

IES LM-79-08

MEASUREMENT AND TEST REPORT

For

P.Q.L., Inc.

2285 Ward Avenue o Simi Valley, CA 93065

Test Model: 83672

Report Type:	Electrical and Photometric tests including: Luminous Flux, Color, Luminous Intensity Distribution
Test Engineer:	Daniel Duan <i>Daniel Duan</i>
Report Number:	R2KS151229052-10
Test Date:	2015-12-31 to 2016-01-03
Report Date:	2016-01-11
Reviewed By:	Jeanne Han/Safety Manager <i>Jeanne Han</i>
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Test Facility:	Test facility was located at Pu Long Cun 69, Puxinghu Industrial Area, Tangxia Town, Dongguan, Guangdong, P.R.China.
Accreditation:	The NVLAP Lab Code is 200707-0.

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1. Product Description

General Information:

One sample was received on 2015-12-29 and used for testing.

Model Tested: 83672
 Manufacturer: P.Q.L., Inc.
 Brand Name: P.Q.L., Inc.
 Product Designation: Linear Retrofit Kit
 Burning Time Before Test: 0hour(For New Products)

Rated Values:

Rated Voltage/Frequency: 120 V AC 60Hz
 Rated Power: 20 W
 Nominal CCT: 5000 K
 Nominal Lumen Output: 2450 lm(For Linear Retrofit Kit)

2. Standards Used

- IESNA LM-79-08: Approved Method: Electrical & Photometric Measurement of Solid-state Lighting Products
- ANSI C82.77-2002: Harmonic Emission Limits – Related Power Quality Requirements for Lighting

3. Description of Test Equipment

Device	Manufacture	Model No	Serial No	Test Range	Calibration date	Calibration due date
Integrating Sphere	SENSING	SPR-600	S09008	25~50℃	2015-03-25	2016-03-24
Spectral photometer	SENSING	SPR3000	90902027	350nm~800nm	2015-03-25	2016-03-24
Power Meter	YOKOGAWA	WT-210	91j926132	15/30/60/150/300/600 V	2015-03-05	2016-03-04
AC Power Supply	ALL Power	APW-105N	970663	220V±10% 50HZ	2015-03-05	2016-03-04
Standard Light Source	EVERFINE	D204	01331191	24V/100W	2015-08-27	2016-08-26
Thermal Meter	SENSING	N/A	N/A	25、50℃	2015-03-05	2016-03-04
DC Power Supply	ITECH	IT6154	0061 0417 6471 0010 19	0~32V	2015-03-05	2016-03-04
AC Power Supply	EVERFINE	VPS1030 PWM	1012017	0-150V, 0-300V	2015-03-05	2016-03-04
DC Power Supply	EVERFINE	WY12010	1009009	30V/5A	2015-03-05	2016-03-04
Power Meter	YOKOGAWA	WT-210	91KB35700	15/30/60/150/300/600 V	2015-03-05	2016-03-04
Goniophotometer	EVERFINE	GO-R5000	YG108492N101 20001	1600mm,3000 W/10A	2015-04-21	2016-04-20
Wireless Remote Sensor	N/A	433MHz	N/A	0℃~50℃;-20℃~60℃	2015-03-23	2016-03-22
Standard Light Source	EVERFINE	D908	1012003	N/A	2015-09-08	2016-09-07

Statement of Traceability: Bay Area Compliance Laboratories Corp. (Shenzhen) attested that all calibration has been performed using suitable standards traceable to National Primary Standards and International System of Units (SI).

4. Test Method

Product was tested with no seasoning. All stabilization and measurements were made in compliance with IES LM-79-08. The product was operated at rated voltage or at voltage required by manufacturer. The ambient temperature of the sample was maintained at $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$ during measurement. And relative humidity is less than 65%.

Integrating Sphere System

The system includes AC power source, digital power meter, DC power supply, spectrophotometer, and integrating sphere. The integrating sphere system is calibrated by standard light source before measurement.

