



Report of Test

LLI-19120-16

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES W 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 900ma.

Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	17321 lm	Min Power Factor	0.94 @ 277 V
Luminaire Power	109.5 W	Max THD(i)*	17.0 % @ 120 V
Luminous Efficacy	158.2 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3930 K	80-90° Zonal Flux %	1.4 %
CIE(x,y) 1931	(0.385, 0.382)	BUG Rating*	B3-U0-G3
CRI	71	Street Classification*	Type II Short

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



LightLab
INTERNATIONAL

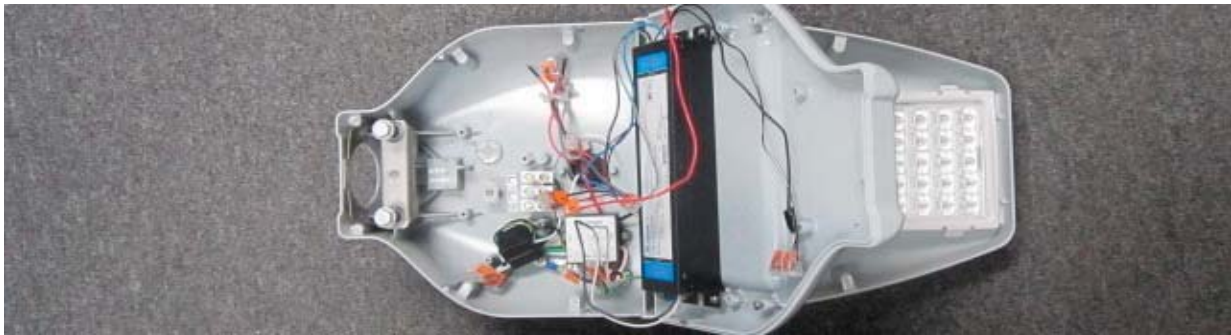
LightLab International, LLC
Phoenix AZ 85085



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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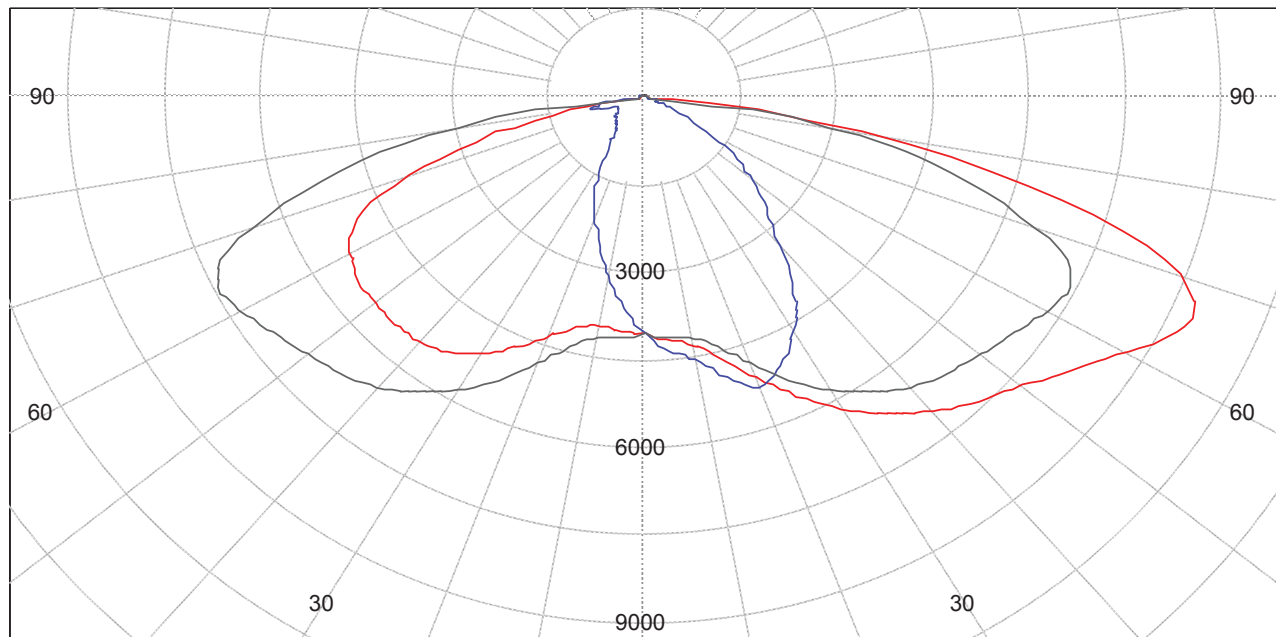
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Polar Light Distribution Curves



