



Report of Test LLI-18312-2

LED Roadway Lighting - Roadway luminaire. Product ID: L6 16S 5 X 2ES B X XX 3 XX X X
Grey painted cast aluminum housing with no lens.
16 LEDs in one 4 x 4 array with clear plastic sheet of individual lenses.
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1000ma.
Operating at 120 VAC and 60 Hz.



Performance Summary

Total Light Output	7123 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	58.6 W	Max THD(i)*	11.0 % @ 277 V
Luminous Efficacy	121.6 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3050 K	80-90° Zonal Flux %	1.5 %
CIE(x,y) 1931	(0.434, 0.406)	BUG Rating*	B2-U0-G2
CRI	72	Street Classification*	Type II Short

PREPARED FOR : LED Roadway Lighting Ltd, Halifax. NS Canada



LightLab
INTERNATIONAL

LightLab International, LLC
Phoenix AZ 85085



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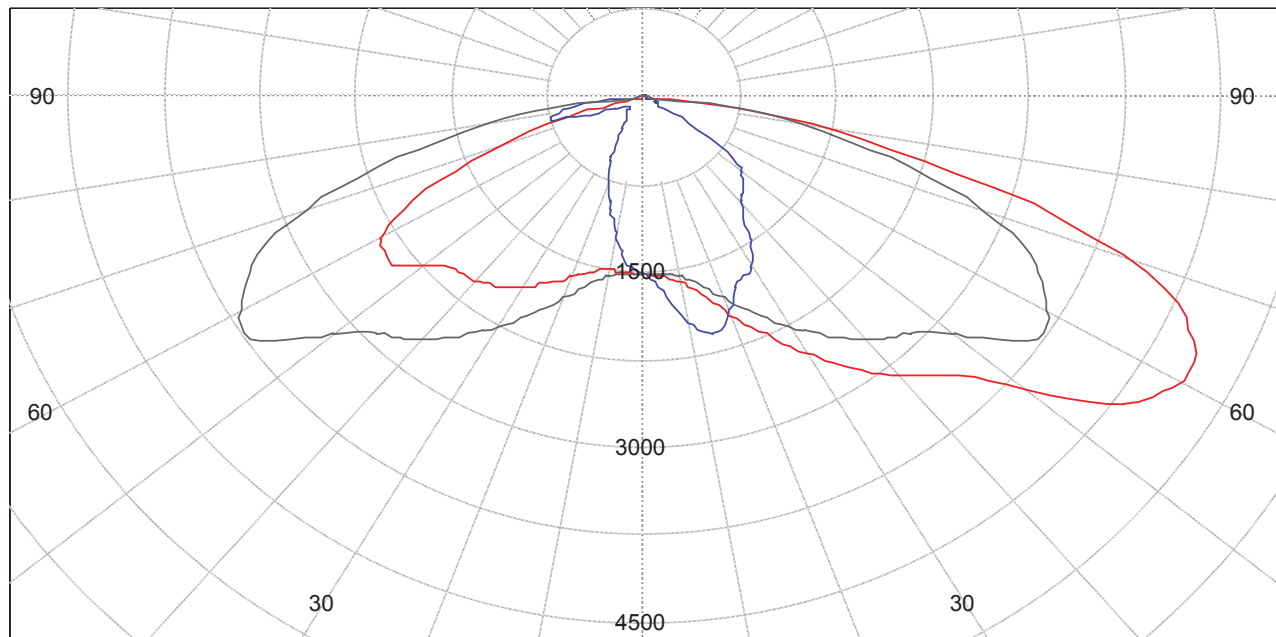
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Polar Light Distribution Curves



House side / L270

L90 / 270 - Black, Plane of maximum - Red, L0 / 180 - Blue (cd)

Street side / L90

Percentage Outputs

	Upward	Downward	Total
Street Side	0.0 %	68.5 %	68.5 %
House Side	0.0 %	31.5 %	31.5 %
	0.0 %	100.0 %	100.0 %

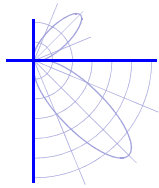
Report data based on absolute values as measured.

Signed:

