Photometric Test Report

Relevant Standards

☑IES LM-79-2008
☑ANSI C82.77:2014

Prepared For

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2019/10/31

Prepared By	**Approved By**
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1.0 Test Summary

DLC Technical Requirements v4.4

Indoor - Troffer/2x2 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	2000		3355
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 100	Premium 125	119.3
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		28.1
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	277V	11.85%
		20.00%	120V	5.44%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	277V	0.974
		0.9	120V	0.997
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	5000		3890
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%		75.02%
SC: 0-180° (Goniophotometer - Section 4.2)	IES LM-79-2008	1.0-2.0		1.28
SC: 90-270° (Goniophotometer - Section 4.2)	IES LM-79-2008	1.0-2.0		1.32
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		0.104
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.232
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		28.1
(Goniophotometer - Section 4.2)		Non-Wrost Case		27.8

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2019/10/30	SWISHFA-EDGE2X2-840U @ 29W input	H1
2	Goniophotometer Test	2019/10/30	SWISHFA-EDGE2X2-840U @ 29W input	H1
3	THD and PF Test	2019/10/30	SWISHFA-EDGE2X2-840U @ 29W input	H1

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-EDGE2X2-840U @ 29W 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-EDGE2X2-840U @ 29W input	Sample ID.	H1
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

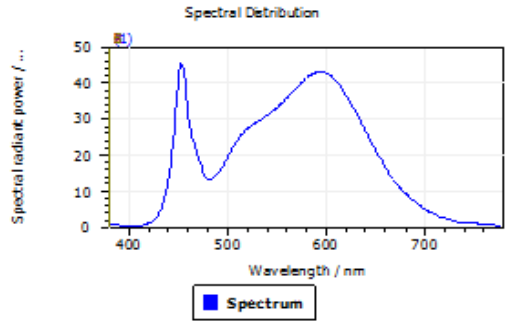
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
277.03	60	0.104	28.2	0.974
120.01	60	0.233	27.9	0.997

Test Result

CCT (K)	CRI	Duv
3890	83	0.0015

4.1 Integrating Sphere Test

Results



Spectral Distribution

Date: 2019/10/30 20:56:41

Spectral values

DominantWavelength	578.73 nm
Purity	0.312
PeakWavelength	452.88 nm
Radiant Power	7.274 W
Width50%:	

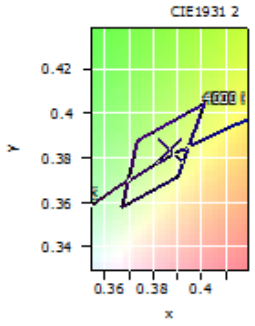
Color Coordinates

Correlated Color Temperatu 3890 K

x:	0.3866	u:	0.2263	u':	0.2263
y:	0.3838	v:	0.3370	v':	0.5056

CRI01	80.6	CRI09	4.6
CRI02	89.9	CRI10	76.1
CRI03	95.9	CRI11	79.3
CRI04	80.5	CRI12	60.5
CRI05	80.8	CRI13	83.0
CRI06	86.3	CRI14	98.1
CRI07	84.9	CRI15	73.7
CRI08	62.2	CRI16	70.6

