LightLab INTERNATIONAL ALLENTOWN LLC

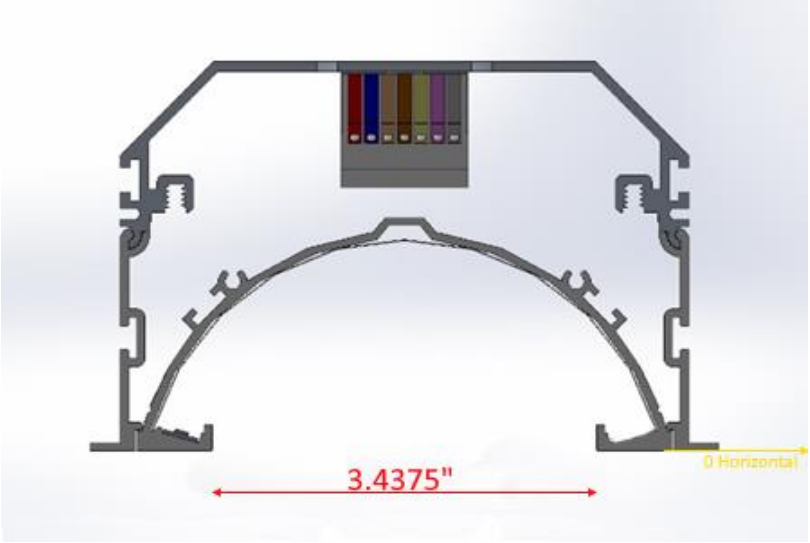
NVLAP TESTING Lab Code: 201079-0

Report of Test

LLIA001607-001A

Indoor Distribution Photometry Test Report

Catalog Number: ARR-ASYM-VHO-K40-80-4-XX-120-DIM1
Recessed mounted, aluminum housing, steel end caps, aluminum reflector/LED holder and white painted ends, white plastic reflector sheet, open bottom.
One energized row of 184 white LEDs aimed up with one-piece diffuse plastic lens above LEDs
One Osram OTi30/120-277/1A0DIM-1LG2 LED driver labeled as 400mA



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

Performance Summary					
Input Voltage	120.0	Vac	Luminous Flux	1585.4	Lumens
Input Current	0.1354	A	Total Efficacy	102.8	Lm/W
Input Power	15.42	W	Downward Flux	1585.4	Lumens
Frequency	60.00	Hz	Downward Flux	100.0	% of Total
Power Factor	0.949				
Current THD	14.5	%			

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

Test date: 12/10/2021
Report date: 12/13/2021

Signed: Michael L. Grather

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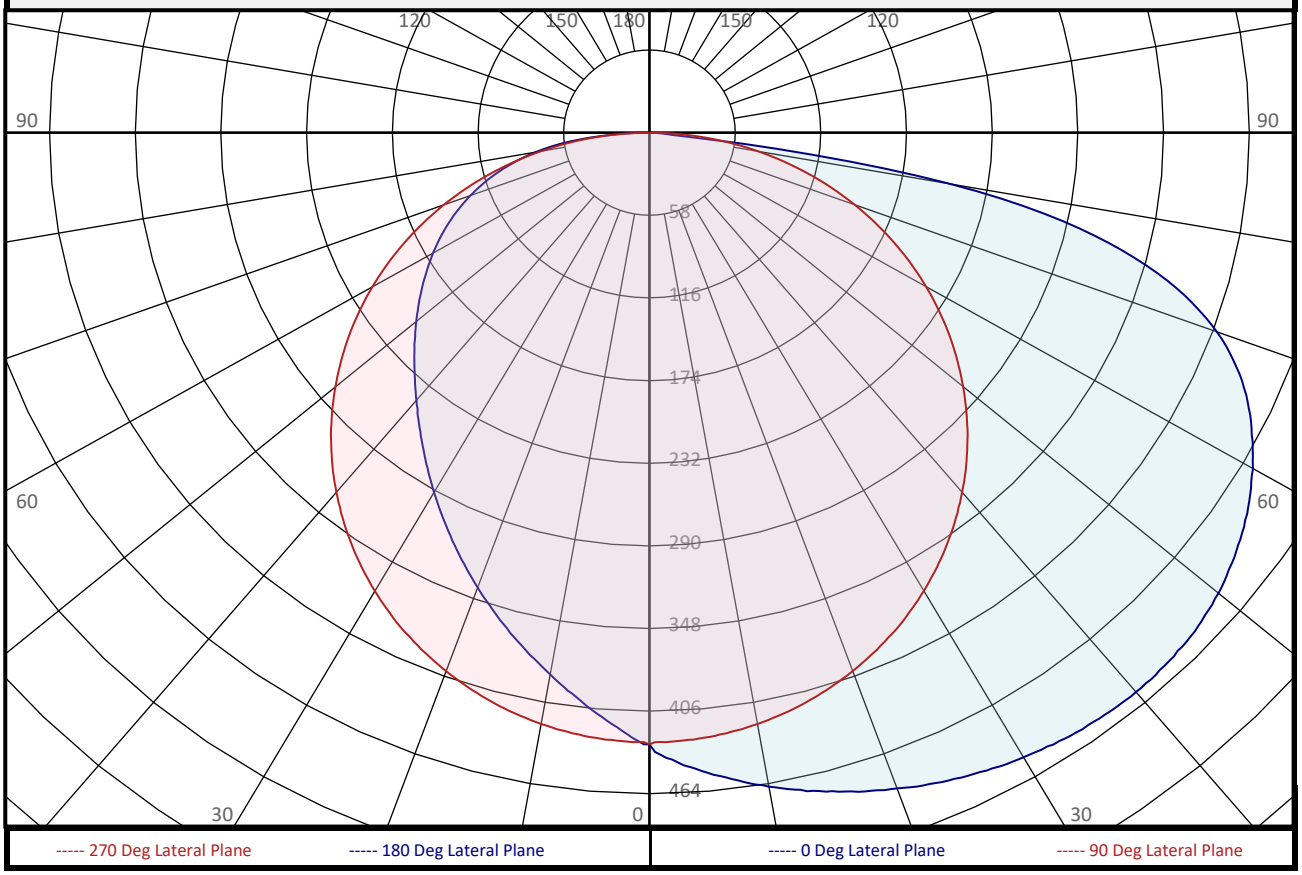
Polar Plot of Candela



