



DesignLights Consortium Test Report

Reference Standards

UL1598-2008

ANSI C82.77-10-2014

IES LM-79-2008

Prepared For

P.Q.L., Inc.

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Test Laboratory:

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Catalog Number

55534 / 55535

Project Number

4790023987

Report Number

4790023987_11

Test Date

2021-08-26~2021-09-01

Issue Date

2021-09-03

Revision Date

N/A

Prepared By

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Test Summary

DLC Technical Requirements V5.1- issued 2020-02-14

Requirement Category	Test Method	Requirements	Tolerance	Test Result
Minimum Light Output (lm)-Luminaires	IES LM-79-2008	≥10000	-10%	20327.2
Zonal Lumen Requirement 1(20°-50°)	IES LM-79-2008	≥30%	-10%	53.30%
Minimum Luminaire Efficacy (lm/W)-Luminaires	IES LM-79-2008	≥135	-3%	158.81
Allowable CCT (4000K)	IES LM-79-2008/ANSI C78.377-2015	3985±275	N/A	4063
Allowable CCT (5000K)	IES LM-79-2008/ANSI C78.377-2015	5029±283	N/A	5146
Minimum CRI	IES LM-79-2008/CIE 13.3-1995	≥70	-1	80
Minimum R9	IES LM-79-2008	≥-40	-1	-14.0
Minimum Rg	IES LM-79-2008	≥89	-1	92
Minimum Rf	IES LM-79-2008	≥70	-1	81
Rcs,h1	IES LM-79-2008	-18%-23%	-1%	-16%
Unified Glare Rating (UGR)	IES LM-79-2008	≤28	N/A	27.0
L70 Lumen maintenance (Hours)	N/A	≥50000	N/A	≥50000
L90 Lumen maintenance (Hours)	N/A	≥36000	N/A	≥36000
Power Factor	ANSI C82.77-10-2014	≥0.9	-0.03	0.9607
Total Harmonic Distortion (A%)	ANSI C82.77-10-2014	≤20%	5%	5.39%
In-Situ Temperature Measurement Test for LED 1 (°C)	UL1598-2008	≤105	N/A	51.5
In-Situ Temperature Measurement Test for Driver 1 (°C)	UL1598-2008	≤90	N/A	52.5
Max Chromaticity Shift (1000-6000h)	N/A	≤0.007	0.0004	0.0023
Minimum Luminaire Warranty (Years)	N/A	≥5	N/A	≥5



Test List

Sample Received Date: 2021-08-04

Test Item	Test Date	Model Number	Tests Conducted By
Integrating Sphere Test	2021-08-27	55534	Yang, Gavin X
Integrating Sphere Test	2021-08-27	55535	Yang, Gavin X
Goniophotometer Test	2021-08-26	55534	Yang, Gavin X
THD and PF Test	2021-08-26	55534	Yang, Gavin X
THD and PF Test	2021-08-26	55535	Yang, Gavin X
In-Situ Temperature Measurement Test	2021-09-01	55534	Yang, Gavin X

Remark (if any)

1. UL test equipment information is recorded on Meter Use in UL's Aurora database.
2. The accuracy method decision rule is applied when the compliance or verdict is made to the results of this report.



Product Description

Lamp/Luminaire Description: High-bay Luminaires for Commercial and Industrial Buildings

Model Number: 55534

Electrical Parameter: 120-277V, 50/60Hz

LED Package: LEMWS28R***SZ***

Family Model and Variation: 55535

Dimming Information: Continuous dimming capability

Products Scaled Value

Model Number	CCT	Luminous Flux	Power	Luminous Efficacy
55534	4000K	20480	128	160
55535	5000K	20608	128	161

Photos of Products Characteristics





Integrating Sphere Test

Model No.	55534	Sample ID.	4167546
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assumed to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