ResultsCRI 82.6



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	0.00061	421	0.00124	461	0.02873	501	0.02014	541	0.03122
381	0.00060	422	0.00140	462	0.02696	502	0.02064	542	0.03142
382	0.00061	423	0.00159	463	0.02566	503	0.02115	543	0.03165
383	0.00062	424	0.00181	464	0.02469	504	0.02168	544	0.03188
384	0.00060	425	0.00205	465	0.02384	505	0.02217	545	0.03208
385	0.00057	426	0.00234	466	0.02307	506	0.02260	546	0.03228
386	0.00057	427	0.00267	467	0.02233	507	0.02301	547	0.03246
387	0.00057	428	0.00302	468	0.02149	508	0.02344	548	0.03265
388	0.00057	429	0.00344	469	0.02058	509	0.02383	549	0.03291
389	0.00056	430	0.00391	470	0.01968	510	0.02418	550	0.03318
390	0.00056	431	0.00447	471	0.01876	511	0.02459	551	0.03343
391	0.00055	432	0.00508	472	0.01779	512	0.02495	552	0.03366
392	0.00053	433	0.00576	473	0.01681	513	0.02525	553	0.03389
393	0.00052	434	0.00654	474	0.01588	514	0.02557	554	0.03415
394	0.00051	435	0.00740	475	0.01507	515	0.02590	555	0.03443
395	0.00049	436	0.00834	476	0.01441	516	0.02621	556	0.03469
396	0.00048	437	0.00939	477	0.01388	517	0.02648	557	0.03494
397	0.00048	438	0.01061	478	0.01350	518	0.02674	558	0.03524
398	0.00047	439	0.01201	479	0.01328	519	0.02705	559	0.03554
399	0.00045	440	0.01363	480	0.01319	520	0.02734	560	0.03581
400	0.00043	441	0.01544	481	0.01320	521	0.02758	561	0.03608
401	0.00042	442	0.01757	482	0.01325	522	0.02776	562	0.03639
402	0.00043	443	0.01995	483	0.01335	523	0.02794	563	0.03673
403	0.00042	444	0.02258	484	0.01348	524	0.02818	564	0.03705
404	0.00041	445	0.02555	485	0.01368	525	0.02840	565	0.03734
405	0.00040	446	0.02888	486	0.01390	526	0.02858	566	0.03760
406	0.00040	447	0.03226	487	0.01410	527	0.02871	567	0.03784
407	0.00040	448	0.03564	488	0.01434	528	0.02890	568	0.03808
408	0.00041	449	0.03895	489	0.01463	529	0.02912	569	0.03839
409	0.00041	450	0.04187	490	0.01493	530	0.02934	570	0.03872
410	0.00043	451	0.04394	491	0.01526	531	0.02952	571	0.03904
411	0.00045	452	0.04524	492	0.01563	532	0.02965	572	0.03935
412	0.00048	453	0.04564	493	0.01603	533	0.02981	573	0.03961
413	0.00052	454	0.04512	494	0.01649	534	0.02999	574	0.03985
414	0.00056	455	0.04347	495	0.01700	535	0.03017	575	0.04011
415	0.00062	456	0.04118	496	0.01752	536	0.03037	576	0.04039
416	0.00068	457	0.03854	497	0.01804	537	0.03057	577	0.04058
417	0.00076	458	0.03582	498	0.01856	538	0.03079	578	0.04082
418	0.00085	459	0.03323	499	0.01910	539	0.03096	579	0.04113
419	0.00096	460	0.03084	500	0.01964	540	0.03107	580	0.04139
420	0.00109								

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	0.04158	621	0.03629	661	0.01621	701	0.00495	741	0.00130
582	0.04179	622	0.03583	662	0.01573	702	0.00479	742	0.00126
583	0.04197	623	0.03532	663	0.01527	703	0.00462	743	0.00123
584	0.04215	624	0.03481	664	0.01478	704	0.00446	744	0.00121
585	0.04233	625	0.03436	665	0.01432	705	0.00433	745	0.00118
586	0.04247	626	0.03388	666	0.01393	706	0.00419	746	0.00114
587	0.04264	627	0.03339	667	0.01358	707	0.00405	747	0.00111
588	0.04281	628	0.03291	668	0.01323	708	0.00392	748	0.00108
589	0.04289	629	0.03245	669	0.01288	709	0.00379	749	0.00105
590	0.04298	630	0.03197	670	0.01254	710	0.00365	750	0.00103
591	0.04303	631	0.03147	671	0.01219	711	0.00353	751	0.00101
592	0.04304	632	0.03097	672	0.01185	712	0.00342	752	0.00098
593	0.04305	633	0.03045	673	0.01152	713	0.00331	753	0.00095
594	0.04307	634	0.02993	674	0.01120	714	0.00319	754	0.00093
595	0.04307	635	0.02939	675	0.01089	715	0.00308	755	0.00091
596	0.04301	636	0.02886	676	0.01058	716	0.00297	756	0.00088
597	0.04297	637	0.02835	677	0.01029	717	0.00287	757	0.00085
598	0.04299	638	0.02785	678	0.01001	718	0.00277	758	0.00083
599	0.04294	639	0.02734	679	0.00973	719	0.00267	759	0.00080
600	0.04277	640	0.02678	680	0.00945	720	0.00258	760	0.00078
601	0.04260	641	0.02622	681	0.00917	721	0.00249	761	0.00076
602	0.04247	642	0.02570	682	0.00891	722	0.00240	762	0.00074
603	0.04231	643	0.02516	683	0.00865	723	0.00231	763	0.00072
604	0.04213	644	0.02459	684	0.00840	724	0.00223	764	0.00070
605	0.04198	645	0.02405	685	0.00814	725	0.00216	765	0.00068
606	0.04178	646	0.02355	686	0.00790	726	0.00208	766	0.00066
607	0.04150	647	0.02306	687	0.00767	727	0.00200	767	0.00064
608	0.04115	648	0.02254	688	0.00745	728	0.00193	768	0.00062
609	0.04086	649	0.02202	689	0.00724	729	0.00187	769	0.00060
610	0.04058	650	0.02151	690	0.00702	730	0.00181	770	0.00058
611	0.04025	651	0.02099	691	0.00681	731	0.00176	771	0.00057
612	0.03994	652	0.02050	692	0.00660	732	0.00170	772	0.00055
613	0.03965	653	0.02003	693	0.00639	733	0.00164	773	0.00054
614	0.03927	654	0.01954	694	0.00620	734	0.00159	774	0.00052
615	0.03884	655	0.01906	695	0.00602	735	0.00155	775	0.00051
616	0.03843	656	0.01857	696	0.00584	736	0.00150	776	0.00049
617	0.03797	657	0.01808	697	0.00568	737	0.00146	777	0.00048
618	0.03753	658	0.01759	698	0.00550	738	0.00141	778	0.00046
619	0.03712	659	0.01712	699	0.00532	739	0.00138	779	0.00045
620	0.03670	660	0.01668	700	0.00514	740	0.00134	780	0.00044

