



Report of Test LLI-19100-3

LED Roadway Lighting - Roadway luminaire. Product ID: L6 16S 5 X 2ES R X XX 4 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 120v AC and 60 Hz.



Performance Summary

Total Light Output	7131 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	55.6 W	Max THD(i)*	12.0 % @ 277 V
Luminous Efficacy	128.3 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3990 K	80-90° Zonal Flux %	1.7 %
CIE(x,y) 1931	(0.381, 0.376)	BUG Rating*	B2-U0-G2
CRI	72	Street Classification*	Type II Short

PREPARED FOR : LED Roadway Lighting Ltd, 115 Chain Lake Drive, Halifax. NS Canada



LightLab
INTERNATIONAL

LightLab International, LLC
Phoenix AZ 85085



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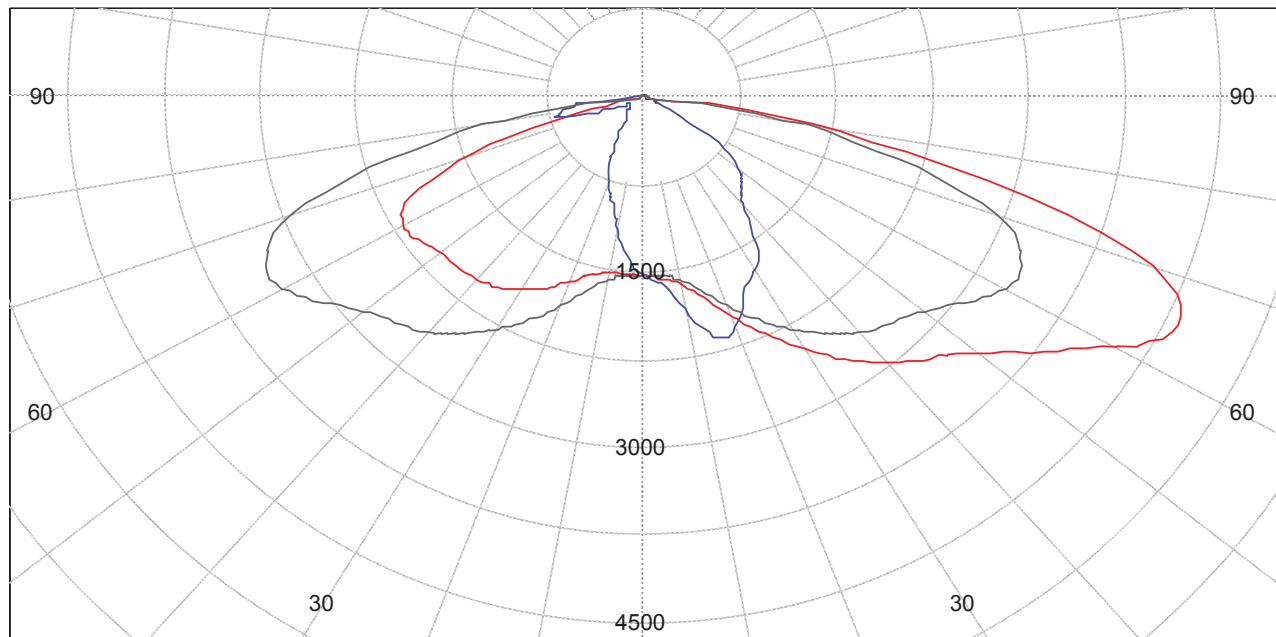
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Polar Light Distribution Curves



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 %	68.3 %	68.3 %
House Side	0.0 %	31.7 %	31.7 %
	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

