



INDEPENDENT TEST LABORATORY REPORT No. 29019

SOLAR OUTDOOR LIGHTING - SHELTER AREA LUMINAIRE, CAT# UNISTAR
WITH CLEAR PLASTIC LENS
LED ARRAY. LUMINAIRE OUTPUT: 104 Lms.
LUMINAIRE OPERATING AT 3.2 VDC AND 2.0 WATTS

SPOTLIGHT SUMMARY:

BEAM ANGLE	44.9 Degrees
FIELD ANGLE	77.0 Degrees
MAX. INTENSITY (CANDLEPOWER)	164 Candelas
CENTER INTENSITY (CANDLEPOWER)	164 Candelas
BEAM LUMENS	54 Lms
BEAM EFFICIENCY	52.4 Percent
FIELD LUMENS	91 Lms
FIELD EFFICIENCY	87.8 Percent
TOTAL LUMENS	103.9 Lms
LUMINAIRE INPUT POWER	2.0 Watts
TOTAL EFFICIENCY	100.0 Percent
EFFICACY	52.0 Lumens per watt

*** THIS IS AN ABSOLUTE TEST REPORT ***
TOTAL EFFICIENCY IS THEREFORE 100%. BEAM AND FIELD
EFFICIENCIES ARE EXPRESSED AS A % OF TOTAL OUTPUT

PREPARED FOR:

SOLAR OUTDOOR LIGHTING INC
PALM CITY, FL

DATE:

May 3 2011

CERTIFIED BY:

FIELD ANGLE IS DEFINED BY 10 PERCENT OF MAX. INTENSITY (CANDLEPOWER)
BEAM ANGLE IS DEFINED BY 50 PERCENT OF MAX. INTENSITY (CANDLEPOWER)

TESTED IN ACCORDANCE WITH IES PROCEDURES.

