



Report of Test LLI-19120-18

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES T 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 1200ma.

Operating at 120v AC and 60 Hz.



Performance Summary

Total Light Output	22204 lm	Min Power Factor	0.95 @ 277 V
Luminaire Power	148.4 W	Max THD(i)*	14.0 % @ 120 V
Luminous Efficacy	149.6 lm/W	0-90° Zonal Flux %	100.0 %
CCT	3920 K	80-90° Zonal Flux %	1.4 %
CIE(x,y) 1931	(0.385, 0.383)	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-19120-18

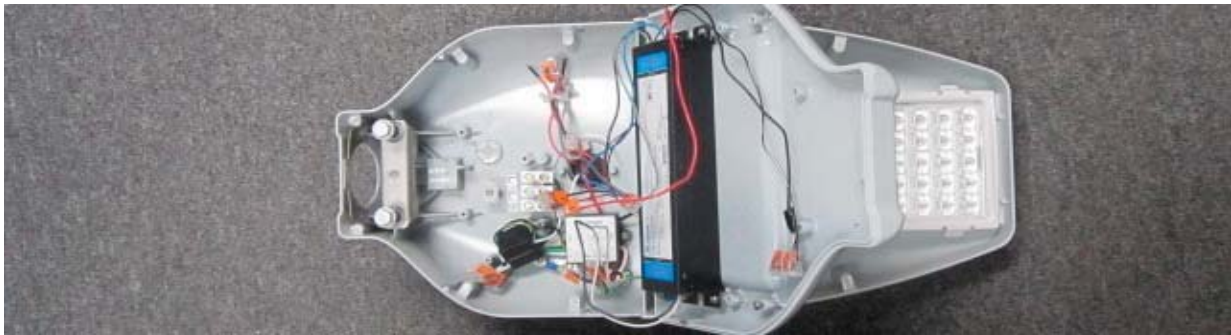
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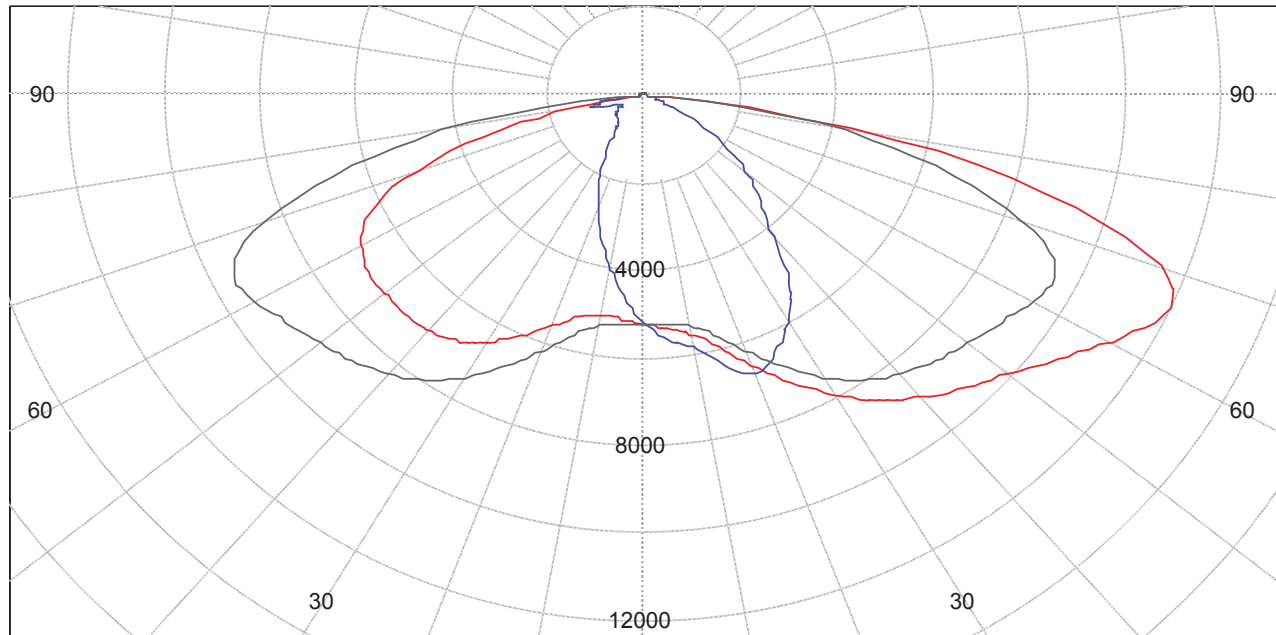
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Polar Light Distribution Curves



