LightLab INTERNATIONAL ALLENTOWN LLC

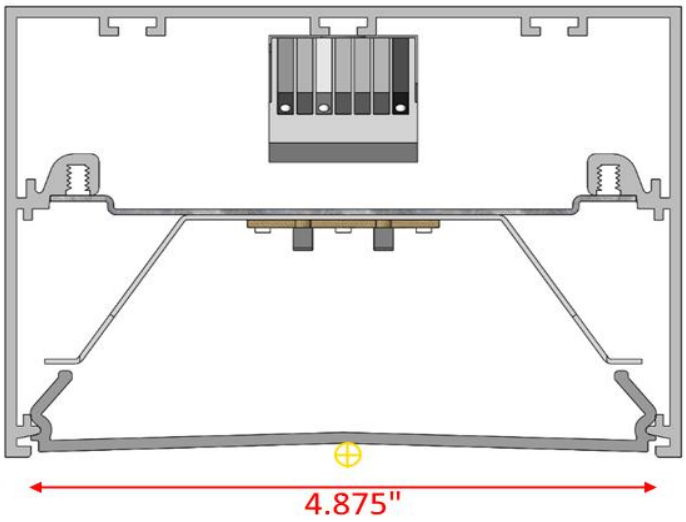
NVLAP TESTING Lab Code: 201079-0

Report of Test

LLIA001197-004A

Indoor Distribution Photometry Test Report

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120
Pendant mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
144 white LEDs, one Osram PrevaLED BAR
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.



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

Performance Summary					
Input Voltage	120.0	V	Luminous Flux	3632.7	Lumens
Input Current	0.2619	A	Total Efficacy	116.9	Lm/W
Input Power	31.07	W	Downward Flux	3632.6	Lumens
Frequency	60.00	Hz	Downward Flux	100.0	% of Total
Power Factor	0.989				
Current THD	6.9	%			

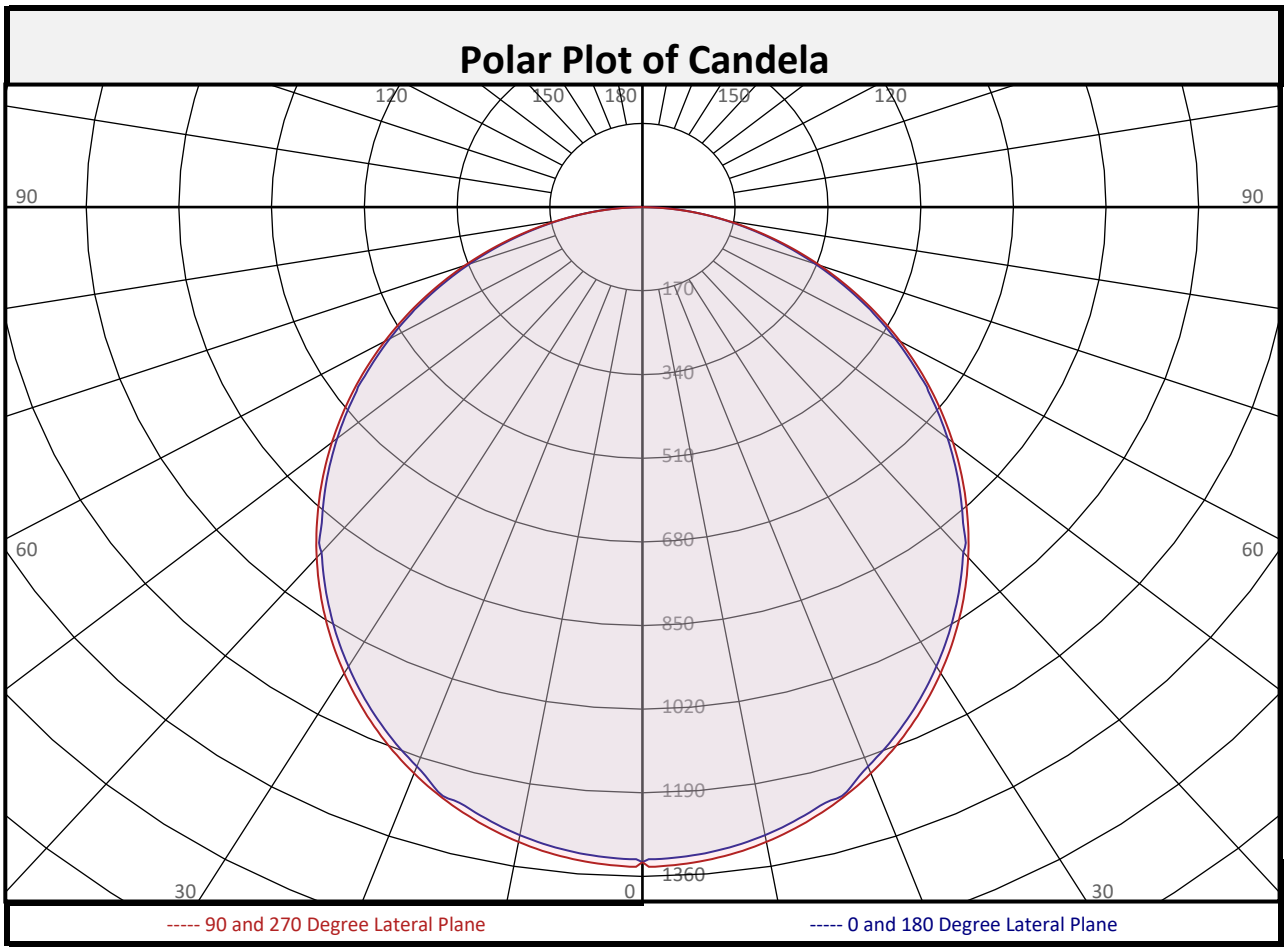
This test report was issued by LightLab International Allentown, LLC without alterations or erasures.