15-Apr-2019
16-Apr-2019



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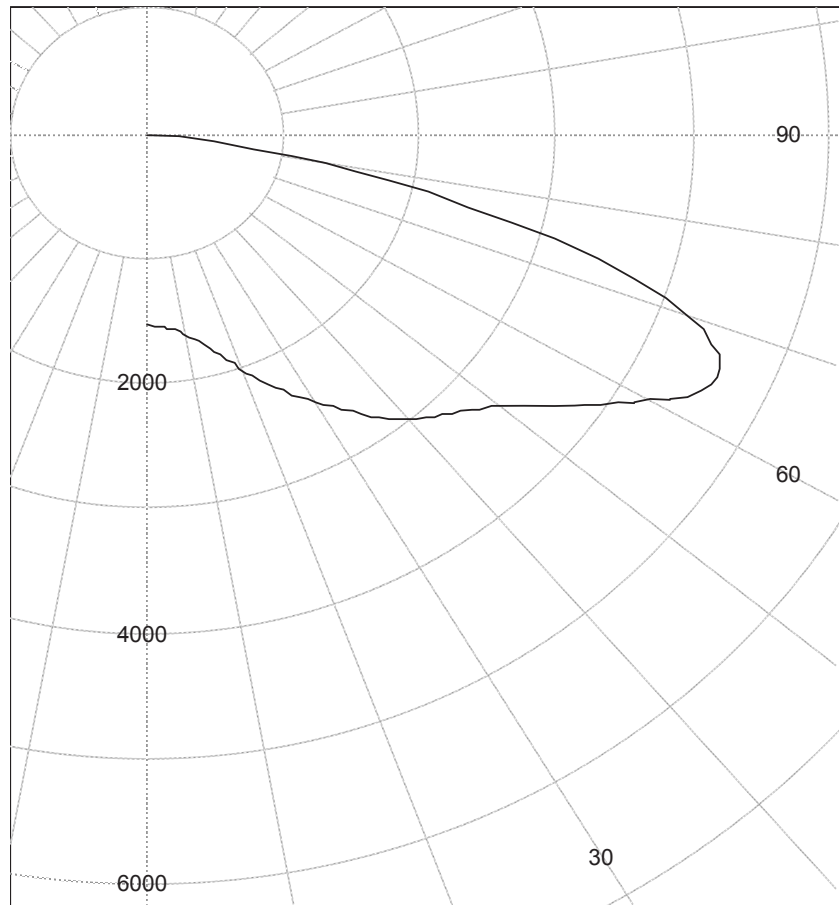
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Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	1534.9
10.0	1623.9
20.0	2000.2
30.0	2488.6
35.0	2739.7
40.0	2975.3
45.0	3163.6
47.5	3257.4
50.0	3413.2
52.5	3584.3
55.0	3801.8
57.5	4012.5
60.0	4273.3
62.5	4517.4
65.0	4603.8
67.5	4513.6
70.0	4220.9
72.5	3610.3
75.0	2770.8
77.5	1963.8
80.0	1335.1
82.5	644.6
85.0	43.2
87.5	6.4
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



Plane of maximum intensity (cd)

House side max intensity
3309.6 cd @ (90.0°, 62.0°)

Street side max intensity
4603.8 cd @ (75.0°, 65.0°)

