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

REPORT

3933 US ROUTE 11 CORTLAND, NEW YORK 13045

Project No. G100888297 Date: October 10, 2012

REPORT NO. 100888297CRT-004A

TEST OF ONE LED ROADWAY LUMINAIRE

FIXTURE MODEL NO. SL3N5SLGG

LED MODEL NO. CREE XLAMP XTE

RENDERED TO

DIALIGHT CORPORATION
1501 ROUTE 34 SOUTH
FARMINGDALE, NJ 08005

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 Version 1.1 (2008): Program Requirements for Solid-State Lighting Luminaires

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 SL3N5SLGG. The samples were received by Intertek on September 11, 2012, in undamaged condition, and both samples were tested as received. The sample designations were 254994 and 254998.

DATES OF TESTS: September 20, 2012 through September 28, 2012

SUMMARY

Model No.:	SL3N5SLGG
Description:	LED Roadway Luminaire

Criteria	Result
Total Lumen Output	20252 Lumens
Total Power	251.9 W
Luminaire Efficacy	80.40
Power Factor (at 120 Vac)	0.992
Power Factor (at 277 Vac)	0.938
Current ATHD (at 120 Vac)	9.85%
Current ATHD (at 277 Vac)	16.15%
Correlated Color Temperature (CCT)	4475 K
Color Rendering Index (CRI) - Ra	76.2
Color Rendering Index (CRI) - R9	-7.6
Duv	0.003
Chromaticity Coordinate (x)	0.363
Chromaticity Coordinate (y)	0.374
Chromaticity Coordinate (u')	0.215
Chromaticity Coordinate (v')	0.498
Maximum In-Situ Source Temperature Point	59.3℃
Backlight Rating	B 3
Uplight Rating	U 1
Glare Rating	G 3

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)

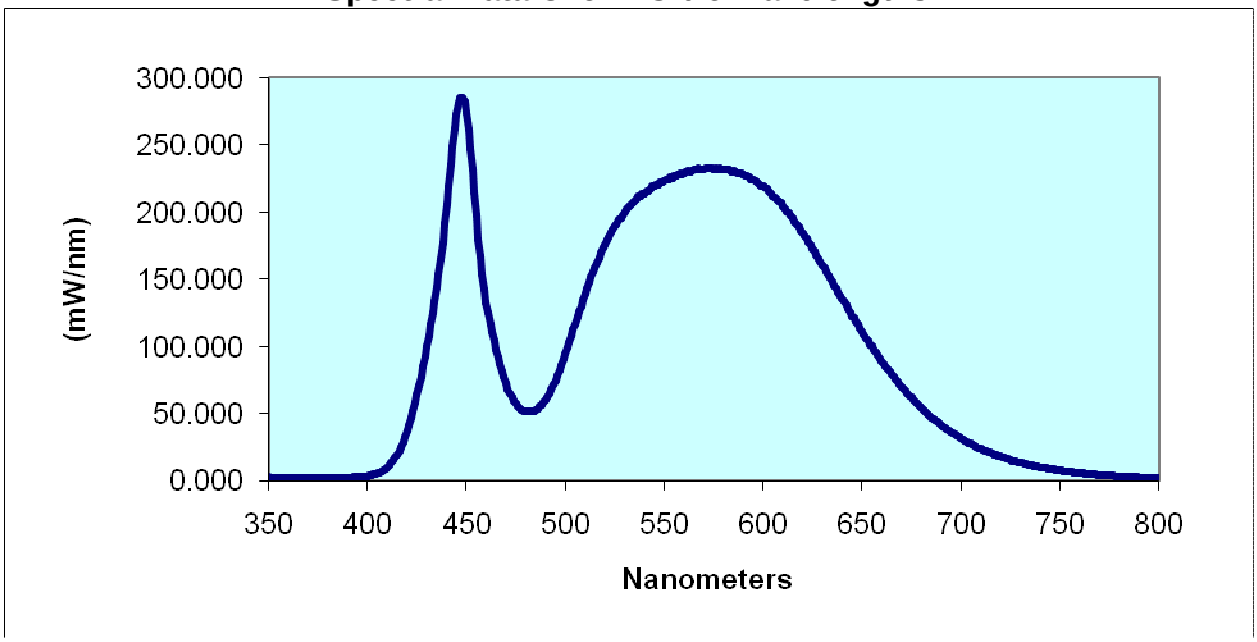
	G0	G1	G2	G3	G4	G5
FVH	10	100	225	500	750	>750
BVH	10	100	225	500	750	>750
FH	660	1800	5000	7500	12000	>12000
BH	660	1800	5000	7500	12000	>12000

