LightLab INTERNATIONAL ALLENTOWN LLC

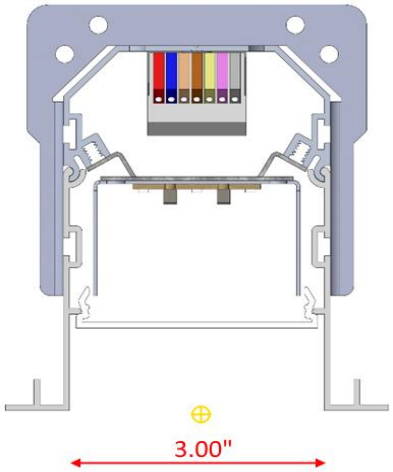
NVLAP TESTING Lab Code: 201079-0

Report of Test

LLIA001168-004A

Indoor Distribution Photometry Test Report

Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV
Recessed ceiling mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
144 white LEDs, four Osram PrevaLED BARs with 36 LEDs each.
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 660mA.



Prepared For:
Precision Architectural Lighting
4830 Timber Creek Drive
Houston, TX 77017, USA

Performance Summary					
Input Voltage	120.0	V	Luminous Flux	2480.2	Lumens
Input Current	0.2154	A	Total Efficacy	97.2	Lm/W
Input Power	25.51	W	Downward Flux	2480.2	Lumens
Frequency	60.00	Hz	Downward Flux	100.0	% of Total
Power Factor	0.987				
Current THD	8.2	%			

This test report was issued by LightLab International Allentown, LLC without alterations or erasures.

Test date: 11/01/2019
Report date: 11/04/2019

Signed: Michael L. Grather

USA west coast LightLab International, LLC, 24825 N. 16th Avenue, Suite 125, Phoenix, AZ, 85085, Ph : +1 623-434-1499, Fx : +1 623-434-1492, www.lightlabint.com
USA east coast LightLab Int'l Allentown LLC, 905 Harrison Street, Suite 135, Allentown, PA 18103, Ph: +1 484-273-0705, www.lightlaballentown.com (issuing laboratory)
Australasia & S.E. Asia LightLab International, 50 Redcliffe Gardens Drive, Clontarf, Queensland, 4019, Australia, Ph : +61 7 3283 7862, Fx : +61 7 3283 8751, www.lightlabint.com

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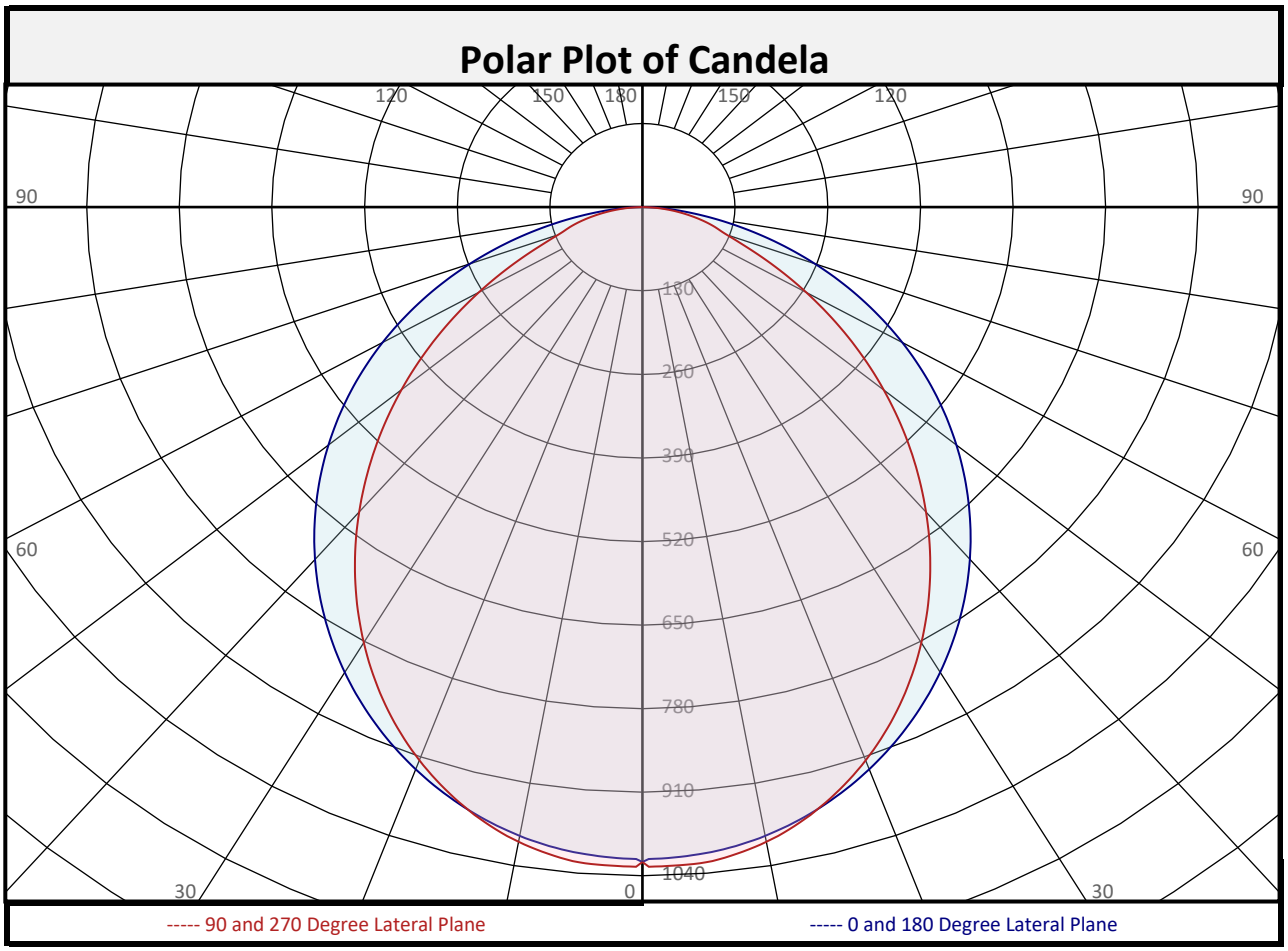

