



Report of Test

LLI-19120-14

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES M X XX 4 XX X X X

Grey cast aluminum housing with no lens.

60 LEDs in three 4 x 5 arrays with clear plastic sheets of individual lenses.

One Delta Electronics LED driver. Model: USCI-200140GA set to 600ma.

Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	11946 lm	Min Power Factor	0.90 @ 277 V
Luminaire Power	72.4 W	Max THD(i)*	29.0 % @ 277 V
Luminous Efficacy	165.0 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3940 K	80-90° Zonal Flux %	1.4 %
CIE(x,y) 1931	(0.384, 0.382)	BUG Rating*	B2-U0-G2
CRI	71	Street Classification*	Type II Short

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



LightLab
INTERNATIONAL

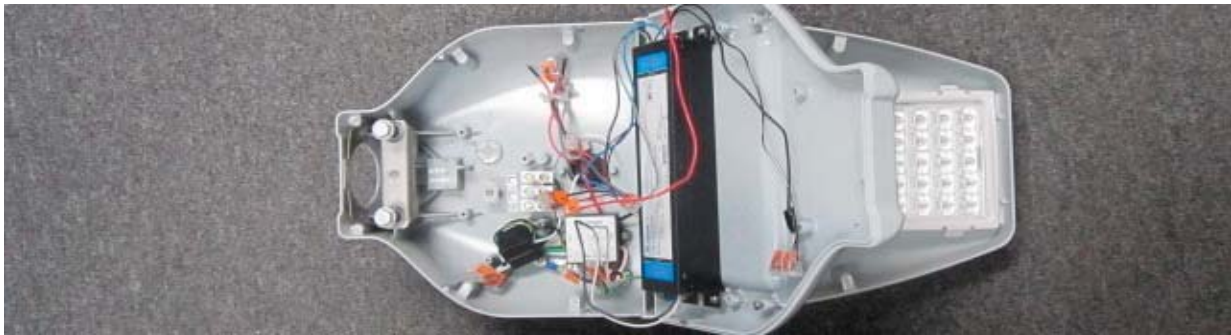
LightLab International, LLC
Phoenix AZ 85085



This document is issued in accordance with the accreditation requirements of NVLAP. The laboratory is accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to the SI system of units.

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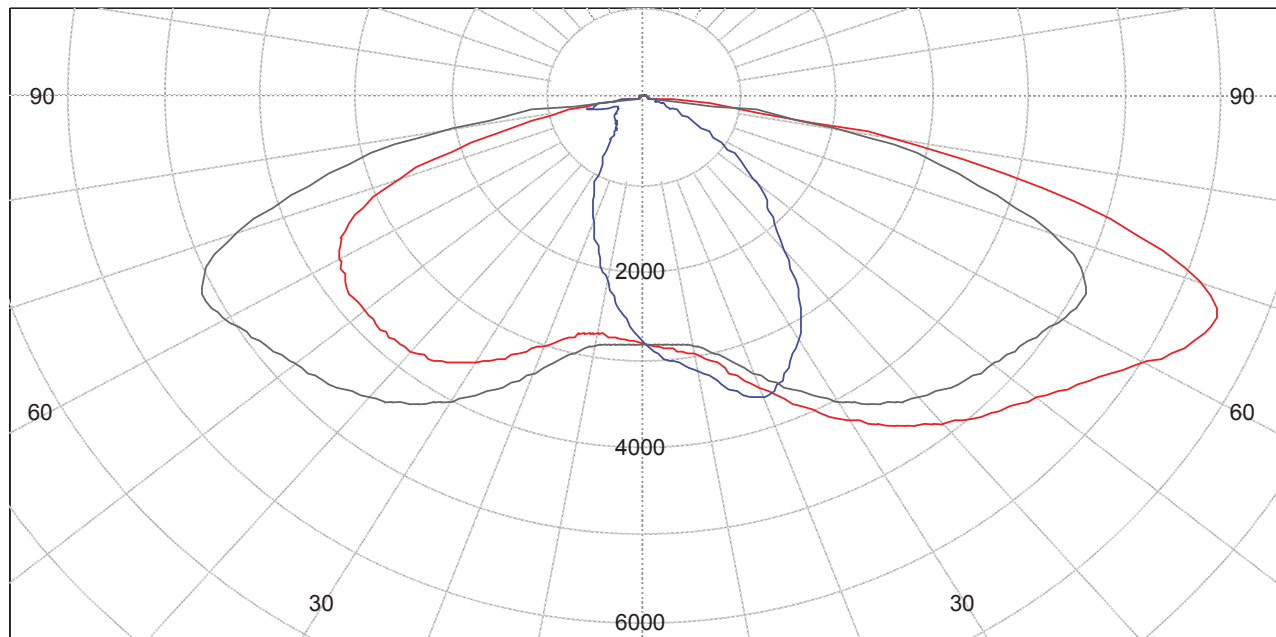
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Polar Light Distribution Curves