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

30-May-2019
31-May-2019

RT



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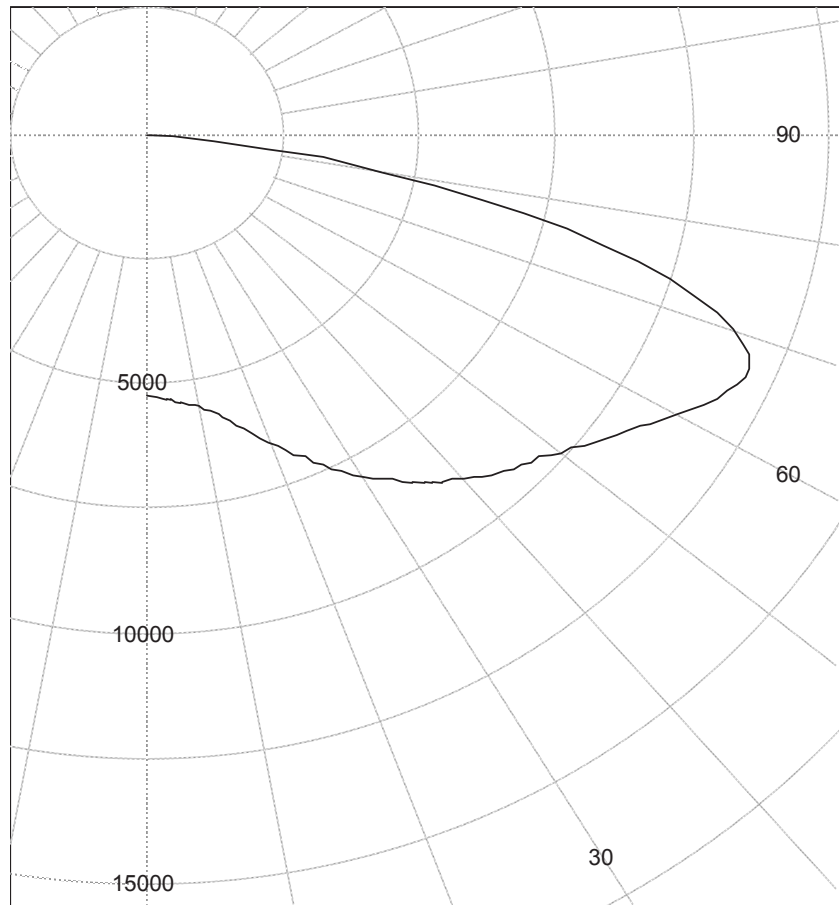
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Intensity in principal plane
(based on overall max intensity)

Vertical Angle (°)	Intensity (cd)
0.0	5233.1
10.0	5535.5
20.0	6568.5
30.0	7911.3
35.0	8493.9
40.0	9012.9
45.0	9473.0
47.5	9670.5
50.0	9904.1
52.5	10211.7
55.0	10504.4
57.5	10836.0
60.0	11231.3
62.5	11623.8
65.0	11932.6
67.5	11927.1
70.0	11408.2
72.5	10274.8
75.0	8632.4
77.5	6694.2
80.0	4366.8
82.5	1738.3
85.0	101.6
87.5	26.7
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
9502.7 cd @ (90.0°, 63.5°)