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

RT



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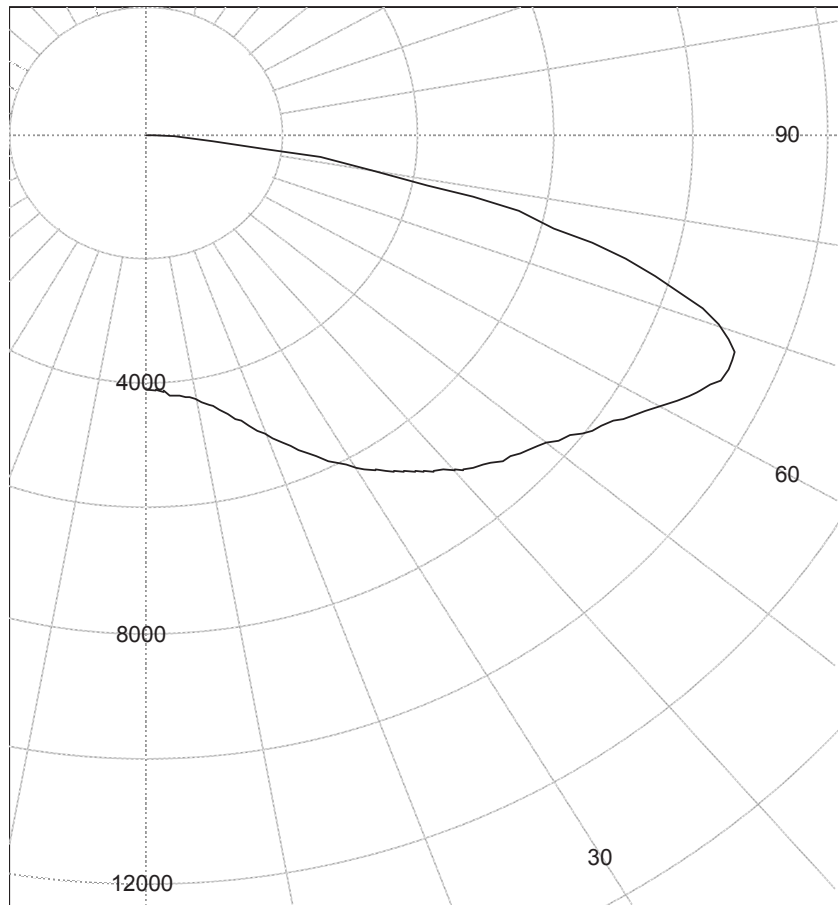
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (L77.5) (cd)
0.0	4083.8
10.0	4317.6
20.0	5121.6
30.0	6168.4
35.0	6617.1
40.0	7021.0
45.0	7372.7
47.5	7517.4
50.0	7696.3
52.5	7926.2
55.0	8152.8
57.5	8407.4
60.0	8724.1
62.5	9047.9
65.0	9299.3
67.5	9316.9
70.0	8921.6
72.5	8030.4
75.0	6762.1
77.5	5248.6
80.0	3432.0
82.5	1383.3
85.0	105.4
87.5	21.0
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



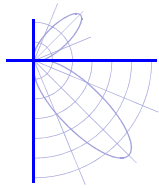
Plane of maximum intensity (cd)

House side max intensity
7403.4 cd @ (90.0°, 63.5°)

