

Photometric Test Report

Relevant Standards

- ☒ IES LM-79-2008
- ☒ ANSI C82.77:2017

Prepared For

RAB Lighting Inc.

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Project Number

DLF2305110

Report Number

DLF2305110-18a

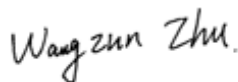
Test Date

2023/5/24

Issue Date

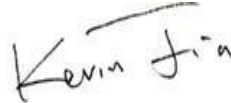
2023/5/25

Prepared By



Wangzun Zhu

Approved By



Kevin Jia

The results contained in this report pertain only to the tested sample.

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1.0 Test Summary

DLC Technical Requirements v5.1

Indoor - Linear Ambient - Direct Linear Ambient Luminaires				
Requirement Category	Test Method	Requirements		Test value
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	750		3105
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		776
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	135.6
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		22.9
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	12.74%
		20.00%	277V	15.74%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.982
		0.9	277V	0.895
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	5029±355	5098
		4 step	5029±220	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		84
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥0		10
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		83
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥89		92
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-12%≤IES Rcs,h1≤+23%		-13%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		72.86%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		21.3
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		0.092
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.178
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		22.9
(Goniophotometer - Section 4.2)		Non-Wrost Case		21.0

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023/5/24	CW4/22W/5000K	R1
2	Goniophotometer Test	2023/5/24	CW4/22W/5000K	R1
3	THD and PF Test	2023/5/24	CW4/22W/5000K	R1

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.

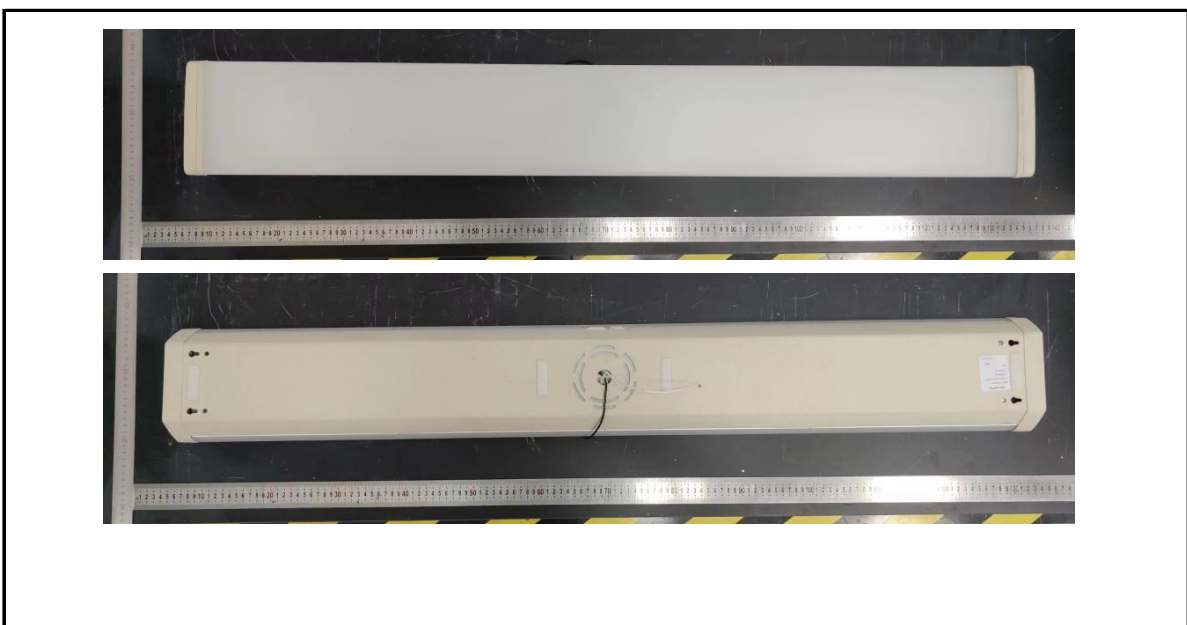
2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing 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: CW4/22W/5000K

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.	CW4/22W/5000K	Sample ID.	R1
Operate 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 parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$.