Street side max intensity
11981.0 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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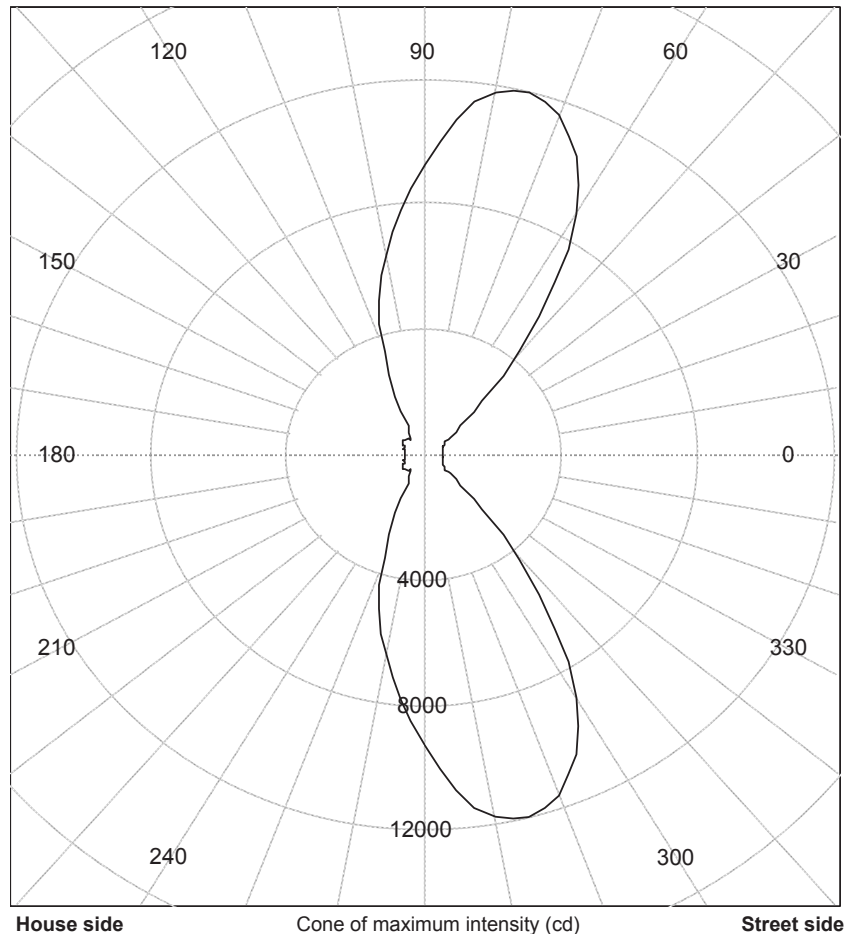
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Operating at 120v AC and 60 Hz.

Intensity in principal cone
(based on overall max intensity)

Lateral Plane (°)	(V66.5) (cd)
0	493.6
15	501.5
30	709.1
40	1429.1
45	2415.7
50	4345.8
55	6726.3
60	8920.2
65	10582.8
70	11566.5
75	11965.7
80	11786.9
85	10795.7
90	9258.5
95	7802.8
100	6531.1
105	5147.8
110	3494.3
115	2010.7
120	1039.4
125	672.8
130	652.5
135	710.7
140	748.2
150	719.0
165	637.4
180	535.7

Principal Conical Surface



House side

Cone of maximum intensity (cd)

Street side

House side max intensity
9502.7 cd @ (90.0°, 63.5°)

Street side max intensity
11981.0 cd @ (77.5°, 66.5°)

Coordinates expressed in the C Type coordinate system

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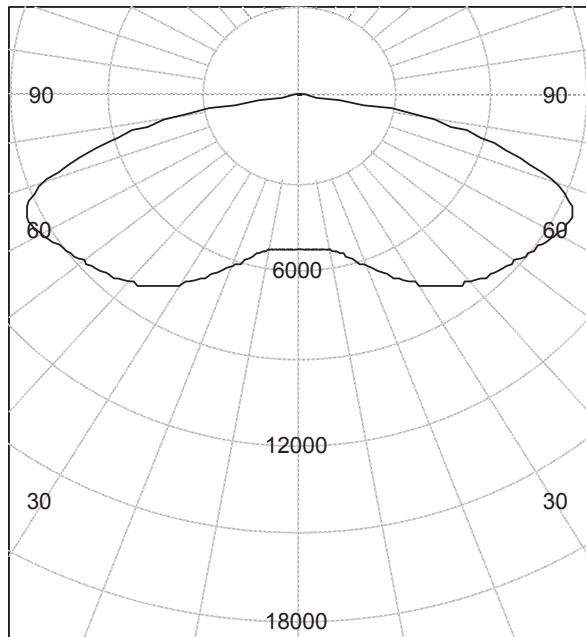
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Polar curve through L90 / L270