Ryder Tunney
Ryder Tunney
Authorized Signatory

Date of test
Date of report

14-Nov-2018
14-Nov-2018



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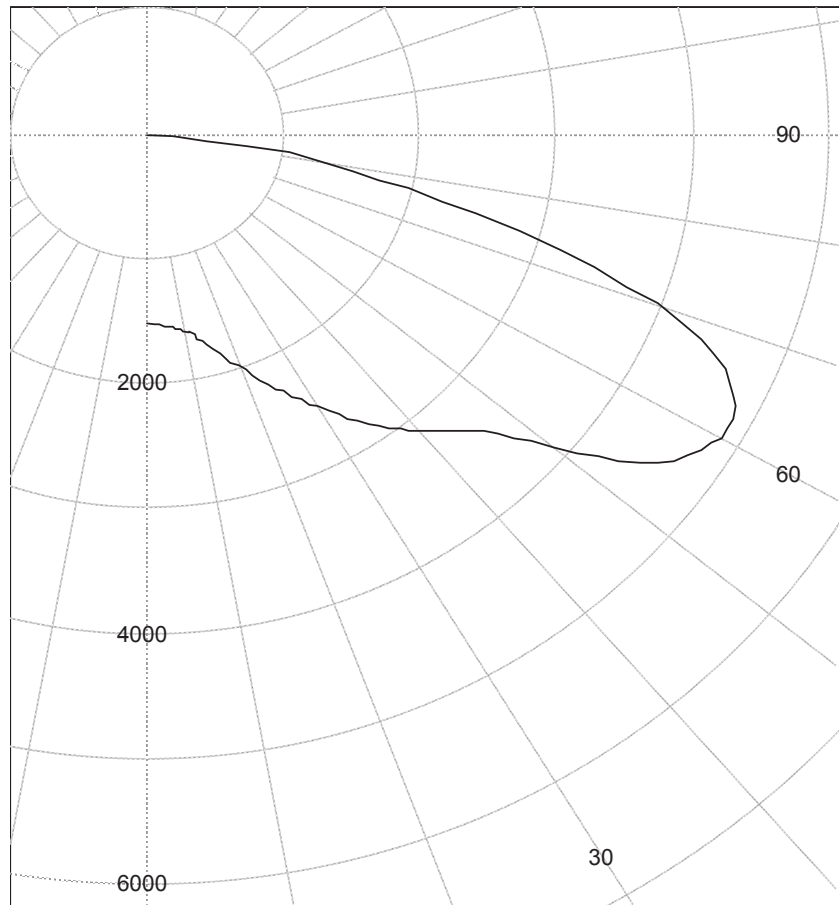
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Operating at 120 VAC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1519.3
10.0	1604.0
20.0	1985.3
30.0	2534.0
35.0	2835.3
40.0	3111.8
45.0	3370.3
47.5	3575.2
50.0	3895.6
52.5	4268.1
55.0	4568.3
57.5	4755.9
60.0	4857.5
62.5	4850.4
65.0	4703.2
67.5	4457.7
70.0	3981.3
72.5	3323.5
75.0	2509.8
77.5	1854.0
80.0	1331.0
82.5	584.2
85.0	40.3
87.5	5.2
90.0	0.0
92.5	0.0
95.0	0.0
97.5	0.0
100.0	0.0
102.5	0.0
105.0	0.0
120.0	0.0
135.0	0.0
150.0	0.0
165.0	0.0
180.0	0.0

Principal Vertical Plane



House side max intensity
3719.6 cd @ (90.0°, 57.0°)

Street side max intensity
4867.3 cd @ (75.0°, 61.0°)

Coordinates expressed in the C Type coordinate system

Data for the two symmetric halves of the luminaire has been averaged.



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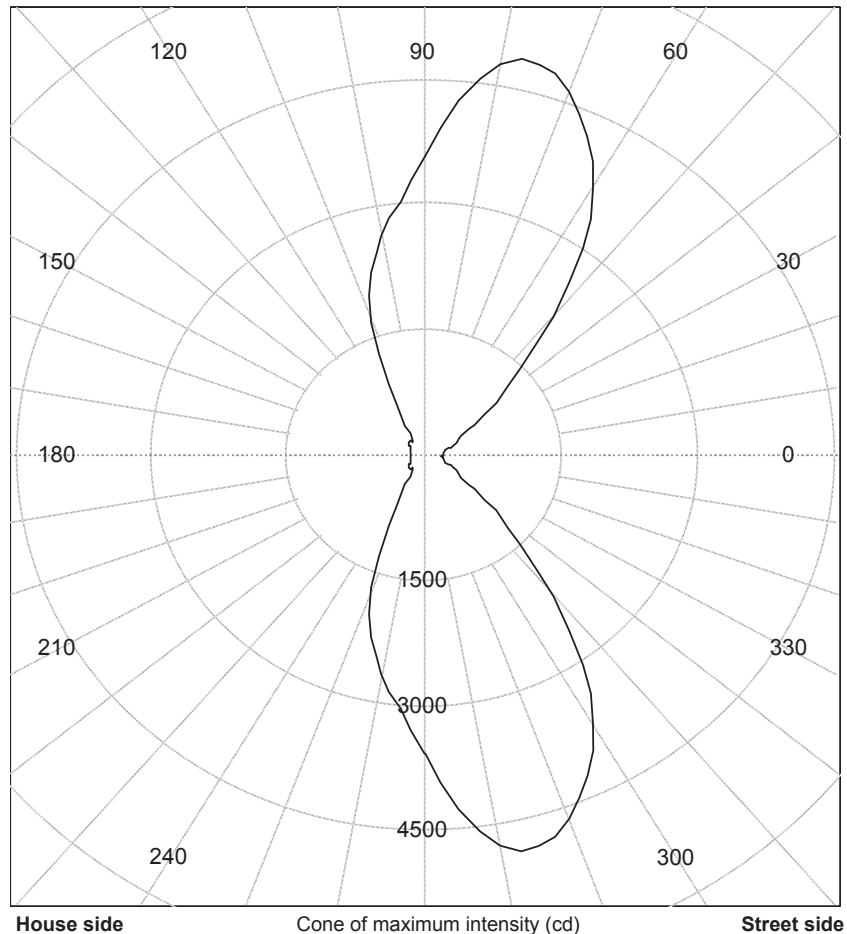
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V61.0) (cd)
0	178.9
15	241.6
30	475.7
40	996.0
45	1476.2
50	2195.2
55	3030.4
60	3702.3
65	4253.1
70	4656.3
75	4867.3
80	4762.1
85	4268.7
90	3594.0
95	3052.2
100	2679.9
105	2281.5
110	1680.6
115	940.1
120	402.8
125	204.6
130	207.3
135	230.6
140	229.3
150	181.9
165	160.1
180	140.4

