



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

# REPORT

3933 US ROUTE 11 CORTLAND, NEW YORK 13045

Project No. G100896445

Date: September 26, 2012

REPORT NO. 100896445CRT-002

TEST OF ONE LED HIGH-BAY FIXTURE

FIXTURE MODEL NO. SL150-KM-PFB(PF-S)  
LED MODEL NO. LUXEON LXR7-SW57

RENDERED TO

DONGBU LIGHTEC CO LTD  
739-8 OJEONG-DONG OJEONG-GU  
BUCHEON-SI, GYEONGGI-DO 421-170  
REPUBLIC OF KOREA

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 500403573.

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 SL150-KM-PFB(PF-S). The samples were received by Intertek on August 29, 2012, in undamaged condition, and two samples were tested as received. The sample designations were 255291 and 255295.

DATES OF TESTS: September 26, 2012

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SUMMARY

Model No.:	SL150-KM-PFB(PF-S)
Description:	LED High-Bay Fixture

Criteria	Result
Total Lumen Output	14501 Lumens
Total Power	150.9 W
Luminaire Efficacy	96.10
Power Factor (at 120 Vac)	0.995
Power Factor (at 277 Vac)	0.949
Current ATHD (at 120 Vac)	7.37%
Current ATHD (at 277 Vac)	13.28%
Correlated Color Temperature (CCT)	5434 K
Color Rendering Index (CRI) - Ra	78.0
Color Rendering Index (CRI) - R9	4.1
Duv	0.006
Chromaticity Coordinate (x)	0.334
Chromaticity Coordinate (y)	0.354
Chromaticity Coordinate (u')	0.203
Chromaticity Coordinate (v')	0.484
Maximum In-Situ Source Temperature Point	62.0°C

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

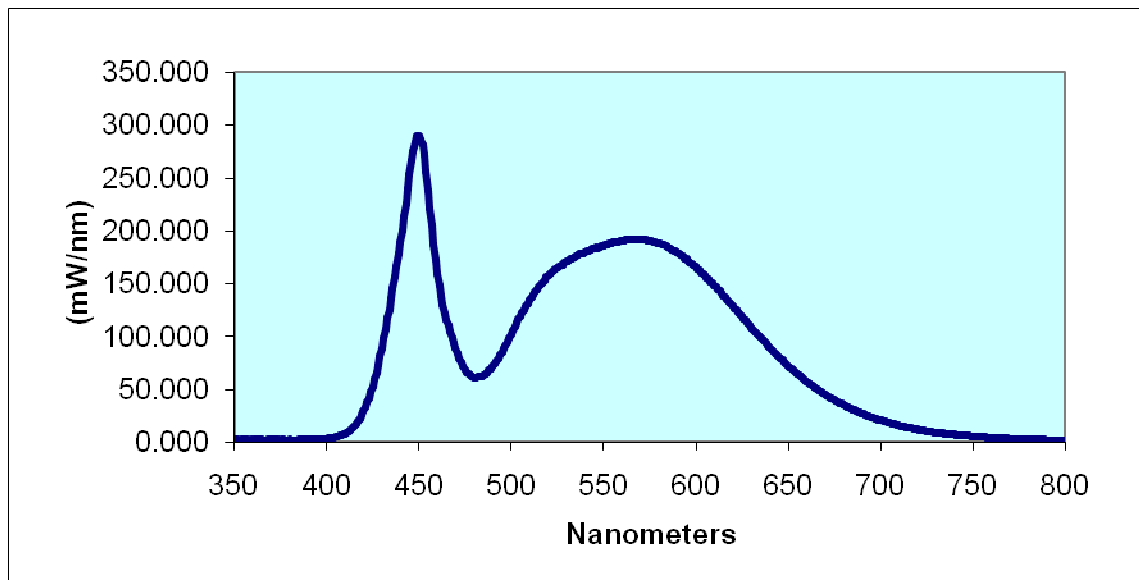
Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven and a half hours before measurements were taken. Power supply or source 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.