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	40.7	2.6%	90-100	0.0	0.0%	0-20	158.3	10.0%
10-20	117.6	7.4%	100-110	0.0	0.0%	0-30	341.3	21.5%
20-30	183.0	11.5%	110-120	0.0	0.0%	0-40	572.5	36.1%
30-40	231.2	14.6%	120-130	0.0	0.0%	0-60	1095	69.1%
40-50	258.9	16.3%	130-140	0.0	0.0%	0-80	1529	96.4%
50-60	263.8	16.6%	140-150	0.0	0.0%	10-90	1545	97.4%
60-70	244.1	15.4%	150-160	0.0	0.0%	20-50	673.2	42.5%
70-80	190.0	12.0%	160-170	0.0	0.0%	40-90	1013	63.9%
80-90	56.0	3.5%	170-180	0.0	0.0%	60-90	490.2	30.9%
0-90	1585	100.0%	90-180	0.0	0.0%	0-180	1585	100.0%

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Luminous Intensity (Candela) Table

Vertical (Gamma) Angles - Data was acquired in 0.5° increments, 2.5° increments shown.	Lateral (C-Plane) Angles									
	0	22.5	45	67.5	90	112.5	135	157.5	180
0	429	429	429	429	429	429	429	429	429
2.5	442	440	436	432	427	423	420	420	420
5	451	447	441	434	426	418	412	409	409
7.5	459	454	446	436	424	412	403	399	397
10	466	461	450	437	421	405	394	388	386
12.5	472	466	454	437	418	398	384	377	375
15	479	472	456	436	413	390	374	366	364
17.5	485	476	458	434	408	382	364	355	352
20	490	481	460	432	402	373	353	343	340
22.5	495	484	460	429	396	363	342	331	328
25	500	488	461	425	388	353	330	319	316
27.5	503	490	460	421	380	342	318	307	304
30	506	493	459	415	372	331	307	295	292
32.5	509	494	457	409	362	319	294	282	279
35	511	495	455	403	352	307	281	270	268
37.5	512	495	452	395	341	294	269	258	256
40	512	495	448	388	329	281	256	247	245
42.5	511	493	444	379	317	267	243	236	235
45	510	491	439	370	305	253	230	225	225
47.5	507	488	434	360	291	239	218	215	215
50	503	483	428	350	277	224	205	205	206
52.5	497	477	420	340	263	210	194	195	197
55	490	469	413	328	248	195	182	185	188
57.5	481	461	403	316	232	180	171	176	178
60	472	451	393	304	216	165	160	166	169
62.5	460	439	381	291	200	150	149	157	160
65	447	427	368	278	183	135	138	147	150
67.5	430	412	354	263	166	122	128	137	140
70	409	393	338	248	148	108	117	126	129
72.5	380	367	321	233	130	96	106	115	117
75	340	333	298	215	111	83	95	103	105
77.5	286	285	268	197	93	71	83	90	92
80	206	216	224	177	74	60	70	76	78
82.5	87	107	156	150	55	48	56	60	61
85	12	12	44	105	36	35	39	40	41
87.5	4	5	5	10	17	20	17	17	17
90	0	0	0	0	0	0	0	0	0