Principal Conical Surface



House side max intensity
3719.6 cd @ (90.0°, 57.0°)

Street side max intensity
4867.3 cd @ (75.0°, 61.0°)

Coordinates expressed in the C Type coordinate system

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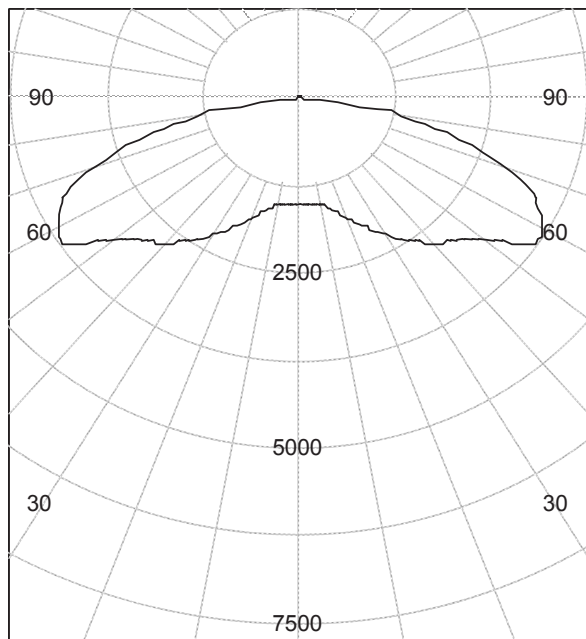
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Polar curve through L90 / L270

