



Report of Test

LLI-19120-17

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES 3 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 1050ma.

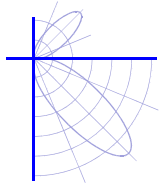
Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	19830 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	128.7 W	Max THD(i)*	15.0 % @ 120 V
Luminous Efficacy	154.1 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



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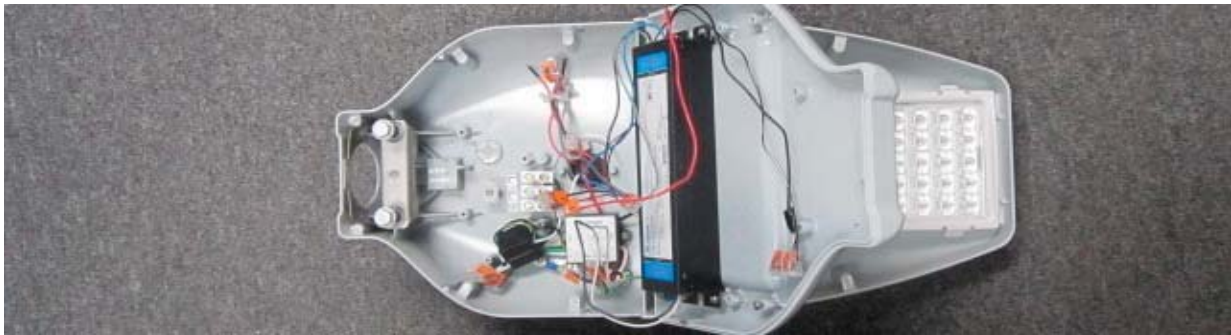
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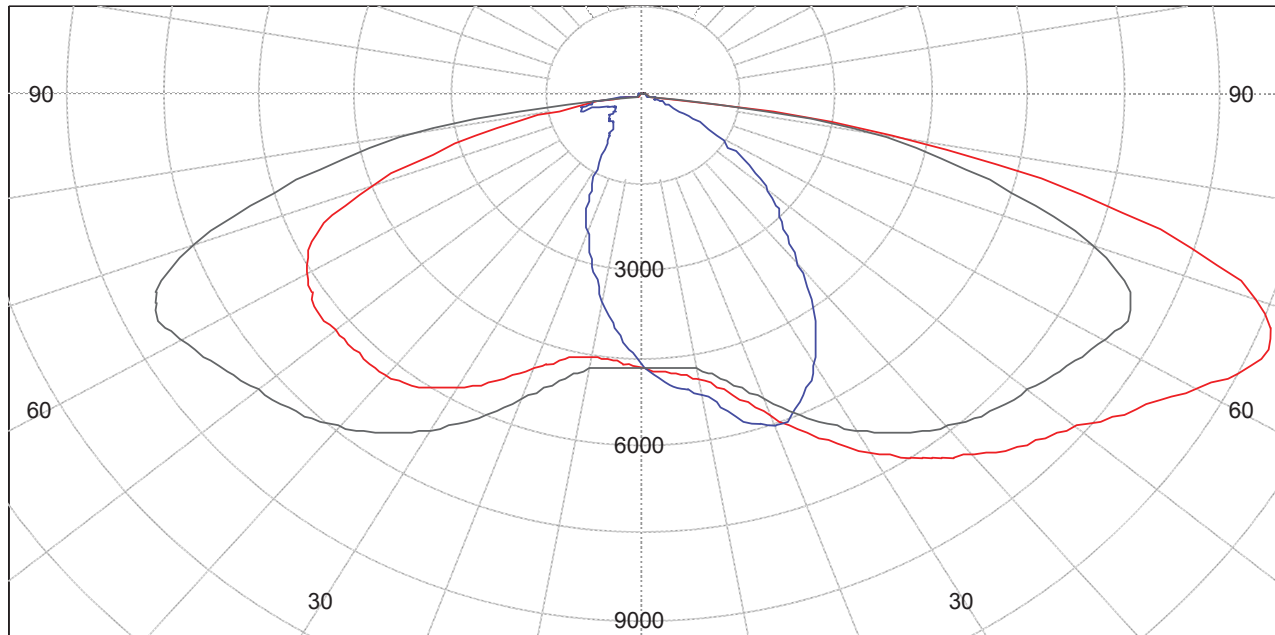
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Polar Light Distribution Curves