Coordinates expressed in the C Type coordinate system

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



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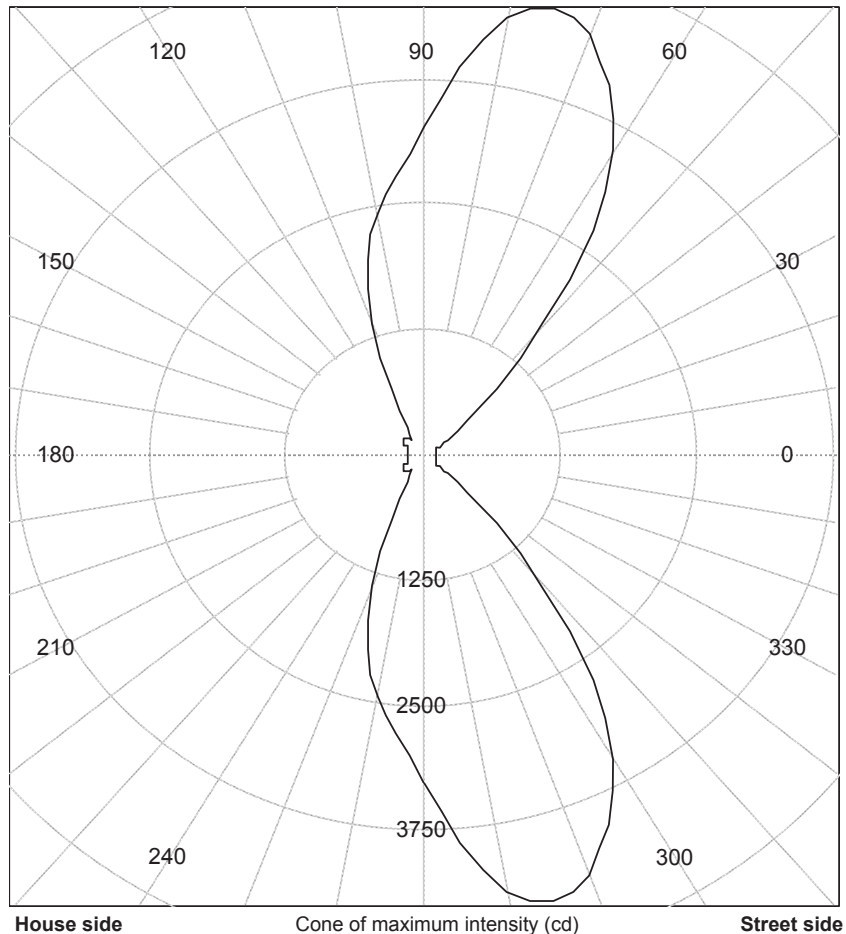
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V65.0) (cd)
0	117.2
15	120.3
30	153.8
40	512.9
45	930.1
50	1690.5
55	2718.5
60	3475.9
65	4040.3
70	4430.1
75	4603.8
80	4399.5
85	3871.4
90	3250.1
95	2783.1
100	2439.3
105	2004.7
110	1387.2
115	705.8
120	296.8
125	189.4
130	215.9
135	239.9
140	238.0
150	178.3
165	153.3
180	155.5

Principal Conical Surface



House side max intensity
3309.6 cd @ (90.0°, 62.0°)

Street side max intensity
4603.8 cd @ (75.0°, 65.0°)

Coordinates expressed in the C Type coordinate system
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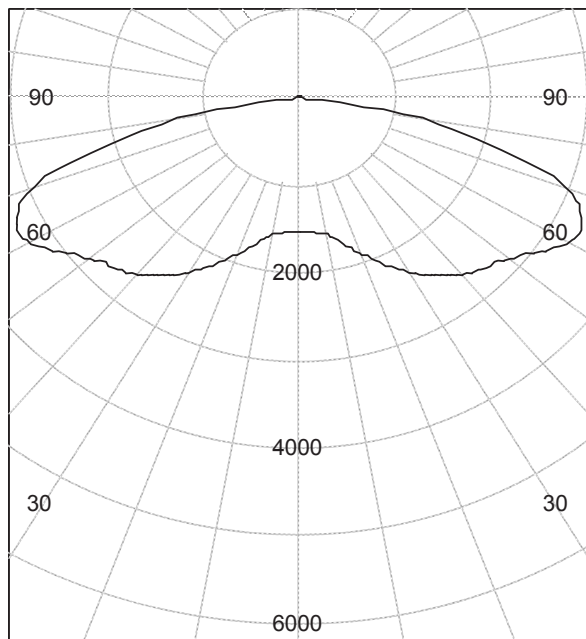
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Polar curve through L90 / L270

