



INDEPENDENT TEST LABORATORY REPORT No. 29015

SOLAR OUTDOOR LIGHTING - LED ROADWAY LUMINAIRE, CAT# 20/20 TYPE 5
WITH ALUMINUM INTERIOR AND CLEAR FLAT GLASS LENS
FORTY EIGHT LEDS. LUMINAIRE OUTPUT: 5087 Lms.
LUMINAIRE OPERATING AT 13.0 VDC AND 60.1 WATTS

IESNA CUTOFF CLASSIFICATION: CUTOFF



PREPARED FOR:

SOLAR OUTDOOR LIGHTING INC
PALM CITY, FL

DATE: APR 28, 2011

CERTIFIED BY:

Ryder Tunney

LABORATORY RESULTS MAY NOT BE REPRESENTATIVE OF FIELD PERFORMANCE.
BALLAST FACTORS HAVE NOT BEEN APPLIED

TESTED IN 30 PLANES LEFT SIDE, 30 PLANES RIGHT SIDE, LEFT AND RIGHT AVERAGED

VERTICAL TEST INCREMENTS ARE 2.5 DEGREES.

TEST DISTANCE EXCEEDS FIVE TIMES THE GREATEST
LUMINOUS OPENING OF LUMINAIRE.

LIGHTING SCIENCES, INC.
7826 E. EVANS RD.
SCOTTSDALE, AZ, USA 85260

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*** THIS IS AN ABSOLUTE TEST REPORT ***

UTILIZATION TABLE

CO-EFFICIENT OF UTILIZATION

RATIO	HOUSE SIDE	STREET SIDE	TOTAL
0.5	0.242	0.243	0.485
1.0	0.388	0.384	0.772
1.5	0.450	0.442	0.892
2.0	0.476	0.467	0.944
2.5	0.489	0.480	0.969
3.0	0.495	0.485	0.980
3.5	0.498	0.489	0.987
4.0	0.500	0.491	0.991
5.0	0.503	0.493	0.996
TOTAL:	0.504	0.495	1.000

PERCENTAGE OUTPUTS

DOWNWARD:	STREET SIDE =	49.5%
	HOUSE SIDE =	50.4%
	TOTAL =	100.0%
UPWARD:	STREET SIDE =	0.0%
	HOUSE SIDE =	0.0%
	TOTAL =	0.0%

EFFICACY (LUMENS PER WATT) 84.6

THE ABOVE COEFFICIENTS HAVE BEEN CALCULATED BASED ON LUMINAIRE LUMENS
BECAUSE IN AN ABSOLUTE TEST THE BARE LAMP LUMENS ARE UNKNOWN.
LIGHTING DESIGN CALCULATIONS MADE USING THESE COEFFICIENTS SHOULD
THEREFORE USE THE LUMINAIRE LUMENS IN THE CALCULATION FORMULA

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ZONAL LUMEN SUMMARY PER IES PUBLICATION TM-15-07

*** THIS IS AN ABSOLUTE TEST REPORT ***

FORWARD LIGHT:

LUMENS	2520.4
% LUMENS	49.5 %
FORWARD LOW ZONE (0 TO 30 DEGREES)	14.0 %
FORWARD MID ZONE (30 TO 60 DEGREES)	27.2 %
FORWARD HIGH ZONE (60 TO 80 DEGREES)	8.1 %
FORWARD VERY HIGH ZONE (80 TO 90 DEGREES)	0.3 %

BACK LIGHT:

LUMENS	2565.8
% LUMENS	50.4 %
BACK LIGHT LOW ZONE (0 TO 30 DEGREES)	14.0 %
BACK LIGHT MID ZONE (30 TO 60 DEGREES)	27.9 %
BACK LIGHT HIGH ZONE (60 TO 80 DEGREES)	8.3 %
BACK LIGHT VERY HIGH ZONE (80 TO 90 DEGREES)	0.2 %

UPLIGHT:

