Photometric Test Report

Relevant Standards

☑IES LM-79-2008

☑ANSI C82.77:2014

Prepared For

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Issue Date

2019/11/20

Prepared By	**Approved By**
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1.0 Test Summary

DLC Technical Requirements v4.4

Indoor - Troffer/2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces				
Requirement Category	**Test Method**	**Requirements**		**Test value**
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	3000		4991
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 100	Premium 125	129.34
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		38.6
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	277V	10.94%
		20.00%	120V	8.34%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	277V	0.963
		0.9	120V	0.994
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	5000		3767
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	80		83
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	75%		74.04%
SC: 0-180° (Goniophotometer - Section 4.2)	IES LM-79-2008	1.0-2.0		1.32
SC: 90-270° (Goniophotometer - Section 4.2)	IES LM-79-2008	1.0-2.0		1.34
Input Voltage (V)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		277
(Goniophotometer - Section 4.2)		Non-Wrost Case		120
Input Current (A)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		0.145
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.321
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		38.6
(Goniophotometer - Section 4.2)		Non-Wrost Case		38.3

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2019/11/19	SWISHFA-EDGE2X4-840U @ 39W input	E1
2	Goniophotometer Test	2019/11/19	SWISHFA-EDGE2X4-840U @ 39W input	E1
3	THD and PF Test	2019/11/19	SWISHFA-EDGE2X4-840U @ 39W input	E1

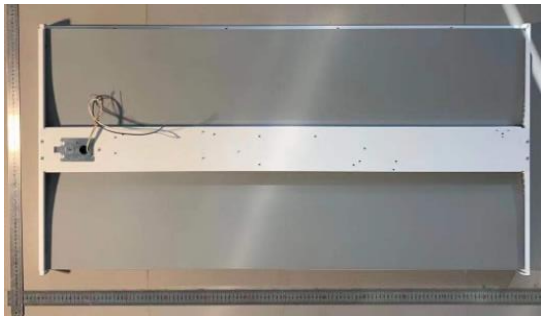
Remark(If any)
1、This report shall not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the US government.
2、The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products. This report does not imply that the product(s) has met the criteria for certification.

3.0 Production Description

Luminaire Description: SWISHFA-EDGE2X4-840U @ 39W input

Electrical Specification: 120V-277V,50/60HZ

Photos of Luminaire Characteristics



4.0 LM-79 Measurement and Test Results

4.1 Integrating Sphere Test

Model No.	SWISHFA-EDGE2X4-840U @ 39W input	Sample ID.	E1
Opreate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	56.0

Test Method
The samples were tested according to the IES LM-79-2008.
Photometric paramters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25º C ± 1º C.
The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere.
The voltage of an AC power supply (RMS voltage) or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ±0.2 percent under load.
The sample was measured using 4π geometry and operated at rated voltage and was stabilized before measurement. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral radiant flux measurements taken at 1 nm intervals over the range of 380 to 780 nm.

Test Result

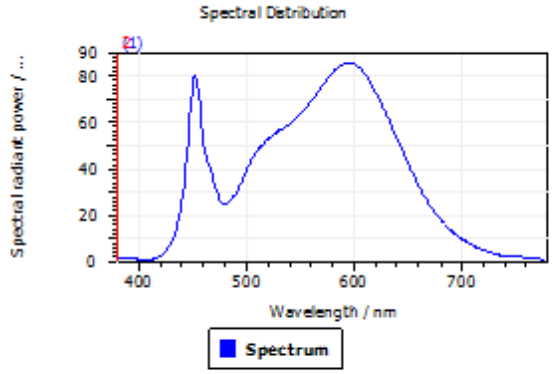
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
277.02	60	0.147	39.1	0.963
120.05	60	0.326	38.9	0.994

Test Result

CCT (K)	CRI	Duv
3767	83	0.0024

4.1 Integrating Sphere Test

Results



Spectral Distribution

Spectral values

DominantWavelength	578.84 nm
Purity	0.351
PeakWavelength	594.56 nm
Radiant Power	14.08 W
Width50%:	