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

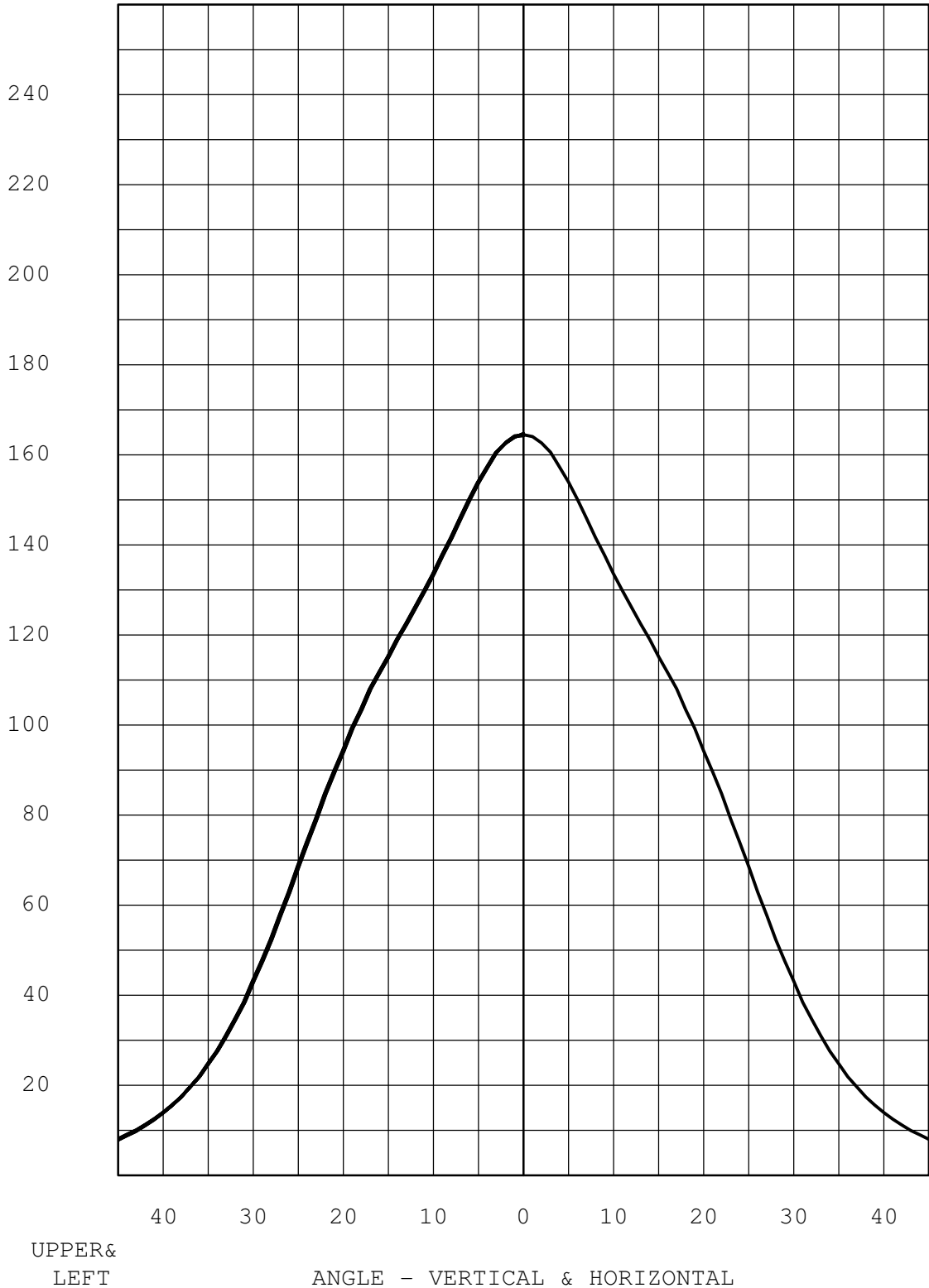
LABORATORY RESULTS MAY NOT BE REPRESENTATIVE OF FIELD PERFORMANCE.
BALLAST FACTORS HAVE NOT BEEN APPLIED.

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SPOTLIGHT
DATA

CANDLEPOWER THROUGH ORIGIN

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

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BEAM CENTER ILLUMINANCE, BEAM AND FIELD DIAMETERS

DISTANCE	ILLUMINANCE AT CENTER	BEAM DIAMETER	FIELD DIAMETER
10	1.6	8.3	15.9
15	0.7	12.4	23.9
20	0.4	16.5	31.8
25	0.3	20.6	39.8
30	0.2	24.8	47.8
35	0.1	28.9	55.7
40	0.1	33.0	63.7
45	0.1	37.2	71.6
50	0.1	41.3	79.6
55	0.1	45.4	87.6
60	0.0	49.5	95.5
65	0.0	53.7	103.5
70	0.0	57.8	111.4
75	0.0	61.9	119.4
80	0.0	66.1	127.4
85	0.0	70.2	135.3
90	0.0	74.3	143.3
95	0.0	78.5	151.2
100	0.0	82.6	159.2
105	0.0	86.7	167.2
110	0.0	90.8	175.1
115	0.0	95.0	183.1
120	0.0	99.1	191.0
125	0.0	103.2	199.0
130	0.0	107.4	207.0
135	0.0	111.5	214.9
140	0.0	115.6	222.9
145	0.0	119.7	230.8
150	0.0	123.9	238.8

IF DISTANCE IS IN FEET, ILLUMINANCE IS IN FOOTCANDLES
IF DISTANCE IS IN METERS, ILLUMINANCE IS IN LUX

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TABULATION OF INTENSITY (CANDLEPOWER) VS ANGLE
 FOR ILLUMINANCE CALCULATION
 Candelas