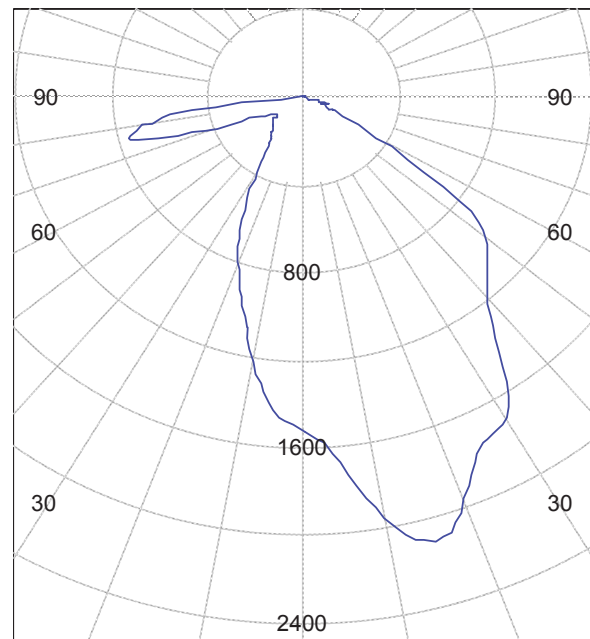


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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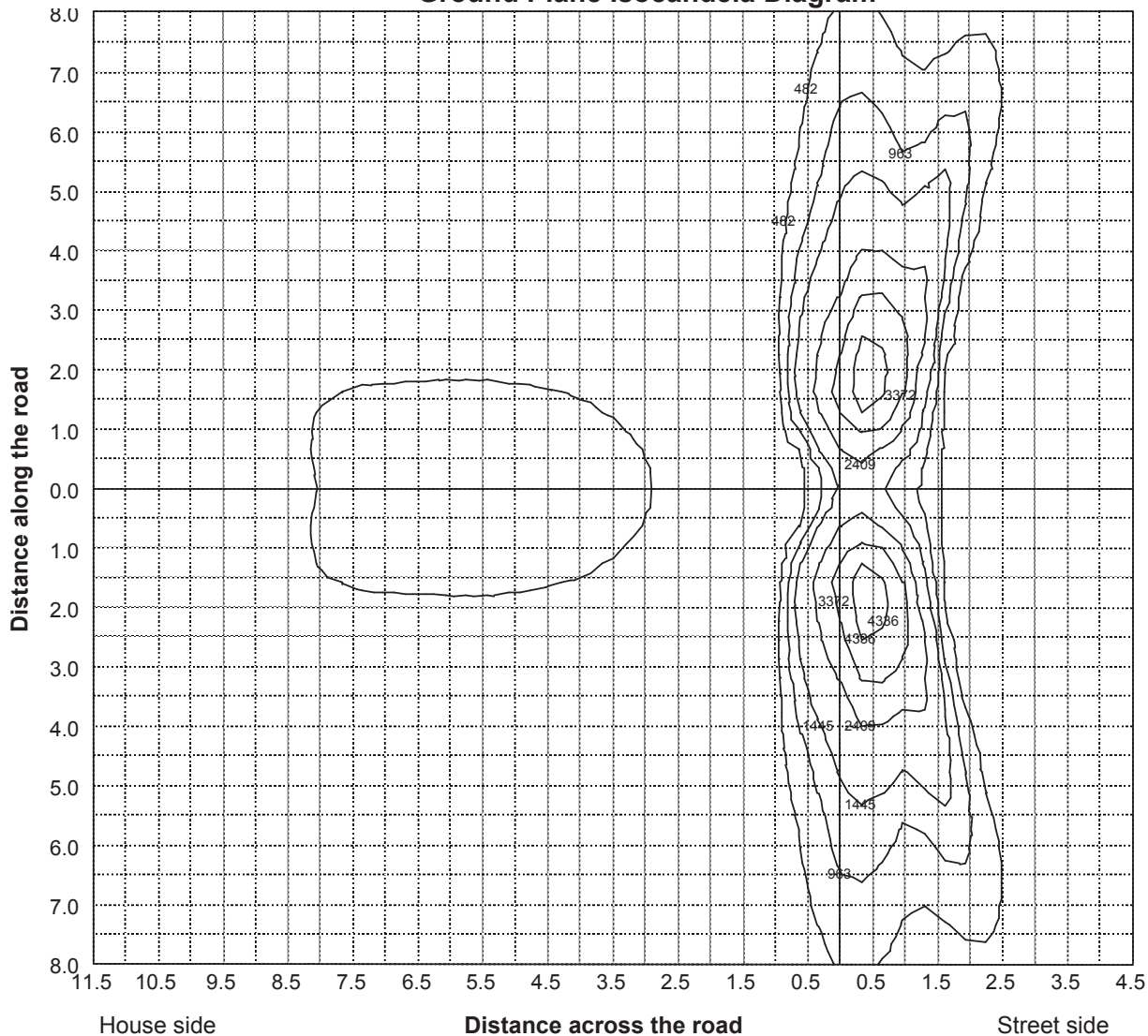
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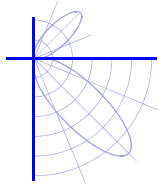
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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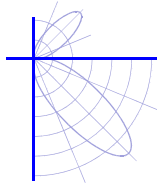
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1519	1519	1519	1519	1519	1519	1519	1519	1519
10.0	1948	1924	1876	1830	1802	1768	1729	1694	1658
20.0	1952	1989	2111	2195	2218	2227	2221	2182	2128
30.0	1682	1715	1859	2084	2238	2401	2545	2639	2665
35.0	1413	1534	1818	2055	2204	2393	2600	2777	2883
40.0	1184	1317	1702	2062	2244	2445	2671	2894	3067
45.0	1087	1223	1636	2100	2393	2672	2911	3107	3280
47.5	1039	1169	1594	2088	2438	2766	3040	3276	3484
50.0	986	1084	1511	2035	2453	2895	3270	3538	3759
52.5	896	973	1382	1933	2384	2875	3343	3722	4014
55.0	702	799	1222	1800	2254	2784	3302	3761	4144
57.5	474	547	966	1596	2061	2655	3227	3759	4220
60.0	265	332	602	1189	1683	2374	3122	3742	4266
62.5	130	152	314	724	1150	1856	2807	3578	4163
65.0	116	118	126	360	668	1218	2209	3216	3915
67.5	95	101	104	139	270	630	1443	2706	3635
70.0	81	86	93	103	122	204	627	1922	3238
72.5	101	89	81	85	89	102	144	908	2460
75.0	98	106	66	73	67	77	90	190	1491
77.5	69	83	50	63	57	55	68	78	720
80.0	46	64	35	39	45	38	42	50	278
82.5	14	22	16	19	20	21	21	24	104
85.0	4	4	4	6	6	7	7	8	13
87.5	1	1	1	2	2	2	3	3	4
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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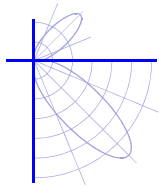
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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1519	1519	1519	1519	1519	1519	1519	1519	1519
10.0	1630	1604	1586	1572	1557	1539	1524	1506	1487
20.0	2060	1985	1928	1884	1835	1789	1729	1646	1551
30.0	2623	2534	2435	2352	2264	2165	2036	1875	1678
35.0	2903	2835	2721	2610	2498	2360	2191	1977	1750
40.0	3139	3112	3003	2863	2706	2525	2306	2054	1809
45.0	3371	3370	3262	3087	2876	2638	2370	2095	1851
47.5	3590	3575	3445	3231	2984	2709	2414	2126	1868
50.0	3902	3896	3743	3480	3168	2851	2517	2218	1939
52.5	4212	4268	4123	3789	3396	3017	2654	2343	2023
55.0	4440	4568	4482	4146	3656	3198	2792	2438	2018
57.5	4586	4756	4663	4279	3714	3208	2800	2421	1914
60.0	4654	4858	4744	4274	3635	3110	2732	2344	1770
62.5	4581	4850	4766	4238	3517	2954	2583	2154	1504
65.0	4352	4703	4748	4196	3375	2773	2389	1876	1138
67.5	4066	4458	4648	4062	3159	2599	2192	1524	746
70.0	3698	3981	4308	3772	2797	2344	1919	1125	442
72.5	3170	3324	3739	3358	2430	2026	1510	700	228
75.0	2620	2510	2812	2712	1987	1583	1001	327	112
77.5	1836	1854	1759	2022	1587	1111	543	113	72
80.0	1064	1331	964	1324	1190	644	199	45	44
82.5	384	584	363	567	636	252	30	22	24
85.0	26	40	34	48	66	28	9	9	12
87.5	4	5	5	5	5	5	5	4	4
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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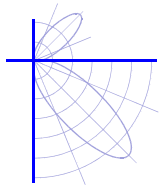
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Operating at 120 VAC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1519	1519	1519	1519	1519	1519	1519	1519	1519
10.0	1466	1442	1415	1386	1357	1331	1285	1234	1223
20.0	1443	1332	1225	1135	1052	988	904	829	804
30.0	1487	1313	1150	991	843	722	552	421	383
35.0	1529	1327	1122	909	699	531	354	271	251
40.0	1579	1344	1061	757	494	335	232	211	207
45.0	1602	1294	914	516	274	209	199	190	177
47.5	1587	1231	789	382	212	194	196	186	166
50.0	1602	1164	650	295	198	190	196	183	160
52.5	1593	1033	506	241	197	200	196	178	150
55.0	1469	843	386	210	207	210	194	165	144
57.5	1270	651	290	201	217	218	190	154	139
60.0	1052	473	222	204	226	226	184	158	140
62.5	754	309	189	215	237	231	179	163	151
65.0	467	201	182	216	235	225	175	171	205
67.5	267	160	179	220	234	214	172	235	304
70.0	170	139	171	219	226	200	172	335	441
72.5	135	119	162	213	212	193	175	459	588
75.0	98	100	147	193	195	186	207	605	750
77.5	66	75	125	161	172	174	260	601	730
80.0	43	56	87	119	128	146	285	541	643
82.5	26	30	48	69	77	109	214	447	523
85.0	10	10	19	20	25	25	78	217	257
87.5	4	4	4	4	5	5	6	4	4
90.0	0	0	0	0	0	0	0	0	0
92.5	0	0	0	0	0	0	0	0	0
95.0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0
100.0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0
105.0	0	0	0	0	0	0	0	0	0
120.0	0	0	0	0	0	0	0	0	0
135.0	0	0	0	0	0	0	0	0	0
150.0	0	0	0	0	0	0	0	0	0
165.0	0	0	0	0	0	0	0	0	0
180.0	0	0	0	0	0	0	0	0	0