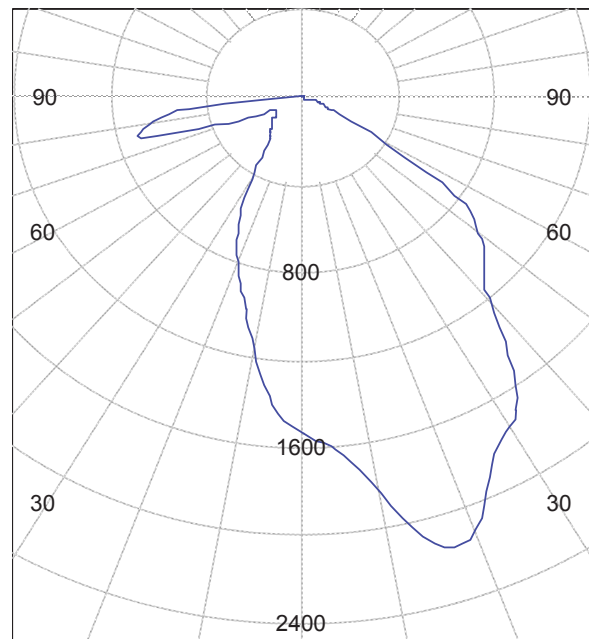


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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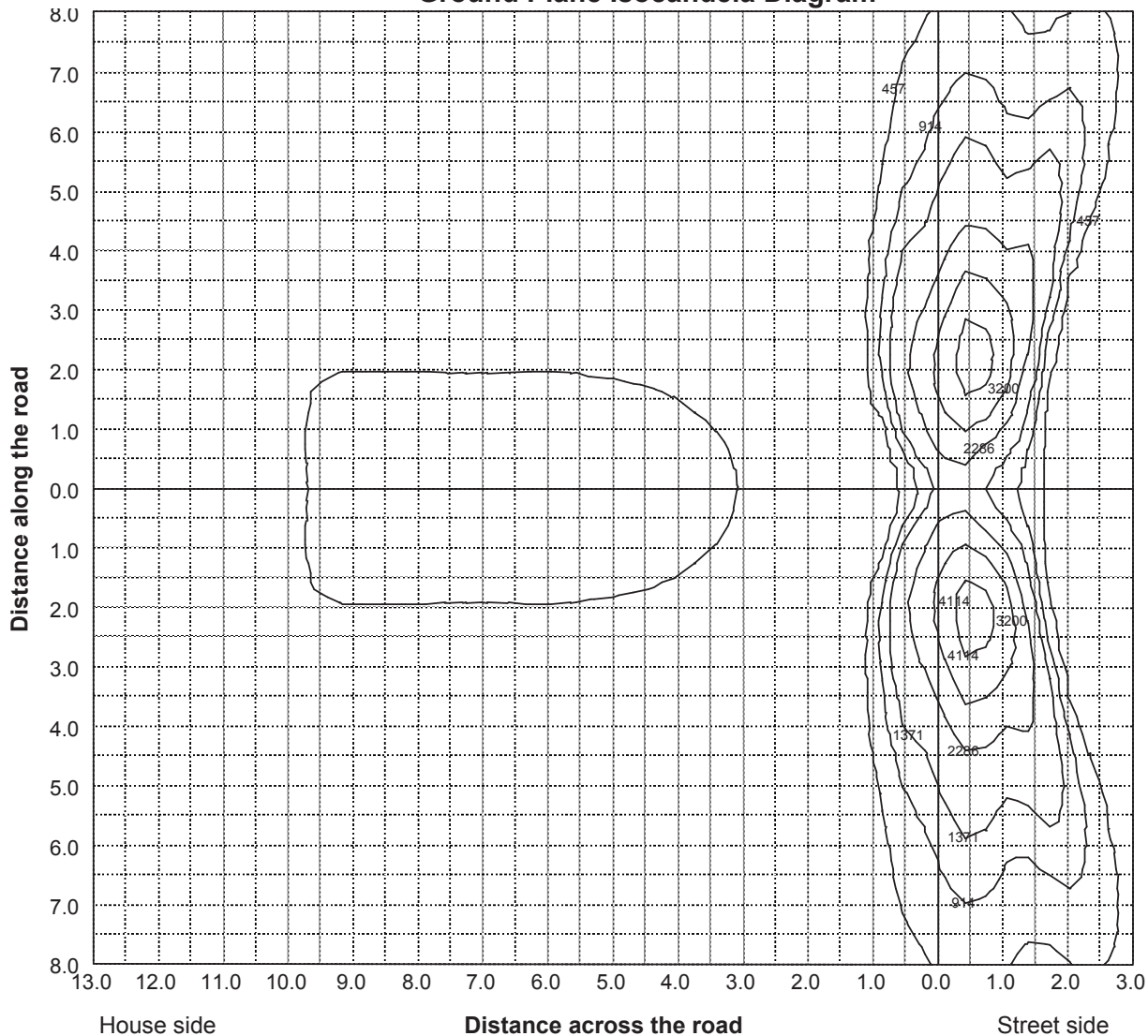
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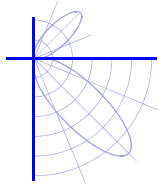
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	1535	1535	1535	1535	1535	1535	1535	1535	1535
10.0	1836	1808	1760	1717	1699	1681	1665	1653	1645
20.0	2099	2128	2211	2255	2244	2225	2185	2129	2073
30.0	1729	1769	1970	2247	2406	2545	2638	2682	2650
35.0	1525	1629	1887	2152	2329	2523	2701	2823	2880
40.0	1202	1361	1762	2111	2301	2505	2721	2911	3033
45.0	1064	1194	1610	2095	2353	2581	2782	2984	3146
47.5	1019	1143	1554	2071	2381	2644	2848	3045	3219
50.0	960	1074	1497	2041	2414	2726	2956	3154	3338
52.5	887	973	1400	1977	2414	2789	3068	3296	3495
55.0	776	853	1256	1855	2340	2791	3153	3429	3657
57.5	555	648	1076	1680	2176	2716	3173	3541	3815
60.0	324	391	764	1408	1923	2564	3117	3589	3990
62.5	147	178	409	963	1485	2266	3007	3586	4092
65.0	117	120	154	513	930	1690	2718	3476	4040
67.5	94	101	105	175	425	974	2089	3163	3815
70.0	75	83	92	101	139	370	1208	2562	3431
72.5	70	70	81	83	88	116	356	1649	2908
75.0	65	69	64	71	65	77	97	765	2126
77.5	62	72	46	62	54	53	69	147	1227
80.0	34	54	31	37	42	35	40	59	619
82.5	12	14	14	17	18	19	19	25	187
85.0	3	3	3	5	5	5	6	6	15
