

# REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G101454549

Date: January 24, 2014

REPORT NO. 101454549CRT-011

TEST OF ONE LED MR16

MODEL NO. M16-L350-C30-B38-W

RENDERED TO

VERBATIM AMERICAS  
1200 WT HARRIS BLVD.  
CHARLOTTE, NC 28262

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 500496843.

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-C30-B38-W. The sample was received by Intertek on January 8, 2014, in undamaged condition and one sample was tested as received. The sample designation was CRT1401081340-001.

DATES OF TESTS: January 16, 2014.

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## SUMMARY

Model No.:	M16-L350-C30-B38-W
Description:	LED MR16

Criteria	Result	
	Sphere	Goniometer
Total Lumen Output (Lumens)	396.5	375.9
Total Power (W)	5.209	5.370
Luminaire Efficacy (LPW)	76.12	70.00

Criteria	Result
Power Factor	0.761
Current ATHD %	73.87
Correlated Color Temperature (CCT - K)	3047
Color Rendering Index (CRI - Ra)	82.9
Color Rendering Index (CRI - R9)	20.8
DUV	0.002
Chromaticity Coordinate (x)	0.430
Chromaticity Coordinate (y)	0.396
Chromaticity Coordinate (u')	0.250
Chromaticity Coordinate (v')	0.517

## 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	01/02/14	02/02/14
Xitron Power Analyzer	2503AH	E235	05/10/13	06/10/14
Fluke Temp Meter	53II	D588	03/15/13	03/15/14
Cole-Parmer Hygro-Thermometer	03313-85	T1469	05/31/13	05/31/14
Elgar AC power supply	CW1251	---	---	---
LSI High Speed Mirror Goniometer	6440	---	12/23/13	01/23/14
Elgar Power Supply	CW1251	---	VBU	VBU
Yokogawa Power Analyzer	WT210	E464	04/17/13	04/17/14
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	02/13/13	02/13/14

## 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**

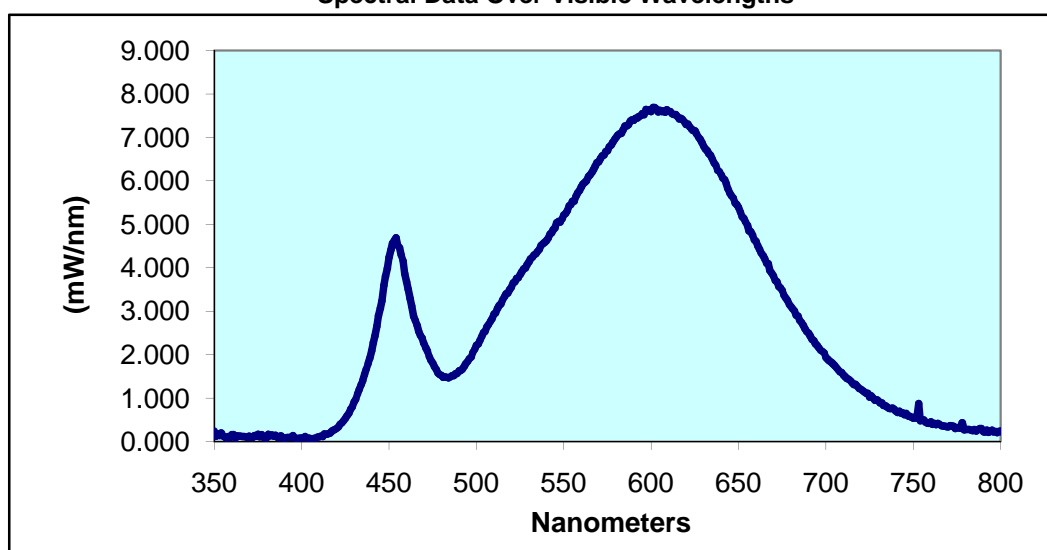
Intertek Sample No.	Base Orientation	Input Voltage {Vac}	Input Current (mA)	Input Power (Watts)	Input Power Factor	Current ATHD (%)	Luminous Flux (Lumens)	Lumen Efficacy (LPW)
CRT1401081340-001	UP	12.0	569.9	5.209	0.761	73.87	396.5	76.12

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')
3047	82.9	20.8	0.002	0.430	0.396	0.250	0.517

## **Spectral Distribution over Visible Wavelengths**

nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.245	440	2.087	530	4.133	620	7.299	710	1.534
355	0.131	445	3.068	535	4.371	625	7.148	715	1.353
360	0.16	450	4.232	540	4.624	630	6.799	720	1.208
365	0.128	455	4.513	545	4.919	635	6.497	725	1.025
370	0.122	460	3.671	550	5.214	640	6.14	730	0.934
375	0.173	465	2.791	555	5.531	645	5.714	735	0.794
380	0.087	470	2.258	560	5.858	650	5.388	740	0.701
385	0.149	475	1.804	565	6.13	655	4.973	745	0.615
390	0.075	480	1.523	570	6.433	660	4.605	750	0.541
395	0.137	485	1.488	575	6.693	665	4.207	755	0.492
400	0.085	490	1.626	580	7.002	670	3.815	760	0.459
405	0.074	495	1.846	585	7.258	675	3.473	765	0.397
410	0.11	500	2.217	590	7.39	680	3.107	770	0.34
415	0.174	505	2.531	595	7.549	685	2.788	775	0.321
420	0.303	510	2.928	600	7.588	690	2.495	780	0.278
425	0.541	515	3.26	605	7.618	695	2.212		
430	0.912	520	3.546	610	7.595	700	1.94		
435	1.401	525	3.841	615	7.482	705	1.744		

