



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-001

TEST OF ONE LED HIGH-BAY FIXTURE

FIXTURE MODEL NO. SL120-UM-PFB(PW-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 SL120-UM-PFB(PW-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 255293 and 255294.

DATES OF TESTS: September 26, 2012

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SUMMARY

Model No.:	SL120-UM-PFB(PW-S)
Description:	LED High-Bay Fixture

Criteria	Result
Total Lumen Output	11890 Lumens
Total Power	122.9 W
Luminaire Efficacy	96.75
Power Factor (at 120 Vac)	0.997
Power Factor (at 277 Vac)	0.941
Current ATHD (at 120 Vac)	3.58%
Current ATHD (at 277 Vac)	18.80%
Correlated Color Temperature (CCT)	5476 K
Color Rendering Index (CRI) - Ra	74.1
Color Rendering Index (CRI) - R9	-4.8
Duv	0.007
Chromaticity Coordinate (x)	0.333
Chromaticity Coordinate (y)	0.356
Chromaticity Coordinate (u')	0.202
Chromaticity Coordinate (v')	0.485
Maximum In-Situ Source Temperature Point	60.8°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

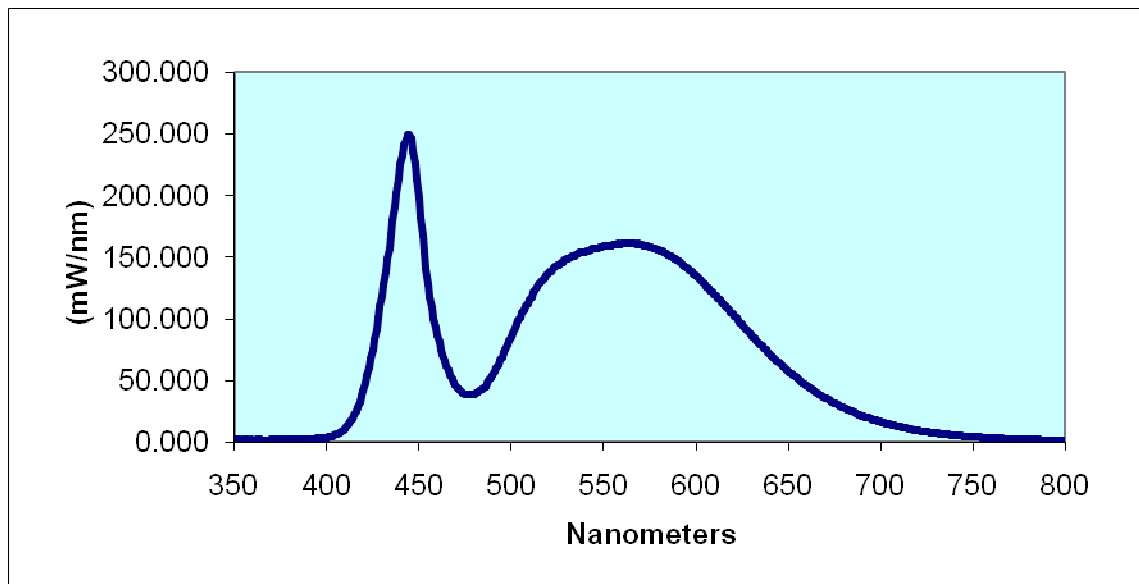
Power supply case and/or LED source operating temperature measurements were taken on one test sample per model with a thermocouple and Fluke 87 temperature meter. The SSL sample was allowed to reach thermal equilibrium for seven and a half hours before measurements were taken. Power supply or source 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	1.539	460	86.290	570	159.712	680	27.639
355	1.661	465	61.584	575	158.233	685	24.461
360	1.581	470	45.943	580	155.749	690	21.233
365	1.501	475	38.816	585	151.729	695	18.719
370	1.739	480	38.686	590	146.935	700	16.294
375	1.643	485	43.939	595	141.231	705	14.270
380	1.707	490	54.303	600	135.022	710	12.435
385	1.832	495	68.817	605	127.654	715	10.830
390	2.102	500	85.272	610	119.691	720	9.488
395	2.716	505	101.118	615	112.133	725	8.076
400	3.689	510	115.618	620	103.470	730	7.135
405	5.901	515	127.310	625	95.088	735	6.185
410	10.854	520	136.715	630	86.936	740	5.385
415	21.688	525	143.145	635	79.078	745	4.730
420	41.591	530	148.137	640	71.617	750	4.146
425	75.208	535	151.337	645	64.154	755	3.619
430	118.592	540	153.841	650	57.243	760	3.189
435	168.174	545	156.385	655	51.531	765	0.000
440	224.891	550	158.381	660	45.681	770	2.444
445	248.670	555	159.739	665	40.507	775	2.165
450	197.751	560	160.573	670	35.775	780	1.895
455	127.312	565	161.342	675	31.534		

