



# REPORT

25800 COMMERCENTRE DRIVE, LAKE FOREST, CA 92630

Project No. G101930166

Date: December 15, 2014

REPORT NO. 101930166LAX-003

TEST OF ONE HID REPLACEMENT LAMP

MODEL NO. DEG-600750  
LED MODEL NO. CREE XM-L2  
DRIVER MODEL NO. N2 POWER XL375-48 CS S120C

RENDERED TO

DIFFERENTIAL ENERGY GLOBAL LIMITED  
1540 LEADER INTERNATIONAL DRIVE  
PORT ORCHARD, WA, 98367

**TEST:** Electrical and Photometric tests as required to the IESNA test standard and In-Situ test.

**STATEMENT OF LIMITATION:** This report must not be used by the client to claim product certification, approval, or endorsement by A2LA, NIST, or any agency of the federal government.

**AUTHORIZATION:** The testing performed was authorized by signed quote number 500568619.

**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: Electrical and Photometric Measurements of Solid State Lighting

Energy Star Manufacturer's Guide Version 2.1 (2010): Guide for Qualifying Solid State Lighting Luminaires

**DESCRIPTION OF SAMPLE:** The client submitted one production sample of model number DEG-600750. The sample was received by Intertek on December 9, 2014, in undamaged condition and one sample was tested as received. The sample designation was LAN14120881317-003.

**DATES OF TESTS:** December 10, 2014 through December 11, 2014.

---

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to copy or distribute this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

## SUMMARY

Model No.:	DEG-600750
Description:	HID Replacement Lamp

Criteria	Result	
	Sphere	Goniometer
Total Lumen Output (Lumens)	22303	22890
Total Power (W)	314.1	311.3
Luminaire Efficacy (LPW)	71.01	73.53

Criteria	Result
Power Factor at 119.96Vac	0.991
Power Factor at 277.01Vac	0.911
Current ATHD % at 119.96Vac	13.74
Current ATHD % at 277.01Vac	23.01
Correlated Color Temperature (CCT - K)	4655
Color Rendering Index (CRI - Ra)	76.4
Color Rendering Index (CRI - R9)	10.5
DUV	0.001
Chromaticity Coordinate (x)	0.355
Chromaticity Coordinate (y)	0.359
Chromaticity Coordinate (u')	0.215
Chromaticity Coordinate (v')	0.490
Maximum In-Situ Source Temperature Point (°C)	57.4

## EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Date Calibrated	Calibration Due Date
LabSphere Power Supply	LPS-100-0833	000832	05/20/14	05/20/15
LapSphere 3M Integrating Sphere	CA-11821-LRT	000830	VBV	VBV
LabSphere Spectrometer	CDS-3020	000834	VBV	VBV
California Instruments Power Supply	CSW5550	001339	VBV	VBV
Yokogawa Power Meter	WT333	001319	05/15/14	05/15/15
Temperature Humidity Meter	971	001181	04/03/14	04/03/15
Extech Instruments Stop Watch	C-510	000351	09/25/14	09/25/15
LSI High Speed Mirror Goniometer	6440T	000943	12/03/14	01/03/15
Elgar Power Supply	CW1251	000944	VBV	VBV
Yokogawa Power Analyzer	WT210	000945	11/14/14	11/14/15
Temperature Humidity Meter	971	001181	04/03/14	04/03/15
Extech Instruments Stop Watch	C-510	000351	09/25/14	09/25/15
Tape Measure	33-428	001120	12/28/13	12/28/14
DMM	87	29	11/07/14	11/07/15
Power Supply (AC 3P / DC)	LAN	1338	06/09/14	06/09/15
Stop Watch	C-510	351	09/25/14	09/25/15

## TEST METHODS

### Seasoning in Sample Orientation – LED Products

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

### Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere CDS 3020 Spectrometer and Three Meter 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 Yokogawa Power Analyzer.

The calibration of the sphere spectrometer system is traceable to the National Institute of Standards and Technology.

### 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 Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

### 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 TMPPS or TS 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.

