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Test report of

IES LM-79-08

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products

Rendered to:

LIGHT EFFICIENT DESIGN, DIV OF TADD LLC.
188 S. Northwest Highway Cary, IL 60013

For products:

LED Lamp

Models No.:

LED-8088M57-MHBC, LED-8088E57-MHBC

Test Date: Oct. 28, 2016 to Oct. 29, 2016
Test Item: Total luminous flux, Luminous Efficacy, Electrical values, Luminous Intensity Distribution, Chromaticity coordinates, CCT and CRI, Spectral Power Distribution.
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Template No.: LC-RT-PL/LM79-08/01
Test Note: *Model LED-8088M57-MHBC and LED-8088E57-MHBC are the same except the lamp base. Model LED-8088M57-MHBC was used for all tests.*

Complied by:

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Nov. 7, 2016

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1. General

1.1 Product Information

Brand Name	-
Product Type	LED Lamp
Model Number	LED-8088M57-MHBC, LED-8088E57-MHBC
Rated Inputs	277V, 60Hz
Rated Power	78 W
Rated Light output	N/A
Declared CCT	5700K
Ballast	M57
LED Package, Array or Module	Model: SPMWHX1228FXXXXXXXX, manufactured by SAMSUNG ELECTRONICS CO., LTD
Receipt Samples	1 unit
Date of Receipt Samples	Oct. 26, 2016
Note	-

1.2 Standards or methods

The following standards are partly or totally used or referenced for test:

No.	Name
ANSI/NEMA/ ANSLG C78.377-2011	Specifications for the Chromaticity of Solid State Lighting Products
ANSI C82.77-2002	Harmonic Emission Limits—Related Power Quality Requirements for Lighting Equipment
CIE Pub. No. 13.3-1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. No. 15:2004	Colorimetry
IES LM-79-08	Electrical and Photometric Measurements of Solid-State Lighting Products

1.3 Equipment list

Instrument	ID	Model name	Cal. date	Next cal. Date
AC Power supply	LC-I-923	CHP-500	2016-02-04	2017-02-03
AC Power supply	LC-I-987	APW-110N	2016-02-04	2017-02-03
Power analyzer	LC-I-928	WT210	2016-01-24	2017-01-24
Power analyzer	LC-I-954	WT210	2016-02-04	2017-02-03
Multimeter	LC-I-972	Fluke 17B	2016-08-10	2017-08-09
Photometric colorimetric electric system (2 meter sphere)	LC-I-900	SPR3000	Before use	Before use
Standard lamp	LC-PL-I-002	24V100W	2016-10-08	2017-10-07
Luminous Flux Standard Lamp	LC-PL-I-001	110V/200W	2016-09-24	2017-09-23
Goniophotometer(with mirror)	LC-I-902	GMS2000	2016-05-07	2017-05-07
Wireless temperature transmitter	LC-I-978	DWRF-B	2016-02-03	2017-02-02
Wireless temperature transmitter	LC-I-979	DWRF-B	2016-02-03	2017-02-02

2. Test conducted and method

The lamp was operated at least 2 hours to reach stabilization and temperature equilibrium before test.

2.1 Ambient Condition

The ambient temperature in which measurements are being taken was maintained at $25\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$; the air flow around the sample(s) being tested did not affect the performance.

2.2 Power Supply Characteristics

The AC power supply had a sinusoidal voltage wave shape at the prescribed frequency (50 Hz) such that the RMS summation of the harmonic components does not exceed 3 percent of the fundamental during operation of the test item.

The voltage of AC power supply (RMS voltage) applied to the device under test was regulated to within ± 0.2 percent under load.

2.3 Seasoning and Stabilization

No seasoning was performed in accordance with IESNA LM-79-08. And before the measurement, the sample was stabilized until the light output and power variations were less than 0.5% in 30 minutes intervals (3 readings, 15 minutes apart).

2.4 Electrical Instrumentation

The calibration uncertainties of the instruments for AC voltage and current were less than 0.2 percent, and the calibration uncertainty of the AC power meter was less than 0.5 percent (95 % confidence interval, $k=2$).

