

Reference note for Photometric Testing and Evaluation to IES LM 79-08

Sample Tested

LA2 Connected Seg-M
6"W x 46"L x 8"H

Lumen Output: 1779



PHOTOMETRIC TESTING & EVALUATION TO IES LM-79-08Sample Tested
Connected


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**Technical Report Number
2741051**

June 27, 2014

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Program Description

Photometric and electrical testing of a “Connected” fixture to IES LM-79-08.

Executive Summary

Sample Tested = **Connected**

Luminous Efficacy* (Lumens/Watt)	Luminous Flux* (Lumens)	Input Power* (Watts)	Power Factor*
50.19	1779	35.444	0.9905

CCT (K)*	CRI*	Stabilization Time (Light & Power)
3025	83.3	90 minutes

* The above results are recorded / derived from measurements made using an Integrating Sphere

TABLE OF CONTENTS

Sample.....	4
Test Results	5
Spectral Flux	6
Chromaticity Diagram	7
Flux Distribution – Zonal Lumen Summary.....	8
Illuminance Plots	9
Candela Plots	10
Candela Tabulation	11
Photometric Testing Information	13
Equipment List:.....	15

Sample

The following sample was submitted for evaluation:

3form: Connected

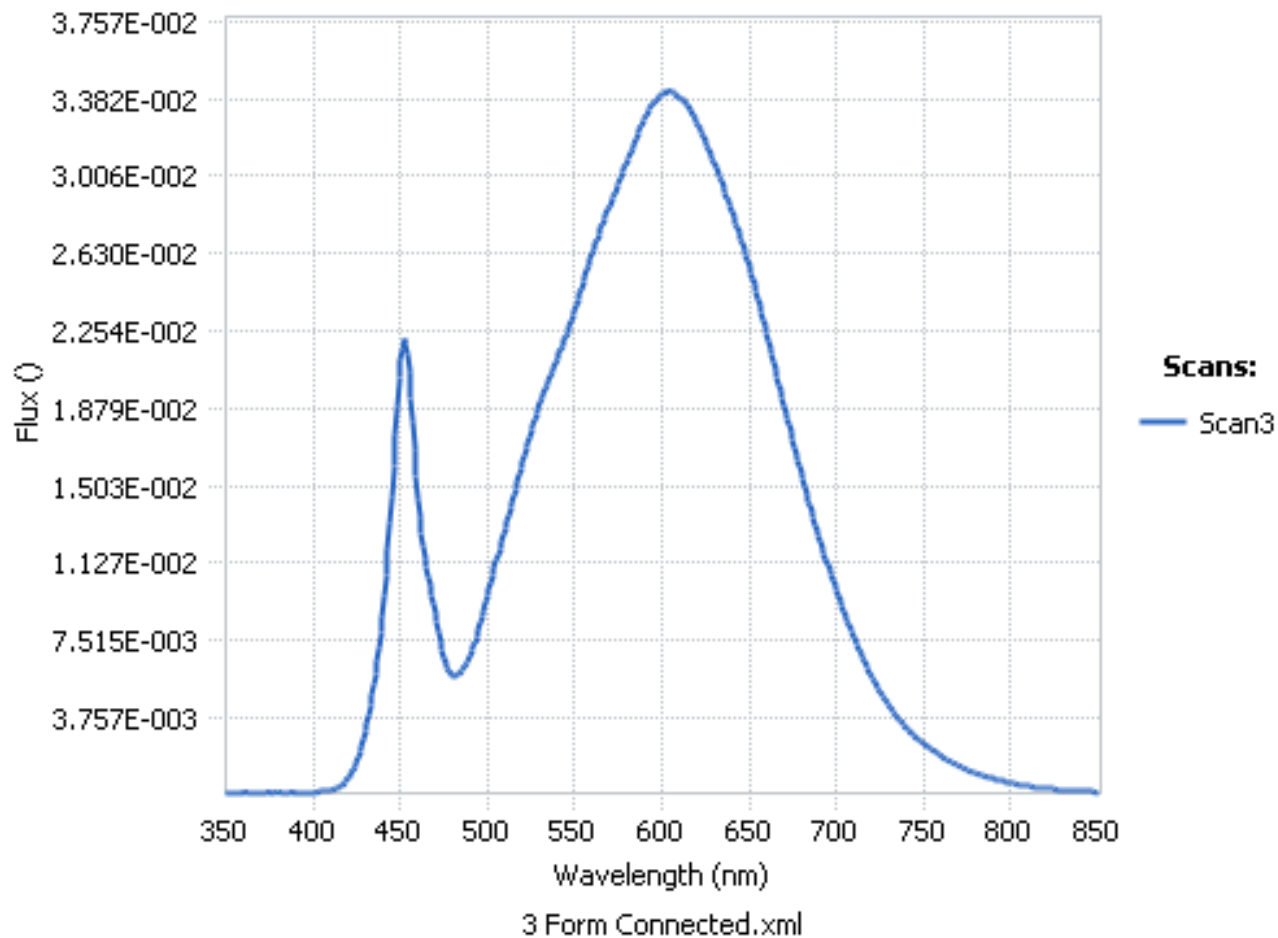


Connected

Test Results –								
The following results were measured after stabilization of the sample in the Integrating Sphere (unless otherwise stated). Stability is reached when the variation of 3 readings of light output and electrical power, taken 15 minutes apart, is less than 0.50% (in accordance with IES LM-79-08).								