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 %	67.9 %	67.9 %
House Side	0.0 %	32.1 %	32.1 %
	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

30-May-2019
30-May-2019



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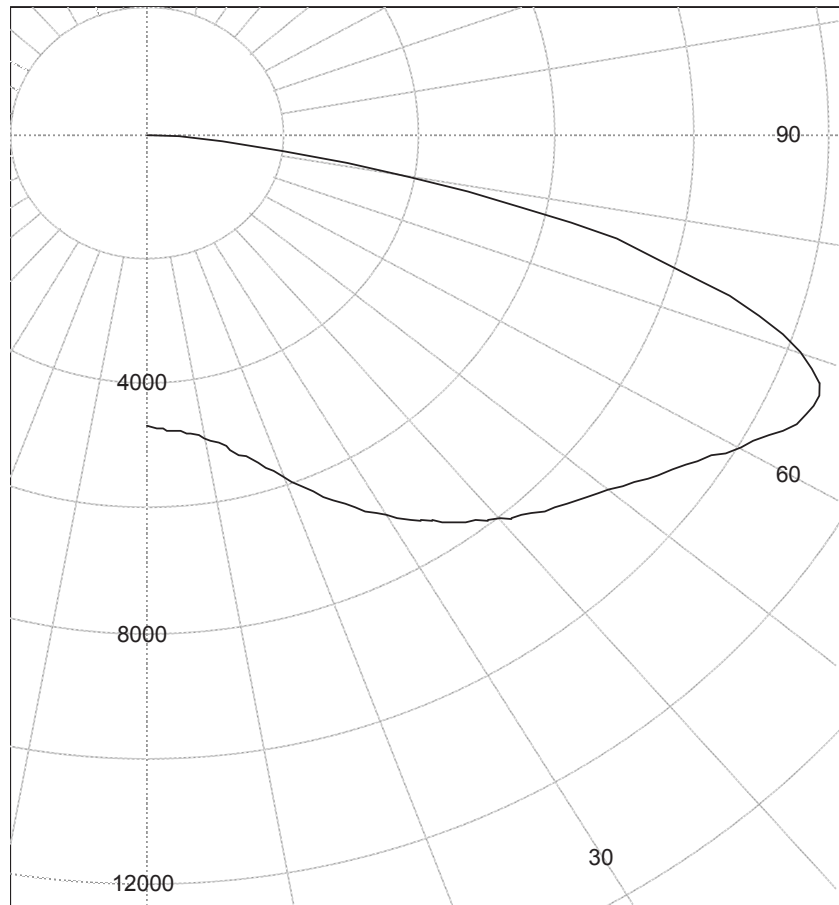
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Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	4664.5
10.0	4934.7
20.0	5856.7
30.0	7060.2
35.0	7581.9
40.0	8048.9
45.0	8463.4
47.5	8635.1
50.0	8844.4
52.5	9119.8
55.0	9379.1
57.5	9672.6
60.0	10026.3
62.5	10383.9
65.0	10657.6
67.5	10667.4
70.0	10203.8
72.5	9193.8
75.0	7733.6
77.5	6006.0
80.0	3937.2
82.5	1590.0
85.0	97.7
87.5	24.1
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
8467.3 cd @ (90.0°, 63.5°)

