



Report of Test LLI-19120-15

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES 2 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 750ma.

Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	14698 lm	Min Power Factor	0.92 @ 277 V
Luminaire Power	90.7 W	Max THD(i)*	21.0 % @ 277 V
Luminous Efficacy	162.1 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3940 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



Test Report No. LLI-19120-15

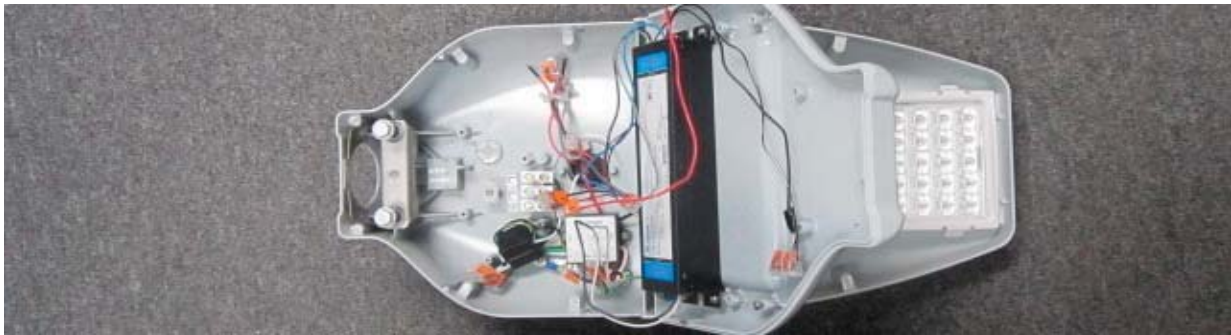
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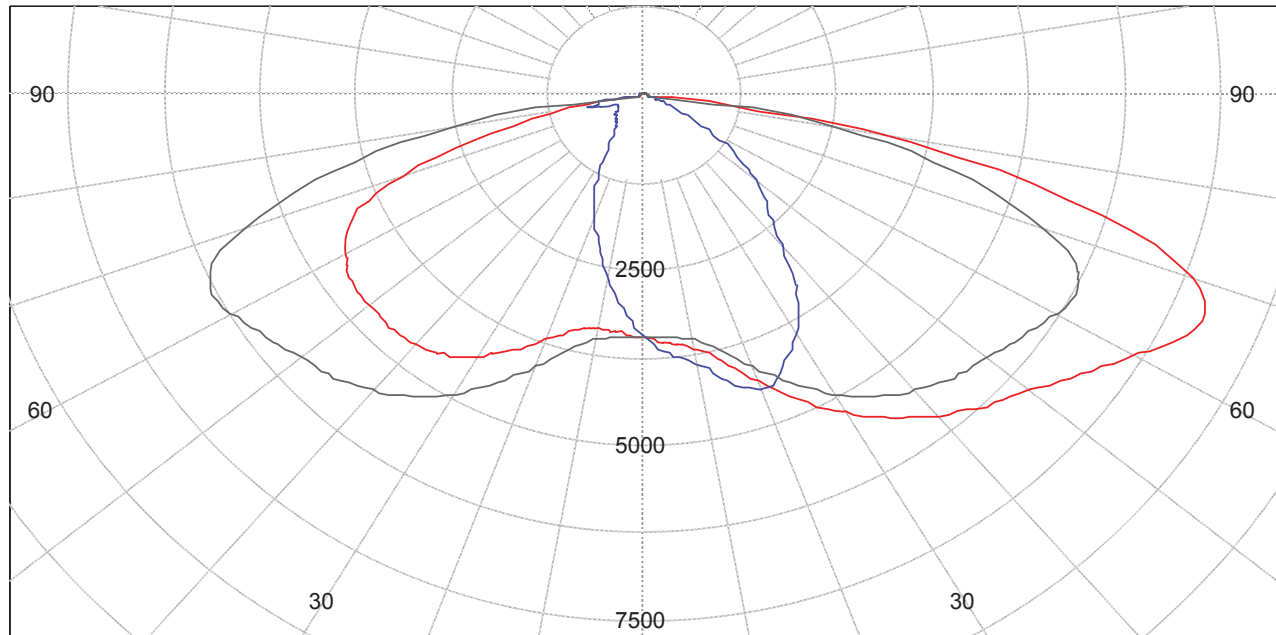
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Polar Light Distribution Curves



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 %	67.7 %	67.7 %
House Side	0.0 %	32.3 %	32.3 %
	0.0 %	100.0 %	100.0 %

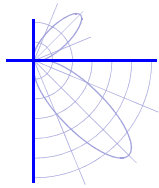
Report data based on absolute values as measured.

