

Photometric Test Report

Relevant Standards

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

Prepared For

RAB Lighting Inc.

Room 6A33, No.1388, Wuzhong road, Shanghai, China

Xiao Xiang, 15921313292, Gary.Xiao@rabweb.com

Prepared By

Deliver Co., Ltd.

Block 11, 78 Keling Road, SSTP, Suzhou, China

0512-66801950, kevin.jia@szdeliver.com

Project Number

DLF2305110

Report Number

DLF2305110-15a

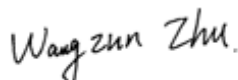
Test Date

2023/5/24

Issue Date

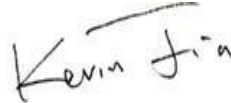
2023/5/25

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		3149
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		787
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	140.0
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		22.5
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	12.52%
		20.00%	277V	15.69%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.982
		0.9	277V	0.894
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3985±275	4033
		4 step	3985±154	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		85
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥0		17
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		85
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥89		95
Minimum IES Rcs,h1 (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	-12%≤IES Rcs,h1≤+23%		-11%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		72.85%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		21.4
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		0.091
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.175
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		22.5
(Goniophotometer - Section 4.2)		Non-Wrost Case		20.6

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023/5/24	CW4/22W/4000K	O1
2	Goniophotometer Test	2023/5/24	CW4/22W/4000K	O1
3	THD and PF Test	2023/5/24	CW4/22W/4000K	O1

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.

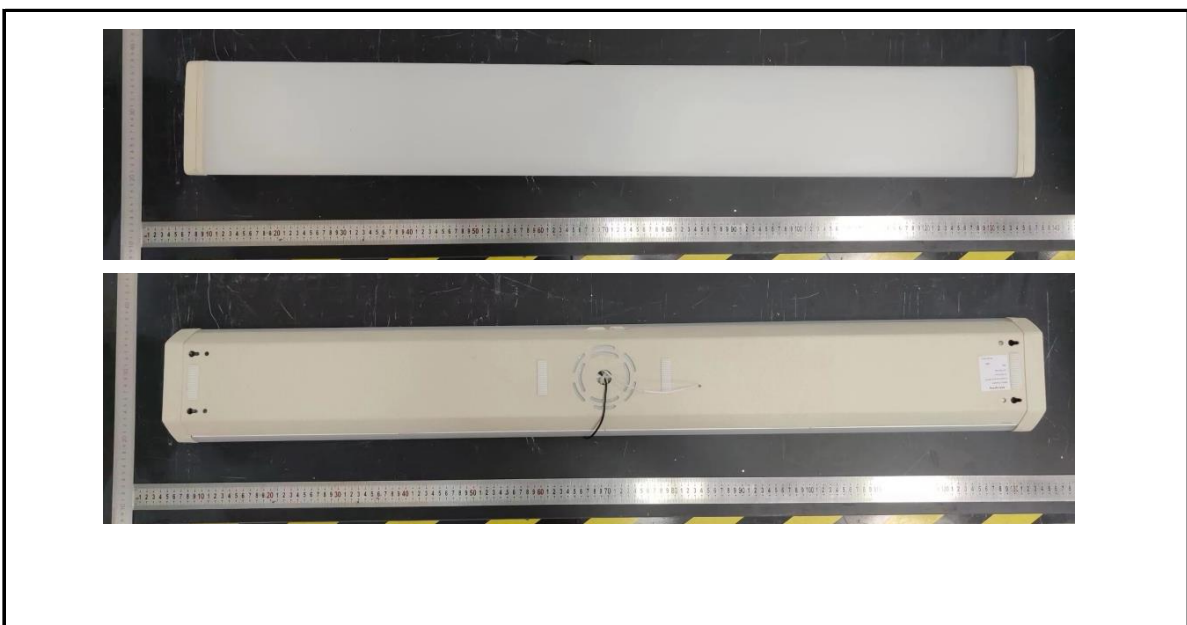
2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing 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/4000K