Street side max intensity
10707.3 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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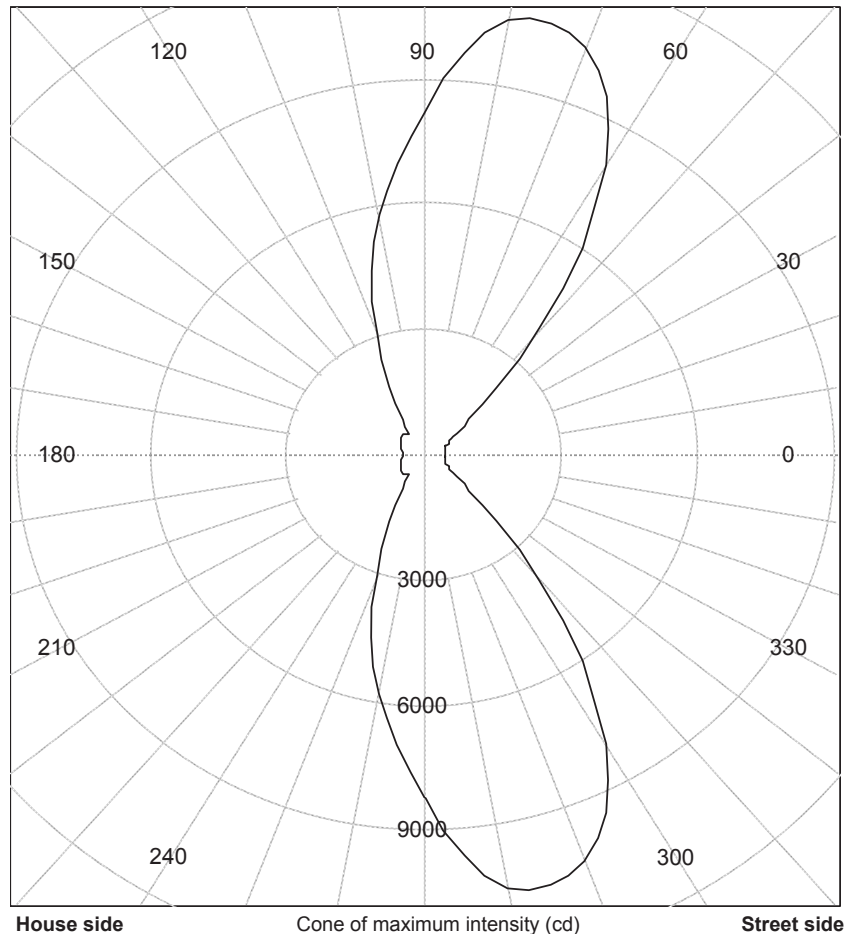
One Delta Electronics LED driver. Model: USCI-200140GA set to 1050ma.

Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	445.0
15	451.4
30	644.0
40	1297.0
45	2189.3
50	3919.6
55	6034.7
60	7989.9
65	9472.8
70	10348.4
75	10699.7
80	10525.2
85	9634.0
90	8251.7
95	6951.7
100	5818.3
105	4576.5
110	3098.8
115	1777.8
120	920.6
125	598.1
130	582.1
135	633.5
140	667.4
150	640.4
165	566.6
180	474.2

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
8467.3 cd @ (90.0°, 63.5°)

Street side max intensity
10707.3 cd @ (77.5°, 66.5°)

Coordinates expressed in the C Type coordinate system

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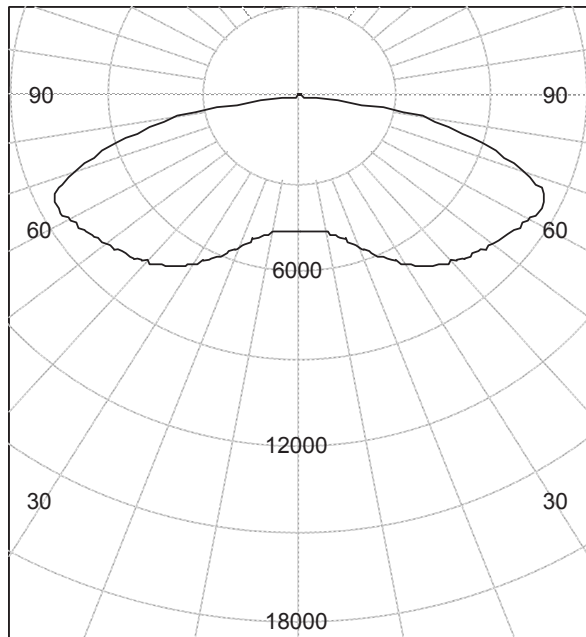
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Polar curve through L90 / L270