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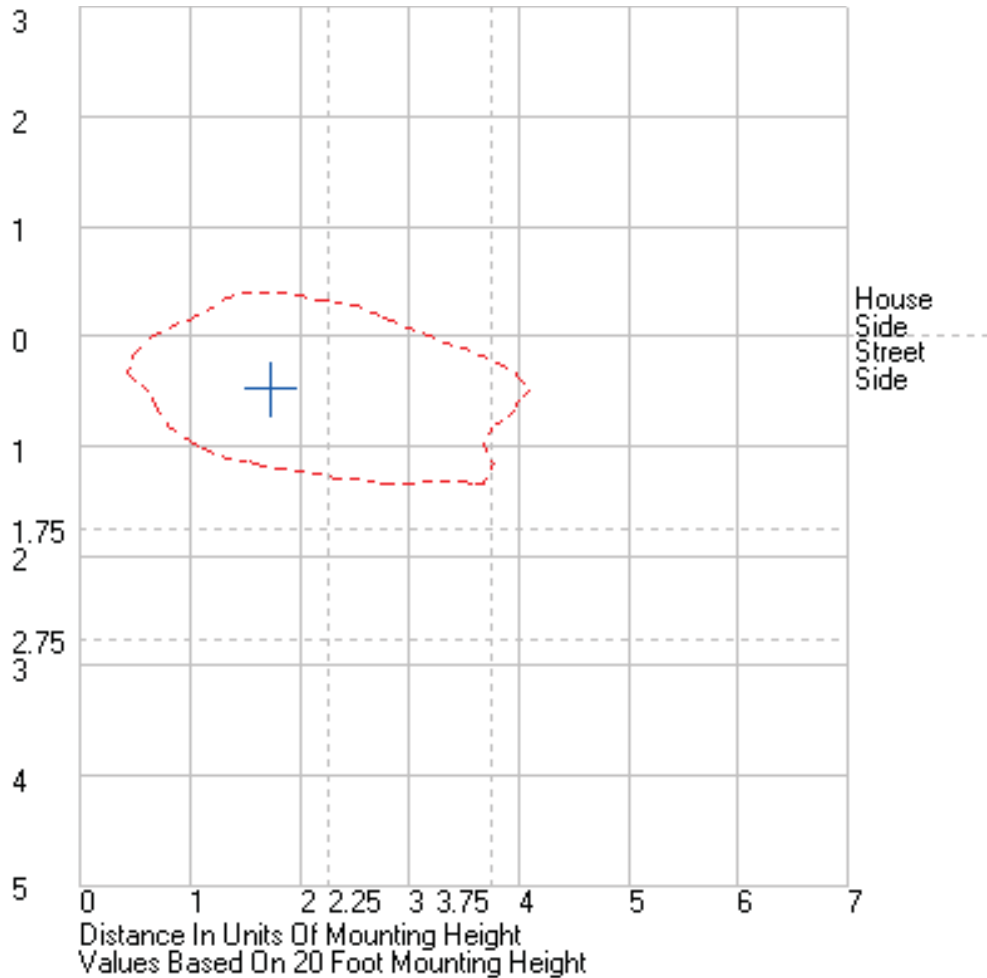
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.434, 0.406)
	CIE 1976 (u', v') ⁽¹⁾	(0.248, 0.522)
	Correlated Color Temperature (CCT) ⁽¹⁾	3050 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	0.0036
	Color Rendering Index (Ra) ⁽¹⁾	71.7
	Special CRI 9 (R ₉) ^{(1),(3)}	-40.6
	Distance from Planckian Locus (Duv) ^{(1),(3)}	0.0010
	Scotopic/Photopic Ratio ^{(1),(3)}	1.26