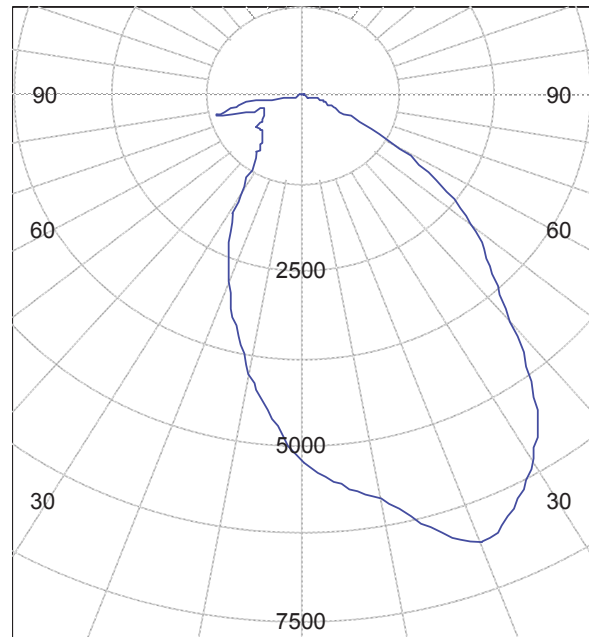


(L90)

(cd)

(L270)

Polar curve through L0 / L180



House side (L180)

(cd)

Street side (L0)



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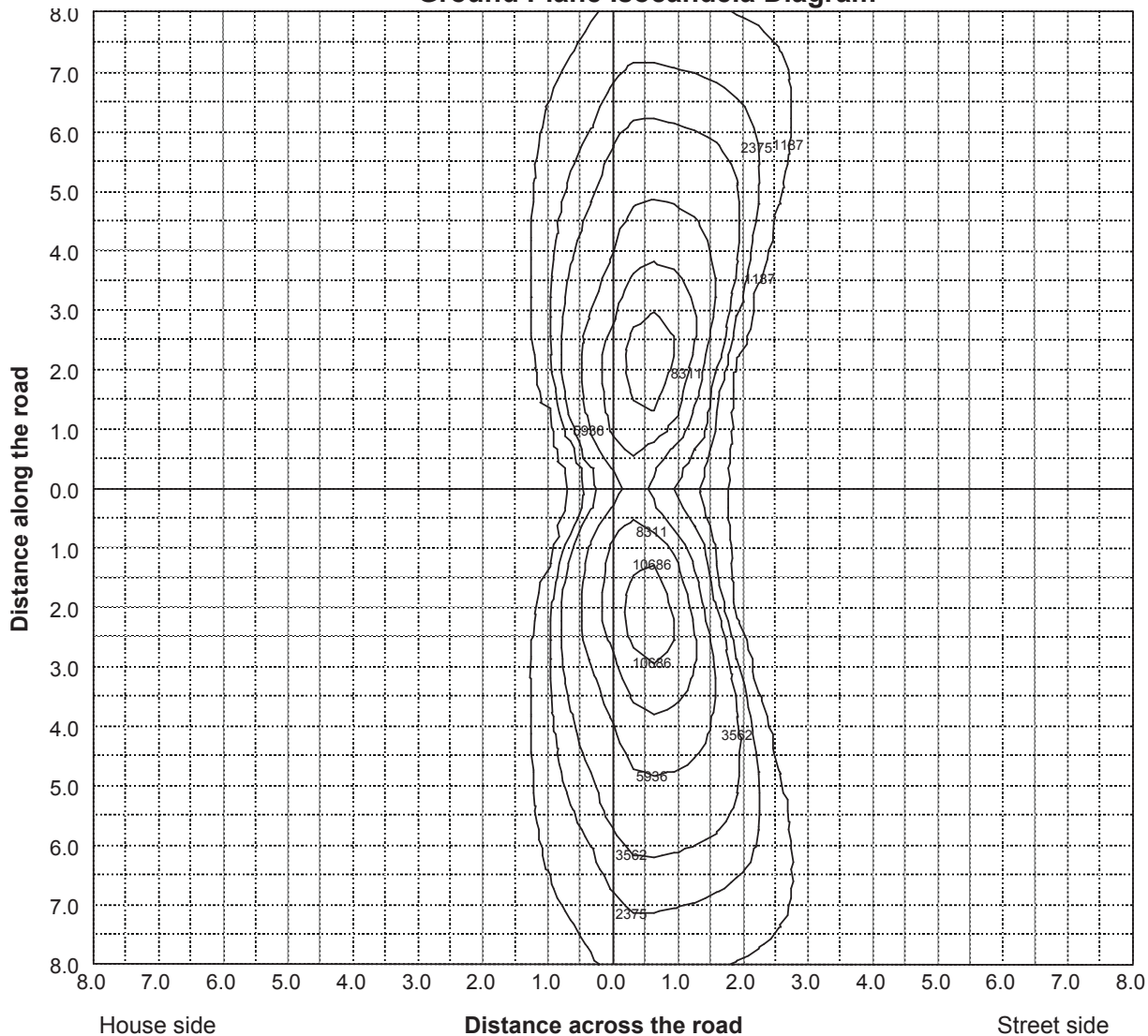
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Ground Plane Isocandela Diagram