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Luminous Intensity (Candela) Table

Vertical (Gamma) Angles - Data was acquired in 0.5° increments, 2.5° increments shown.	Lateral (C-Plane) Angles									
		0	22.5	45	67.5	90	112.5	135	157.5	180
	90	0	0	0	0	0	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	107	101	96	92		104	99	94	90		94	91	87		90	87	84		87	84	82	80
2	96	86	78	72		93	84	77	71		81	75	69		77	72	68		74	70	66	64
3	86	75	65	58		84	73	64	58		70	63	57		67	61	55		64	59	54	52
4	79	65	56	48		76	64	55	48		61	53	47		59	52	46		57	51	46	43
5	72	58	48	41		70	57	47	41		54	46	40		52	45	40		50	44	39	37
6	66	52	42	35		64	51	42	35		49	41	35		47	40	34		45	39	34	32
7	61	47	37	31		59	46	37	31		44	36	30		43	36	30		41	35	30	28
8	57	42	33	27		55	42	33	27		40	33	27		39	32	27		38	31	27	25
9	53	39	30	24		51	38	30	24		37	29	24		36	29	24		35	28	24	22
10	50	36	27	22		48	35	27	22		34	27	22		33	26	22		32	26	21	20

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	11.9	8.40	7.72
8.0	6.7	11.20	10.30
10.0	4.3	14.00	12.87
12.0	3.0	16.80	15.44
14.0	2.2	19.61	18.02
16.0	1.7	22.41	20.59

Spacing Criterion

0 deg:	1.8
90 deg:	1.3
180 deg:	1.0
270 deg:	1.3

Average Luminance (cd/m^2)

	0 deg Plane	45 deg Plane	90 deg Plane
0	4208	4208	4208
45	7072	6091	4222
55	8371	7051	4238
65	10364	8539	4242
75	12884	11304	4220
85	1320	4957	4070

Beam and Field Angle

0-180 Degree Plane

Beam Angle: 116.1°

Field Angle: 166.9°

90-270 Degree Plane

Beam Angle: 107.2°

Field Angle: 166.1°

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UGR Table - Corrected

Reflectances											
Ceiling Cavity		70	70	50	50	30	70	70	50	50	30
Walls		50	30	50	30	30	50	30	50	30	30
Floor Cavity		20	20	20	20	20	20	20	20	20	20
Room Size		UGR Viewed Crosswise					UGR Viewed Endwise				
X=2H	Y=2H	21.5	23.2	21.8	23.5	23.9	17.2	18.9	17.5	19.3	19.6
	3H	24.6	26.2	24.9	26.5	26.8	19.4	21.0	19.8	21.3	21.7
	4H	25.9	27.4	26.3	27.8	28.2	20.3	21.8	20.7	22.2	22.5
	6H	26.9	28.4	27.3	28.7	29.1	21.0	22.5	21.4	22.8	23.2
	8H	27.1	28.5	27.5	28.9	29.2	21.3	22.7	21.7	23.1	23.5
	12H	27.1	28.4	27.5	28.8	29.2	21.5	22.9	22.0	23.2	23.7
4H	2H	22.2	23.7	22.6	24.1	24.4	18.6	20.1	19.0	20.5	20.8
	3H	25.5	26.9	25.9	27.2	27.6	21.1	22.4	21.5	22.8	23.2
	4H	27.1	28.3	27.5	28.7	29.1	22.2	23.4	22.6	23.8	24.2
	6H	28.3	29.4	28.8	29.8	30.2	23.2	24.2	23.6	24.6	25.1
	8H	28.5	29.5	29.0	29.9	30.4	23.5	24.5	24.0	24.9	25.4
	12H	28.5	29.4	29.0	29.9	30.3	23.8	24.7	24.3	25.1	25.6
8H	4H	27.6	28.6	28.0	29.0	29.5	23.3	24.3	23.7	24.7	25.2
	6H	28.9	29.8	29.4	30.3	30.7	24.5	25.3	25.0	25.8	26.3
	8H	29.2	30.0	29.7	30.5	30.9	25.0	25.8	25.5	26.3	26.8
	12H	29.2	29.9	29.7	30.4	30.9	25.5	26.1	26.0	26.6	27.2
12H	4H	27.7	28.6	28.1	29.0	29.5	23.5	24.4	23.9	24.8	25.3
	6H	29.1	29.8	29.6	30.3	30.8	24.8	25.6	25.3	26.0	26.6
	8H	29.4	30.0	29.9	30.5	31.1	25.4	26.1	25.9	26.6	27.1