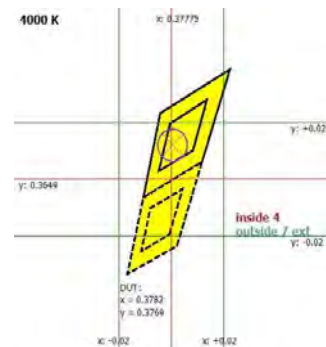
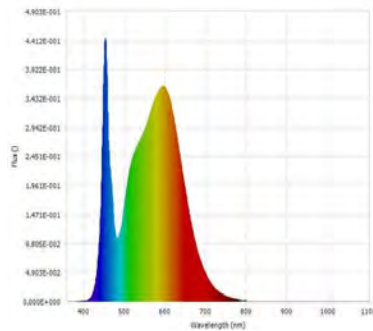
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions was using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.07	60	1.0687	127.9	0.9968	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
4063	83	7.0	0.0007	20636.6	161.35	N/A

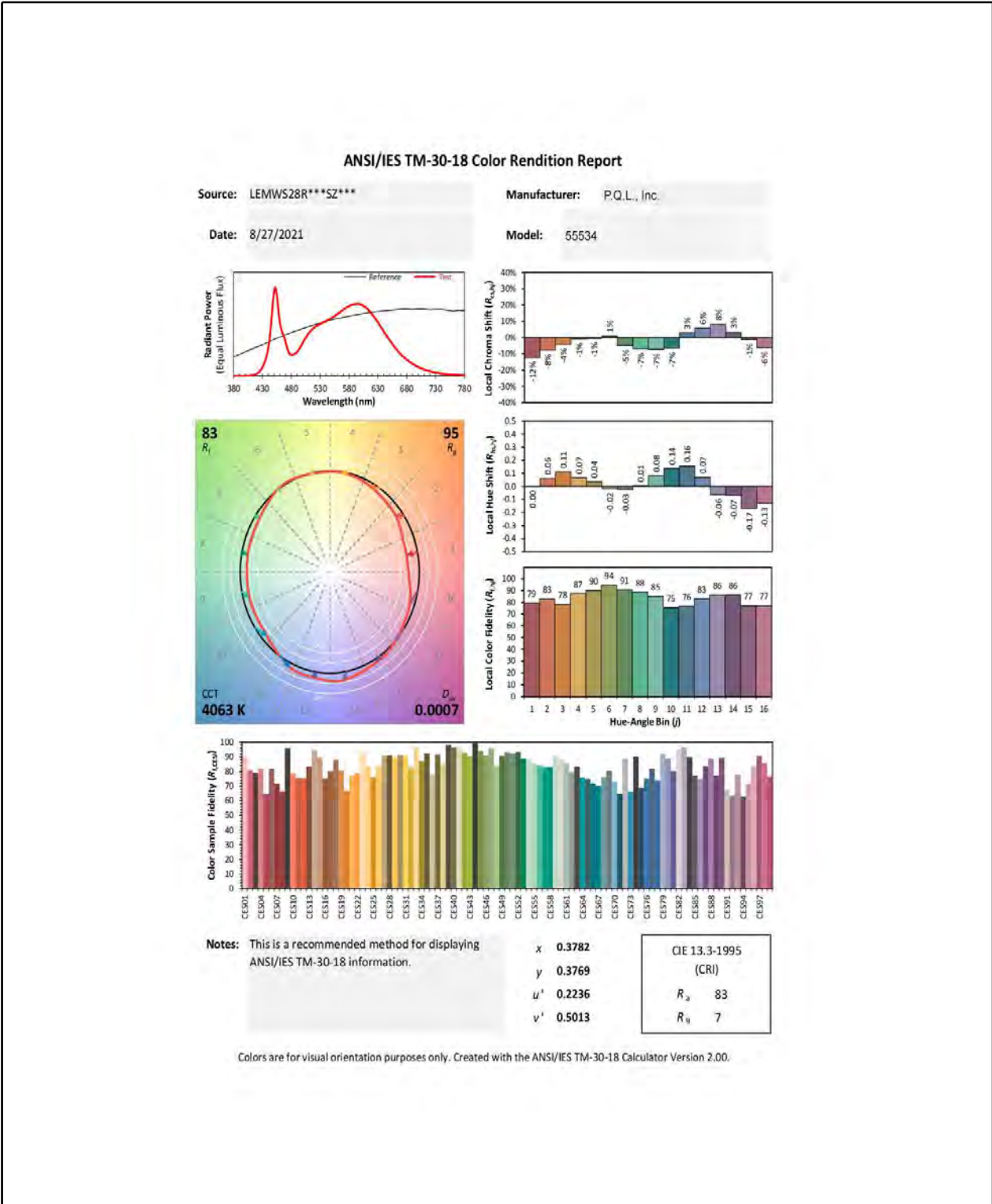


Luminous Flux (lm)	20636.6	Chrom x	0.3782
Chrom y	0.3769	Chrom u	0.2236
Chrom v	0.3342	Duv	0.0007
Chrom u'	0.2236	Chrom v'	0.5013
CCT (K)	4063	Luminous Efficacy (lm/W)	161.35
Ra	83	R1	80.9
R2	89.4	R3	95.0
R4	80.9	R5	80.7
R6	84.7	R7	85.7
R8	63.8	R9	7.0
R10	74.4	R11	79.6
R12	58.9	R13	83.1
R14	97.5	R15	74.8
Rf	83	Rg	95
Rcs,h1	-12%		



Integrating Sphere Test (Cont'd)

TM-30 Report





Integrating Sphere Test

Model No.	55535	Sample ID.	4109783
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The sample was tested according to the IES LM-79-2008, and the product is assumed to be brand new without seasoning.