4π geometry was used during measurement. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the light output (luminous flux) measurements is $U=2.1\%$ ($K=2$), at the 95% confidence level. The uncertainty of the correlated color temperature measurements is $U=32\text{K}$ ($K=2$), at the 95% confidence level. The uncertainty of the CRI is $U=2.1$ ($K=2$), at the 95% confidence level.

The uncertainty of power meter AC current $U=0.19\%$ of rdg, AC Voltage $U=0.15\%$ of rdg, Power $U=0.20\%$ ($K=2$), at the 95% confidence level.

Goniophotometer System

The goniophotometer system is calibrated by standard light source before measurement.

Type C goniophotometer was used for measuring total luminous flux, luminous intensity distribution, and color spatial uniformity. The product was operated in its intended orientation in application and was recorded in this report.

The uncertainty of the luminous intensity is $U=2.82\%$ ($K=2$), at the 95% confidence level.

5. Test Result

[Integrating Sphere System]

Total operating time for integrating sphere test: **1.0 hour**

Test orientation: **Downward**

Electrical Measurement

Voltage (V)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.10	60	0.1789	21.23	0.988

Photometric Measurement

Luminous Flux (lm)	Radiant Flux (W)	Efficacy (lm/W)	CCT (K)	Duv
1901.426	5.825	89.563	4849	0.00375