Signed:


Ryder Tunney
Authorized Signatory

Date of test
Date of report

29-May-2019
30-May-2019



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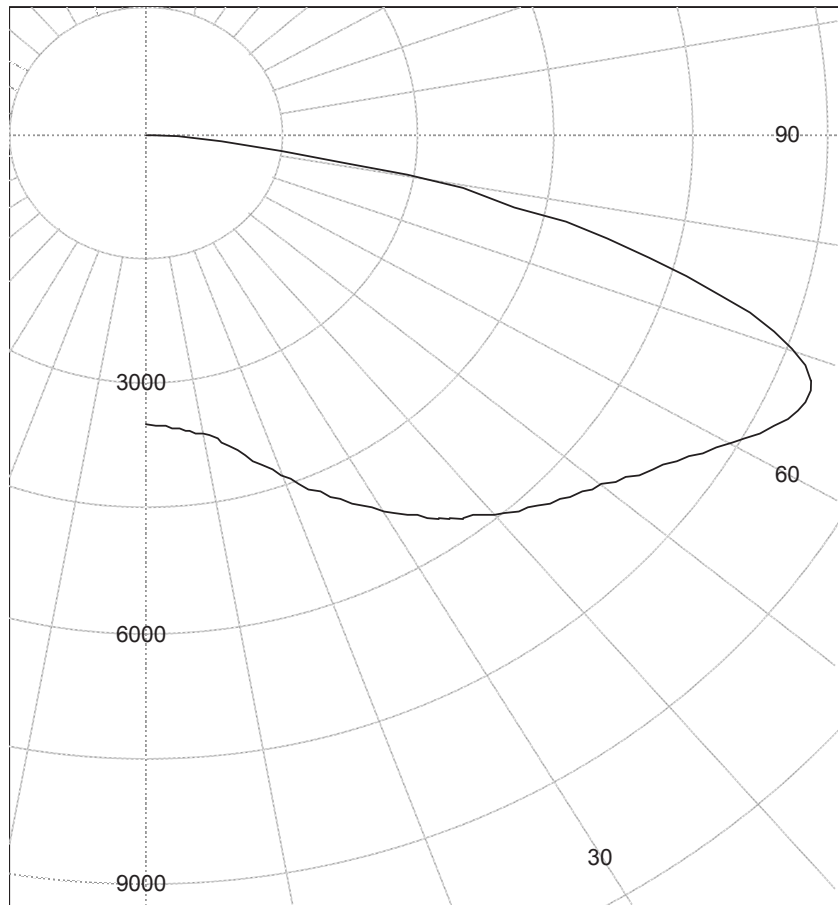
One Delta Electronics LED driver. Model: USCI-200140GA set to 750ma.

Operating at 120v AC and 60 Hz.

Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (L77.5) (cd)
0.0	3468.5
10.0	3665.9
20.0	4348.7
30.0	5236.5
35.0	5622.6
40.0	5967.0
45.0	6270.6
47.5	6396.0
50.0	6548.7
52.5	6748.8
55.0	6939.4
57.5	7155.0
60.0	7419.5
62.5	7693.5
65.0	7908.2
67.5	7917.6
70.0	7569.8
72.5	6811.6
75.0	5723.7
77.5	4444.7
80.0	2904.0
82.5	1171.3
85.0	79.8
87.5	17.7
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

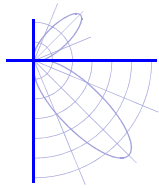


House side max intensity
6291.3 cd @ (90.0°, 63.5°)