Street side max intensity
9348.3 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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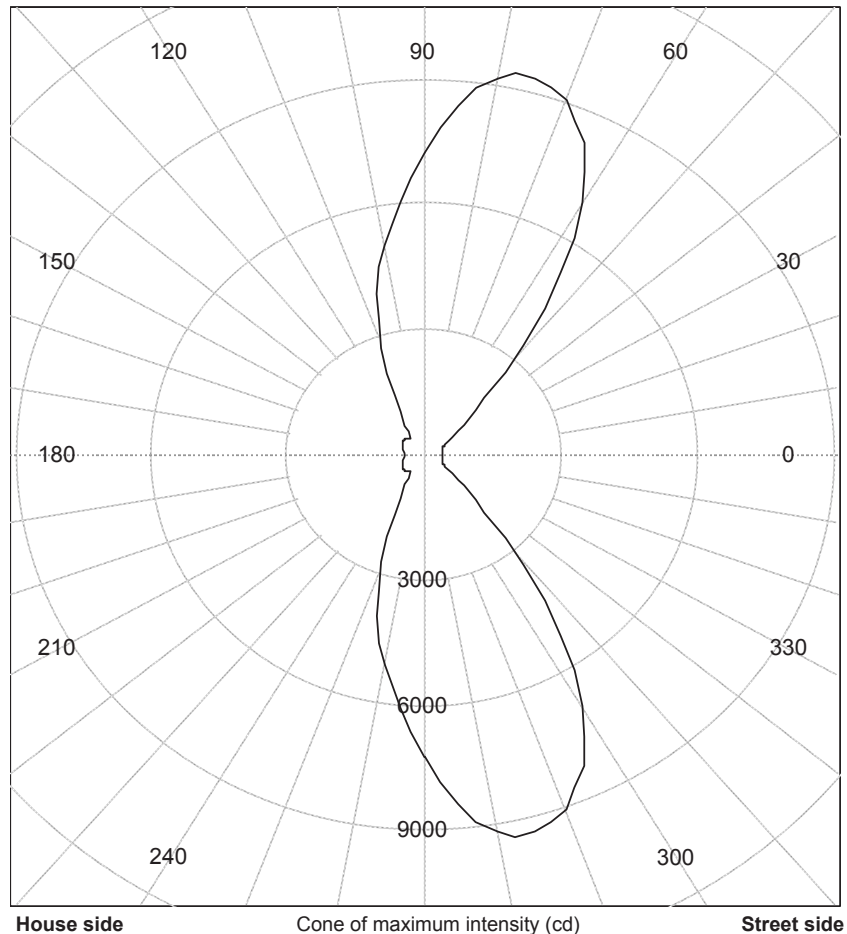
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Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	383.9
15	390.8
30	554.7
40	1124.1
45	1902.3
50	3422.0
55	5270.1
60	6975.4
65	8268.6
70	9036.7
75	9340.8
80	9195.5
85	8429.0
90	7230.5
95	6097.3
100	5111.2
105	4033.1
110	2741.6
115	1579.5
120	815.2
125	524.5
130	507.7
135	552.9
140	582.0
150	559.7
165	492.4
180	409.4

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
7403.4 cd @ (90.0°, 63.5°)

Street side max intensity
9348.3 cd @ (77.5°, 66.5°)

Coordinates expressed in the C Type coordinate system

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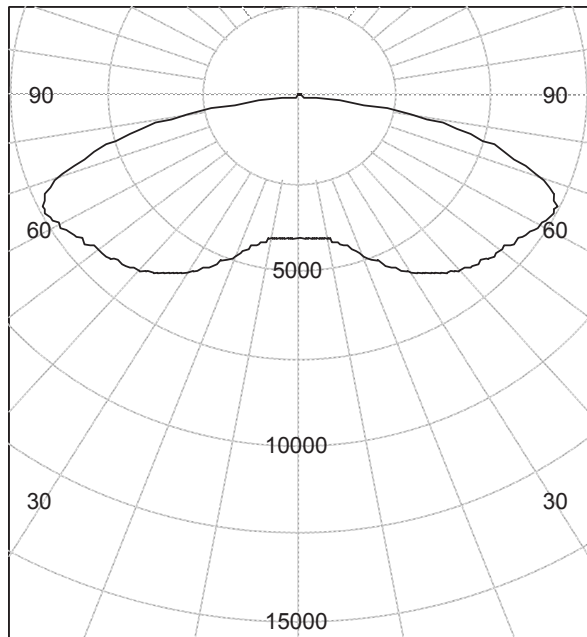
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Polar curve through L90 / L270