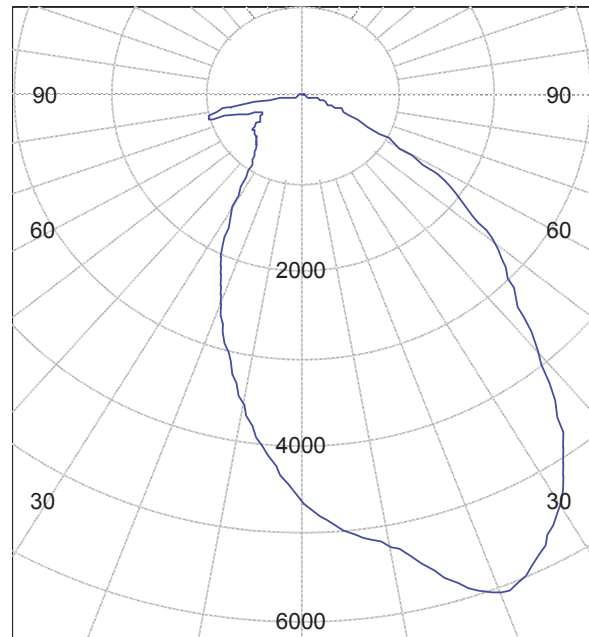


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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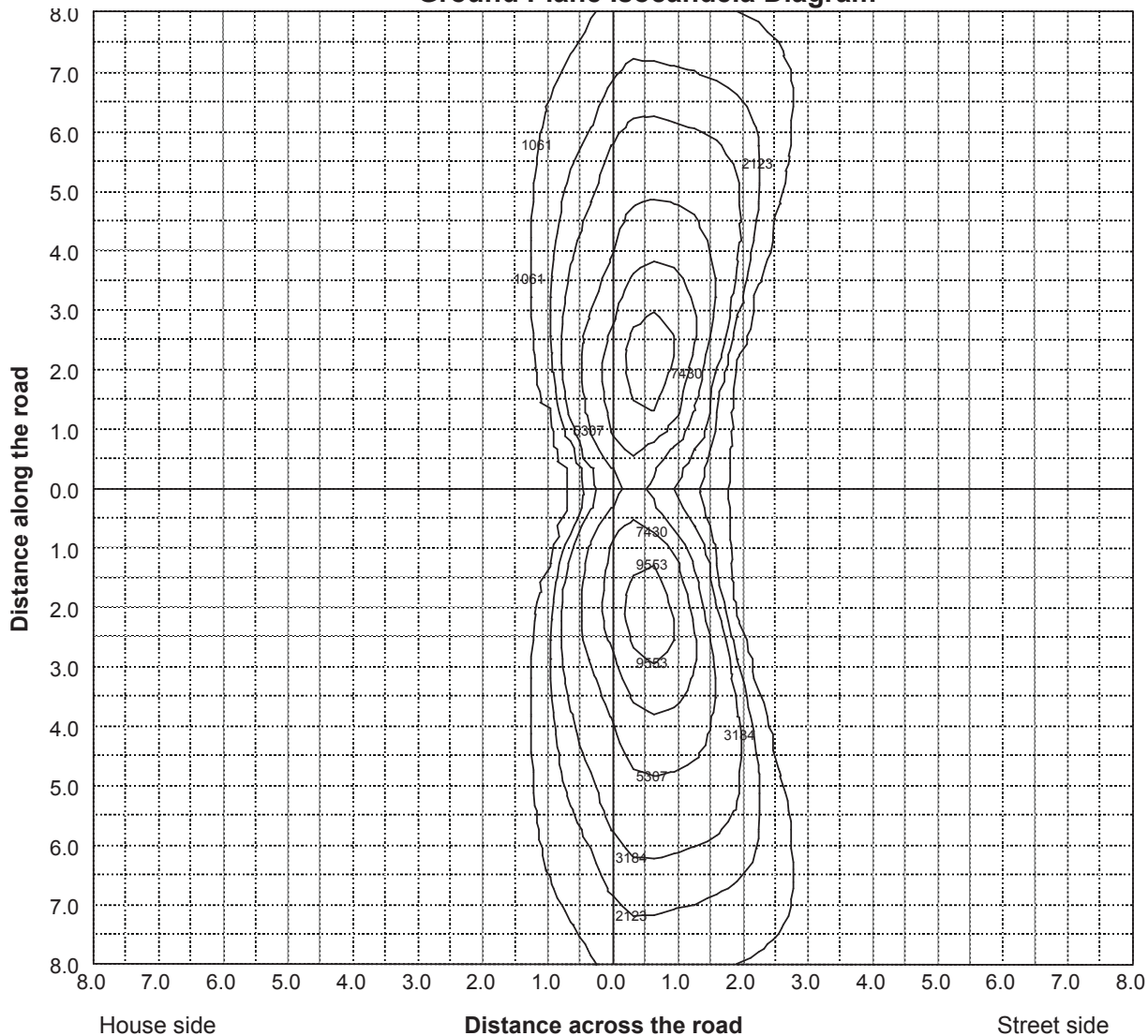
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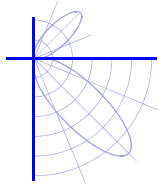
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Ground Plane Isocandela Diagram