LUMENS	0.8
% LUMENS	0.0 %
UPLIGHT LOW ZONE (90 TO 100 DEGREES)	0.0 %
UPLIGHT HIGH ZONE (100 TO 180 DEGREES)	0.0 %

TRAPPED LIGHT: NOT APPLICABLE TO AN ABSOLUTE TEST

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IES "BUG" RATING (BACK LIGHT, UPLIGHT, GLARE)
PER ADDENDUM TO IES TM-15-07

	LUMENS	SECONDARY SOLID ANGLE RATING
BACK LIGHT		
BH (60-80 DEGREES)	422.3	B1
BM (30-60 DEGREES)	1420.6	B2
BL (0-30 DEGREES)	710.5	B2
UPLIGHT		
UH (100-180 DEGREES)	0.8	U1
UL (90-100 DEGREES)	0.0	U0
FVH (80-90 DEGREES)	14.4	U1
BVH (80-90 DEGREES)	12.4	U1
GLARE LIGHT		
FVH (80-90 DEGREES)	14.4	G1
BVH (80-90 DEGREES)	12.4	G1
FH (60-80 DEGREES)	410.7	G0
BH (60-80 DEGREES)	422.3	G0

IES BUG RATING: B2 U1 G1

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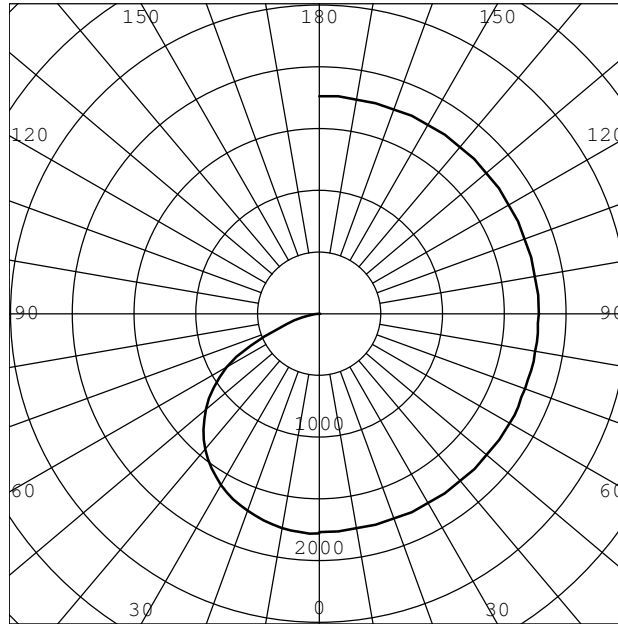
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LUMINAIRE OPERATING AT 13.0 VDC AND 60.1 WATTS

INTENSITY (CANDLEPOWER)
IN MAX. PLANE

INTENSITY (CANDLEPOWER)
IN MAX. CONE

ANGLE	CANDLEPOWER
0.0	1777
5.0	1775
10.0	1762
15.0	1735
20.0	1699
25.0	1656
30.0	1598
35.0	1525
40.0	1440
45.0	1330
50.0	1199
52.5	1127
55.0	1047
57.5	961
60.0	868
62.5	758
65.0	618
67.5	485
70.0	352
72.5	277
75.0	212
77.5	144
80.0	86
82.5	39
85.0	13
87.5	2
90.0	0
95.0	0
105.0	0
115.0	0
125.0	0
135.0	0
145.0	0
155.0	0
165.0	0
175.0	1
180.0	1



ANGLE	CANDLEPOWER
0.0	1767
5.0	1770
15.0	1769
25.0	1775
35.0	1776
45.0	1778
55.0	1779
60.0	1781
62.5	1782
65.0	1780
67.5	1771
70.0	1777
72.5	1773
75.0	1778
77.5	1779
80.0	1775
82.5	1778
85.0	1778
87.5	1774
90.0	1778
95.0	1780
105.0	1777
115.0	1777
125.0	1777
135.0	1775
145.0	1773
155.0	1772
165.0	1768
175.0	1770
180.0	1762

