FOR THE SCOPE OF ACCREDITATION UNDER NVLAP LAB CODE 100402-0.

REPORT

3933 US ROUTE 11 CORTLAND, NEW YORK 13045

Project No. G100888297

Original Issue Date: September 28, 2012
Revision Date: October 10, 2012

REPORT NO. 100888297CRT-003

TEST OF ONE ROADWAY LUMINAIRE

FIXTURE MODEL NO. SL3N5HLGG

LED MODEL NO. CREE XLAMP XTE

RENDERED TO

DIALIGHT CORPORATION
1501 ROUTE 34 SOUTH
FARMINGDALE, NJ 08005

Revision Note October 10, 2012: Report was revised to correct fixture model number and insitu results.

TEST: Electrical and Photometric tests as required to the IESNA test standard.

LABORATORY NOTE: The laboratory that conducted the testing detailed in this report has been Qualified, Verified, and Recognized for LM-79 Testing for ENERGY STAR for SSL by US DOE's CALiPER program.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION: The testing performed was authorized by signed quote number 500403100.

STANDARDS USED: The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

IESNA LM-79: 2008 Approved Method for Electrical and Photometric Measurements of Solid-State Lighting Products

ANSI ANSLG C38.377: 2012 Specifications of the Chromaticity of Solid State Lighting Products

Energy Star Manufacturer's Guide Version 2.0 (2009): Guide for Qualifying Solid State Lighting Luminaires

DESCRIPTION OF SAMPLE: The client submitted two samples of model number SL3N5HLGG. The samples were received by Intertek on September 11, 2012, in undamaged condition, and both samples were tested as received. The sample designations were 254993 and 254991.

DATES OF TESTS: September 20, 2012 through September 27, 2012

SUMMARY

Model No.:	SL3N5HLGG
Description:	LED Roadway Luminaire

Criteria	Result
Total Lumen Output	10918 Lumens
Total Power	130.7 W
Luminaire Efficacy	83.53
Power Factor (at 120 Vac)	0.993
Power Factor (at 277 Vac)	0.942
Current ATHD (at 120 Vac)	9.94%
Current ATHD (at 277 Vac)	16.00%
Correlated Color Temperature (CCT)	4436 K
Color Rendering Index (CRI) - Ra	76.1
Color Rendering Index (CRI) - R9	-9.2
Duv	0.005
Chromaticity Coordinate (x)	0.365
Chromaticity Coordinate (y)	0.378
Chromaticity Coordinate (u')	0.215
Chromaticity Coordinate (v')	0.500
Maximum In-Situ Source Temperature Point	61.4℃
Backlight Rating	B 2
Uplight Rating	U 1
Glare Rating	G 2

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Calibration Date	Calibration Due Date
Leeds & Northup Standard Resistor	Manganin	Y089	02/24/12	02/24/13
Data Precision Digital Voltmeter	3600	V124	02/24/12	02/24/13
Fluke Multimeter	45	M133	02/24/12	02/24/13
Kikusui DC Power Supply	35-10L	E160	---	---
Sorenson DC Power Supply	DLM150-20E	---	---	---
NIST Spectral Flux Standard Source	RF1024	---	09/18/10	100 hours of use
LSI High Speed Mirror Goniometer	6440	---	09/10/12	10/10/12
Elgar Power Supply	CW1251	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	04/19/12	04/19/13
Extech Hygro-Thermometer	445703	T1359	10/26/11	10/26/12
Yokogawa Power Analyzer	WT1600	E462	07/06/12	07/06/13
LABSPHERE 3M	W/ CDS 1100	N307	VBU	VBU
Fluke Temperature Meter	53 II	T1318	03/12/12	03/12/13
Extech Hygro-Thermometer	445703	T1366	10/26/11	10/26/12
Fluke Multimeter	87 V	D590	03/23/12	03/23/13
Fluke Temperature Meter	53 II	D587	03/12/12	04/13/13