2.5 Color Measurement Method

Spectral radiant flux was measured by a sphere (2 meter)-spectroradiometer system, and the color characteristics (Color rendering index, correlated color temperature, chromaticity coordinate) were calculated from these by software automatically.

2.6 Total Luminous Flux Measurement Method

Total luminous flux was measured type C goniophotometer system.

Light intensity distribution was measured by a type C goniophotometer (with mirror) which can keep the sample in burn position when the tests conduct, and the total luminous flux was calculated from the intensity data by software automatically.

2.7 Luminous Intensity Distribution Measurement Method

Luminous intensity distribution was measured by a mirror-type goniophotometer (Type C) which can keep the sample in burn position when the tests conduct, and the kinds of graph were generated by software automatically.

2.8 Spatial Non-uniformity of Chromaticity

The customer did not require this measurement.

3. Test Result Summary

3.1 Electrical data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Input Voltage & Frequency	277.00V~60Hz	277.00V~60Hz
Input Current(A)	0.443	0.444
Total Power(W)	83.90	83.66
Power Factor	0.684	0.681
I-THD(%)	41.81	-
Off-state Power(W)	-	-

3.2 Photometric data

Criteria Item	Result(Sphere)	Result(Goniophotometer)
Total Lumens(lm)	-	5617.95
Luminaire Efficacy(Lm/W)	-	67.15
Correlated Color Temperature (CCT)(K)	5666	-
Color Rendering Index (CRI)	85.0	-
R9	23	-
Chromaticity Coordinate (x,y)	x=0.3287 y=0.3406	-
Chromaticity Coordinate (u,v)	u=0.2045 v=0.3178	-
Chromaticity Coordinate (u',v')	u'=0.2045 v'=0.4767	-
Duv	0.00145	-
Central intensity(cd)	-	1936.933
Beam angle	-	111.0°
Spacing Criteria(0-180°)	-	1.34
Spacing Criteria(90-270°)	-	1.30
Zone Lumens between 0-60 °	-	80.80%
Zone Lumens between 60-90 °	-	17..70%
Zone Lumens between 90-120 °	-	1.10%
Zone Lumens between 120-180 °	-	0.30%

