IESNA LM79-2008 Test Report

TÜV SÜD America

Photometric Testing and Evaluation in Accordance with LM79-2008

Report Prepared for:

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Sample Tested:	**LS 38 90WE NW FL G1 BX**
Manufacturer:	**Lighting Science Group Corporation**
Technical Report Number:	**JI1400199-13-LM79**
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Summary of Key Test Results

Model#	**LS 38 90WE NW FL G1 BX**
Manufacturer	LSGC
TÜV Sample#	1183-13
Date of Test	January 14th 2014

Notes:

Tested in LBU orientation (Lamp-Base-Up)

Parameter	Measured Result
Luminous Flux	**1214.0 Lumens**
Input Power	**17.52 Watts**
Efficacy	**69.30 Lumens/Watt**
C.C.T.	**4091 K**
C.R.I. (R_a)	**84.2**
Stabilization Time	**60 minutes**

The above results are recorded / derived from measurements in accordance with LM79-08

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Test Results –

The following results were obtained after stabilization of the sample in accordance with the requirements set forth in section 5.0 of IES LM79-2008. Stability is achieved when the variation of 3 readings of light output and electrical power over a period of 30 minutes, taken 15 minutes apart, is less than 0.5%.

Photometric Results	LS 38 90WE NW FL G1 BX	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	1214.0	1202.3
Luminous Efficacy (Lumens/Watt)	69.30	68.66
Total Radiant Flux (Watts)	3.8	-
Correlated Color Temperature (CCT)	4091	-
Color Rendering Index (CRI – R_a)	84.2	-
R_9 Value	2.9	-
Chromaticity (Chroma x / Chroma y)	0.3764 / 0.3744	-
Chromaticity (Chroma u / Chroma v)	0.2234 / 0.3333	-
Chromaticity (Chroma u' / Chroma v')	0.2234 / 0.4999	-
D_{uv} Value	0.00007	-

Electrical Results	LS 38 90WE NW FL G1 BX	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	17.52	17.51
Input Voltage (Volts AC)	119.99	120.01
Input Current (Amps)	0.156	0.160
Power Factor	0.938	0.939
Input Frequency (Hertz)	60.0	60.0
A-THD (Current %)	34.56 %	34.41 %

Additional Parameters	LS 38 90WE NW FL G1 BX	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	60 minutes
Test Geometry Configuration	4π	Type C
Spectroradiometer	Labsphere CDS1100	Gigahertz Optik P9801
Ambient Temperature	24.7 °C	24.3 °C
ISTMT (In-Situ Temperature Measurement)	Not tested	
Spacing Criteria	N/A	

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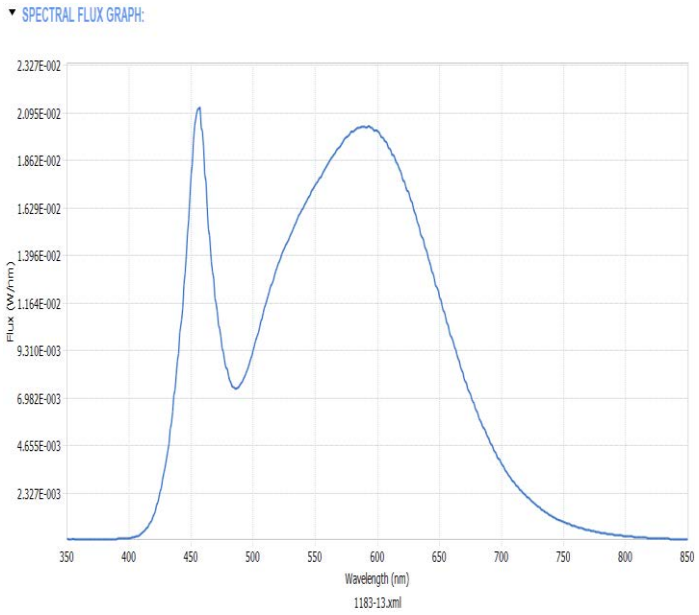
Spectral Flux and Chromaticity Diagram