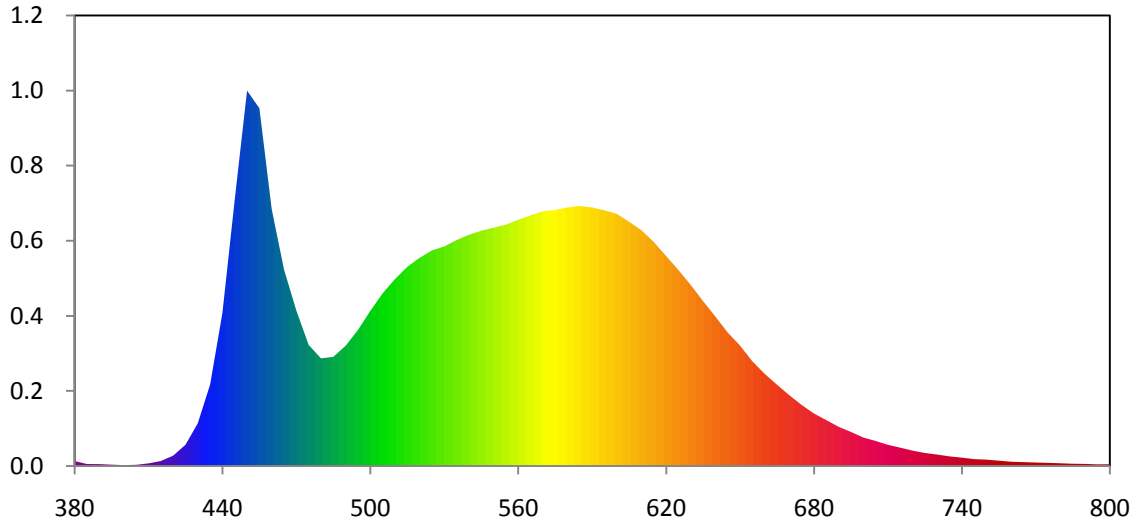
Chromaticity Coordinate

x	y	u	v	u'	v'
0.3505	0.3634	0.2105	0.3274	0.2105	0.4911

Color Rendering Index

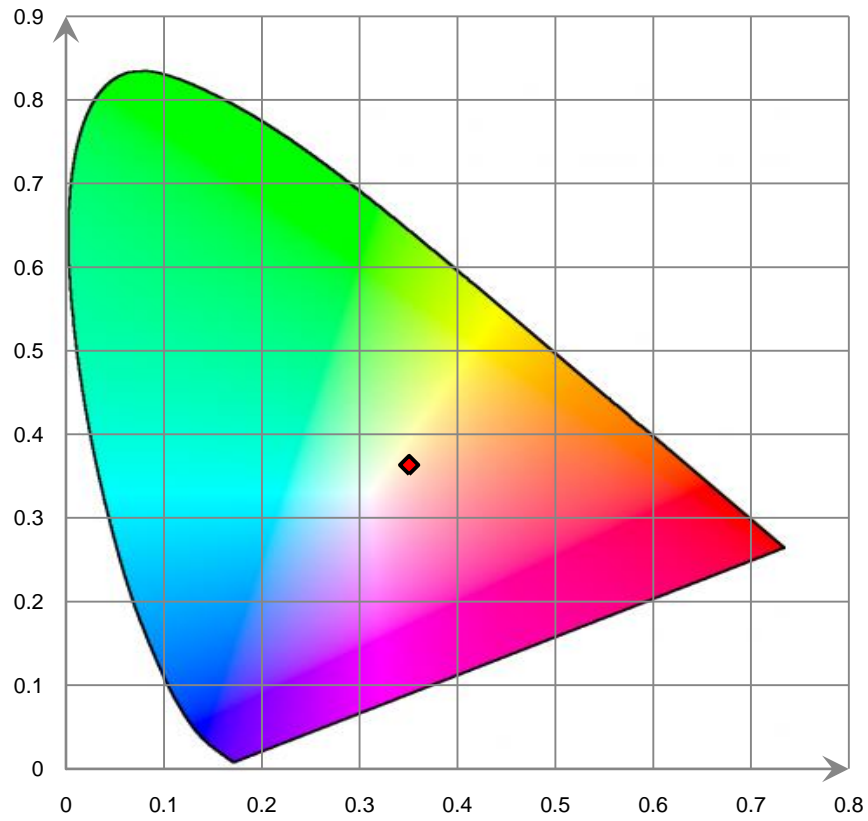
Ra			
82.7			
R1 81	R2 89	R3 94	R4 81
R5 80	R6 84	R7 87	R8 66
R9 5	R10 73	R11 79	R12 56
R13 84	R14 97	R15 75	