RESULTS OF TESTS

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	2.858	460	133.096	570	231.836	680	54.383
355	1.998	465	97.800	575	231.982	685	47.295
360	2.147	470	73.066	580	232.011	690	41.553
365	2.017	475	57.234	585	230.989	695	36.479
370	2.256	480	51.975	590	227.818	700	31.600
375	2.131	485	53.014	595	224.505	705	27.524
380	2.109	490	60.332	600	219.405	710	23.852
385	2.301	495	74.334	605	212.236	715	20.814
390	2.330	500	94.549	610	203.736	720	18.117
395	2.794	505	116.920	615	195.486	725	15.584
400	3.591	510	139.048	620	184.250	730	13.660
405	5.656	515	158.761	625	172.968	735	11.721
410	10.239	520	175.980	630	160.413	740	10.199
415	19.688	525	189.526	635	148.079	745	8.910
420	37.022	530	200.731	640	135.521	750	7.715
425	64.325	535	208.307	645	122.696	755	6.669
430	100.076	540	213.648	650	110.698	760	5.949
435	143.738	545	219.119	655	100.205	765	5.137
440	206.142	550	223.313	660	89.332	770	4.501
445	272.697	555	227.001	665	79.280	775	3.906
450	273.831	560	229.361	670	69.994	780	3.431
455	197.126	565	232.005	675	61.792		

Sample No. 254994
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')
254994	4475	76.2	-7.6	0.003	0.363	0.374	0.215	0.498

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)
254994	UP	120.0	2121	252.8	0.992	9.85

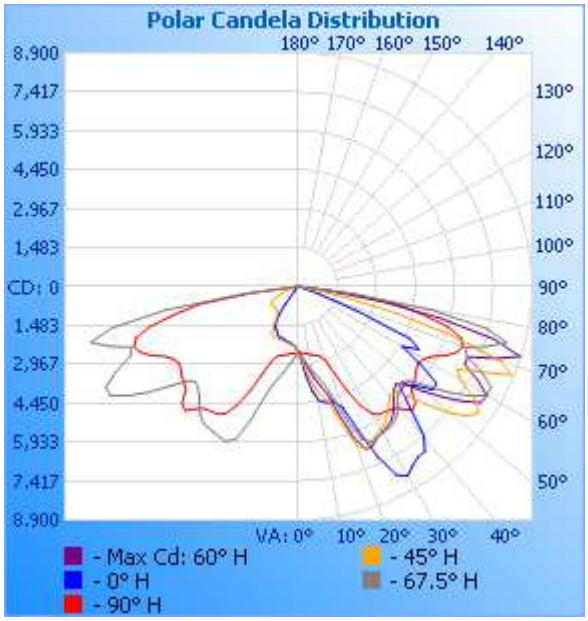
Intertek Sample No.	Input Voltage (Vac)	Input Power (Watts)	Input Power Factor	Current ATHD (%)
254994	277.0	257.1	0.938	16.15

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)
254994	UP	120.0	2113	251.9	0.993	20252	80.40

Intensity (Candlepower) Summary at 25℃ – Candelas

Angle	0	22.5	45	67.5	90
0	2506	2506	2506	2506	2506
5	3466	3375	3190	2857	2551
10	4402	4347	4024	3326	2629
15	4592	4638	4624	3873	2715
20	4907	6098	6407	5477	3018
25	7174	6644	6575	6527	4371
30	8326	6896	6275	6426	5593
35	7936	6810	5926	6331	5801
40	7427	6034	5401	5893	6076
45	5528	6225	5858	5437	6299
50	5887	7210	7453	5581	5706
55	6414	6742	8379	7032	5485
60	4552	5574	7142	8284	5510
65	4691	6556	7699	7696	6202
70	809	3225	8124	6768	6667
75	181	607	3667	8205	5885
80	60	126	562	5166	3835
85	25	37	63	356	99
90	8	14	18	39	17
95	2	4	8	14	15
100	0	1	3	8	11
105	0	0	1	4	8
110	0	0	0	3	6