MAXIMUM INTENSITY (CANDLEPOWER) : 1782 CD
 PLANE OF MAXIMUM: 62.5
 VERTICAL ANGLE OF MAXIMUM: 2.5

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INTENSITY (CANDLEPOWER) SUMMARY

VERT. ANGLE	HORIZONTAL ANGLES - STREET SIDE										
	0.0	5.0	15.0	25.0	35.0	45.0	55.0	62.5	65.0	75.0	85.0

0.0	1777	1777	1777	1777	1777	1777	1777	1777	1777	1777	1777
2.5**	1767	1770	1769	1775	1776	1778	1779	1782	1780	1778	1778
5.0	1766	1767	1768	1772	1774	1774	1774	1775	1775	1772	1771
10.0	1756	1755	1757	1759	1761	1759	1760	1762	1763	1758	1756
15.0	1738	1736	1740	1740	1741	1735	1732	1735	1735	1730	1729
20.0	1708	1703	1706	1706	1710	1702	1700	1699	1699	1693	1689
25.0	1656	1652	1660	1658	1667	1660	1658	1656	1656	1639	1637
30.0	1588	1583	1591	1593	1604	1601	1598	1598	1596	1574	1572
35.0	1497	1495	1504	1510	1524	1528	1527	1525	1519	1501	1493
40.0	1399	1397	1406	1416	1429	1436	1441	1440	1434	1413	1400
45.0	1132	1132	1161	1250	1320	1324	1332	1330	1322	1304	1288
50.0	1001	1005	1012	1034	1068	1190	1196	1199	1194	1175	1155
55.0	837	848	865	894	908	916	1042	1047	1046	1028	1005
60.0	691	698	709	724	736	745	781	868	866	848	825
65.0	545	552	560	570	565	573	579	618	647	652	615
70.0	394	400	408	410	408	404	375	352	352	395	388
75.0	216	218	223	233	245	219	214	212	213	236	235
80.0	90	93	97	98	91	89	86	86	86	81	85
85.0	16	18	17	18	15	14	13	13	13	11	10
90.0	0	0	0	0	0	0	0	0	0	0	0

VERT. ANGLE	HORIZONTAL ANGLES - HOUSE SIDE										
	90.0	95.0	105.0	115.0	125.0	135.0	145.0	155.0	165.0	175.0	180.0
0.0	1777	1777	1777	1777	1777	1777	1777	1777	1777	1777	1777
2.5**	1778	1780	1777	1777	1777	1775	1773	1772	1768	1770	1762
5.0	1771	1775	1772	1770	1772	1772	1770	1769	1763	1766	1759
10.0	1756	1758	1756	1758	1757	1756	1755	1755	1749	1751	1743
15.0	1728	1732	1728	1730	1725	1727	1730	1733	1732	1737	1729
20.0	1689	1690	1686	1689	1690	1699	1703	1704	1703	1705	1691
25.0	1640	1640	1637	1642	1647	1657	1662	1663	1663	1664	1656
30.0	1570	1573	1571	1586	1590	1600	1610	1609	1605	1604	1602
35.0	1495	1494	1494	1516	1521	1534	1546	1535	1530	1521	1523
40.0	1404	1398	1404	1430	1441	1458	1460	1444	1436	1426	1422
45.0	1290	1284	1300	1319	1342	1354	1353	1334	1293	1239	1227
50.0	1153	1150	1175	1197	1218	1223	1196	1088	1068	1054	1052
55.0	1005	1000	1023	1050	1070	1023	954	947	925	902	900
60.0	823	818	840	878	880	786	781	771	752	738	738
65.0	605	602	642	675	617	604	592	595	588	576	573
70.0	380	383	394	369	376	420	421	422	420	413	409
75.0	230	234	240	221	219	222	236	233	229	222	219
80.0	83	85	81	86	82	85	90	83	84	74	74
85.0	9	9	9	9	10	11	11	11	10	8	9
90.0	0	0	0	0	0	0	0	0	0	0	0