Maximum UGR = 31.1

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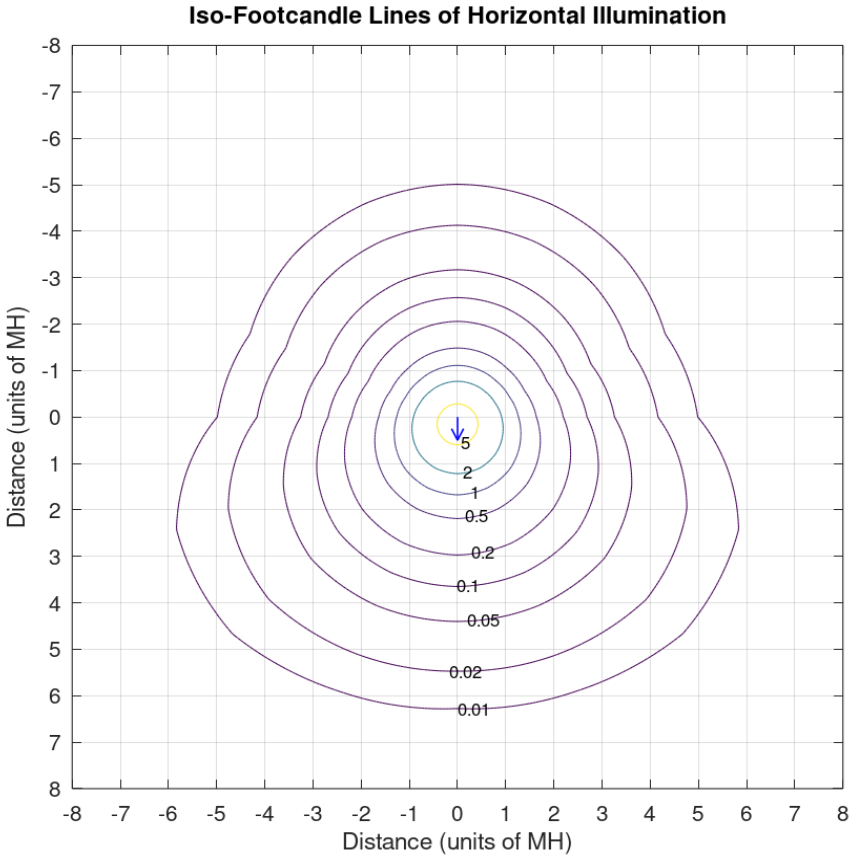
Iso-Illuminance Plot



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

Report of Test

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Test Distance	9.5 m
Ambient Temperature	24.8 °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 IES LM-79-19. Format of reports and angular increments based on IES LM-41-20 and LM-46-20.

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.

LightLab INTERNATIONAL ALLENTOWN LLC

NVLAP TESTING Lab Code: 201079-0

Report of Test

LLIA001607-001B

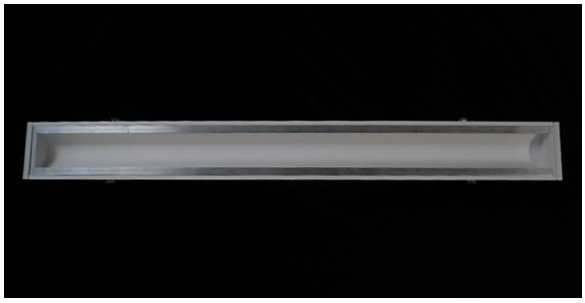
Integrating Sphere Report

Catalog Number: ARR-ASYM-VHO-K40-80-4-XX-120-DIM1

Recessed mounted, aluminum housing, steel end caps, aluminum reflector/LED holder and white painted ends, white plastic reflector sheet, open bottom.