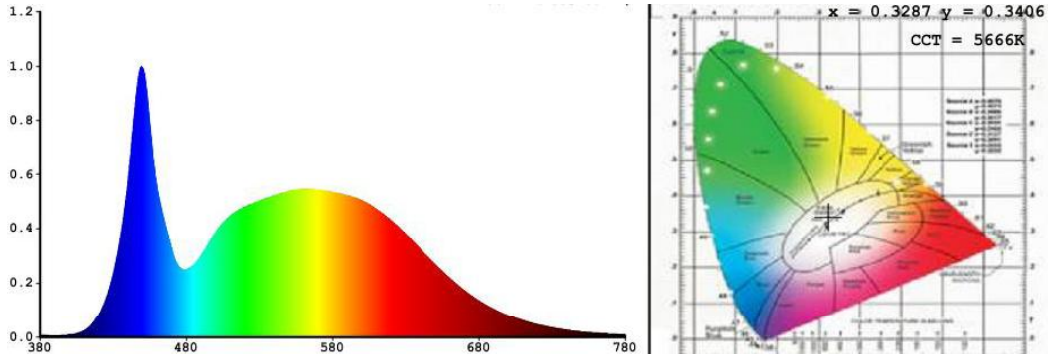
3.3 Color Rendering Details

R1	R2	R3	R4	R5	R6	R7	R8
84	88	90	86	85	84	89	74
R9	R10	R11	R12	R13	R14	R15	-
23	71	86	66	85	95	80	-

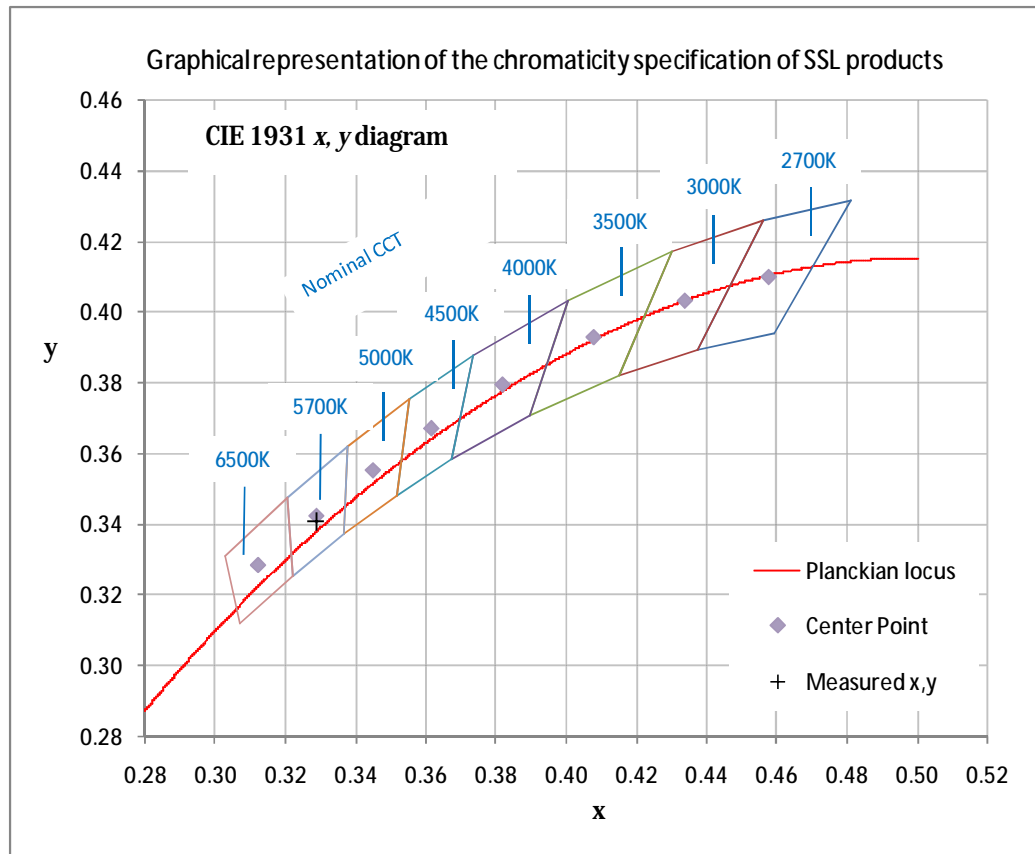
Note: N.A.

4. Test Data

4.1 Spectral Distribution



4.2 ANSI Chromaticity Quadrangles Diagram





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4.3 Goniometry Test Data

CIE Type	Direct	Basic Luminous Shape	Rectangular
Spacing Criteria (0-180°)	1.34	Luminous Length	0.12 m
Spacing Criteria (90-270°)	1.30	Luminous Width	0.08 m
Spacing Criteria (Diagonal)	1.44	Luminous Height	0.00 m
Test Distance	29.65 m		

4.4 Zonal Lumen Summary

Zone	Lumens	%Lamp	%Fixt
0-20	720.45	12.80	12.80
0-30	1556.16	27.70	27.70
0-40	2585.05	46.00	46.00
0-60	4542.00	80.80	80.80
0-80	5453.95	97.10	97.10
0-90	5531.82	98.50	98.50
10-90	5347.66	95.20	95.20
20-40	1864.6	33.20	33.20
20-50	2918.38	51.90	51.90
40-70	2581.5	46.00	46.00
60-80	911.95	16.20	16.20
70-80	287.40	5.10	5.10
80-90	77.87	1.40	1.40
90-110	50.82	0.90	0.90
90-120	61.88	1.10	1.10
90-130	68.50	1.20	1.20
90-150	76.69	1.40	1.40
90-180	86.13	1.50	1.50
110-180	35.31	0.60	0.60
0-180	5617.95	100.00	100.00