ANGLE	COSINE OF ANGLE	CP	ANGLE	COSINE OF ANGLE	CP	ANGLE	COSINE OF ANGLE	CP
0	1.00	164	30	0.87	43	60	0.50	2
1	1.00	164	31	0.86	38	61	0.48	2
2	1.00	163	32	0.85	35	62	0.47	1
3	1.00	161	33	0.84	31	63	0.45	1
4	1.00	157	34	0.83	28	64	0.44	1
5	1.00	154	35	0.82	25	65	0.42	1
6	0.99	150	36	0.81	22	66	0.41	1
7	0.99	146	37	0.80	20	67	0.39	1
8	0.99	142	38	0.79	17	68	0.37	1
9	0.99	138	39	0.78	16	69	0.36	1
10	0.98	133	40	0.77	14	70	0.34	1
11	0.98	130	41	0.75	12	71	0.33	1
12	0.98	126	42	0.74	11	72	0.31	1
13	0.97	122	43	0.73	10	73	0.29	1
14	0.97	119	44	0.72	9	74	0.28	0
15	0.97	115	45	0.71	8	75	0.26	0
16	0.96	112	46	0.69	7	76	0.24	0
17	0.96	108	47	0.68	6	77	0.22	0
18	0.95	103	48	0.67	6	78	0.21	0
19	0.95	99	49	0.66	5	79	0.19	0
20	0.94	94	50	0.64	5	80	0.17	0
21	0.93	90	51	0.63	4	81	0.16	0
22	0.93	85	52	0.62	4	82	0.14	0
23	0.92	79	53	0.60	4	83	0.12	0
24	0.91	74	54	0.59	3	84	0.10	0
25	0.91	69	55	0.57	3	85	0.09	0
26	0.90	63	56	0.56	3	86	0.07	0
27	0.89	58	57	0.54	2	87	0.05	0
28	0.88	52	58	0.53	2	88	0.03	0
29	0.87	48	59	0.52	2	89	0.02	0

ILLUMINANCE AT ANY POINT ON A PLANE PERPENDICULAR TO THE LUMINAIRE
 AXIS CAN BE CALCULATED BY EITHER OF TWO METHODS:

METHOD 1:
$$\text{ILLUMINANCE} = \frac{\text{CANDLEPOWER} \times \text{COSINE OF ANGLE}}{\text{DISTANCE SQUARED FROM SPOTLIGHT TO POINT}}$$

METHOD 2:
$$\text{ILLUMINANCE} = \frac{\text{CANDLEPOWER} \times \text{COSINE CUBED OF ANGLE}}{\text{DISTANCE SQUARED FROM SPOTLIGHT TO POINT}}$$

IF DISTANCE IS IN FEET, ILLUMINANCE IS IN FOOTCANDLES
 IF DISTANCE IS IN METERS, ILLUMINANCE IS IN LUX

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CONE OF LIGHT TABULATION
 (ILLUMINANCES ON A PLANE PERPENDICULAR TO LAMP AXIS)

DISTANCE FROM LUMINAIRE	ILLUMINANCE DIRECTLY ON AXIS	DIAMETER OF CIRCLE	ILLUMINANCE AT EDGE OF CIRCLE
1.0	165.0	0.7	82.5
1.5	73.3	1.1	36.7
2.0	41.2	1.4	20.6
2.5	26.4	1.8	13.2
3.0	18.3	2.1	9.2
3.5	13.5	2.5	6.7
4.0	10.3	2.8	5.2
4.5	8.1	3.2	4.1
5.0	6.6	3.5	3.3
5.5	5.5	3.9	2.7
6.0	4.6	4.2	2.3
6.5	3.9	4.6	2.0
7.0	3.4	4.9	1.7
7.5	2.9	5.3	1.5
8.0	2.6	5.6	1.3
8.5	2.3	6.0	1.1
9.0	2.0	6.3	1.0
9.5	1.8	6.7	0.9
10.0	1.6	7.0	0.8
11.0	1.4	7.7	0.7
12.0	1.1	8.4	0.6
13.0	1.0	9.1	0.5
14.0	0.8	9.8	0.4
15.0	0.7	10.5	0.4
16.0	0.6	11.2	0.3
17.0	0.6	11.9	0.3
18.0	0.5	12.6	0.3
19.0	0.5	13.3	0.2
20.0	0.4	14.0	0.2
21.0	0.4	14.7	0.2
22.0	0.3	15.4	0.2
23.0	0.3	16.1	0.2
24.0	0.3	16.8	0.1
25.0	0.3	17.5	0.1
26.0	0.2	18.2	0.1
27.0	0.2	18.9	0.1
28.0	0.2	19.6	0.1
29.0	0.2	20.3	0.1
30.0	0.2	21.0	0.1

