

TIVOLI, LCC

TEST REPORT

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

SCOPE OF WORK

Electrical and Photometric tests as required to the IESNA test standard.

MODEL NUMBER

LSL2-B-12-V-30-O

PROJECT NUMBER

G104746257

REPORT NUMBER

104746257LAX-009

ISSUE DATE

July 13, 2021

REVISION DATE

October 22, 2021



TEST REPORT

REPORT NO.: 104746257LAX-009**REPORT DATE: July 13, 2021****TEST OF (1) LITESPHERE 2.0, 3000K, VERY HIGH OUTPUT, OPAL GLOBE****MODEL NO. LSL2-B-12-V-30-O****RENDERED TO:****TIVOLI, LCC
17110 ARMSTRONG AVENUE
IRVINE, CA 92614****AUTHORIZATION**

The testing performed was authorized by signed quote number Qu-01190155-4 .

STANDARDS USED

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting

ANSI NEMA ANSLG C78.377: 2015: Specifications of the Chromaticity of Solid State Lighting Products

SAMPLE INFORMATION

CONTROL NO.	MODEL/SERIAL NO.	DESCRIPTION	TYPE	RECEIVED
LAN2107061128-003	LSL2-B-12-V-30-O	LED LIGHT ENGINE	production	7/6/2021
LAN2107061128-004O	--	GLOBE	production	7/6/2021

DATE OF TESTS

July 12 ,2021 through July 13, 2021

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

TEST RESULTS SUMMARY

MODEL NO:	LSL2-B-12-V-30-O
DESCRIPTION:	Litesphere 2.0, 3000K, Very High Output, Opal Globe

CRITERIA	RESULTS	
	INTEGRATING SPHERE	GONIOPHOTOMETER
Lumen Output (lumens)	61.9	63.0
Input Power (W) @ 12 VDC	0.84	0.84
Lumen Efficacy (lm/W)	73.8	75.0
Input Power Factor () @ 12 VDC	--	--

CRITERIA	RESULTS
Input Current ATHD (%) @ 12 VDC	--
Correlated Color Temperature (K)	3078
Color Rendering Index - Ra ()	83.9
Color Rendering - R9 ()	14.6
DUV ()	0.0003
Chromaticity Coordinate (x)	0.432
Chromaticity Coordinate (y)	0.403
Chromaticity Coordinate (u')	0.248
Chromaticity Coordinate (v')	0.520

EQUIPMENT LIST

EQUIPMENT USED	MODEL NUMBER	CONTROL NO.	CAL DUE DATE	DATE USED
Goniophotometer	6440T	000943	VBU	07/13/21
DC Power Supply	LPS-100-0833	000836	07/09/22	07/13/21
Power Analyzer	WT210	000945	09/29/21	07/13/21
Digital Caliper	CD-6" ASX	001458	03/01/22	07/13/21
Magnetic Level	581-9	001610	10/21/21	07/13/21
Thermometer	DPI8-C24	001782	10/09/21	07/13/21
Temp. & RH Meter	971	002137	10/13/21	07/13/21
2m Sphere	LMS760	000835	VBU	07/12/21
Spectrometer	CDS-3020-T	000838	VBU	07/12/21
DC Power Supply	LPS-100-0833	000836	7/9/2022	07/12/21
Network TC Reader	iSD-TC	001824	11/17/2021	07/12/21
DC Power Supply	N5750A	000949	3/22/2022	07/12/21
Power Meter	WT330	001322	09/30/21	07/12/21
Temp. & RH Meter	971	002137	10/13/2021	07/12/21

TEST METHODS**SEASONING IN SAMPLE ORIENTATION - LED PRODUCTS**

No seasoning was performed in accordance with IESNA LM-79.

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD

A Spectroradiometer and integrating sphere were used to measure light output, correlated color temperature, chromaticity coordinates, color rendering index, and the spectral distribution for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD

A Type C Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

Some graphics were created with Photometrics Pro and Cooper Photometric Toolbox software.