TEST METHODS

Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model CDS 1100 CCD Array Spectroradiometer and Two Meter or Ten Foot Sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Xitron or Yokogawa Power Analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

In-Situ Maximum Measured Power Supply Case and LED Source Point Temperature

Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven and a half hours before measurements were taken. Power supply or source temperature measurements were measured at the TMP_{PS} or T_S point as indicated by the included diagram in accordance with manufacturers declared hot spot location, or at a hot spot location found with a thermal camera when no diagram from the manufacturer is given. The maximum temperature was recorded for the sample. A simulated ceiling or other enclosure may be used in accordance to UL 1598 or UL 153 as applicable.

TEST METHODS (cont'd)

BUG Ratings (Backlight, Uplight, Glare) – for Outdoor Fixtures Only

Zonal Lumens were calculated and grouped using the formula in IESNA TM-15-11 for each zone as defined in the BUG addendum. The maximum lumen rating in each zone was compared against the BUG zonal requirements of Energy Star.

RATING TABLE: BACKLIGHT

NOTE: MAX RATING IN ANY ZONE = RATING FOR LUMINAIRE

	B0	B1	B2	B3	B4	B5
BH	110	500	1000	2500	5000	>5000
BM	220	1000	2500	5000	8500	>8500
BL	110	500	1000	2500	5000	>5000

RATING TABLE: UPLIGHT

NOTE: MAX RATING IN ANY ZONE = RATING FOR LUMINAIRE

	U0	U1	U2	U3	U4	U5
UH	0	10	50	500	1000	>1000
UL	0	10	50	500	1000	>1000

GLARE RATINGS

NOTE: MAX RATING IN ANY ZONE = RATING FOR LUMINAIRE

FOR ASYMMETRICAL LUMINAIRE TYPES (I, II, III, IV)

	G0	G1	G2	G3	G4	G5
FVH	10	100	225	500	750	>750
BVH	10	100	225	500	750	>750
FH	660	1800	5000	7500	12000	>12000
BH	110	500	1000	2500	5000	>5000

FOR QUADRILATERAL SYMMETRICAL LUMINAIRE TYPES (V, VSQUARE)

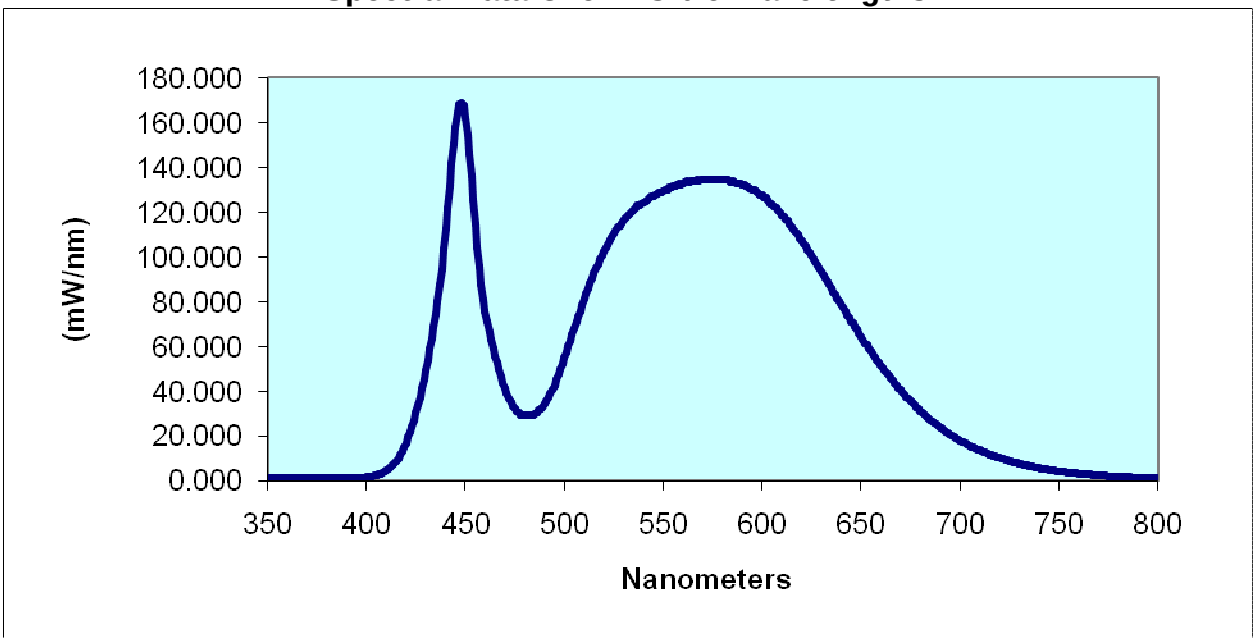
	G0	G1	G2	G3	G4	G5
FVH	10	100	225	500	750	>750
BVH	10	100	225	500	750	>750
FH	660	1800	5000	7500	12000	>12000
BH	660	1800	5000	7500	12000	>12000

