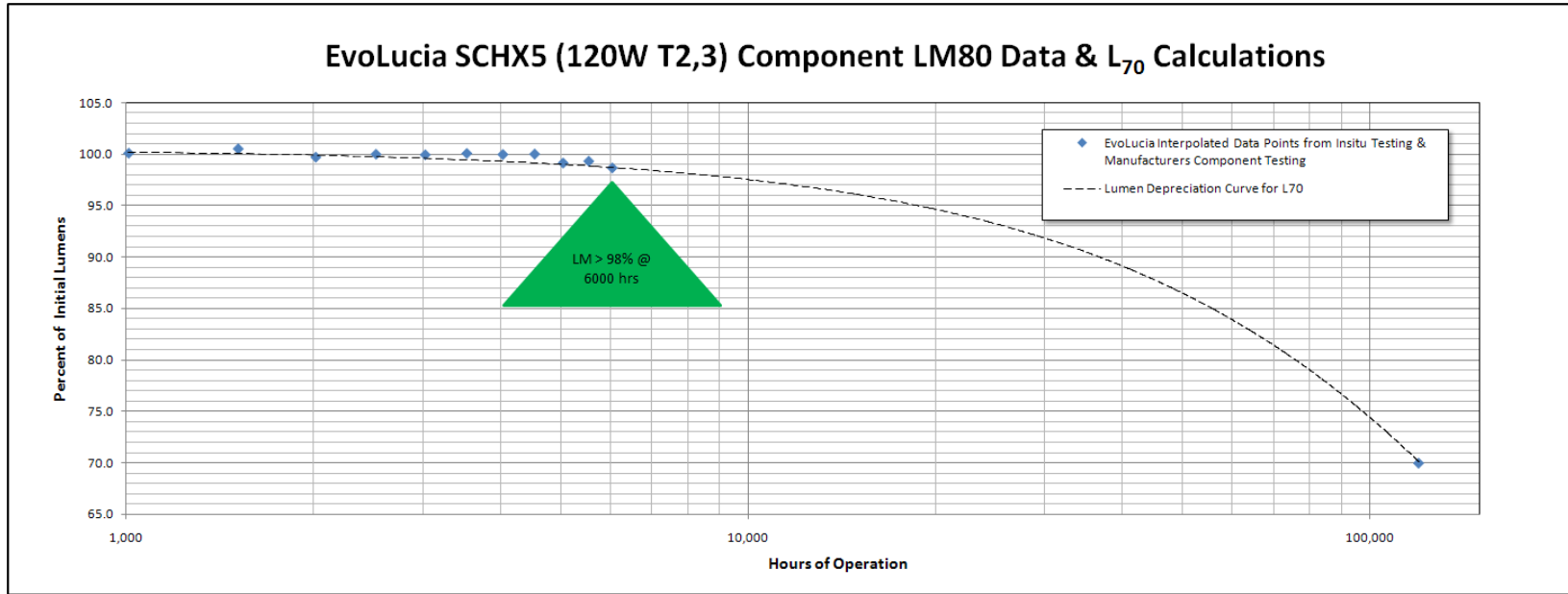


Manufacturers Component LM80 Data for White LEDs																				L ₇₀		
Comments	LM80 Test Conditions			Statistics				Initial Lumens, Vf		Mean Lumen Maintenance (%)											Greater Than 120,000	
	T _{s,a} (C)	T _j (C)	If (mA)	n	Sigma	Min	Max	Mean Values	t=0	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048		
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7	
XPG WHT	85	95	350	28	4.9	114.5	131.9	125.10	3.11	100.0	99.0	98.4	97.9	97.8	98.2	98.8	98.4	98.4	98.7	98.4	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.8	98.6	
XPG WHT	55	61	350	30	11.2	94.4	124.0	112.90	3.10	100.0	98.1	98.6	98.6	99.1	99.2	98.6	98.3	98.7	97.6	99.3	99.1	
XPG WHT	45	65	1000	29	6.58	113.3	136.6	128.00	3.17	100.0	101.4	101.7	101.0	101.1	101.0	100.5	100.0	99.5	98.9	98.6	98.7	
EvoLucia Interpolated Data Points from Insitu Testing & Manufacturers Component Testing																						
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.8	98.6	
SCHX5 100W T2,3	80	90	525					NA		100.0	100.2	100.5	99.3	100.0	100.1	100.0	99.7	99.8	98.9	99.2	98.6	70

Notes:

- Interpolation was done using: $L_{TMP} = L_{Below} + (L_{Above} - L_{below} / T_{s,Above} - T_{s,Below}) (TMP_{LED} - T_{s,Below})$ per Energy Star Requirements
- L₇₀ is Predicted using an Exponential Degradation Curve Fit from Interpolated Insitu Data based on Mean Lumen Depreciation at 6000 Hrs Operation per Energy Star Requirements
- IES TM-21 will be used for L₇₀ calculations when it has been finalized and approved
- Thermal data has been scaled & calculated from insitu temperature measurements at max temp or nominal temp conditions (25C ambient typical) and stated LED drive currents

