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

REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G101620590 Date: May 16, 2014

REPORT NO. 101620590CRT-001

TEST OF ONE LED MR16 LAMP (12VAC)

MODEL NO. M16-L350-C27-B38-W

RENDERED TO

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

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 500522931.

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

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number M16-L350-C27-B38-W. The sample was received by Intertek on May 7, 2014, in undamaged condition and one sample was tested as received. The sample designation was CRT1405071322-001-1.

DATES OF TESTS: May 12, 2014 through May 15, 2014.

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SUMMARY

Model No.:	M16-L350-C27-B38-W
Description:	LED MR16 Lamp (12VAC)

	Result	
Criteria	Sphere	Goniometer
Total Lumen Output (Lumens)	367.0	378.2
Total Power (W)	5.04	5.25
Luminaire Efficacy (LPW)	72.82	72.04

Criteria	Result
Power Factor	0.790
Current ATHD %	62.35
Correlated Color Temperature (CCT - K)	2717
Color Rendering Index (CRI - Ra)	83.6
Color Rendering Index (CRI - R9)	23.3
DUV	0.002
Chromaticity Coordinate (x)	0.456
Chromaticity Coordinate (y)	0.406
Chromaticity Coordinate (u')	0.262
Chromaticity Coordinate (v')	0.525

EQUIPMENT LIST

Equipment Used	Model Number	Control Number	Last Date Calibrated	Calibration Due Date
ITS 2 Meter Integ. Sphere	---	N308	VBU	VBU
Labsphere Diode Array	CDS 600	W/N308	05/02/14	06/02/14
Yokogawa	WT1600	E473	04/22/14	04/22/15
Fluke Temp Meter	52 k/j	T801	10/23/13	10/23/14
Cole-Parmer Hygro-Thermometer	445703	T1366	11/27/13	11/27/14
Elgar AC power supply	CW1251	---	VBU	VBU
Intensity Standard	---	BS5186	05/01/13	05/31/14
SECONDARY LM STD. #1	---	882295	05/01/13	05/31/14
SECONDARY LM STD. #2	---	BS4743	05/01/13	05/31/14
SECONDARY LM STD. #3	---	BS3616	05/01/13	05/31/14
LSI High Speed Mirror Goniometer	6440	---	04/25/14	05/25/14
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

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.

RESULTS OF TEST

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

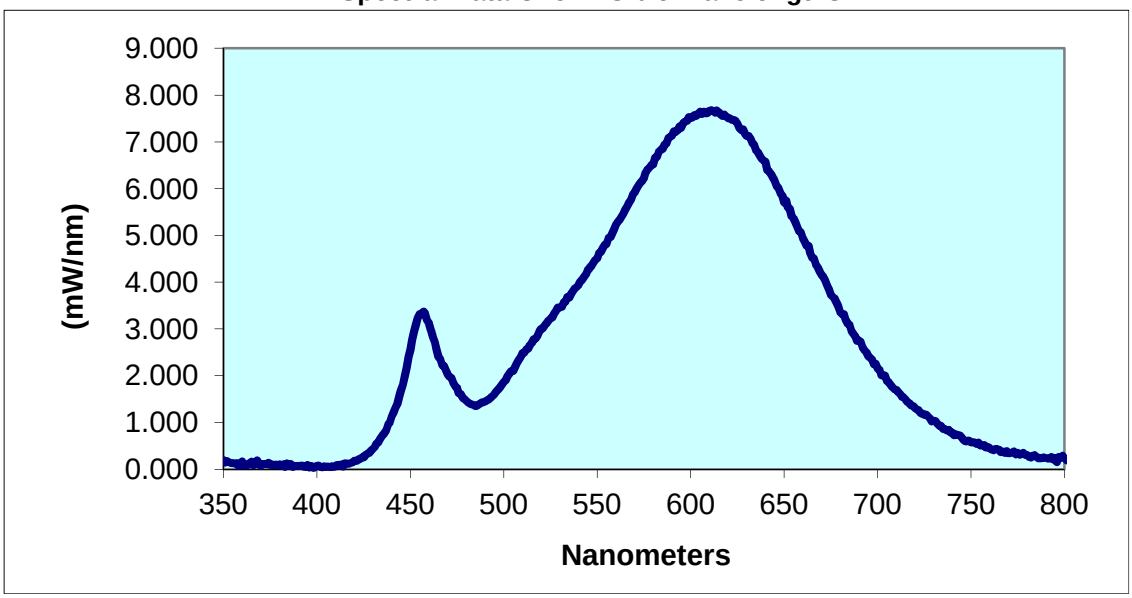
Intertek Sample No.	Base Orientation	Input Voltage {Vac}	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)	Luminous Flux (Lumens)	Lumen Efficacy (LPW)
CRT1405071322-001-1	UP	12.0	528.8	5.04	0.790	62.35	367.0	72.82

Correlated Color Temperature (K)	CRI -Ra	CRI -R9	DUV	CIE 31' Chromaticity Coordinate (x)	CIE 31' Chromaticity Coordinate (y)	CIE 76' Chromaticity Coordinate (u')	CIE 76' Chromaticity Coordinate (v')
2717	83.6	23.3	0.002	0.456	0.406	0.262	0.525