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/4000K	Sample ID.	O1
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	0.175	20.6	0.982
277.02	60	0.091	22.5	0.894

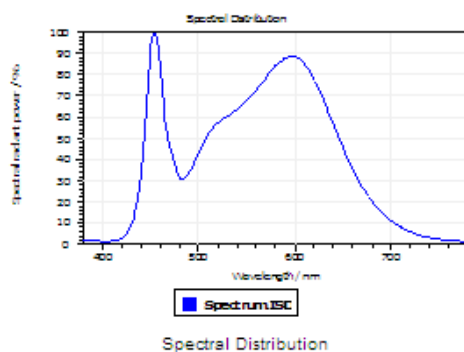
Test Result

CCT (K)	CRI	R9	Duv
4033	85	17	0.0024

Rf	Rg	IES Rcs,h1
85	95	-11%

4.1 Integrating Sphere Test

Results

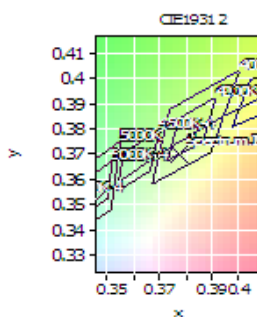


Spectral values

DominantWavelength 580.42 nm
Purity 0.242
PeakWavelength 454.19 nm
Radiant Power 8.101 W
Width50%:

Color Coordinates

Correlated Color Temperat 4033 K
x: 0.3774 u: 0.2259 u': 0.2259
y: 0.3698 v: 0.3320 v': 0.4980
CRI01 84.6 CRI09 16.5
CRI02 93.5 CRI10 83.9
CRI03 95.3 CRI11 82.2
CRI04 82.5 CRI12 66.1
CRI05 84.5 CRI13 87.5
CRI06 89.7 CRI14 98.3
CRI07 84.6 CRI15 78.8
CRI08 65.6 CRI16 74.8
ResultsCRI 85.1