One energized row of 184 white LEDs aimed up with one-piece diffuse plastic lens above LEDs

One Osram OTi30/120-277/1A0DIM-1LG2 LED driver labeled as 400mA



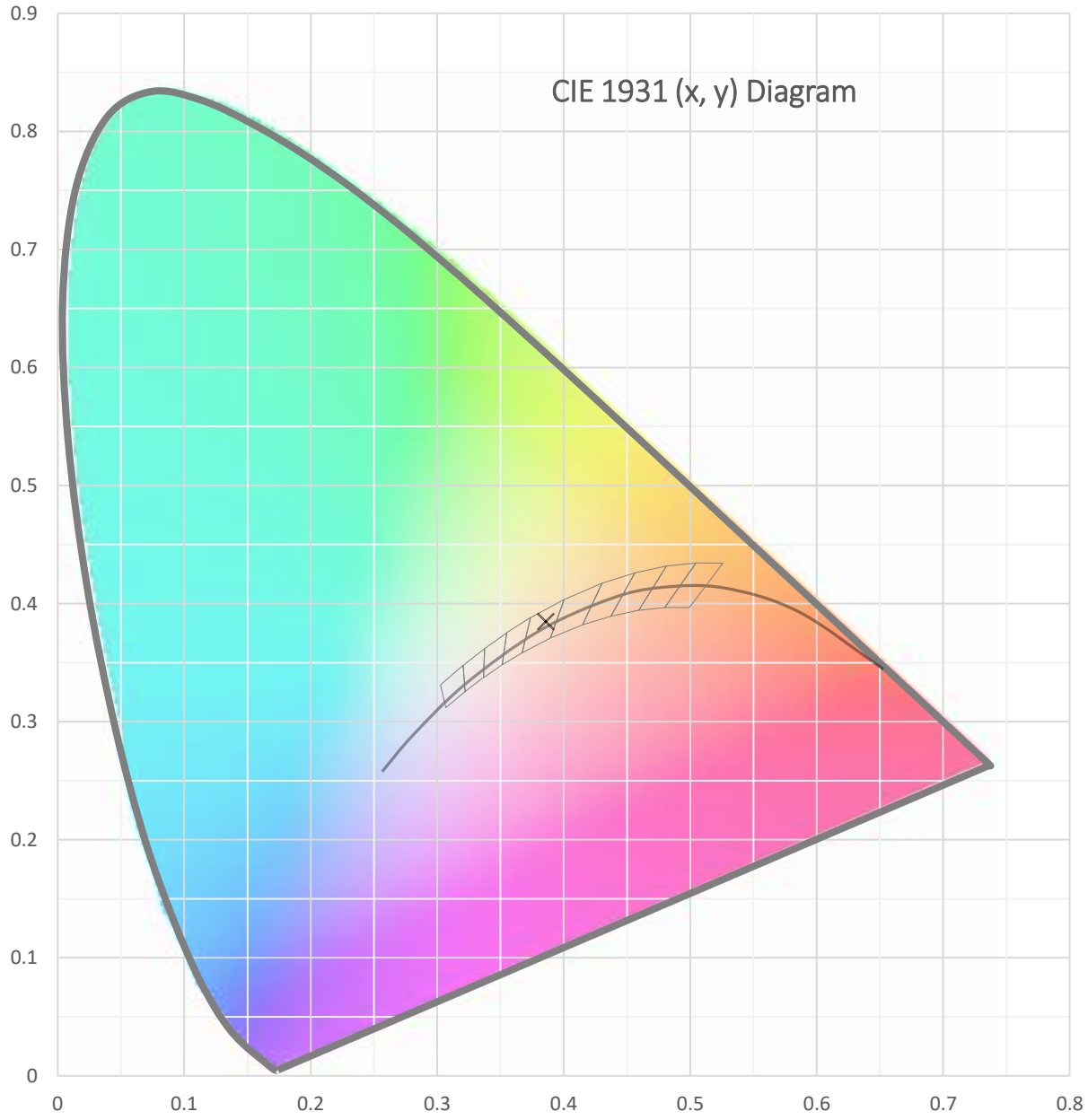
Performance Summary

Voltage	120.0	Vac
Current	0.1345	A
Power	15.45	W
Frequency	59.99	Hz
Power Factor	0.957	
Current THD	13.3	%
Total Luminous Flux	1595.6	lm
Efficacy	103.3	lm/W
Chromaticity (x,y)	(0.3857, 0.3847)	
(u',v')	(0.2254, 0.5058)	
Duv	0.0022	
CCT	3919	K
CRI (Ra)	83	
R9	8	
TM-30: Rf	82	
TM-30: Rg	94	
TM-30: Rcs,h1	-12	