RESULTS OF TESTS

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	1.911	460	158.577	570	190.835	680	34.815
355	1.999	465	115.460	575	189.990	685	30.821
360	1.790	470	88.522	580	187.886	690	26.830
365	2.009	475	68.303	585	183.968	695	23.623
370	2.105	480	61.036	590	178.741	700	20.545
375	1.853	485	63.517	595	172.934	705	17.951
380	1.942	490	71.336	600	165.782	710	15.749
385	1.945	495	84.607	605	157.163	715	13.667
390	1.977	500	102.215	610	148.014	720	11.820
395	2.302	505	118.335	615	138.701	725	10.306
400	3.095	510	134.091	620	128.561	730	8.925
405	4.413	515	146.574	625	118.507	735	7.701
410	7.736	520	157.124	630	108.427	740	6.817
415	14.809	525	164.659	635	98.829	745	5.932
420	28.616	530	171.064	640	89.572	750	5.227
425	52.737	535	175.297	645	80.235	755	4.625
430	89.028	540	179.192	650	71.940	760	3.985
435	135.661	545	182.864	655	64.727	765	0.000
440	189.139	550	185.704	660	57.544	770	3.077
445	252.820	555	188.484	665	50.869	775	2.723
450	289.659	560	190.225	670	45.071	780	2.381
455	237.684	565	191.858	675	39.659		

**Sample No. 255291**  
**Spectral Data Over Visible Wavelengths**





RESULTS OF TESTS (cont'd)

Photometric and Electrical Measurements at 25°C – Integrating Sphere Method

Intertek Sample No.	Correlated Color			DUV	CIE 31'	CIE 31'	CIE 76'	CIE 76'
	Temperature (K)	CRI -Ra	CRI -R9		Chromaticity Coordinate (x)	Chromaticity Coordinate (y)	Chromaticity Coordinate (u')	Chromaticity Coordinate (v')
255291	5434	78.0	4.1	0.006	0.334	0.354	0.203	0.484

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)
255291	UP	120.0	1265	151.3

Intertek Sample No.	Input Power Factor 120 Vac	Current ATHD (%) 120 Vac	Input Power Factor 277 Vac	Current ATHD (%) 277 Vac
255291	0.995	7.37	0.949	13.28

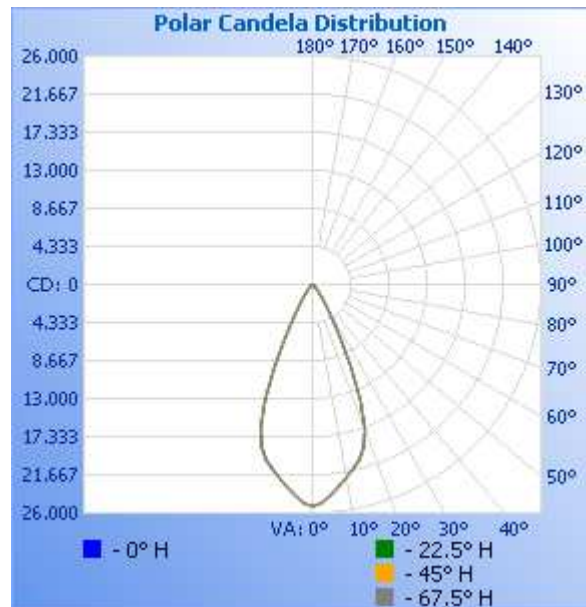
## RESULTS OF TESTS (cont'd)