RESULTS OF TESTS

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	1.050	460	75.726	570	134.348	680	31.247
355	1.234	465	55.800	575	134.431	685	27.308
360	1.190	470	41.380	580	134.460	690	23.824
365	1.149	475	32.074	585	133.854	695	20.861
370	1.100	480	29.212	590	132.050	700	18.088
375	1.232	485	30.089	595	130.071	705	15.638
380	1.262	490	34.546	600	127.631	710	13.653
385	1.236	495	42.712	605	123.523	715	11.869
390	1.370	500	54.984	610	118.528	720	10.313
395	1.443	505	67.934	615	113.490	725	8.922
400	1.713	510	81.179	620	107.333	730	7.698
405	2.624	515	92.763	625	100.589	735	6.620
410	4.533	520	102.541	630	93.122	740	5.822
415	8.830	525	110.369	635	86.067	745	4.983
420	16.876	530	116.851	640	78.910	750	4.320
425	30.737	535	120.949	645	71.217	755	3.809
430	49.579	540	124.062	650	64.279	760	3.329
435	74.769	545	127.024	655	58.188	765	2.897
440	112.939	550	129.527	660	51.741	770	2.487
445	158.242	555	131.517	665	45.740	775	2.133
450	162.248	560	132.688	670	40.540	780	1.925
455	114.654	565	134.187	675	35.589		

Sample No. 254991
Spectral Data Over Visible Wavelengths



RESULTS OF TESTS (cont'd)

Photometric and Electrical Measurements at 25℃ – Integrating Sphere Method

Intertek Sample No.	Correlated Color Temperature (K)	CRI -Ra	CRI -R9	DUV	CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
254991	4436	76.1	-9.2	0.005	0.365	0.378	0.215	0.500

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)
254991	UP	120.0	1098	131.0	0.993	9.94

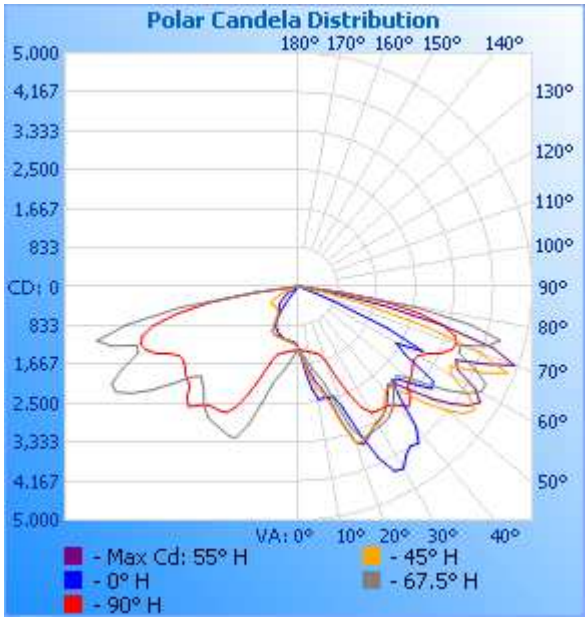
Intertek Sample No.	Input Voltage (Vac)	Input Power (Watts)	Input Power Factor	Current ATHD (%)
254991	277.0	128.5	0.942	16.00