TOTAL CONE ANGLE = 38.6 DEGREES
 (BASED UPON POINT WHERE ILLUMINANCE DROPS TO: 50% OF CENTER VALUE)

NOTE: DISTANCE IN FEET, ILLUMINANCE IN FOOTCANDLES
 DISTANCE IS IN METERS, ILLUMINANCE IS IN LUX

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ELECTRICAL MEASUREMENTS

INPUT VOLTAGE: 3.2 VOLTS DC
INPUT CURRENT: 0.626 AMPS
INPUT POWER: 2.0 WATTS
POWER FACTOR: N/A PERCENT
TOTAL HARMONIC DISTORTION: N/A PERCENT
OFF STATE POWER: 0.00 WATTS

LIGHT OUTPUT

LUMENS: 104 lm
EFFICACY: 52.0 lm/W

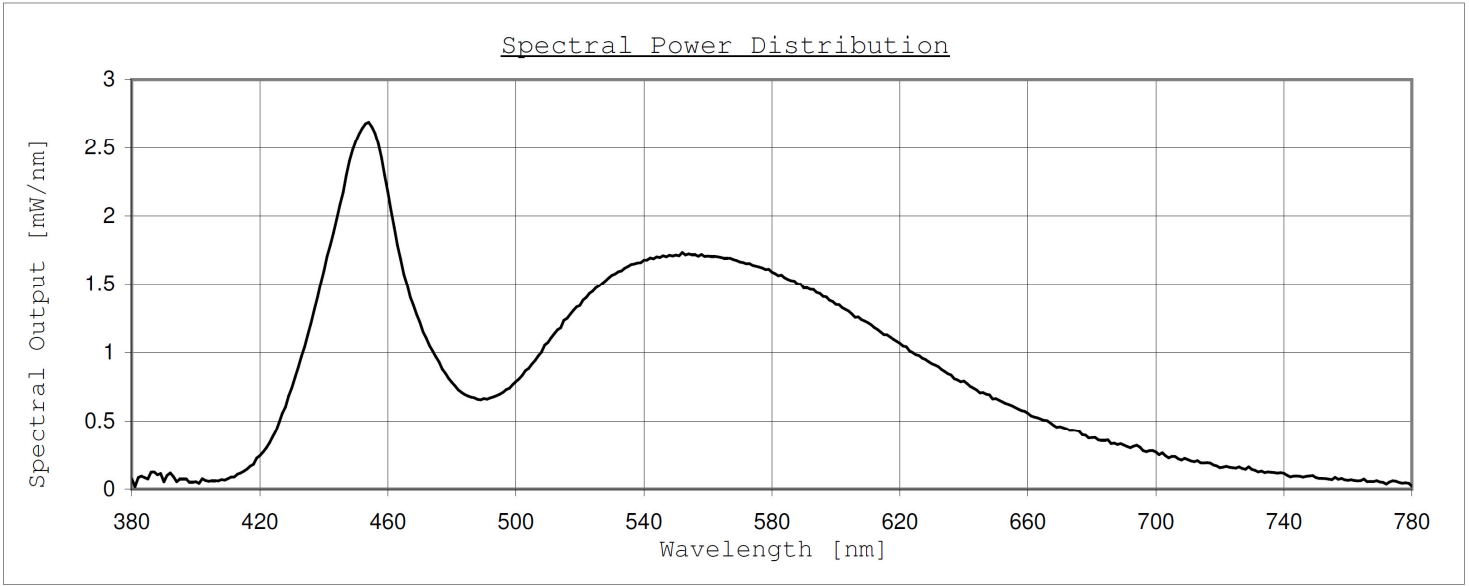
SPECTRAL MEASUREMENTS

X: 0.3199
y: 0.3394
u/u': 0.1989
v: 0.3166
v': 0.4748
Duv: 0.0050
CRI (R_a): 77.6
CRI (R_g): -6.2
CCT: 6077 K
RADIANT FLUX: 337 mW

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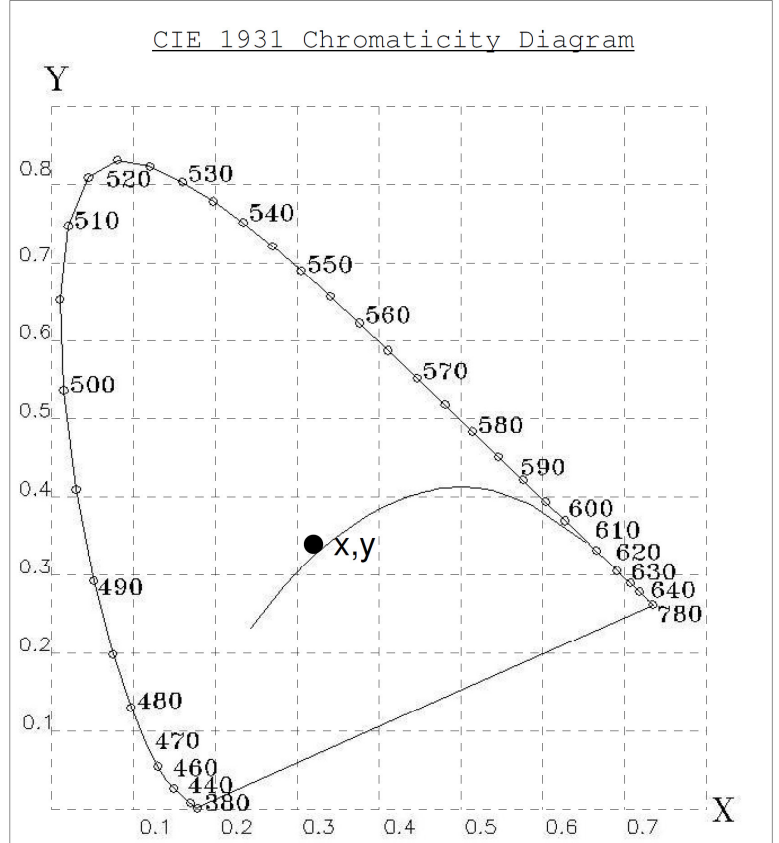
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Tabulated Spectral Power Distribution

Wavelength [nm]	[mW/nm]	Wavelength [nm]	[mW/nm]
380	0.07288	590	1.47252
390	0.05335	600	1.35165
400	0.05394	610	1.21810
410	0.07588	620	1.06738
420	0.24457	630	0.91889
430	0.74570	640	0.79306
440	1.59954	650	0.66520
450	2.54773	660	0.55836
460	2.17559	670	0.45936
470	1.22128	680	0.37570
480	0.78365	690	0.32119
490	0.66567	700	0.27069
500	0.78928	710	0.21487
510	1.07356	720	0.15646
520	1.34399	730	0.14353
530	1.56817	740	0.11573
540	1.67807	750	0.08467
550	1.71623	760	0.06442
560	1.70908	770	0.05208
570	1.66594	780	0.02213
580	1.59125		



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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.