The isocandela contour units are expressed as cd

Upstream and downstream sides have been averaged.



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Intensity data (cd)

Vertical	L-Plane								
	L0	L15	L30	L40	L45	L50	L55	L60	L65
0.0	5233	5233	5233	5233	5233	5233	5233	5233	5233
10.0	5855	5855	5813	5787	5767	5749	5729	5702	5665
20.0	6766	6798	6794	6781	6745	6698	6660	6647	6648
30.0	5989	6232	6862	7532	7829	7999	8067	8097	8043
35.0	5247	5590	6482	7396	7878	8296	8594	8696	8715
40.0	4215	4741	5932	7122	7768	8349	8855	9167	9257
45.0	3439	3916	5377	6830	7656	8382	9015	9487	9718
47.5	3160	3602	5127	6730	7668	8494	9183	9687	9953
50.0	2862	3297	4836	6619	7694	8646	9404	9955	10244
52.5	2525	2934	4498	6423	7668	8779	9627	10225	10568
55.0	2134	2484	4064	6052	7416	8705	9708	10391	10788
57.5	1702	1979	3454	5484	6888	8346	9576	10409	10940
60.0	1291	1486	2641	4651	6083	7711	9200	10273	11000
62.5	903	1010	1779	3458	4902	6733	8524	9964	10970
65.0	588	626	1030	2105	3370	5351	7507	9389	10809
67.5	445	451	568	1067	1857	3645	6139	8540	10360
70.0	334	354	431	508	865	2016	4446	7282	9492
72.5	265	281	359	355	414	842	2537	5570	8069
75.0	246	260	284	302	288	370	966	3421	6109
77.5	225	260	208	261	228	243	385	1533	3913
80.0	165	217	158	174	194	169	212	532	1907
82.5	99	146	102	104	104	108	106	184	594
85.0	44	51	41	42	41	41	38	39	55
87.5	8	9	8	9	11	13	15	17	20
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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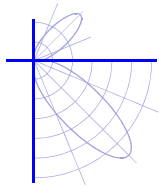
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Intensity data (cd)

Vertical	L-Plane								
	L70	L75	L80	L85	L90	L95	L100	L105	L110
0.0	5233	5233	5233	5233	5233	5233	5233	5233	5233
10.0	5615	5563	5505	5440	5350	5255	5151	5042	4935
20.0	6637	6601	6526	6410	6227	6001	5734	5437	5137
30.0	7982	7940	7861	7706	7444	7097	6686	6226	5742
35.0	8626	8537	8428	8249	7935	7523	7051	6520	5958
40.0	9209	9083	8923	8691	8308	7823	7256	6646	6007
45.0	9722	9573	9356	9058	8599	8036	7342	6640	5912
47.5	9962	9790	9526	9198	8697	8074	7349	6603	5824
50.0	10253	10050	9736	9352	8803	8118	7342	6559	5719
52.5	10608	10384	10011	9562	8940	8198	7390	6558	5645
55.0	10858	10661	10293	9771	9067	8252	7383	6475	5467
57.5	11111	10984	10618	10045	9222	8276	7298	6299	5173
60.0	11367	11347	11020	10376	9382	8294	7224	6109	4835
62.5	11545	11707	11410	10658	9493	8256	7086	5852	4418
65.0	11617	11943	11719	10823	9435	8052	6808	5477	3892
67.5	11446	11900	11750	10700	9070	7582	6299	4884	3205
70.0	10753	11328	11268	10144	8344	6822	5576	4085	2441
72.5	9472	10137	10236	9262	7361	5838	4631	3142	1687
75.0	7703	8494	8662	8083	6294	4783	3608	2192	1067
77.5	5674	6519	6742	6571	5105	3652	2562	1347	621
80.0	3448	4193	4427	4490	3633	2405	1502	655	347
82.5	1304	1630	1848	1942	1654	1027	619	230	173
85.0	92	99	108	99	92	77	66	65	67
87.5	22	25	28	29	31	32	33	32	32
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
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180.0	0	0	0	0	0	0	0	0	0



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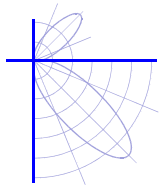
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Operating at 120v AC and 60 Hz.