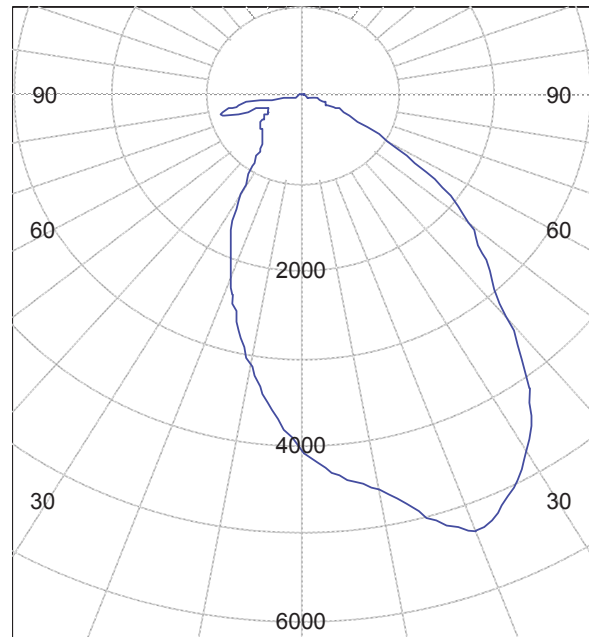


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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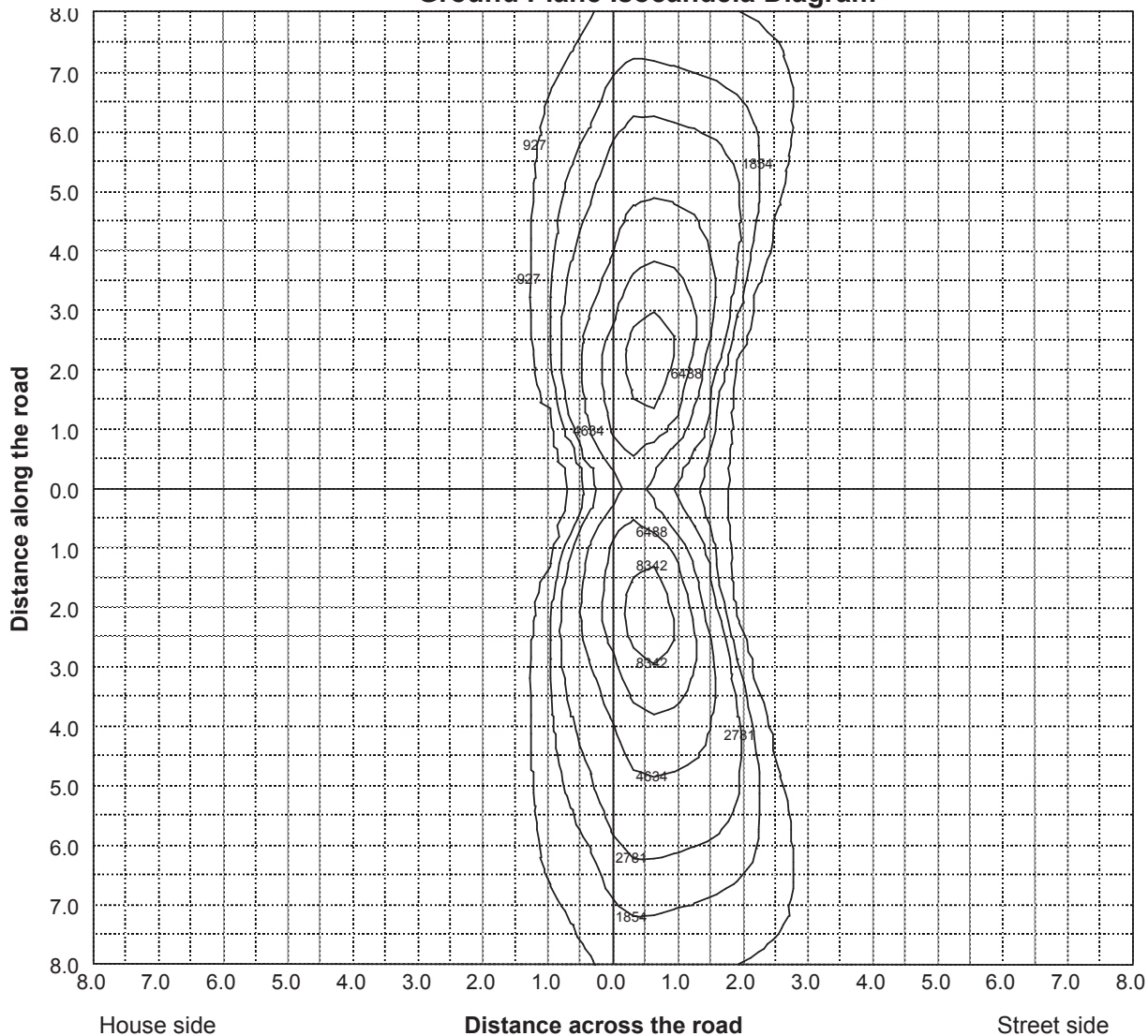
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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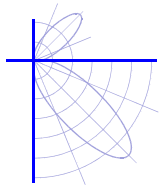
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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	4084	4084	4084	4084	4084	4084	4084	4084	4084
10.0	4562	4566	4536	4509	4502	4481	4469	4451	4420
20.0	5273	5300	5296	5279	5260	5209	5185	5180	5183
30.0	4668	4863	5353	5874	6104	6233	6284	6307	6263
35.0	4093	4364	5058	5767	6141	6469	6697	6773	6789
40.0	3291	3704	4625	5557	6056	6510	6904	7141	7209
45.0	2682	3059	4191	5327	5968	6535	7027	7391	7567
47.5	2465	2811	3994	5246	5974	6616	7150	7540	7747
50.0	2232	2573	3769	5157	5994	6725	7317	7740	7967
52.5	1968	2289	3507	5006	5975	6833	7492	7948	8218
55.0	1664	1938	3168	4720	5784	6778	7560	8081	8386
57.5	1330	1545	2695	4278	5378	6510	7468	8100	8510
60.0	1008	1160	2066	3633	4756	6019	7177	8008	8566
62.5	704	788	1393	2710	3843	5269	6659	7767	8557
65.0	458	487	807	1654	2652	4203	5877	7332	8438
67.5	346	351	443	839	1463	2870	4814	6687	8101
70.0	260	276	336	398	682	1594	3498	5717	7439
72.5	205	219	280	277	324	671	2014	4386	6332
75.0	190	201	221	236	225	291	774	2707	4805
77.5	173	201	161	203	178	190	305	1222	3098
80.0	127	167	122	135	152	132	167	429	1522
82.5	76	112	79	81	81	84	83	145	481
85.0	34	39	32	32	32	32	30	31	47
87.5	6	7	6	7	9	10	12	14	15