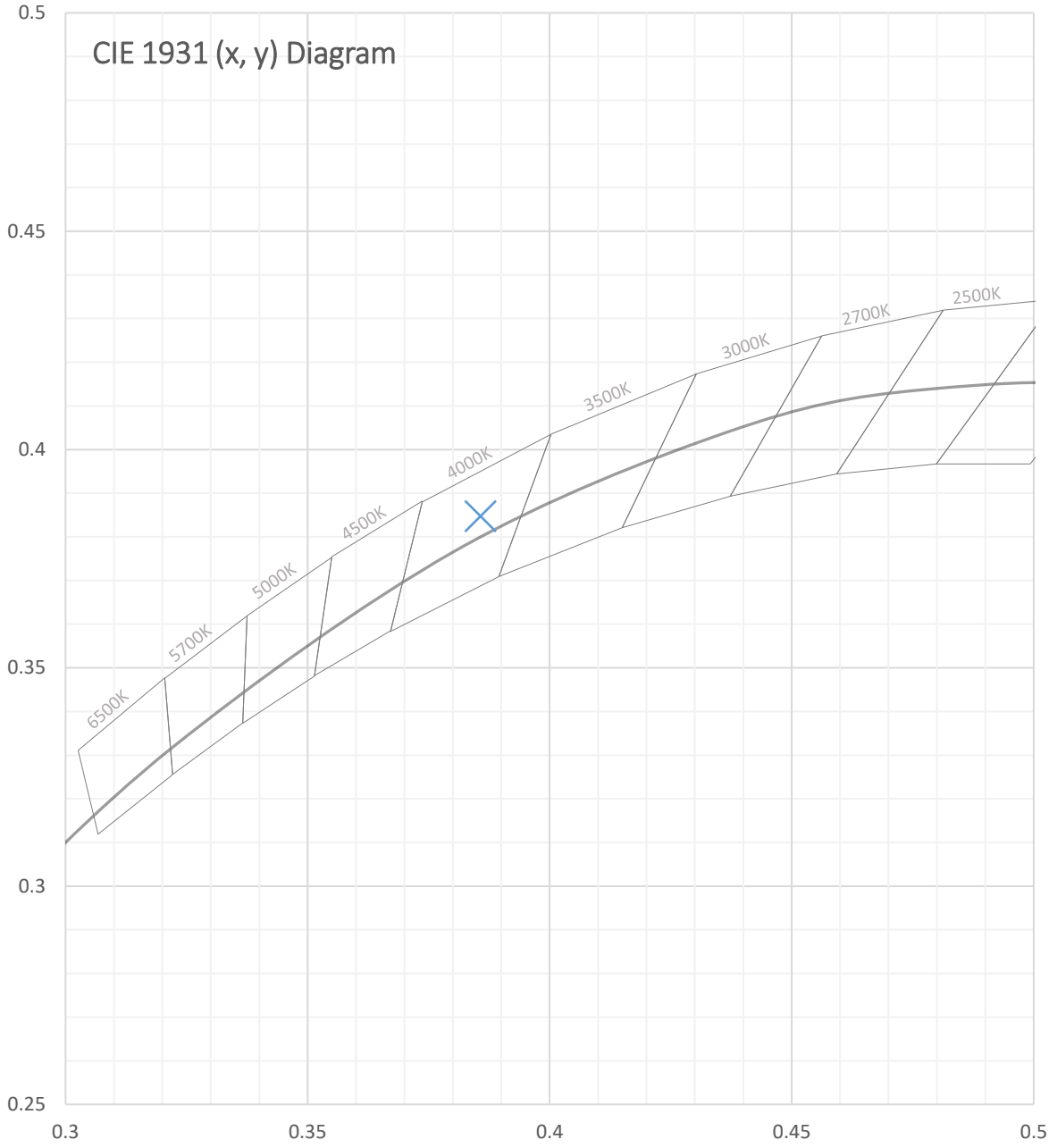
Prepared For:
Precision Architectural Lighting
4830 Timber Creek Drive
Houston, TX 77017, USA

Test date: 12/14/2021
Report date: 12/16/2021

Test Report Number: LLIA001607-001B



Test Report Number: LLIA001607-001B



Test Report Number: LLIA001607-001B

Total Radiant Flux	4.822	W
Total Luminous Flux	1595.6	Lm
Chromaticity CIE 1931 (x, y)	(0.3857, 0.3847)	
Chromaticity CIE 1976 (u', v')	(0.2254, 0.5058)	
Correlated Color Temperature (CCT)	3919	K
Color Rendering Index (Ra)	83	
R1	81	
R2	90	
R3	96	
R4	81	
R5	81	
R6	86	
R7	86	
R8	64	
R9	8	
R10	77	
R11	81	
R12	60	
R13	84	
R14	98	
TM-30: Rf	82	
TM-30: Rg	94	
TM-30: Rcs,h1	-12	
Distance from Planckian Locus (Duv)	0.0022	
Scotopic/Photopic Ratio ǂ	1.677	