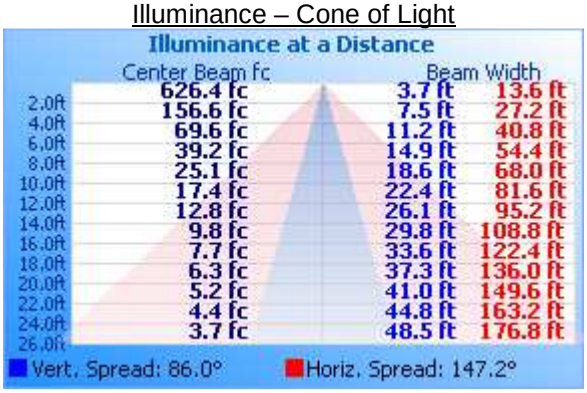


RESULTS OF TESTS (cont'd)

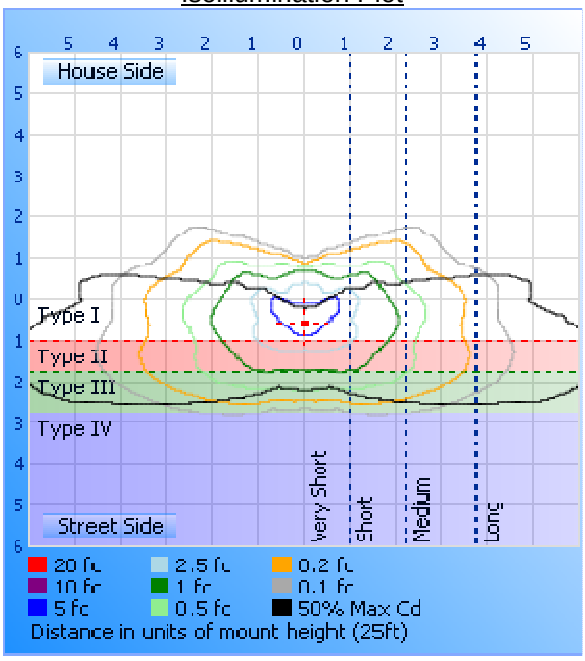
Illumination Plots

Mounting Height: 25 ft.

Illuminance – Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25℃

Zone	Lumens	% Luminaire
0-30	3221	15.9
0-40	5960	29.4
0-60	13013	64.3
60-90	7225	35.7
0-90	20239	99.9
90-180	13.8	0.1
0-180	20252	100.0

Zonal Lumens and Percentages at 25℃

Zone	Lumens	% Luminaire
0-10	270.3	1.3
10-20	952.4	4.7
20-30	1998	9.9
30-40	2739	13.5
40-50	3148	15.5
50-60	3906	19.3
60-70	4115	20.3
70-80	2704	13.3
80-90	406.5	2.0
90-100	9.6	0.0
100-110	3.6	0.0
110-120	0.6	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	3221	FL	2270	BL	951	--	--
30-60	9792	FM	7385	BM	2407	--	--
60-80	6818	FH	5160	BH	1658	--	--
80-90	407	FVH	278	BVH	129	--	--
90-100	10					UL	10
100-180	4					UH	4

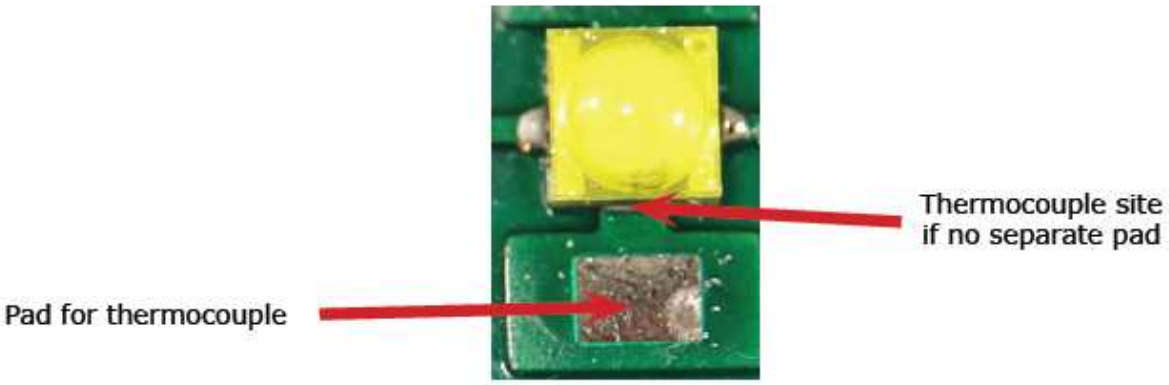
Backlight Rating: B 3
Uplight Rating: U 1
Glare Rating: G 3

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)