PlankDistance 2.4E-003

4.1 Integrating Sphere Test

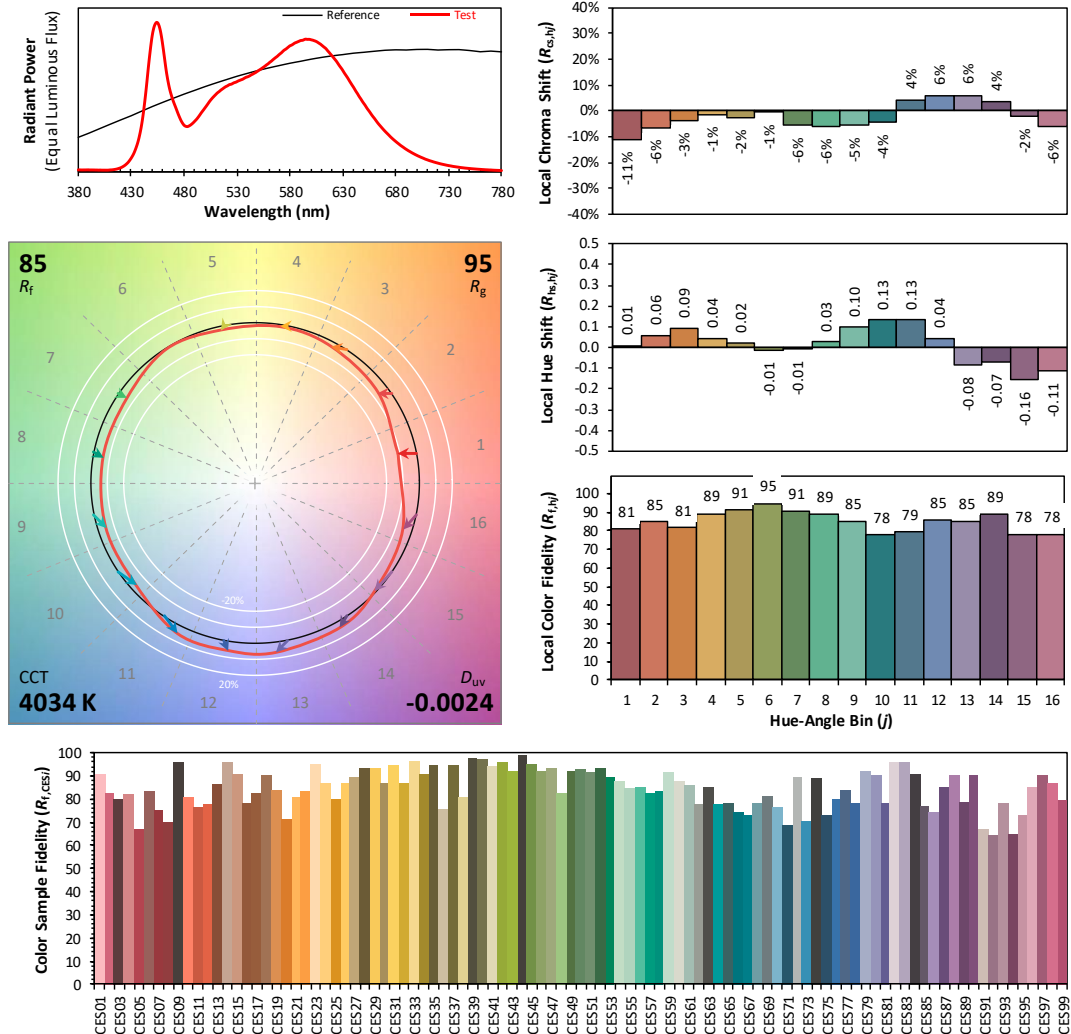
IES TM-30-18 Color Rendition Report

Source: DLF2305110-15a

Manufacturer: RAB Lighting Inc.

Date: 2023/5/24

Model: CW4/22W/4000K



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

x 0.3774
 y 0.3698
 u' 0.2259
 v' 0.4980

CIE 13.3-1995
(CRI)

R_a 86
 R_g 22

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	7.05E-04	485	1.60E-02	590	4.56E-02	695	6.73E-03
385	6.88E-04	490	1.76E-02	595	4.61E-02	700	5.76E-03
390	6.94E-04	495	1.99E-02	600	4.59E-02	705	4.93E-03
395	6.76E-04	500	2.24E-02	605	4.53E-02	710	4.19E-03
400	6.20E-04	505	2.49E-02	610	4.40E-02	715	3.58E-03
405	6.16E-04	510	2.69E-02	615	4.24E-02	720	3.05E-03
410	6.72E-04	515	2.85E-02	620	4.02E-02	725	2.59E-03
415	8.99E-04	520	2.97E-02	625	3.79E-02	730	2.20E-03
420	1.43E-03	525	3.05E-02	630	3.53E-02	735	1.87E-03
425	2.57E-03	530	3.14E-02	635	3.24E-02	740	1.61E-03
430	4.77E-03	535	3.21E-02	640	2.95E-02	745	1.37E-03
435	8.77E-03	540	3.30E-02	645	2.65E-02	750	1.18E-03
440	1.66E-02	545	3.40E-02	650	2.37E-02	755	1.02E-03
445	3.17E-02	550	3.51E-02	655	2.11E-02	760	8.85E-04
450	4.76E-02	555	3.64E-02	660	1.85E-02	765	7.52E-04
455	5.18E-02	560	3.77E-02	665	1.62E-02	770	6.52E-04
460	4.37E-02	565	3.93E-02	670	1.41E-02	775	5.61E-04
465	3.12E-02	570	4.08E-02	675	1.22E-02	780	4.82E-04
470	2.44E-02	575	4.24E-02	680	1.06E-02		
475	1.96E-02	580	4.38E-02	685	9.12E-03		
480	1.62E-02	585	4.48E-02	690	7.84E-03		

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	CW4/22W/4000K	Sample ID.	O1
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	277.02	60	0.091	22.5	0.894
NON-WROST CASE	120.01	60	0.175	20.6	0.982