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	4084	4084	4084	4084	4084	4084	4084	4084	4084
10.0	4382	4339	4296	4238	4174	4103	4018	3934	3848
20.0	5182	5149	5087	4993	4856	4682	4469	4238	4000
30.0	6223	6189	6125	6003	5803	5537	5210	4855	4468
35.0	6722	6655	6569	6421	6186	5868	5494	5082	4637
40.0	7179	7076	6954	6766	6476	6101	5656	5180	4676
45.0	7571	7453	7284	7052	6699	6267	5721	5176	4603
47.5	7757	7619	7412	7154	6774	6294	5724	5146	4535
50.0	7974	7816	7570	7270	6849	6321	5714	5109	4452
52.5	8244	8068	7779	7429	6954	6378	5745	5102	4390
55.0	8438	8278	7997	7589	7046	6418	5740	5035	4250
57.5	8644	8534	8249	7803	7161	6436	5676	4903	4028
60.0	8851	8824	8567	8059	7293	6453	5622	4759	3768
62.5	8999	9121	8881	8294	7391	6430	5523	4565	3451
65.0	9071	9321	9136	8439	7360	6284	5318	4284	3048
67.5	8951	9294	9171	8361	7088	5931	4934	3831	2517
70.0	8417	8858	8809	7929	6519	5342	4374	3213	1920
72.5	7418	7931	8003	7232	5751	4571	3636	2476	1329
75.0	6036	6657	6776	6314	4911	3741	2837	1729	840
77.5	4457	5116	5290	5150	4031	2862	2027	1061	490
80.0	2727	3298	3482	3534	2932	1873	1180	541	273
82.5	1046	1305	1459	1543	1390	828	480	187	139
85.0	87	97	109	104	113	86	64	52	55
87.5	18	20	22	23	25	26	26	26	26
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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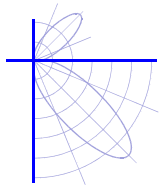
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Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	4084	4084	4084	4084	4084	4084	4084	4084	4084
10.0	3760	3676	3600	3521	3456	3393	3285	3185	3142
20.0	3760	3510	3270	3048	2864	2713	2483	2279	2210