EvoLucia SCHX5 (120W T2,3) Component LM80 Data & L₇₀ Calculations



Manufacturers Component LM80 Data for White LEDs																						L ₇₀
Comments	LM80 Test Conditions			Statistics				Initial Lumens, Vf		Mean Lumen Maintenance (%)												Greater Than
	T _{s,a} (C)	T _j (C)	If (mA)	n	Sigma	Min	Max	Mean Values	t=0	1008	1512	2016	2520	3024	3528	4032	4536	5040	5544	6048	120,000	
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7	
XPG WHT	85	95	350	28	4.9	114.5	131.9	125.10	3.11	100.0	99.0	98.4	97.9	97.8	98.2	98.8	98.4	98.4	98.7	98.4	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.8	98.6	
XPG WHT	55	61	350	30	11.2	94.4	124.0	112.90	3.10	100.0	98.1	98.6	98.6	99.1	99.2	98.6	98.3	98.7	97.6	99.3	99.1	
XPG WHT	45	65	1000	29	6.58	113.3	136.6	128.00	3.17	100.0	101.4	101.7	101.0	101.1	101.0	100.5	100.0	99.5	98.9	98.6	98.7	
EvoLucia Interpolated Data Points from Insitu Testing & Manufacturers Component Testing																						
XPG WHT	85	105	1000	29	6.6	96.0	124.4	115.40	2.97	100.0	100.0	100.5	100.2	99.9	99.7	100.2	100.2	100.3	99.4	99.5	98.7	
XPG WHT	55	75	1000	30	4.1	105.1	123.5	118.64	3.02	100.0	100.4	100.5	98.4	100.1	100.5	99.8	99.2	99.3	98.4	98.8	98.6	
SCHX5 120W T2,3	85	97	625				NA			100.0	100.1	100.5	99.7	100.0	99.9	100.1	100.0	100.0	99.1	99.3	98.7	70

Notes:

1. Interpolation was done using: $L_{TMP} = L_{Below} + (L_{Above} - L_{below} / T_{s,Above} - T_{s,Below}) (TMP_{LED} - T_{s,Below})$ per Energy Star Requirements
2. L₇₀ is Predicted using an Exponential Degredation Curve Fit from Interpolated Insitu Data based on Mean Lumen Depreciation at 6000 Hrs Operation per Energy Star Requirements
3. IES TM-21 will be used for L₇₀ calculations when it has been finalized and approved
4. Thermal data has been scaled & calculated from insitu temperature measurements at max temp or nominal temp conditions (25C ambient typical) and stated LED drive currents

Figure B3 – Component Insitu Thermal Testing Results

SCHX5 120W / @ 25C (1 of 7 pages)

Project No.
LABORATORY DATA PACKAGE

File E338496

Page 1

Number of pages in this package 29 [including additional pages 0]
(Fill in when using printed copy as record)

TEST LOCATION:					
<input type="checkbox"/> UL or Affiliate	<input type="checkbox"/> WTDP	<input type="checkbox"/> CTDP	<input checked="" type="checkbox"/> TPTDP	<input type="checkbox"/> TCP	<input type="checkbox"/> PPP
	<input type="checkbox"/> WMT	<input type="checkbox"/> TMP	<input type="checkbox"/> SMT		
Company Name Wilger Liaison Co. Inc.					
Address 5654 Sarah Ave., Sarasota FL, 34233					

CLIENT INFORMATION	
Company Name	EvoLucia Inc.
Address	6408 Parkland Drive, Suite 104, Sarasota, FL 34243 USA

AUDIT INFORMATION:				
Description of Tests	Per Standard No.	C22.2 No.	Edition/ Revision	3 rd /2010-01-01;
		250.0-08;	Date	3 rd /2010-01-11
		UL 1598		
		<input checked="" type="checkbox"/> UL 8750		1 st /2009-11-18
<input checked="" type="checkbox"/> Tests Conducted by +	Ernesto Quiroz	Ernesto Quiroz		
	Printed Name	Signature		
<input checked="" type="checkbox"/> Tests Supervised by	Joseph O'Neill	Joseph O'Neill		
	Printed Name	Signature		
<input type="checkbox"/> UL Staff conducting or witnessing testing (WTDP, TMP, WMT only)				
<input type="checkbox"/> UL Staff supervising UL Staff in training	Joseph O'Neill	Joseph O'Neill	2011-04-11	
<input checked="" type="checkbox"/> Authorized Signatory (CTDP, TPTDP, TCP, PPP, SMT)	Printed Name	Signature, and include date for CTDP, TPTDP, TCP, PPP, WMT, TMP, SMT		
Reviewed and accepted by qualified Project Handler	Gerard Plank	Gerard Plank		
	Printed Name	Signature		

TESTS TO BE CONDUCTED:			
Test No.	Done	Test Name	<input checked="" type="checkbox"/> Comments/Parameters <input type="checkbox"/> Tests Conducted by ++
1.	2011 /04/ 08	NORMAL TEMPERATURE TEST, SURFACE:	UL1598 Clause 14/ 19.1.4; (110W OUTPUT)