Relative Spectral Power Distribution

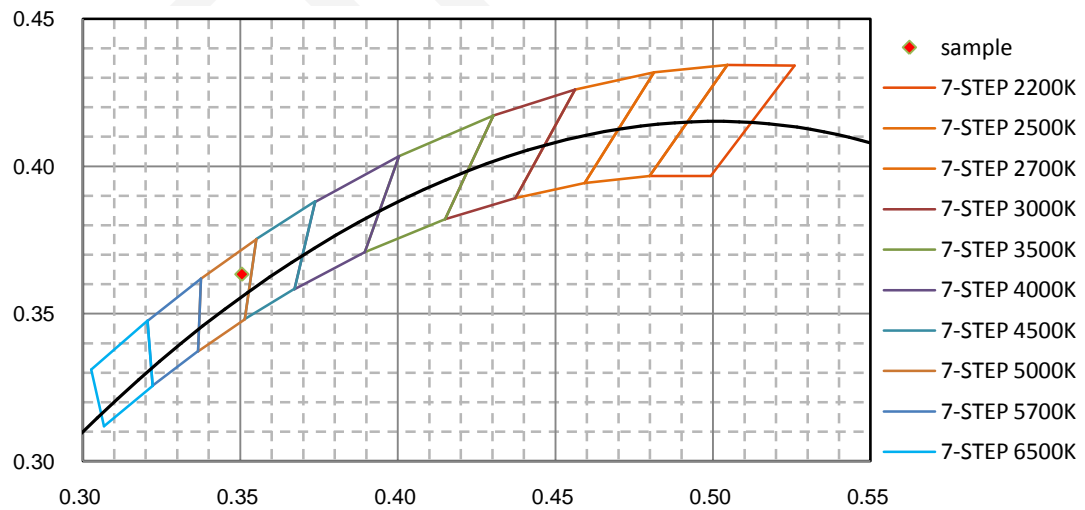


nm	mW	nm	mW	nm	mW	nm	mW	nm	mW
380	1.857E-03	465	7.068E-02	550	8.571E-02	635	5.932E-02	720	5.583E-03
385	7.709E-04	470	5.591E-02	555	8.684E-02	640	5.378E-02	725	4.743E-03
390	7.322E-04	475	4.357E-02	560	8.856E-02	645	4.805E-02	730	4.165E-03
395	5.412E-04	480	3.876E-02	565	9.017E-02	650	4.335E-02	735	3.517E-03
400	3.853E-04	485	3.930E-02	570	9.162E-02	655	3.770E-02	740	3.061E-03
405	4.899E-04	490	4.330E-02	575	9.211E-02	660	3.320E-02	745	2.531E-03
410	9.938E-04	495	4.897E-02	580	9.301E-02	665	2.930E-02	750	2.343E-03
415	1.845E-03	500	5.580E-02	585	9.353E-02	670	2.551E-02	755	1.981E-03
420	3.764E-03	505	6.211E-02	590	9.299E-02	675	2.202E-02	760	1.595E-03
425	7.677E-03	510	6.725E-02	595	9.197E-02	680	1.893E-02	765	1.447E-03
430	1.540E-02	515	7.166E-02	600	9.071E-02	685	1.657E-02	770	1.313E-03
435	2.931E-02	520	7.489E-02	605	8.785E-02	690	1.416E-02	775	1.194E-03
440	5.510E-02	525	7.754E-02	610	8.482E-02	695	1.231E-02	780	1.041E-03
445	9.585E-02	530	7.898E-02	615	8.061E-02	700	1.031E-02		
450	1.350E-01	535	8.126E-02	620	7.555E-02	705	9.070E-03		
455	1.287E-01	540	8.318E-02	625	7.053E-02	710	7.672E-03		
460	9.242E-02	545	8.463E-02	630	6.515E-02	715	6.648E-03		

CIE 1931 x y Chromaticity Diagram



7-Step Chromaticity Quadrangles



[Goniophotometer System]

Total operating time for luminous intensity distribution: **1.0 hour**

Test orientation: **Downward**

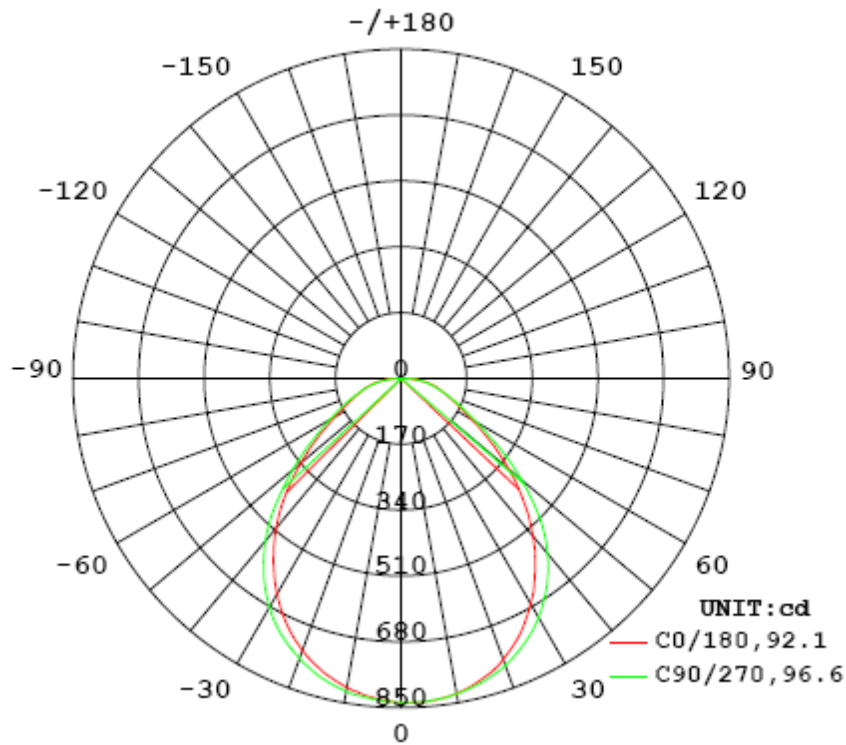
Electrical Measurement

Input Voltage (V)	Frequency (Hz)	Input Current (A)	Power (W)	Power Factor
120.08	60	0.1792	21.3	0.9899