TEST RESULTS

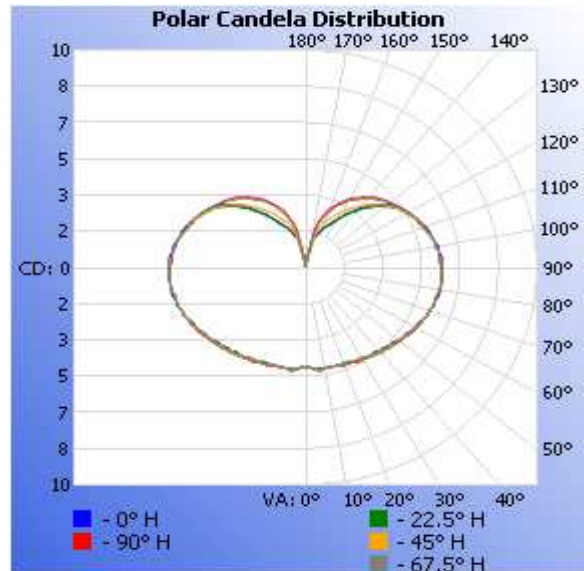
PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)

INTERTEK CONTROL NO.	BASE POSITION	INPUT VOLTAGE VDC	INPUT CURRENT (mA)	INPUT POWER (W)	INPUT POWER FACTOR ()	LIGHT OUTPUT (lm)	LUMEN EFFICACY (lm/W)
LAN2002041000-001	Up	12.00	70.0	0.84	--	63.0	75.0

INTENSITY SUMMARY - CANDELAS

Angle	0	22.5	45	67.5	90
0	5	5	5	5	5
5	5	5	5	5	5
10	5	5	5	5	5
15	5	5	5	5	5
20	5	5	5	5	5
25	5	5	5	5	5
30	5	5	5	5	5
35	5	5	5	5	5
40	5	5	5	5	5
45	5	5	5	5	5
50	5	5	5	5	5
55	5	5	5	5	5
60	6	6	6	6	6
65	6	6	6	6	6
70	6	6	6	6	6
75	6	6	6	6	6
80	6	6	6	6	6
85	6	6	6	6	6
90	6	6	6	6	6
95	6	6	6	6	6
100	6	6	6	6	6
105	6	6	6	6	6
110	6	6	6	6	6
115	5	5	5	5	5
120	5	5	5	5	5
125	5	5	5	5	5
130	5	4	4	5	5
135	4	4	4	4	4
140	4	3	4	4	4
145	3	3	3	4	4
150	2	2	3	4	4
155	2	2	2	3	3
160	2	2	2	3	3
165	2	2	1	2	2
170	0	0	0	0	1
178	0	0	0	0	0
180	0	0	0	0	0