** DENOTES VERTICAL ANGLE OF MAXIMUM CONE

**** DENOTES LATERAL ANGLE OF MAXIMUM PLANE

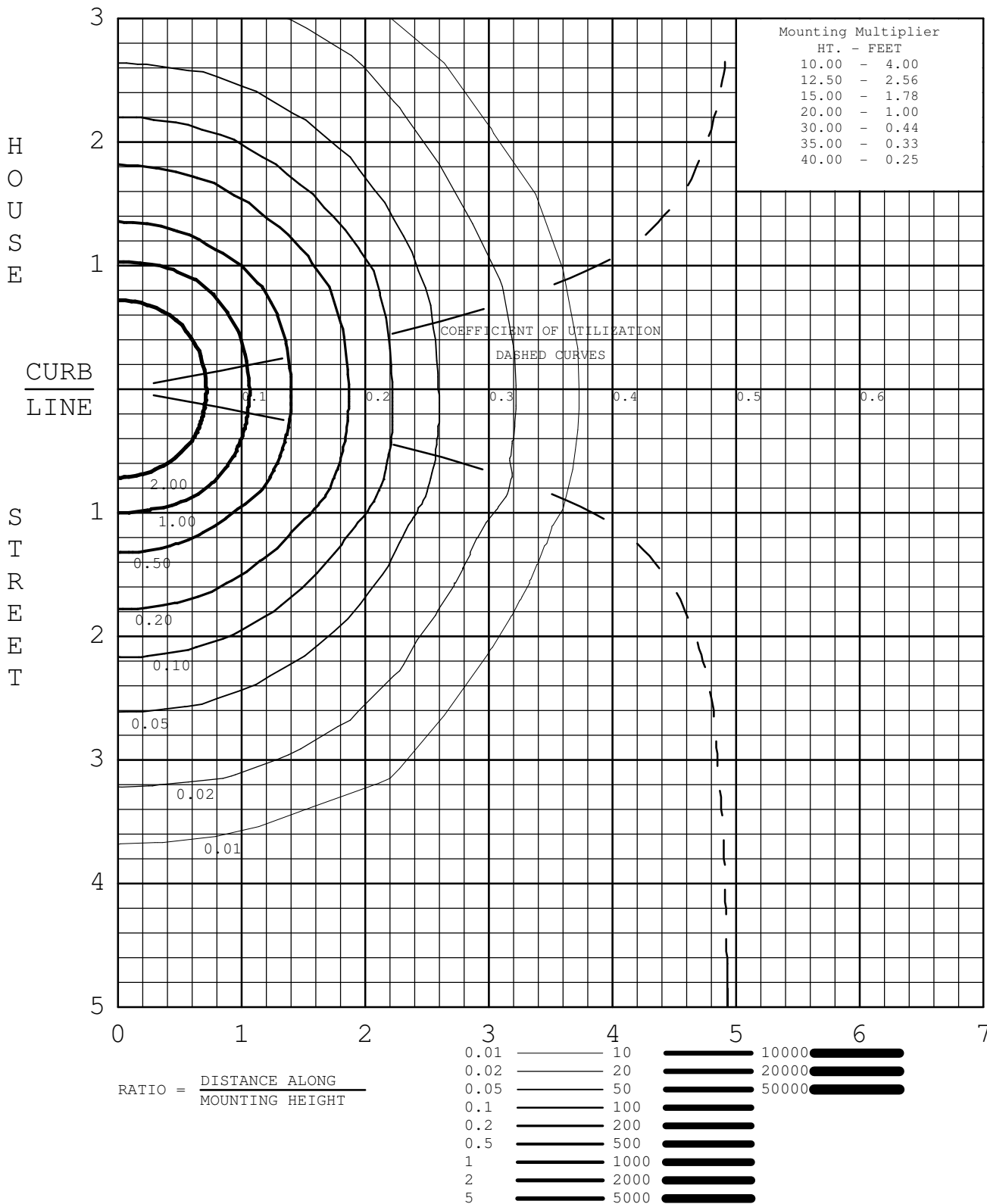
INTENSITY WAS MEASURED IN 2.5 DEGREE STEPS - TABULATIONS ARE AVAILABLE

ISOFOOTCANDLE

CERTIFIED TEST REPORT NO.29015

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MOUNTING HEIGHT FOR ISOFC 20.0 FEET



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** ILLUMINANCE(FOOTCANDLE) TABLE FOR SINGLE LUMINAIRE AT 20.0 FT. **															
LATERAL RATIOS															
-3.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.027	.026	.023	.018	.012	.008	.005	.003	.002	.001	.001	.001	.000	.000	
-2.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.060	.057	.046	.033	.021	.012	.008	.005	.003	.002	.001	.001	.001	.000	
-2.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	0.14	0.12	.096	.062	.037	.019	.011	.007	.004	.002	.001	.001	.001	.000	
-1.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	0.36	0.32	0.21	0.11	.061	.029	.015	.009	.005	.003	.002	.001	.001	.000	
-1.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	1.0	0.88	0.49	0.23	0.10	.042	.021	.012	.006	.003	.002	.001	.001	.000	
-0.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	2.9	2.0	0.92	0.36	0.14	.053	.026	.013	.007	.004	.002	.001	.001	.000	
HOUSE		CURB LINE													
STREET	4.4	2.8	1.1	0.41	0.15	.056	.026	.013	.007	.004	.002	.001	.001	.000	