2. Photometric parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The reference standard lamp is rated current 2.679A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.

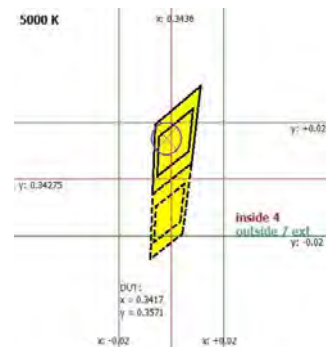
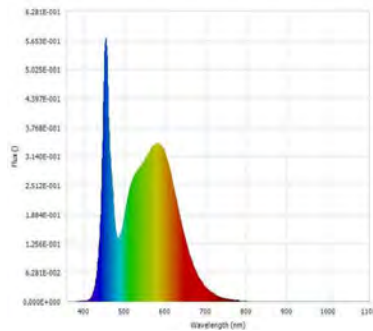
3. The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. Coating reflectance of the integrating sphere was 90% to 98%. Photometric measurement conditions were using 4π geometry. The self-absorption factor is applied in the final test result. The sample was operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Integrating Sphere Test Conditions

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Orientation
24.9	120.07	60	1.0595	126.79	0.9967	Horizontal

Test Results

CCT (K)	CRI (Ra)	R9	Duv	Flux (lm)	Luminous Efficacy (lm/W)	Efficacy(lm/ft)
5146	80	-14.0	0.0041	20676.4	163.08	N/A