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 %	67.8 %	67.8 %
House Side	0.0 %	32.2 %	32.2 %
	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

29-May-2019
30-May-2019



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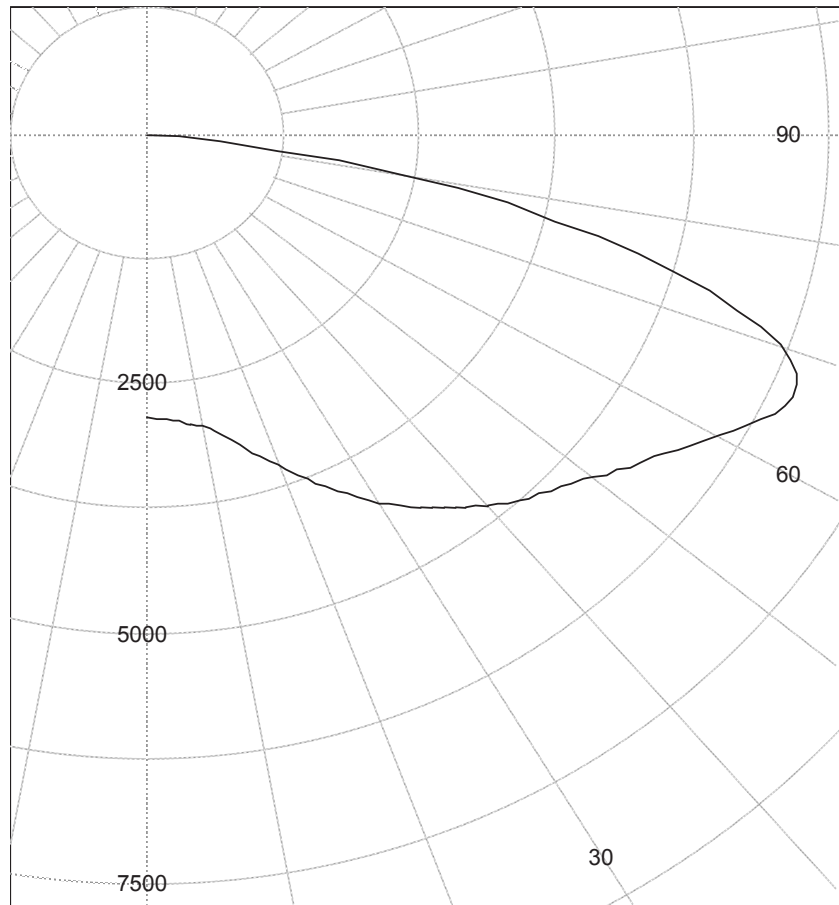
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Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	2818.1
10.0	2978.4
20.0	3532.0
30.0	4256.2
35.0	4572.5
40.0	4856.5
45.0	5106.3
47.5	5209.9
50.0	5335.2
52.5	5500.4
55.0	5654.0
57.5	5830.0
60.0	6045.9
62.5	6267.0
65.0	6437.9
67.5	6443.9
70.0	6158.9
72.5	5539.3
75.0	4654.5
77.5	3615.8
80.0	2360.8
82.5	950.7
85.0	64.0
87.5	14.4
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
5111.4 cd @ (90.0°, 63.0°)

Street side max intensity
6468.2 cd @ (77.5°, 66.5°)