0.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	2.9	2.0	0.92	0.36	0.14	.054	.026	.013	.007	.004	.002	.001	.001	.000	
1.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	1.0	0.81	0.44	0.21	.098	.041	.021	.011	.006	.003	.002	.001	.001	.000	
1.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	0.34	0.30	0.20	0.11	.059	.028	.015	.008	.005	.003	.002	.001	.001	.000	
2.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	0.13	0.12	.092	.060	.036	.019	.011	.006	.004	.002	.001	.001	.001	.000	
2.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.058	.055	.044	.032	.021	.013	.008	.005	.003	.002	.001	.001	.001	.000	
3.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.027	.026	.023	.017	.012	.008	.005	.003	.002	.001	.001	.001	.000	.000	
3.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.013	.013	.011	.009	.007	.005	.003	.002	.002	.001	.001	.001	.000	.000	
4.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.007	.007	.006	.005	.004	.003	.002	.002	.001	.001	.001	.000	.000	.000	
4.50	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.004	.004	.004	.003	.003	.002	.002	.001	.001	.001	.000	.000	.000	.000	
5.00	+	+	+	+	+	+	+	+	+	+	+	+	+	+	
	.002	.002	.002	.002	.002	.001	.001	.001	.001	.000	.000	.000	.000	.000	
	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
	LONGITUDINAL MOUNTING HEIGHT RATIOS														