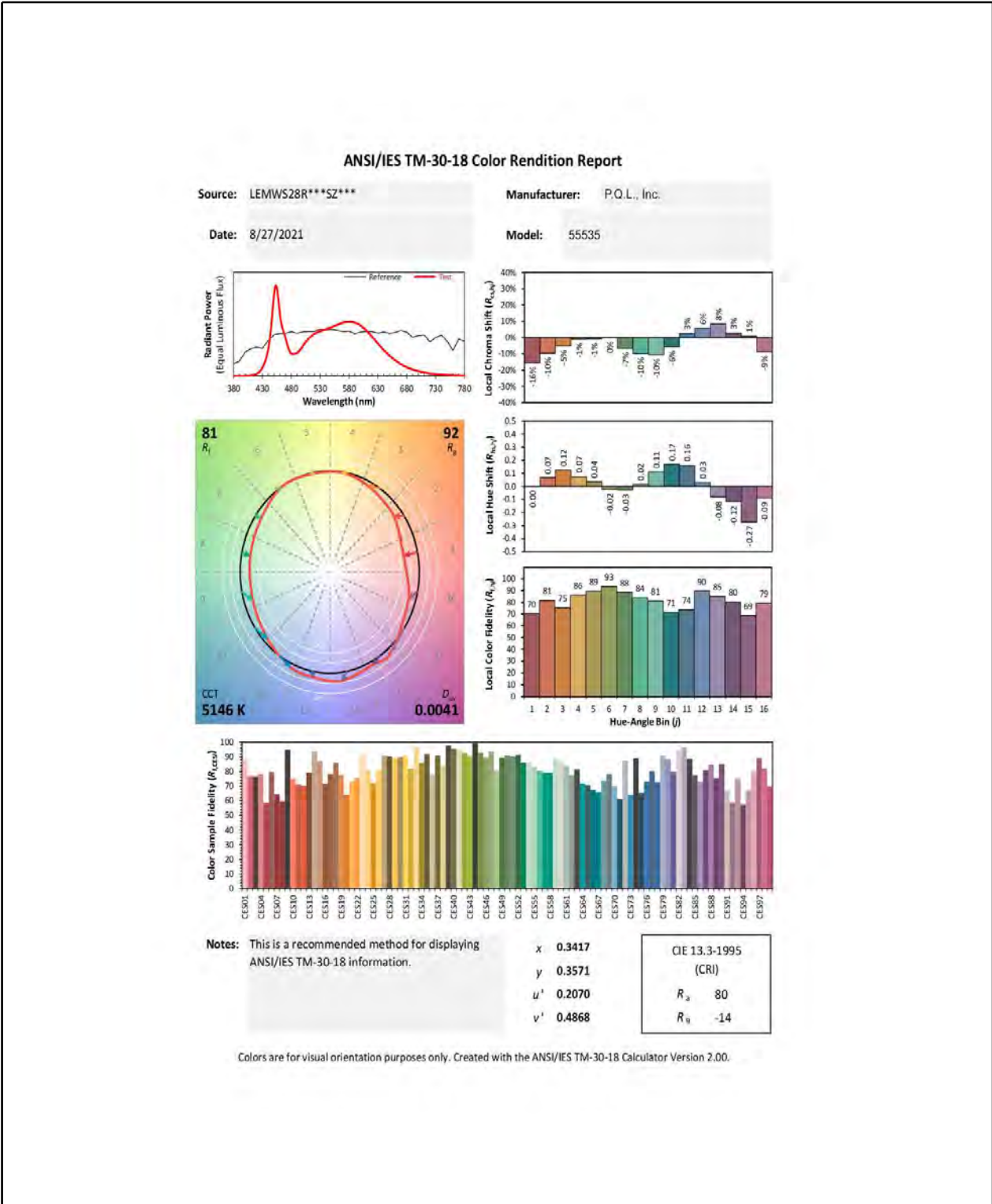


Luminous Flux (lm)	20676.4	Chrom x	0.3417
Chrom y	0.3571	Chrom u	0.2070
Chrom v	0.3245	Duv	0.0041
Chrom u'	0.2070	Chrom v'	0.4868
CCT (K)	5146	Luminous Efficacy (lm/W)	163.08
Ra	80	R1	76.9
R2	87.4	R3	93.4
R4	77.2	R5	77.7
R6	81.8	R7	84.1
R8	59.4	R9	-14.0
R10	69.8	R11	75.6
R12	55.7	R13	79.9
R14	96.7	R15	70.3
Rf	81	Rg	92
Rcs,h1	-16%		



Integrating Sphere Test (Cont'd)

TM-30 Report





Goniophotometer Test

Model No.	55534	Sample ID.	4167546
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

- 1.The sample was tested according to the IES LM-79-2008, and the product is assume to be brand new without seasoning.
- 2.Photometric parameters were measured using a type C goniophotometer and software.
- 3.The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample. The reference standard lamp is rated current 3.8581A, 3.8558A, 3.8466A omni-directional Incandescent lamp and was calibrated by National Institute of Metrology P.R.China.
- 4.The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonallumen were calculated from the software taken at 1° vertical intervals and 22.5° horizontal intervals. Photometric distance was more than five times of the largest dimension of the test SSL product.

Goniophotometer Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.8	120.01	60	1.0712	128.00	0.9961	4.23%	Horizontal

Test Results

Luminous Flux (lm)	Zonal Lumen Requirement 1	Zonal Lumen Requirement 2	Beam Angle (50%)		Luminous Efficacy (lm/W)
	20°-50°	N/A	Horizontal Spread	Vertical Spread	
20327.2	53.30%	N/A	102.3	105.7	158.81