Total Luminaire Efficiency = 100.00%

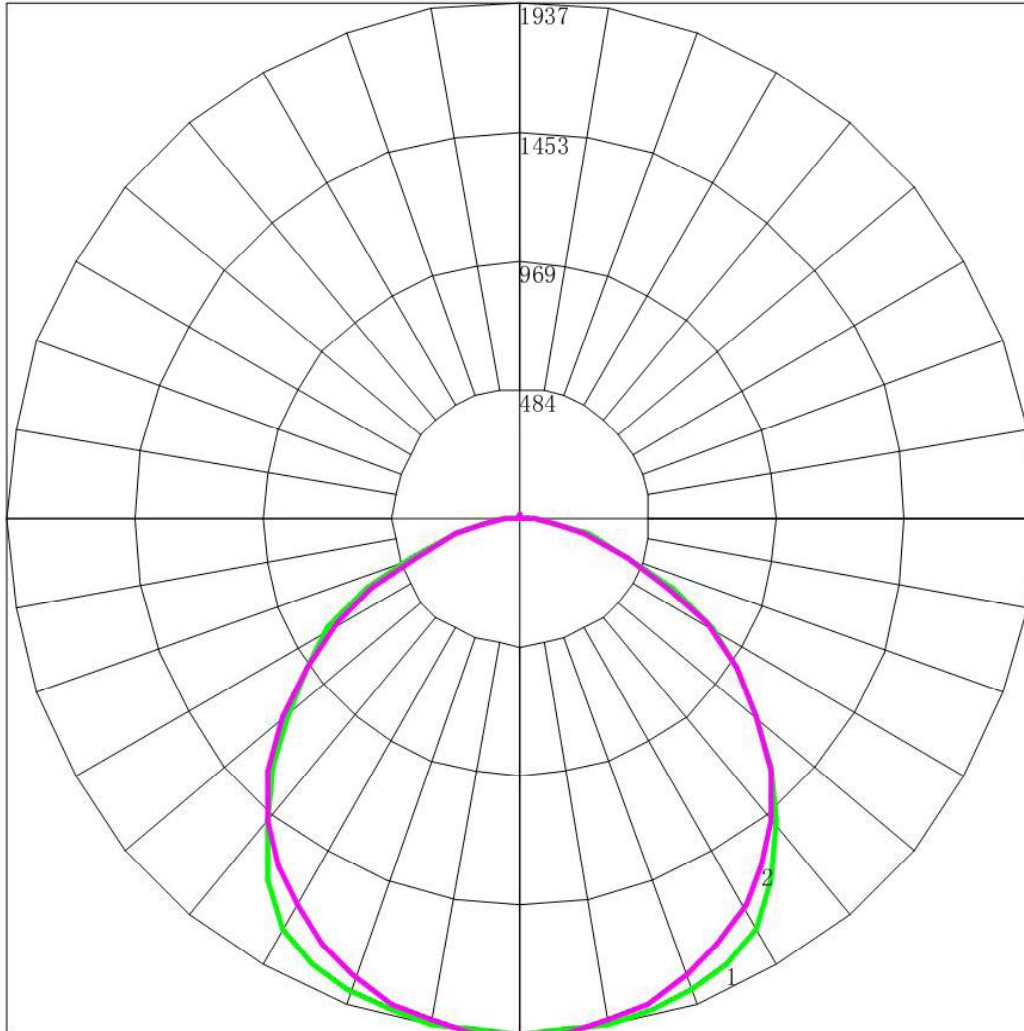
ZONAL LUMEN SUMMARY

Zone	Lumens
0-10	184.16
10-20	536.29
20-30	835.72
30-40	1028.88
40-50	1053.78
50-60	903.17
60-70	624.55
70-80	287.40
80-90	77.87
90-100	29.90
100-110	20.92
110-120	11.05
120-130	6.62
130-140	4.19
140-150	4.00
150-160	4.27
160-170	3.69
170-180	1.49