Photometric Measurement

Luminous Flux (lm)	Efficacy (lm/W)	I _{max} (cd)	S/MH (C0/180)	S/MH (C90/270)
1915.25	89.92	838.7	1.20	1.26

Luminous Intensity Distribution



	C0/180	C45/225	C90/270	C135/315	AVG.
Beam Angle (50% I _{max}):	92.1	93.5	96.6	93.5	93.9
Field Angle (10% I _{max}):	155.4	148.4	154.0	148.1	151.5

Luminous Intensity (cd) Distribution Data

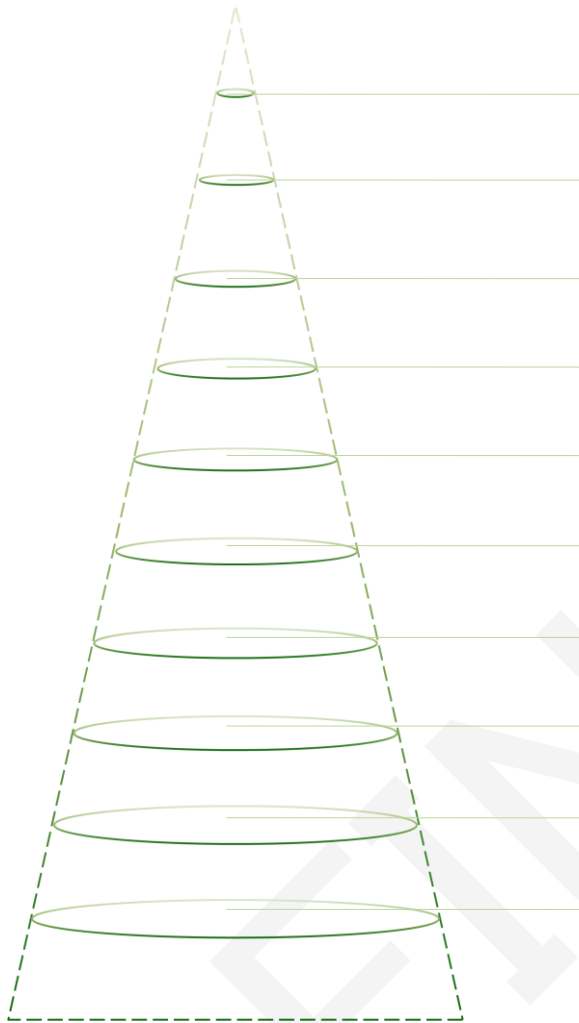
C y	0°	22.5°	45°	67.5°	90°	112.5°	135°	157.5°
0.0°	837	837	837	837	837	837	837	837
5.0°	827	827	827	829	831	833	835	836
10.0°	810	809	811	815	820	822	825	825
15.0°	784	783	787	794	800	803	805	805
20.0°	748	747	753	761	769	773	774	773
25.0°	701	701	708	720	732	735	732	730
30.0°	643	644	652	670	682	686	679	674
35.0°	578	574	586	604	621	622	613	607
40.0°	505	499	507	528	547	546	535	529
45.0°	424	416	424	442	460	460	449	446
50.0°	340	336	344	357	368	373	366	362
55.0°	262	262	268	272	282	284	287	284
60.0°	198	198	198	201	215	208	211	214
65.0°	152	153	144	152	165	156	152	163
70.0°	119	120	106	117	125	120	111	127
75.0°	95	91	80	88	93	90	82	97
80.0°	69	64	58	60	65	62	61	69
85.0°	35	34	28	27	28	29	31	38
90.0°	4	3	0	0	0	0	0	2
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	0	0	0	0	0	1	1	0
110.0°	0	0	1	1	1	1	1	0
115.0°	0	0	0	1	1	1	1	0
120.0°	0	0	0	1	1	1	1	0
125.0°	0	1	1	1	1	1	1	1
130.0°	0	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Luminous Intensity (cd) Distribution Data (cont.)