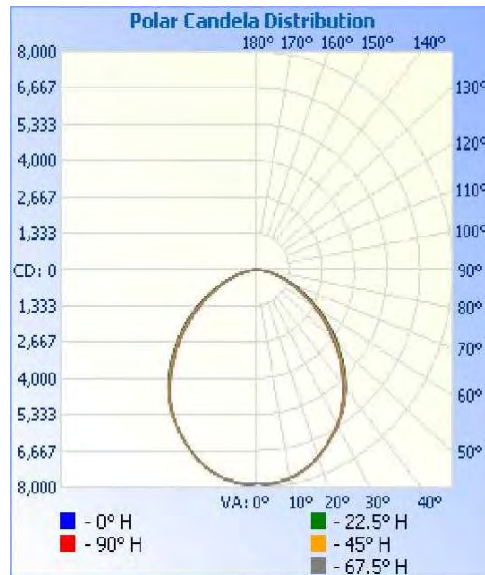
Backlight	Uplight	Glare
N/A	N/A	N/A

UGR		Spacing Criteria (0-180°)	Spacing Criteria (90°-270°)
Crosswise	Endwise		
27.0	26.4	N/A	N/A

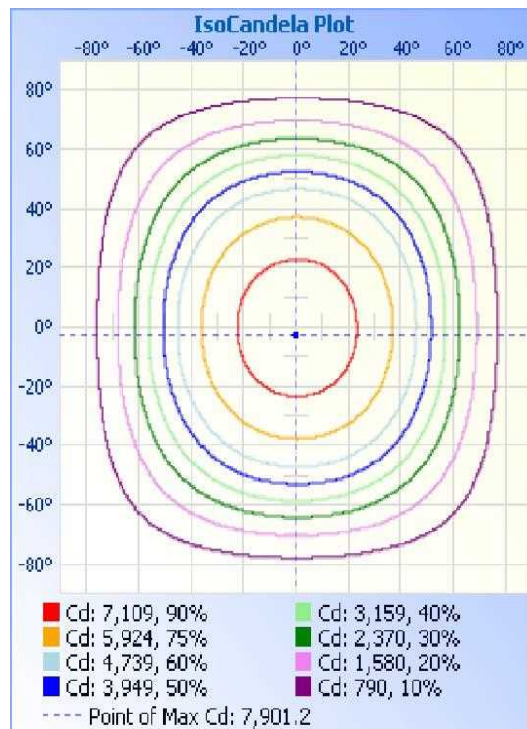


Goniophotometer Test (Cont'd)

Polar Candela Distribution



IsoCandela Plot





Goniophotometer Test (Cont'd)
Zonal Lumen Summary

Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	6104.4	30.00%
0-40	9937.8	48.90%
0-60	16881.9	83.10%
60-90	3390.4	16.70%
70-100	1298.4	6.40%
90-120	15.1	0.10%
0-90	20272.3	99.70%
90-180	54.9	0.30%
0-180	20327.2	100.00%

Lumens Per Zone

Lumens Per Zone					
Zone	Lumens	%Total	Zone	Lumens	%Total
0-5	188.4	0.90%	90-95	3.3	0.00%
5-10	560.1	2.80%	95-100	2.6	0.00%
10-15	911.6	4.50%	100-105	2.3	0.00%
15-20	1229.5	6.00%	105-110	2.2	0.00%
20-25	1498.5	7.40%	110-115	2.2	0.00%
25-30	1716.2	8.40%	115-120	2.4	0.00%
30-35	1876.4	9.20%	120-125	2.7	0.00%
35-40	1957.1	9.60%	125-130	3.2	0.00%
40-45	1945.1	9.60%	130-135	3.7	0.00%
45-50	1850.6	9.10%	135-140	3.9	0.00%
50-55	1688.1	8.30%	140-145	4.3	0.00%
55-60	1460.2	7.20%	145-150	4.2	0.00%
60-65	1187.5	5.80%	150-155	4.2	0.00%
65-70	910.5	4.50%	155-160	4.0	0.00%
70-75	647.7	3.20%	160-165	3.7	0.00%
75-80	401.7	2.00%	165-170	3.2	0.00%
80-85	193.3	1.00%	170-175	2.1	0.00%
85-90	49.7	0.20%	175-180	0.7	0.00%



Goniophotometer Test (Cont'd)
Intensity Data(cd)