Zonal Flux Summary												
Zone (Deg Vert)	Flux (Lumens)	Percent of Total		Zone (Deg Vert)	Flux (Lumens)	Percent of Total		Zone (Deg Vert)	Flux (Lumens)	Percent of Total
0-10	96.4	3.9%		90-100	0.0	0.0%		0-20	368.8	14.9%
10-20	272.5	11.0%		100-110	0.0	0.0%		0-30	770.1	31.0%
20-30	401.3	16.2%		110-120	0.0	0.0%		0-40	1234	49.8%
30-40	463.6	18.7%		120-130	0.0	0.0%		0-60	2065	83.3%
40-50	453.8	18.3%		130-140	0.0	0.0%		0-80	2446	98.6%
50-60	377.6	15.2%		140-150	0.0	0.0%		10-90	2384	96.1%
60-70	253.0	10.2%		150-160	0.0	0.0%		20-50	1319	53.2%
70-80	127.4	5.1%		160-170	0.0	0.0%		40-90	1246	50.2%
80-90	34.6	1.4%		170-180	0.0	0.0%		60-90	415.1	16.7%
0-90	2480	100.0%		90-180	0.0	0.0%		0-180	2480	100.0%

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Luminous Intensity (Candela) Table

	Lateral (C-Plane) Angles									
Vertical (Gamma) Angles		0	22.5	45	67.5	90	112.5	135	157.5	180
	0	1018	1018	1018	1018	1018	1018	1018	1018	1018
	2.5	1012	1013	1016	1021	1025	1021	1016	1013	1012
	5	1009	1010	1013	1019	1023	1019	1013	1010	1009
	7.5	1002	1004	1008	1011	1014	1011	1008	1004	1002
	10	993	996	998	1000	1002	1000	998	996	993
	12.5	981	984	984	985	986	985	984	984	981
	15	966	970	968	966	965	966	968	970	966
	17.5	949	952	948	944	942	944	948	952	949
	20	930	932	925	918	915	918	925	932	930
	22.5	909	910	899	890	886	890	899	910	909
	25	886	886	872	860	854	860	872	886	886
	27.5	862	860	842	827	819	827	842	860	862
	30	835	832	810	791	782	791	810	832	835
	32.5	807	803	777	753	744	753	777	803	807
	35	778	771	741	714	703	714	741	771	778
	37.5	747	739	705	674	662	674	705	739	747
	40	715	705	666	632	619	632	666	705	715
	42.5	681	670	628	590	575	590	628	670	681
	45	647	634	587	546	531	546	587	634	647
	47.5	611	596	545	502	486	502	545	596	611
	50	575	558	503	458	441	458	503	558	575
	52.5	538	519	460	414	397	414	460	519	538
	55	499	479	417	370	352	370	417	479	499
	57.5	460	438	374	326	308	326	374	438	460
	60	421	396	331	282	265	282	331	396	421
	62.5	380	354	288	240	224	240	288	354	380
	65	340	312	245	200	186	200	245	312	340
	67.5	298	270	204	163	152	163	204	270	298
	70	257	228	164	132	126	132	164	228	257
	72.5	216	187	128	110	109	110	128	187	216
	75	176	148	98	95	94	95	98	148	176
	77.5	138	110	80	78	77	78	80	110	138
	80	101	76	63	61	60	61	63	76	101
	82.5	69	49	46	44	44	44	46	49	69
	85	41	32	29	28	28	28	29	32	41
	87.5	18	14	13	13	13	13	13	14	18
	90	0	0	0	1	1	1	0	0	0

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Luminous Intensity (Candela) Table