Spectral Distribution over Visible Wavelengths

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.196	440	1.124	530	3.459	620	7.507	710	1.701
355	0.131	445	1.683	535	3.669	625	7.383	715	1.490
360	0.168	450	2.562	540	3.936	630	7.125	720	1.311
365	0.162	455	3.318	545	4.258	635	6.814	725	1.166
370	0.071	460	3.119	550	4.515	640	6.575	730	1.033
375	0.089	465	2.412	555	4.819	645	6.169	735	0.863
380	0.105	470	2.033	560	5.229	650	5.701	740	0.781
385	0.085	475	1.739	565	5.553	655	5.369	745	0.681
390	0.070	480	1.459	570	5.917	660	4.944	750	0.576
395	0.091	485	1.348	575	6.230	665	4.527	755	0.508
400	0.070	490	1.444	580	6.523	670	4.164	760	0.452
405	0.051	495	1.606	585	6.854	675	3.724	765	0.418
410	0.067	500	1.870	590	7.130	680	3.354	770	0.346
415	0.124	505	2.099	595	7.302	685	3.085	775	0.349
420	0.179	510	2.477	600	7.507	690	2.751	780	0.302
425	0.252	515	2.696	605	7.644	695	2.427		
430	0.438	520	3.001	610	7.665	700	2.153		
435	0.722	525	3.227	615	7.637	705	1.882		

Spectral Data Over Visible Wavelengths



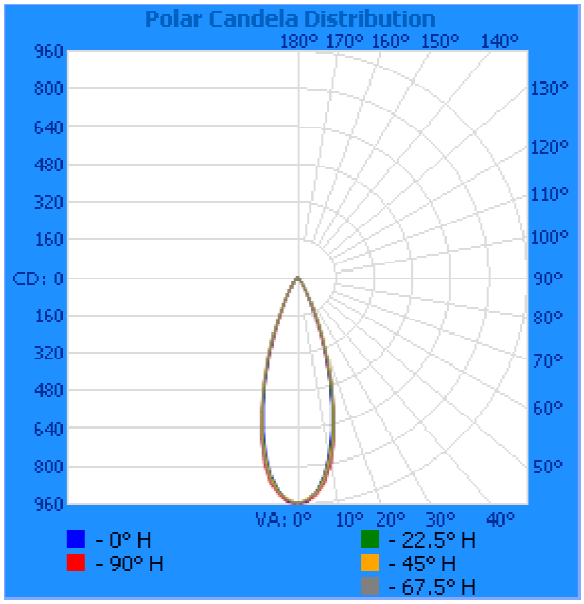
RESULTS OF TEST (cont'd)

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)
CRT1405071322-001-1	UP	12.0	573.4	5.25	0.761	378.2	72.04

Intensity (Candlepower) Summary at 25°C - Candelas

Angle	0	22.5	45	67.5	90
0	958	958	958	958	958
5	909	910	914	917	924
10	760	773	775	792	800
15	553	563	578	587	574
20	351	354	372	362	334
25	189	187	196	183	163
30	89	87	90	82	73
35	40	39	41	38	35
40	20	20	21	20	19
45	12	12	13	13	12
50	9	9	9	9	9
55	7	8	7	7	8
60	6	6	6	6	6
65	5	5	5	5	5
70	4	4	4	4	4
75	3	3	3	3	3
80	1	1	1	1	1
85	0	0	0	0	0
90	0	0	0	0	0

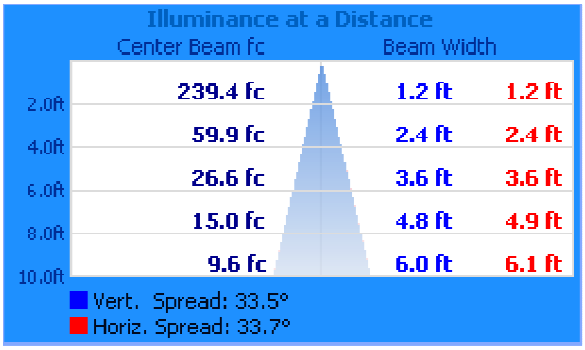


RESULTS OF TEST (cont'd)

Illumination Plots

Mounting Height: 10 ft.

Illuminance - Cone of Light



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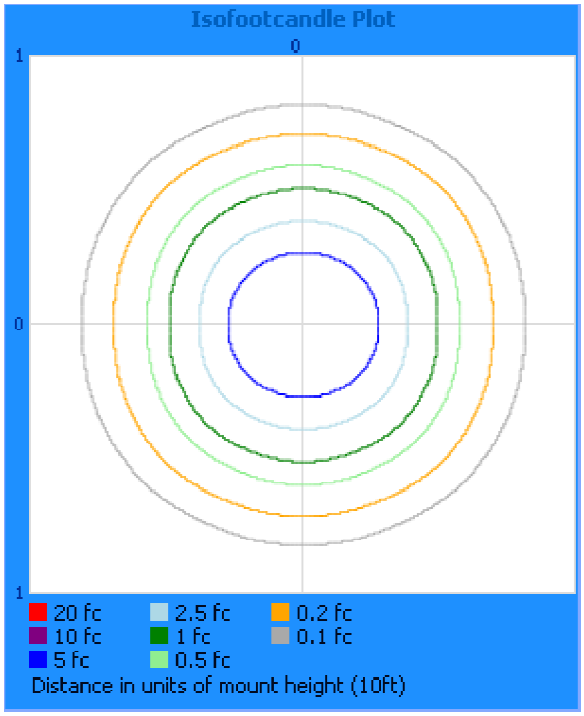

Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	326.2	86.3
0-40	352.9	93.3
0-60	369.7	97.8
60-90	8.4	2.2
0-90	378.1	100.0
90-180	0.0	0.0
0-180	378.2	100.0

Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	82.8	21.9
10-20	155.4	41.1
20-30	88.0	23.3
30-40	26.7	7.1
40-50	10.1	2.7
50-60	6.7	1.8
60-70	5.1	1.3
70-80	2.9	0.8
80-90	0.5	0.1

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:

Vladimir Kozak
Associate Engineer
Lighting Division

Report Reviewed By:

Joe Schledorn
Engineering Team Lead
Lighting Division

Attachment: None