CORRECTION FACTORS FOR OTHER MOUNTING HEIGHTS: SEE ISOFOOTCANDLE PAGE

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ELECTRICAL MEASUREMENTS

INPUT VOLTAGE: 13.0 VOLTS DC
INPUT CURRENT: 4.616 AMPS
INPUT POWER: 60.1 WATTS
OFF STATE POWER: 0.00 WATTS

LIGHT OUTPUT

LUMENS: 5087 lm
EFFICACY: 84.6 lm/W

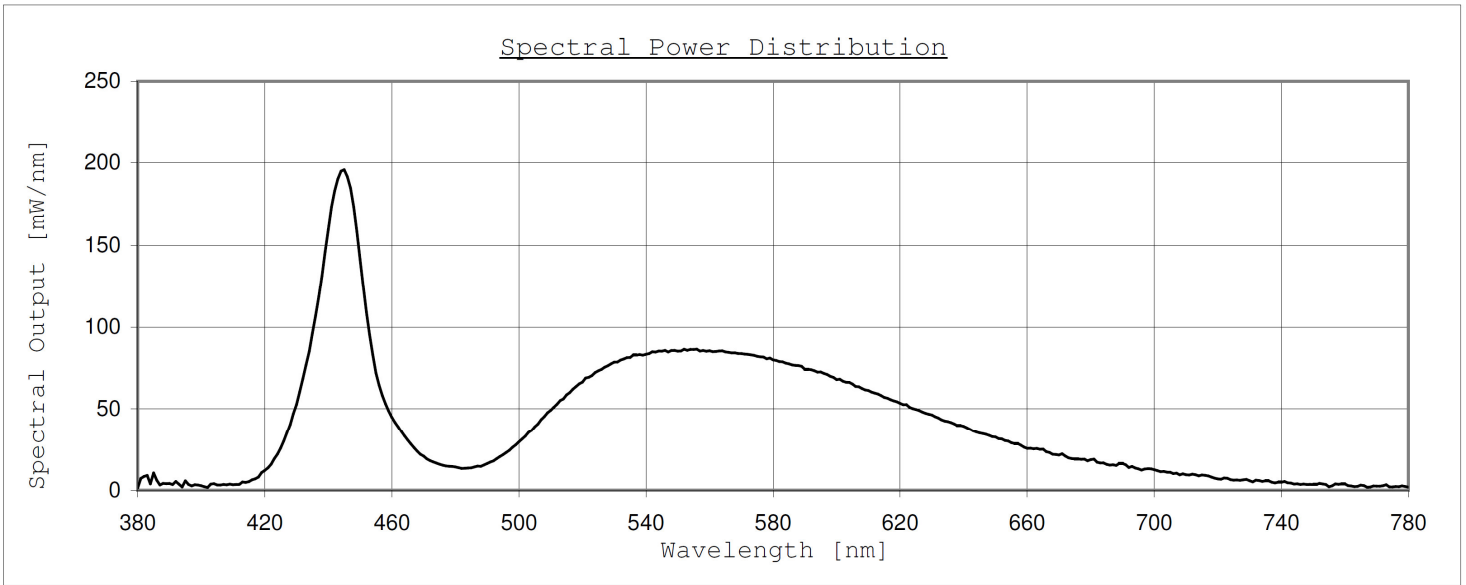
SPECTRAL MEASUREMENTS

X: 0.3255
y: 0.3334
u/u': 0.2050
v: 0.3150
v': 0.4726
Duv: 0.0007
CRI (R_a): 71.0
CRI (R_g): -14.2
CCT: 5821 K
RADIANT FLUX: 16269 mW

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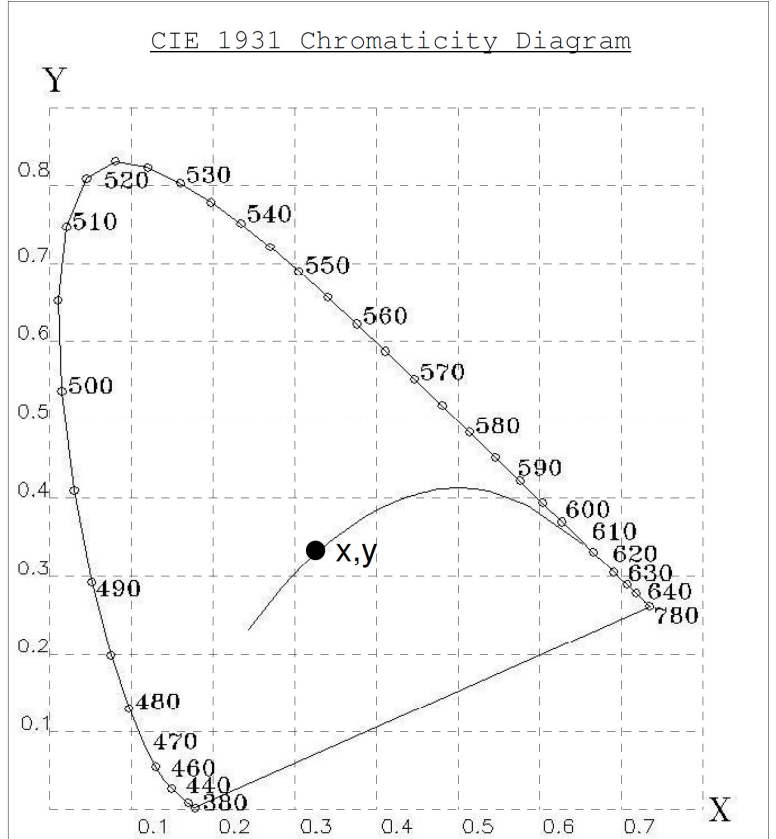
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Tabulated Spectral Power Distribution