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.491 A	
	Power	58.6 W	
	Power Factor	0.995	
	Current THD	4.9 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.214 A	
	Power	56.4 W	
	Power Factor	0.952	
	Current THD	11 %	

Performance data in accordance with IESNA LM-79-08. Spectral calculations are for a CIE 2° observer

Photometric and spectral values were measured at Setpoint 1

(1) Value is computed from the weighted average of the spatial measurements

(2) Value is the maximum deviation of the spatial u' and v' measurements from the weighted average

(3) Quantity is in addition to the scope of IESNA LM-79-08



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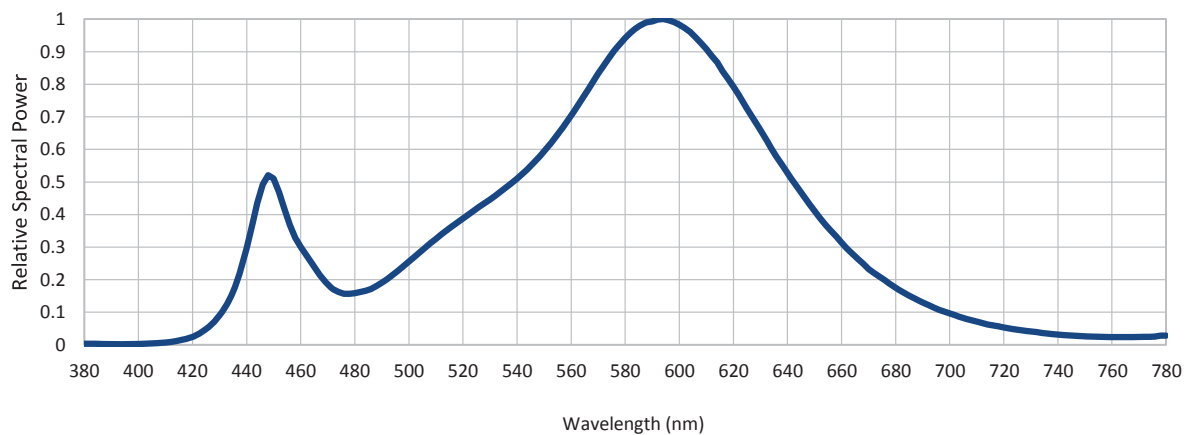
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LM-79 Performance Data