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
120.04	60	0.178	21.0	0.982
276.96	60	0.092	22.9	0.895

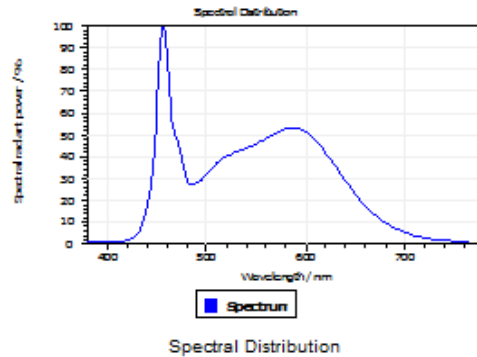
Test Result

CCT (K)	CRI	R9	Duv
5098	84	10	0.00088

Rf	Rg	IES Rcs,h1
83	92	-13%

4.1 Integrating Sphere Test

Results

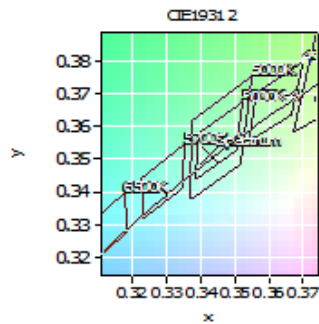


Spectral values

DominantWavelength 570.29 nm
Purity 0.082
PeakWavelength 456.36 nm
Radiant Power 8.065 W
Width50%:

Color Coordinates

Correlated Color Temporal		5098 K	
x: 0.3426	u: 0.2098	u': 0.2098	
y: 0.3513	v: 0.3228	v': 0.4842	
CRI01	84.1	CRI09	10.2
CRI02	94.6	CRI10	85.6
CRI03	93.7	CRI11	79.6
CRI04	79.7	CRI12	62.2
CRI05	83.4	CRI13	88.0
CRI06	89.1	CRI14	97.3
CRI07	83.5	CRI15	78.4
CRI08	65.0	CRI16	72.8
ResultsCRI	84.1		