Intensity data (cd)

Vertical	L-Plane								
	L115	L120	L125	L130	L135	L140	L150	L165	L180
0.0	5233	5233	5233	5233	5233	5233	5233	5233	5233
10.0	4819	4713	4614	4513	4434	4349	4216	4087	4029
20.0	4821	4507	4200	3912	3681	3481	3187	2923	2832
30.0	5212	4664	4113	3566	3068	2653	2131	1745	1630
35.0	5342	4694	4011	3311	2662	2113	1493	1141	1073
40.0	5315	4578	3767	2893	2075	1460	1008	871	847
45.0	5122	4250	3290	2262	1369	936	827	791	770
47.5	4970	4008	2961	1882	1052	829	797	763	747
50.0	4780	3724	2593	1504	857	793	769	786	739
52.5	4602	3425	2221	1199	791	766	762	799	738
55.0	4293	3014	1792	958	753	752	780	788	731
57.5	3880	2554	1398	808	724	752	785	725	624
60.0	3433	2088	1091	731	715	758	770	679	580
62.5	2927	1637	875	695	717	763	752	662	562
65.0	2362	1238	736	668	716	757	733	643	541
67.5	1779	922	638	645	699	743	703	624	538
70.0	1258	691	566	622	683	726	643	598	604
72.5	845	518	508	583	653	682	558	703	861
75.0	553	419	452	529	596	599	540	965	1144
77.5	372	340	383	443	506	513	611	931	1075
80.0	258	263	296	349	409	450	525	763	903
82.5	164	173	191	228	263	318	398	598	680
85.0	68	72	80	90	113	128	194	261	258
87.5	32	31	30	29	27	31	35	54	58
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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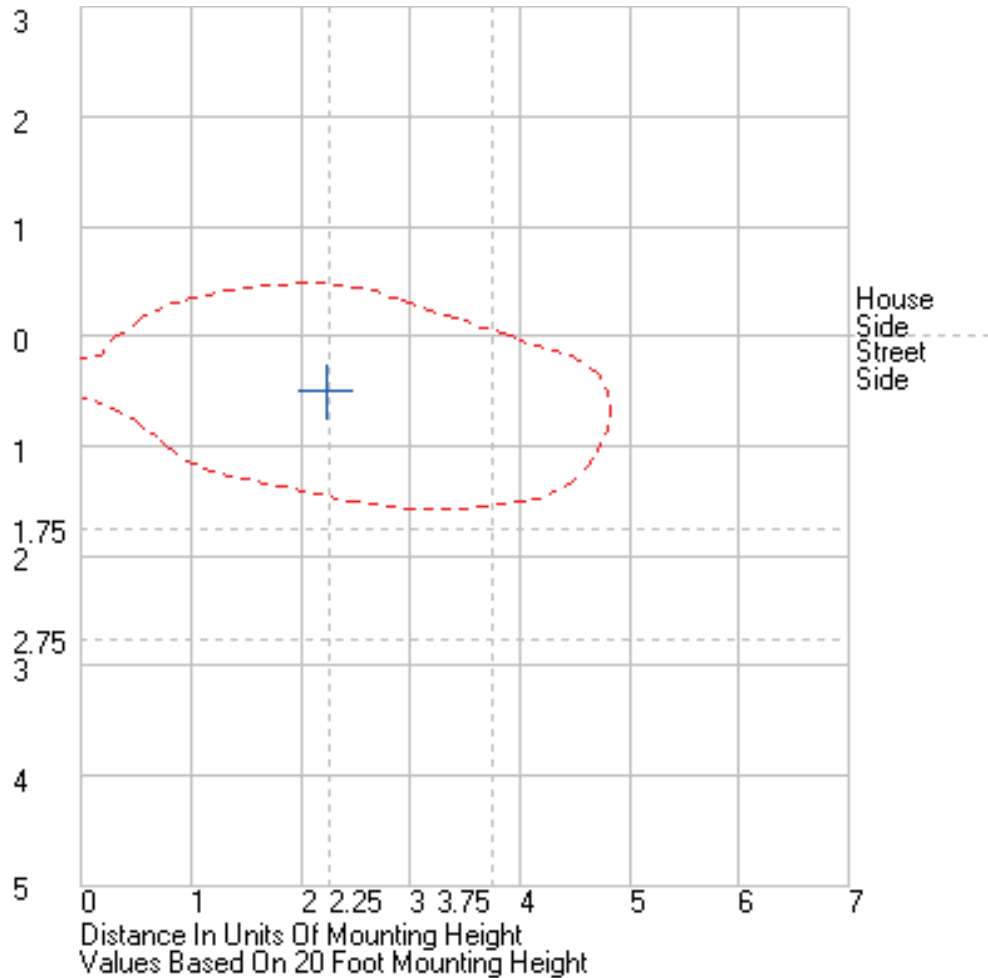
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LM-79 Performance Data