POLAR CANDELA PLOT

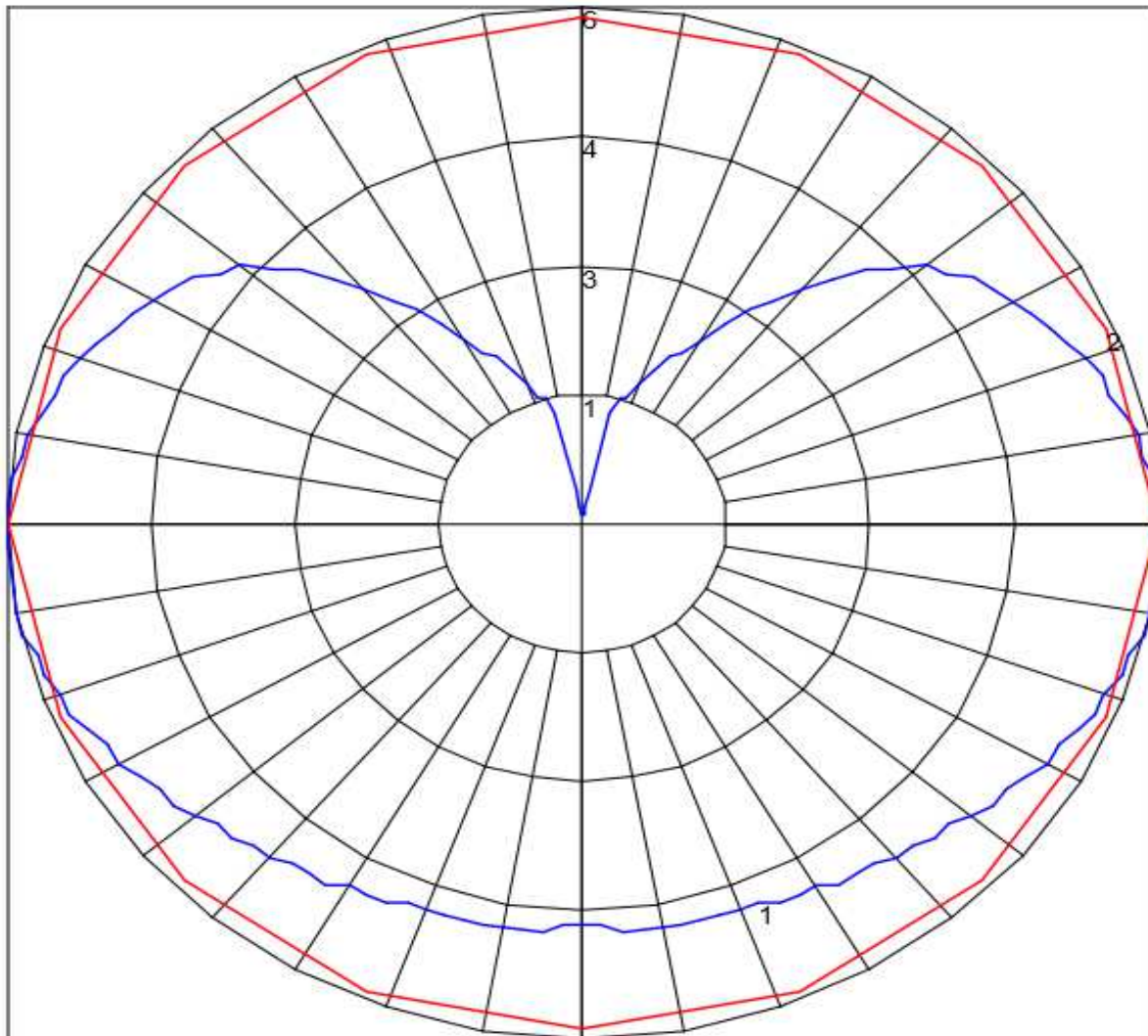


TEST RESULTS (cont'd)

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)

POLAR GRAPH AND MAXIMUM CANDELA INTENSITY

Maximum Candela	Location - Horizontal Angle	Location - Vertical Angle
5.9	0	77.5



Maximum Candela = 5.9 Located At Horizontal Angle = 0, Vertical Angle = 77.5

1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)

2 - Horizontal Cone Through Vertical Angle (77.5) (Through Max. Cd.)

1 - Vertical Plane Through Horizontal Angles (0 - 180) (Through Max. Cd.)

2 - Horizontal Cone Through Vertical Angle (77.5) (Through Max. Cd.)

TEST RESULTS (cont'd)