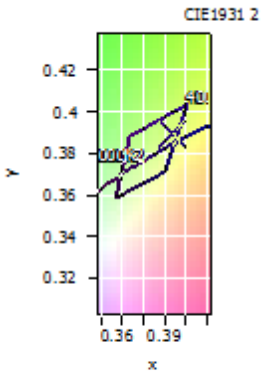
Date:

Color Coordinates

Correlated Color Temperatu		3767 K			
x:	0.3934	u:	0.2284	u':	0.2284
y:	0.3897	v:	0.3394	v':	0.5091

CRI01	80.7	CRI09	3.1
CRI02	89.9	CRI10	76.3
CRI03	96.4	CRI11	80.2
CRI04	80.9	CRI12	62.0
CRI05	80.6	CRI13	83.0
CRI06	86.1	CRI14	98.5
CRI07	85.4	CRI15	73.3
CRI08	61.9	CRI16	70.4

ResultsCRI 82.7



PlanckDistance 2.4E-003

SPD Table

Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)
380	0.00144	421	0.00267	461	0.04778	501	0.04037	541	0.05976
381	0.00142	422	0.00304	462	0.04557	502	0.04130	542	0.06016
382	0.00144	423	0.00346	463	0.04390	503	0.04219	543	0.06050
383	0.00144	424	0.00395	464	0.04238	504	0.04319	544	0.06093
384	0.00138	425	0.00449	465	0.04119	505	0.04409	545	0.06132
385	0.00135	426	0.00508	466	0.04001	506	0.04481	546	0.06184
386	0.00131	427	0.00578	467	0.03879	507	0.04573	547	0.06235
387	0.00130	428	0.00651	468	0.03743	508	0.04656	548	0.06262
388	0.00134	429	0.00733	469	0.03571	509	0.04715	549	0.06304
389	0.00131	430	0.00828	470	0.03400	510	0.04809	550	0.06347
390	0.00129	431	0.00939	471	0.03225	511	0.04873	551	0.06393
391	0.00125	432	0.01055	472	0.03041	512	0.04897	552	0.06444
392	0.00117	433	0.01183	473	0.02872	513	0.04957	553	0.06506
393	0.00114	434	0.01334	474	0.02731	514	0.05018	554	0.06564
394	0.00113	435	0.01488	475	0.02617	515	0.05062	555	0.06622
395	0.00111	436	0.01655	476	0.02540	516	0.05113	556	0.06680
396	0.00111	437	0.01851	477	0.02484	517	0.05174	557	0.06725
397	0.00108	438	0.02102	478	0.02442	518	0.05239	558	0.06775
398	0.00101	439	0.02370	479	0.02433	519	0.05275	559	0.06851
399	0.00097	440	0.02664	480	0.02449	520	0.05299	560	0.06917
400	0.00094	441	0.03009	481	0.02471	521	0.05340	561	0.06952
401	0.00091	442	0.03436	482	0.02511	522	0.05378	562	0.07026
402	0.00089	443	0.03917	483	0.02558	523	0.05400	563	0.07107
403	0.00089	444	0.04427	484	0.02582	524	0.05443	564	0.07170
404	0.00087	445	0.04977	485	0.02629	525	0.05469	565	0.07238
405	0.00085	446	0.05600	486	0.02689	526	0.05491	566	0.07297
406	0.00083	447	0.06209	487	0.02750	527	0.05513	567	0.07357
407	0.00081	448	0.06806	488	0.02816	528	0.05542	568	0.07431
408	0.00082	449	0.07285	489	0.02874	529	0.05559	569	0.07491
409	0.00086	450	0.07726	490	0.02943	530	0.05601	570	0.07566
410	0.00087	451	0.07995	491	0.03011	531	0.05665	571	0.07627
411	0.00091	452	0.08061	492	0.03093	532	0.05688	572	0.07696
412	0.00098	453	0.07959	493	0.03201	533	0.05715	573	0.07770
413	0.00106	454	0.07705	494	0.03299	534	0.05756	574	0.07813
414	0.00115	455	0.07337	495	0.03399	535	0.05783	575	0.07877
415	0.00126	456	0.06885	496	0.03509	536	0.05793	576	0.07945
416	0.00141	457	0.06378	497	0.03621	537	0.05843	577	0.07997
417	0.00162	458	0.05851	498	0.03728	538	0.05882	578	0.08037
418	0.00184	459	0.05422	499	0.03837	539	0.05905	579	0.08098
419	0.00207	460	0.05080	500	0.03941	540	0.05939	580	0.08164
420	0.00235								

Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)	Wavel Length (nm)	Spectral Power (W/nm)
581	0.08207	621	0.07197	661	0.03195	701	0.00956	741	0.00245
582	0.08265	622	0.07102	662	0.03106	702	0.00925	742	0.00239
583	0.08300	623	0.07018	663	0.03021	703	0.00895	743	0.00233
584	0.08326	624	0.06938	664	0.02934	704	0.00865	744	0.00227
585	0.08369	625	0.06833	665	0.02849	705	0.00838	745	0.00222
586	0.08401	626	0.06713	666	0.02770	706	0.00810	746	0.00216
587	0.08453	627	0.06608	667	0.02692	707	0.00785	747	0.00210
588	0.08498	628	0.06505	668	0.02617	708	0.00760	748	0.00205
589	0.08501	629	0.06424	669	0.02542	709	0.00732	749	0.00200
590	0.08510	630	0.06332	670	0.02461	710	0.00708	750	0.00194
591	0.08540	631	0.06240	671	0.02395	711	0.00684	751	0.00188
592	0.08554	632	0.06142	672	0.02337	712	0.00660	752	0.00183
593	0.08545	633	0.06029	673	0.02273	713	0.00639	753	0.00179
594	0.08561	634	0.05924	674	0.02204	714	0.00617	754	0.00174
595	0.08555	635	0.05828	675	0.02138	715	0.00594	755	0.00170
596	0.08546	636	0.05729	676	0.02081	716	0.00571	756	0.00166
597	0.08556	637	0.05616	677	0.02022	717	0.00553	757	0.00162
598	0.08538	638	0.05507	678	0.01959	718	0.00534	758	0.00157
599	0.08541	639	0.05400	679	0.01903	719	0.00514	759	0.00153
600	0.08538	640	0.05295	680	0.01850	720	0.00495	760	0.00149
601	0.08502	641	0.05183	681	0.01793	721	0.00476	761	0.00144
602	0.08464	642	0.05077	682	0.01742	722	0.00458	762	0.00139
603	0.08425	643	0.04980	683	0.01695	723	0.00440	763	0.00135
604	0.08410	644	0.04877	684	0.01646	724	0.00424	764	0.00132
605	0.08382	645	0.04758	685	0.01596	725	0.00408	765	0.00128
606	0.08328	646	0.04644	686	0.01544	726	0.00395	766	0.00124
607	0.08244	647	0.04534	687	0.01497	727	0.00382	767	0.00120
608	0.08162	648	0.04444	688	0.01458	728	0.00367	768	0.00116
609	0.08142	649	0.04343	689	0.01412	729	0.00355	769	0.00113
610	0.08089	650	0.04243	690	0.01368	730	0.00343	770	0.00110
611	0.07996	651	0.04152	691	0.01327	731	0.00330	771	0.00107
612	0.07936	652	0.04044	692	0.01287	732	0.00321	772	0.00104
613	0.07902	653	0.03947	693	0.01247	733	0.00311	773	0.00100
614	0.07828	654	0.03844	694	0.01205	734	0.00301	774	0.00097
615	0.07733	655	0.03745	695	0.01164	735	0.00292	775	0.00094
616	0.07633	656	0.03652	696	0.01129	736	0.00284	776	0.00092
617	0.07532	657	0.03556	697	0.01094	737	0.00275	777	0.00089
618	0.07442	658	0.03465	698	0.01060	738	0.00268	778	0.00086
619	0.07352	659	0.03371	699	0.01025	739	0.00260	779	0.00083
620	0.07274	660	0.03278	700	0.00990	740	0.00253	780	0.00082