PlanckDistance 8.8E-004

4.1 Integrating Sphere Test

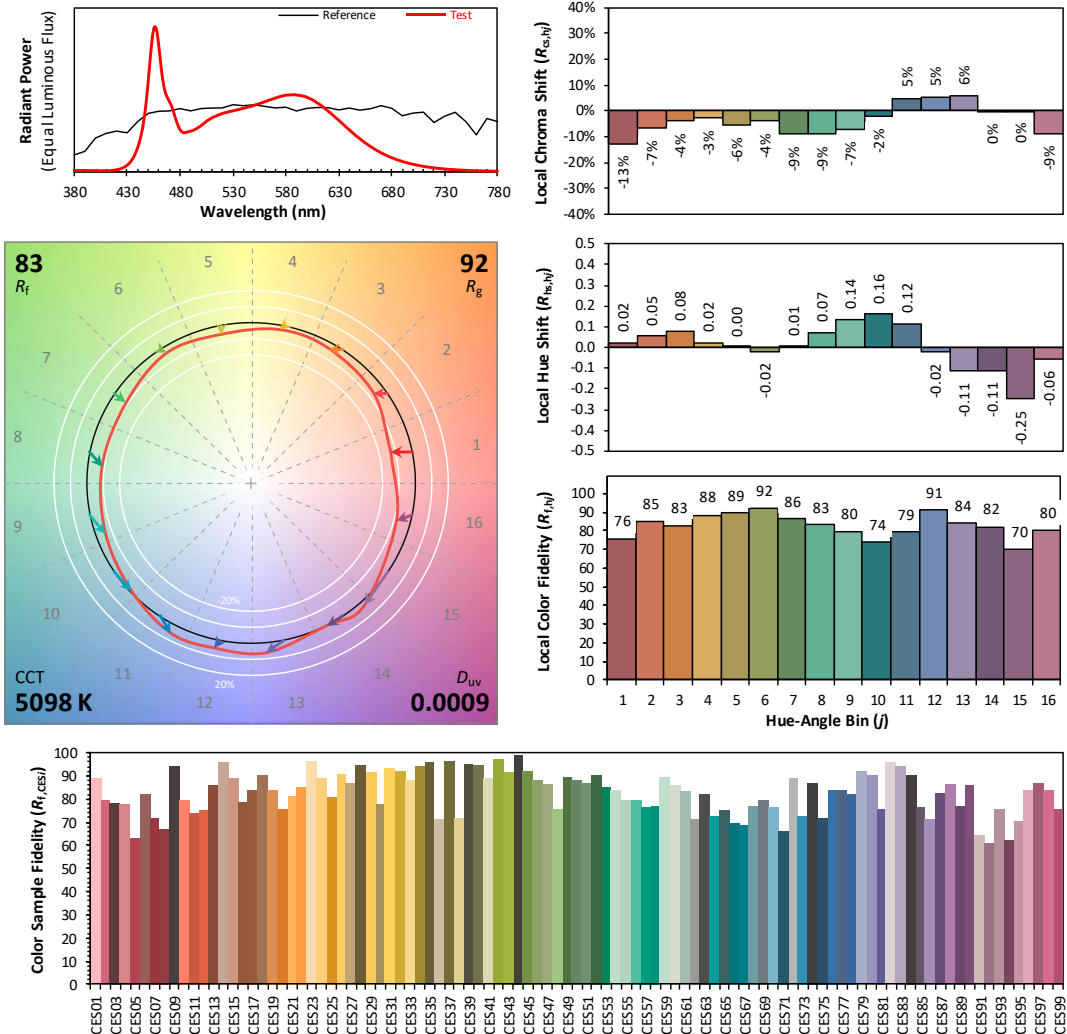
IES TM-30-18 Color Rendition Report

Source: DLF2305110-18a

Manufacturer: RAB Lighting Inc.

Date: 2023/5/24

Model: CW4/22W/5000K



Notes: This is a recommended method for displaying IES TM-30-18 information.

x 0.3426
 y 0.3513
 u' 0.2098
 v' 0.4842

CIE 13.3-1995
(CRI)

R_a 85
 R_g 14

4.1 Integrating Sphere Test

Spectral Distribution over Visible Wavelength							
WL (nm)	Radiant (Watts/nm)	WL (nm)	Radiant (Watts/nm)	WL (nm)	Radiant (Watts/nm)	WL (nm)	Radiant (Watts/nm)
380	8.01E-04	485	2.14E-02	590	4.18E-02	695	4.89E-03
385	7.73E-04	490	2.22E-02	595	4.14E-02	700	4.18E-03
390	7.65E-04	495	2.34E-02	600	4.05E-02	705	3.56E-03
395	7.63E-04	500	2.52E-02	605	3.92E-02	710	3.03E-03
400	6.70E-04	505	2.75E-02	610	3.74E-02	715	2.58E-03
405	6.40E-04	510	2.93E-02	615	3.54E-02	720	2.21E-03
410	6.46E-04	515	3.07E-02	620	3.30E-02	725	1.88E-03
415	7.98E-04	520	3.18E-02	625	3.06E-02	730	1.61E-03
420	1.17E-03	525	3.25E-02	630	2.80E-02	735	1.38E-03
425	1.99E-03	530	3.32E-02	635	2.55E-02	740	1.17E-03
430	3.68E-03	535	3.39E-02	640	2.28E-02	745	1.01E-03
435	6.99E-03	540	3.45E-02	645	2.03E-02	750	8.67E-04
440	1.33E-02	545	3.54E-02	650	1.80E-02	755	7.56E-04
445	2.52E-02	550	3.62E-02	655	1.58E-02	760	6.51E-04
450	5.00E-02	555	3.71E-02	660	1.38E-02	765	5.65E-04
455	7.72E-02	560	3.81E-02	665	1.20E-02	770	4.91E-04
460	6.80E-02	565	3.92E-02	670	1.04E-02	775	4.21E-04
465	4.58E-02	570	4.01E-02	675	8.98E-03	780	3.65E-04
470	3.81E-02	575	4.10E-02	680	7.73E-03		
475	3.04E-02	580	4.17E-02	685	6.66E-03		
480	2.29E-02	585	4.19E-02	690	5.70E-03		

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	CW4/22W/5000K	Sample ID.	R1
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, 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° vertical intervals and 10° horizontal intervals.

Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WROST CASE	277.01	60	0.092	22.9	0.895
NON-WROST CASE	120.02	60	0.178	21.0	0.982

