



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

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G101656298

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REPORT NO. 101656298CRT-001

TEST OF ONE PARKING GARAGE LUMINAIRE

MODEL NO. PG45-UM-PFB(NT5M)

LED MODEL NO. SEOUL SEMICONDUCTOR SZ5-M1-WN-00

DRIVER MODEL NO. HIGH PERFECTION TECH LF1048-24-C2200-010V

RENDERED TO

DONGBU LIGHTEC CO., LTD
739-8 OJEONG-DONG OJEONG-GU
BUCHEON-SI 421-170 KOREA, SOUTH

REVISION NOTE: Report was revised to correct the measured LED current.

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

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 500528152.

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

ANSI NEMA ANSLG C78.377: 2012: Specifications of the Chromaticity of Solid State Lighting Products

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

DESCRIPTION OF SAMPLE: The client submitted one prototype sample of model number PG45-UM-PFB(NT5M). The sample was received by Intertek on May 19, 2014, in undamaged condition and one sample was tested as received. The sample designation was CRT1405191624-001A.

DATES OF TESTS: May 29, 2014 through May 30, 2014.

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SUMMARY

Model No.:	PG45-UM-PFB(NT5M)
Description:	PARKING GARAGE LUMINAIRE

Criteria	Result	
	Sphere	Goniometer
Total Lumen Output (Lumens)	4383	4470
Total Power (W)	45.67	45.75
Lumen Efficacy (LPW)	95.97	97.70

Criteria	Result
Power Factor at 120Vac	0.995
Power Factor at 277Vac	0.940
Current ATHD % at 120Vac	6.12
Current ATHD % at 277Vac	16.22
Correlated Color Temperature (CCT - K)	4346
Color Rendering Index (CRI - Ra)	72.1
Color Rendering Index (CRI - R9)	-11.3
DUV	0.001
Chromaticity Coordinate (x)	0.366
Chromaticity Coordinate (y)	0.366
Chromaticity Coordinate (u')	0.220
Chromaticity Coordinate (v')	0.494
Maximum In-Situ Source Temperature Point (°C)	55.6

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Date Calibrated	Calibration Due Date
Yokogawa Power Analyzer	WT1600	E474	03/07/14	03/07/15
LABSPHERE 3M	W/ CDS 1100	N307	VBU	VBU
Fluke Temperature Meter	53 II	T1318	03/21/14	03/21/15
Elgar Power Supply	CW1251	---	VBU	VBU
Extech Hygro-Thermometer	445703	T1366	11/27/13	11/27/14
SORENSEN POWER SUPPLY	XFR 150-8	---	VBU	VBU
NIST Spectral Flux Standard Source	RF1024	---	09/18/10	100 hrs of use
LSI High Speed Mirror Goniometer	6440	---	05/27/14	06/27/14
Elgar Power Supply	CW1251	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	04/17/14	04/17/15
ExTech Hygro Thermometer	445703	T1357	11/25/13	11/25/14
Fisher Scientific	14-649-9	N1405	08/13/13	08/13/14
M-D Building Products	Smart Tool	L112	03/14/14	03/15/15
Cole Parmer Hygro-thermometer	03313-85	T1469	05/31/13	05/31/14
Fluke Multimeter	87	E259	03/20/14	03/20/15
Fluke Temperature Meter	53 II	N1324	03/21/14	03/21/15



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 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.

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.