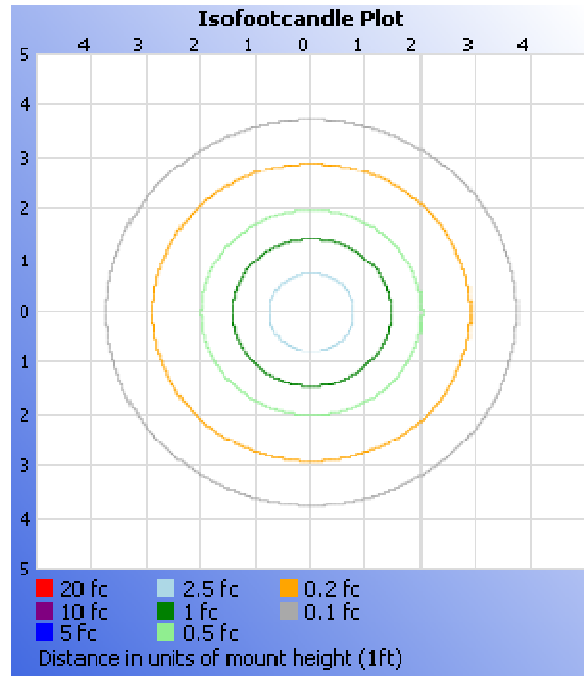
PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - DISTRIBUTION METHOD (25°C +/- 1°C)

MOUNTING HEIGHT: 1ft

ILLUMINANCE - CONE OF LIGHT



ISOILLUMINATION PLOT



ZONAL LUMEN SUMMARY AND PERCENTAGES

ZONE	LUMENS	% LUMINAIRE
0-30	4.0	6.4
0-40	7.1	11.3
0-60	15.9	25.2
60-90	18.2	28.8
0-90	34.1	54.1
90-180	28.9	45.9
0-180	63.0	100.0

ZONE	LUMENS	% LUMINAIRE
0-10	0.4	0.7
10-20	1.3	2.1
20-30	2.2	3.5
30-40	3.1	4.9
40-50	4.0	6.3
50-60	4.8	7.6
60-70	5.6	8.9
70-80	6.1	9.7
80-90	6.4	10.2
90-100	6.4	10.1
100-110	5.9	9.4
110-120	5.2	8.3
120-130	4.3	6.9
130-140	3.2	5.2
140-150	2.1	3.4
150-160	1.2	1.9
160-170	0.5	0.7
170-180	0.0	0.0

LUMINAIRE CLASSIFICATION SYSTEM (CLS)

LCS	ZONE	LUMENS	% LUMINAIRE
FL	(0-30)	2.0	3.2
FM	(30-60)	5.9	9.4
FH	(60-80)	5.9	9.3
FVH	(80-90)	3.2	5.1
BL	(0-30)	2.0	3.2
BM	(30-60)	5.9	9.4
BH	(60-80)	5.9	9.3
BVH	(80-90)	3.2	5.1
UL	(90-100)	6.4	10.1
UH	(100-180)	22.6	35.8
Total		63.0	100.0

BUG RATING:	BO-U2-G0
IES CLASSIFICATION:	N.A.
LONGITUDINAL CLASSIFICATION:	N.A.