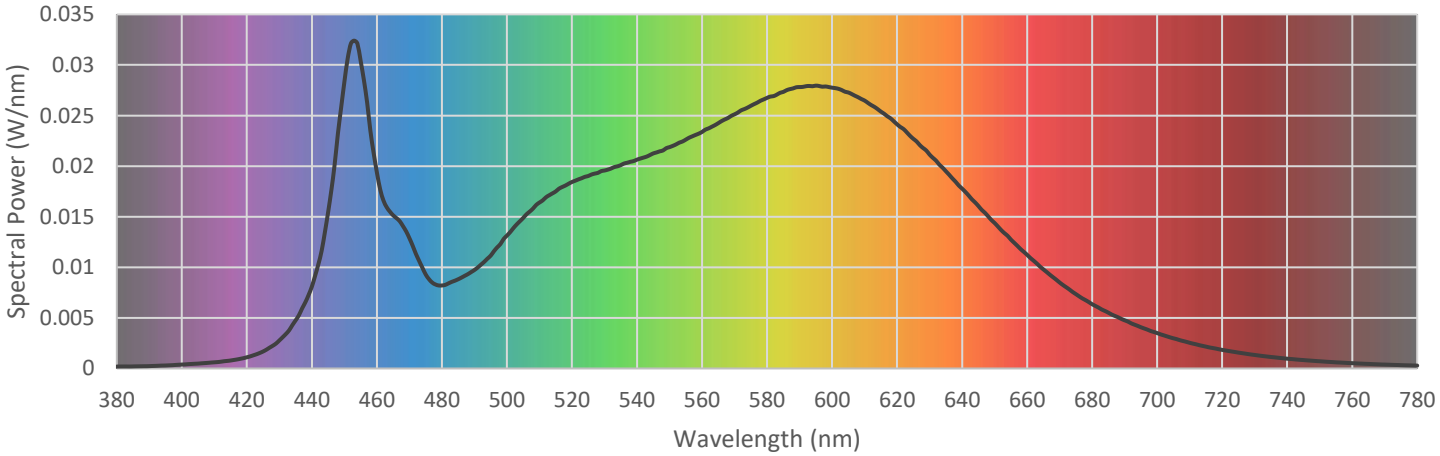
Electrical Data

Voltage	120.0	Vac
Current	0.1345	A
Power	15.45	W
Frequency	59.99	Hz
Power Factor	0.957	
Current THD	13.3	%

Test Report Number: LLIA001607-001B

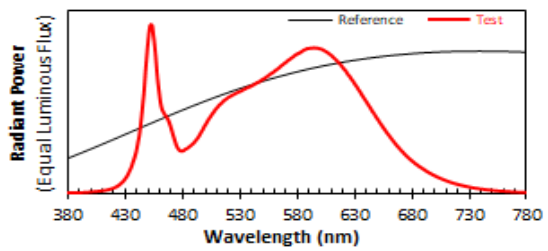
Summary Spectral Power Distribution (wavelength - nm, spectral power - W/nm)

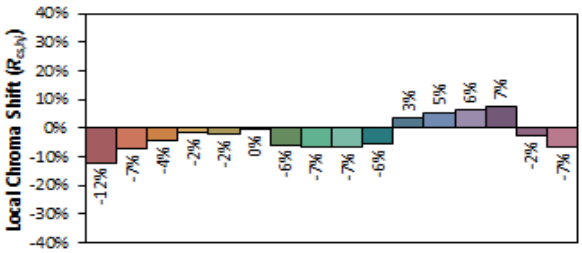
380	0.000190	480	0.008205	580	0.026746	680	0.006352
385	0.000203	485	0.008818	585	0.027334	685	0.005514
390	0.000233	490	0.009732	590	0.027815	690	0.004761
395	0.000294	495	0.011153	595	0.027955	695	0.004074
400	0.000386	500	0.013134	600	0.027753	700	0.003500
405	0.000482	505	0.014879	605	0.027279	705	0.002979
410	0.000609	510	0.016401	610	0.026482	710	0.002538
415	0.000787	515	0.017498	615	0.025392	715	0.002161
420	0.001107	520	0.018432	620	0.024136	720	0.001837
425	0.001682	525	0.019023	625	0.022698	725	0.001568
430	0.002774	530	0.019565	630	0.021141	730	0.001335
435	0.004760	535	0.020095	635	0.019500	735	0.001135
440	0.008099	540	0.020641	640	0.017778	740	0.000965
445	0.015469	545	0.021258	645	0.016066	745	0.000828
450	0.028339	550	0.021877	650	0.014381	750	0.000710
455	0.030392	555	0.022618	655	0.012744	755	0.000606
460	0.019363	560	0.023375	660	0.011233	760	0.000523
465	0.015134	565	0.024246	665	0.009795	765	0.000449
470	0.012878	570	0.025117	670	0.008497	770	0.000384
475	0.009295	575	0.025959	675	0.007351	775	0.000329
						780	0.000283