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

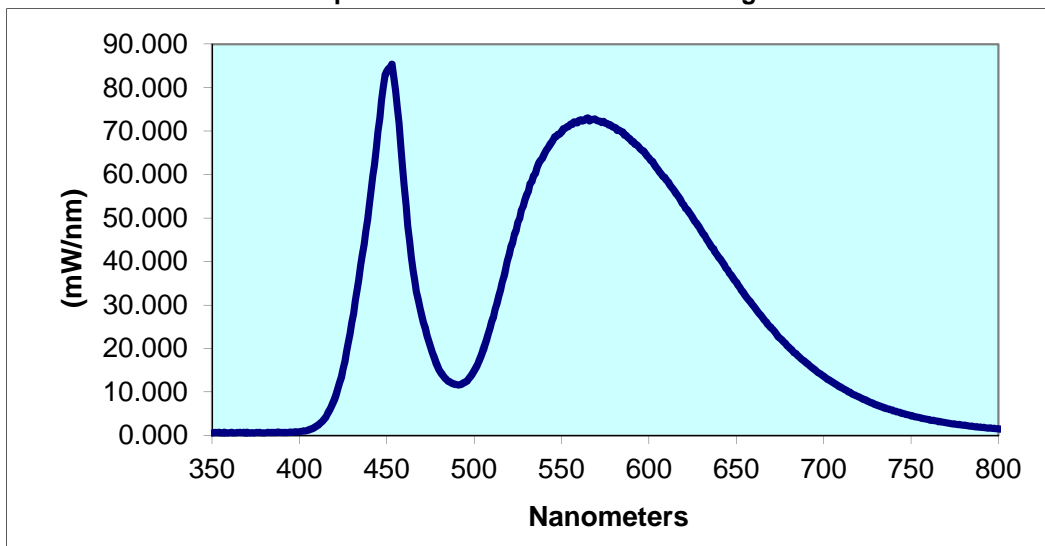
Intertek Sample No.	Base Orientation	Input Voltage {Vac}	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)	Luminous Flux (Lumens)	Lumen Efficacy (LPW)
CRT1405191624-001A	UP	120.0	382.6	45.67	0.995	6.12	4383	95.97
		277.0	171.2	44.60	0.940	16.22		

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')
4346	72.1	-11.3	0.001	0.366	0.366	0.220	0.494

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.558	440	53.010	530	55.460	620	53.000	710	11.030
355	0.586	445	69.970	535	60.300	625	50.150	715	9.937
360	0.659	450	83.740	540	64.590	630	46.980	720	8.937
365	0.644	455	79.330	545	67.780	635	43.890	725	7.959
370	0.705	460	57.310	550	69.850	640	40.920	730	7.073
375	0.658	465	37.850	555	71.570	645	38.030	735	6.338
380	0.585	470	27.520	560	72.460	650	35.250	740	5.700
385	0.671	475	20.450	565	73.010	655	32.260	745	5.115
390	0.675	480	15.200	570	72.490	660	29.710	750	4.585
395	0.721	485	12.550	575	71.850	665	27.100	755	4.088
400	0.910	490	11.710	580	70.880	670	24.740	760	3.659
405	1.218	495	12.320	585	69.800	675	22.350	765	3.278
410	2.213	500	14.940	590	67.740	680	20.290	770	2.941
415	4.181	505	19.530	595	65.980	685	18.420	775	2.635
420	8.283	510	26.110	600	63.830	690	16.690	780	2.346
425	15.320	515	33.520	605	61.230	695	15.110		
430	25.890	520	41.570	610	58.710	700	13.630		
435	39.150	525	49.060	615	55.950	705	12.270		

Spectral Data Over Visible Wavelengths



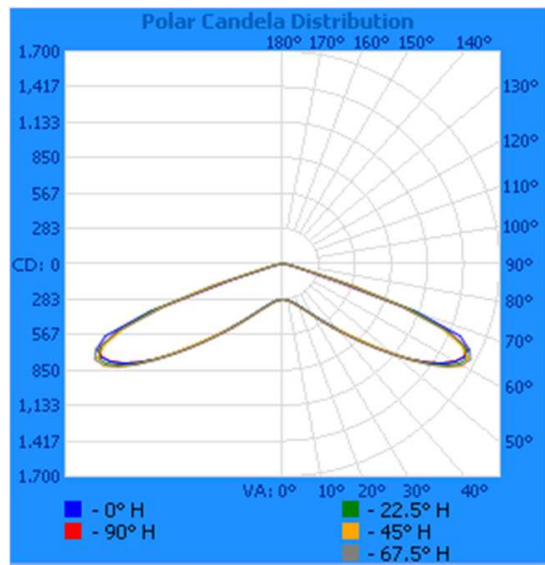
RESULTS OF TEST (cont'd)