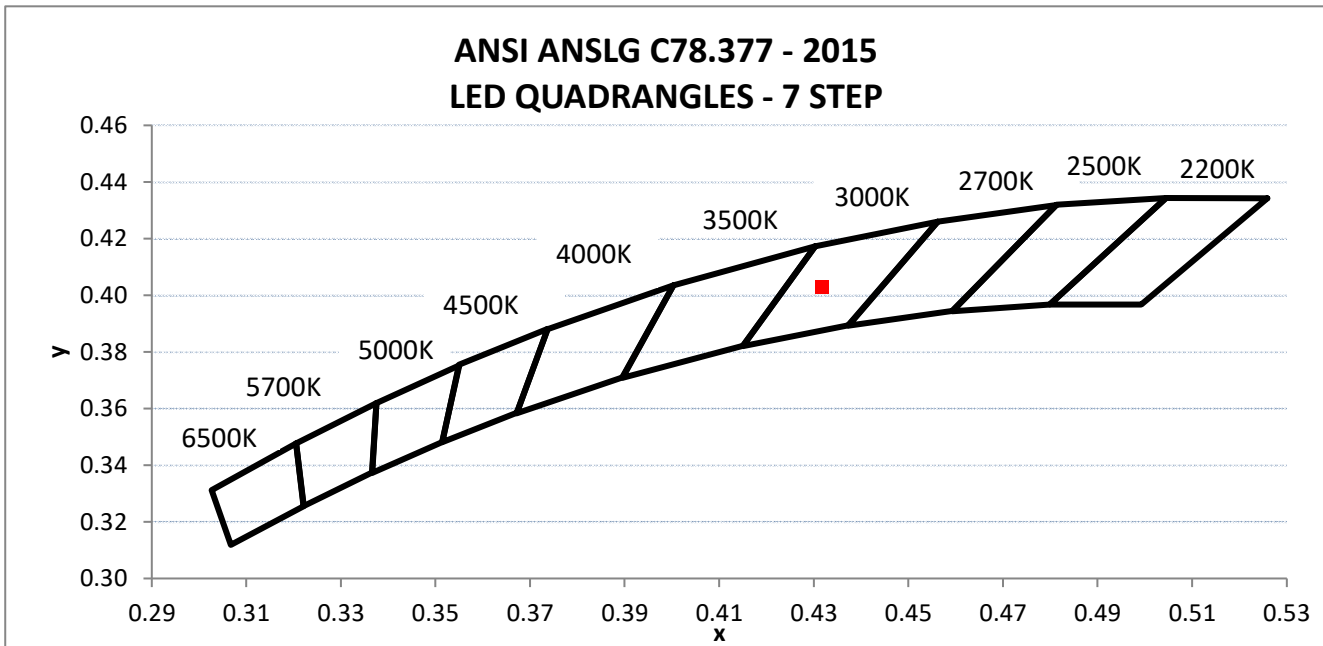
TEST RESULTS (cont'd)

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD (25°C +/- 1°C)

INTERTEK CONTROL NO.	BASE POSITION	INPUT VOLTAGE VDC	INPUT CURRENT (mA)	INPUT POWER (W)	INPUT POWER FACTOR ()	INPUT CURRENT ATHD (%)
LAN2002041000-001	Up	11.99	70.0	0.84	--	--

LIGHT OUTPUT (lm)	LUMEN EFFICACY (lm/W)	CORRELATED COLOR TEMPERATURE - CCT (K)	CRI - Ra ()	CRI - R9 ()	DUV ()
61.9	73.8	3078	83.9	14.6	0.0003

CIE 1931 CHROMATICITY COORDINATE (x)	CIE 1931 CHROMATICITY COORDINATE (y)	CIE 1976 CHROMATICITY COORDINATE (u')	CIE 1976 CHROMATICITY COORDINATE (v')
0.432	0.403	0.248	0.520