Test date: 11/04/2019
Report date: 12/09/2019

Signed: Michael L. Grather

Report of Test

LLIA001197-004A



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	125.6	3.5%	90-100	0.0	0.0%	0-20	482.4	13.3%
10-20	356.8	9.8%	100-110	0.0	0.0%	0-30	1015	27.9%
20-30	532.1	14.6%	110-120	0.0	0.0%	0-40	1644	45.3%
30-40	629.2	17.3%	120-130	0.0	0.0%	0-60	2856	78.6%
40-50	641.1	17.6%	130-140	0.0	0.0%	0-80	3553	97.8%
50-60	571.3	15.7%	140-150	0.0	0.0%	10-90	3507	96.5%
60-70	436.1	12.0%	150-160	0.0	0.0%	20-50	1802	49.6%
70-80	260.9	7.2%	160-170	0.0	0.0%	40-90	1989	54.8%
80-90	79.5	2.2%	170-180	0.0	0.0%	60-90	776.5	21.4%
0-90	3633	100.0%	90-180	0.0	0.0%	0-180	3633	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	1331	1331	1331	1331	1331	1331	1331	1331	1331
	2.5	1323	1325	1327	1333	1338	1333	1327	1325	1323
	5	1318	1319	1321	1327	1332	1327	1321	1319	1318
	7.5	1308	1309	1312	1318	1323	1318	1312	1309	1308
	10	1296	1297	1299	1305	1309	1305	1299	1297	1296
	12.5	1279	1280	1282	1288	1293	1288	1282	1280	1279
	15	1259	1260	1263	1269	1273	1269	1263	1260	1259
	17.5	1246	1242	1239	1246	1250	1246	1239	1242	1246
	20	1209	1214	1214	1220	1224	1220	1214	1214	1209
	22.5	1181	1181	1189	1191	1196	1191	1189	1181	1181
	25	1149	1149	1159	1160	1164	1160	1159	1149	1149
	27.5	1114	1115	1119	1126	1130	1126	1119	1115	1114
	30	1078	1079	1083	1090	1094	1090	1083	1079	1078
	32.5	1040	1040	1044	1052	1055	1052	1044	1040	1040
	35	999	1000	1004	1012	1014	1012	1004	1000	999
	37.5	958	959	963	971	973	971	963	959	958
	40	916	916	920	933	929	933	920	916	916
	42.5	870	872	875	885	884	885	875	872	870
	45	824	826	829	836	838	836	829	826	824
	47.5	778	779	783	789	791	789	783	779	778
	50	731	732	735	741	743	741	735	732	731
	52.5	682	683	687	693	694	693	687	683	682
	55	637	634	638	644	645	644	638	634	637
	57.5	585	587	589	595	595	595	589	587	585
	60	535	536	540	545	546	545	540	536	535
	62.5	485	486	490	495	495	495	490	486	485
	65	435	436	441	445	445	445	441	436	435
	67.5	386	387	391	395	395	395	391	387	386
	70	337	338	343	346	346	346	343	338	337
	72.5	289	290	294	297	297	297	294	290	289
	75	242	243	247	249	249	249	247	243	242
	77.5	197	198	201	203	203	203	201	198	197
	80	154	155	157	158	157	158	157	155	154
	82.5	113	113	114	114	113	114	114	113	113
	85	73	72	72	72	71	72	72	72	73
	87.5	34	33	32	30	29	30	32	33	34
	90	0	0	0	0	1	0	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	0	1	0	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	109	104	99	96		106	101	98	94		97	94	91		93	91	88		90	88	86	83
2	99	90	84	78		96	89	82	77		85	80	75		82	77	73		79	75	72	69
3	90	79	71	65		88	78	70	64		75	68	63		72	66	62		69	65	61	59
4	82	70	62	55		80	69	61	54		67	59	54		64	58	53		62	57	52	50
5	76	63	54	47		74	62	53	47		60	52	46		58	51	46		56	50	45	43
6	70	57	48	41		68	56	47	41		54	46	41		52	46	40		51	45	40	38
7	65	51	43	37		63	51	42	36		49	42	36		48	41	36		46	40	36	34
8	61	47	38	33		59	46	38	32		45	38	32		44	37	32		43	36	32	30
9	57	43	35	29		55	43	35	29		41	34	29		40	34	29		39	33	29	27
10	53	40	32	27		52	39	32	27		38	31	26		37	31	26		36	31	26	24