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	4665	4665	4665	4665	4665	4665	4665	4665	4665
10.0	5221	5219	5186	5158	5150	5127	5113	5089	5055
20.0	6037	6063	6062	6048	6024	5974	5944	5932	5933
30.0	5353	5564	6131	6728	6989	7139	7201	7228	7180
35.0	4696	4996	5795	6607	7036	7411	7672	7764	7783
40.0	3780	4244	5305	6369	6942	7463	7913	8186	8266
45.0	3076	3506	4808	6110	6845	7495	8063	8479	8681
47.5	2829	3222	4586	6023	6859	7597	8210	8657	8891
50.0	2564	2952	4330	5924	6884	7730	8412	8896	9153
52.5	2263	2629	4029	5752	6862	7852	8615	9140	9448
55.0	1917	2231	3642	5421	6640	7791	8689	9290	9643
57.5	1531	1780	3104	4917	6171	7471	8572	9307	9782
60.0	1165	1341	2380	4174	5458	6908	8236	9190	9835
62.5	816	913	1611	3114	4411	6042	7637	8910	9812
65.0	531	565	935	1904	3048	4815	6733	8408	9672
67.5	400	406	513	970	1687	3293	5514	7658	9278
70.0	301	319	387	460	789	1834	4008	6548	8508
72.5	238	253	323	320	375	768	2302	5028	7243
75.0	221	232	256	271	259	334	885	3108	5501
77.5	201	232	187	235	205	219	349	1401	3546
80.0	148	194	142	157	176	152	191	485	1745
82.5	90	132	92	94	95	98	96	168	553
85.0	40	48	38	38	38	37	35	35	52
87.5	8	9	8	9	10	11	13	16	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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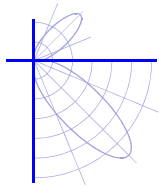
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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	4665	4665	4665	4665	4665	4665	4665	4665	4665
10.0	5011	4961	4910	4846	4767	4687	4587	4491	4394
20.0	5926	5887	5817	5710	5548	5349	5101	4839	4569
30.0	7130	7086	7010	6870	6633	6327	5952	5544	5105
35.0	7708	7623	7524	7354	7073	6707	6280	5807	5297
40.0	8232	8112	7965	7750	7409	6977	6466	5920	5342
45.0	8691	8556	8356	8084	7669	7167	6543	5918	5257
47.5	8907	8748	8511	8209	7759	7203	6550	5884	5181
50.0	9166	8980	8695	8344	7851	7241	6544	5845	5089
52.5	9486	9279	8942	8533	7979	7312	6588	5845	5025
55.0	9706	9530	9194	8717	8085	7361	6580	5772	4866
57.5	9934	9815	9484	8964	8218	7377	6505	5612	4601
60.0	10164	10142	9841	9252	8361	7391	6436	5440	4298
62.5	10319	10468	10187	9506	8459	7353	6311	5208	3924
