

PHOTOMETRIC TESTING & EVALUATION

Sample Tested
CO1024BBCA

Prepared for:

Construlita Lighting International S.A. de C.V.

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Program Description

Photometric and electrical testing of a “CO1024BBCA” replacement fixture

Executive Summary

Sample Tested = **CO1024BBCA**

Luminous Efficacy* (Lumens/Watt)	Luminous Flux* (Lumens)	Input Power* (Watts)	Power Factor*
72.00	1728	24.00	0.9498

CCT (K)*	CRI*	Stabilization Time (Light & Power)
3037	97.37	60 minutes

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

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Sample

The following sample was submitted for evaluation:

Construlita Lighting International: CO1024BBCA

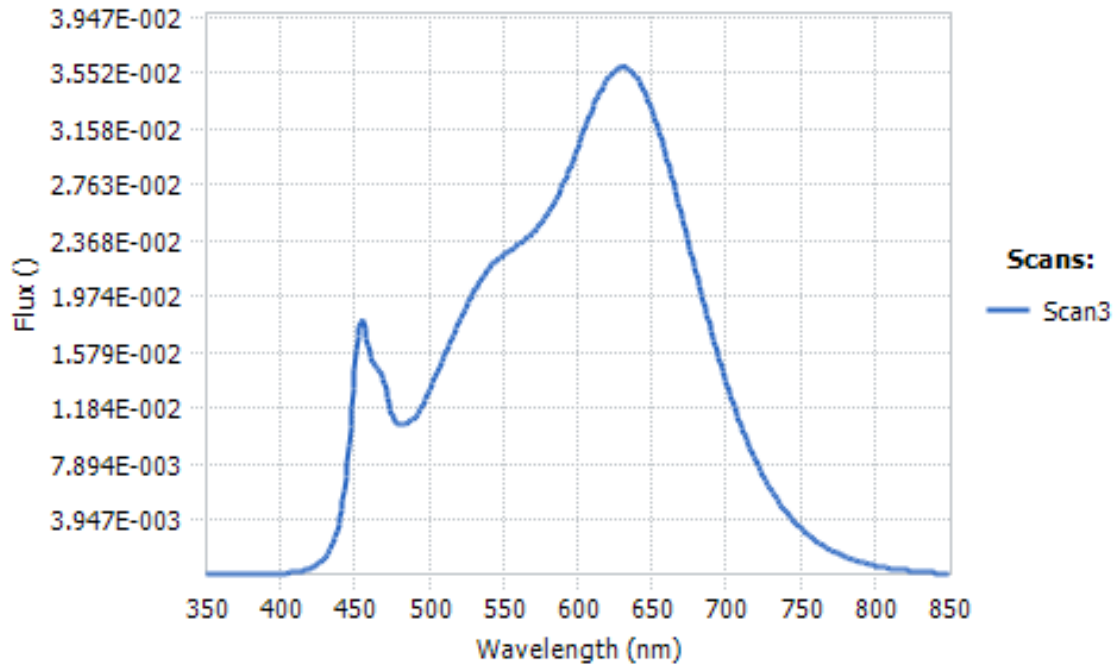


CO1024BBCA

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%.		
Key Photometric Results	Sample Reference	
	CO1024BBCA	
	Integrating Sphere	Goniophotometer
Luminous Efficacy (Lumens/Watt)	72.00	72.77
Total Luminous Flux (Lumens)	1728	1746.71
Total Radiant Flux (Watts)	6.37	
Correlated Color Temperature (CCT)	3037	
Color Rendering Index (CRI) (Ra)	97.37	
R9 Value	86.8	
Chromaticity (Chroma x / Chroma y)	0.4339 / 0.4025	
Chromaticity (Chroma u / Chroma v)	0.2493 / 0.3469	
Chromaticity (Chroma u' / Chroma v')	0.2493 / 0.5203	
D _{uv} Value	0.0003	
Stabilization Time (Light and Power)	Approx. 60 minutes	
Total Run Time – Integrating Sphere	64 minutes	
Total Run Time – Goniophotometer	65 minutes	
Spacing Criteria	1.18 (0° – 180°) / 1.14 (90° – 270°)	
Scotopic/Photopic ratio $\Phi(v')/\Phi(v)$	1.48	
Electrical Input Results:	Sample Reference	
	CO1024BBCA	
Input Power (Watts)	24.00	
Input Voltage (Volts AC)	277.01	
Input Current (Amps)	0.09122	
Input Frequency (Hertz)	60.0	
Power Factor	0.9498	
Total Harmonic Distortion (%THD V/A)	0.15 / 12.18	
Additional Information	Sample Reference	
	CO1024BBCA	
Ambient Temperature	25.5°C	
Integrating Sphere Detector	CDS 1100 Spectroradiometer	
Absorption Correction used?	Yes	