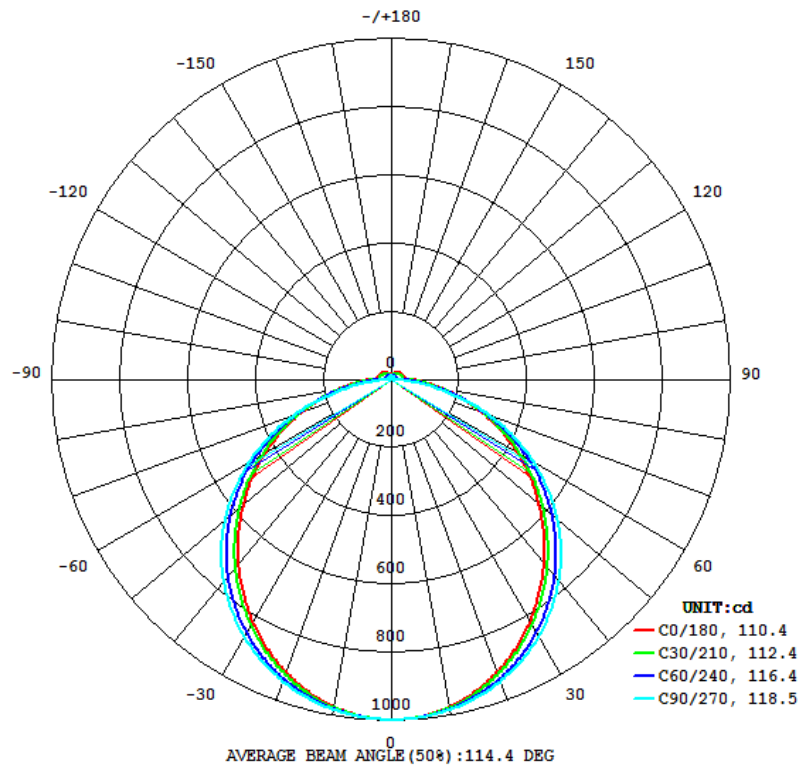
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
3105	169.1	162.3	110.4	118.5	135.6

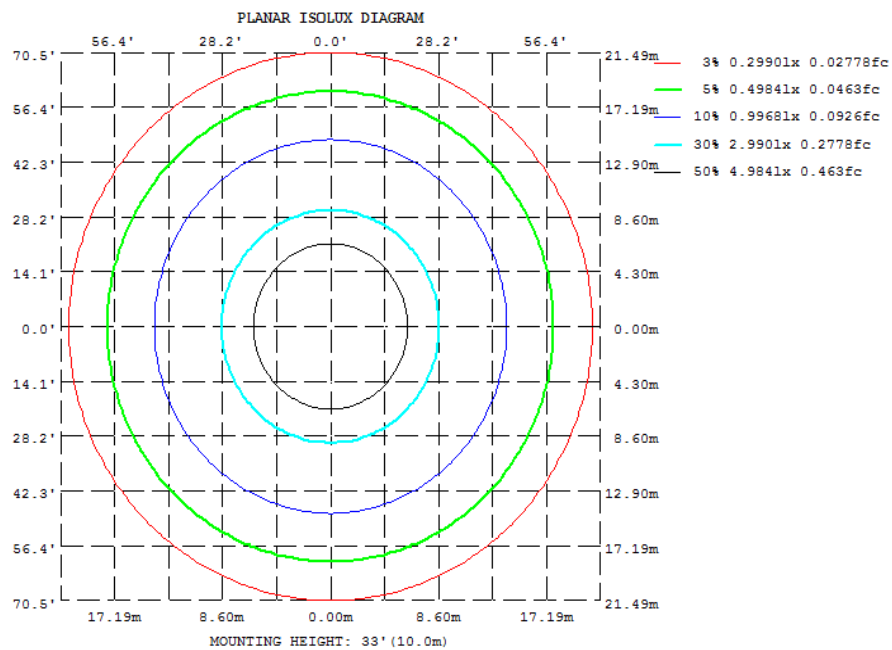
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
72.86%	21.3	4.00	776

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	975.2	978.9	982.6	978.9	975.2	978.9	982.6	978.9
20	912.9	926.2	940.4	926.2	912.9	926.2	940.4	926.2
30	818.4	842.4	869.2	842.4	818.4	842.4	869.2	842.4
40	701.8	732.6	769.6	732.6	701.8	732.6	769.6	732.6
50	570.7	602.1	641.7	602.1	570.7	602.1	641.7	602.1
60	430.5	455.4	486.2	455.4	430.5	455.4	486.2	455.4
70	287.1	297.7	306.6	297.7	287.1	297.7	306.6	297.7
80	152.5	144.2	119.2	144.2	152.5	144.2	119.2	144.2
90	56.99	38.24	0.1445	38.24	56.99	38.24	0.1445	38.24
100	45.59	30.79	1.230	30.79	45.59	30.79	1.230	30.79
110	42.29	29.05	4.338	29.05	42.29	29.05	4.338	29.05
120	38.71	27.18	7.786	27.18	38.71	27.18	7.786	27.18
130	34.48	24.83	11.05	24.83	34.48	24.83	11.05	24.83
140	29.63	22.54	13.73	22.54	29.63	22.54	13.73	22.54
150	25.14	20.45	15.06	20.45	25.14	20.45	15.06	20.45
160	21.14	18.03	13.88	18.03	21.14	18.03	13.88	18.03
170	18.37	15.07	12.50	15.07	18.37	15.07	12.50	15.07
180	11.32	13.59	14.20	13.59	11.32	13.59	14.20	13.59
DEG	LUMINOUS INTENSITY:cd							