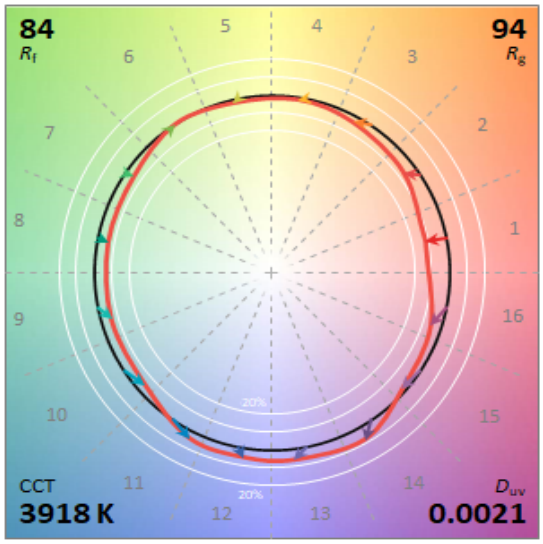


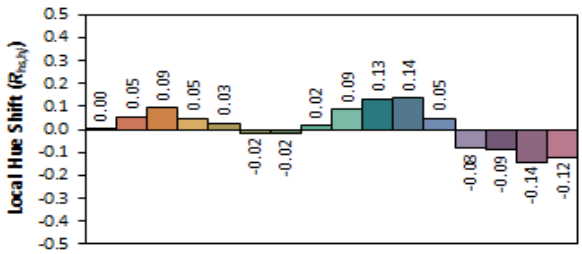
Test Report Number: LLIA001607-001B

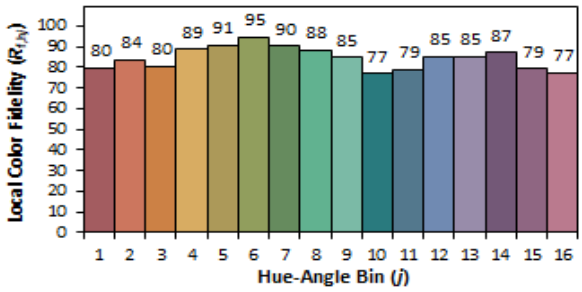
IES TM-30 Details

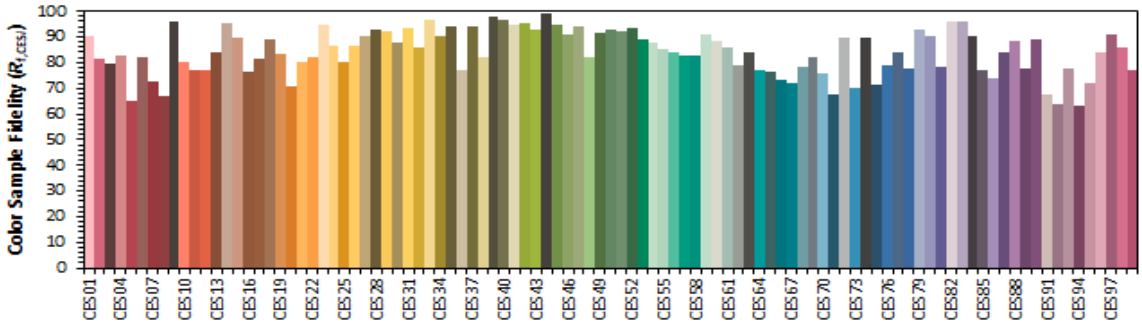












Notes:

x	0.3857
y	0.3847
u'	0.2254
v'	0.5058

CIE 13.3-1995 (CRI)

R_a	83
R_9	8

Test Report Number: LLIA001607-001B

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:	25.2 °C
Test Procedure:	Tested in accordance with the applicable sections of: LM-79-19, LM-78-20, LM-58-20, ANSI_ANSLG C78.377-2017, TM-30-20
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. 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.

Sphere Report Template V2-17