30.0	4061	3634	3206	2781	2392	2071	1665	1365	1276
35.0	4166	3660	3128	2585	2078	1652	1168	891	838
40.0	4147	3572	2940	2261	1623	1142	787	679	660
45.0	3996	3318	2571	1771	1072	731	645	616	599
47.5	3878	3130	2316	1475	822	647	621	593	581
50.0	3728	2909	2029	1178	668	618	598	610	575
52.5	3585	2675	1739	938	617	597	592	621	573
55.0	3345	2354	1402	748	587	585	605	613	569
57.5	3028	1998	1095	630	563	585	610	565	486
60.0	2682	1636	853	568	556	589	599	528	451
62.5	2292	1283	683	540	557	593	585	514	437
65.0	1855	971	574	520	557	589	570	499	416
67.5	1398	723	498	501	544	579	547	480	411
70.0	988	542	441	484	531	566	502	459	449
72.5	665	406	396	454	508	532	435	527	646
75.0	435	328	353	413	466	467	414	737	880
77.5	294	267	301	348	395	399	469	722	834
80.0	204	207	233	275	322	351	405	595	701
82.5	131	137	152	182	210	250	309	469	537
85.0	55	57	65	74	90	106	155	210	207
87.5	26	25	24	23	22	26	29	46	48
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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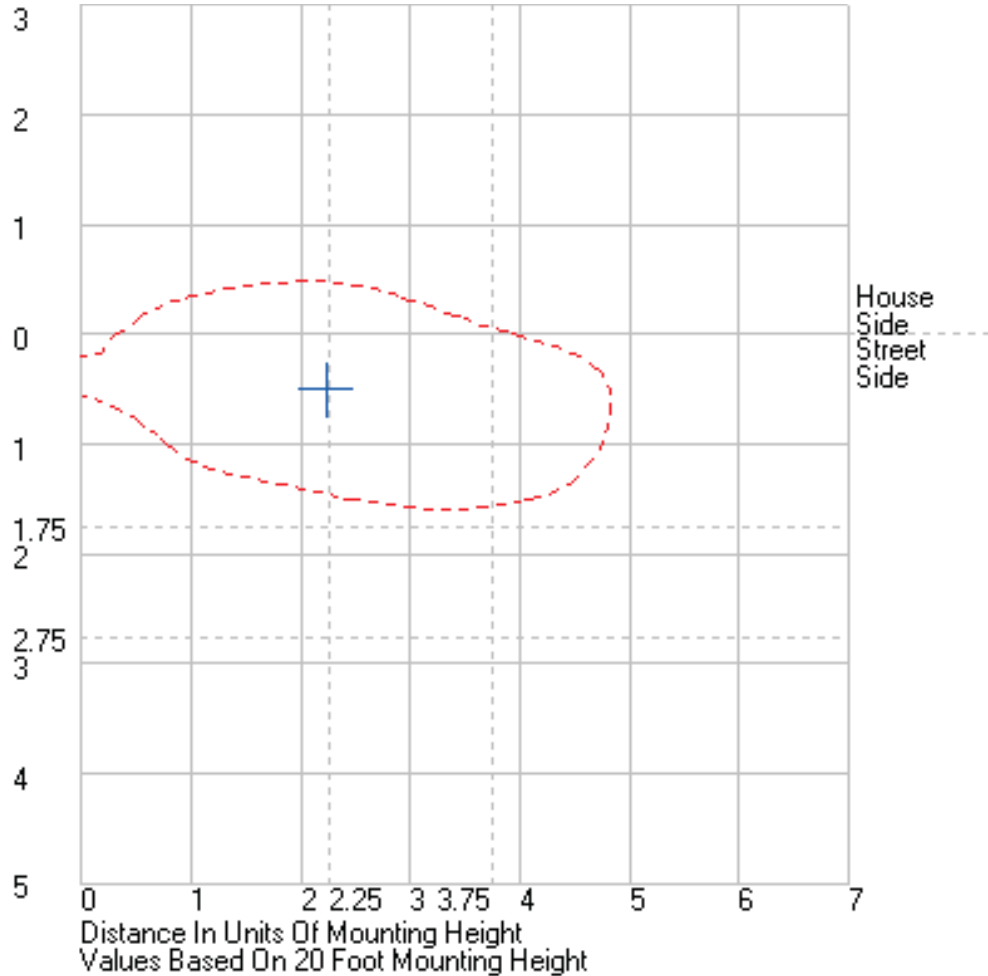
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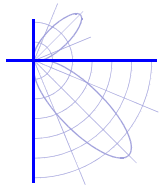
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.385, 0.382)
	CIE 1976 (u', v') ⁽¹⁾	(0.226, 0.505)
	Correlated Color Temperature (CCT) ⁽¹⁾	3930 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.75E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.2
	Special CRI 9 (R ₉) ^{(1),(3)}	-36.5
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.38E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.50