	Lateral (C-Plane) Angles									
Vertical (Gamma) Angles		0	22.5	45	67.5	90	112.5	135	157.5	180
	90	0	0	0	1	1	1	0	0	0
	92.5	0	0	0	0	0	0	0	0	0
	95	0	0	0	0	0	0	0	0	0
	97.5	0	0	0	0	0	0	0	0	0
	100	0	0	0	0	0	0	0	0	0
	102.5	0	0	0	0	0	0	0	0	0
	105	0	0	0	0	0	0	0	0	0
	107.5	0	0	0	0	0	0	0	0	0
	110	0	0	0	0	0	0	0	0	0
	112.5	0	0	0	0	0	0	0	0	0
	115	0	0	0	0	0	0	0	0	0
	117.5	0	0	0	0	0	0	0	0	0
	120	0	0	0	0	0	0	0	0	0
	122.5	0	0	0	0	0	0	0	0	0
	125	0	0	0	0	0	0	0	0	0
	127.5	0	0	0	0	0	0	0	0	0
	130	0	0	0	0	0	0	0	0	0
	132.5	0	0	0	0	0	0	0	0	0
	135	0	0	0	0	0	0	0	0	0
	137.5	0	0	0	0	0	0	0	0	0
	140	0	0	0	0	0	0	0	0	0
	142.5	0	0	0	0	0	0	0	0	0
	145	0	0	0	0	0	0	0	0	0
	147.5	0	0	0	0	0	0	0	0	0
	150	0	0	0	0	0	0	0	0	0
	152.5	0	0	0	0	0	0	0	0	0
	155	0	0	0	0	0	0	0	0	0
	157.5	0	0	0	0	0	0	0	0	0
	160	0	0	0	0	0	0	0	0	0
	162.5	0	0	0	0	0	0	0	0	0
	165	0	0	0	0	0	0	0	0	0
	167.5	0	0	0	0	0	0	0	0	0
	170	0	0	0	0	0	0	0	0	0
	172.5	0	0	0	0	0	0	0	0	0
	175	0	0	0	0	0	0	0	0	0
	177.5	0	0	0	0	0	0	0	0	0
	180	0	0	0	0	0	0	0	0	0

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Coefficients of Utilization/Room Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80					70					50				30				10			0
RW	70	50	30	10		70	50	30	10		50	30	10		50	30	10		50	30	10	0
RCR																						
0	119	119	119	119		116	116	116	116		111	111	111		106	106	106		102	102	102	100
1	110	105	101	97		107	103	99	96		99	96	93		95	92	90		91	89	87	85
2	100	92	86	81		98	91	85	80		87	82	78		84	80	76		81	77	74	72
3	92	82	74	68		89	80	73	67		77	71	66		75	69	65		72	68	64	62
4	84	73	64	58		82	72	64	58		69	62	57		67	61	56		65	60	55	53
5	78	65	57	50		76	64	56	50		62	55	50		60	54	49		58	53	48	46
6	72	59	50	44		70	58	50	44		56	49	44		55	48	43		53	47	43	41
7	67	54	45	39		65	53	45	39		51	44	39		50	43	39		49	43	38	36
8	62	49	41	35		61	49	41	35		47	40	35		46	39	35		45	39	34	33
9	58	45	37	32		57	45	37	32		44	37	32		42	36	31		41	36	31	29
10	55	42	34	29		53	41	34	29		40	33	29		39	33	29		39	33	29	27

For absolute test reports, RUs are expressed as a percentage of total lumen output. For relative test reports, CUs are expressed as a percentage of total lamp output. Calculations were based on published IES procedures, and are based on the zonal cavity method. Basic assumptions: 1) Room surfaces are lambertian reflectors. 2) Incident flux on each surface is uniformly distributed. 3) The room is spectrally neutral. When luminaires are not evenly distributed throughout the room, or do not exhibit lateral symmetry, CU values may differ from actual performance.

Circle of Light Plot

Height(ft)	Illuminance at Nadir (fc)	Ground-level distance to half-of-nadir illuminance (ft) 0-180 deg	90-270 deg
6.0	28.3	7.33	6.92
8.0	15.9	9.78	9.22
10.0	10.2	12.22	11.53
12.0	7.1	14.66	13.83
14.0	5.2	17.11	16.14
16.0	4.0	19.55	18.44

Average Luminance (cd/m^2)

	0 deg Plane	45 deg Plane	90 deg Plane
0	11256	11256	11256
45	10106	9180	8294
55	9623	8039	6782
65	8880	6413	4859
75	7528	4195	4020
85	5174	3677	3526

Spacing Criterion

0 degree plane:	1.2
90 degree plane:	1.2
180 degree plane:	1.2
270 degree plane:	1.2

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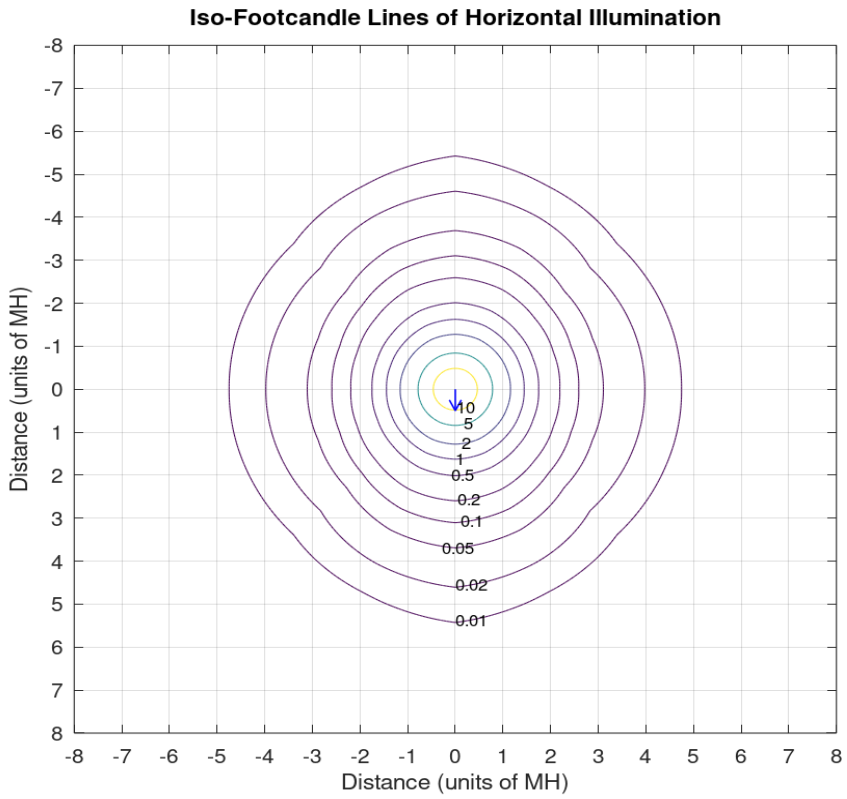
Iso-Illuminance Plot