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	37.0	7.25	7.34
8.0	20.8	9.66	9.78
10.0	13.3	12.08	12.23
12.0	9.2	14.49	14.68
14.0	6.8	16.91	17.12
16.0	5.2	19.33	19.57

Average Luminance (cd/m^2)

	0 deg Plane	45 deg Plane	90 deg Plane
0	9002	9002	9002
45	7888	7934	8014
55	7508	7527	7608
65	6971	7052	7128
75	6332	6458	6512
85	5653	5601	5510

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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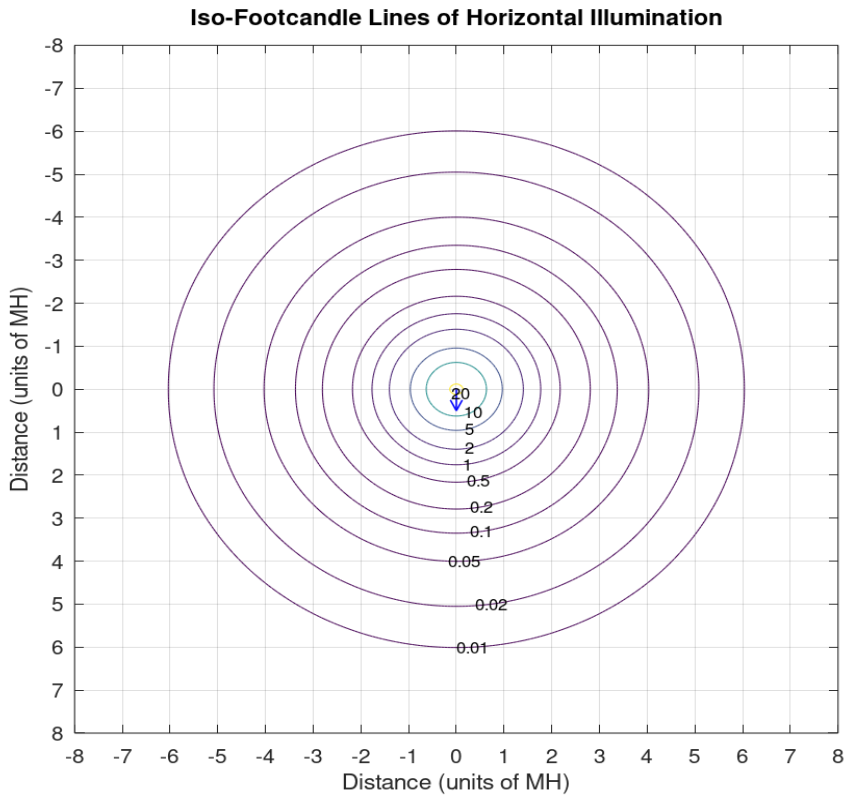
Iso-Illuminance Plot



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.