# **RESULTS OF TEST**

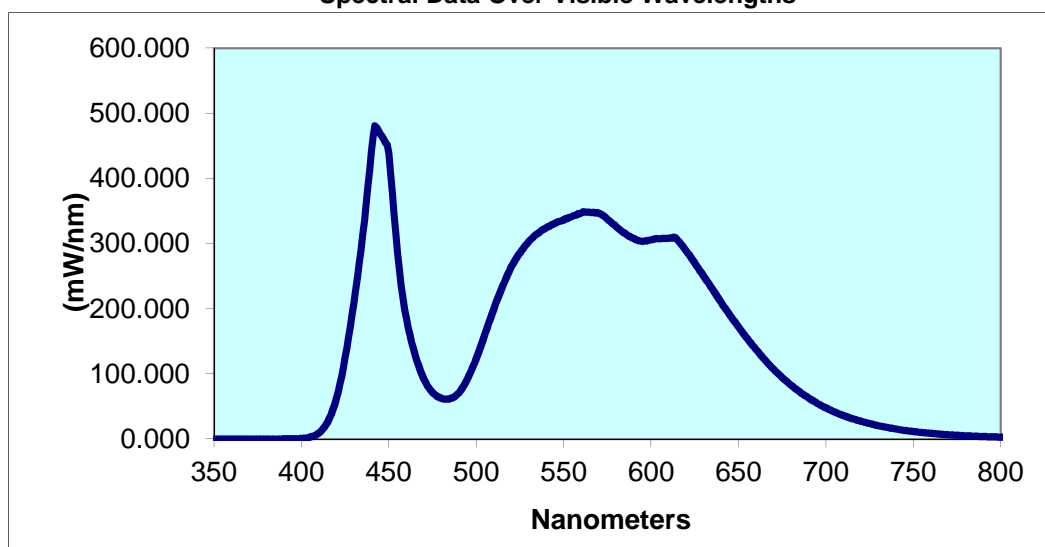
## **Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) - Integrating Sphere Method**

Intertek Sample No.	Base Orientation	Input Voltage {Vac}	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)	Luminous Flux (Lumens)	Lumen Efficacy (LPW)
LAN14120881317-003	UP	120.0	2643	314.1	0.991	13.74	22303	71.01
		277.0	1222	308.4	0.911	23.01		
Correlated Color Temperature (K)	CRI -Ra	CRI -R9	DUV	CIE 31' Chromaticity Coordinate	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')	
4655	76.4	10.5	0.001	0.355	0.359	0.215	0.490	

## **Spectral Distribution over Visible Wavelengths**

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	-0.400	440	440.200	530	303.50	620	288.700	710	35.850
355	-0.486	445	467.900	535	315.30	625	269.800	715	31.170
360	-0.510	450	438.100	540	324.50	630	250.100	720	27.130
365	-0.345	455	285.200	545	331.50	635	230.000	725	23.670
370	-0.300	460	184.700	550	336.50	640	210.200	730	20.380
375	-0.531	465	128.900	555	342.10	645	190.200	735	17.550
380	-0.245	470	92.000	560	346.90	650	171.600	740	15.170
385	-0.252	475	70.860	565	348.20	655	153.800	745	13.040
390	0.099	480	62.420	570	346.70	660	137.300	750	11.330
395	0.043	485	61.990	575	337.50	665	121.500	755	9.818
400	0.705	490	71.080	580	325.70	670	107.200	760	8.477
405	2.816	495	92.610	585	316.00	675	94.060	765	7.399
410	9.405	500	123.900	590	308.10	680	82.560	770	6.388
415	26.290	505	161.500	595	303.30	685	72.220	775	5.550
420	62.330	510	199.400	600	305.70	690	62.940	780	4.683
425	125.400	515	234.300	605	307.50	695	54.590		
430	209.700	520	263.900	610	308.10	700	47.590		
435	313.200	525	285.700	615	306.00	705	41.240		

**Spectral Data Over Visible Wavelengths**



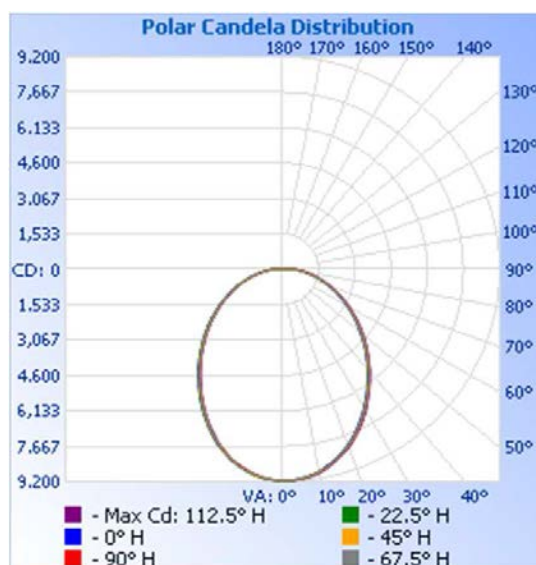
# RESULTS OF TEST (cont'd)

## Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – 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)
LAN14120881317-003	UP	120.0	2617	311.3	0.992	22890	73.53

## Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	9146	9146	9146	9146	9146
5	9067	9096	9091	9113	9131
10	8886	8897	8898	8929	8935
15	8525	8561	8571	8580	8601
20	8073	8103	8135	8157	8181
25	7508	7551	7579	7603	7655
30	6885	6920	6958	6988	7037
35	6233	6275	6311	6338	6380
40	5591	5628	5665	5708	5737
45	4945	4987	5017	5055	5087
50	4295	4344	4390	4424	4471
55	3704	3744	3782	3814	3852
60	3105	3156	3194	3220	3255
65	2567	2609	2649	2679	2705
70	2049	2090	2130	2159	2188
75	1583	1616	1650	1681	1705
80	1146	1179	1208	1233	1272
85	764	789	820	837	863
90	436	462	501	504	512