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	SWISHFA-EDGE2X4-840U @ 39W input	Sample ID.	E1
Opreate time (Min.)	90	Stabilization time (Min.)	45
Temperature (°C)	25.3	Humidity (%RH)	54.0

Test Method
The samples were tested according to the IES LM-79-2008.
Photometric paramters were measured using a type C goniophotometer and software.
The ambient temperature shall be maintained at 25° C ± 1° C, measured at a point not more than 1 m from the sample and at the same height as the sample.
The voltage of an AC power supply (RMS voltage)or DC power supply (instantaneous voltage) applied to the device under test shall be regulated to within ±0.2 percent under load.
The samples were operated at rated voltage and was stabilized before measurement. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 0.5^{o} vertical intervals and 10^{o} horizontal intervals.

Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WROST CASE	277.06	60	0.145	38.6	0.959
NON-WROST CASE	120.01	60	0.321	38.3	0.994

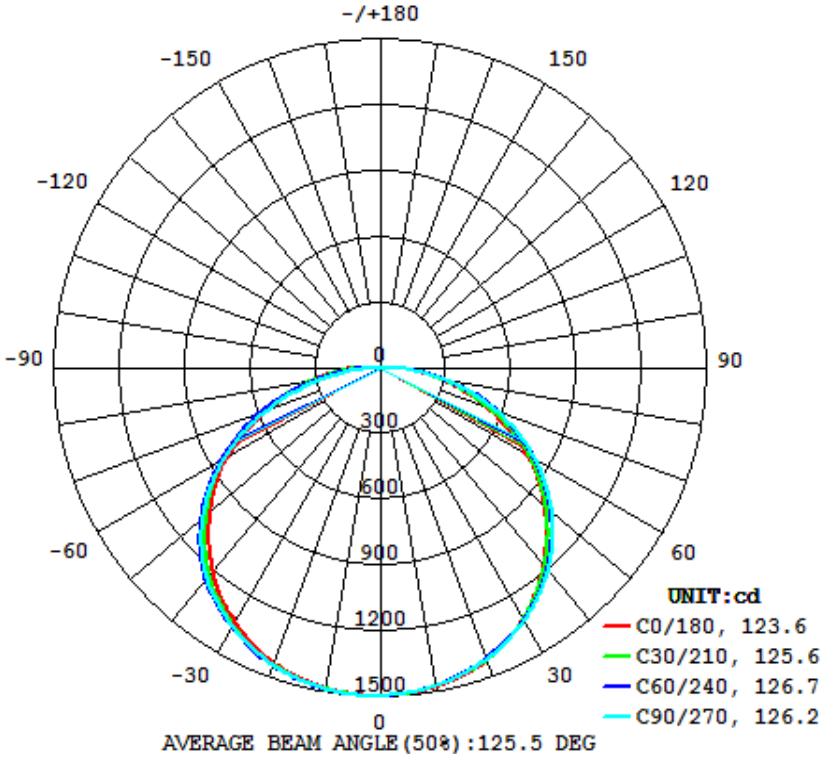
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
4991	172.6	168.5	123.6	126.2	129.3