Street side max intensity
7946.9 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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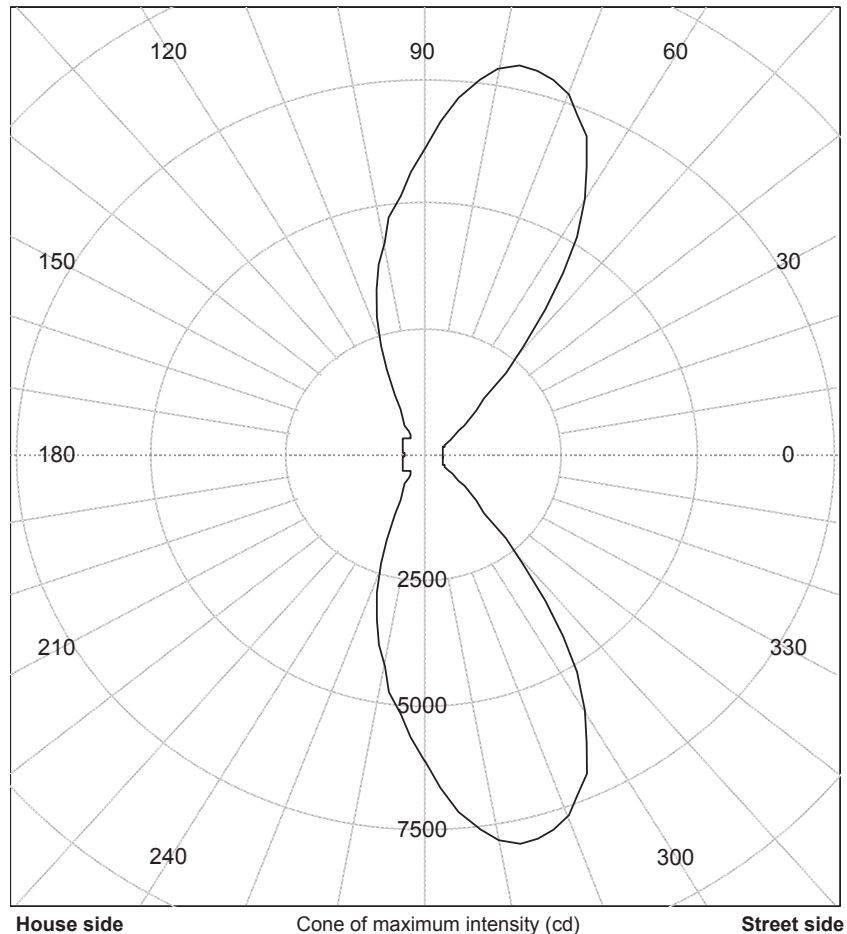
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Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	324.4
15	329.7
30	465.4
40	935.1
45	1585.8
50	2865.9
55	4443.8
60	5909.0
65	7013.9
70	7671.2
75	7936.2
80	7821.3
85	7164.8
90	6138.5
95	5170.9
100	4336.3
105	3421.7
110	2326.3
115	1341.6
120	695.1
125	446.1
130	431.0
135	469.2
140	494.7
150	475.4
165	418.6
180	344.2

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
6291.3 cd @ (90.0°, 63.5°)

Street side max intensity
7946.9 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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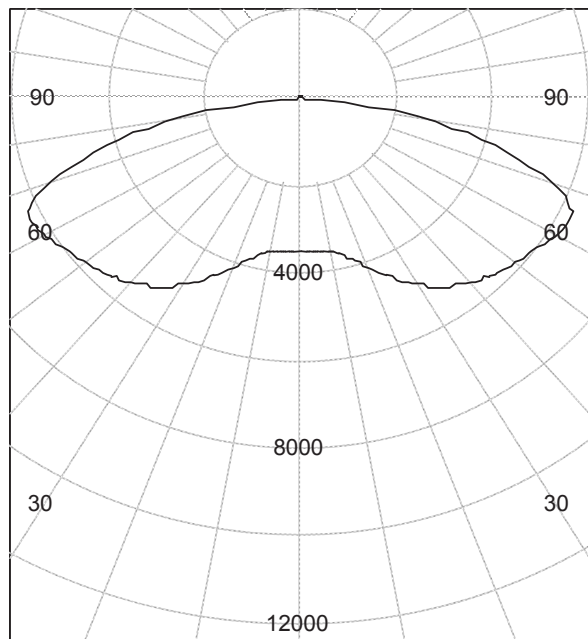
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Operating at 120v AC and 60 Hz.