Coordinates expressed in the C Type coordinate system

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



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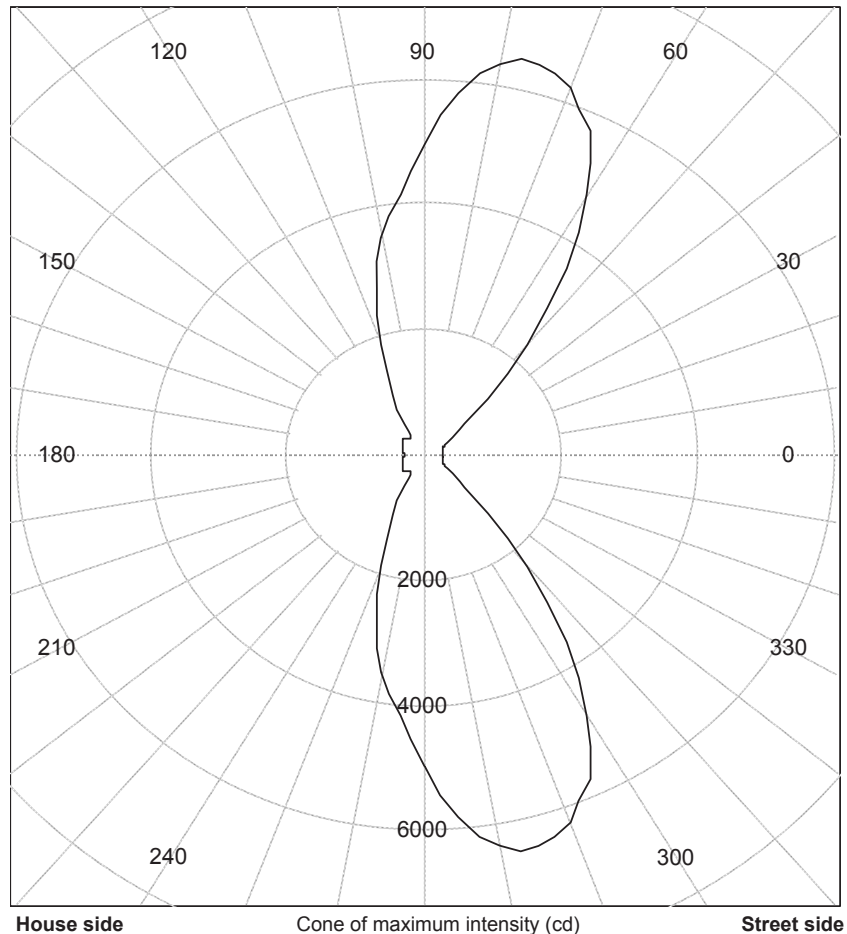
One Delta Electronics LED driver. Model: USCI-200140GA set to 600ma.

Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	263.9
15	267.4
30	376.3
40	755.2
45	1277.1
50	2317.5
55	3609.5
60	4802.0
65	5705.7
70	6244.1
75	6458.7
80	6364.3
85	5828.0
90	4984.9
95	4197.0
100	3517.7
105	2772.7
110	1879.8
115	1080.9
120	559.3
125	360.9
130	350.1
135	381.6
140	401.8
150	386.1
165	339.3
180	278.7

Principal Conical Surface



House side max intensity
5111.4 cd @ (90.0°, 63.0°)

Street side max intensity
6468.2 cd @ (77.5°, 66.5°)

Coordinates expressed in the C Type coordinate system
Data for the two symmetric halves of the luminaire has been averaged.



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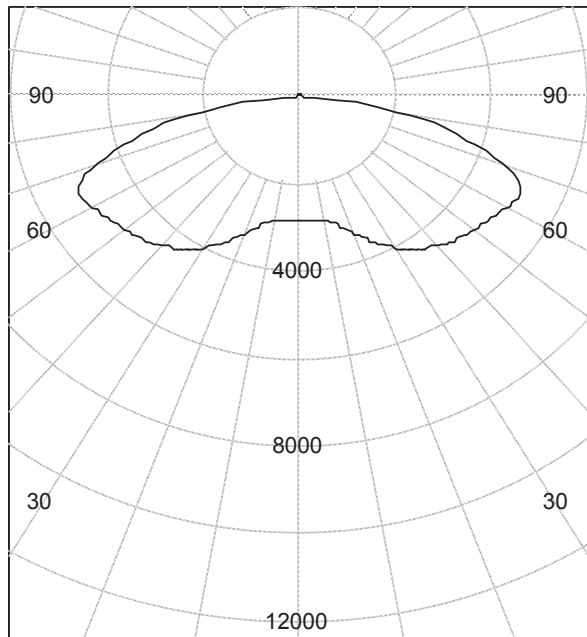
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Operating at 120v AC and 60 Hz.