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4.5 Polar Curves



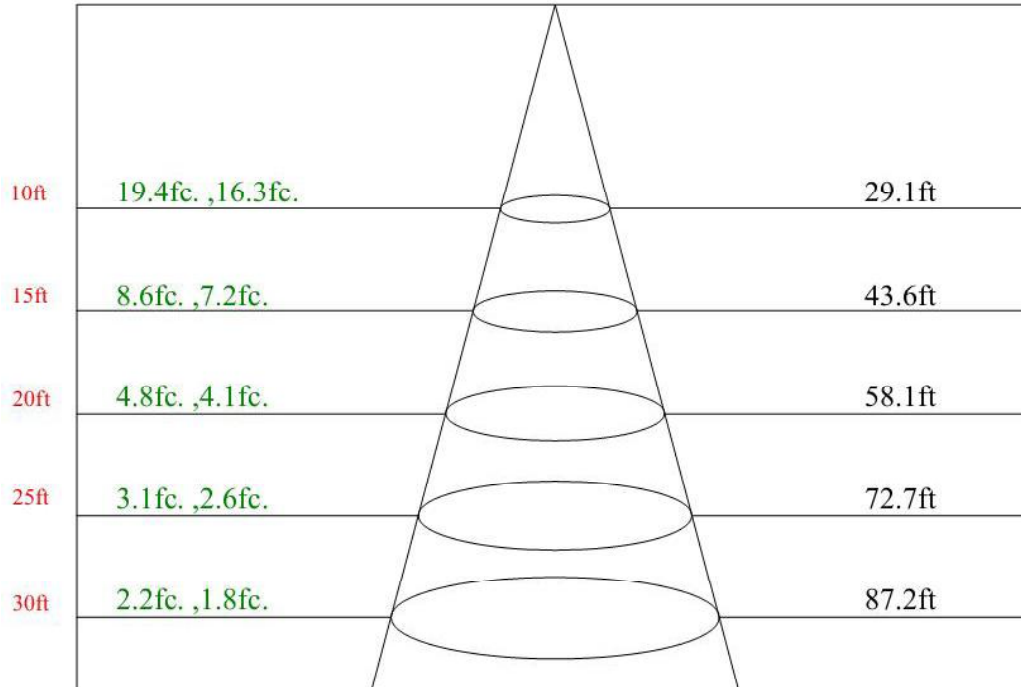
Maximum Candela = 1937.369 Located At Horizontal Angle = 90, Vertical Angle = 5
1 - Vertical Plane Through Horizontal Angles (0 - 180)
2 - Vertical Plane Through Horizontal Angles (90 - 270)