Spectral	CIE 1931 (x, y) ⁽¹⁾	(0.385, 0.383)
	CIE 1976 (u', v') ⁽¹⁾	(0.226, 0.505)
	Correlated Color Temperature (CCT) ⁽¹⁾	3920 K
	Spatial Δ (u', v') Uniformity ⁽²⁾	2.54E-03
	Color Rendering Index (Ra) ⁽¹⁾	71.1
	Special CRI 9 (R ₉) ^{(1),(3)}	-36.2
	Distance from Planckian Locus (Duv) ^{(1),(3)}	1.35E-03
	Scotopic/Photopic Ratio ^{(1),(3)}	1.49

Electrical	Voltage	120.0 V	(Setpoint 1)
	Frequency	60.0 Hz	
	Current	1.254 A	
	Power	148 W	
	Power Factor	0.99	
	Current THD	14 %	
	Voltage	277.1 V	(Setpoint 2)
	Frequency	60.0 Hz	
	Current	0.556 A	
	Power	147 W	
	Power Factor	0.95	
	Current THD	8.3 %	

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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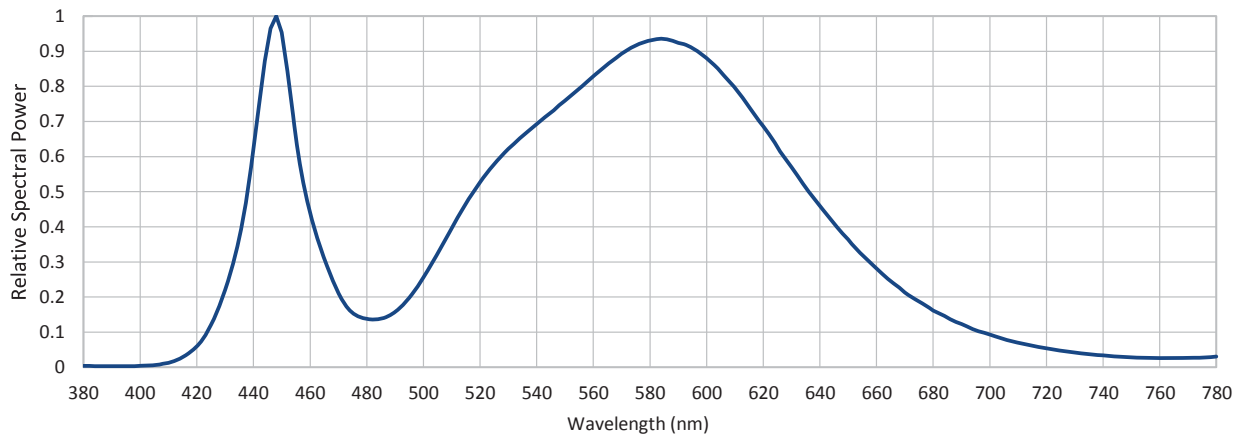
Operating at 120v AC and 60 Hz.