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	SWISHFA-EDGE2X2-840U @ 29W input	Sample ID.	H1
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	277.01	60	0.104	28.1	0.971
NON-WROST CASE	120.03	60	0.232	27.8	0.997

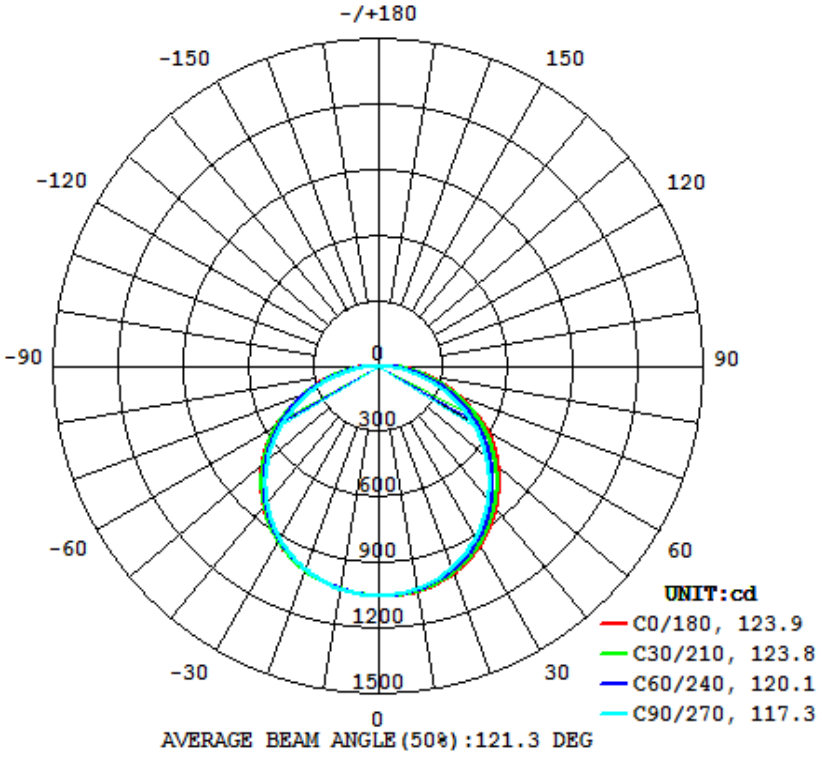
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
3355	172.4	165.6	123.9	117.3	119.3