**Spectral Data Over Visible Wavelengths**



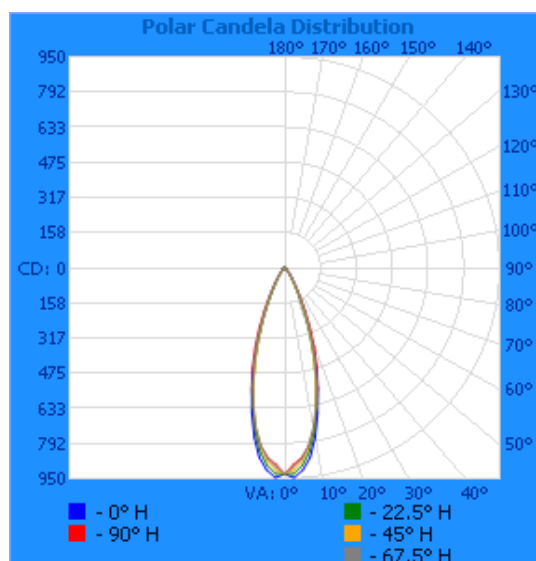
## RESULTS OF TEST (cont'd)

### 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)
CRT1401081340-001	UP	12.0	587.3	5.370	0.762	375.9	70.00

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

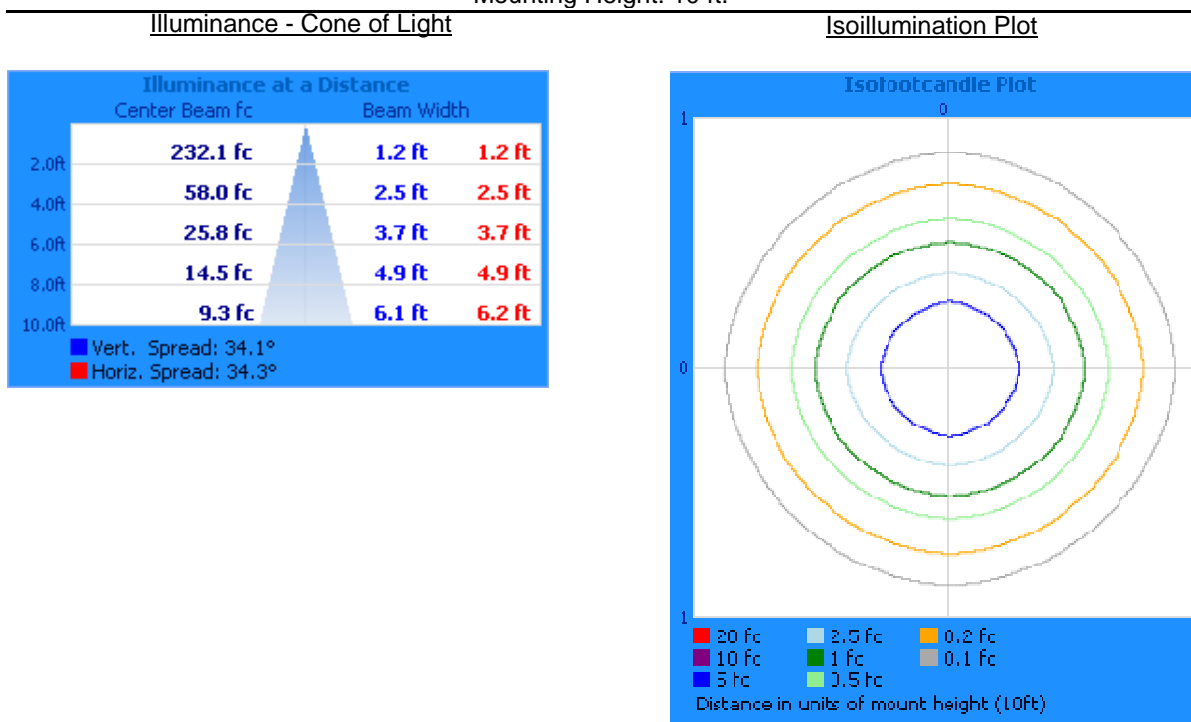
Angle	0	22.5	45	67.5	90
0	928	928	928	928	928
5	914	894	872	861	858
10	775	751	734	731	743
15	563	538	532	548	565
20	352	333	339	359	381
25	186	176	181	198	214
30	91	86	88	97	104
35	46	43	43	47	52
40	25	24	24	25	27
45	15	15	14	15	16
50	11	11	10	10	11
55	8	8	8	8	8
60	7	7	6	6	7
65	5	6	5	5	5
70	4	4	4	4	4
75	3	3	3	3	3
80	1	2	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.



## Zonal Lumen Summary and Percentages at 25°C

Zone	Lumens	% Luminaire
0-30	317.0	84.3
0-40	347.7	92.5
0-60	367.3	97.7
60-90	8.6	2.3
0-90	375.9	100.0
90-180	0.0	0.0
0-180	375.9	100.0

## Zonal Lumens and Percentages at 25°C

Zone	Lumens	% Luminaire
0-10	79.4	21.1
10-20	148.4	39.5
20-30	89.3	23.7
30-40	30.7	8.2
40-50	12.2	3.2
50-60	7.4	2.0
60-70	5.3	1.4
70-80	2.9	0.8
80-90	0.4	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

Attachment: None

Report Reviewed By:



Kenda Branch  
Engineer  
Lighting Division