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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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	1535	1535	1535	1535	1535	1535	1535	1535	1535
10.0	1638	1624	1610	1599	1585	1568	1550	1525	1495
20.0	2032	2000	1968	1941	1904	1851	1778	1684	1573
30.0	2576	2489	2423	2367	2295	2197	2068	1905	1712
35.0	2837	2740	2648	2572	2476	2353	2188	1986	1781
40.0	3048	2975	2862	2763	2630	2469	2274	2042	1822
45.0	3213	3164	3043	2906	2739	2539	2300	2062	1837
47.5	3302	3257	3129	2973	2781	2559	2306	2059	1828
50.0	3441	3413	3271	3079	2859	2601	2325	2072	1824
52.5	3609	3584	3422	3206	2935	2646	2360	2103	1838
55.0	3801	3802	3652	3396	3064	2731	2428	2155	1844
57.5	3992	4013	3863	3573	3177	2803	2480	2176	1791
60.0	4237	4273	4093	3749	3279	2867	2519	2168	1706
62.5	4422	4517	4297	3845	3309	2867	2528	2135	1587
65.0	4430	4604	4400	3871	3250	2783	2439	2005	1387
67.5	4231	4514	4409	3855	3142	2636	2260	1741	1064
70.0	3866	4221	4302	3753	2927	2434	2043	1411	698
72.5	3316	3610	3919	3446	2513	2098	1724	1020	407
75.0	2777	2771	3197	2933	2061	1683	1252	554	187
77.5	2173	1964	2166	2188	1574	1209	711	243	89
80.0	1422	1335	1233	1510	1103	782	286	65	48
82.5	575	645	488	728	542	317	75	25	30
85.0	29	43	36	53	60	29	12	12	15
87.5	5	6	6	6	6	6	6	5	5
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