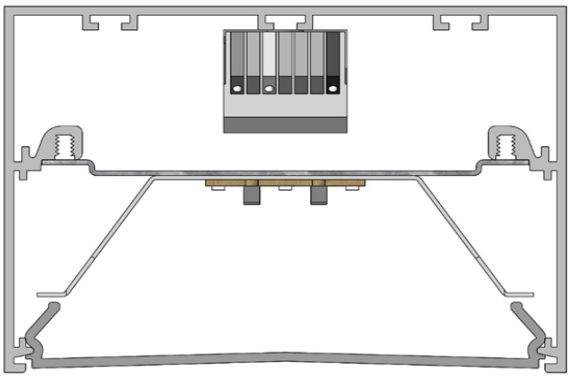
This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with ‡ are not covered.

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

LLIA001197-004B

Integrating Sphere Report
Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120
Pendant mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
144 white LEDs, one Osram PrevaLED BAR
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.



Performance Summary

Voltage	120.0	Vac
Current	0.2617	A
Power	30.98	W
Frequency	59.99	Hz
Power Factor	0.987	
Current THD	6.8	%
Total Luminous Flux	3679.5	lm
Efficacy	118.8	lm/W
Chromaticity (x,y)	(0.4071, 0.3946)	
(u',v')	(0.2353, 0.5131)	
Duv	0.0013	
CCT	3492	K
CRI (Ra)	82	
R9	5	
TM-30: Rf	81	
TM-30: Rg	98	

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

Test date: 12/05/2019
Report date: 12/09/2019

Test Report Number: LLIA001197-004B
Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120
Pendant mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
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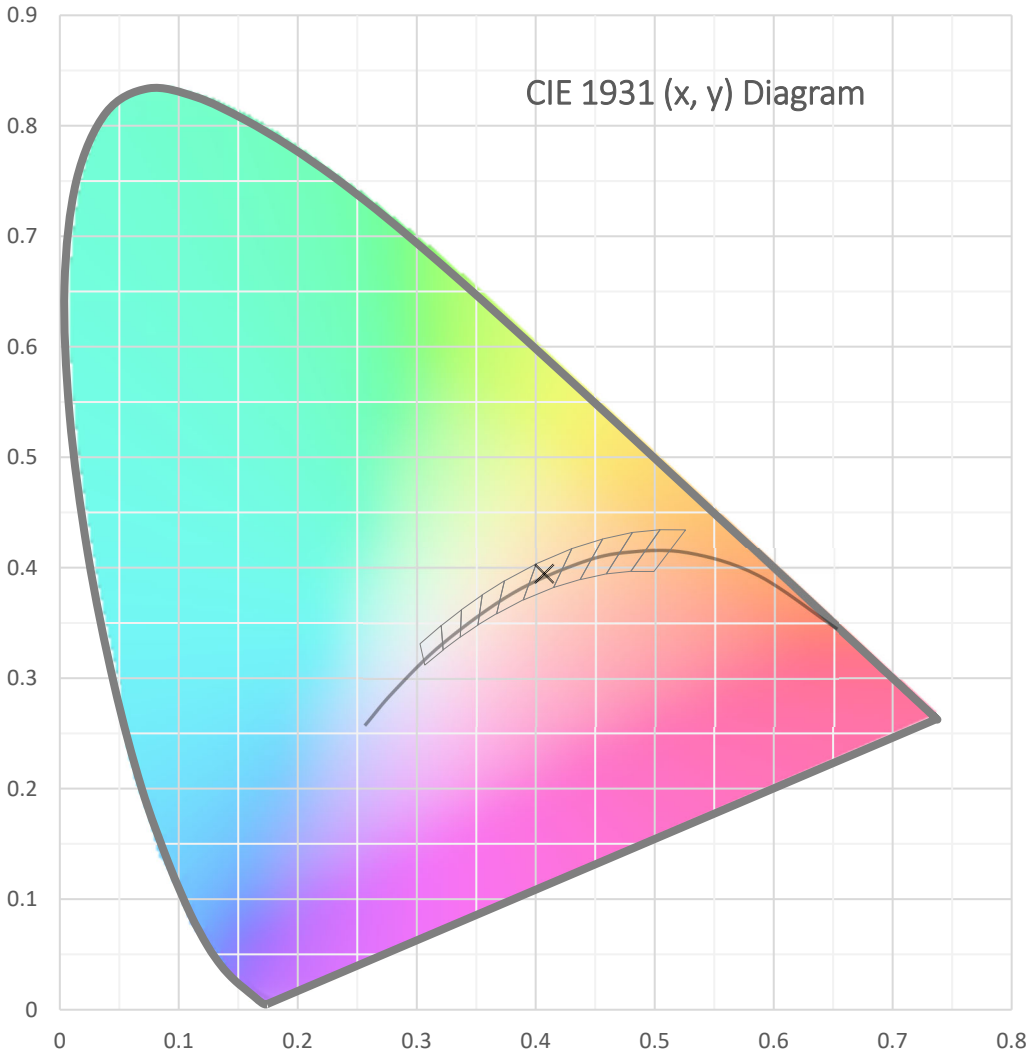