Sample No. 255293
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			CIE 31' Chromaticity Coordinate		CIE 31' Chromaticity Coordinate		CIE 76' Chromaticity Coordinate	CIE 76' Chromaticity Coordinate
	Temperature (K)	CRI -Ra	CRI -R9	DUV	(x)	(y)	(u')	(v')	
255293	5476	74.1	-4.8	0.007	0.333	0.356	0.202	0.485	

Intertek Sample No.	Base Orientation	Input Voltage (Vac)	Input Current (mA)	Input Power (Watts)
255293	UP	120.0	1026	123.0

Intertek Sample No.	Input Power Factor 120 Vac	Current ATHD (%) 120 Vac	Input Power Factor 277 Vac	Current ATHD (%) 277 Vac
255293	0.997	3.58	0.941	18.8

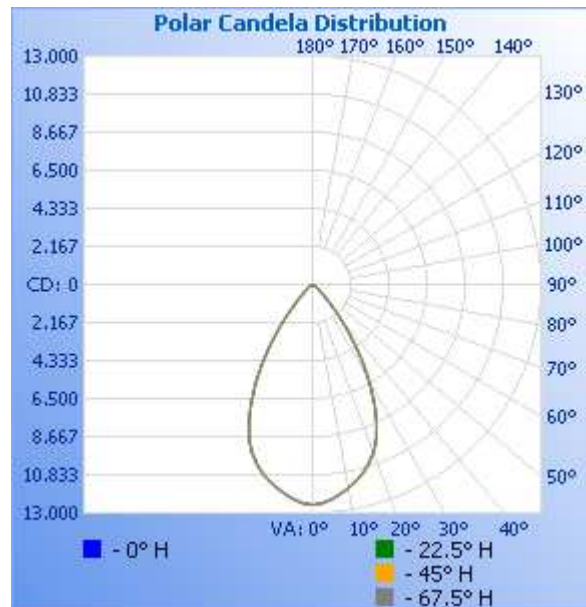
RESULTS OF TESTS (cont'd)

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)
255293	UP	120.0	1026	122.9	0.998	11890	96.75

Intensity (Candlepower) Summary at 25°C - Candelas

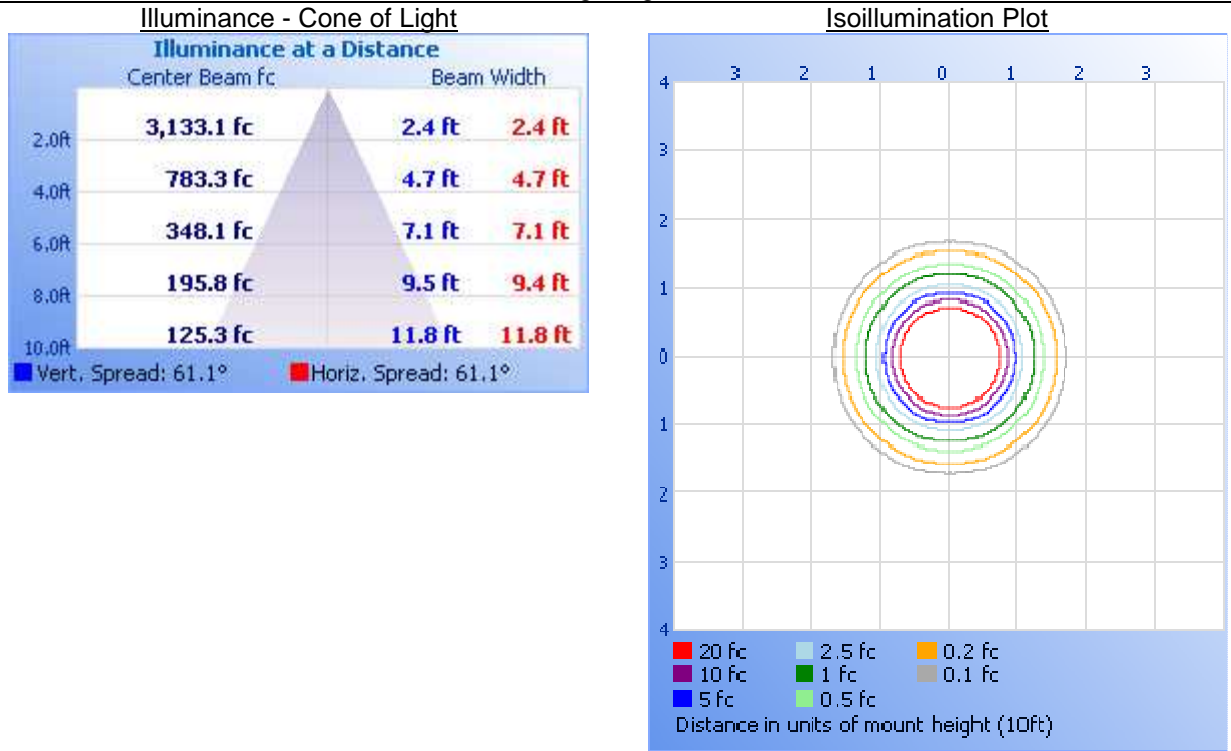
Angle	0	22.5	45	67.5	90
0	12532	12532	12532	12532	12532
5	12256	12278	12272	12269	12283
10	11737	11746	11766	11754	11736
15	11086	11089	11059	11096	11041
20	10137	10163	10189	10116	10153
25	8603	8604	8586	8578	8568
30	6524	6500	6502	6521	6518
35	4268	4281	4276	4295	4290
40	2266	2290	2305	2299	2300
45	1038	1061	1067	1061	1054
50	444	459	454	455	452
55	190	200	194	197	195
60	63	72	67	66	65
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