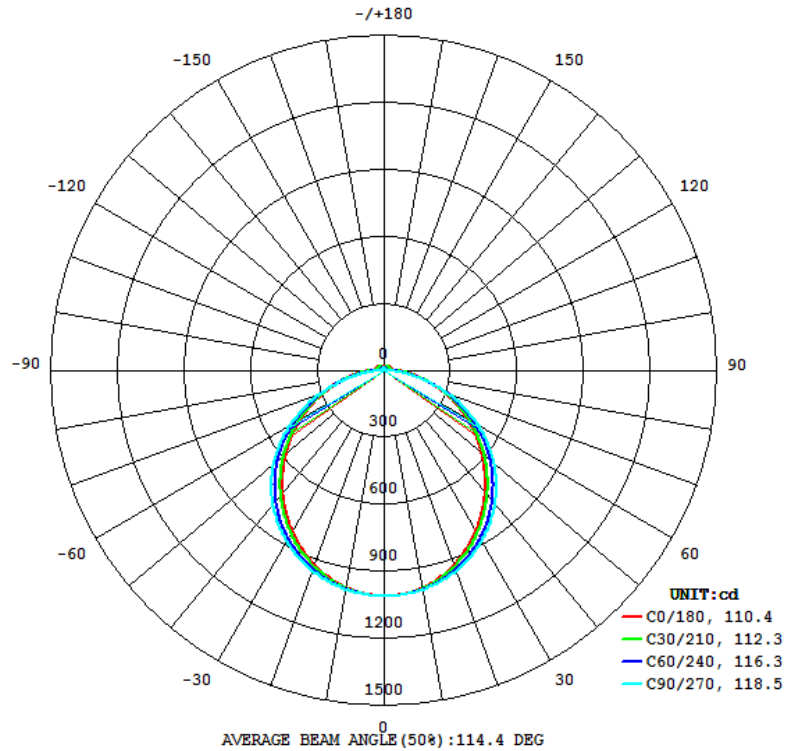
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
3149	169.2	162.3	110.4	118.5	140.0

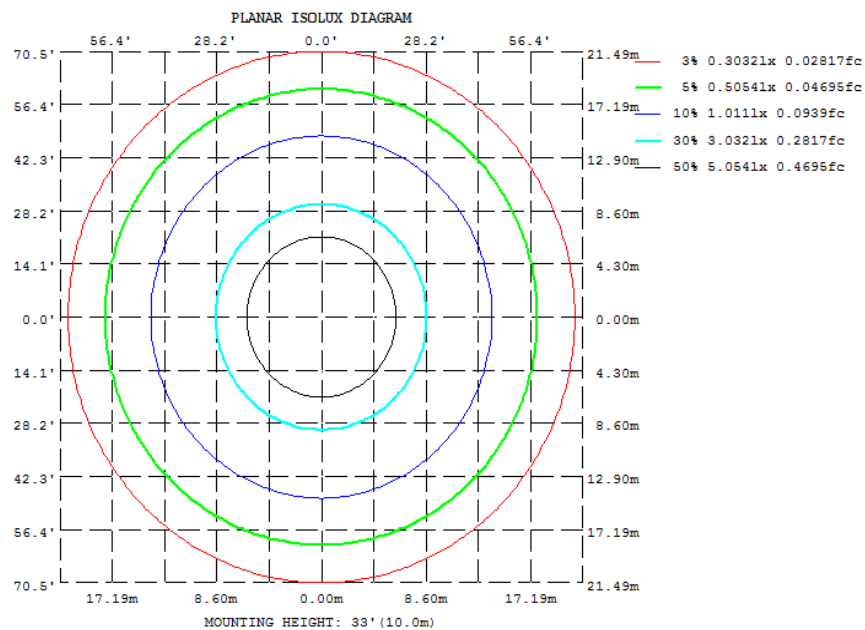
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
72.85%	21.4	4.00	787