Test Report Number: LLIA001197-004B

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120

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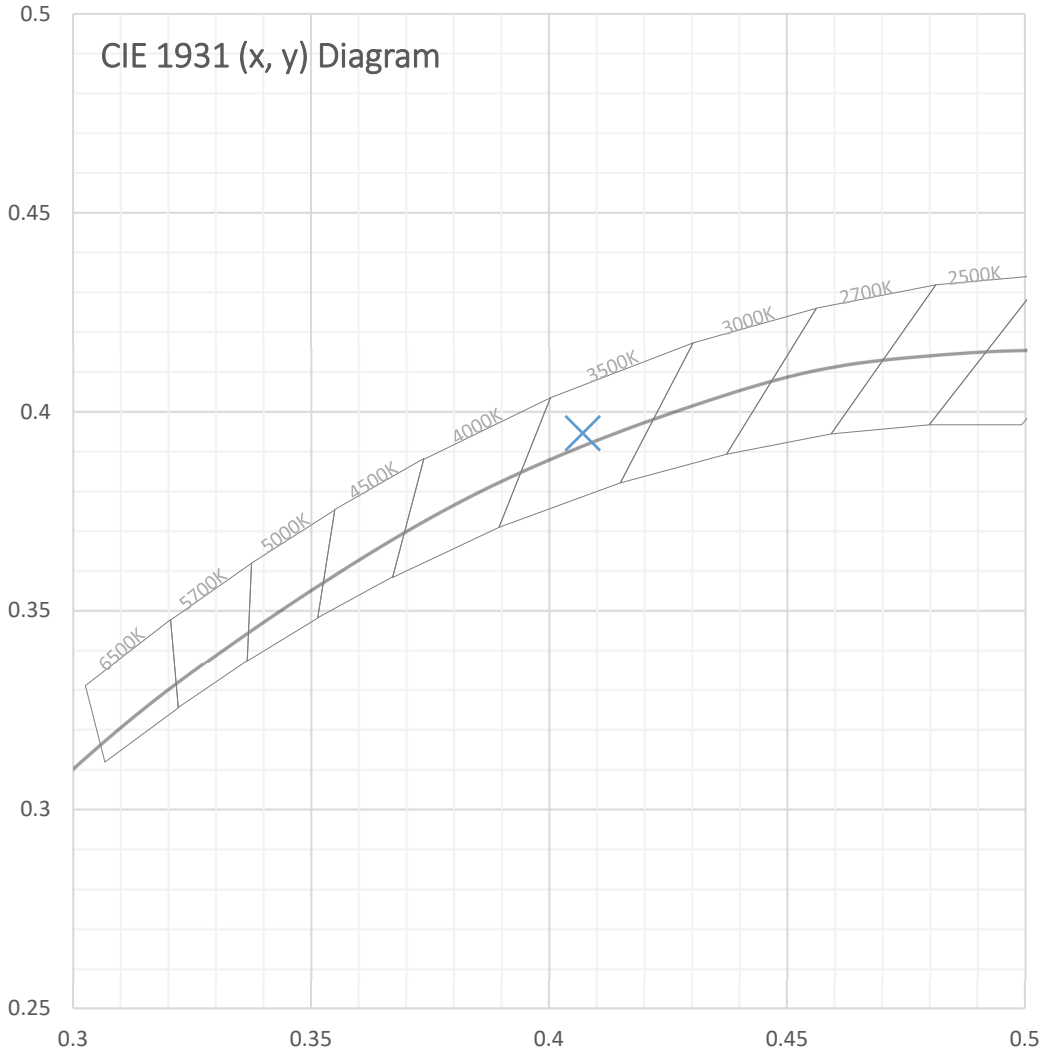


Test Report Number: LLIA001197-004B

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120

Pendant mounted, extruded aluminum housing, formed

white enamel aluminum reflector, translucent white plastic enclosure.

144 white LEDs, one Osram PrevaLED BAR

One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.