The isofootcandle values shown in the plot above are based on a mounting height of h = 8.0 feet. Grid values show multiples of mounting height. The isoilluminance contour lines are expressed in units of footcandles. The values expressed are based on the direct light from a single unit without the contribution of room reflections.

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Additional Pictures of Test Subject

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Test Distance	9.5 m
Ambient Temperature	24.4 °C

Notes

The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of publications: IES LM-79-19 and ANSI C82.77-10:2014. Format of reports and angular increments based on IES LM-41-14 and LM-46-04.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the CIE C-Gamma coordinate system as defined in CIE publication number 121.

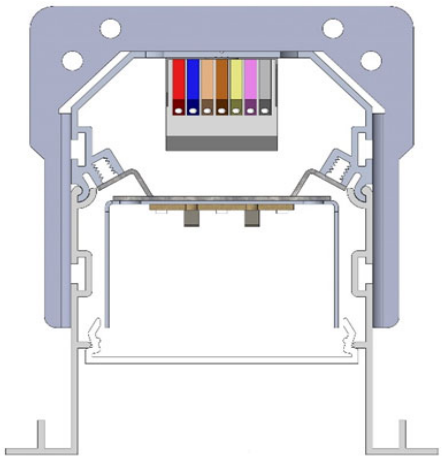
This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with ‡ are not covered.

This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the Federal Government.

Report of Test

LLIA001168-004B

Integrating Sphere Report
Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV
Recessed ceiling mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
144 white LEDs, four Osram PrevaLED BARs with 36 LEDs each.
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 660mA.



Performance Summary

Voltage	120.0	Vac
Current	0.2162	A
Power	25.49	W
Frequency	59.97	Hz
Power Factor	0.982	
Current THD	8.1	%
Total Luminous Flux	2499.9	lm
Efficacy	98.1	lm/W
Chromaticity (x,y)	(0.4057, 0.3917)	
(u',v')	(0.2356, 0.5117)	
Duv	0.0003	
CCT	3498	K
CRI (Ra)	82	
R9	6	
TM-30: Rf	81	
TM-30: Rg	98	

Prepared For:
Precision Architectural Lighting
4830 Timber Creek Drive
Houston, TX 77017, USA

Test date: 11/01/2019
Report date: 11/04/2019

Test Report Number: LLIA001168-004B

Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV

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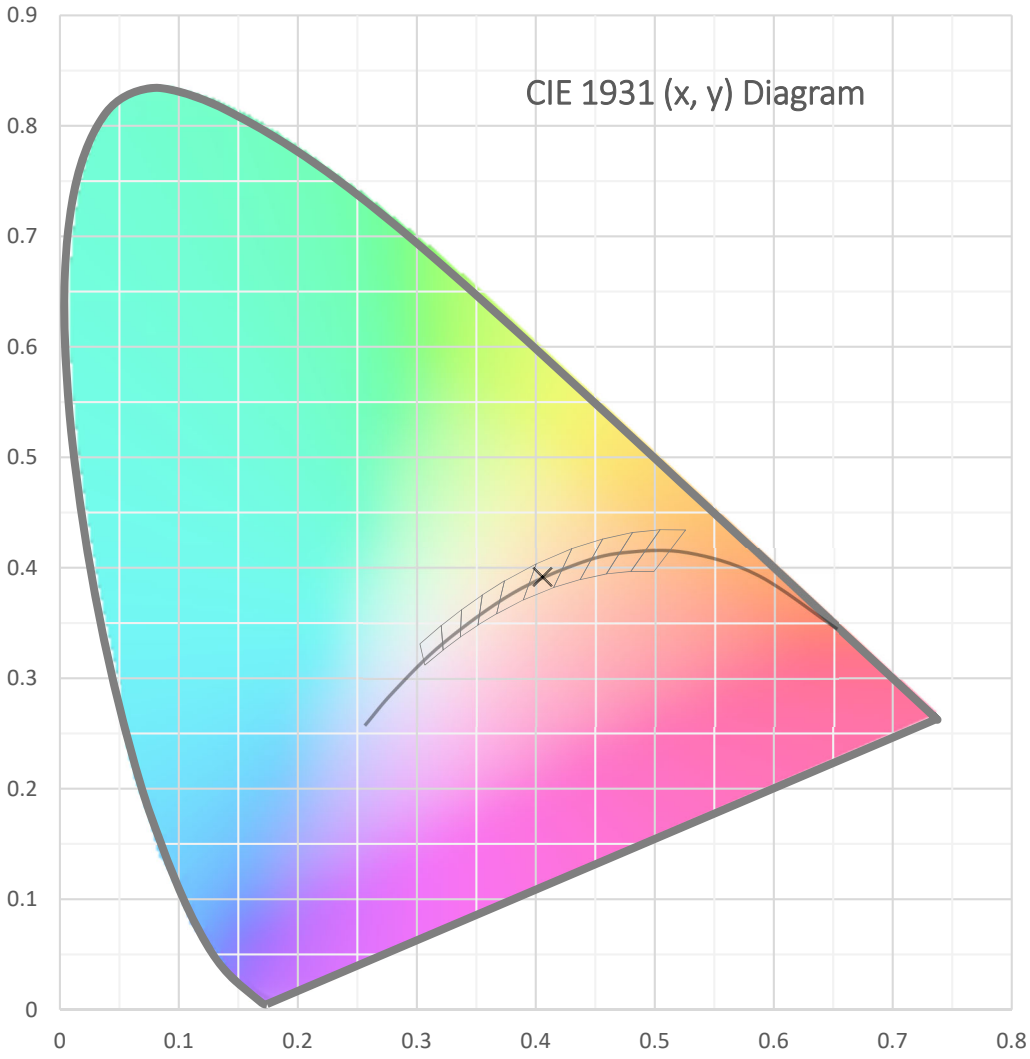