Polar curve through L90 / L270

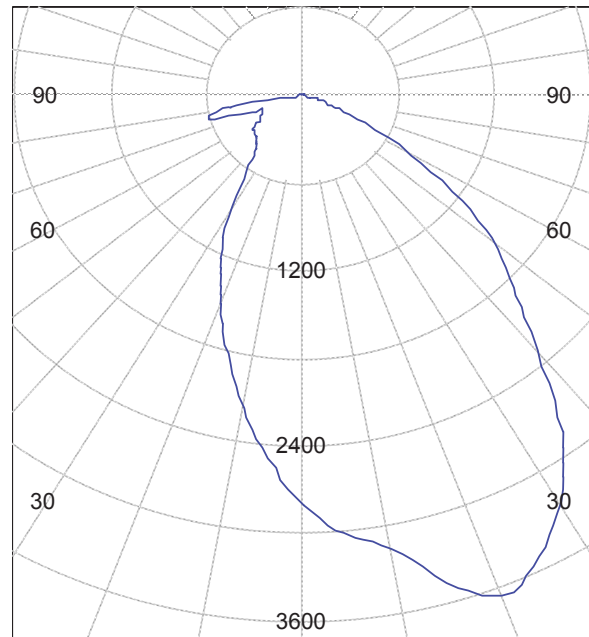


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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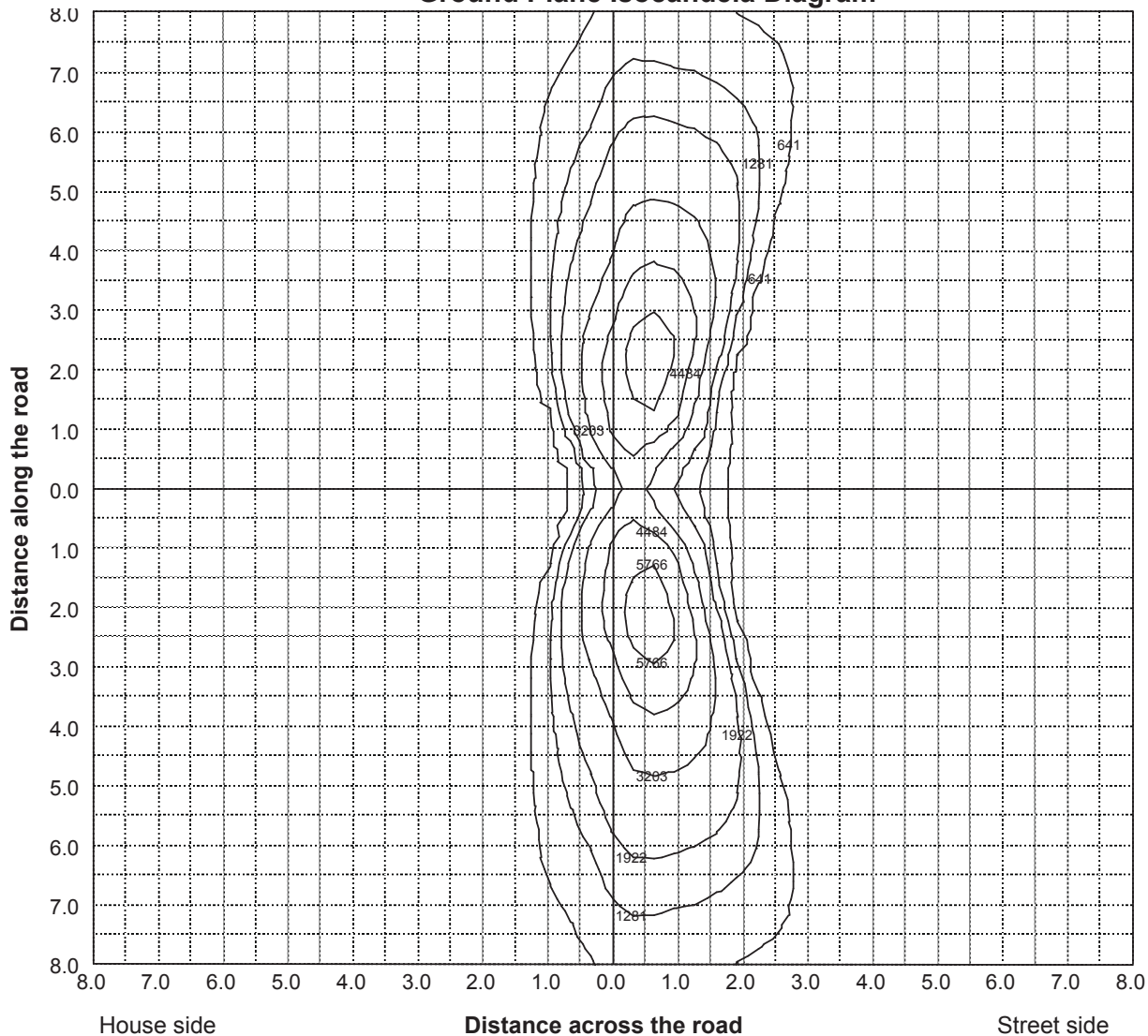
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Ground Plane Isocandela Diagram