Spectral Data	Total Radiant Flux	10.97 W
	Total Luminous Flux	3679.5 Lm
	Chromaticity CIE 1931 (x, y)	(0.4071, 0.3946)
	Chromaticity CIE 1976 (u', v')	(0.2353, 0.5131)
	Correlated Color Temperature (CCT)	3492 K
	Color Rendering Index (Ra)	82
	R1	81
	R2	87
	R3	93
	R4	83
	R5	80
	R6	83
	R7	86
	R8	63
	R9	5
	R10	70
	R11	83
	R12	60
	R13	82
	R14	96
	TM-30: Rf	81
	TM-30: Rg	98
	Distance from Planckian Locus (Duv)	0.0013
	Scotopic/Photopic Ratio *	1.473
Electrical Data		
	Voltage	120.0 Vac
	Current	0.2617 A
	Power	30.98 W
	Frequency	59.99 Hz
	Power Factor	0.987
	Current THD	6.8 %

Test Report Number: LLIA001197-004B

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120

Pendant mounted, extruded aluminum housing, formed

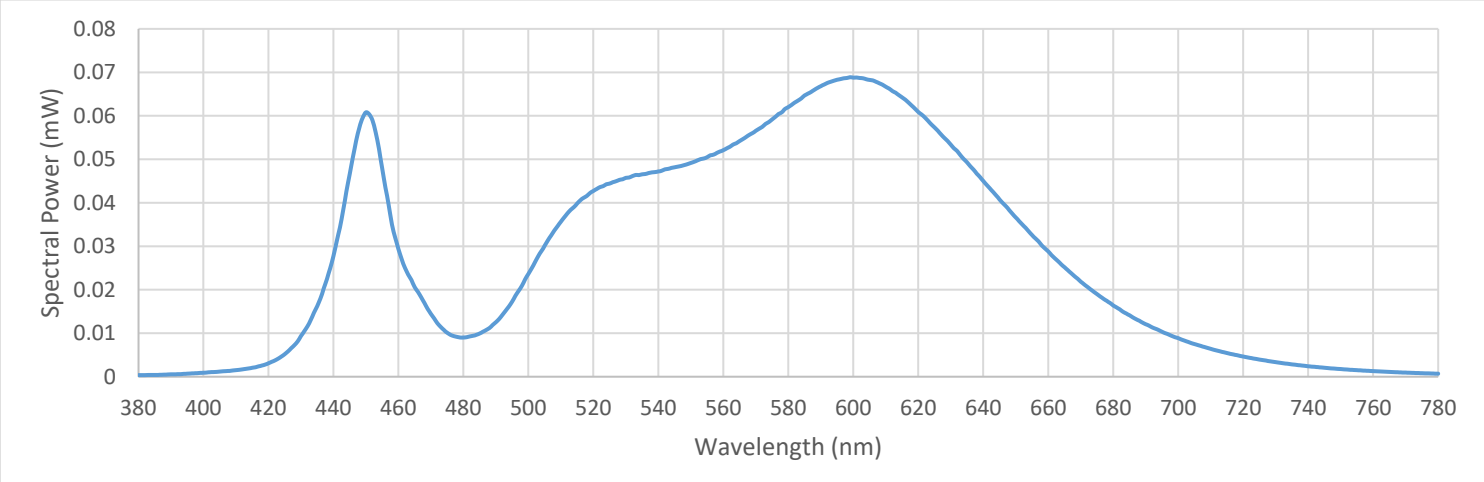
white enamel aluminum reflector, translucent white plastic enclosure.