### 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)
255291	UP	120.0	1262	150.9	0.996	14501	96.08

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

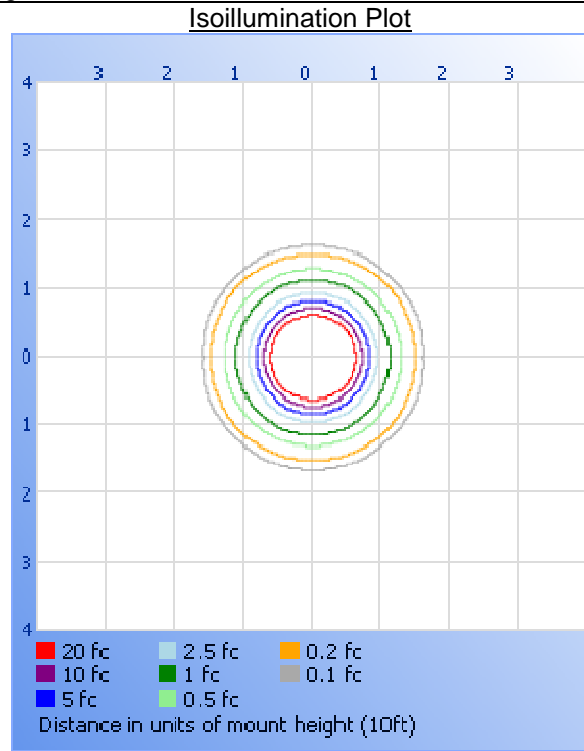
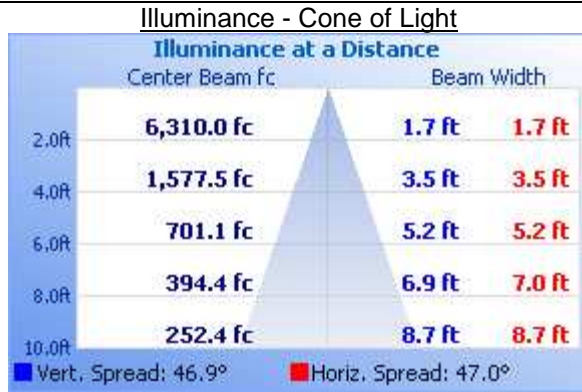
Angle	0	22.5	45	67.5	90
0	25240	25240	25240	25240	25240
5	23958	24052	24000	23955	23988
10	22236	22271	22244	22235	22323
15	20542	20691	20678	20546	20673
20	17323	17279	17352	17465	17289
25	10209	10274	10277	10191	10258
30	4309	4342	4343	4288	4318
35	2049	2069	2019	1965	2021
40	1000	1025	988	956	976
45	500	509	502	495	490
50	287	294	295	280	283
55	142	152	161	140	147
60	42	46	36	32	29
65	0	0	0	0	0
70	0	0	0	0	0
75	0	0	0	0	0
80	0	0	0	0	0
85	0	0	0	0	0
90	0	0	0	0	0



## RESULTS OF TESTS (cont'd)

### Illumination Plots

Mounting Height: 10 ft.



### Zonal Lumen Summary and Percentages at 25°C

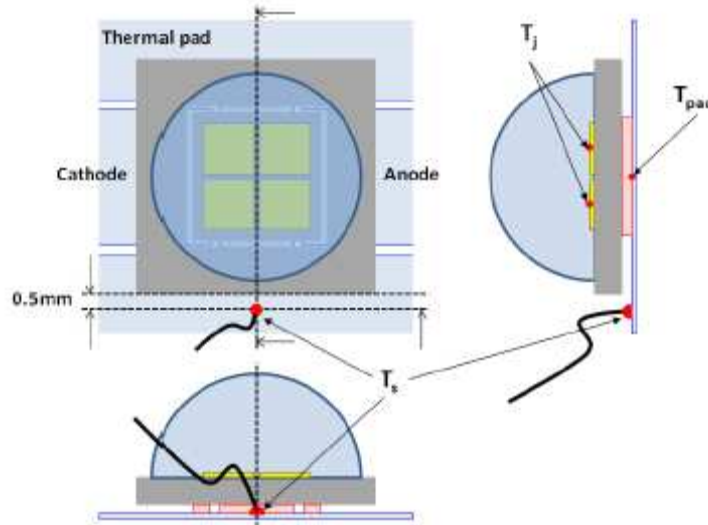
Zone	Lumens	% Luminaire
0-30	12570	86.7
0-40	13941	96.1
0-60	14496	100.0
60-90	5.1	0.0
0-90	14501	100.0
90-180	0.0	0.0
0-180	14501	100.0