Wavelength [nm]	[mW/nm]	Wavelength [nm]	[mW/nm]
380	1.38701	590	74.18169
390	4.16961	600	67.88799
400	2.81117	610	61.28289
410	3.39254	620	53.40647
420	12.09174	630	46.34284
430	52.64369	640	39.30207
440	159.40807	650	32.58983
450	141.29832	660	25.60048
460	44.84870	670	21.53800
470	20.85807	680	18.69255
480	14.22725	690	16.36277
490	16.33991	700	12.57312
500	29.59868	710	9.46055
510	49.15115	720	6.92364
520	66.39241	730	5.83089
530	78.54414	740	4.89383
540	83.31656	750	3.52824
550	85.23924	760	3.87821
560	85.49778	770	2.55405
570	83.76651	780	1.90197
580	79.99401		

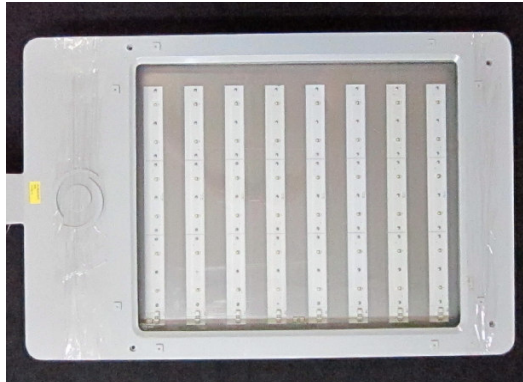


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LUMINOUS OPENING



SIDE VIEW



All testing was conducted in accordance with LM-79-08,

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products as published by the Illuminating Engineering Society of North America (IESNA).

The condition of the item tested was new. Stabilization time before testing exceeded 16 hours.

The test results (luminous distribution and flux) were obtained by using a Lighting Sciences series 6000 Type C Moving Mirror Goniophotometer

- The photometric reference standard used is a set of three incandescent luminous intensity standard lamps calibrated and traceable to the U.S. National Institute of Standards and Technology.

The test results (colorimetric and luminous flux) were obtained by using a Lighting Sciences model 4000 Integrating Sphere of either 1 or 2 meters diameter, having an internal reflectance exceeding 0.80. 4π geometry was used. Correction factors were applied for spectral mismatch and self-absorption. The spectroradiometer employed was a LSC model 500E having a bandwidth of .84.

- The photometric reference standard used is a set of three incandescent luminous flux standard lamps calibrated and traceable to the U.S. National Institute of Standards and Technology.
- The colorimetric reference standard used is an incandescent spectral standard lamp calibrated and traceable to the U.S. National Institute of Standards and Technology.

Power measurements were obtained with a Yokogawa WT210 power analyzer.

Ambient temperature during testing was $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured using an Omega model DP460.

Calibration certificates are on file at the laboratories of Lighting Sciences Inc.