Polar curve through L90 / L270

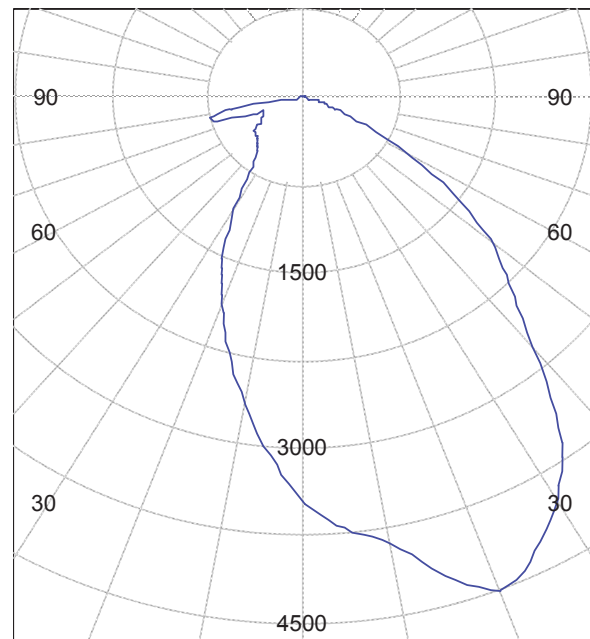


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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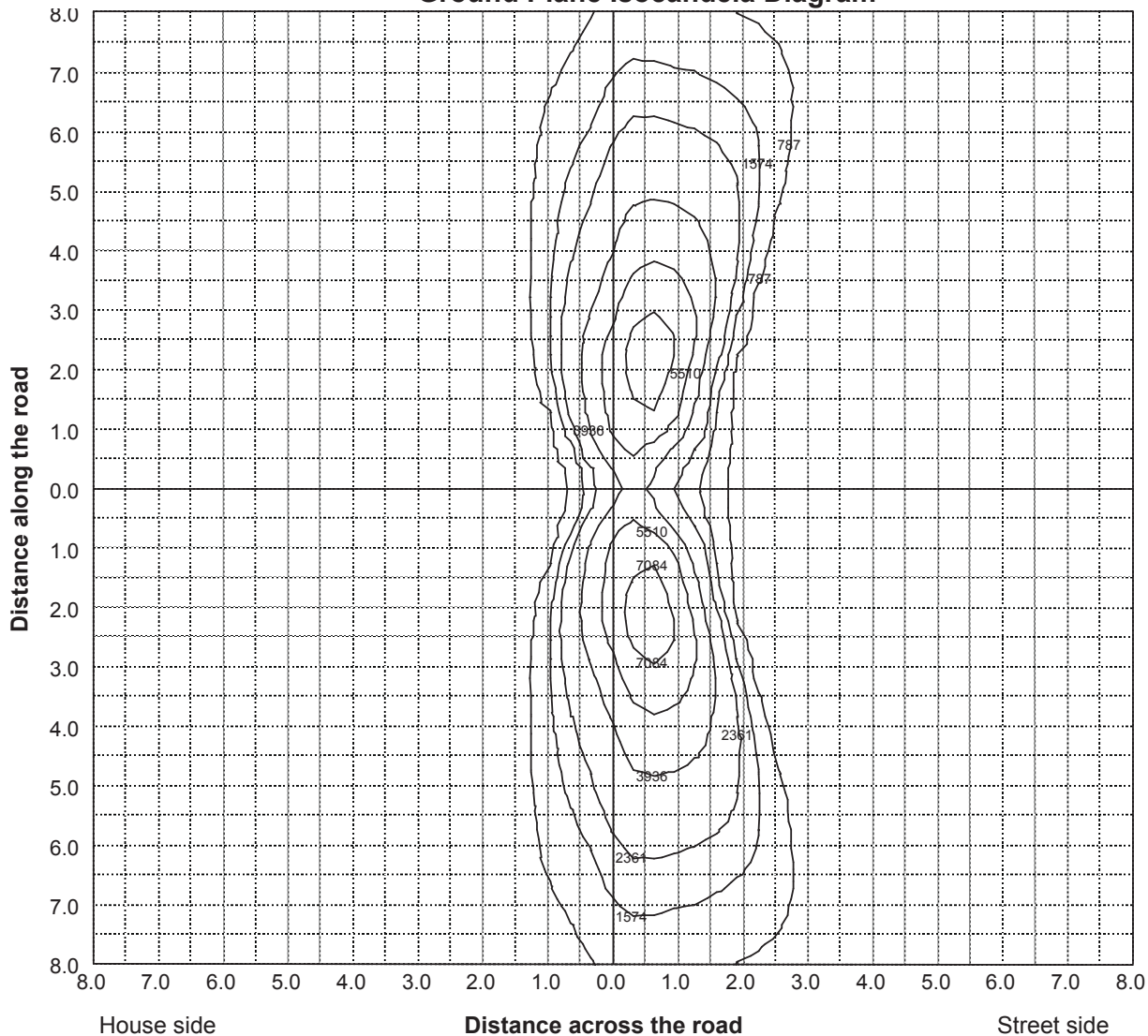
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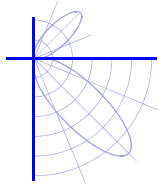
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Ground Plane Isocandela Diagram