RT



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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	1535	1535	1535	1535	1535	1535	1535	1535	1535
10.0	1461	1424	1389	1357	1326	1290	1234	1181	1169
20.0	1448	1325	1212	1121	1045	979	895	823	802
30.0	1527	1356	1194	1042	896	767	594	468	431
35.0	1578	1380	1186	983	778	600	397	290	262
40.0	1606	1390	1135	862	592	395	246	214	211
45.0	1603	1334	1011	650	345	222	203	192	181
47.5	1577	1272	905	507	250	199	199	186	167
50.0	1536	1187	762	382	204	195	202	184	159
52.5	1495	1071	607	288	198	202	204	181	152
55.0	1424	921	472	233	207	216	203	174	143
57.5	1290	749	358	212	215	224	198	155	135
60.0	1121	580	270	206	226	232	189	151	134
62.5	936	434	213	211	237	239	183	151	135
65.0	706	297	189	216	240	238	178	153	155
67.5	456	194	181	216	243	228	176	186	228
70.0	261	154	170	214	235	215	172	265	339
72.5	163	128	159	208	221	202	170	373	498
75.0	114	106	145	192	202	194	181	544	695
77.5	75	81	125	165	178	181	236	585	690
80.0	48	59	93	118	135	154	282	534	632
82.5	30	39	60	76	104	115	239	450	540
85.0	16	20	26	30	41	62	114	275	323
87.5	5	6	6	7	7	7	8	7	6
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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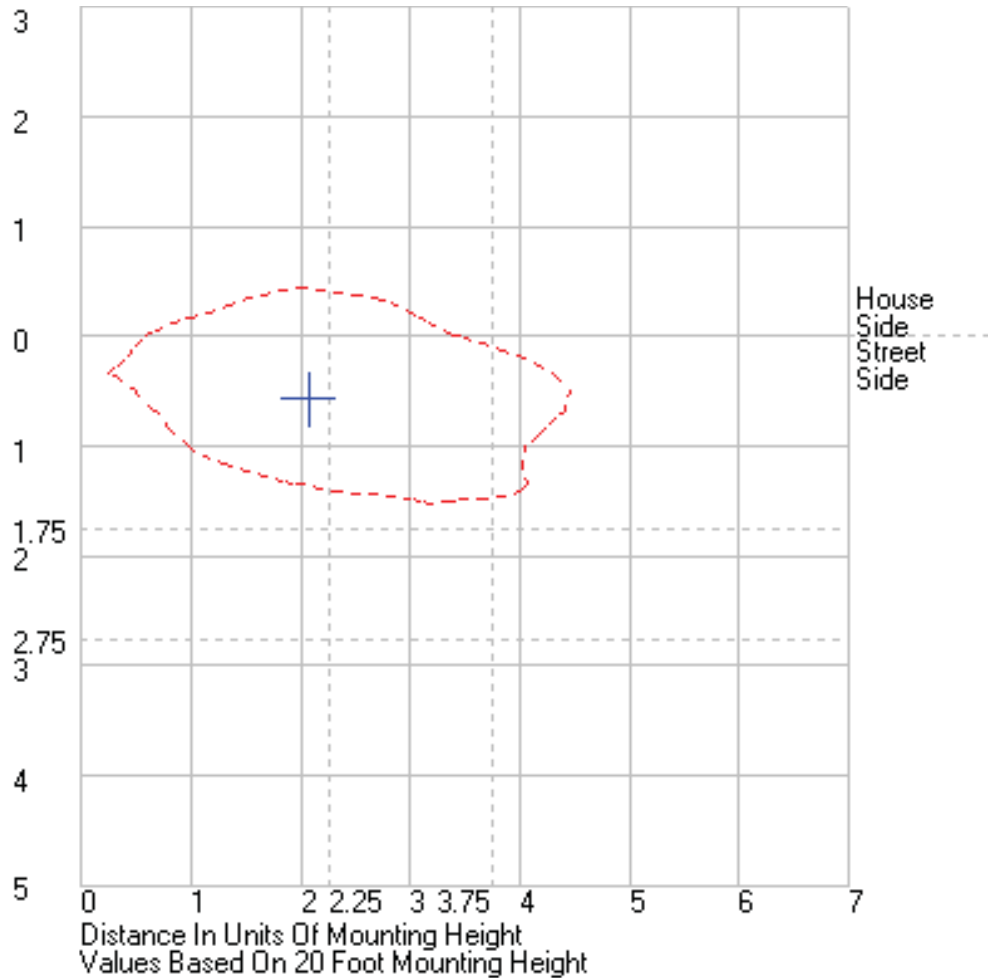
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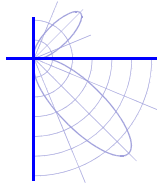
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.381, 0.376)
	CIE 1976 (u', v') ⁽¹⁾	(0.225, 0.501)
	Correlated Color Temperature (CCT) ⁽¹⁾	3990 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	3.54E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.9
	Special CRI 9 (R ₉) ^{(1),(3)}	-33.2
	Distance from Planckian Locus (Duv) ^{(1),(3)}	-3.04E-04
	Scotopic/Photopic Ratio ^{(1),(3)}	1.52