Candela Table - Type C																	
	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	360
0	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847	7847
1	7863	7854	7866	7856	7844	7851	7854	7849	7886	7859	7864	7854	7848	7844	7849	7848	7863
2	7885	7870	7877	7874	7869	7879	7876	7866	7896	7871	7880	7868	7872	7877	7877	7871	7885
3	7894	7878	7883	7877	7874	7886	7886	7878	7901	7884	7882	7875	7879	7890	7893	7882	7894
4	7894	7874	7881	7876	7878	7890	7893	7885	7899	7879	7882	7877	7880	7891	7895	7888	7894
5	7889	7866	7871	7866	7866	7881	7890	7885	7892	7873	7877	7867	7875	7881	7893	7883	7889
6	7875	7851	7859	7855	7852	7865	7880	7874	7878	7857	7860	7851	7860	7874	7882	7876	7875
7	7855	7830	7840	7838	7833	7848	7860	7854	7861	7839	7844	7838	7837	7850	7861	7859	7855
8	7841	7809	7819	7817	7810	7828	7842	7838	7844	7815	7823	7820	7815	7828	7840	7840	7841
9	7815	7791	7803	7791	7786	7803	7819	7813	7817	7799	7802	7795	7789	7808	7816	7820	7815
10	7790	7766	7773	7768	7758	7772	7784	7783	7795	7770	7777	7769	7766	7781	7793	7794	7790
11	7764	7738	7745	7731	7726	7738	7750	7750	7759	7741	7754	7744	7740	7752	7767	7764	7764
12	7731	7706	7710	7700	7691	7701	7707	7712	7726	7706	7722	7714	7713	7715	7729	7724	7731
13	7690	7669	7674	7667	7654	7660	7673	7670	7682	7673	7684	7677	7673	7678	7680	7683	7690
14	7648	7631	7637	7628	7619	7625	7628	7632	7647	7633	7644	7634	7633	7628	7633	7634	7648
15	7601	7591	7597	7587	7574	7581	7585	7587	7603	7598	7598	7592	7585	7582	7585	7590	7601
16	7556	7546	7558	7546	7529	7538	7537	7539	7559	7551	7556	7543	7540	7535	7540	7542	7556
17	7505	7500	7516	7500	7482	7480	7484	7491	7506	7501	7509	7496	7488	7487	7490	7494	7505
18	7454	7450	7463	7444	7428	7427	7428	7432	7454	7452	7460	7445	7439	7438	7442	7446	7454
19	7397	7392	7404	7386	7363	7362	7372	7369	7389	7393	7408	7395	7380	7380	7390	7390	7397
20	7336	7327	7344	7324	7299	7300	7306	7311	7325	7327	7348	7336	7318	7322	7330	7331	7336
25	6982	6972	6979	6956	6945	6960	6973	6976	6982	6972	6983	6960	6953	6965	6979	6984	6982
30	6622	6608	6610	6572	6556	6569	6587	6601	6607	6608	6609	6585	6572	6587	6613	6620	6622
35	6174	6168	6152	6105	6088	6106	6136	6160	6163	6165	6163	6121	6109	6126	6154	6175	6174
40	5639	5627	5595	5536	5510	5529	5580	5621	5631	5623	5594	5535	5509	5543	5597	5635	5639
45	5026	5004	4938	4849	4821	4847	4906	4978	4995	4993	4929	4859	4837	4884	4950	5015	5026
50	4359	4334	4251	4145	4105	4141	4210	4296	4327	4327	4248	4163	4135	4195	4266	4343	4359
55	3654	3623	3532	3430	3387	3430	3516	3613	3647	3616	3540	3442	3410	3446	3535	3628	3654
60	2940	2901	2796	2690	2653	2703	2792	2893	2928	2892	2795	2694	2664	2708	2808	2908	2940
65	2242	2202	2104	2002	1978	2002	2087	2174	2216	2194	2089	2011	1997	2038	2124	2210	2242
70	1614	1578	1497	1432	1409	1422	1489	1566	1608	1575	1499	1442	1427	1452	1514	1587	1614
75	1060	1031	969	924	910	937	981	1031	1057	1026	975	935	921	939	988	1037	1060
80	588	568	531	496	484	497	529	562	577	566	529	502	494	514	542	577	588
85	221	212	198	181	173	178	194	212	213	215	201	188	182	187	205	217	221
90	11	9	9	8	7	10	11	10	11	9	11	9	9	10	8	12	11
95	7	6	4	5	4	6	5	6	4	5	6	5	5	6	5	6	7
100	6	5	5	5	6	5	4	4	3	4	4	6	2	5	5	4	6
105	5	5	5	3	5	4	4	2	4	4	6	5	4	4	4	5	5
110	4	6	5	5	2	2	3	3	4	4	5	5	5	2	2	2	4
115	6	5	4	5	4	6	5	4	4	7	2	4	6	2	4	3	6
120	4	4	4	5	6	6	7	6	4	6	5	6	2	6	7	3	4
125	6	7	6	6	6	8	7	8	7	5	6	7	6	6	9	6	6
130	8	9	10	9	8	7	6	11	9	8	7	6	9	9	7	11	8
135	9	11	8	9	10	9	10	12	8	10	11	11	8	10	11	9	9
140	13	11	12	10	12	12	12	14	13	10	13	12	11	11	11	11	13
145	14	13	13	16	14	15	13	12	14	15	14	12	14	14	13	13	14
150	13	15	15	15	15	15	15	16	16	18	16	14	16	17	15	16	13
155	19	18	15	17	19	18	18	16	17	16	18	17	19	18	19	18	19
160	21	19	22	22	22	22	18	20	21	21	19	18	21	21	21	20	21
165	24	27	24	24	26	25	26	25	25	22	25	26	24	25	25	24	24
170	29	29	30	31	30	28	30	29	26	30	28	28	30	29	28	27	29
175	27	31	29	29	31	29	27	28	29	28	30	29	29	28	27	28	27
180	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30