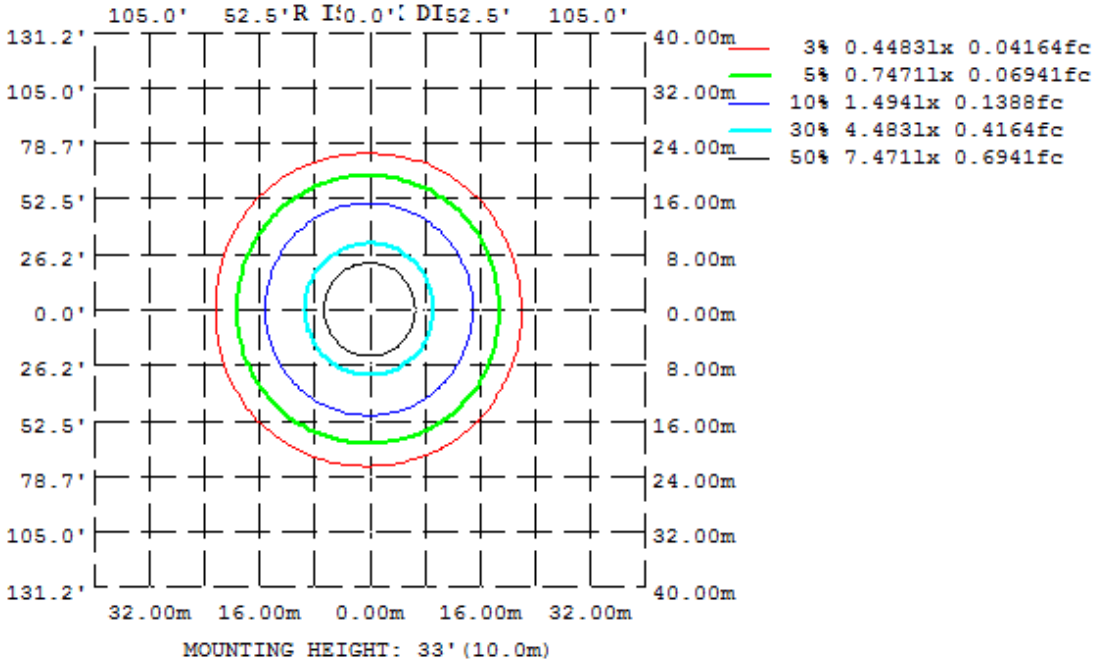
Zonal Lumen Requirement (0°-60°)	SC:0-180°	SC:90°-270°
74.04%	1.32	1.34

4.2 Goniophotometer Test

Light Distrubtion Curve



Isolux Plot



4.2 Goniophotometer Test

Zonal Lumen Summary

γ	C0	C45	C90	C135	C180	C225	C270	C315
10	1473	1468	1469	1475	1481	1486	1486	1478
20	1419	1412	1414	1425	1435	1444	1443	1433
30	1317	1321	1325	1339	1339	1366	1362	1346
40	1170	1186	1201	1211	1202	1244	1245	1217
50	988.8	1009	1032	1036	1024	1065	1068	1035
60	772.0	799.5	817.0	830.1	817.9	847.0	835.9	815.6
70	515.6	554.3	564.0	595.0	554.5	584.9	554.5	544.3
80	262.8	282.5	283.7	320.0	308.0	297.9	251.3	262.2
90	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0
DEG	LUMINOUS INTENSITY:cd							