Photometric and Electrical Measurements – Distribution Method

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Absolute Luminous Flux (Lumens)	Lumen Efficacy (Lumens Per Watt)
254991	UP	120.0	1096	130.7	0.994	10918	83.53

Intensity (Candlepower) Summary at 25℃ – Candelas

Angle	0	22.5	45	67.5	90
0	1344	1344	1344	1344	1344
5	1887	1855	1732	1542	1380
10	2447	2383	2208	1816	1419
15	2455	2537	2569	2155	1478
20	2750	3417	3529	3144	1693
25	4043	3586	3505	3533	2529
30	4500	3738	3393	3457	3115
35	4178	3628	3198	3393	3159
40	3907	3135	2895	3164	3314
45	2830	3414	3226	2917	3385
50	3265	3943	4121	3005	3100
55	3522	3583	4601	3863	2979
60	2415	2984	3763	4515	2957
65	2121	3503	4390	4172	3371
70	222	1468	4106	3691	3600
75	77	218	1548	4474	3221
80	23	48	208	2585	1932
85	9	18	24	181	50
90	2	6	11	27	7
95	0	0	4	7	6
100	0	0	1	2	4
105	0	0	0	1	2

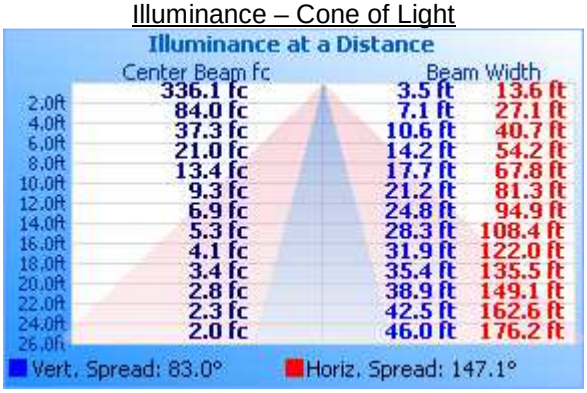


RESULTS OF TESTS (cont'd)

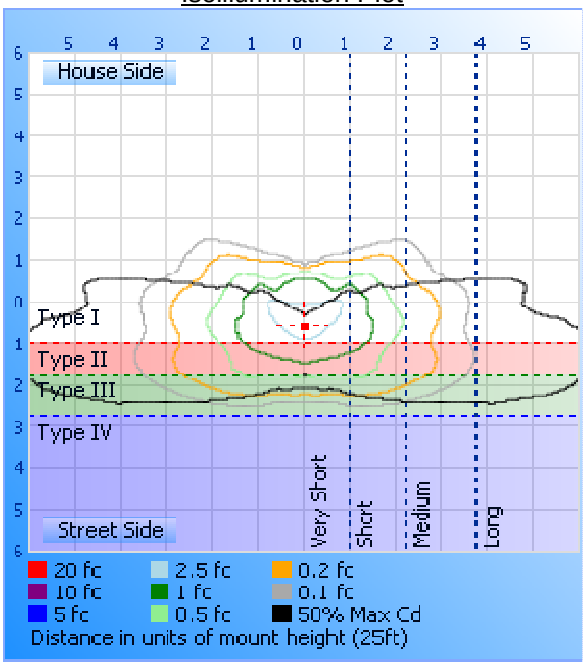
Illumination Plots

Mounting Height: 25 ft.