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)
CRT1405191624-001A	UP	120.1	382.4	45.75	0.996	4470	97.70

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	283	283	283	283	283
5	286	288	288	289	289
10	297	299	301	302	302
15	318	320	324	324	325
20	352	353	359	360	360
25	396	399	404	407	407
30	466	470	475	477	476
35	559	567	571	577	575
40	691	696	695	711	709
45	872	872	863	890	886
50	1108	1112	1104	1125	1119
55	1372	1386	1403	1404	1370
60	1561	1594	1628	1613	1556
65	1607	1574	1544	1616	1580
70	1110	1077	1027	984	997
75	172	206	218	177	152
80	75	79	72	62	54
85	29	33	35	29	23
90	6	8	8	5	5
95	1	1	1	0	0

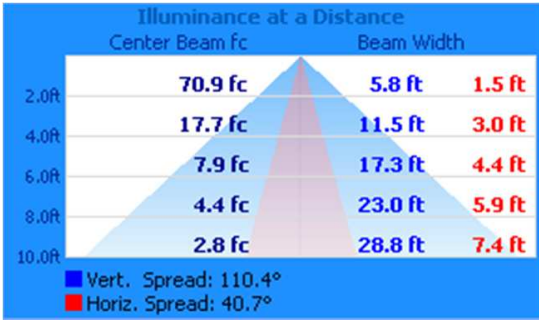


RESULTS OF TEST (cont'd)

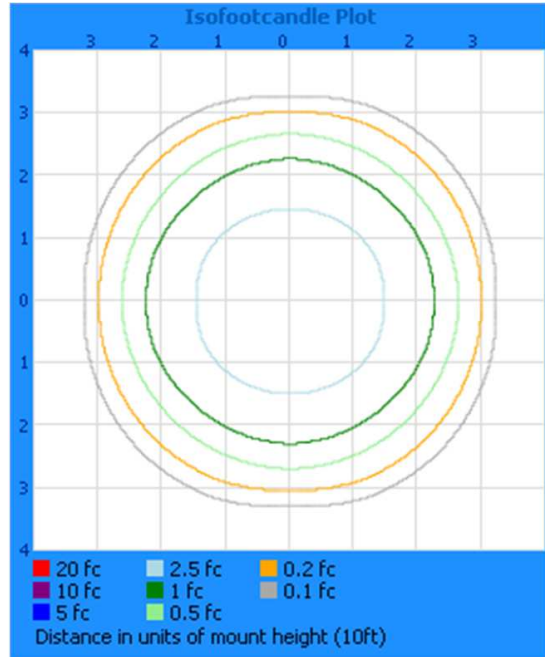
Illumination Plots

Mounting Height: 10 ft.

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	311.3	7.0
0-40	676.6	15.1
0-60	2609	58.4
60-90	1860	41.6
0-90	4469	100.0
90-180	1.7	0.0
0-180	4470	100.0

Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	27.9	0.6
10-20	93.0	2.1
20-30	190.4	4.3
30-40	365.2	8.2
40-50	692.2	15.5
50-60	1240	27.7
60-70	1467	32.8
70-80	356.8	8.0
80-90	36.0	0.8
90-100	1.7	0.0

RESULTS OF TEST (cont'd)

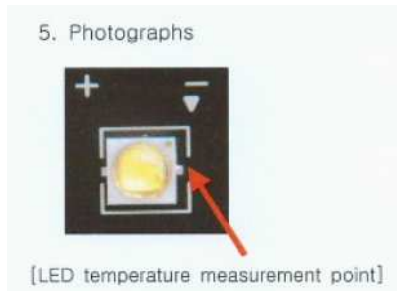
In-Situ Maximum Measured LED Source Temperature

Manufacturer Supplied Documentation:

LED model identified as: SEOUL SEMICONDUCTOR SZ5-M1-WN-00

Table 4. Absolute Maximum Ratings, $T_j = 25^\circ\text{C}$

Parameter	Symbol	Value			Unit	Typical Forward Voltage (V_f)		
		Min.	Typ.	Max.		Bin Code	Min.	Max.
Forward Current [1]	I_F	-	-	1.5	A	G	2.75	3.00
Peak Pulsed Forward Current [2]	I_F	-	-	2.0	A	H	3.00	3.25
Reverse Voltage	V_R	-	-	5	V	I	3.25	3.50
Power Dissipation	P_d	-	-	5.22	W			
Junction Temperature	T_j	-	-	150	$^\circ\text{C}$			
Operating Temperature	T_{opr}	-40	-	125	$^\circ\text{C}$			
Storage Temperature	T_{stg}	-40	-	125	$^\circ\text{C}$			
Thermal resistance (J to S) [3]	$R\theta_{j-s}$	-	4.5	-	K/W			
ESD Sensitivity(HBM) [4]		Class 3A JESD22-A114-E						

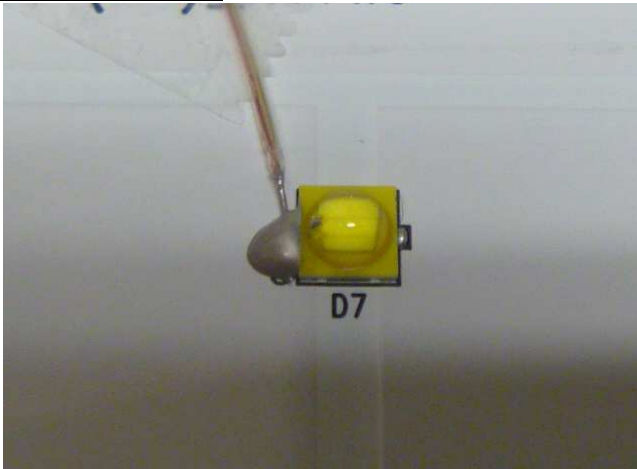


Maximum Junction Temperature from LED specification (T_j) = 150°C
 Thermal Resistance Formula from LED specification = 4.5°C/W
 Maximum Forward Voltage (V_f) from LED specification = 3.5V
 Measured LED Current = 550.8mA
 Calculated LED Wattage = $V_f \times \text{Measured LED Current} = 1.928\text{W}$
 Maximum Source Temperature (T_s) = $T_j - (\text{LED Wattage} \times \text{Thermal Resistance}) = 141.3^\circ\text{C}$

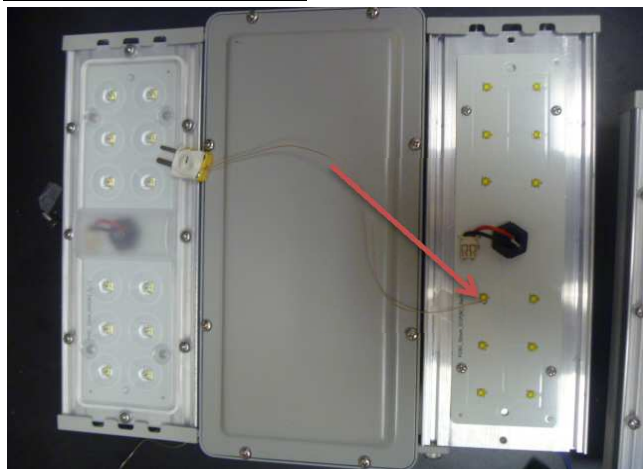
Maximum Measured Manufacturer Designated Source Temperature

Sample No.	Maximum Measured Source Temperature ($^\circ\text{C}$)	Location	Maximum Rated Source Temperature ($^\circ\text{C}$)
CRT1405191624-001A	55.6	Per diagram	141.3

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:



Melanie Brittain
Associate Engineer
Lighting Division

Attachment: None

Report Reviewed By:



Jeffrey Davis
Engineering Manager
Lighting Division