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	2818	2818	2818	2818	2818	2818	2818	2818	2818
10.0	3156	3155	3133	3111	3107	3093	3084	3069	3049
20.0	3644	3660	3661	3647	3638	3603	3585	3576	3575
30.0	3218	3343	3685	4045	4205	4300	4340	4358	4332
35.0	2819	2996	3480	3969	4227	4458	4620	4679	4695
40.0	2269	2544	3183	3825	4171	4488	4762	4931	4983
45.0	1848	2103	2885	3669	4115	4510	4853	5108	5235
47.5	1698	1933	2751	3617	4124	4574	4944	5215	5361
50.0	1537	1768	2598	3558	4140	4655	5065	5359	5517
52.5	1355	1572	2417	3450	4125	4727	5189	5505	5695
55.0	1146	1329	2182	3249	3986	4685	5230	5593	5810
57.5	914	1058	1852	2940	3698	4489	5157	5603	5892
60.0	692	791	1413	2490	3259	4140	4950	5531	5922
62.5	481	535	947	1845	2621	3608	4582	5358	5910
65.0	313	331	547	1116	1791	2863	4033	5052	5826
67.5	238	241	302	562	980	1941	3293	4602	5588
70.0	179	190	232	269	453	1068	2376	3929	5122
72.5	142	151	193	191	220	439	1347	3009	4351
75.0	132	140	152	163	155	196	511	1843	3293
77.5	119	139	111	140	123	130	205	817	2122
80.0	88	115	84	93	105	91	114	286	1045
82.5	52	77	54	56	56	58	57	99	329
85.0	23	27	22	22	22	22	21	21	32
87.5	4	4	4	5	6	7	8	9	11
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	2818	2818	2818	2818	2818	2818	2818	2818	2818
10.0	3025	2994	2963	2922	2879	2830	2772	2715	2658
20.0	3574	3550	3508	3443	3348	3227	3082	2923	2759
30.0	4300	4274	4227	4140	4004	3819	3594	3348	3080
35.0	4651	4599	4538	4436	4271	4051	3791	3506	3196
40.0	4969	4894	4808	4676	4475	4214	3904	3574	3226
45.0	5244	5162	5042	4878	4633	4330	3954	3575	3178
47.5	5375	5279	5135	4953	4686	4350	3957	3556	3132
50.0	5528	5418	5245	5037	4742	4373	3953	3533	3077
52.5	5721	5597	5394	5148	4815	4414	3977	3532	3037
55.0	5851	5745	5543	5259	4879	4442	3974	3485	2941
57.5	5989	5916	5717	5408	4960	4452	3927	3391	2783
60.0	6126	6115	5935	5583	5046	4459	3885	3287	2600
62.5	6224	6316	6152	5742	5106	4437	3811	3149	2376
65.0	6270	6446	6324	5837	5077	4329	3664	2948	2093
67.5	6179	6421	6350	5783	4885	4080	3395	2631	1725
70.0	5799	6109	6087	5480	4493	3673	3008	2201	1312
72.5	5106	5459	5522	4999	3962	3141	2496	1693	907