Illuminance – Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25℃

Zone	Lumens	% Luminaire
0-30	1766	16.2
0-40	3247	29.7
0-60	7070	64.8
60-90	3843	35.2
0-90	10913	100.0
90-180	5.0	0.0
0-180	10918	100.0

Zonal Lumens and Percentages at 25℃

Zone	Lumens	% Luminaire
0-10	147.0	1.3
10-20	524.2	4.8
20-30	1095	10.0
30-40	1481	13.6
40-50	1706	15.6
50-60	2117	19.4
60-70	2222	20.4
70-80	1411	12.9
80-90	209.6	1.9
90-100	4.0	0.0
100-110	0.9	0.0

RESULTS OF TESTS (cont'd)

BUG Rating (Backlight, Uplight, Glare)

Zone	Total Lumens	Frontlight Category	Frontlight Lumens	Backlight Category	Backlight Lumens	Uplight Category	Uplight Lumens
0-30	1766	FL	1246	BL	520	--	--
30-60	5304	FM	3976	BM	1328	--	--
60-80	3633	FH	2722	BH	911	--	--
80-90	210	FVH	138	BVH	72	--	--
90-100	4					UL	4
100-180	1					UH	1

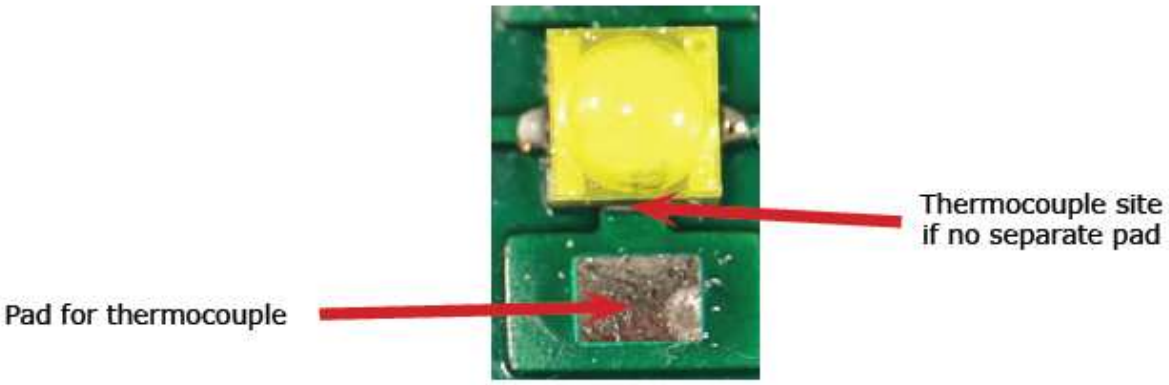
Backlight Rating: B 2
Uplight Rating: U 1
Glare Rating: G 2

RESULTS OF TESTS (cont'd)

In-Situ Maximum Measured LED Source Temperature

Manufacturer Supplied Documentation:

LED identified as: CREE XLAMP XTE



PRODUCT CHARACTERISTICS

Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		5	
Viewing angle (FWHM) - white	degrees		115	
Viewing angle (FWHM) - royal blue	degrees		140	
Temperature coefficient of voltage	mV/°C		-2.5	
ESD classification (HBM per Mil-Std-883D)			Class 2	
DC forward current	mA			1500
Reverse voltage	V			5
Forward voltage (@ 350 mA, 85 °C)	V		2.85	3.4
LED junction temperature	°C			150

RESULTS OF TESTS (cont'd)