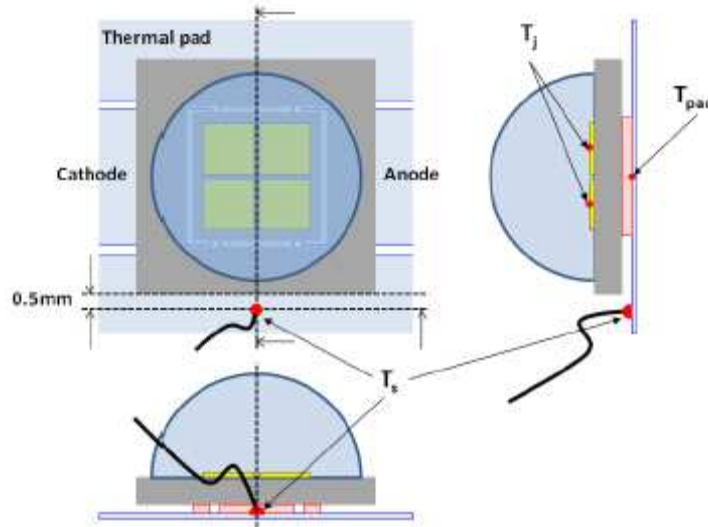
Zone	Lumens	% Luminaire
0-30	8132	68.4
0-40	10793	90.8
0-60	11877	99.9
60-90	12.4	0.1
0-90	11890	100.0
90-180	0.0	0.0
0-180	11890	100.0

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 ⁽¹⁾ (V)			Typical Temperature Coefficient of Forward Voltage ⁽²⁾ $\Delta V_f / \Delta T_j$ (mV/°C)	Typical Thermal Resistance Junction to Thermal Pad ⁽³⁾ $R\theta_{JC}$ (°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 ⁽¹⁾⁽²⁾	1050 mA
Peak Pulsed Forward Current ⁽¹⁾⁽²⁾	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 ⁽¹⁾	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 _r)	LUXEON M LEDs are not designed to be driven in reverse bias.

RESULTS OF TESTS (cont'd)

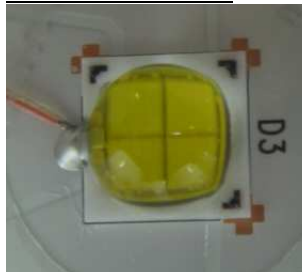
In-Situ Maximum Measured LED Source Temperature

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 = 624 mA
 Calculated LED Wattage = $V_f \times \text{Measured LED Current} = 7.485 \text{ W}$
 Maximum Source Temperature (T_s) = $T_j - (\text{LED Wattage} \times \text{Thermal Resistance}) = 126^\circ\text{C}$

Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature (°C)	Location	Maximum Rated Source Temperature(°C)
255294	60.8	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