THD and PF Test

Model No.	55534	Sample ID.	4167546
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
 2. The ambient temperature condition was maintained at 25 °C ± 1 °C. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.8	120.01	60	1.0712	128.00	0.9961	4.23%	Horizontal
24.8	277.07	60	0.4753	126.55	0.9610	5.39%	Horizontal



THD and PF Test

Model No.	55535	Sample ID.	4109783
Operate time (Min.)	90	Stabilization time (Min.)	45

Test Method

1. The samples were tested according to the ANSI C82.77-10-2014.
2. The ambient temperature condition was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$. The sample measurement was made using a digital power meter and power supply. The sample was operated at rated voltage and stabilized before measurement. The total harmonic distortion were calculated from the digital power meter.

Test Results

Temperature ($^{\circ}\text{C}$)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.8	119.98	60	1.0752	128.44	0.9957	4.17%	Horizontal
24.8	277.04	60	0.4762	126.71	0.9607	4.84%	Horizontal



In-Situ Temperature Measurement Test

Model No.	55534	Sample ID.	4167546
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Test Method

1. In-Situ Temperature Measurement Test is conducted according to the UL 1598-2008, Section 14.
2. The testing was conducted in a room with ambient temperature of 25 °C ± 5 °C. The apparatus construction followed those described in UL1598-2008 for normal temperature testing. Thermocouples were placed on the LED package in the locations indicated by LM-80 report. Thermocouples were placed on the LED driver case in the locations specified by the manufacture if necessary. The temperature was recorded after the lamp was operated by 7.5 hours.
3. The data and photos in LM-80 test report is provided by the customer/ The data and photos in driver specification is provided by the customer.

In-Situ Temperature Measurement Test Conditions

Temperature (°C)	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	Current THD	Orientation
24.3	120.01	60	1.0712	128.00	0.9961	4.23%	Horizontal

Test Results (LEDs)

Thermocouple Location	Declared Light Source Current (mA)	Temperature for Light Source (°C)		Max Chromaticity Shift (1000-6000h)	LED Model Number	LM-80 Limit Current (mA)	LM-80 Limit Temp (°C)
		Test Result	Test Result (Correct to 25 °C)				
Ambient TEMP	N/A	24.3	25.0				
TMP of Location 1	50	50.8	51.5	0.0023	LEMWS28R* **SZ***	150	105