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	3469	3469	3469	3469	3469	3469	3469	3469	3469
10.0	3876	3877	3851	3829	3822	3807	3796	3779	3754
20.0	4478	4497	4496	4482	4469	4427	4407	4399	4401
30.0	3958	4116	4535	4979	5173	5290	5337	5357	5322
35.0	3467	3689	4282	4886	5204	5486	5683	5753	5767
40.0	2788	3132	3915	4706	5132	5523	5858	6062	6124
45.0	2271	2588	3548	4512	5059	5548	5968	6277	6429
47.5	2087	2378	3382	4445	5067	5621	6076	6408	6585
50.0	1889	2176	3193	4369	5084	5716	6223	6582	6772
52.5	1665	1934	2969	4239	5064	5805	6370	6757	6986
55.0	1409	1637	2681	3993	4896	5754	6422	6865	7128
57.5	1124	1304	2279	3616	4545	5515	6334	6880	7232
60.0	851	978	1740	3065	4014	5092	6085	6795	7273
62.5	592	662	1170	2277	3232	4446	5638	6587	7261
65.0	387	410	675	1380	2219	3530	4965	6216	7160
67.5	293	297	373	697	1219	2402	4056	5662	6870
70.0	219	234	285	332	566	1328	2931	4836	6296
72.5	174	185	238	235	272	549	1668	3699	5350
75.0	162	171	187	200	190	244	636	2273	4047
77.5	146	171	137	172	151	160	254	1010	2601
80.0	108	142	103	114	129	112	140	352	1281
82.5	64	95	67	68	68	71	70	121	400
85.0	28	33	27	27	27	27	26	26	38
87.5	5	6	5	6	7	8	10	11	13
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	3469	3469	3469	3469	3469	3469	3469	3469	3469
10.0	3723	3685	3647	3600	3544	3484	3413	3341	3269
20.0	4398	4370	4319	4241	4123	3977	3795	3600	3398
30.0	5286	5256	5201	5097	4927	4703	4425	4122	3795
35.0	5712	5653	5579	5458	5254	4985	4668	4317	3938
40.0	6103	6012	5909	5752	5503	5183	4806	4400	3972
45.0	6437	6337	6193	5996	5695	5329	4863	4399	3911
47.5	6597	6480	6305	6085	5760	5349	4867	4374	3854
50.0	6784	6648	6438	6184	5826	5376	4861	4345	3785
52.5	7015	6865	6620	6321	5919	5426	4890	4341	3735
55.0	7177	7048	6805	6455	5995	5460	4885	4283	3617
57.5	7348	7259	7016	6639	6094	5475	4830	4170	3425
60.0	7518	7504	7286	6857	6202	5484	4779	4045	3204
62.5	7643	7753	7552	7055	6281	5461	4693	3878	2930
65.0	7702	7918	7769	7176	6250	5332	4515	3636	2588
67.5	7593	7892	7799	7108	6020	5027	4185	3249	2135