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.466 A	
	Power	55.6 W	
	Power Factor	1.00	
	Current THD	5.2 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.205 A	
	Power	53.8 W	
	Power Factor	0.95	
	Current THD	12 %	

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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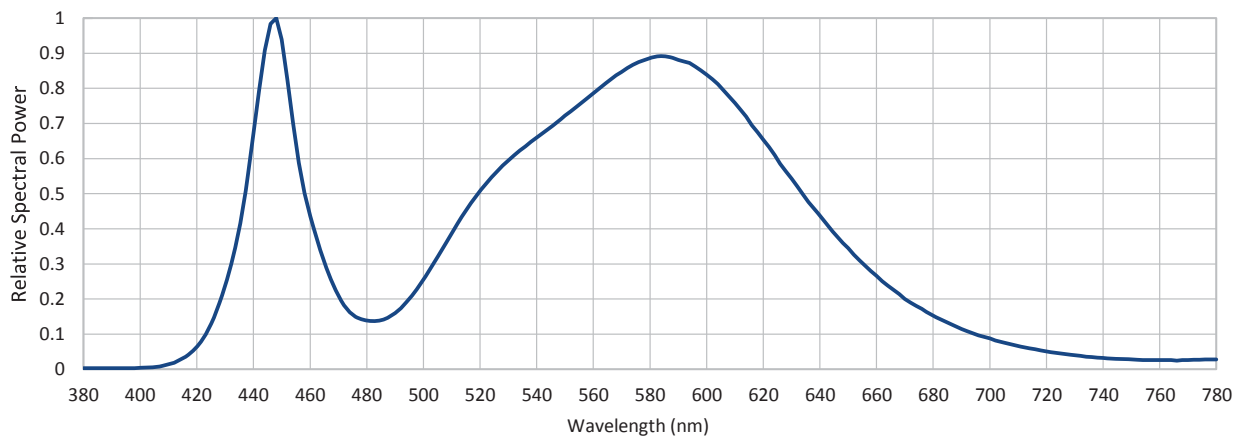
Operating at 120v AC and 60 Hz.

LM-79 Performance Data

Relative spectral power distribution

(Relative to peak = 1, weighted average of spatial measurements)

λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power	λ (nm)	Relative Power
380	0.003	460	0.436	540	0.660	620	0.654	700	0.088
385	0.003	465	0.306	545	0.690	625	0.597	705	0.076
390	0.003	470	0.208	550	0.722	630	0.543	710	0.066
395	0.003	475	0.156	555	0.753	635	0.487	715	0.058
400	0.004	480	0.139	560	0.787	640	0.437	720	0.051
405	0.007	485	0.140	565	0.818	645	0.388	725	0.045
410	0.014	490	0.160	570	0.847	650	0.345	730	0.040
415	0.031	495	0.200	575	0.871	655	0.302	735	0.036
420	0.064	500	0.256	580	0.886	660	0.266	740	0.032
425	0.130	505	0.320	585	0.891	665	0.232	745	0.030
430	0.237	510	0.387	590	0.881	670	0.200	750	0.028
435	0.405	515	0.452	595	0.867	675	0.176	755	0.026
440	0.670	520	0.508	600	0.839	680	0.153	760	0.026
445	0.946	525	0.556	605	0.803	685	0.133	765	0.026
450	0.939	530	0.595	610	0.758	690	0.115	770	0.026
455	0.644	535	0.629	615	0.707	695	0.100	775	0.027
								780	0.028