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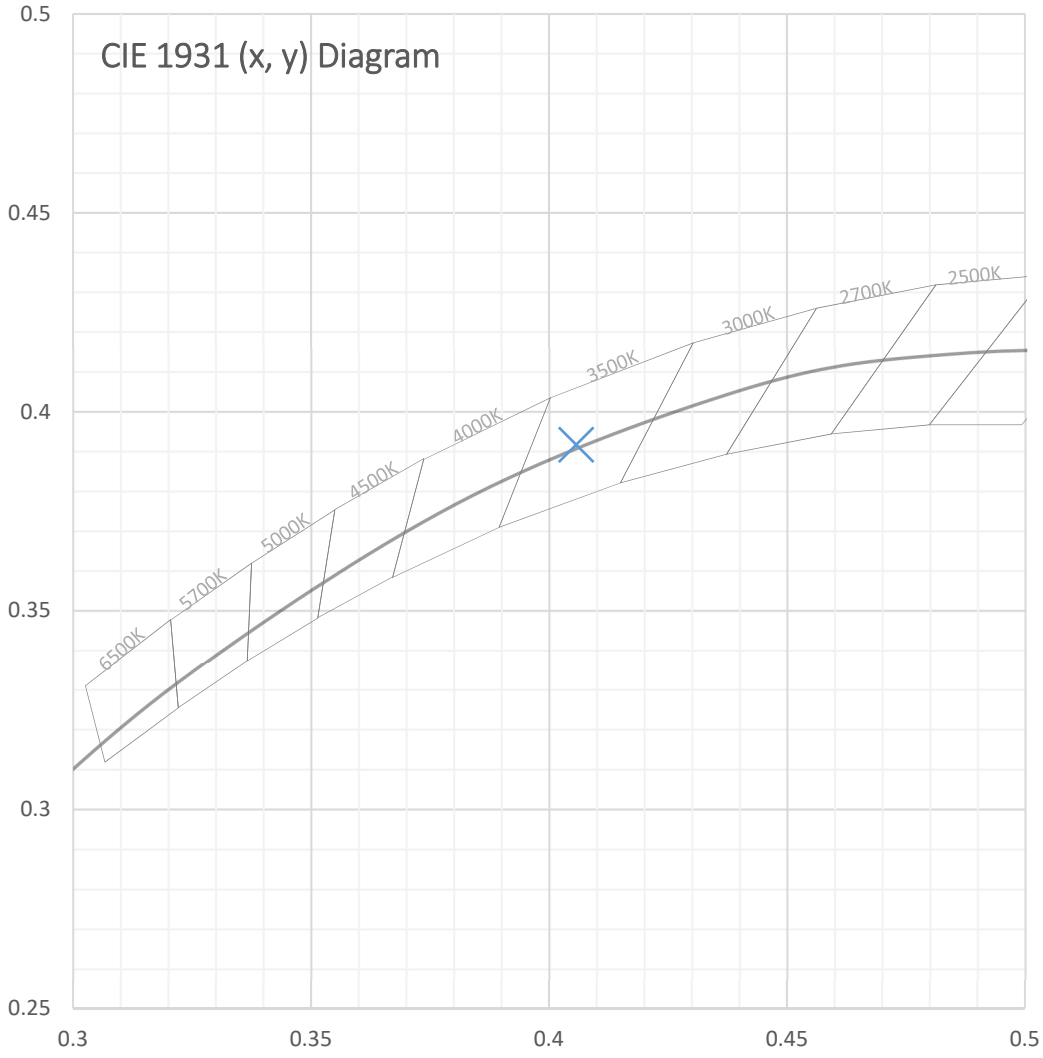

Test Report Number: LLIA001168-004B

Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV

Recessed ceiling mounted, extruded aluminum housing, formed white enamel aluminum reflector, translucent white plastic enclosure.