65.0	10391	10680	10464	9656	8409	7172	6061	4872	3453
67.5	10244	10640	10498	9559	8086	6755	5611	4344	2841
70.0	9626	10138	10074	9059	7438	6081	4968	3632	2160
72.5	8485	9081	9162	8271	6563	5204	4126	2794	1492
75.0	6915	7620	7756	7233	5614	4264	3219	1945	945
77.5	5106	5860	6047	5886	4579	3258	2287	1197	551
80.0	3127	3782	3986	4030	3308	2135	1332	599	309
82.5	1200	1492	1677	1758	1540	938	545	206	156
85.0	92	97	103	98	95	71	61	58	60
87.5	20	23	25	26	28	29	29	29	29
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	4665	4665	4665	4665	4665	4665	4665	4665	4665
10.0	4294	4197	4110	4022	3946	3874	3754	3641	3590
20.0	4292	4010	3733	3482	3272	3096	2835	2601	2522
30.0	4636	4149	3653	3171	2725	2356	1893	1550	1448
35.0	4755	4176	3564	2944	2362	1873	1325	1014	955
40.0	4733	4072	3344	2570	1838	1292	897	776	756
45.0	4559	3780	2919	2006	1210	831	738	706	686
47.5	4425	3564	2625	1667	931	739	711	681	666
50.0	4253	3312	2300	1331	762	708	685	701	658
52.5	4094	3045	1969	1062	706	683	679	712	656
55.0	3818	2678	1587	850	671	671	695	700	649
57.5	3448	2266	1237	719	645	671	699	645	555
60.0	3050	1850	965	651	638	676	687	605	517
62.5	2596	1449	775	620	639	681	670	589	500
65.0	2091	1096	653	596	639	675	653	573	479
67.5	1572	817	568	575	623	663	625	553	477
70.0	1112	613	505	555	609	648	573	530	534
72.5	747	461	453	520	583	608	496	624	768
75.0	490	373	403	472	531	534	480	859	1020
77.5	331	303	341	395	451	457	543	827	952
80.0	230	234	265	312	366	401	465	678	802
82.5	147	154	171	204	235	284	353	530	598
85.0	61	64	71	81	101	113	171	229	226
87.5	29	28	27	26	24	28	31	48	51
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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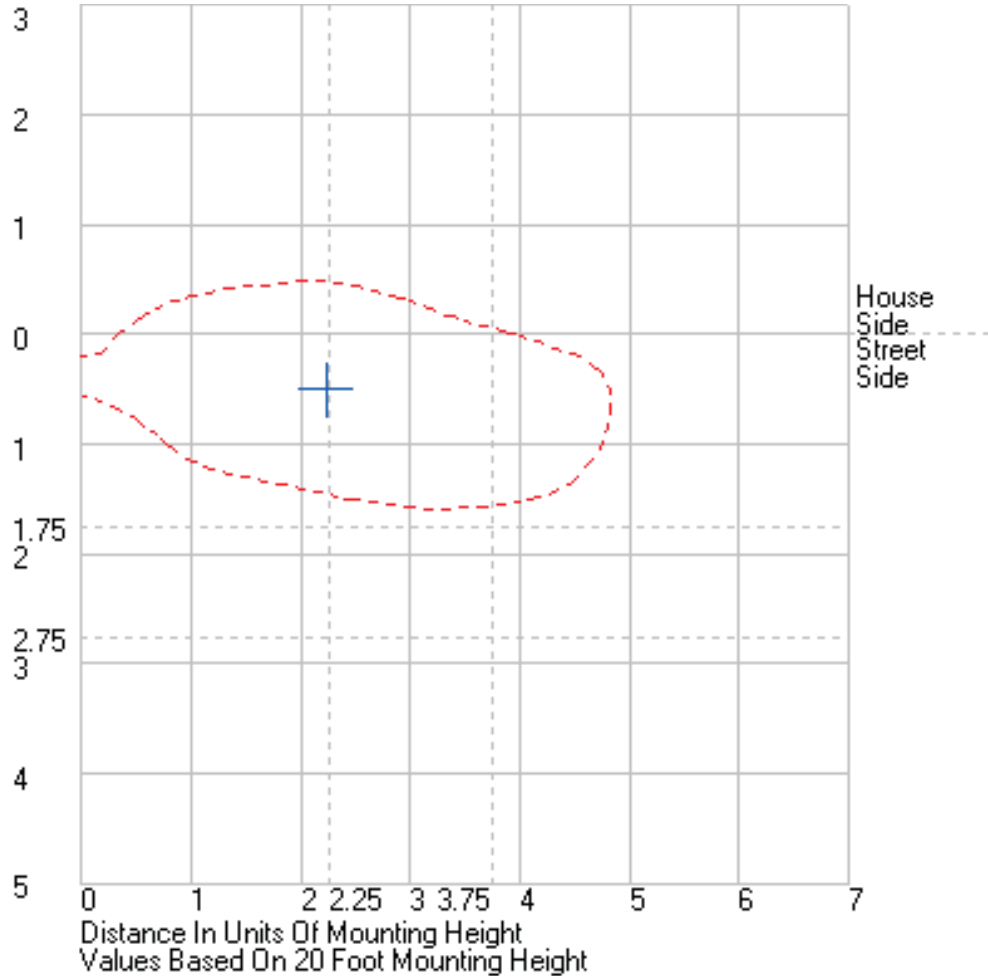
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.385, 0.382)
	CIE 1976 (u', v') ⁽¹⁾	(0.226, 0.505)
	Correlated Color Temperature (CCT) ⁽¹⁾	3930 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.87E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.2
	Special CRI 9 (R ₉) ^{(1),(3)}	-36.3
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.36E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.49