Key Photometric Results	Sample Reference							
	Connected							
	Integrating Sphere				Goniophotometer			
Luminous Efficacy (Lumens/Watt)	50.19				48.44			
Total Luminous Flux (Lumens)	1779				1716.98			
Total Radiant Flux (Watts)	5.874							
Correlated Color Temperature (CCT)	3025							
Color Rendering Index (CRI) (Ra)	83.3							
R1 thru R7 Value	81.9	89.5	94.7	80.8	80.8	84.8	86.6	
R8 thru R14 Value	67.4	25.1	74.5	77.8	64.1	83.4	96.7	
Chromaticity (Chroma x / Chroma y)	0.4333 / 0.3998							
Chromaticity (Chroma u / Chroma v)	0.2501 / 0.3461							
Chromaticity (Chroma u' / Chroma v')	0.2501 / 0.5192							
Duv Value	-0.00119							
Stabilization Time (Light and Power)	Approx. 90 minutes							
Total Run Time – Integrating Sphere	94 minutes							
Total Run Time – Goniophotometer	59 minutes							
Spacing Criteria	1.36 (0° – 180°) / 1.36 (90° – 270°)							
Scotopic/Photopic ratio $\Phi(v')/\Phi(v)$	1.326							
Electrical Input Results:	Sample Reference							
	Connected							
Input Power (Watts)	35.444							
Input Voltage (Volts AC)	120.03							
Input Current (Amps)	0.29810							
Input Frequency (Hertz)	60							
Power Factor	0.9905							
Total Harmonic Distortion (%THD V/A)	0.09 / 8.38							
Additional Information	Sample Reference							
	Connected							
Ambient Temperature	24.3°C							
Integrating Sphere Detector	CDS 600 Spectroradiometer							
Absorption Correction used?	Yes							