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4.6 Lux distance Curve

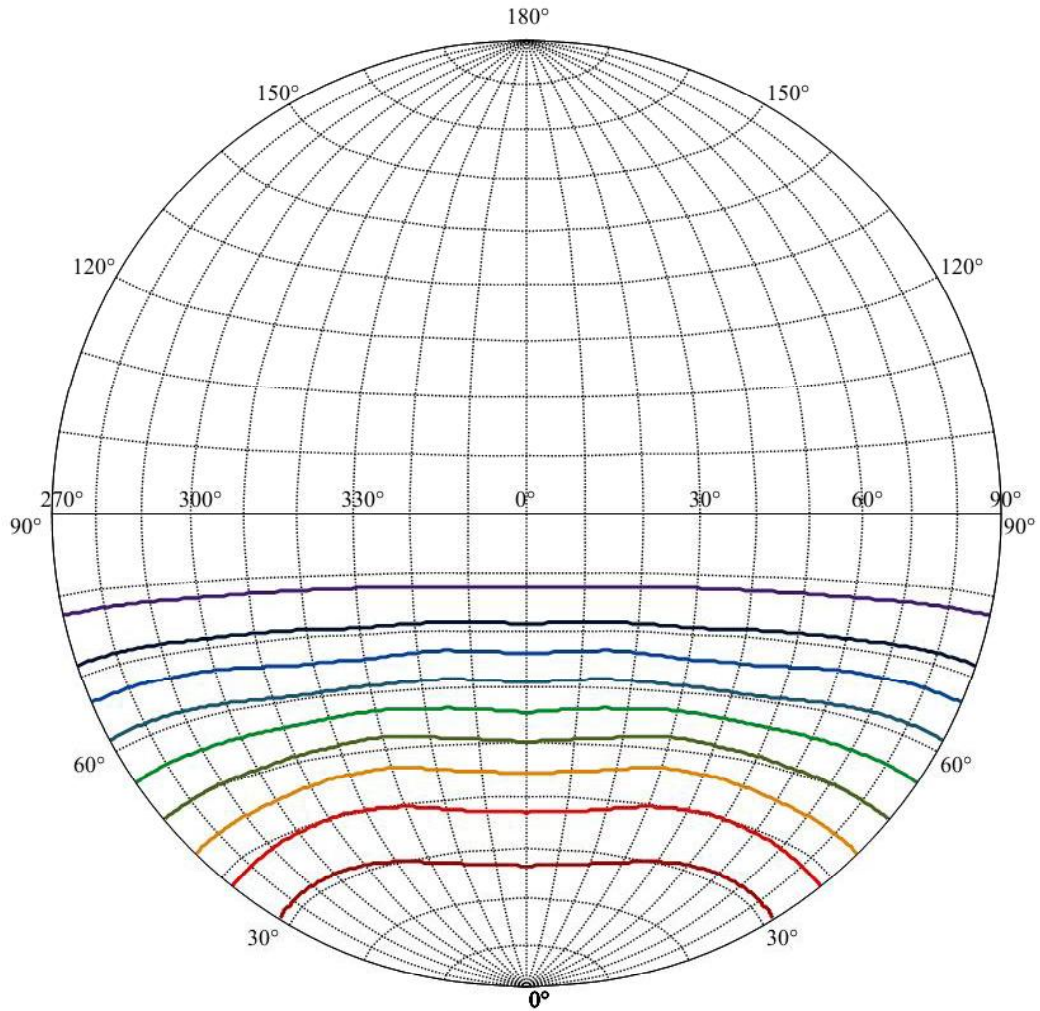




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4.7 ISO candela diagram on circular web



House

[Unit:cd]

Road

Imax:1937.37

- (10%Imax) 193.737
- (20%Imax) 387.474
- (30%Imax) 581.211
- (40%Imax) 774.948
- (50%Imax) 968.684
- (60%Imax) 1162.42
- (70%Imax) 1356.16
- (80%Imax) 1549.9
- (90%Imax) 1743.63