Spectral Flux

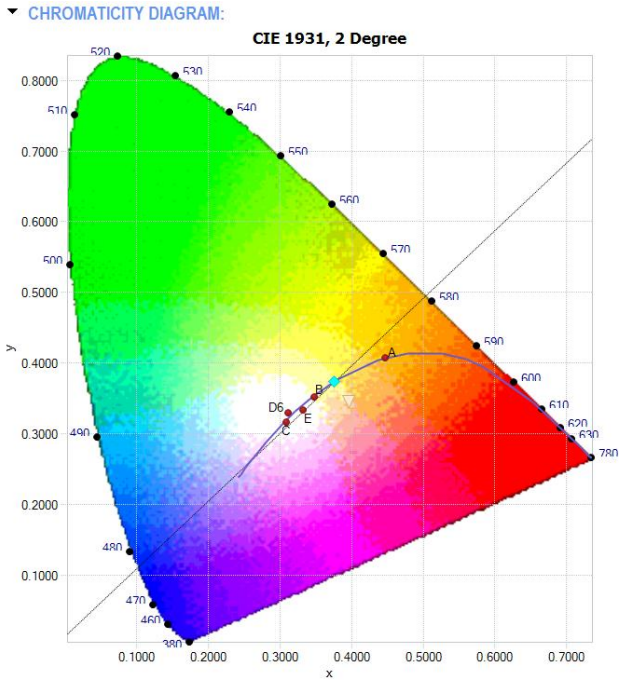


Spectral response of the Radiant Flux

(350nm to 850nm)

Parameter	Stable Data
Peak Wavelength (nm)	455.5
Dominant Wavelength (nm)	578.7

Chromaticity Diagram



Tristimulus values (from page 5):

x / y = 0.3764 / 0.3744

The locations on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	1135.4	94.4 %
60 - 90	66.9	5.6 %
0 - 90	1202.3	100 %
90 - 180	0.0	0.0 %
0 - 180	1202.3	100 %

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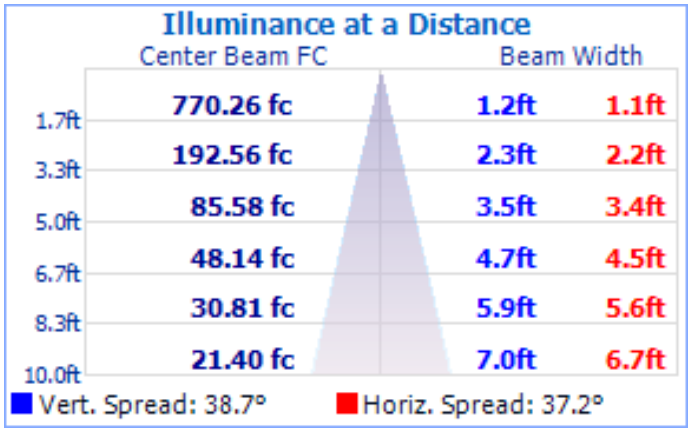
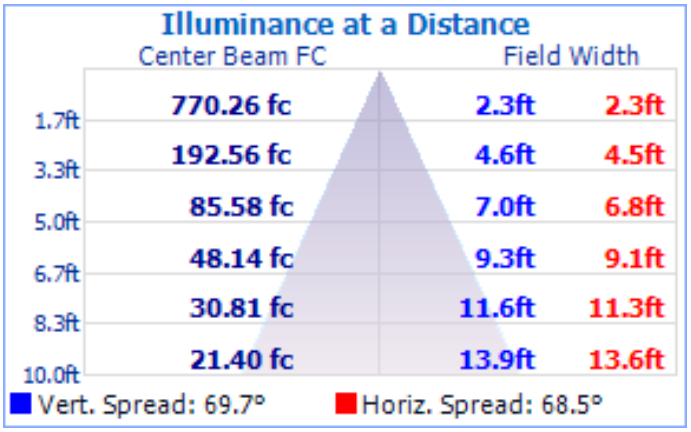
Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