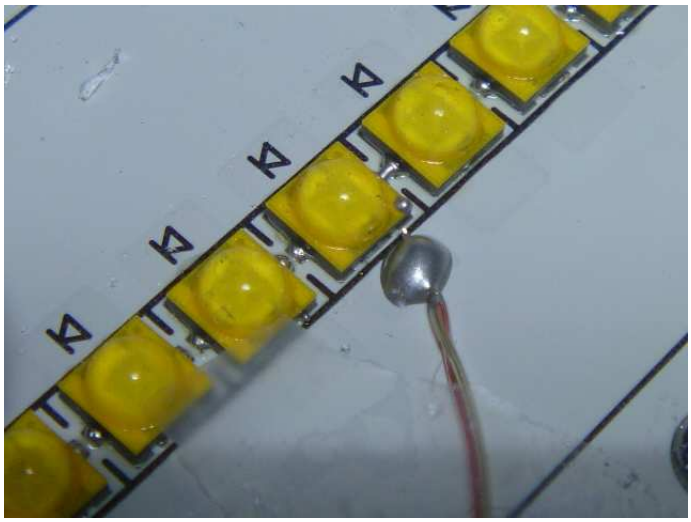
In-Situ Maximum Measured LED Source Temperature

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 = 452mA
Calculated LED Wattage = Vf x Measured LED Current = 1.537W
Maximum Source Temperature (Ts) = Tj – (LED Wattage x Thermal Resistance) = 142℃

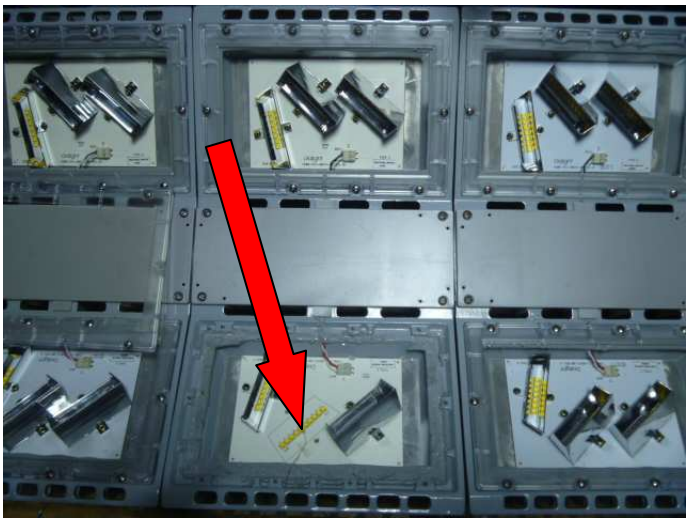
Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (℃)	Location	Maximum Rated Source Temperature(℃)
254998	59.3	Per diagram above	142

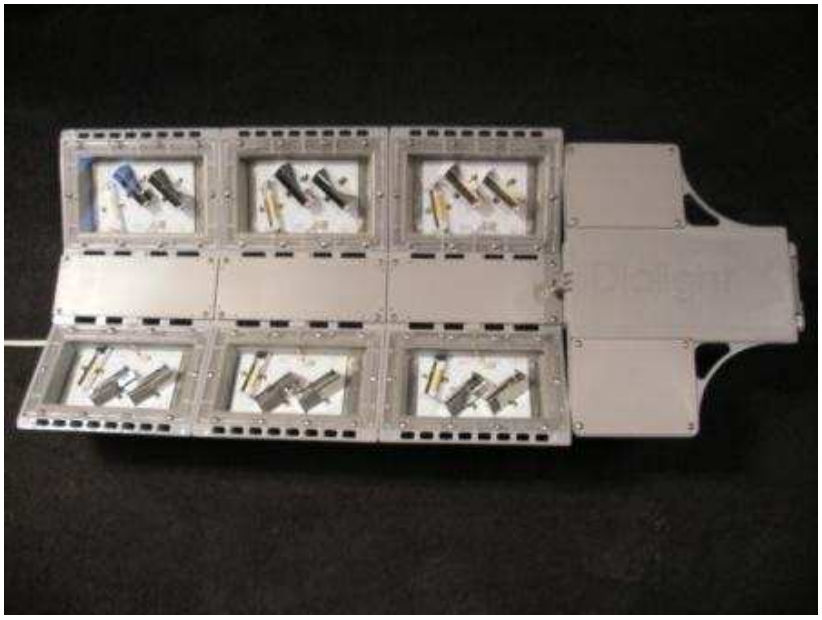
In-Situ Picture – Ts



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: 254994.IES