Spectral Flux

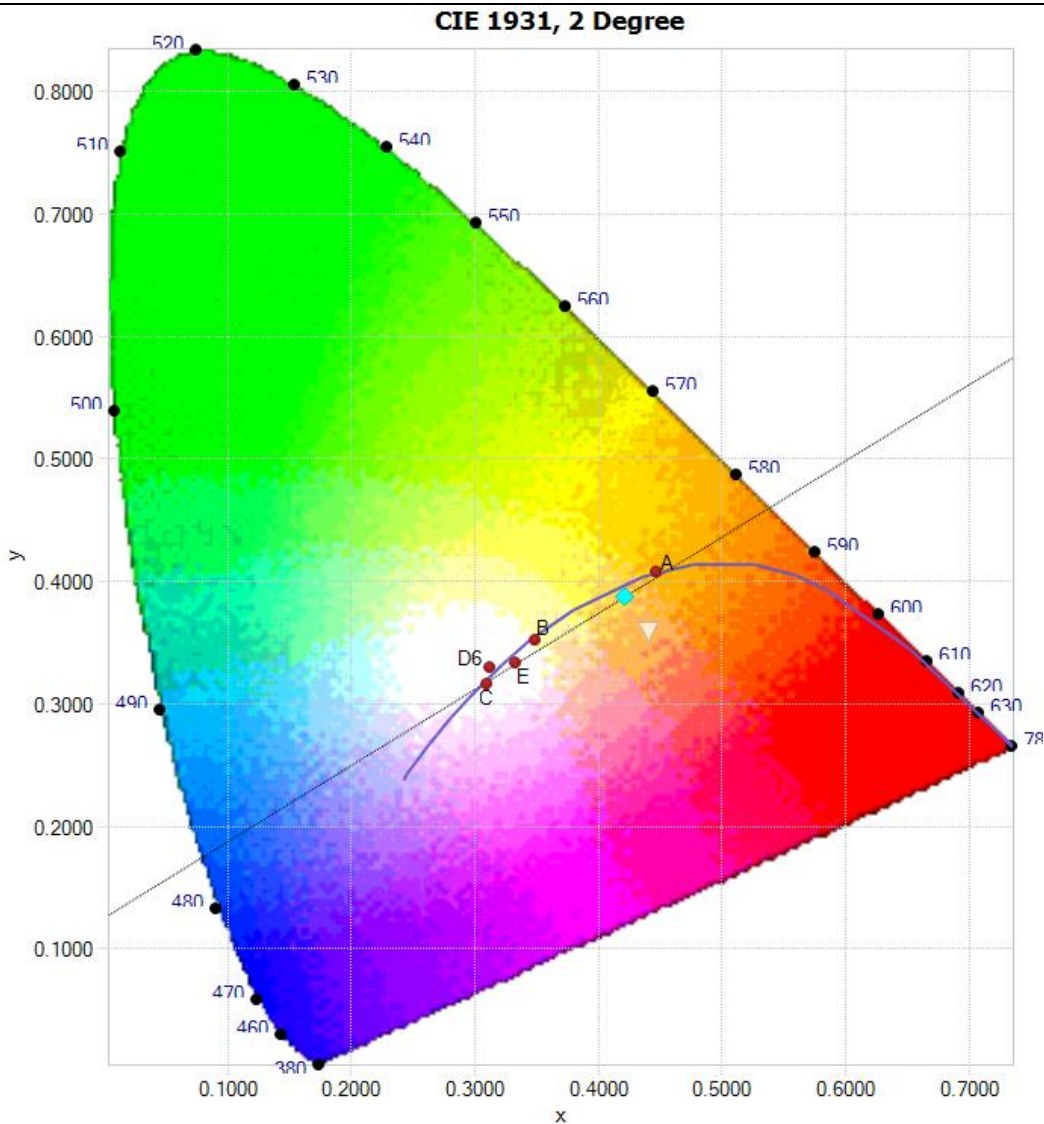
The following graph shows the spectral response curve of the radiant flux for the sample:



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):
 $x / y = 0.4339 / 0.4025$

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:

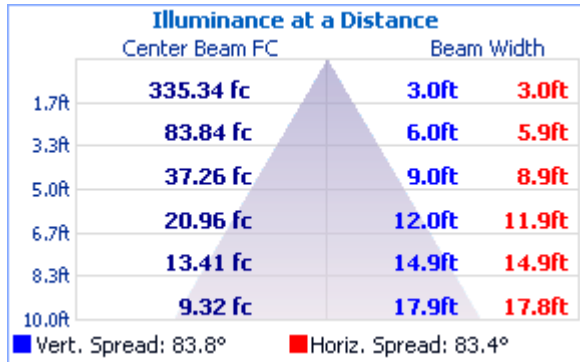
Zone	Lumens	% Total
0-10	88.3	5.1%
10-20	251.6	14.4%
20-30	369.2	21.1%
30-40	390.7	22.4%
40-50	300.0	17.2%
50-60	182.3	10.4%
60-70	97.9	5.6%
70-80	50.3	2.9%
80-90	16.3	0.9%
90-100	0	0%
100-110	0	0%
110-120	0	0%
120-130	0	0%
130-140	0	0%
140-150	0	0%
150-160	0	0%
160-170	0	0%
170-180	0	0%
Total	1746.8 LUMENS	100%

Zonal Lumen Summary

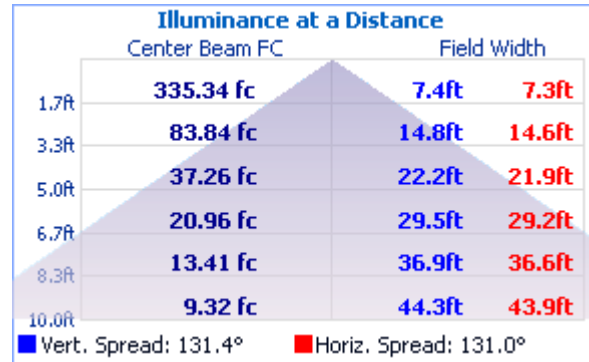
Zone	Lumens	% Luminaire
0-30	709.0	40.6%
0-40	1,099.7	63%
0-60	1,582.1	90.6%
60-90	164.5	9.4%
70-100	66.6	3.8%
90-120	0.0	0%
0-90	1,746.6	100%
90-180	0.2	0%
0-180	1,746.8	100%

Test Results – Illuminance Plots

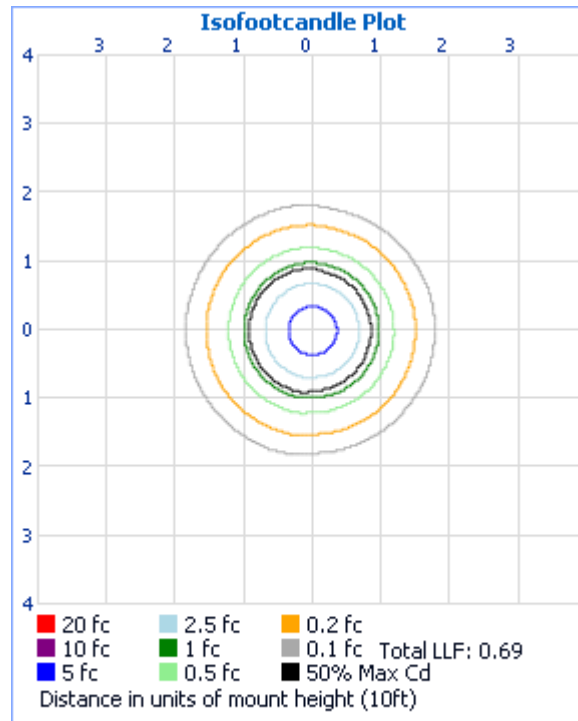
The following images depict the illuminance characteristics of the luminaire.