Spectral Flux

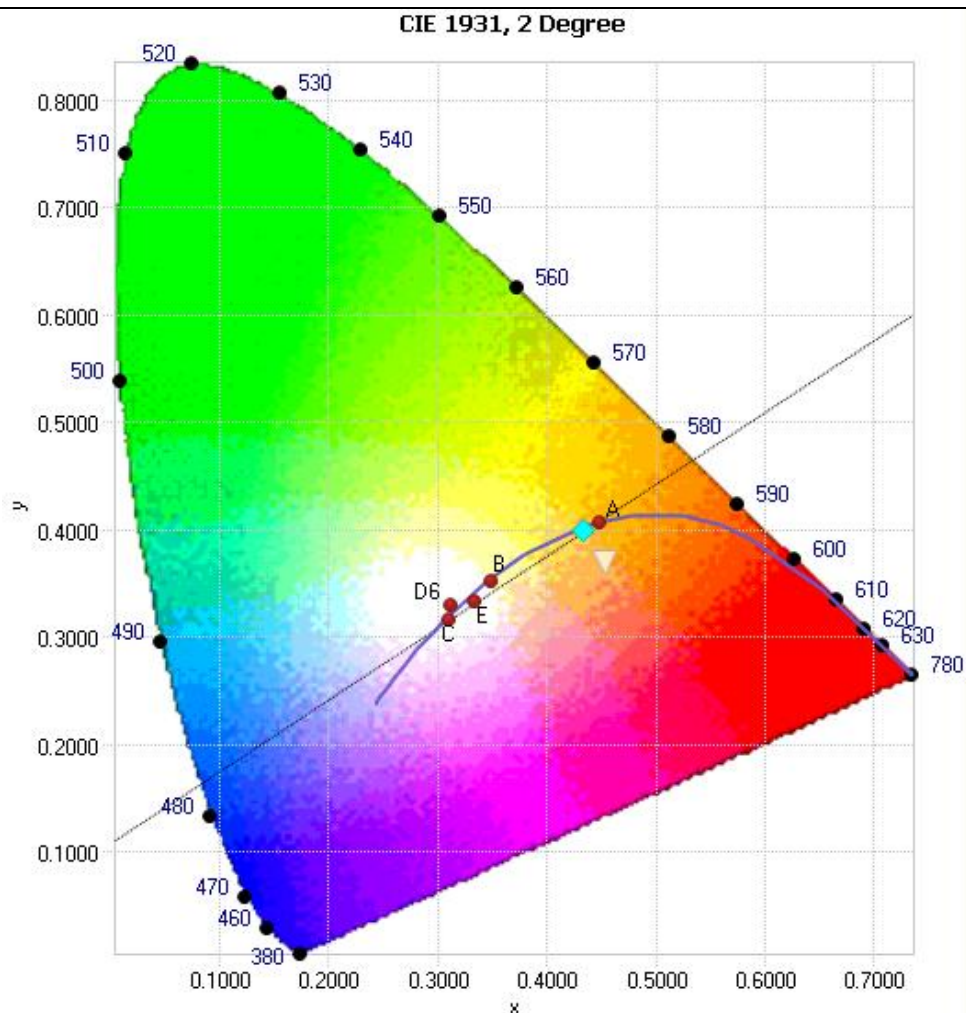
The following graph shows the spectral response curve of the radiant flux for the sample:



Spectral response of the Radiant Flux
(350nm to 850nm – calibrated range of the Spectroradiometer).

Chromaticity Diagram

The following image shows the chromaticity diagram for the sample:



Tristimulus values (from page 6):
x / y = 0.4333 / 0.3998

The locations on the diagram of the tristimulus coordinates are indicated by the blue diamond.

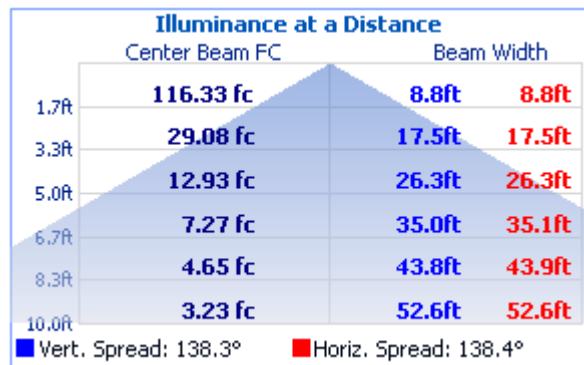
Test Results – Flux Distribution – Zonal Lumen Summary

The following table depicts the zonal lumen distribution for the sample:

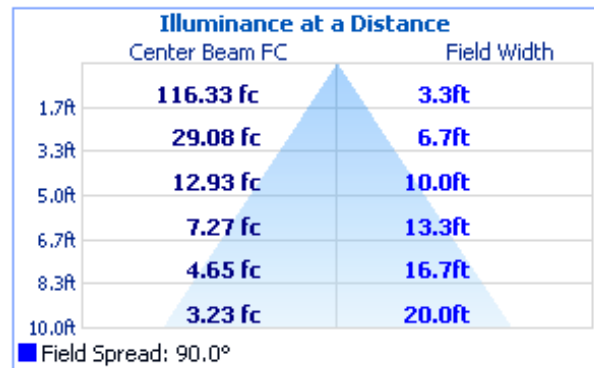
Zone	Lumens	% Total
0 - 10	30.8	1.80%
10 - 20	90.1	5.20%
20 - 30	140.8	8.20%
30 - 40	177.9	10.40%
40 - 50	196.8	11.50%
50 - 60	197.9	11.50%
60 - 70	178.3	10.40%
70 - 80	143	8.30%
80 - 90	100.8	5.90%
90-100	87.5	5.10%
100-110	88.7	5.20%
110-120	83.5	4.90%
120-130	70.5	4.10%
130-140	52.9	3.10%
140-150	37.4	2.20%
150-160	23.7	1.40%
160-170	12.4	0.70%
170-180	4	0.20%
Total	1717.0 LUMENS	100.0%
Zone		
0-60	834.4	48.60%
60-90	422.1	24.60%
0-90	1,256.50	73.20%
90-180	460.5	26.80%
0-180	1,717.00	100%

Test Results – Illuminance Plots

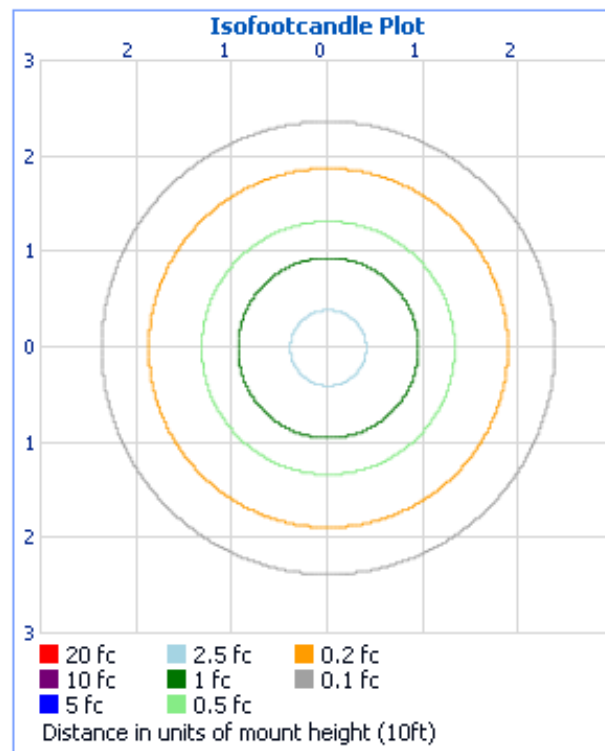
The following images depict the illuminance characteristics of the luminaire.