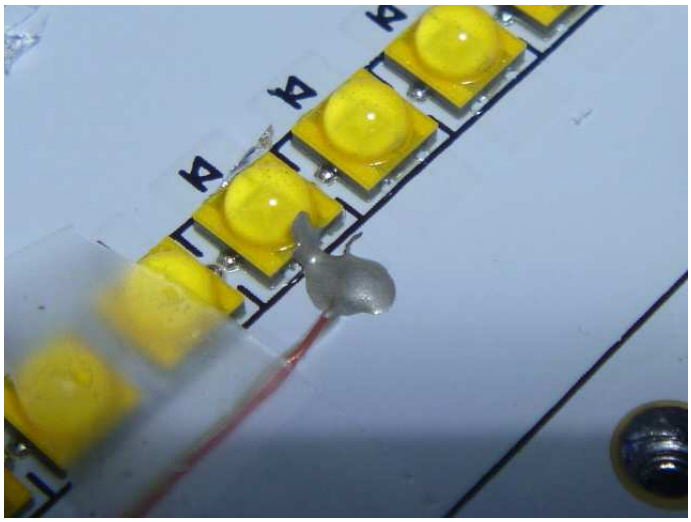
In-Situ Maximum Measured LED Source Temperature

Maximum Junction Temperature from LED specification (Tj) = 150℃
Thermal Resistance Formula from LED specification = 5℃/W
Maximum Forward Voltage (Vf) from LED specification = 3.4 V
Measured LED Current = 345mA
Calculated LED Wattage = Vf x Measured LED Current = 1.173W
Maximum Source Temperature (Ts) = Tj – (LED Wattage x Thermal Resistance) = 144℃

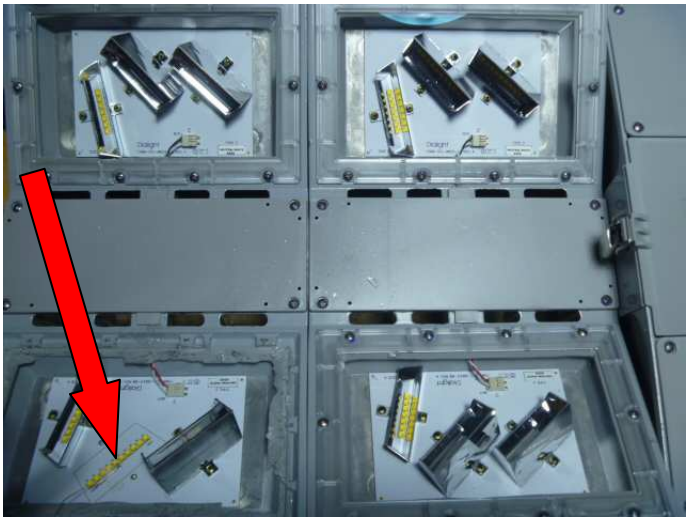
Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (℃)	Location	Maximum Rated Source Temperature(℃)
254993	61.4	Per diagram above	144

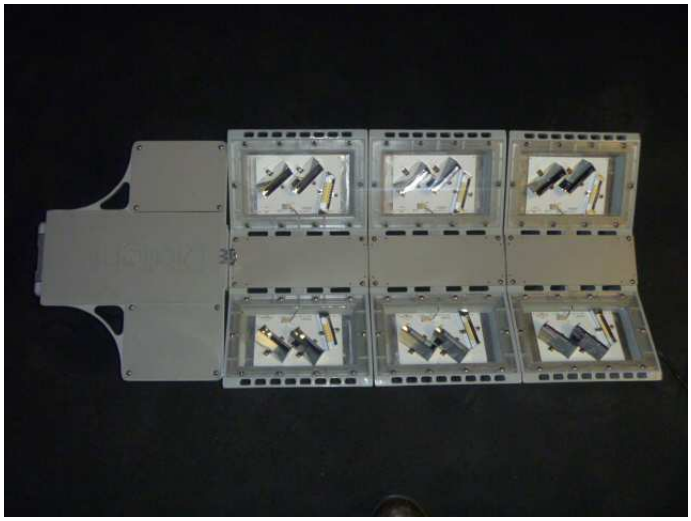
In-Situ Picture – Ts



In-Situ Picture – Ts location



Picture (not to scale)



CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Joe Schledorn
Engineer
Lighting Division

Report Reviewed By:

Dave Ellis
Senior Project Engineer
Lighting Division

Attachment: 254991.IES