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LM-79 Performance Data

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0.0° plane	Horiz. ° plane
0.0	(0.224, 0.498)	(0.224, 0.499)
10.0	(0.224, 0.499)	(0.225, 0.501)
20.0	(0.225, 0.502)	(0.224, 0.500)
30.0	(0.225, 0.502)	(0.225, 0.502)
40.0	(0.226, 0.502)	(0.224, 0.500)
50.0	(0.226, 0.502)	(0.225, 0.500)
60.0	(0.226, 0.502)	I <= 10% peak
70.0	(0.226, 0.502)	I <= 10% peak
80.0	(0.224, 0.498)	I <= 10% peak
-	-	-

Spatial measurements

Vert. angle (°)	CIE 1976 (u',v') coordinates	
	Horiz. 0.0° plane	Horiz. ° 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 0.5 / 16.5 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 1.0.10 / 5.9 (14th Dec 2017)

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Test Report No. LLI-19100-3

LED Roadway Lighting - Roadway luminaire. Product ID: L6 16S 5 X 2ES R X XX 4 XX X X

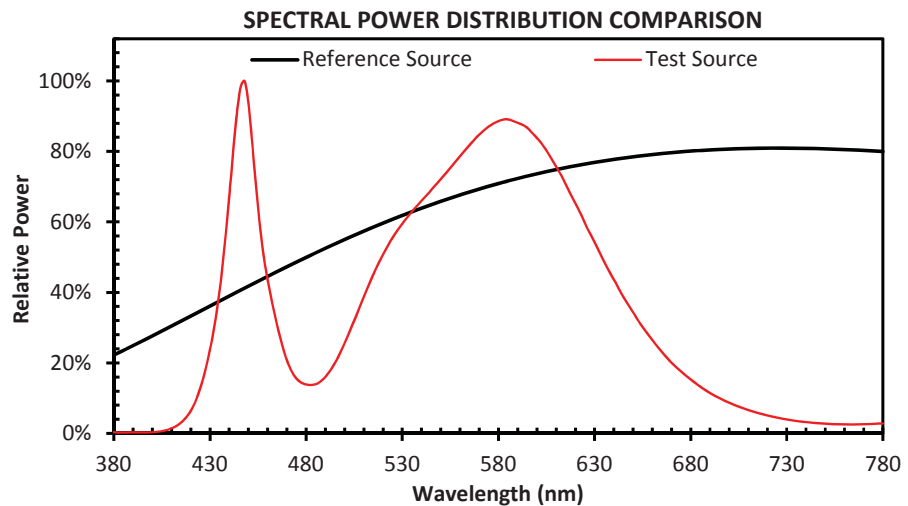
Grey painted cast aluminum housing with no lens.

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

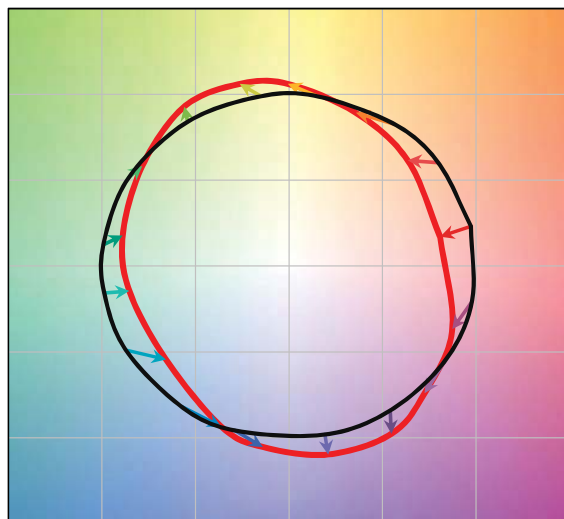
One Osram power supply. Model: OT 50/120-277/1A2 2DIMLT2 P set to 1000ma.

Operating at 120v AC and 60 Hz.

R_f	71
R_g	94



COLOR VECTOR GRAPHIC



— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19100-3

LED Roadway Lighting - Roadway luminaire. Product ID: L6 16S 5 X 2ES R X XX 4 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 120v AC and 60 Hz.

Test Distance 8.0 m
Test Temperature 25.2 °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.

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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.