70.0	7134	7518	7481	6736	5536	4526	3707	2720	1627
72.5	6283	6726	6790	6145	4883	3875	3080	2095	1126
75.0	5113	5636	5741	5367	4178	3177	2403	1462	712
77.5	3776	4335	4483	4369	3420	2431	1711	901	416
80.0	2309	2780	2960	2987	2477	1595	1000	460	234
82.5	877	1088	1243	1301	1164	704	411	161	118
85.0	69	76	84	83	90	68	54	44	46
87.5	15	17	19	20	21	22	22	22	22
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	3469	3469	3469	3469	3469	3469	3469	3469	3469
10.0	3195	3122	3057	2992	2938	2883	2793	2705	2664
20.0	3193	2982	2774	2590	2433	2304	2110	1936	1875
30.0	3448	3088	2722	2365	2034	1760	1415	1160	1083
35.0	3537	3110	2657	2200	1769	1405	993	758	712
40.0	3521	3035	2498	1927	1384	972	670	577	560
45.0	3395	2819	2188	1512	916	622	548	523	508
47.5	3295	2662	1972	1260	705	549	528	503	492
50.0	3169	2475	1730	1008	572	525	508	517	486
52.5	3050	2281	1484	804	525	506	502	526	484
55.0	2846	2008	1199	642	498	496	513	519	481
57.5	2578	1706	937	539	478	496	518	479	413
60.0	2282	1395	730	485	472	500	509	447	383
62.5	1949	1096	583	460	472	504	497	436	371
65.0	1576	829	489	441	472	500	484	423	351
67.5	1187	616	423	426	462	492	464	407	345
70.0	838	461	374	411	451	481	427	386	374
72.5	564	346	336	385	432	452	369	441	540
75.0	370	279	299	351	396	396	351	620	745
77.5	250	227	255	295	337	339	397	611	709
80.0	173	176	198	234	274	298	343	505	594
82.5	111	117	130	155	179	214	261	400	456
85.0	46	49	55	63	78	90	132	181	178
87.5	22	21	21	20	19	22	25	40	41
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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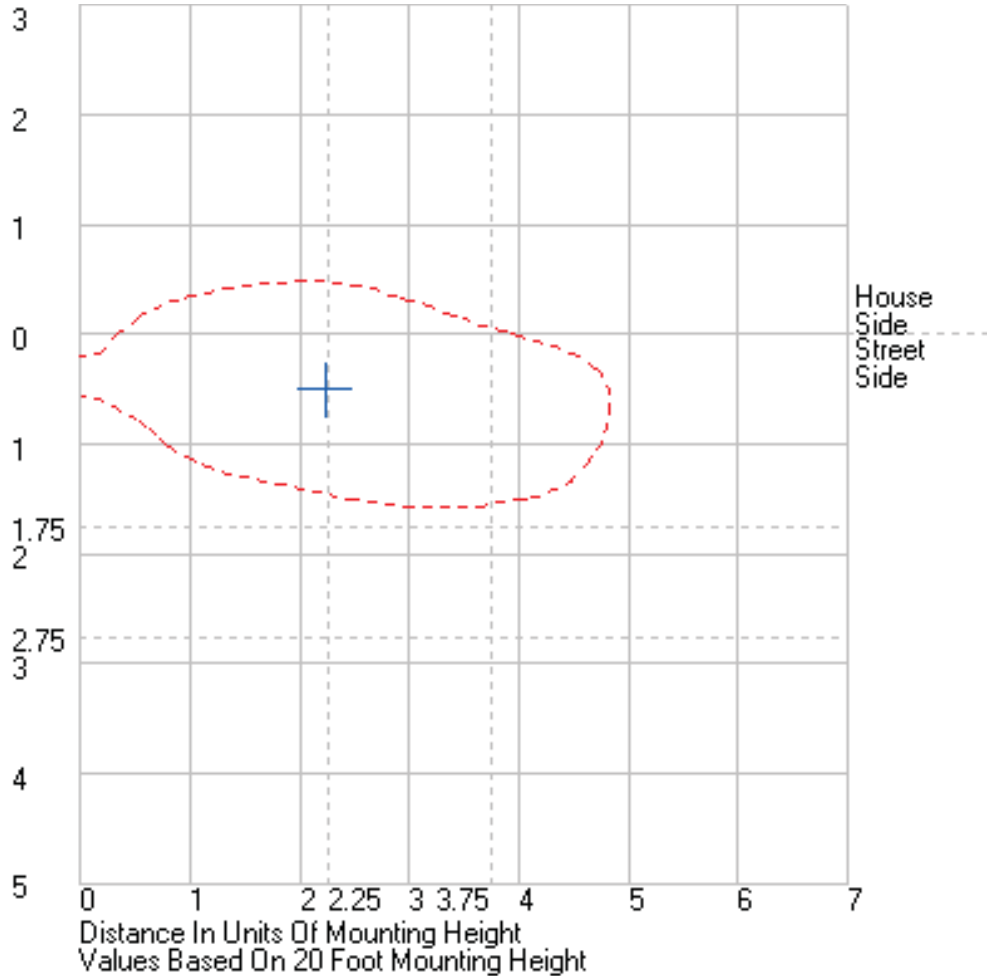
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.385, 0.382)
	CIE 1976 (u', v') ⁽¹⁾	(0.225, 0.505)
	Correlated Color Temperature (CCT) ⁽¹⁾	3940 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.55E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.2
	Special CRI 9 (R ₉) ^{(1),(3)}	-36.6
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.44E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.50