C y	180°	202.5°	225°	247.5°	270°	292.5°	315°	337.5°
0.0°	837	837	837	837	837	837	837	837
5.0°	836	837	837	837	836	833	831	829
10.0°	826	827	829	830	827	822	818	813
15.0°	804	808	812	814	811	804	794	787
20.0°	772	779	786	792	789	779	763	752
25.0°	729	736	748	756	755	741	723	706
30.0°	671	679	697	712	712	695	669	650
35.0°	605	617	637	655	657	636	608	584
40.0°	531	543	563	585	590	565	532	512
45.0°	450	460	477	501	507	482	449	430
50.0°	364	371	388	408	407	389	364	343
55.0°	282	286	304	311	308	296	283	263
60.0°	211	213	219	221	226	211	202	196
65.0°	161	159	151	159	169	153	141	149
70.0°	126	123	107	118	128	114	101	117
75.0°	99	97	81	90	96	88	78	91
80.0°	73	70	63	65	69	63	60	66
85.0°	38	41	36	36	35	33	33	37
90.0°	0	0	0	0	0	0	0	0
95.0°	0	0	0	0	0	0	0	0
100.0°	0	0	0	0	0	0	0	0
105.0°	1	0	0	0	1	0	0	0
110.0°	1	0	1	1	1	1	0	0
115.0°	1	0	1	1	1	1	0	0
120.0°	1	0	1	1	1	1	0	0
125.0°	1	1	1	1	1	1	1	0
130.0°	1	1	1	1	1	1	1	1
135.0°	1	1	1	1	1	1	1	1
140.0°	1	1	1	1	1	1	1	1
145.0°	1	1	1	1	1	1	1	1
150.0°	1	1	1	1	1	1	1	1
155.0°	1	1	1	1	1	1	1	1
160.0°	1	1	1	1	1	1	1	1
165.0°	1	1	1	1	1	1	1	1
170.0°	1	1	1	1	1	1	1	1
175.0°	1	1	1	1	1	1	1	1
180.0°	1	1	1	1	1	1	1	1

Average Area Illumination Figure

Angle:93.9°. Flux out:1274.0 lm



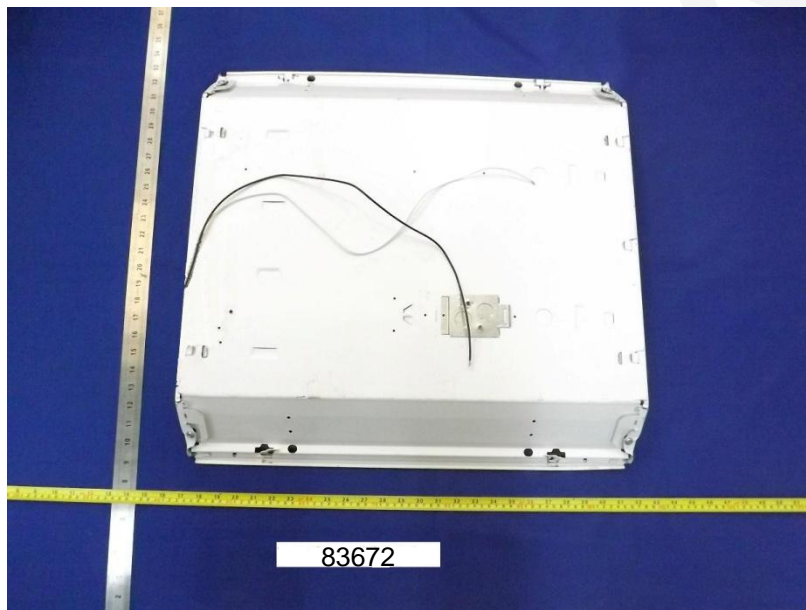
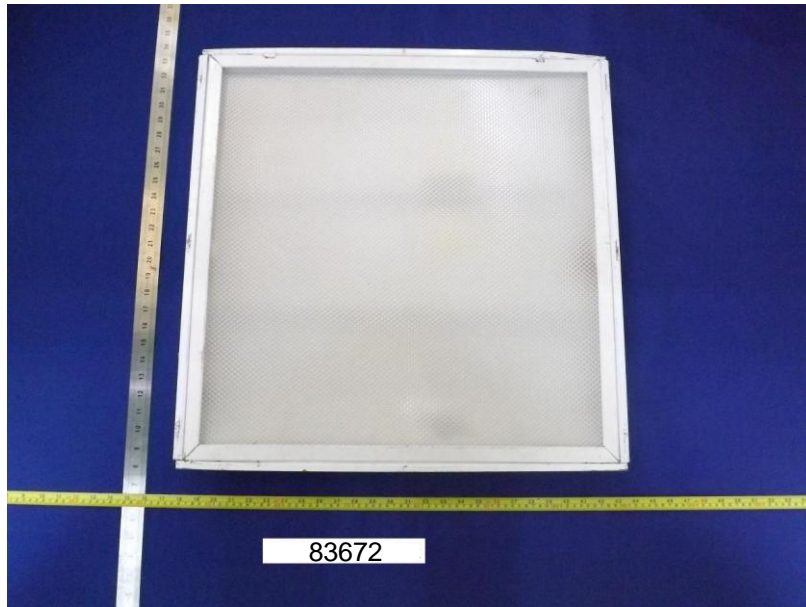
Height (m)	Diameter (cm)	E _{avg} (lx)	E _{max} (lx)
0.5	107.05	1411.0	3352.0
1.0	214.10	352.7	838.1
1.5	321.15	156.8	372.5
2.0	428.20	88.2	209.5
2.5	535.25	56.4	134.1
3.0	642.30	39.2	93.1
3.5	749.35	28.8	68.4
4.0	856.40	22.1	52.4
4.5	963.44	17.4	41.4
5.0	1070.49	14.1	33.5