144 white LEDs, four Osram PrevaLED BARs with 36 LEDs each.

One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 660mA.

Spectral Data	Total Radiant Flux	7.471	W
	Total Luminous Flux	2499.9	Lm
	Chromaticity CIE 1931 (x, y)	(0.4057, 0.3917)	
	Chromaticity CIE 1976 (u', v')	(0.2356, 0.5117)	
	Correlated Color Temperature (CCT)	3498	K
	Color Rendering Index (Ra)	82	
	R1	81	
	R2	87	
	R3	93	
	R4	83	
	R5	81	
	R6	84	
	R7	85	
	R8	63	
	R9	6	
	R10	70	
	R11	84	
	R12	61	
	R13	83	
	R14	96	
	TM-30: Rf	81	
	TM-30: Rg	98	
	Distance from Planckian Locus (Duv)	0.0003	
	Scotopic/Photopic Ratio *	1.481	
Electrical Data			
	Voltage	120.0	Vac
	Current	0.2162	A
	Power	25.49	W
	Frequency	59.97	Hz
	Power Factor	0.982	
	Current THD	8.1	%

Test Report Number: LLIA001168-004B

Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV

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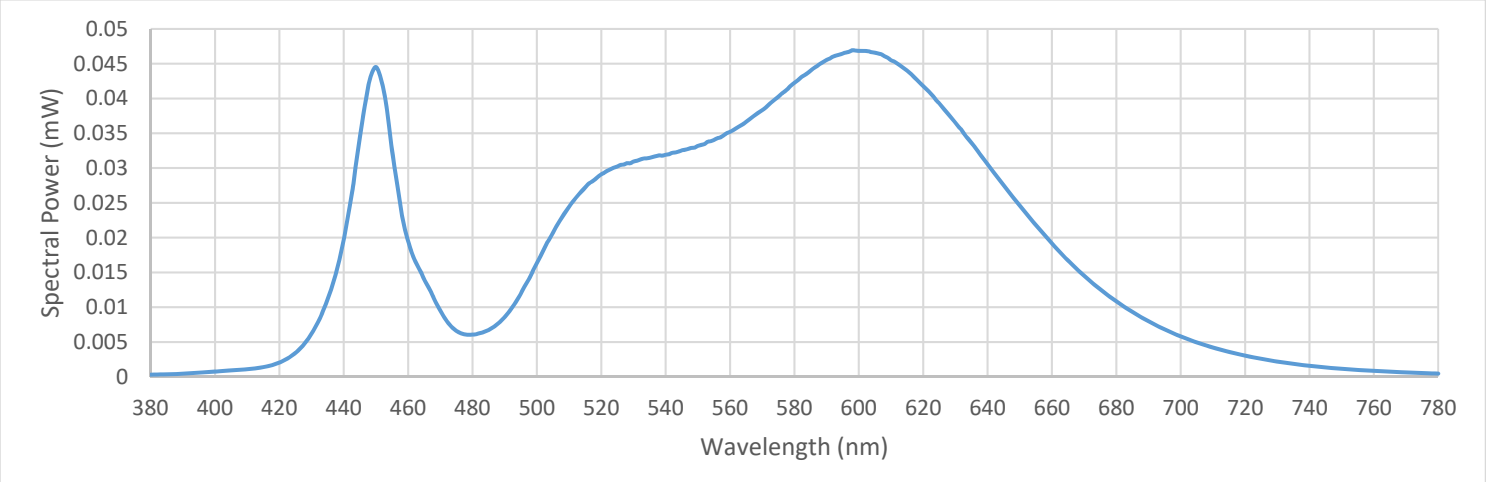
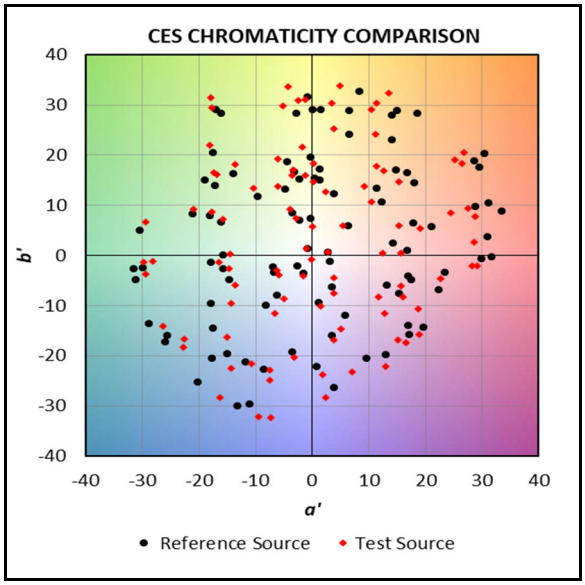
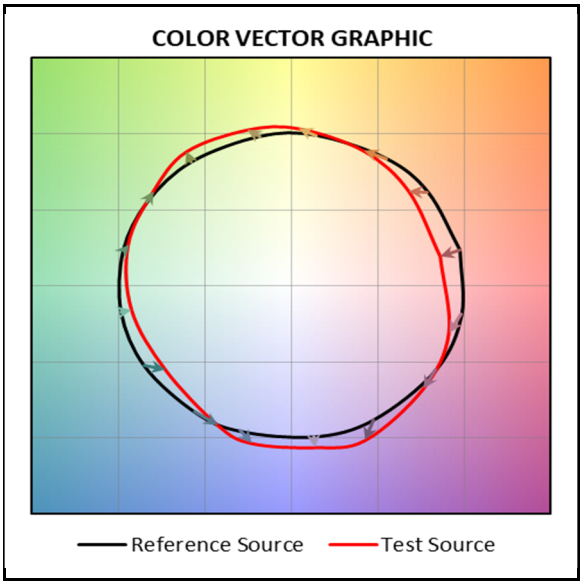
Summary Spectral Power Distribution (wavelength - nm, spectral power - mW)