75.0	4154	4577	4671	4367	3385	2573	1947	1179	573
77.5	3069	3516	3645	3555	2780	1971	1390	723	335
80.0	1880	2256	2405	2431	2022	1289	811	372	188
82.5	717	878	1011	1061	958	566	331	129	96
85.0	57	60	69	66	72	55	45	36	38
87.5	12	14	15	16	17	17	18	18	18
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								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	2818	2818	2818	2818	2818	2818	2818	2818	2818
10.0	2596	2537	2484	2431	2385	2343	2270	2197	2166
20.0	2591	2419	2251	2101	1974	1869	1711	1570	1523
30.0	2798	2503	2206	1915	1646	1425	1146	938	877
35.0	2871	2522	2153	1781	1430	1137	804	614	578
40.0	2859	2461	2024	1558	1118	785	543	469	456
45.0	2757	2287	1771	1220	738	504	445	425	413
47.5	2676	2159	1596	1016	567	446	429	409	399
50.0	2574	2008	1400	812	462	427	412	419	392
52.5	2478	1849	1201	648	427	411	407	426	391
55.0	2312	1628	968	517	405	403	416	419	389
57.5	2091	1380	755	435	388	403	420	388	335
60.0	1848	1126	587	392	383	406	413	363	311
62.5	1576	882	470	373	384	409	404	354	301
65.0	1271	667	395	359	384	406	393	343	285
67.5	956	497	342	346	375	399	377	330	278
70.0	675	372	304	334	366	391	347	312	303
72.5	454	279	273	314	351	367	300	357	441
75.0	298	226	243	286	322	322	284	505	607
77.5	202	184	207	240	274	275	321	498	580
80.0	141	143	161	190	223	242	278	411	483
82.5	90	95	105	126	145	174	211	325	371
85.0	38	40	45	51	62	73	108	146	145
87.5	18	17	16	16	15	18	20	32	34
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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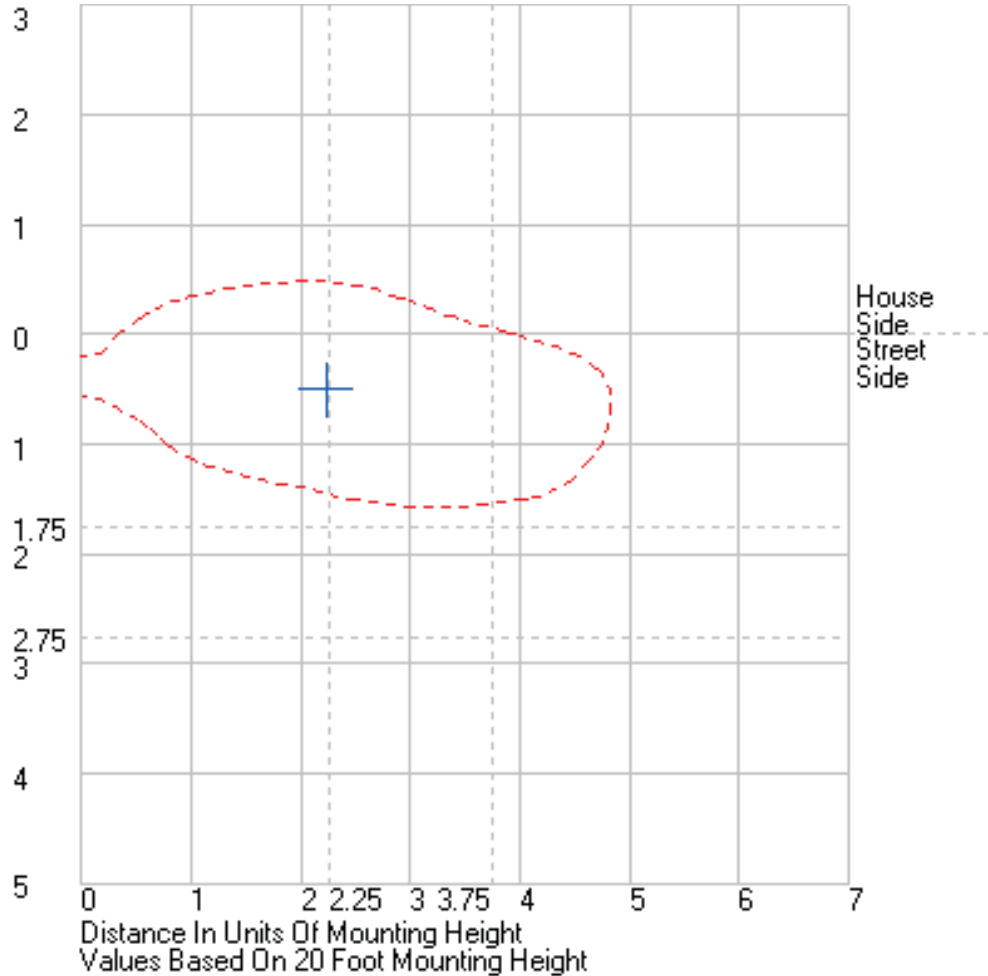
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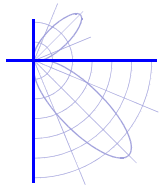
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.384, 0.382)
	CIE 1976 (u', v') ⁽¹⁾	(0.225, 0.504)
	Correlated Color Temperature (CCT) ⁽¹⁾	3940 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.51E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.3
	Special CRI 9 (R ₉) ^{(1),(3)}	-36.4
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.42E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.50