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	0.774 A	
	Power	90.7 W	
	Power Factor	0.98	
	Current THD	18 %	
	Voltage	277.0 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.351 A	
	Power	89.6 W	
	Power Factor	0.92	
	Current THD	21 %	

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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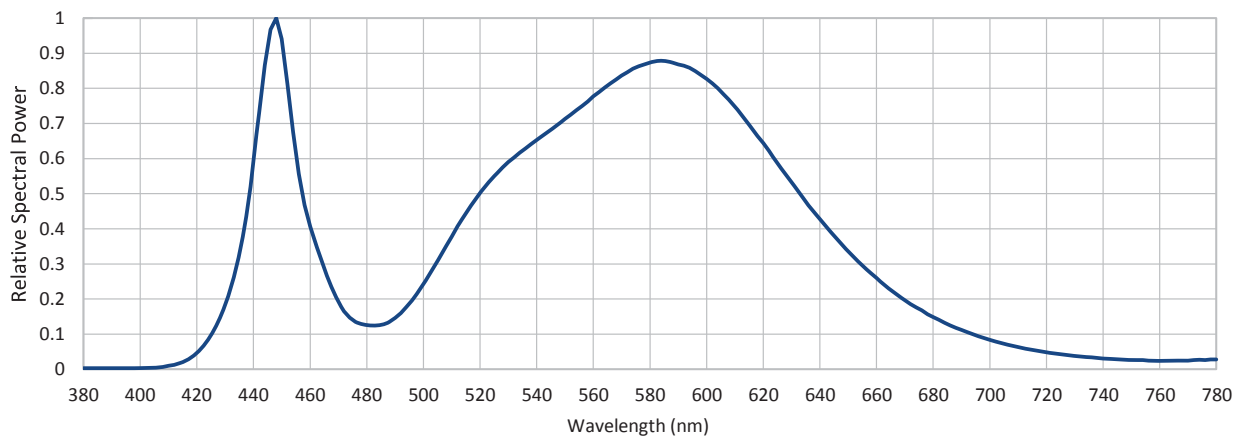
Operating at 120v AC and 60 Hz.