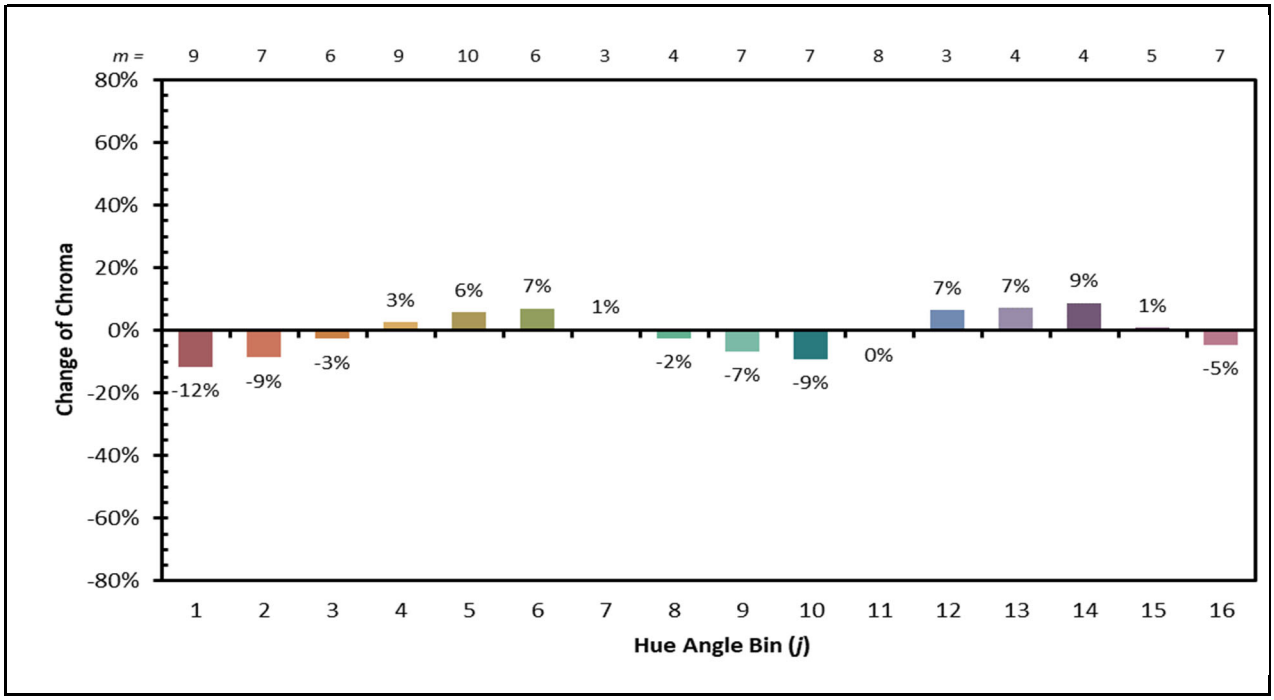
380	0.000306	480	0.006063	580	0.042232	680	0.010833
385	0.000344	485	0.006734	585	0.043967	685	0.009325
390	0.000447	490	0.008613	590	0.045552	690	0.007972
395	0.000585	495	0.011949	595	0.046481	695	0.006815
400	0.000756	500	0.016359	600	0.046852	700	0.005821
405	0.000913	505	0.020731	605	0.046586	705	0.004946
410	0.001095	510	0.024486	610	0.045499	710	0.004200
415	0.001392	515	0.027199	615	0.043979	715	0.003574
420	0.002046	520	0.029107	620	0.041771	720	0.003036
425	0.003434	525	0.030229	625	0.039304	725	0.002575
430	0.006237	530	0.030937	630	0.036517	730	0.002191
435	0.011143	535	0.031475	635	0.033620	735	0.001858
440	0.019681	540	0.031913	640	0.030524	740	0.001573
445	0.034372	545	0.032539	645	0.027538	745	0.001345
450	0.044526	550	0.033182	650	0.024580	750	0.001147
455	0.032720	555	0.034043	655	0.021768	755	0.000983
460	0.019547	560	0.035200	660	0.019199	760	0.000844
465	0.013967	565	0.036648	665	0.016722	765	0.000726
470	0.009502	570	0.038321	670	0.014512	770	0.000620
475	0.006581	575	0.040255	675	0.012567	775	0.000534
						780	0.000459



IES TM-30 Details







Test Report Number: LLIA001168-004B

Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV
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Test Equipment Configuration:	LightLab International Allentown 2m Integrating Sphere Measurements acquired using a Labsphere CDS 2600 spectroradiometer Testing was performed using 4π geometry
Test Temperature:	25.4 °C
Test Procedure:	Tested in accordance with the applicable sections of: LM-79-19, LM-78-07, LM-58-13, ANSI_ANSLG C78.377-2017, ANSI C82-77-10:2014, TM-30-15
Significance:	The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.
Notes:	The measurements and other derived quantities contained in this report are based on the absolute data as measured. Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results. This report is free of erasures and corrections This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.