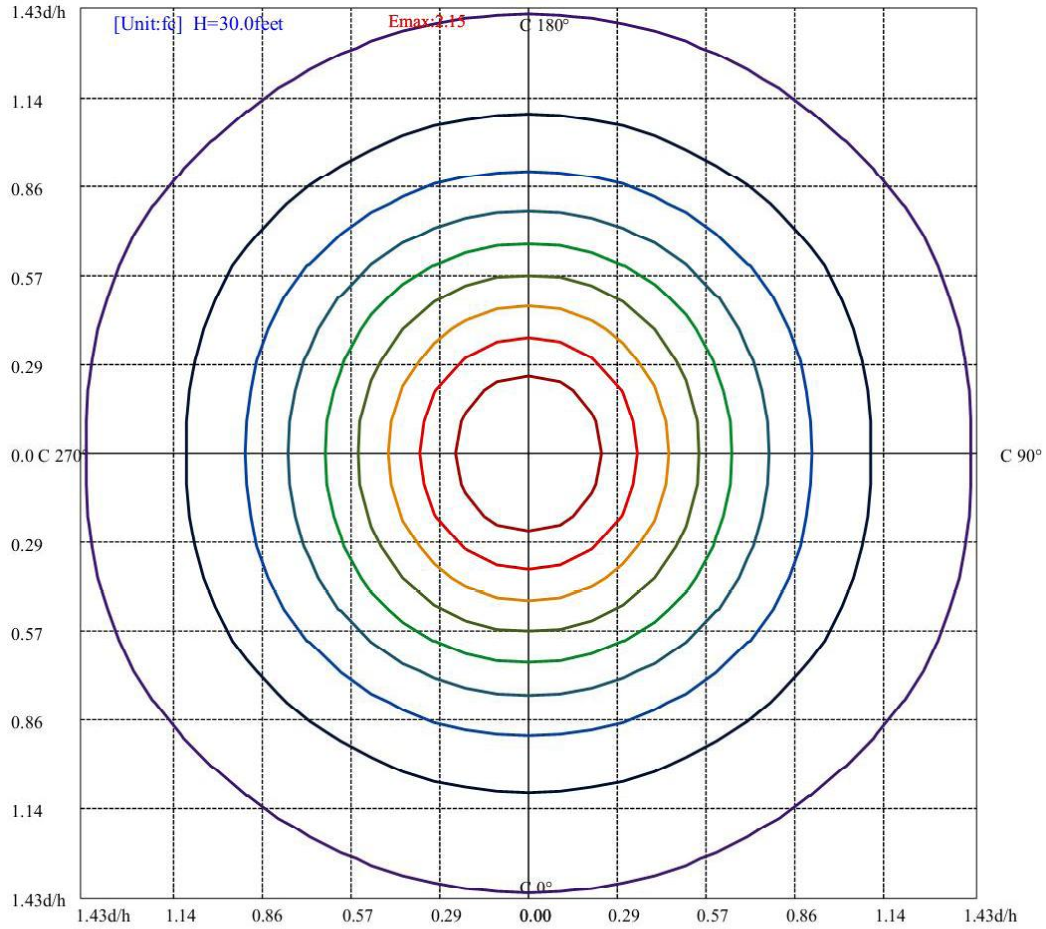




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4.8 ISO illuminance diagram



(10%Emax) 0.2152926	—
(20%Emax) 0.4305864	—
(30%Emax) 0.6458791	—
(40%Emax) 0.8611717	—
(50%Emax) 1.076464	—
(60%Emax) 1.291758	—
(70%Emax) 1.507047	—
(80%Emax) 1.722348	—
(90%Emax) 1.937637	—



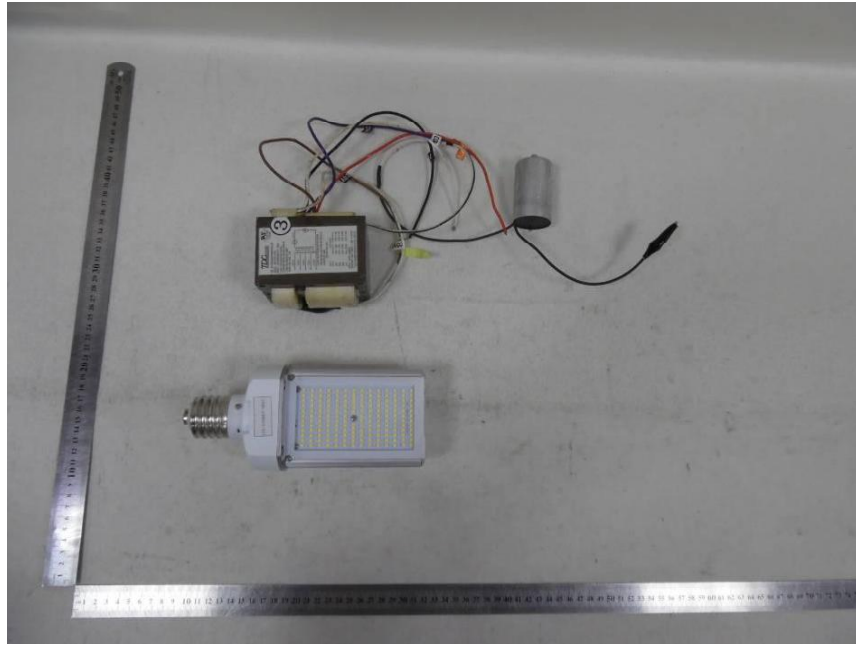
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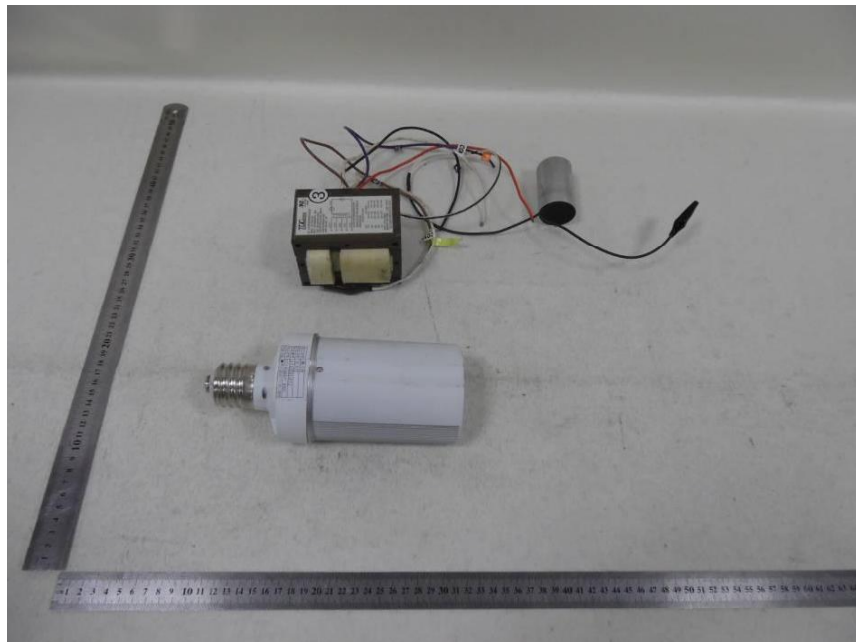
4.9 Candela Tabulation

