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

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G102322298 Date: July 1, 2016

REPORT NO. 102322298CRT-031

TEST OF ONE 4" DOWNLIGHT LED 3000K DIMMABLE

MODEL NO. LED 4" DOWNLIGHT D4-L650-C30-E
PART NO. 99346

RENDERED TO:

VERBATIM AMERICAS
1200 W.T. HARRIS BLVD.
CHARLOTTE, NC 28269

TESTS: 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 Qu-00647973.

STANDARDS USED:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting
ANSI NEMA ANSLG C78.377: 2011: Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number LED 4" DOWNLIGHT D4-L650-C30-E. The sample was received by Intertek on June 20, 2016 in undamaged condition and one sample was tested as received. The sample designation was CRT1606201051-001A.

DATE OF TESTS: June 21, 2016 through July 1, 2016.

SUMMARY:

MODEL NO. LED 4" DOWNLIGHT D4-L650-C30-E
DESCRIPTION: 4" Downlight LED 3000K Dimmable

Criteria	Integrating Sphere	Goniophotometer
Light Output (Lumens)	780.7	773.2
Total Power (W)	10.24	10.20
Lumen Efficacy (Lm/W)	76.30	75.80
Power Factor ( )	0.932	0.931

Criteria	Results
Current ATHD (%)	33.33
Correlated Color Temp. (CCT-K)	3077
Color Rendering Index (CRI - Ra)	81.4
CRI - R9	2.5
DUV ( )	0.002
Chromaticity Coordinate (x)	0.435
Chromaticity Coordinate (y)	0.410
Chromaticity Coordinate (u')	0.247
Chromaticity Coordinate (v')	0.523

EQUIPMENT LIST

Equipment Used	Model No.	Control No.	Last Cal.	Cal. Due
LSI High Speed Mirror Goniometer	6440	---	06/02/16	07/02/16
Elgar AC Power Supply	CW1251	---	VBU	VBU
Sorenson DC Power Supply	XG 150-10	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	05/02/16	05/02/17
Omega Thermometer	DPi8-C24	M263	05/02/16	05/02/17
M-D Building Products Digital Level	Smart Tool	L112	04/08/16	04/08/17
NIST Luminous Intensity Standard Source	NBS10322	N1427	12/12/14	12/12/16
NIST Luminous Intensity Standard Source	NBS10215	N1432	12/12/14	12/12/16
NIST Luminous Intensity Standard Source	960629-3	N1428	12/12/14	12/12/16
NIST Luminous Flux Standard Source	NBS10428	N1424	12/17/14	12/17/16
2M Integrating Sphere Spectrometer System	CDS 600	W/N308	06/15/16	07/15/16
Yokogawa Power Analyzer	WT1600	E474	04/25/16	04/25/17
Extech Hygro-Thermometer	445715	T1550	01/08/16	01/08/17
Fisher Scientific Stopwatch	14-649-9	N1404	08/22/15	08/22/16
Sorensen DC Power Supply	XFR 35-35	---	VBU	VBU
Xantrex DC Power Supply	XTR 150-5.6	---	VBU	VBU
Elgar AC Power Supply	CW1251	---	VBU	VBU
Secondary Spectral Intensity Standard Source	BS5186	RF5186	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS3616	---	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS4116	---	01/27/16	01/27/17
Secondary Luminous Flux Standard Source	BS3612	---	01/27/16	01/27/17

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. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a 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 the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