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	1.091 A	
	Power	129 W	
	Power Factor	0.98	
	Current THD	15 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.485 A	
	Power	127 W	
	Power Factor	0.95	
	Current THD	10 %	

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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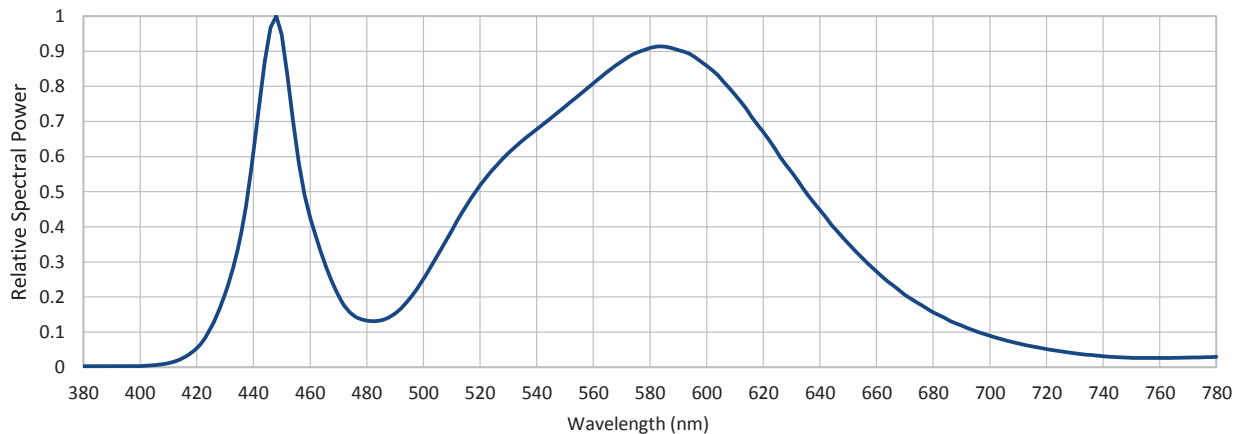
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LM-79 Performance Data