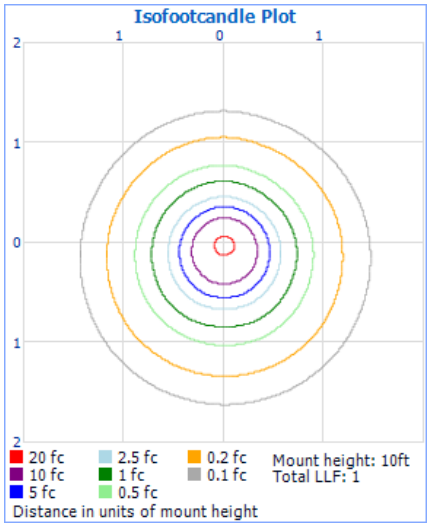


Beam Angle = 38.7°

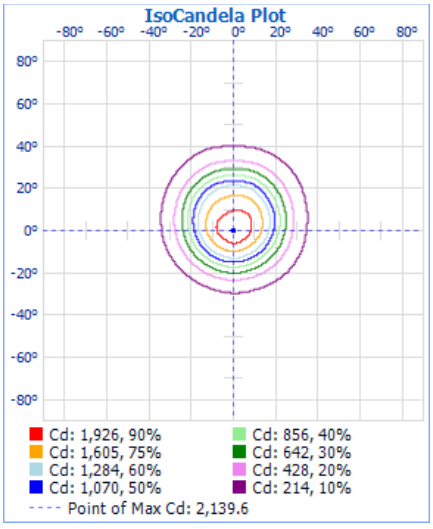
Field Angle = 69.7°

Test Results – Candela Plots

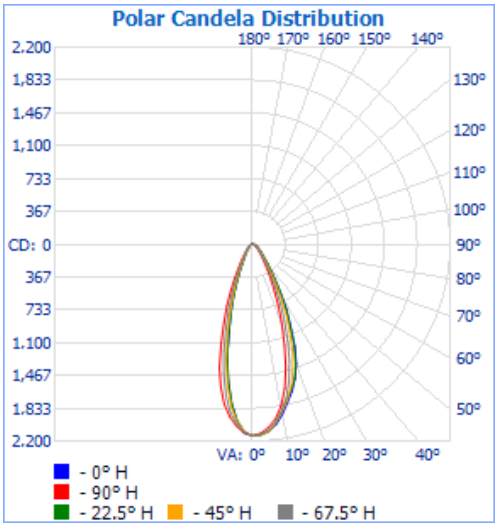
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela

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Test Results – Candela Tabulation

The table below displays the tabulated Candela measurements from the IES file:
Horizontal (lateral) angles are shown in **red** across the top of the table, in increments of 22.5°.
Vertical (longitudinal) angles are shown in **blue** down the side of the table, in increments of 2.5°.

	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0	247.5	270.0	292.5	315.0	337.5	360.0
0.0	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**	**2140**
2.5	2130	2131	2129	2124	2113	2097	2091	2094	2103	2094	2092	2098	2112	2119	2119	2123	2130
5.0	2090	2100	2097	2083	2052	2020	1984	1972	1984	1975	1988	2020	2041	2065	2080	2079	2090
7.5	2028	2011	2007	1992	1965	1901	1824	1786	1791	1786	1825	1894	1944	1988	2021	2030	2028
10.0	1925	1891	1895	1879	1833	1733	1623	1565	1560	1546	1602	1708	1814	1889	1949	1955	1925
12.5	1806	1778	1784	1748	1653	1514	1388	1314	1311	1293	1351	1481	1632	1747	1838	1854	1806
15.0	1700	1675	1652	1573	1430	1278	1134	1036	1011	1020	1097	1232	1424	1570	1696	1742	1700
17.5	1572	1567	1491	1367	1184	1032	887	807	798	797	861	989	1159	1355	1505	1604	1572
20.0	1424	1411	1315	1148	958	806	681	614	619	611	666	780	931	1119	1276	1429	1424
22.5	1233	1201	1100	929	758	617	509	457	457	456	506	603	748	900	1029	1211	1233
25.0	996	977	902	739	584	463	373	336	340	337	381	460	575	711	858	976	996
27.5	816	801	701	563	446	343	273	250	254	253	288	349	435	549	672	809	816
30.0	623	616	530	426	339	255	205	189	194	195	220	265	328	419	523	625	623
32.5	472	472	400	323	256	195	159	149	155	156	173	205	250	319	408	475	472
35.0	358	365	302	245	198	155	130	123	128	128	140	164	196	246	314	363	358
37.5	278	284	235	191	158	128	109	102	107	108	117	134	159	194	245	277	278
40.0	222	223	188	155	131	109	94	87	91	92	99	112	132	159	194	219	222
42.5	183	180	156	130	111	94	81	75	78	79	84	95	111	133	159	179	183
45.0	153	150	133	112	96	81	71	66	68	68	73	81	95	113	134	148	153
47.5	130	127	114	96	83	71	62	58	60	60	63	70	81	96	114	125	130
50.0	112	108	98	83	72	63	55	51	52	53	55	61	71	82	98	107	112
52.5	96	93	85	73	64	55	49	45	47	47	49	53	61	71	84	92	96
55.0	83	81	74	64	56	49	44	41	42	42	44	47	54	62	73	80	83
57.5	72	70	65	57	50	44	40	37	37	38	39	42	47	54	64	69	72
60.0	62	61	57	50	45	40	36	33	33	34	35	38	42	48	56	60	62
62.5	54	54	50	45	40	36	32	29	30	31	32	34	38	43	49	52	54
65.0	48	48	45	40	36	32	28	26	26	27	28	31	34	39	43	46	48
67.5	43	44	41	36	32	29	25	22	23	23	24	27	31	35	39	41	43
70.0	38	39	37	32	29	25	21	19	19	20	21	24	27	31	35	37	38
72.5	34	35	33	29	25	21	18	15	16	16	18	20	24	28	31	34	34
75.0	31	31	29	25	21	18	14	12	12	13	14	17	20	25	28	30	31
77.5	27	27	25	22	18	14	11	8	9	9	11	13	17	21	24	26	27
80.0	23	24	21	18	15	11	7	4	5	5	7	10	14	17	21	23	23
82.5	20	20	18	15	11	7	3	1	1	1	3	6	10	14	17	19	20
85.0	16	16	14	11	7	3	0	0	0	0	0	3	6	10	14	16	16
87.5	12	12	10	7	3	0	0	0	0	0	0	0	3	7	10	12	12
90.0	9	8	7	3	0	0	0	0	0	0	0	0	0	3	6	9	9