UGR Table - Corrected

UGR Table - Corrected										
Reflectances										
Ceiling Cavity	70	70	50	50	30	70	70	50	50	30
Walls	50	30	50	30	30	50	30	50	30	30
Floor Cavity	20	20	20	20	20	20	20	20	20	20
Room Size										
X=2H Y=2H	UGR Viewed Crosswise					UGR Viewed Endwise				
3H	16.7	18.3	17.2	18.7	19.1	16.5	18.0	16.9	18.4	18.9
4H	18.5	19.9	18.9	20.3	20.8	18.4	19.8	18.8	20.2	20.7
6H	19.0	20.4	19.5	20.8	21.3	19.2	20.5	19.7	21.0	21.5
8H	19.4	20.6	19.9	21.1	21.6	19.9	21.1	20.4	21.6	22.1
12H	19.5	20.6	20.0	21.1	21.6	20.2	21.3	20.7	21.8	22.3
	19.5	20.6	20.0	21.1	21.6	20.4	21.6	20.9	22.0	22.6
4H 2H	17.3	18.6	17.8	19.1	19.6	17.1	18.4	17.6	18.9	19.4
3H	19.3	20.4	19.7	20.9	21.4	19.2	20.3	19.7	20.8	21.4
4H	20.0	21.0	20.5	21.5	22.0	20.2	21.2	20.7	21.7	22.2
6H	20.4	21.3	21.0	21.9	22.4	21.0	21.9	21.5	22.4	23.0
8H	20.5	21.4	21.1	21.9	22.5	21.3	22.2	21.9	22.7	23.3
12H	20.6	21.3	21.1	21.9	22.5	21.7	22.4	22.2	23.0	23.6
8H 4H	20.3	21.1	20.8	21.6	22.2	20.4	21.3	21.0	21.8	22.4
6H	20.9	21.6	21.4	22.1	22.7	21.4	22.1	22.0	22.7	23.3
8H	21.0	21.7	21.6	22.2	22.8	21.8	22.5	22.4	23.1	23.7
12H	21.1	21.7	21.7	22.3	22.9	22.3	22.8	22.9	23.4	24.1
12H 4H	20.3	21.1	20.9	21.6	22.2	20.5	21.2	21.0	21.8	22.4
6H	20.9	21.6	21.5	22.1	22.8	21.5	22.1	22.0	22.6	23.3
8H	21.2	21.7	21.7	22.3	23.0	22.0	22.5	22.5	23.1	23.7
Maximum UGR = 24.1										

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	94.29	0 - 10	94.29	3.04%
10-20	270.01	0 - 20	364.30	11.73%
20-30	409.42	0 - 30	773.72	24.92%
30-40	495.23	0 - 40	1268.95	40.86%
40-50	517.99	0 - 50	1786.94	57.55%
50-60	475.63	0 - 60	2262.57	72.86%
60-70	373.67	0 - 70	2636.24	84.90%
70-80	229.41	0 - 80	2865.65	92.28%
80-90	85.68	0 - 90	2951.33	95.04%
90-100	31.71	0 - 100	2983.04	96.06%
100-110	28.52	0 - 110	3011.56	96.98%
110-120	25.71	0 - 120	3037.27	97.81%
120-130	22.04	0 - 130	3059.31	98.52%
130-140	17.74	0 - 140	3077.05	99.09%
140-150	13.26	0 - 150	3090.31	99.52%
150-160	8.85	0 - 160	3099.16	99.80%
160-170	4.71	0 - 170	3103.87	99.96%
170-180	1.37	0 - 180	3105.24	100.00%