## RESULTS OF TESTS (cont'd)

### In-Situ Maximum Measured LED Source Temperature

Manufacturer Supplied Documentation:

LED identified as: LUXEON LXR7-SW57



Nominal CCT	Forward Voltage $V_f$ <sup>(1)</sup> (V)			Typical Temperature Coefficient of Forward Voltage <sup>(2)</sup> $\Delta V_f / \Delta T_j$ (mV/°C)	Typical Thermal Resistance Junction to Thermal Pad <sup>(3)</sup> $R\theta_{JC}$ (°C/W)
	Min.	Typ.	Max.		
4000K	10.5	11.2	12	-5.5	1.25
5700K	10.5	11.2	12	-5.5	1.25

Parameter	Maximum Performance
DC Forward Current <sup>(1)(2)</sup>	1050 mA
Peak Pulsed Forward Current <sup>(1)(2)</sup>	1200 mA
ESD Sensitivity	≤ 8000V Human Body Model (HBM) Class 3B JESD22-A114-E < 400V Machine Model (MM) Class B JESD22-A115-B
LED Junction Temperature <sup>(1)</sup>	135°C
Operating Case Temperature at Current	-40°C - 135°C @ 700 mA
Storage Temperature	-40°C - 135°C
Lead Soldering Temperature	JEDEC 020c 260°C
Allowable Reflow Cycles	3
Autoclave Conditions	121°C at 2.ATM 100% Relative Humidity for 96 Hours Maximum
Reverse Voltage (V <sub>r</sub> )	LUXEON M LEDs are not designed to be driven in reverse bias.



RESULTS OF TESTS (cont'd)

In-Situ Maximum Measured LED Source Temperature

Maximum Junction Temperature from LED specification ( $T_j$ ) = 150°C  
 Thermal Resistance Formula from LED specification = 1.25°C/W  
 Maximum Forward Voltage ( $V_f$ ) from LED specification = 12 V  
 Measured LED Current = 623 mA  
 Calculated LED Wattage =  $V_f \times \text{Measured LED Current}$  = 7.470 W  
 Maximum Source Temperature ( $T_s$ ) =  $T_j - (\text{LED Wattage} \times \text{Thermal Resistance})$  = 126°C

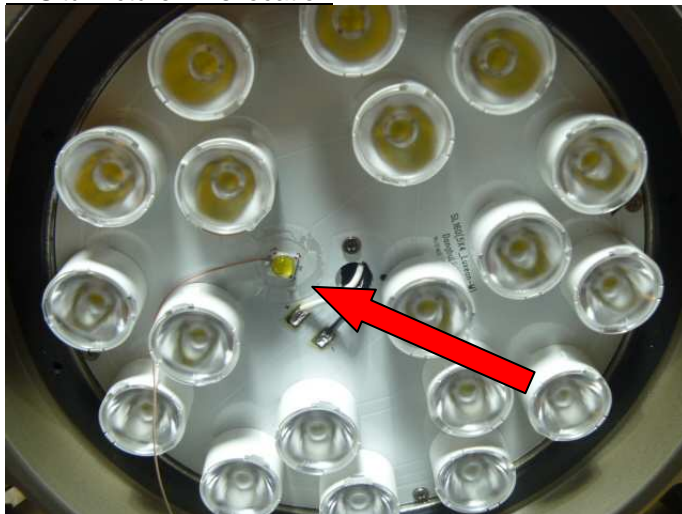
Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (°C)	Location	Maximum Rated Source Temperature(°C)
255295	62.0	Per diagram above	126

In-Situ Picture –  $T_s$



In-Situ Picture –  $T_s$  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:

Kenda Branch  
Engineer  
Lighting Division

Attachment: None

Report Reviewed By:

Jeffrey Davis  
Senior Associate Engineer  
Lighting Division