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.931 A	
	Power	110 W	
	Power Factor	0.98	
	Current THD	17 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.417 A	
	Power	108 W	
	Power Factor	0.94	
	Current THD	15 %	

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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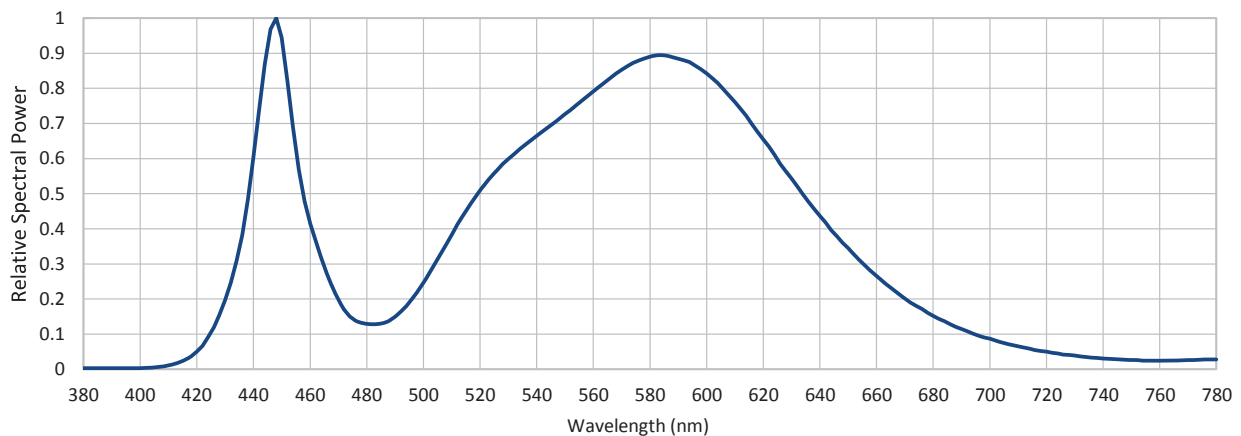
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LM-79 Performance Data