## RESULTS OF TEST (cont'd)

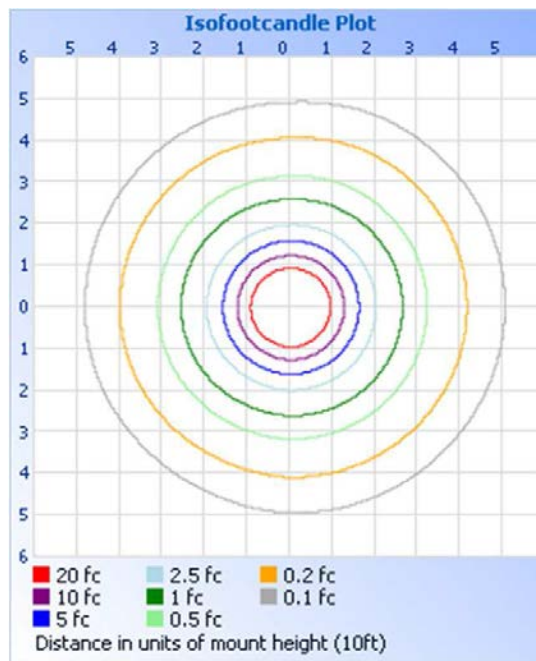
### Illumination Plots

Mounting Height: 10 ft.

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	6713	29.3
0-40	10608	46.3
0-60	17732	77.5
60-90	5093	22.3
0-90	22825	99.7
90-180	65.5	0.3
0-180	22890	100.0

Zonal Lumens and Percentages at 25°C

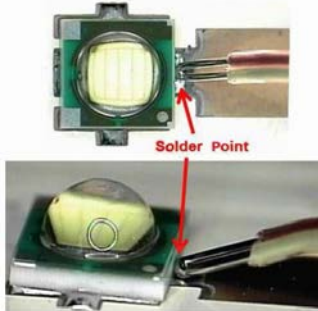
Zone	Lumens	% Luminaire
0-10	860.3	3.8
10-20	2400	10.5
20-30	3452	15.1
30-40	3895	17.0
40-50	3811	16.6
50-60	3313	14.5
60-70	2552	11.1
70-80	1685	7.4
80-90	855.5	3.7
90-100	65.5	0.3

## RESULTS OF TEST (cont'd)

### In-Situ Maximum Measured LED Source Temperature

#### Manufacturer Supplied Documentation:

LED model identified as:



Characteristics	Unit	Minimum	Typical	Maximum
Thermal resistance, junction to solder point	°C/W		2.5	
Forward voltage (@ 3000 mA, 85 °C)	V		3.3	
LED junction temperature	°C			150

Maximum Junction Temperature from LED specification ( $T_j$ ) = 150°C

Thermal Resistance Formula from LED specification = 2.5°C/W

Maximum Forward Voltage ( $V_f$ ) from LED specification = 3.3V

Measured LED Current = 2003mA

Calculated LED Wattage =  $V_f \times \text{Measured LED Current}$  = 6.61W

Maximum Source Temperature ( $T_s$ ) =  $T_j - (\text{LED Wattage} \times \text{Thermal Resistance})$  = 133.5°C

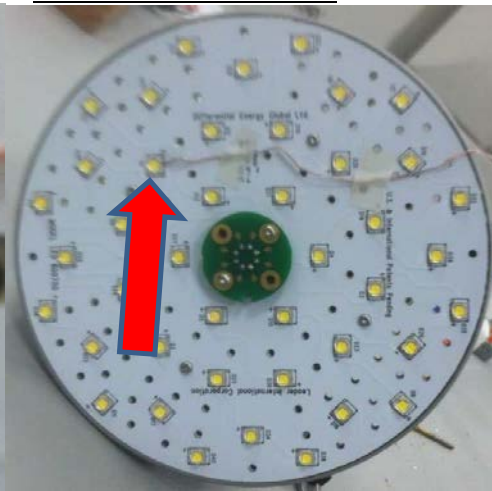
#### Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (°C)	Location	Maximum Rated Source Temperature (°C)
LAN14120881317-003	57.4	Per diagram	133.5

#### In-Situ Picture – $T_s$



#### In-Situ Picture – $T_s$ locator



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:

ENR

Erik Linares  
Technician  
Lighting Division

Attachment: None

Report Reviewed By:

KP

Kenda Branch  
Lighting Performance Team Lead  
Lighting Division