Summary relative spectral irradiance distribution (wavelength – nm, irradiance – relative to peak = 1)

380	0.003	480	0.159	580	0.942	680	0.175
385	0.003	485	0.169	585	0.977	685	0.151
390	0.002	490	0.191	590	0.993	690	0.130
395	0.002	495	0.221	595	0.999	695	0.112
400	0.003	500	0.256	600	0.983	700	0.097
405	0.004	505	0.291	605	0.952	705	0.083
410	0.007	510	0.325	610	0.908	710	0.071
415	0.013	515	0.358	615	0.853	715	0.062
420	0.025	520	0.388	620	0.792	720	0.053
425	0.049	525	0.418	625	0.725	725	0.047
430	0.091	530	0.446	630	0.659	730	0.041
435	0.165	535	0.477	635	0.591	735	0.036
440	0.298	540	0.510	640	0.529	740	0.032
445	0.464	545	0.549	645	0.467	745	0.029
450	0.511	550	0.594	650	0.413	750	0.026
455	0.393	555	0.646	655	0.360	755	0.025
460	0.301	560	0.705	660	0.314	760	0.025
465	0.239	565	0.767	665	0.272	765	0.024
470	0.185	570	0.832	670	0.233	770	0.025
475	0.160	575	0.891	675	0.203	775	0.025
						780	0.028



The relative spectral power distribution combines the weighted spectral power distributions of all spatial measurements.



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LM-79 Performance Data

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0° plane	Horiz. 90° plane
0.0	(0.247, 0.521)	(0.247, 0.521)
10.0	(0.247, 0.521)	(0.248, 0.521)
20.0	(0.248, 0.522)	(0.247, 0.522)
30.0	(0.248, 0.522)	(0.248, 0.521)
40.0	(0.249, 0.522)	(0.247, 0.521)
50.0	(0.249, 0.522)	(0.248, 0.520)
60.0	(0.249, 0.523)	I <= 10% peak
70.0	(0.249, 0.522)	I <= 10% peak
80.0	(0.246, 0.519)	I <= 10% peak
-	-	-

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0° plane	Horiz. 90° plane
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-

Test procedure

All measurements were performed in an environmentally controlled laboratory employing suitable baffling to minimize stray light. The sample was mounted in its normal operating orientation on a rotating mirror goniophotometer and operated from a stabilized supply. The photometric output was monitored and measurements were performed once stability was achieved.

The goniophotometer was used to measure the spatial distribution of both luminous intensity and, in conjunction with a spectroradiometer, spectral irradiance. The distribution locus comprises points in two or more planes (as indicated in the table above) at no more than 10° vertical intervals. The CIE (x,y) coordinates and other derived metrics (CIE (u', v'), CCT and CRI) are calculated from the weighted sum (weighted for intensity and represented solid angle) of the measured spectral irradiances.

Sample Orientation

Horizontal

Stabilization & total operation time 16.5 / 19.25 hours

Equipment and uncertainties

LightLab International R80A C-gamma rotating mirror goniophotometer with a test distance of 8 m.

Luminous Intensity ± 4 %
Luminous Flux ± 4 %
Horiz., Vert. Angles ± 0.25°

Temperature ± 1 °C
Luminous Efficacy ± 4.5 %

PhotoResearch PR-670 spectroradiometer (grating with 380 - 780 nm range, 2 nm / pixel, 5 nm bandwidth, incandescent/halogen calibration source). Measured at a distance from the sample deemed >5 times the maximum observed luminous opening dimension.

CIE (x, y) coordinates ± 0.003 CCT ± 100 K
CIE (u', v') coordinates ± 0.002 CRI (Ra) ± 2
Spatial Δ (u', v') uniformity ± 0.001 Scotopic / Photopic Ratio * ± 0.02
Rel. Spectral Irradiance * ± 2 % R9 * ± 2
Duv * ± 5E-04

Yokogawa WT210 power meter connected in circuit to the sample electrical supply

Voltage ± 0.5 % Frequency * ± 0.1 Hz
Current ± 0.5 % Power ± 0.5 %
Current THD * ± 3 % Power Factor ± 0.02

This report contains data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.