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	0.415	540	0.665	620	0.655	700	0.087
385	0.003	465	0.293	545	0.695	625	0.598	705	0.075
390	0.003	470	0.196	550	0.727	630	0.543	710	0.065
395	0.003	475	0.145	555	0.759	635	0.487	715	0.057
400	0.003	480	0.129	560	0.792	640	0.437	720	0.050
405	0.005	485	0.130	565	0.823	645	0.388	725	0.044
410	0.011	490	0.150	570	0.853	650	0.345	730	0.039
415	0.024	495	0.190	575	0.876	655	0.303	735	0.034
420	0.050	500	0.247	580	0.890	660	0.266	740	0.031
425	0.106	505	0.314	585	0.894	665	0.232	745	0.028
430	0.197	510	0.383	590	0.884	670	0.201	750	0.026
435	0.345	515	0.451	595	0.870	675	0.176	755	0.025
440	0.603	520	0.509	600	0.842	680	0.152	760	0.025
445	0.919	525	0.559	605	0.806	685	0.133	765	0.025
450	0.944	530	0.599	610	0.761	690	0.115	770	0.026
455	0.627	535	0.634	615	0.710	695	0.099	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	(0.226, 0.505)	(0.226, 0.505)
10.0	(0.226, 0.505)	(0.226, 0.505)
20.0	(0.226, 0.507)	(0.226, 0.506)
30.0	(0.226, 0.506)	(0.226, 0.505)
40.0	(0.226, 0.505)	(0.225, 0.504)
50.0	(0.226, 0.504)	(0.226, 0.506)
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 1.0 / 15.25 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)

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Test Report No. LLI-19120-16

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

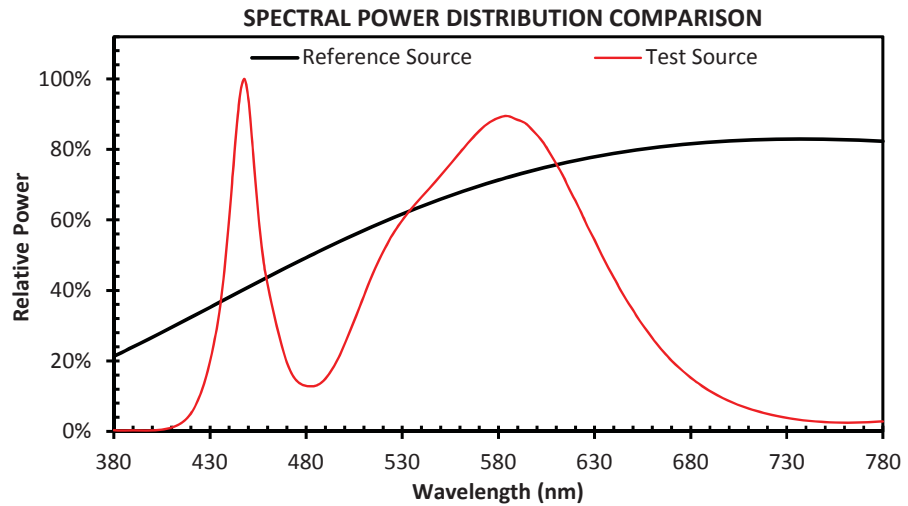
Grey cast aluminum housing with no lens.

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

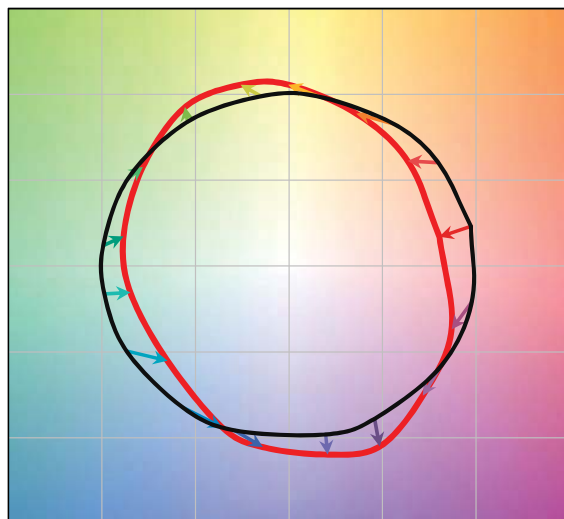
One Delta Electronics LED driver. Model: USCI-200140GA set to 900ma.

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-19120-16

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES W 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 900ma.
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.