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	0.425	540	0.678	620	0.670	700	0.090
385	0.003	465	0.301	545	0.709	625	0.611	705	0.078
390	0.003	470	0.203	550	0.742	630	0.556	710	0.068
395	0.003	475	0.150	555	0.775	635	0.499	715	0.059
400	0.004	480	0.133	560	0.809	640	0.448	720	0.052
405	0.006	485	0.134	565	0.842	645	0.397	725	0.045
410	0.012	490	0.153	570	0.871	650	0.354	730	0.040
415	0.027	495	0.194	575	0.895	655	0.310	735	0.035
420	0.055	500	0.252	580	0.909	660	0.273	740	0.032
425	0.114	505	0.319	585	0.913	665	0.238	745	0.029
430	0.209	510	0.389	590	0.903	670	0.206	750	0.027
435	0.359	515	0.458	595	0.888	675	0.181	755	0.026
440	0.613	520	0.518	600	0.859	680	0.157	760	0.026
445	0.919	525	0.568	605	0.822	685	0.137	765	0.026
450	0.948	530	0.610	610	0.776	690	0.119	770	0.028
455	0.641	535	0.646	615	0.725	695	0.103	775	0.029
								780	0.030





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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	(0.227, 0.507)	(0.226, 0.506)
30.0	(0.226, 0.505)	(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)	(0.226, 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 2.0 / 4.0 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-19120-17

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES 3 X XX 4 XX X X X

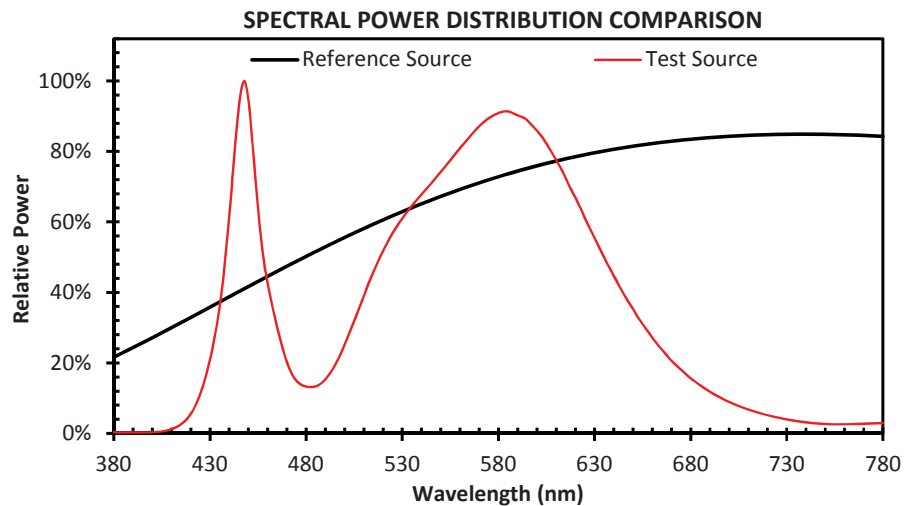
Grey cast aluminum housing with no lens.

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

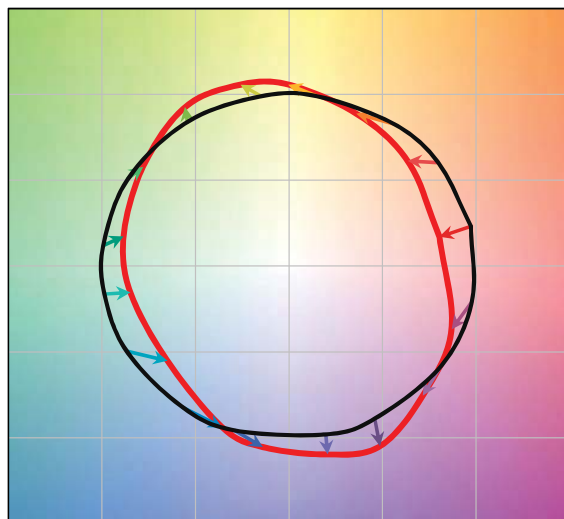
One Delta Electronics LED driver. Model: USCI-200140GA set to 1050ma.

Operating at 120v AC and 60 Hz.

R_f	71
R_g	94



COLOR VECTOR GRAPHIC

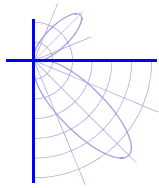


— Test Source

→ Series1

COLOR DISTORTION GRAPHIC





Test Report No. LLI-19120-17

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES 3 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 1050ma.

Operating at 120v AC and 60 Hz.

Test Distance 8.0 m
Test Temperature 25.4 °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.