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.620 A	
	Power	72.4 W	
	Power Factor	0.97	
	Current THD	18 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.287 A	
	Power	71.2 W	
	Power Factor	0.90	
	Current THD	29 %	

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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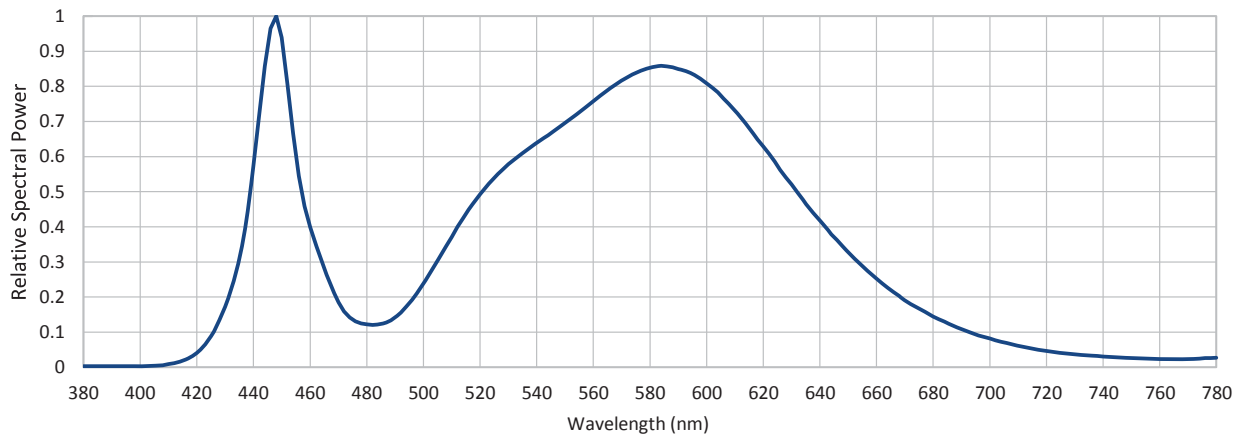
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LM-79 Performance Data

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	0.398	540	0.639	620	0.629	700	0.082
385	0.003	465	0.282	545	0.667	625	0.574	705	0.071
390	0.003	470	0.185	550	0.696	630	0.521	710	0.061
395	0.003	475	0.136	555	0.726	635	0.467	715	0.053
400	0.003	480	0.122	560	0.758	640	0.418	720	0.046
405	0.004	485	0.123	565	0.788	645	0.370	725	0.041
410	0.009	490	0.142	570	0.816	650	0.329	730	0.037
415	0.019	495	0.183	575	0.839	655	0.288	735	0.033
420	0.041	500	0.239	580	0.853	660	0.253	740	0.031
425	0.089	505	0.304	585	0.858	665	0.220	745	0.028
430	0.172	510	0.371	590	0.849	670	0.190	750	0.026
435	0.312	515	0.437	595	0.835	675	0.167	755	0.025
440	0.573	520	0.493	600	0.809	680	0.145	760	0.024
445	0.912	525	0.540	605	0.774	685	0.126	765	0.023
450	0.939	530	0.578	610	0.731	690	0.109	770	0.024
455	0.605	535	0.610	615	0.681	695	0.094	775	0.025
								780	0.027