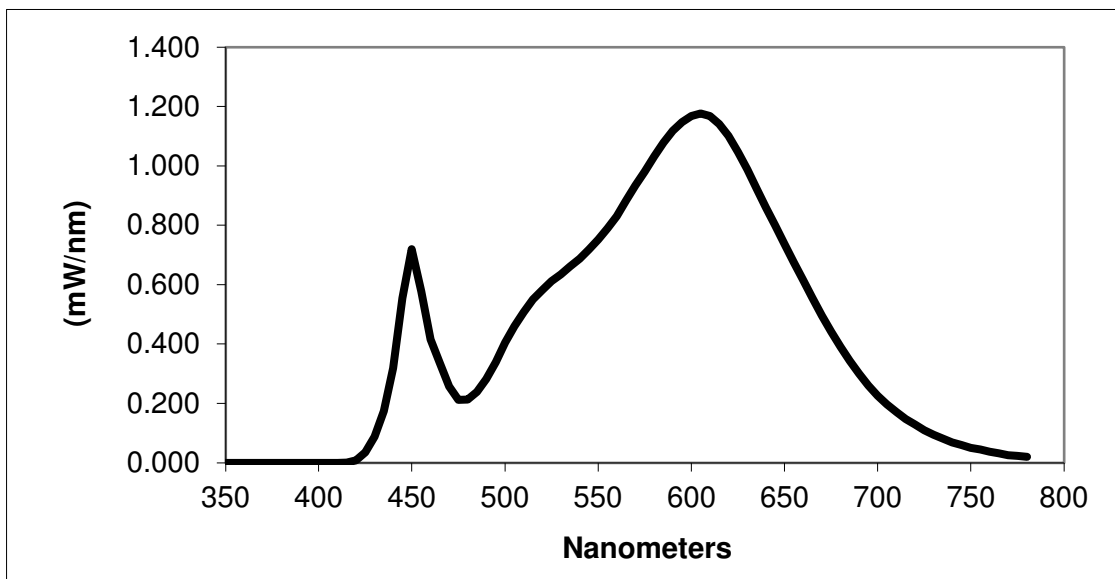


TEST RESULTS (cont'd)

PHOTOMETRIC AND ELECTRICAL MEASUREMENTS - INTEGRATING SPHERE METHOD (25°C +/- 1°C)

SPECTRAL DISTRIBUTION OVER VISIBLE WAVELENGTHS*							
nm	mW/nm	nm	mW/nm	nm	mW/nm	nm	mW/nm
350	0.000	460	0.415	570	0.934	680	0.390
355	0.000	465	0.336	575	0.980	685	0.343
360	0.000	470	0.257	580	1.032	690	0.300
365	0.000	475	0.212	585	1.078	695	0.260
370	0.000	480	0.213	590	1.118	700	0.225
375	0.000	485	0.239	595	1.148	705	0.196
380	0.000	490	0.282	600	1.168	710	0.171
385	0.000	495	0.339	605	1.177	715	0.147
390	0.000	500	0.404	610	1.168	720	0.128
395	0.000	505	0.459	615	1.141	725	0.109
400	0.000	510	0.507	620	1.101	730	0.094
405	0.000	515	0.550	625	1.046	735	0.081
410	0.000	520	0.582	630	0.988	740	0.069
415	0.001	525	0.611	635	0.924	745	0.059
420	0.007	530	0.635	640	0.860	750	0.050
425	0.034	535	0.661	645	0.799	755	0.044
430	0.088	540	0.687	650	0.737	760	0.037
435	0.174	545	0.718	655	0.675	765	0.031
440	0.318	550	0.752	660	0.616	770	0.025
445	0.554	555	0.790	665	0.555	775	0.023
450	0.720	560	0.831	670	0.495	780	0.020
455	0.577	565	0.883	675	0.441		

*Without correction of sample absorption.



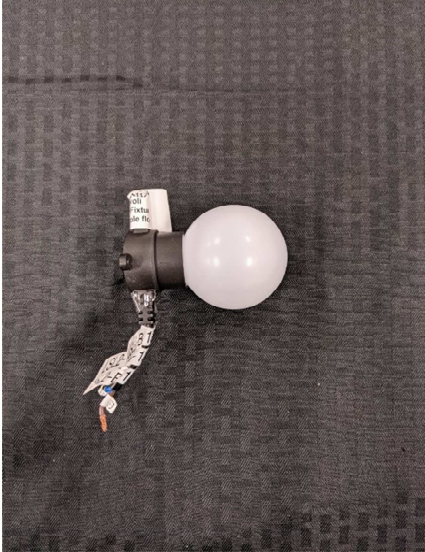
END OF TEST RESULTS

TEST REPORT

REPORT NO.: 104746257LAX-009

REPORT DATE: July 13, 2021

PICTURES (not to scale)



CONCLUSION

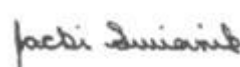
The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Report:



Nicolas Manders
Engineer
Lighting Division

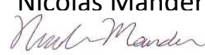
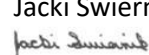
Report Reviewed By:



Jacki Swiernik
Staff Engineer
Lighting Division

Attachments: IES file, TM-30 Report No. 104746257LAX-009T

REVISION HISTORY

JOB NUMBER	DATE OF REVISION	PROJECT	REVIEWED BY	REVISION NOTE
None	10/22/2021	Nicolas Manders 	Jacki Swiernik 	Added BUG rating