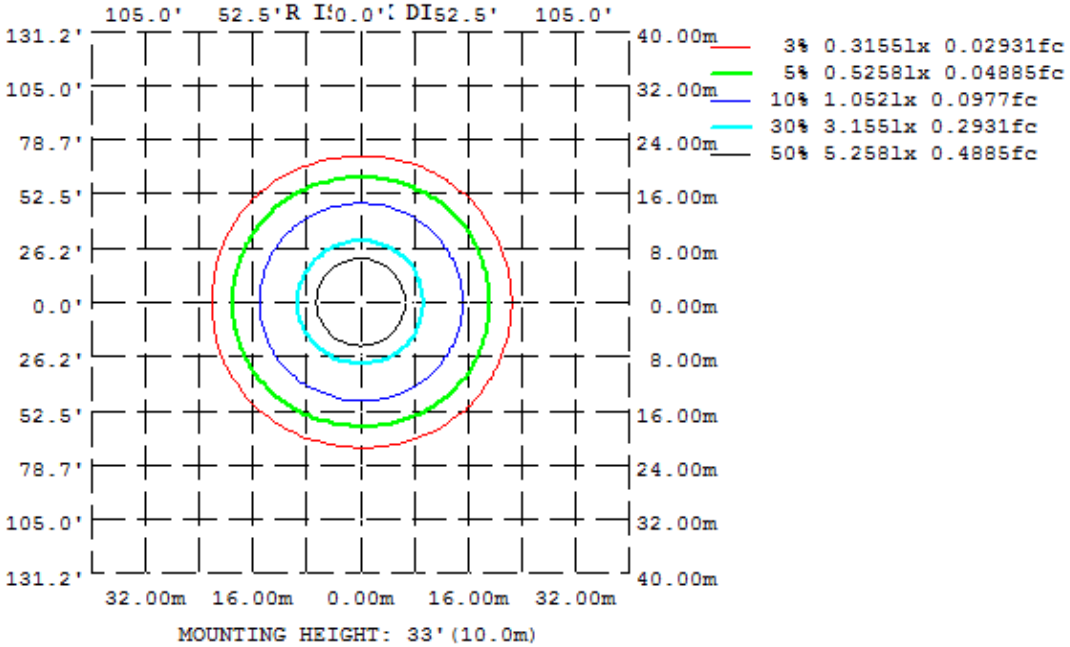
Zonal Lumen Requirement (0°-60°)	SC:0-180°	SC:90°-270°
75.02%	1.28	1.32

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	1046	1041	1034	1033	1036	1035	1038	1043
20	1011	999.5	983.3	986.9	996.1	994.8	991.3	1005
30	944.0	926.7	902.8	912.3	926.8	922.4	913.8	933.3
40	847.1	825.4	793.5	809.3	827.4	820.8	804.1	831.5
50	727.5	697.1	656.9	680.2	702.8	691.0	668.8	701.7
60	577.8	549.8	497.8	531.0	547.7	541.3	509.0	551.7
70	397.1	373.7	323.4	355.5	366.4	363.7	333.3	374.9
80	221.7	195.3	148.6	175.2	185.5	180.3	155.3	193.3
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	15.0	16.5	15.2	16.7	16.9	14.3	15.9	14.6	16.1	16.3
	3H	16.8	18.3	17.1	18.5	18.7	16.0	17.4	16.3	17.7	17.9
	4H	17.6	19.0	18.0	19.3	19.5	16.6	18.0	17.0	18.3	18.6
	6H	18.4	19.7	18.7	20.0	20.3	17.2	18.5	17.5	18.8	19.0
	8H	18.7	20.0	19.1	20.3	20.6	17.4	18.6	17.7	18.9	19.2
	12H	19.1	20.3	19.4	20.6	20.9	17.5	18.7	17.8	19.0	19.3
4H	2H	15.6	17.0	15.9	17.2	17.5	15.1	16.5	15.4	16.8	17.0
	3H	17.6	18.9	18.0	19.2	19.5	17.0	18.2	17.3	18.5	18.8
	4H	18.6	19.7	19.0	20.1	20.4	17.8	18.9	18.2	19.2	19.6
	6H	19.6	20.6	20.0	20.9	21.3	18.5	19.5	18.9	19.8	20.2
	8H	20.0	20.9	20.4	21.3	21.7	18.7	19.6	19.1	20.0	20.4
	12H	20.4	21.3	20.8	21.7	22.1	18.9	19.7	19.3	20.1	20.5
8H	4H	18.9	19.9	19.4	20.3	20.6	18.2	19.2	18.6	19.5	19.9
	6H	20.1	20.9	20.5	21.3	21.7	19.1	19.9	19.5	20.3	20.7
	8H	20.7	21.4	21.1	21.8	22.2	19.5	20.2	19.9	20.6	21.0
	12H	21.2	21.8	21.7	22.3	22.8	19.7	20.3	20.2	20.8	21.3
12H	4H	19.0	19.8	19.4	20.2	20.6	18.3	19.2	18.7	19.5	19.9
	6H	20.2	20.9	20.6	21.3	21.8	19.2	19.9	19.7	20.4	20.8
	8H	20.8	21.4	21.3	21.9	22.3	19.7	20.3	20.2	20.7	21.2
Variations with the observer position at spacings:											
S = 1.0H		+ 0.1 / - 0.1					+ 0.1 / - 0.2				
1.5H		+ 0.2 / - 0.3					+ 0.2 / - 0.3				
2.0H		+ 0.2 / - 0.3					+ 0.1 / - 0.4				