Beam Angle



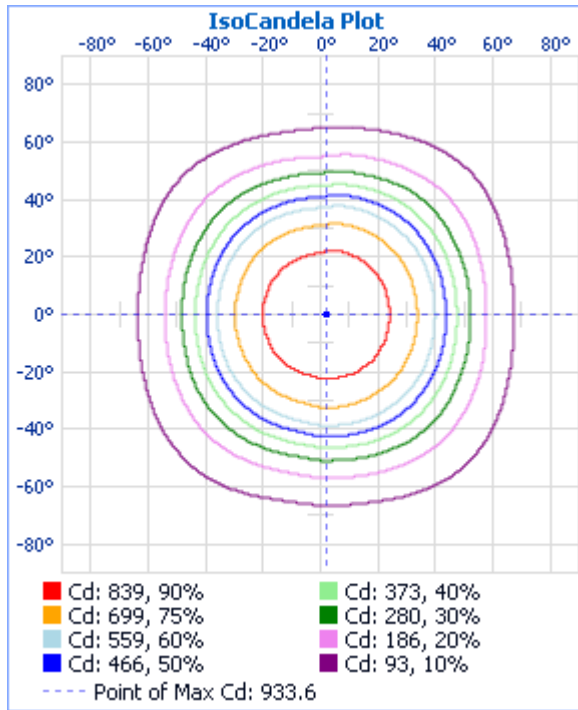
Field Angle



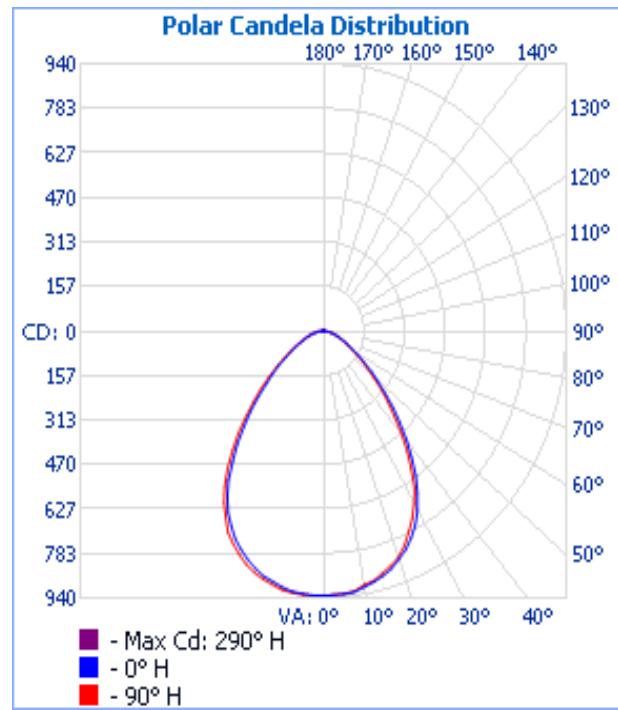
Illuminance Plot (Footcandles)

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			10			0
RW %:	70	50	30	0	70	50	30	0	50	30	20	50	30	20	50	30	20	0
RCR: 0	1.19	1.19	1.19	1.19	1.16	1.16	1.16	1.00	1.11	1.11	1.11	1.06	1.06	1.06	1.02	1.02	1.02	1.00
1	1.11	1.07	1.04	1.00	1.08	1.05	1.02	.89	1.01	.98	.96	.97	.95	.93	.93	.92	.90	.88
2	1.03	.96	.90	.86	1.00	.94	.89	.78	.91	.86	.83	.88	.84	.81	.85	.82	.79	.77
3	.95	.86	.80	.74	.93	.85	.79	.69	.82	.77	.72	.79	.75	.71	.77	.73	.70	.68
4	.88	.78	.71	.65	.86	.77	.70	.62	.75	.69	.64	.72	.67	.63	.70	.66	.62	.60
5	.82	.71	.63	.58	.80	.70	.63	.55	.68	.62	.57	.66	.61	.56	.64	.60	.56	.54
6	.77	.65	.57	.51	.75	.64	.57	.50	.62	.56	.51	.61	.55	.50	.59	.54	.50	.48
7	.72	.60	.52	.46	.70	.59	.51	.45	.57	.51	.46	.56	.50	.46	.55	.49	.45	.44
8	.67	.55	.47	.42	.66	.54	.47	.41	.53	.46	.42	.52	.46	.42	.51	.45	.41	.40
9	.63	.51	.43	.38	.62	.50	.43	.38	.49	.43	.38	.48	.42	.38	.47	.42	.38	.36
10	.59	.47	.40	.35	.58	.47	.40	.35	.46	.39	.35	.45	.39	.35	.44	.39	.35	.33



Test Results - Candela Tabulation

The following table provides the tabulated Candela measurements:

Candela Table - Type C. A large data table with columns representing distance (0 to 360) and rows representing height (0 to 180). The table contains numerical candela measurements, with some cells highlighted in yellow or red.

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

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	11/2018
Equipment List: Sphere B Equipment			
Description	Manufacturer and Model Number	CSA Instrument Reference Number	Calibration Due Date
Integrating Sphere 76"	Labsphere LMS760	SPH200	N/A
Spectroradiometer	Labsphere CDS1100	N/A	N/A
Auxiliary Lamp PSU	Labsphere LPS100	LPS100	N/A
Power Analyzer	Yokogawa WT210	PA118	12/2018
Regulated Power Supply	Chroma Instruments 61603	N/A	N/A

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