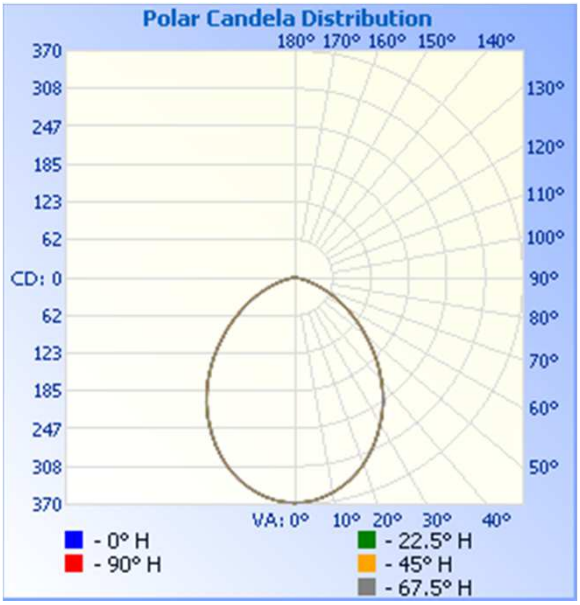
RESULTS:

Photometric and Electrical Measurements at Ambient Temperature (25℃ +/- 1℃) – Distribution Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Light Output (Lumens)	Lumen Efficacy (lm/W)
CRT1606201051-001A	Base Up	120.01	91.29	10.20	0.931	773.2	75.80

Intensity (Candlepower) Summary at 25℃ - Candelas

Angle	0	22.5	45	67.5	90
0	367	367	367	367	367
5	364	364	364	364	364
10	356	356	356	356	355
15	342	342	342	342	342
20	324	324	324	324	324
25	302	302	302	302	302
30	277	276	276	276	277
35	249	249	249	248	249
40	218	218	218	218	218
45	187	186	186	186	185
50	152	154	154	153	152
55	122	122	123	122	123
60	92	92	93	94	93
65	67	67	66	66	66
70	43	43	43	43	43
75	23	23	23	23	23
80	10	10	10	10	10
85	4	4	4	4	4
90	0	0	0	0	0

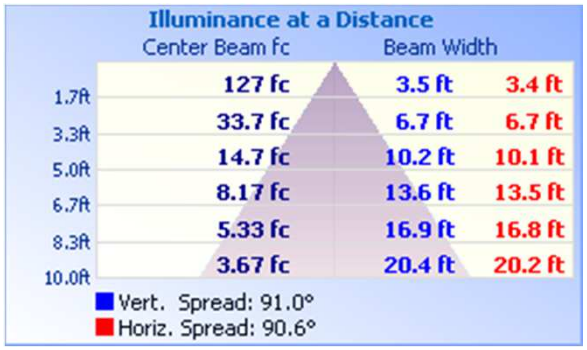


RESULTS:

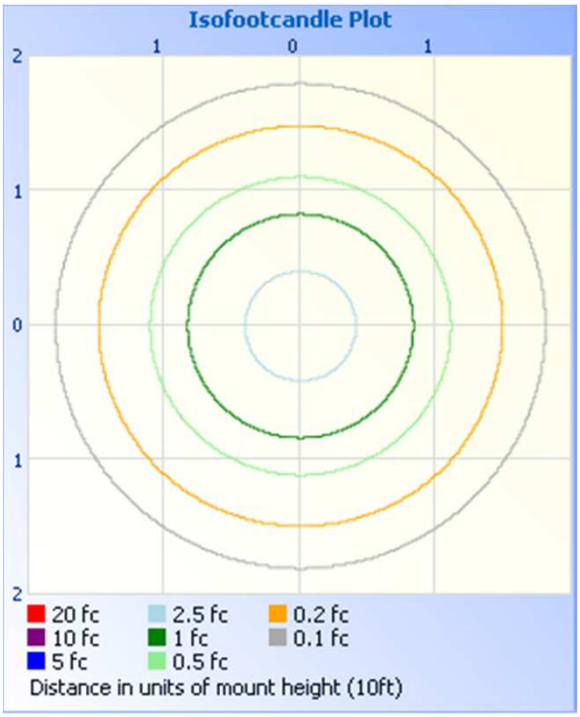
Illumination Plots

Mounting Height: 10ft

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25℃

Zone	Lumens	% Luminaire
0-30	269.4	34.8
0-40	424.6	54.9
0-60	676.9	87.5
60-90	96.3	12.5
0-90	773.2	100.0
90-180	0.0	0.0
0-180	773.2	100.0