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	99.76	0 - 10	99.76	2.97%
10-20	288.36	0 - 20	388.12	11.57%
20-30	444.13	0 - 30	832.25	24.81%
30-40	547.50	0 - 40	1379.75	41.13%
40-50	585.00	0 - 50	1964.75	58.57%
50-60	552.04	0 - 60	2516.79	75.02%
60-70	446.83	0 - 70	2963.62	88.34%
70-80	286.92	0 - 80	3250.54	96.90%
80-90	104.07	0 - 90	3354.61	100.00%
90-100	0.00	0 - 100	3354.61	100.00%
100-110	0.00	0 - 110	3354.61	100.00%
110-120	0.00	0 - 120	3354.61	100.00%
120-130	0.00	0 - 130	3354.61	100.00%
130-140	0.00	0 - 140	3354.61	100.00%
140-150	0.00	0 - 150	3354.61	100.00%
150-160	0.00	0 - 160	3354.61	100.00%
160-170	0.00	0 - 170	3354.61	100.00%
170-180	0.00	0 - 180	3354.61	100.00%

4.2 Goniophotometer Test

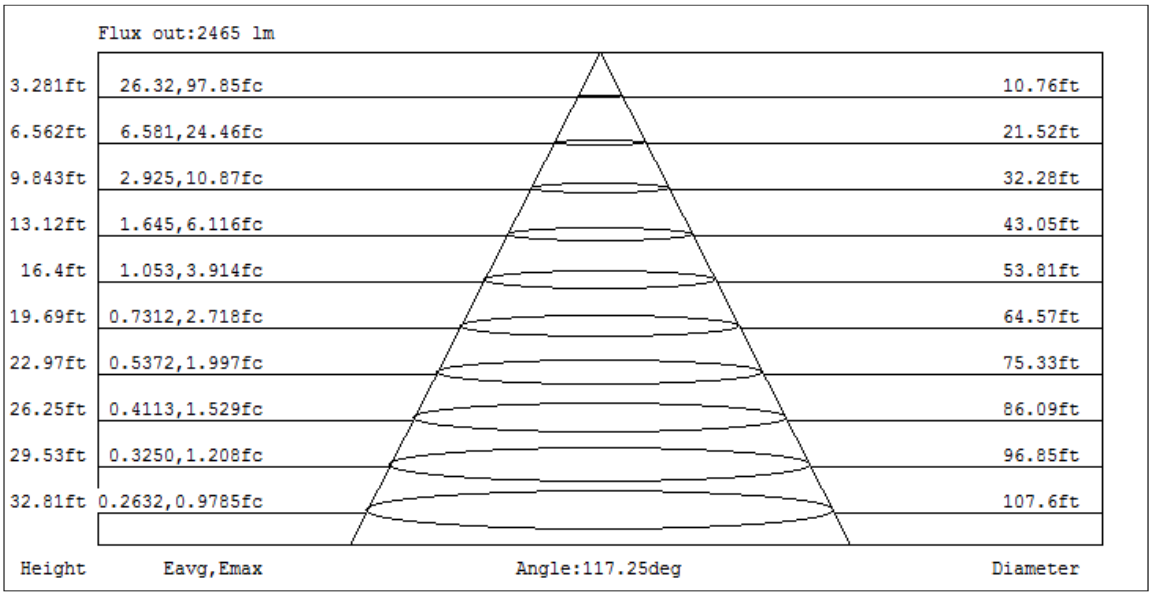
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	103	98	94	105	100	96	92	96	92	89	92	89	86	88	86	84	82
2	97	89	81	75	95	87	80	74	83	77	73	80	75	71	77	73	69	67
3	88	77	69	62	86	76	68	61	73	66	60	70	64	59	67	62	58	56
4	81	68	59	52	78	67	58	52	64	57	51	62	55	50	60	54	49	47
5	74	61	51	44	72	60	51	44	57	50	44	55	49	43	53	48	43	40
6	68	54	45	39	66	54	45	38	52	44	38	50	43	38	48	42	37	35
7	63	49	40	34	61	48	40	34	47	39	34	45	38	33	44	38	33	31
8	59	45	36	30	57	44	36	30	43	35	30	42	35	30	40	34	29	27
9	55	41	33	27	53	41	32	27	39	32	27	38	31	27	37	31	26	25
10	51	38	30	24	50	37	30	24	36	29	24	35	29	24	35	28	24	22

CONE OF LIGHT DIAGRAM



4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	SWISHFA-EDGE2X2-840U @ 29W input	Sample ID.	H1
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
277.03	60	0.104	28.2	0.974	11.85%
120.01	60	0.233	27.9	0.997	5.44%

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**********