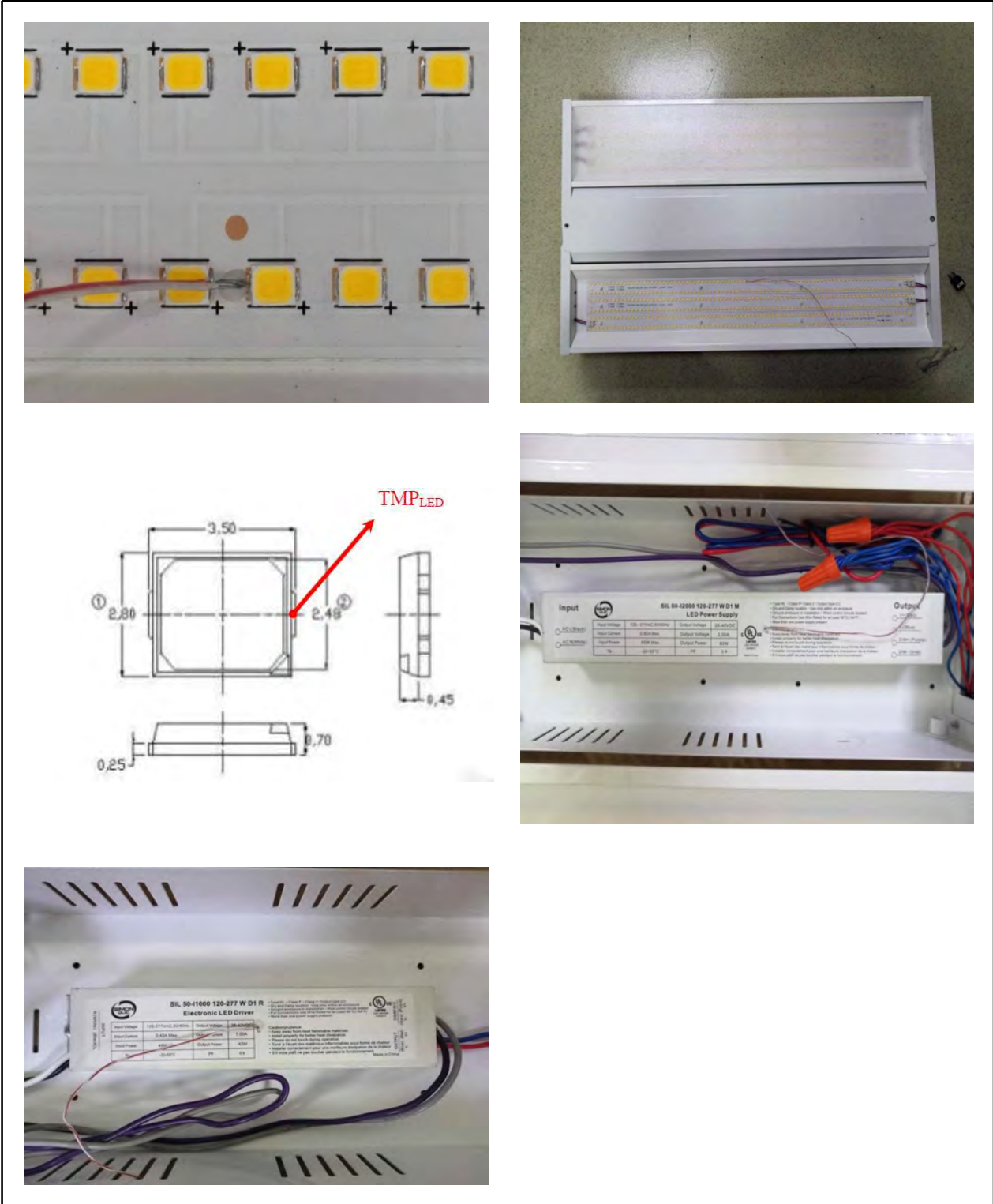
Test Results (Drivers)

Thermocouple Location	Temperature for Driver (°C)		Driver Model Number	Driver Limit Temp (°C)
	Test Result	Test Result (Correct to 25 °C)		
Ambient TEMP	24.3	25.0		
TMP of Location 1	51.8	52.5	SIL80-I2000 120-277 W D1 M	90
TMP of Location 2	54.4	55.1	SIL50-I1000 120-277 W D1 R	90



In-Situ Temperature Measurement Test (Cont'd)

Test Photos for Ts Point of Light Sources & Tc Point of Drivers





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