UGR Table

ceiling/cavity		0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
walls		0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3
working plane		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Room dimensions		Viewed crosswise					Viewed endwise				
x = 2H	y = 2H	14.4	16.0	14.6	16.2	16.4	14.6	16.2	14.9	16.4	16.6
	3H	16.1	17.6	16.4	17.8	18.1	16.5	18.0	16.8	18.2	18.5
	4H	16.9	18.3	17.2	18.5	18.8	17.3	18.7	17.6	19.0	19.2
	6H	17.5	18.8	17.8	19.1	19.4	18.0	19.3	18.3	19.6	19.9
	8H	17.8	19.0	18.1	19.3	19.6	18.2	19.5	18.6	19.8	20.1
	12H	18.0	19.2	18.3	19.5	19.8	18.4	19.7	18.8	20.0	20.3
4H	2H	15.1	16.5	15.4	16.8	17.0	15.3	16.7	15.6	17.0	17.2
	3H	17.0	18.3	17.4	18.6	18.9	17.4	18.6	17.7	18.9	19.2
	4H	17.9	19.1	18.3	19.4	19.7	18.4	19.5	18.7	19.8	20.2
	6H	18.7	19.7	19.1	20.1	20.5	19.2	20.2	19.6	20.5	20.9
	8H	19.0	20.0	19.5	20.4	20.8	19.5	20.5	19.9	20.8	21.2
	12H	19.4	20.2	19.8	20.6	21.0	19.8	20.7	20.2	21.1	21.5
8H	4H	18.3	19.3	18.8	19.7	20.0	18.7	19.6	19.1	20.0	20.4
	6H	19.3	20.1	19.8	20.5	20.9	19.7	20.5	20.2	20.9	21.4
	8H	19.8	20.5	20.2	20.9	21.4	20.2	20.9	20.6	21.3	21.8
	12H	20.2	20.8	20.7	21.3	21.8	20.6	21.2	21.1	21.6	22.1
12H	4H	18.4	19.3	18.8	19.7	20.1	18.7	19.6	19.2	20.0	20.4
	6H	19.4	20.1	19.9	20.6	21.0	19.8	20.5	20.3	21.0	21.4
	8H	20.0	20.6	20.4	21.0	21.5	20.4	21.0	20.8	21.4	21.9
Variations with the observer position at spacings:											
S = 1.0H		+ 0.1 / - 0.2					+ 0.1 / - 0.1				
1.5H		+ 0.2 / - 0.3					+ 0.2 / - 0.3				
2.0H		+ 0.2 / - 0.4					+ 0.1 / - 0.3				

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	141.79	0 - 10	141.79	2.84%
10-20	411.71	0 - 20	553.50	11.09%
20-30	640.62	0 - 30	1194.12	23.92%
30-40	800.82	0 - 40	1994.94	39.97%
40-50	868.91	0 - 50	2863.85	57.38%
50-60	831.86	0 - 60	3695.71	74.04%
60-70	684.51	0 - 70	4380.22	87.76%
70-80	445.70	0 - 80	4825.92	96.69%
80-90	165.45	0 - 90	4991.37	100.00%
90-100	0.00	0 - 100	4991.37	100.00%
100-110	0.00	0 - 110	4991.37	100.00%
110-120	0.00	0 - 120	4991.37	100.00%
120-130	0.00	0 - 130	4991.37	100.00%
130-140	0.00	0 - 140	4991.37	100.00%
140-150	0.00	0 - 150	4991.37	100.00%
150-160	0.00	0 - 160	4991.37	100.00%
160-170	0.00	0 - 170	4991.37	100.00%
170-180	0.00	0 - 180	4991.37	100.00%