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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	(0.225, 0.505)	(0.225, 0.504)
10.0	(0.226, 0.505)	(0.226, 0.505)
20.0	(0.226, 0.507)	(0.226, 0.505)
30.0	(0.226, 0.505)	(0.225, 0.505)
40.0	(0.225, 0.505)	(0.225, 0.504)
50.0	(0.225, 0.504)	(0.226, 0.505)
60.0	(0.225, 0.503)	(0.225, 0.506)
70.0	(0.226, 0.505)	I <= 10% peak
80.0	(0.225, 0.502)	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 2.75 / 4.75 hours

Equipment and uncertainties

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

Luminous Intensity	± 4 %	Temperature	± 1 °C
Luminous Flux	± 4 %	Luminous Efficacy	± 4.5 %
Horiz., Vert. Angles	± 0.25°		

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)

Page 14 of 16 *RT*



Test Report No. LLI-19120-14

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES M X XX 4 XX X X X

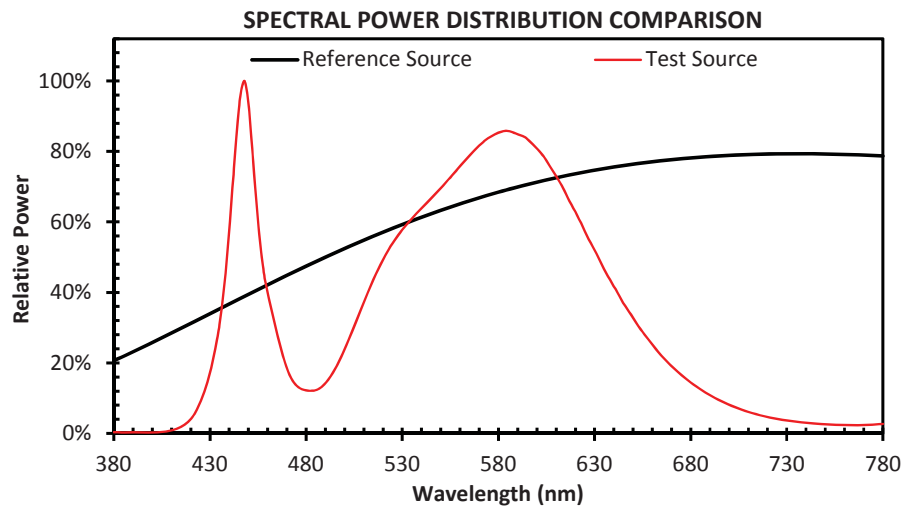
Grey cast aluminum housing with no lens.

60 LEDs in three 4 x 5 arrays with clear plastic sheets of individual lenses.

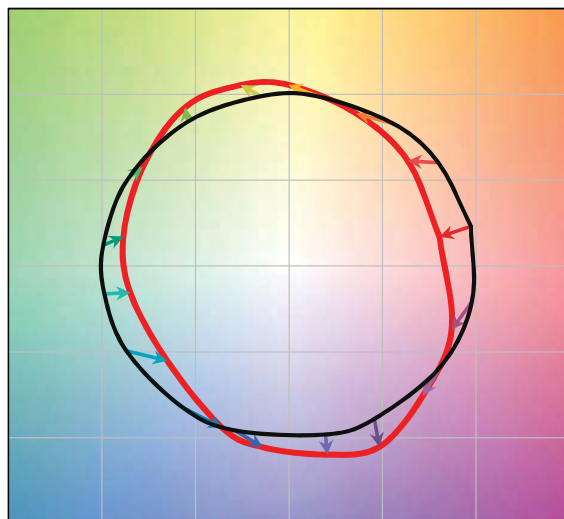
One Delta Electronics LED driver. Model: USCI-200140GA set to 600ma.

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-19120-14

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES M X XX 4 XX X X X
Grey cast aluminum housing with no lens.
60 LEDs in three 4 x 5 arrays with clear plastic sheets of individual lenses.
One Delta Electronics LED driver. Model: USCI-200140GA set to 600ma.
Operating at 120v AC 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.

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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.