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Report of Test

LLIA001168-004C

ISTM Report
Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV
Recessed ceiling mounted, extruded aluminum housing, formed
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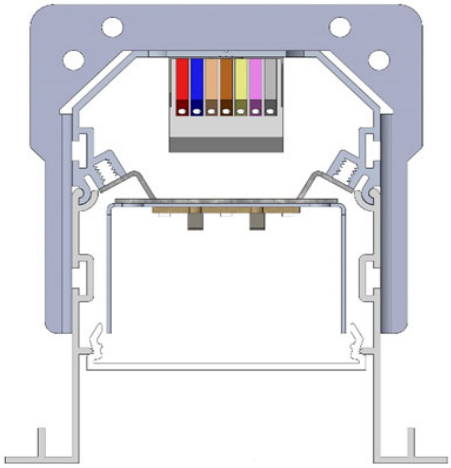
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 660mA.



Prepared For:
Precision Architectural Lighting
4830 Timber Creek Drive
Houston, TX 77017, USA

This test report was issued by LightLab International Allentown, LLC without alterations or erasures.

Test date: 11/04/2019
Report date: 11/04/2019

Test Report Number: LLIA001168-004C

Catalog Number: MLR3RG-HO-K35-80-4-XX-LOH-UNV
Recessed ceiling mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
144 white LEDs, four Osram PrevaLED BARs with 36 LEDs each.
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 660mA.

Purpose of Test:	To determine the in-situ temperature of the specified LED Ts point and driver Tc point. In this test, in-situ temperature refers to standard laboratory conditions with the luminaire configured in accordance with appropriate sections of UL1598-2008
Luminaire Mounting:	Recessed/Ceiling (NON-IC)
LED Test Point:	Thermocouples were attached to the LED case temperature point (Ts) as specified by report number SQETMR704203, issued 06/04/2018 by Nichia Corporation LED Testing Laboratory. The measured LED was selected according to guidance provided by DLC and ENERGY STAR for lumen maintenance projection.
Driver Test Point:	Thermocouples were attached to the driver case in the location (Tc) designated by the manufacturer.
Sample Selection:	LightLab International Allentown. LLC has not participated in the selection of sample(s) being tested. Testing is performed on the understanding that the significance of the report is limited to the extent to which the sample is representative of production units.
Disclaimer:	This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
Procedure:	In-situ temperature measurements were performed with the luminaire mounted inside of a normal temperature test box for type NON-IC luminaires. The luminaire supply voltage and frequency was set according to the luminaire manufacturer's instructions. The luminaire was allowed to reach stabilization as defined in UL1598-2008 prior to reported measurements. Testing was performed in a draft-free, temperature-controlled environment with an ambient temperature of 25 +/- 5 °C.
Test Equipment:	GW Instek APS-7100 AC Power Source Xitron 2801 Power Analyzer Fluke 52-ii Thermometer

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Test Report Number: LLIA001168-004C

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Electrical Measurements

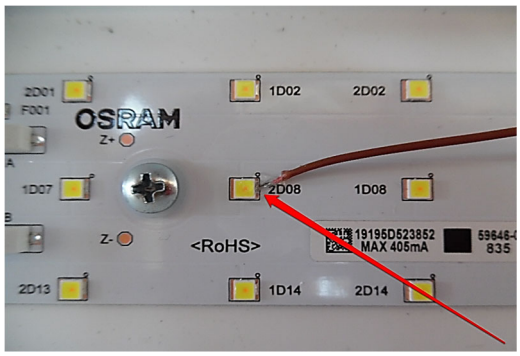
Voltage	120.0	Vac
Current	0.2154	A
Power	25.54	W
Frequency	60.0	Hz
Power Factor	0.988	
Current THD	8.1	%
Driver #1 Output	0.658	Adc

Temperature Measurements

LED #1 (Ts)	42.6°C	Driver #1 (Tc)	45.2°C

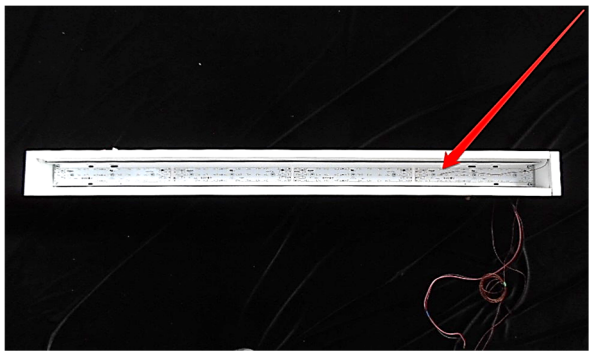
*The above temperatures have been normalized to 25°C ambient.

Measured Ambient Temperature (Ta) 23.3°C



LED Thermocouple Location

Driver Thermocouple Location



Selected LED Location