Zonal Lumens and Percentages at 25℃

Zone	Lumens	% Luminaire
0-10	34.5	4.5
10-20	96.3	12.4
20-30	138.7	17.9
30-40	155.2	20.1
40-50	143.0	18.5
50-60	109.3	14.1
60-70	66.3	8.6
70-80	25.6	3.3
80-90	4.4	0.6

RESULTS:

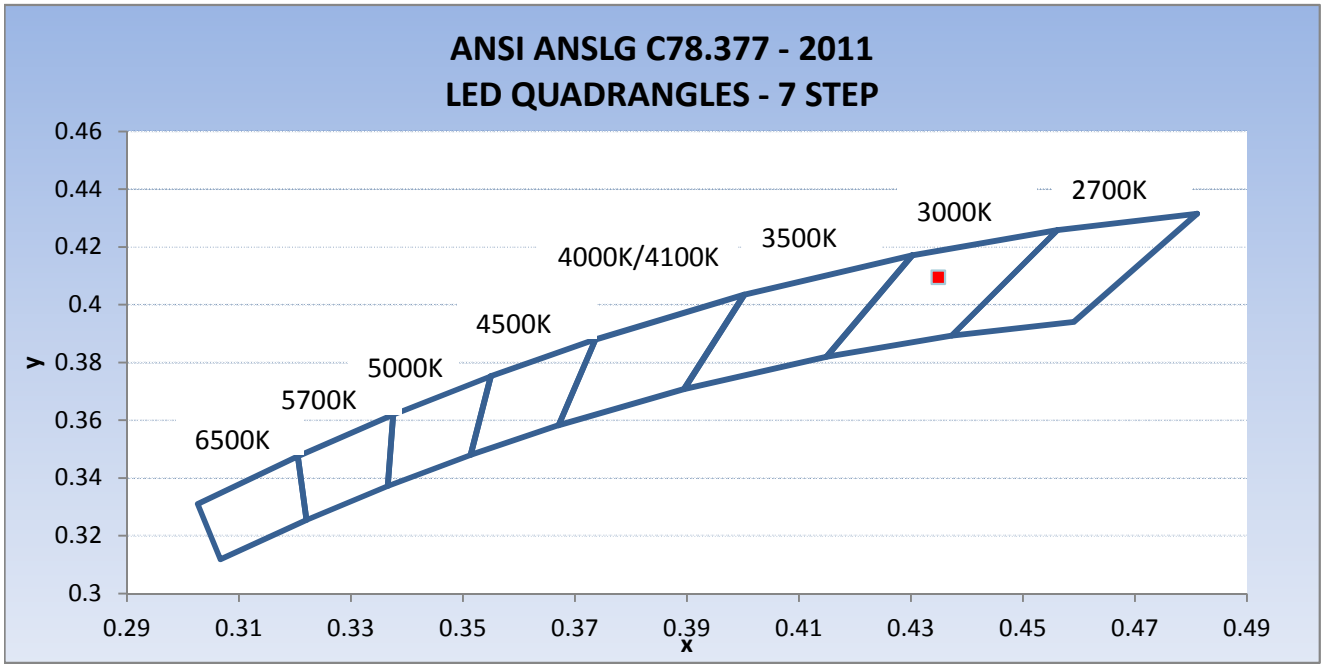
Photometric and Electrical Measurements at Ambient Temperature (25℃ +/- 1℃) – Sphere Method

Intertek Control No.	Base Orientation	Input Voltage (VAC)	Input Current (mA)	Input Power (W)	Input Power Factor ( )	Current ATHD (%)
CRT1606201051-001A	Base Up	120.00	91.60	10.24	0.932	33.33

Light Output (Lumens)	Lumen Efficacy (lm/W)	Correlated Color Temperature - CCT (K)	CRI -Ra	CRI -R9	DUV ( )
780.7	76.30	3077	81.4	2.5	0.002

CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
0.435	0.410	0.247	0.523

ANSI C78.377 SSL Chromaticity (2011 Version)

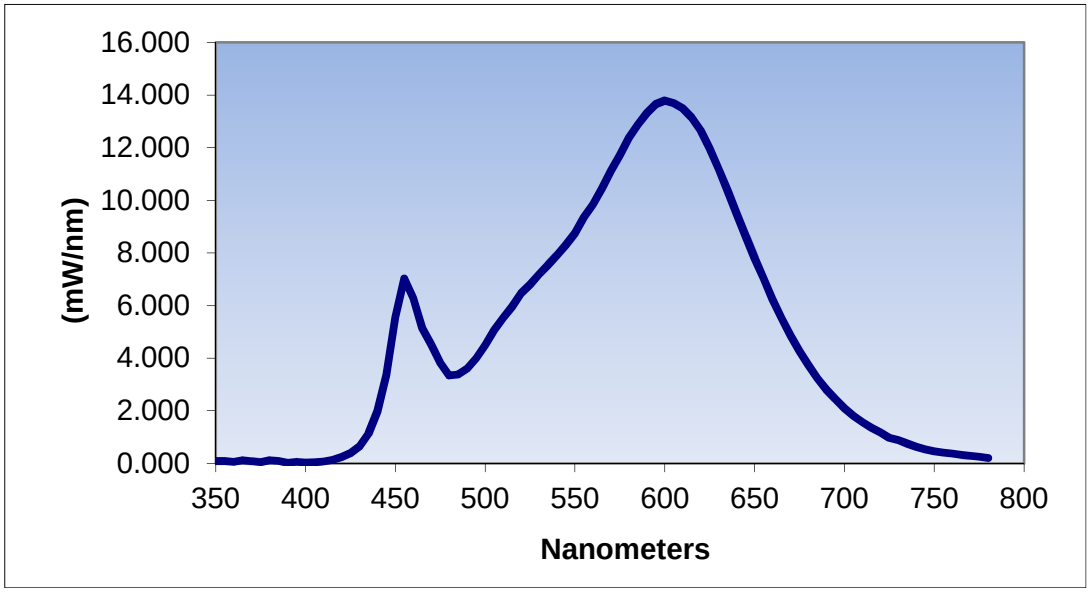


RESULTS:

Spectral Distribution Over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.087	460	6.288	570	11.123	680	3.743
355	0.079	465	5.145	575	11.726	685	3.233
360	0.061	470	4.517	580	12.382	690	2.811
365	0.118	475	3.831	585	12.877	695	2.439
370	0.088	480	3.340	590	13.323	700	2.094
375	0.045	485	3.380	595	13.655	705	1.803
380	0.118	490	3.610	600	13.798	710	1.563
385	0.092	495	4.004	605	13.691	715	1.346
390	0.020	500	4.497	610	13.495	720	1.174
395	0.053	505	5.072	615	13.143	725	0.976
400	0.031	510	5.531	620	12.662	730	0.886
405	0.036	515	5.961	625	11.983	735	0.757
410	0.069	520	6.470	630	11.178	740	0.632
415	0.127	525	6.801	635	10.350	745	0.538
420	0.241	530	7.184	640	9.470	750	0.457
425	0.381	535	7.537	645	8.636	755	0.414
430	0.646	540	7.902	650	7.794	760	0.374
435	1.132	545	8.304	655	7.033	765	0.324
440	1.979	550	8.744	660	6.233	770	0.286
445	3.367	555	9.349	665	5.523	775	0.251
450	5.561	560	9.846	670	4.868	780	0.206
455	7.023	565	10.456	675	4.267		

Spectral Data Over Visible Wavelengths



PRODUCT PICTURE:

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

Melanie Brittain
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Report Reviewed By:

Jeffrey Davis
Engineering Supervisor
Lighting Division

Attachments: IES File - CRT1606201051-001A