144 white LEDs, one Osram PrevaLED BAR

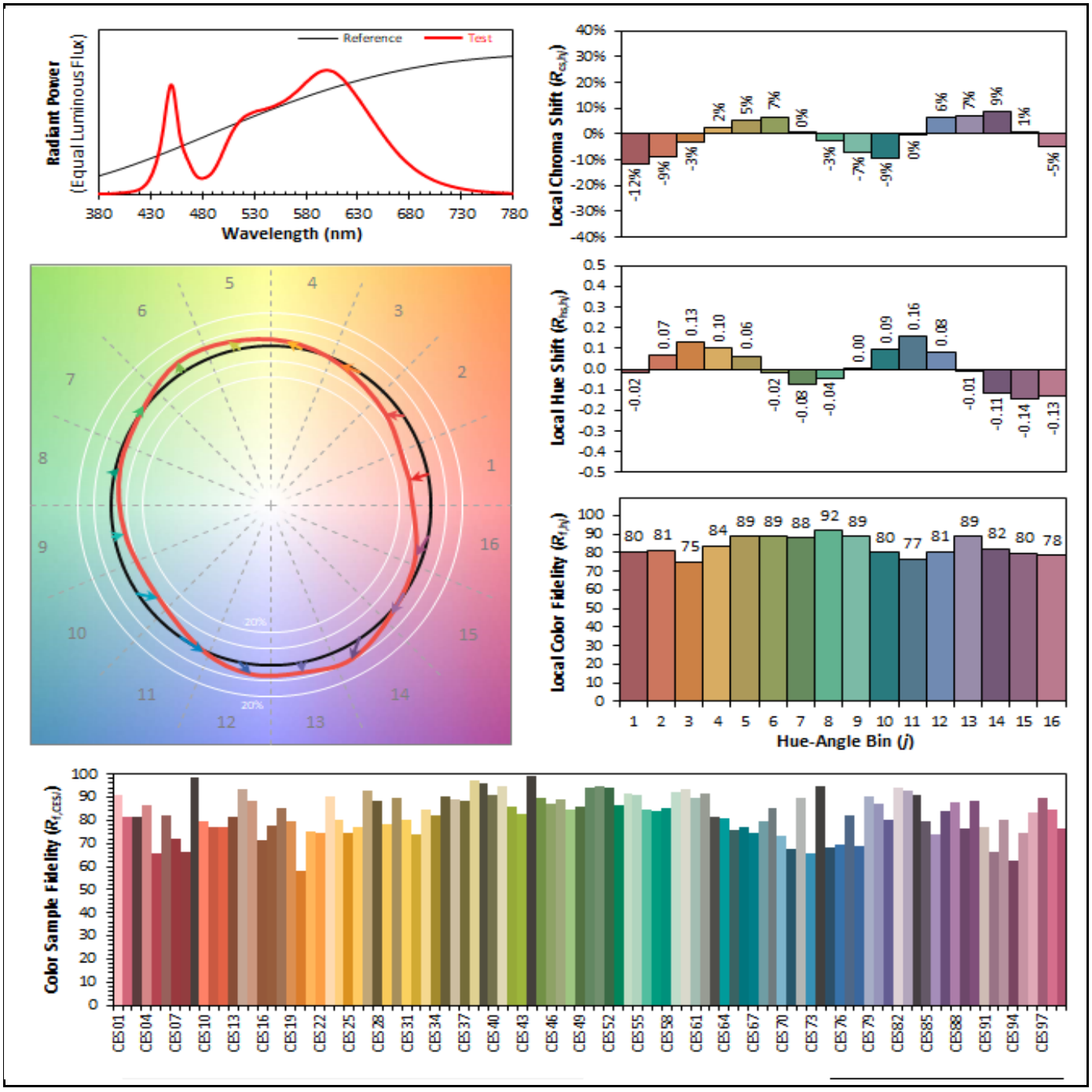
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.

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

380	0.000372	480	0.009026	580	0.062020	680	0.016395
385	0.000419	485	0.009963	585	0.064688	685	0.014128
390	0.000556	490	0.012556	590	0.066856	690	0.012095
395	0.000700	495	0.017283	595	0.068292	695	0.010339
400	0.000917	500	0.023681	600	0.068803	700	0.008867
405	0.001196	505	0.030107	605	0.068256	705	0.007536
410	0.001525	510	0.035676	610	0.066677	710	0.006408
415	0.002059	515	0.039829	615	0.064266	715	0.005460
420	0.003109	520	0.042754	620	0.060893	720	0.004648
425	0.005194	525	0.044435	625	0.057333	725	0.003951
430	0.009351	530	0.045761	630	0.053374	730	0.003363
435	0.016229	535	0.046572	635	0.049316	735	0.002855
440	0.027718	540	0.047218	640	0.045015	740	0.002421
445	0.046597	545	0.048182	645	0.040800	745	0.002078
450	0.060809	550	0.049191	650	0.036629	750	0.001774
455	0.047919	555	0.050483	655	0.032568	755	0.001518
460	0.029426	560	0.052104	660	0.028812	760	0.001307
465	0.020625	565	0.054208	665	0.025191	765	0.001116
470	0.014490	570	0.056564	670	0.021885	770	0.000958
475	0.010116	575	0.059197	675	0.019016	775	0.000824
						780	0.000709



IES TM-30 Details



Test Report Number: LLIA001197-004B

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120
Pendant mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
144 white LEDs, one Osram PrevaLED BAR
One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.

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:	25.7 °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.