Beam Angle



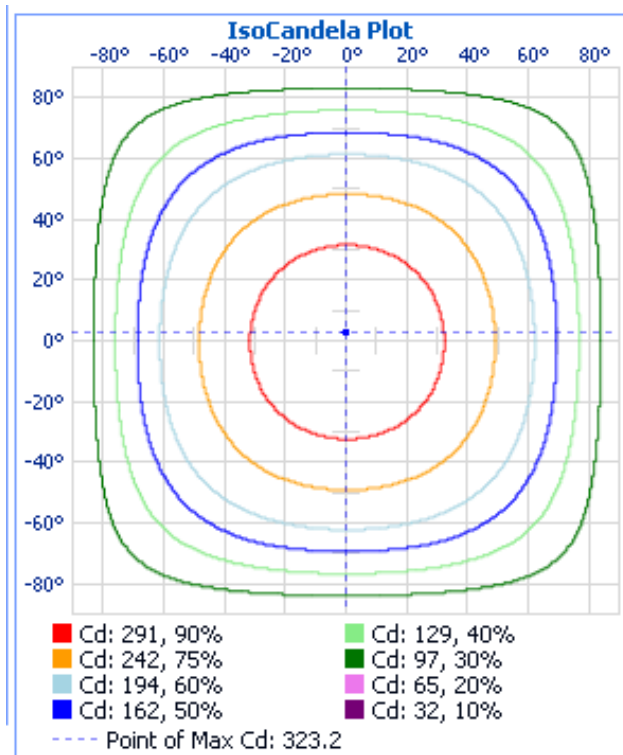
Field Angle



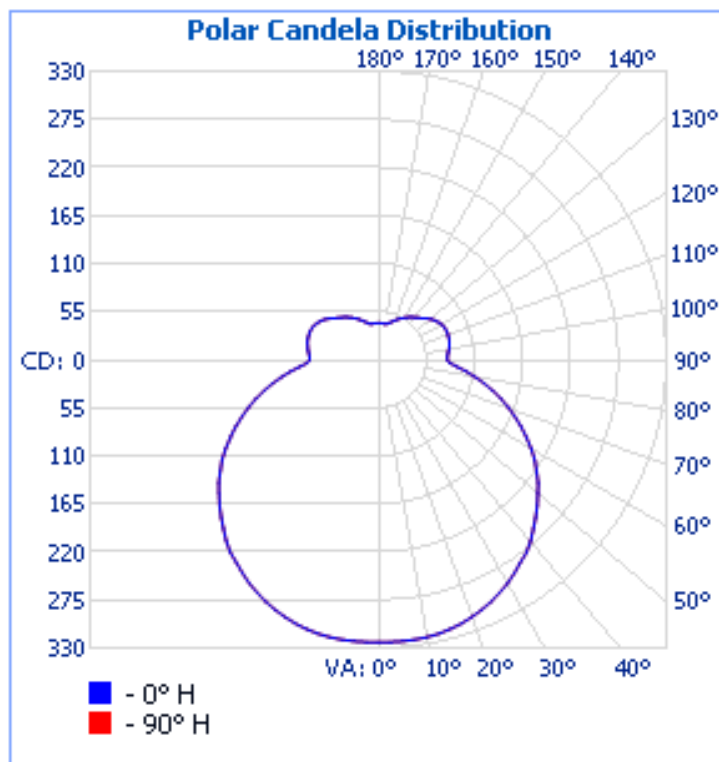
Illuminance Plot (Footcandles)

Test Results – Candela Plots

The following images depict the luminous intensity distribution characteristics of the luminaire.



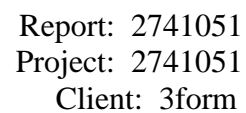
Isocandela Plot



Polar Candela Distribution

Coefficients Of Utilization - Zonal Cavity Method

		Effective Floor Cavity Reflectance: 20%															
RCC %:		80				70				50				30			
RW %:		70	50	30	0	70	50	30	0	50	30	20	0	50	30	20	0
RCR: 0		1.13	1.13	1.13	1.13	1.07	1.07	1.07	.73	.96	.96	.96	.86	.86	.86	.77	.77
1		1.00	.95	.90	.85	.95	.90	.85	.57	.80	.77	.74	.72	.69	.67	.64	.62
2		.90	.81	.74	.67	.85	.77	.70	.46	.69	.63	.59	.62	.57	.53	.55	.51
3		.82	.70	.62	.55	.77	.67	.59	.38	.60	.53	.48	.54	.48	.44	.48	.44
4		.74	.62	.53	.46	.70	.59	.50	.32	.53	.46	.40	.47	.42	.37	.42	.37
5		.68	.55	.45	.39	.64	.52	.44	.27	.47	.40	.34	.42	.36	.32	.38	.33
6		.63	.49	.40	.33	.59	.47	.38	.24	.42	.35	.30	.38	.32	.27	.34	.29
7		.58	.44	.35	.29	.54	.42	.34	.21	.38	.31	.26	.34	.28	.24	.31	.26
8		.54	.40	.31	.26	.51	.38	.30	.19	.35	.28	.23	.31	.25	.21	.28	.23
9		.50	.37	.28	.23	.47	.35	.27	.17	.32	.25	.20	.29	.23	.19	.26	.21
10		.47	.34	.26	.20	.44	.32	.25	.15	.29	.23	.18	.27	.21	.17	.24	.19

Continued.....