4.2 Goniophotometer Test

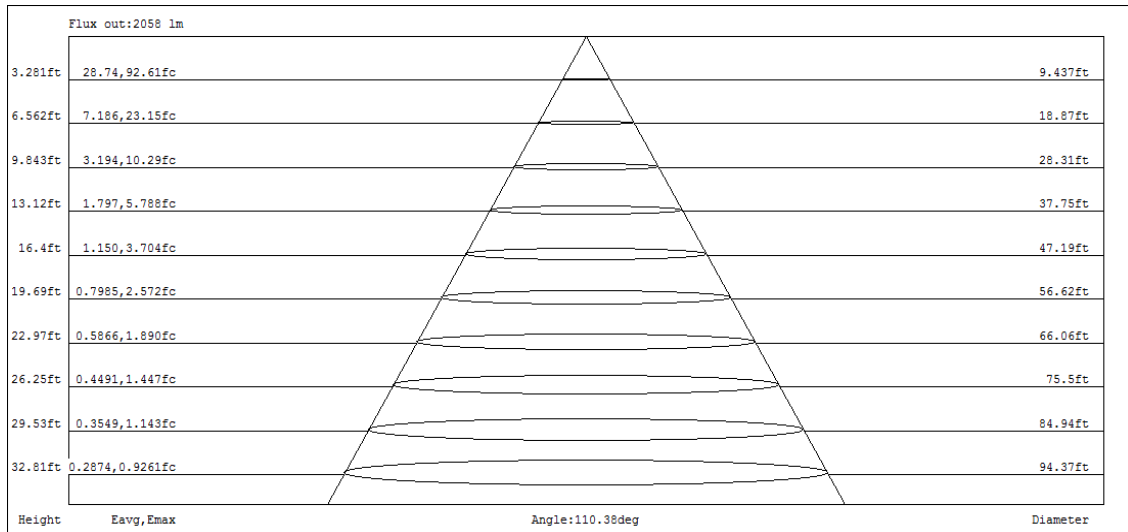
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

Coefficients Of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 0.20

RC	80				70				50			30			10			0
R/W	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
0	118	118	118	118	115	115	115	115	108	108	108	103	103	103	97	97	97	95
1	107	102	98	94	104	99	95	92	94	91	88	89	87	84	85	83	81	78
2	97	89	82	76	94	86	80	74	82	76	72	78	73	69	74	70	67	65
3	88	78	69	63	85	76	68	62	72	65	60	68	63	58	65	61	57	54
4	81	69	60	53	78	67	59	52	64	57	51	61	55	50	58	53	48	46
5	74	61	52	45	72	60	51	45	57	50	44	54	48	43	52	47	42	40
6	68	55	46	39	66	54	45	39	51	44	38	49	43	38	47	41	37	35
7	63	50	41	35	61	49	40	34	47	39	34	45	38	33	43	37	33	31
8	59	45	37	31	57	44	36	31	43	35	30	41	34	30	40	34	29	27
9	55	42	33	28	53	41	33	28	39	32	27	38	31	27	36	31	26	24
10	52	38	30	25	50	38	30	25	36	29	25	35	29	24	34	28	24	22

CONE OF LIGHT DIAGRAM



4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	CW4/22W/5000K	Sample ID.	R1
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 $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$. 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
120.04	60	0.178	21.0	0.982	12.74%
276.96	60	0.092	22.9	0.895	15.74%

5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2022/12/24	2023/12/23
DLF108	Auxiliary Lamp	2022/12/24	2023/12/23
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-directional	2022/12/24	2023/12/23
DLF116	AC Power Source	2022/12/16	2023/12/15
DLF516	Power Meter	2022/12/16	2023/12/15
DLF112	Temperature Recorder	2022/12/28	2023/12/27
DLF114	Temperature & Humidity Datalogger	2022/12/28	2023/12/27
DLF101	Goniophotometer	2022/12/24	2023/12/23
DLF511	AC Power Source	2022/12/16	2023/12/15
DLF512	AC Power Source	2022/12/16	2023/12/15
DLF513	AC Power Source	2022/12/16	2023/12/15
DLF507	DC Power Source	2022/12/16	2023/12/15
DLF111	Temperature & Humidity Datalogger	2022/12/28	2023/12/27
DLF119	Power Meter	2022/12/16	2023/12/15
DLF031	Temperature data logger	2022/6/22	2023/6/21
DLF073	Power Analyzer	2022/6/22	2023/6/21
DLF003	Temperature & Humidity Datalogger	2022/6/22	2023/6/21

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