Calculator / report version 1.0.7 / 5.7 (30th Jan 2017)

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Test Report No. LLI-18312-2

LED Roadway Lighting - Roadway luminaire. Product ID: L6 16S 5 X 2ES B X XX 3 XX X X

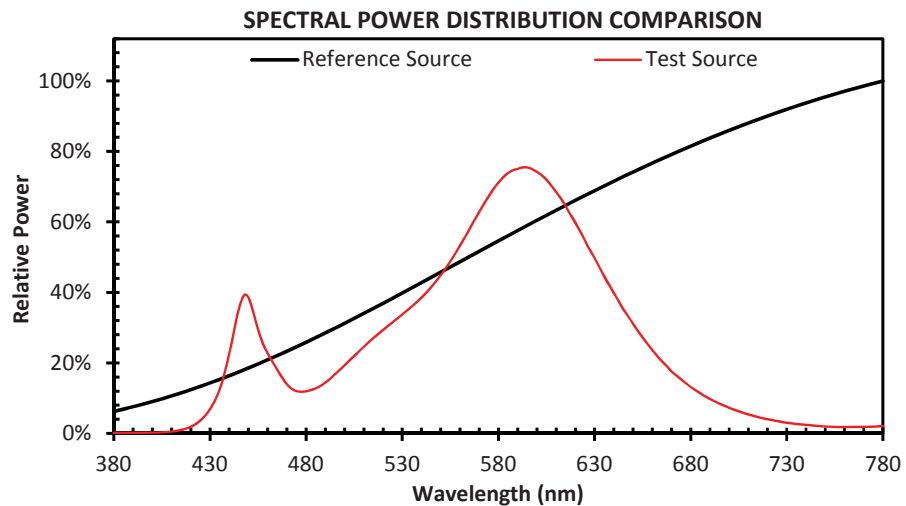
Grey painted cast aluminum housing with no lens.

16 LEDs in one 4 x 4 array with clear plastic sheet of individual lenses.

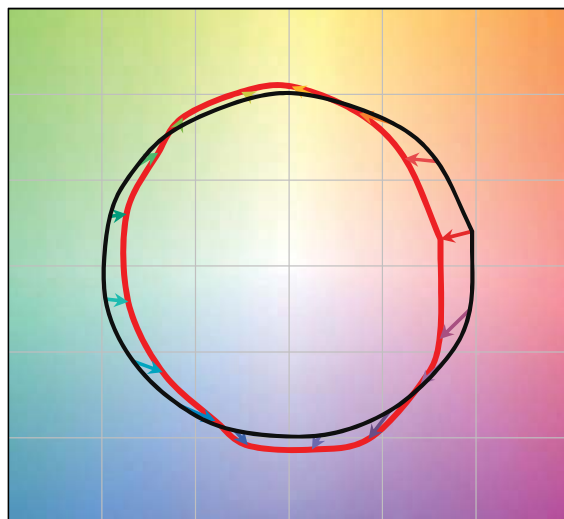
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1000ma.

Operating at 120 VAC and 60 Hz.

R_f	74
R_g	92



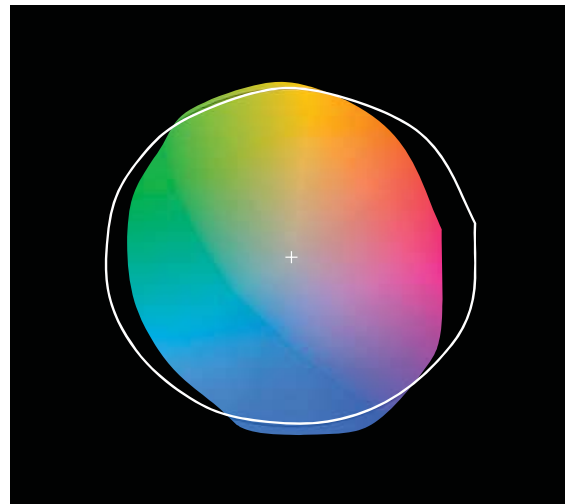
COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-18312-2

LED Roadway Lighting - Roadway luminaire. Product ID: L6 16S 5 X 2ES B X XX 3 XX X X

Grey painted cast aluminum housing with no lens.

16 LEDs in one 4 x 4 array with clear plastic sheet of individual lenses.

One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1000ma.

Operating at 120 VAC and 60 Hz.

Test Distance 8.0 m
Test Temperature 25.3 °C

Notes The laboratory has not participated in the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent that the test sample is representative of production units.

Tested in accordance with the applicable sections of publications: IES LM-79-08 (Sec. 12), IES LM-16-93, IES LM-58-13, CIE 13.3:1995, CIE 15:2004, ANSI C78.377:2015, ANSI C82.77-10:2014.

The luminous intensity values, and other derived quantities, contained in this report are based on the absolute data, as measured.

Prorating the performance of the sample for the use of other component combinations (such as lamp / LED / Ballast / driver), or for use in different environmental conditions than that tested, may produce erroneous results.

This report is free of erasures and corrections.

Photometric intensity values are reported using the IESNA Type C coordinate system (L, V) as defined in IESNA publication LM-75.

This report may contain data that are not covered by the NVLAP accreditation. Quantities marked with * are not covered.

This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the Federal Government.