	<u>0</u>	<u>15</u>	<u>30</u>	<u>45</u>	<u>60</u>	<u>75</u>	<u>90</u>
0	1936.933	1936.933	1936.933	1936.933	1936.933	1936.933	1936.933
5	1930.764	1934.511	1933.629	1933.416	1933.194	1932.987	1937.369
10	1923.274	1928.116	1925.266	1918.251	1918.045	1915.672	1916.002
15	1911.818	1911.796	1906.556	1896.068	1886.869	1884.103	1882.426
20	1886.703	1889.304	1877.719	1861.786	1849.105	1835.440	1832.281
25	1847.048	1846.746	1839.860	1811.158	1797.181	1776.036	1768.792
30	1775.668	1777.616	1773.719	1756.336	1728.108	1699.909	1689.082
35	1657.584	1666.941	1676.522	1673.962	1644.655	1608.016	1595.157
40	1491.561	1509.261	1535.041	1557.550	1542.231	1499.719	1481.610
45	1329.857	1337.579	1360.409	1407.828	1415.444	1361.419	1334.661
50	1153.920	1166.085	1180.121	1219.563	1253.648	1200.830	1168.177
55	984.461	984.784	994.789	1013.706	1054.690	1022.827	985.647
60	832.449	834.924	818.925	799.792	824.635	839.752	804.337
65	642.193	649.859	647.860	603.620	611.291	652.080	616.443
70	438.189	447.386	435.790	436.597	420.124	450.495	427.634
75	258.287	264.519	258.603	261.275	261.822	258.381	253.083
80	135.268	133.253	130.480	132.970	136.567	132.740	127.893
85	59.527	60.970	64.293	65.564	62.991	60.217	54.419
90	31.724	32.526	32.972	32.478	28.764	24.694	16.788
95	24.102	24.520	27.270	29.415	28.804	27.154	26.250
100	22.163	22.338	23.133	26.166	29.990	29.833	29.651
105	15.906	16.780	17.520	19.446	21.977	21.156	20.625
110	16.611	16.781	15.121	13.094	12.977	13.196	13.212
115	12.513	12.084	11.731	11.491	9.177	8.857	8.198
120	10.354	10.364	9.641	8.262	8.168	7.848	7.369
125	9.209	8.534	6.889	6.745	7.004	6.927	6.497
130	6.918	6.748	6.075	5.537	5.511	5.568	5.320
135	6.345	6.152	5.503	4.768	4.611	4.494	4.142
140	6.653	6.483	6.053	5.317	4.808	4.516	4.142
145	7.402	7.233	6.845	6.394	5.796	5.327	4.927
150	8.460	8.335	8.056	7.646	7.180	6.752	6.454
155	9.782	9.813	9.553	9.184	8.804	8.505	8.198
160	11.897	11.863	11.600	11.359	11.110	10.917	10.727
165	13.571	13.583	13.338	13.271	13.173	13.043	12.733
170	14.893	14.951	14.879	14.721	14.666	14.599	14.390
175	16.038	16.119	16.046	15.995	15.984	15.937	15.698
180	16.574	16.574	16.574	16.574	16.574	16.574	16.574

Appendix 1 Product Photo



Picture 1



Picture 2

****End of test report****