Zonal Lumen Density Measurement

Deg	Flux (lm)	%
0-5	20.0	1.04
5-10	59.1	3.09
10-15	96.1	5.02
15-20	129.4	6.75
20-25	157.1	8.21
25-30	177.8	9.28
30-35	189.7	9.90
35-40	192.1	10.03
40-45	184.1	9.61
45-50	165.8	8.66
50-55	141.2	7.37
55-60	112.9	5.90
60-65	87.5	4.57
65-70	68.4	3.57
70-75	53.8	2.81
75-80	41.4	2.16
80-85	27.2	1.42
85-90	8.2	0.43
90-95	0.1	0.01
95-100	0.2	0.00
100-105	0.2	0.02
105-110	0.3	0.01
110-115	0.3	0.01
115-120	0.3	0.02
120-125	0.2	0.01
125-130	0.3	0.01
130-135	0.2	0.02
135-140	0.2	0.01
140-145	0.2	0.01
145-150	0.2	0.01
150-155	0.2	0.01
155-160	0.2	0.01
160-165	0.1	0.01
165-170	0.1	0.01
170-175	0.1	0.00
175-180	0.0	0.00

Deg	Flux (lm)	%
0-5	20.0	1.04
0-10	79.1	4.13
0-15	175.2	9.15
0-20	304.6	15.90
0-25	461.7	24.11
0-30	639.4	33.39
0-35	829.2	43.29
0-40	1021.3	53.32
0-45	1205.3	62.93
0-50	1371.2	71.59
0-55	1512.3	78.96
0-60	1625.2	84.86
0-65	1712.7	89.43
0-70	1781.1	93.00
0-75	1835.0	95.81
0-80	1876.4	97.97
0-85	1903.6	99.39
0-90	1911.8	99.82
0-95	1911.9	99.83
0-100	1912.1	99.83
0-105	1912.3	99.85
0-110	1912.6	99.86
0-115	1912.8	99.87
0-120	1913.1	99.89
0-125	1913.3	99.90
0-130	1913.6	99.91
0-135	1913.8	99.93
0-140	1914.1	99.94
0-145	1914.3	99.95
0-150	1914.5	99.96
0-155	1914.7	99.97
0-160	1914.9	99.98
0-165	1915.1	99.99
0-170	1915.2	100.00
0-175	1915.2	100.00
0-180	1915.2	100.00

6. Product Photo



*****END OF REPORT*****