Maximum Candela = **2139.6** at Horizontal 0.0°, Vertical: 0.0°

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TÜV SÜD Photometric Testing Information

Testing is performed in accordance with the procedures outlined in IESNA LM79-2008. The sample is evaluated for photometric and electrical characteristics using an integrating sphere and a goniophotometer, located in an accredited, temperature and humidity-controlled, draft free photometric laboratory.

Sphere Geometry

The integrating spheres used for measurement utilize a "4π geometry" configuration in accordance with section 9 of IES LM-79-2008 and is applicable for all types of SSL products (directional and non-directional light projections). The spectroradiometer is an array-type detector manufactured and calibrated by Labsphere (Model# CDS1100).

Self-Absorption Correction

The integrating sphere uses self-absorption correction to eliminate errors due to mismatches between the standard reference lamp and the test samples being measured. This auxiliary correction lamp is a halogen type lamp powered by a calibrated Lamp Power Supply manufactured and calibrated by Labsphere (model LPS150). Ambient temperature is measured using a thermocouple located inside the integrating sphere at the same height as the sample under test (UUT) and not more than 1 meter in horizontal distance away from the sample (section 2.2 of LM79-2008). The thermocouple is located behind a baffle in order to eliminate any direct optical radiation from the sample under test.

Sample Stabilization

The sample (UUT) is placed inside the integrating sphere and powered by a regulated and conditioned alternating or direct current supply. The stabilization times shown on the results pages of this report denote the time of the 3rd measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization in accordance with section 5.0 of LM79-2008.

Sphere Calibration

The integrating sphere is calibrated using a quartzline halogen lamp with the following specifications:

Manufacturer: EYE Lighting International
Model# J94/JD28V75W
Voltage = 28.0 Volts DC
Wattage = 75.0 Watts
Calibration Current = 2.679 Amperes
Luminous Flux = 1685 Lumens
Calibration Date = 2-17-2011 (calibrated by Labsphere – NIST traceable).

Continued…..

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TÜV SÜD Photometric Testing Information (continued)

Goniophotometer

The Goniophotometer is a Type C optical measurement system in accordance with section 9.3.1 of IESNA LM79-2008.

Goniophotometer Calibration

The Goniophotometer is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

Manufacturer: General Electric
Part Number: CSB-110
Lamp Number: 105-A
Voltage: 16.71 Volts DC
Wattage: 150.0 Watts
Calibration Current: 4.847 Amperes
Luminous Intensity: 166.3 Candelas
Calibration Date: 11-07-2011 (NIST traceable)

TÜV SÜD Test Equipment List:

TÜV SÜD Sphere System – contains the following:			
Description	**Manufacturer / Model#**	**TÜV SÜD Ref#**	**Calibration Due Date**
Integrating Sphere	Labsphere LM760	SPH003	weekly
Spectroradiometer	Labsphere CDS1100	ATLE0048	9/7/2016
Power Analyzer	Yokogawa WT210	ATLE0058	3/7/2014
Power Source	Chroma 61602	AC003	N/A
Thermometer	Fluke 52-II	ATLE0008	11/17/2014
TÜV SÜD Goniophotometer System – contains the following:			
Goniophotometer	M.E. GONC01	GON001	weekly
Spectroradiometer	Gigahertz Optik P9801	GIG001	weekly
Power Analyzer	Yokogawa WT210	ATLE0031	11/16/2014
Power Source	Chroma 61602	AC006	N/A