Sphere Report Template V2-11

Report of Test

LLIA001197-004C

ISTM Report
Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120
Pendant mounted, extruded aluminum housing, formed
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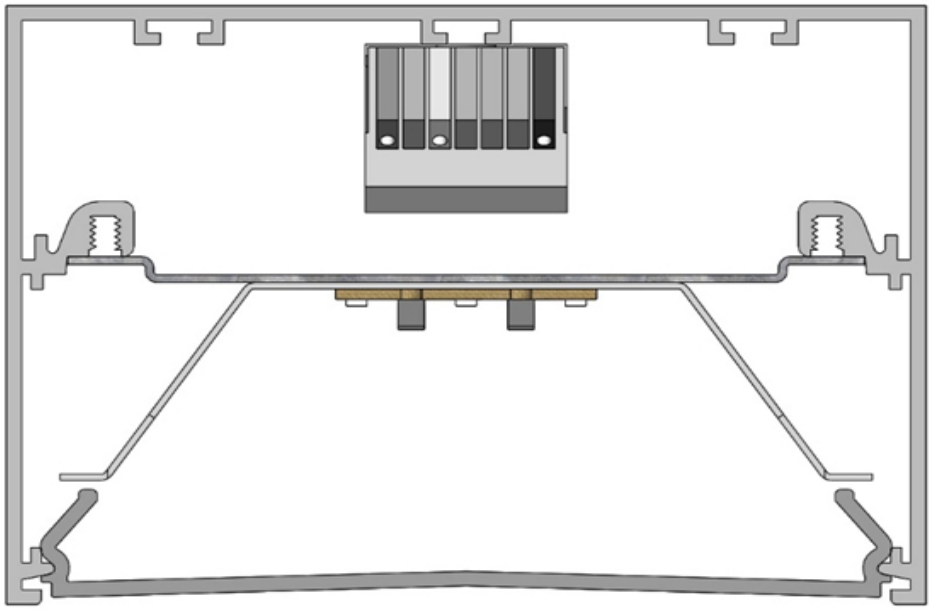

Prepared For:
Precision Architectural Lighting
4830 Timber Creek Drive
Houston, TX 77017, USA

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

Test date: 12/06/2019
Report date: 12/09/2019

Test Report Number: LLIA001197-004C

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120
Pendant mounted, extruded aluminum housing, formed
white enamel aluminum reflector, translucent white plastic enclosure.
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One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.

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:	Pendant
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 suspended from a simulated ceiling. 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: LLIA001197-004C

Catalog Number: MLS5-D-HO-K35-80-XX-LOH-XXXX-120

Pendant mounted, extruded aluminum housing, formed

white enamel aluminum reflector, translucent white plastic enclosure.

144 white LEDs, one Osram PrevaLED BAR

One Osram Optotronic OTi 30/120-277/1A0 DIM-1 L G2 LED driver labeled as 540mA.

Electrical Measurements

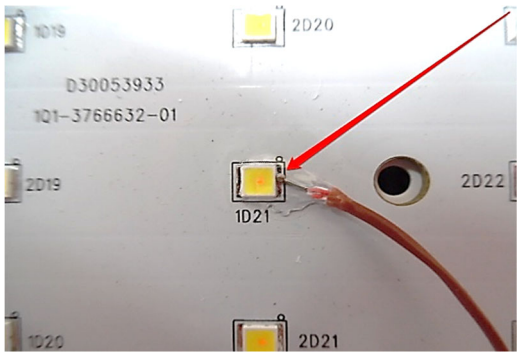
Voltage	120.0	Vac
Current	0.2619	A
Power	31.08	W
Frequency	60.0	Hz
Power Factor	0.989	
Current THD	6.8	%
Driver #1 Output	0.539	Adc

Temperature Measurements

LED #1 (Ts)	46.1°C	Driver #1 (Tc)	46.3°C

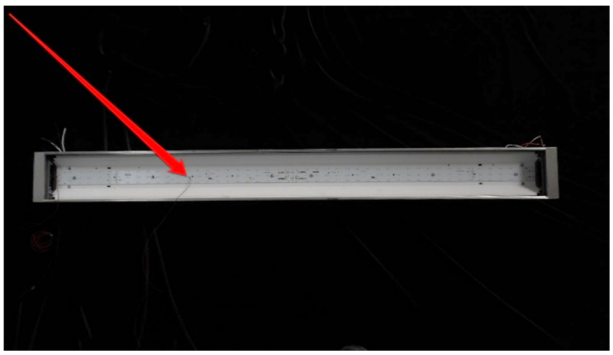
*The above temperatures have been normalized to 25°C ambient.

Measured Ambient Temperature (Ta) 21.8°C



LED Thermocouple Location

Driver Thermocouple Location



Selected LED Location