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	0.004	460	0.438	540	0.693	620	0.686	700	0.093
385	0.003	465	0.310	545	0.725	625	0.627	705	0.081
390	0.003	470	0.211	550	0.759	630	0.570	710	0.070
395	0.003	475	0.156	555	0.794	635	0.512	715	0.061
400	0.004	480	0.138	560	0.829	640	0.460	720	0.054
405	0.006	485	0.138	565	0.862	645	0.408	725	0.047
410	0.013	490	0.158	570	0.893	650	0.364	730	0.042
415	0.029	495	0.198	575	0.916	655	0.319	735	0.037
420	0.060	500	0.256	580	0.931	660	0.281	740	0.034
425	0.122	505	0.324	585	0.935	665	0.246	745	0.031
430	0.220	510	0.396	590	0.924	670	0.213	750	0.028
435	0.372	515	0.466	595	0.909	675	0.187	755	0.027
440	0.621	520	0.527	600	0.880	680	0.162	760	0.026
445	0.918	525	0.579	605	0.842	685	0.141	765	0.026
450	0.954	530	0.622	610	0.795	690	0.123	770	0.026
455	0.658	535	0.659	615	0.742	695	0.106	775	0.027
								780	0.031





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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, 0.506)
20.0	(0.227, 0.507)	(0.226, 0.506)
30.0	(0.226, 0.506)	(0.226, 0.505)
40.0	(0.226, 0.505)	(0.226, 0.504)
50.0	(0.226, 0.505)	(0.226, 0.506)
60.0	(0.226, 0.504)	(0.226, 0.506)
70.0	(0.226, 0.506)	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 / 2.75 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-19120-18

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

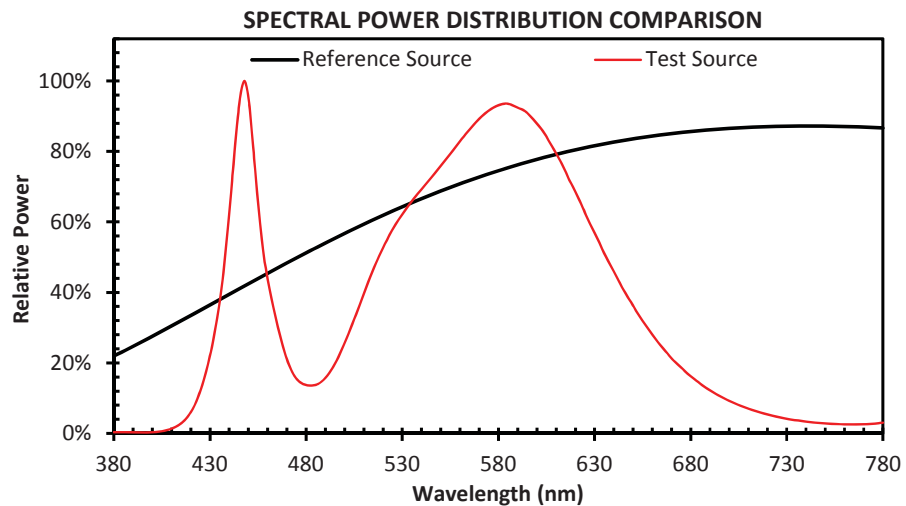
Grey cast aluminum housing with no lens.

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

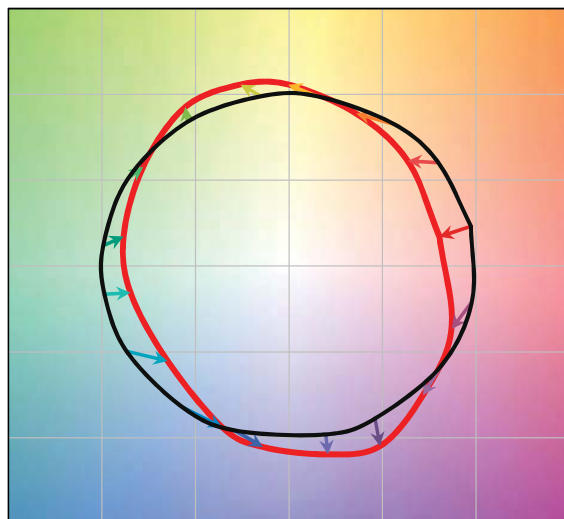
One Delta Electronics LED driver. Model: USCI-200140GA set to 1200ma.

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-19120-18

LED Roadway Lighting - Roadway luminaire. Product ID: L6 60M 5 X 2ES T 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 1200ma.
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.