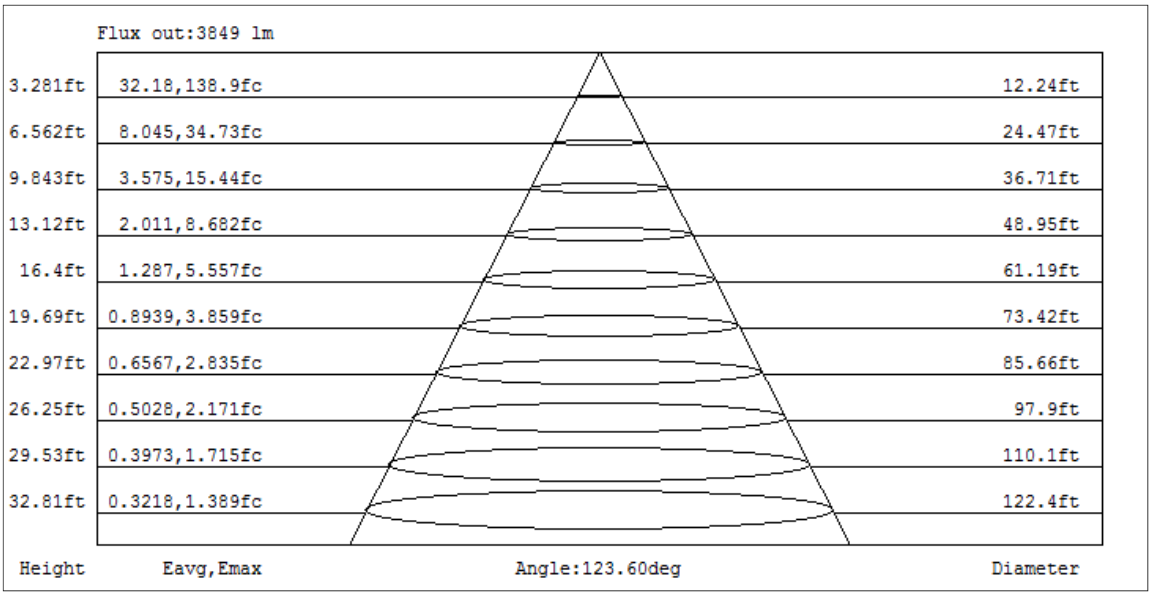
4.2 Goniophotometer Test

COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

Coefficients Of Utilization - Zonal Cavity Method
Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0
RW	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	108	102	98	93	105	100	96	92	96	92	89	92	89	86	88	86	84	81
2	97	88	81	75	94	86	80	74	83	77	72	79	75	70	76	72	69	66
3	88	77	68	61	86	75	67	61	72	65	60	69	63	58	67	62	57	55
4	80	68	58	51	78	66	58	51	64	56	50	61	55	49	59	53	49	46
5	74	60	51	44	71	59	50	43	57	49	43	55	48	42	53	47	42	40
6	68	54	45	38	66	53	44	38	51	43	37	49	42	37	48	42	37	34
7	63	49	40	33	61	48	39	33	46	39	33	45	38	33	43	37	32	30
8	58	44	36	29	57	44	35	29	42	35	29	41	34	29	40	34	29	27
9	54	41	32	26	53	40	32	26	39	31	26	38	31	26	37	30	26	24
10	51	37	29	24	50	37	29	24	36	29	24	35	28	24	34	28	23	22

CONE OF LIGHT DIAGRAM



4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	SWISHFA-EDGE2X4-840U @ 39W input	Sample ID.	E1
Temperature (°C)	25.3	Humidity (%RH)	56.0

Test Method
The samples were tested according to the ANSI C82.77:2002. The total harmonic distortion shall be measured to the 40th order. The ambient temperature condition was maintained at 25º C ± 1º C. The sample measurements were made using a digital power meter and power supply. The sample was operated at rated voltage and was stabilized before measurement. The total harmonic distortion were calculated.

Test Results					
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD
277.02	60	0.147	39.1	0.963	10.94%
120.05	60	0.326	38.9	0.994	8.34%

5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2018/12/26	2019/12/25
DLF108	Auxiliary Lamp	2018/12/26	2019/12/25
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2018/12/26	2019/12/25
DLF116	AC Power Source	2018/12/26	2019/12/25
DLF113	Power Meter	2018/12/26	2019/12/25
DLF112	Temperature Recorder	2018/12/26	2019/12/25
DLF114	Temperature & Humidity Datalogger	2018/12/26	2019/12/25
DLF101	Goniophotometer	2018/12/26	2019/12/25
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2018/12/26	2019/12/25
DLF104	AC Power Source	2018/12/26	2019/12/25
DLF507	DC Power Source	2018/12/26	2019/12/25
DLF102	Power Meter	2018/12/26	2019/12/25
DLF111	Temperature & Humidity Datalogger	2018/12/26	2019/12/25
DLF119	Power Meter	2018/12/26	2019/12/25
DLF031	Temperature data logger	2018/12/26	2019/12/25
DLF022	Digital power meter	2018/12/26	2019/12/25
DLF003	Temperature & Humidity Datalogger	2018/12/26	2019/12/25

********** End of Test Report**********