Photometric Testing Information

The sample was evaluated for photometric and electrical characteristics using an integrating sphere and a goniophotometer, each located in purpose-built, temperature and humidity-controlled, draft free environments.

The integrating sphere is by Labsphere which exhibits a “ 4π geometry” configuration according to IES LM-79-08 and is applicable for all types of LED products (directional and non-directional light projections). Its spectroradiometer is an array-type detector manufactured and calibrated by Labsphere.

The integrating sphere uses self-absorption correction to eliminate errors due to mismatches between the standard reference lamp and the test samples being measured. The auxiliary lamp used to perform this task is a halogen type lamp powered by a calibrated *Lamp Power Supply* manufactured and calibrated by Labsphere. Ambient temperature (for photometric analysis) is measured using a “J-Type” thermocouple located inside the integrating sphere at the same height as the sample under test and not more than 1 meter in horizontal distance away from the sample. The thermocouple is located behind the baffle of the photo detector in order to eliminate any direct optical radiation from the sample under test.

Luminaire Stabilization.

The sample was placed inside the integrating sphere and powered by a regulated and conditioned Voltage alternating current supply. The correlated color temperature, color rendering index, chromaticity coordinates and electrical power measurements contained in this report are the numeric **averages** of the three readings upon which stabilization is verified. The stabilization times shown on the results pages of this report denote the time of the 1st measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization.

The integrating sphere is calibrated using a quartzline halogen lamp with the following specifications:

Manufacturer: Sylvania

Model# 75Q/CL-28V

Voltage = 28.0 Volt

Wattage = 75.0 Watts

Calibration Current = 2.679 Amperes

Luminous Flux = 1538.8 Lumens

Calibration Date = 8-18-2005 (calibrated by Labsphere – NIST traceable).

Continued.....

Photometric Testing Information (continued)

The goniophotometer Mayer Engineering Type C is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

Manufacturer: GE
Part Number: DZE 88
Bulb Number: 114-A
Voltage: 16.59 Volts DC reference
Calibration Current: 4.810 Amperes
Luminous Intensity: 154.7 Candelas
Calibration Date: 7/12/12 (NIST traceable)

Manufacturer: GE
Part Number: DZE 88
Bulb Number: 114-B
Voltage: 16.61 Volts DC reference
Calibration Current: 4.819 Amperes
Luminous Intensity: 150.6 Candelas
Calibration Date: 7/12/12(NIST traceable)

Manufacturer: GE
Part Number: DZE 88
Bulb Number: 114-C
Voltage: 16.66 Volts DC reference
Calibration Current: 4.815 Amperes
Luminous Intensity: 155.4 Candelas
Calibration Date: 7/12/12 (NIST traceable)

A Yokogawa WT210 Power Analyzer was used to measure all electrical characteristics of the sample.

CSA is an accredited Test Laboratory (TL-430)
National Voluntary Laboratory Accreditation Program
(NVLAP)200732-0

Equipment List: Goniophotometer Type C (Mirror 1)			
Description	Manufacturer and Model Number	CSA Instrument Reference Number	Calibration Due Date
Optometer	Gigahertz Optik P9801	N/A	N/A
Regulated Power Supply	Chroma Instruments 61602P-80-60	DCP401	N/A
Regulated Power Supply	Chroma Instruments 61602	DCP301	N/A
Power Analyzer	Yokogawa WT210	POA400	11/2014
Equipment List: Sphere D Equipment			
Description	Manufacturer and Model Number	CSA Instrument Reference Number	Calibration Due Date
Integrating Sphere 109"	Labsphere LMS760	SPH400	N/A
Spectroradiometer	Labsphere CDS1100	N/A	N/A
Auxiliary Lamp PSU	Labsphere LPS100	LPS100	N/A
Power Analyzer	Yokogawa WT210	PA118	12/2014
Regulated Power Supply	Chroma Instruments 61603	N/A	N/A

All equipment is calibrated to ISO / IEC 17025-2005 guidelines.