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	0.406	540	0.653	620	0.644	700	0.084
385	0.003	465	0.287	545	0.682	625	0.587	705	0.073
390	0.003	470	0.191	550	0.713	630	0.533	710	0.063
395	0.003	475	0.141	555	0.744	635	0.478	715	0.055
400	0.003	480	0.126	560	0.777	640	0.428	720	0.048
405	0.005	485	0.127	565	0.808	645	0.379	725	0.043
410	0.010	490	0.146	570	0.836	650	0.337	730	0.038
415	0.022	495	0.186	575	0.859	655	0.296	735	0.034
420	0.046	500	0.243	580	0.874	660	0.260	740	0.031
425	0.098	505	0.309	585	0.878	665	0.226	745	0.029
430	0.185	510	0.378	590	0.868	670	0.196	750	0.026
435	0.329	515	0.445	595	0.854	675	0.172	755	0.025
440	0.589	520	0.502	600	0.827	680	0.149	760	0.025
445	0.916	525	0.550	605	0.791	685	0.129	765	0.025
450	0.941	530	0.590	610	0.747	690	0.112	770	0.025
455	0.616	535	0.623	615	0.697	695	0.097	775	0.026
								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, 0.504)
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)	(0.226, 0.505)
40.0	(0.226, 0.505)	(0.225, 0.504)
50.0	(0.226, 0.505)	(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 0.75 / 2.5 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-19120-15

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

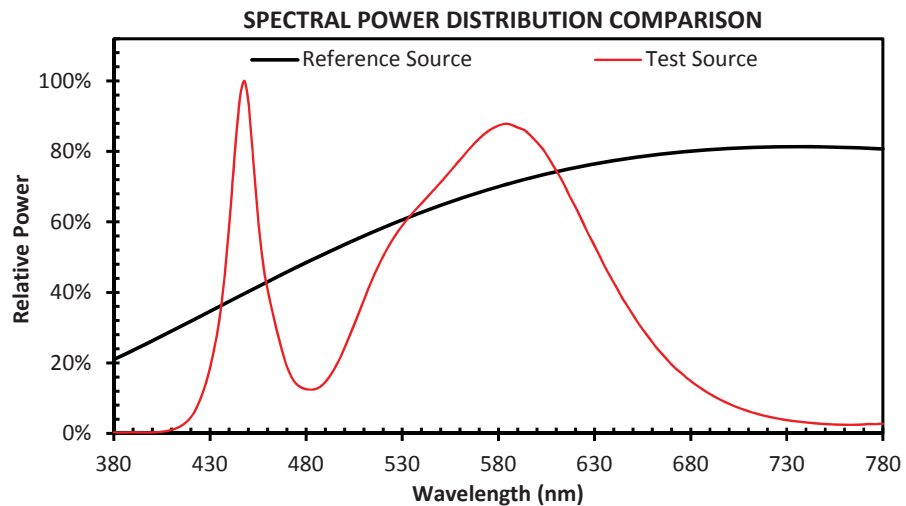
Grey cast aluminum housing with no lens.

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

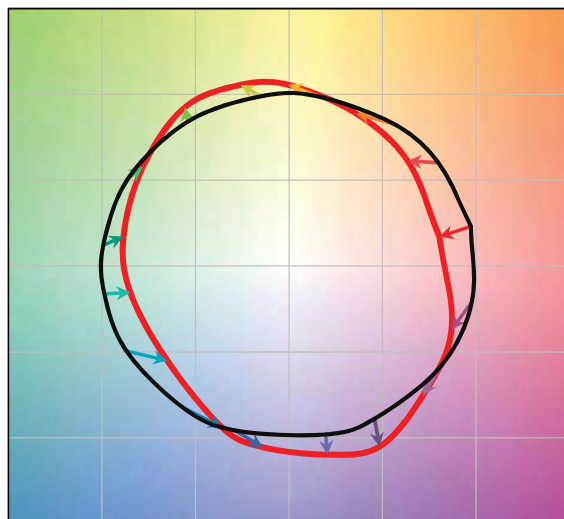
One Delta Electronics LED driver. Model: USCI-200140GA set to 750ma.

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-19120-15

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES 2 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 750ma.
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.