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	988.9	992.6	996.5	992.6	988.9	992.6	996.5	992.6
20	925.6	939.0	953.8	939.0	925.6	939.0	953.8	939.0
30	829.6	854.4	881.8	854.4	829.6	854.4	881.8	854.4
40	711.3	742.6	780.4	742.6	711.3	742.6	780.4	742.6
50	578.5	610.3	650.6	610.3	578.5	610.3	650.6	610.3
60	436.2	461.6	492.9	461.6	436.2	461.6	492.9	461.6
70	291.1	301.7	311.0	301.7	291.1	301.7	311.0	301.7
80	154.9	146.4	121.0	146.4	154.9	146.4	121.0	146.4
90	59.27	39.71	0.1600	39.71	59.27	39.71	0.1600	39.71
100	46.25	31.23	1.245	31.23	46.25	31.23	1.245	31.23
110	42.90	29.45	4.366	29.45	42.90	29.45	4.366	29.45
120	39.24	27.56	7.884	27.56	39.24	27.56	7.884	27.56
130	34.96	25.17	11.20	25.17	34.96	25.17	11.20	25.17
140	30.04	22.83	13.92	22.83	30.04	22.83	13.92	22.83
150	25.48	20.74	15.26	20.74	25.48	20.74	15.26	20.74
160	21.45	18.32	14.06	18.32	21.45	18.32	14.06	18.32
170	18.55	15.30	12.68	15.30	18.55	15.30	12.68	15.30
180	10.92	13.72	14.41	13.72	10.92	13.72	14.41	13.72
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										
UGR Viewed Crosswise										
X=2H Y=2H	16.8	18.4	17.3	18.8	19.2	16.6	18.1	17.0	18.5	19.0
3H	18.6	20.0	19.0	20.4	20.9	18.5	19.9	18.9	20.3	20.8
4H	19.1	20.5	19.6	20.9	21.4	19.3	20.6	19.8	21.1	21.6
6H	19.5	20.7	20.0	21.2	21.7	20.0	21.2	20.5	21.7	22.2
8H	19.6	20.7	20.1	21.2	21.7	20.3	21.4	20.8	21.9	22.4
12H	19.6	20.7	20.1	21.2	21.7	20.5	21.7	21.0	22.1	22.7
UGR Viewed Endwise										
4H 2H	17.4	18.7	17.9	19.2	19.7	17.2	18.5	17.7	19.0	19.5
3H	19.4	20.5	19.8	21.0	21.5	19.3	20.4	19.8	20.9	21.5
4H	20.1	21.1	20.6	21.6	22.1	20.3	21.3	20.8	21.8	22.3
6H	20.5	21.4	21.1	22.0	22.5	21.1	22.0	21.6	22.5	23.1
8H	20.6	21.5	21.2	22.0	22.6	21.4	22.3	22.0	22.8	23.4
12H	20.7	21.4	21.2	22.0	22.6	21.8	22.5	22.3	23.1	23.7
UGR Viewed Endwise										
8H 4H	20.4	21.2	20.9	21.7	22.3	20.5	21.4	21.1	21.9	22.5
6H	21.0	21.7	21.5	22.2	22.8	21.5	22.2	22.1	22.8	23.4
8H	21.1	21.8	21.7	22.3	22.9	21.9	22.6	22.5	23.2	23.8
12H	21.2	21.8	21.8	22.4	23.0	22.4	22.9	23.0	23.5	24.2
UGR Viewed Endwise										
12H 4H	20.4	21.2	21.0	21.7	22.3	20.6	21.3	21.1	21.9	22.5
6H	21.0	21.7	21.6	22.2	22.9	21.6	22.2	22.1	22.7	23.4
8H	21.3	21.8	21.8	22.4	23.1	22.1	22.6	22.6	23.2	23.8
Maximum UGR = 24.2										

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	95.62	0 - 10	95.62	3.04%
10-20	273.80	0 - 20	369.42	11.73%
20-30	415.15	0 - 30	784.57	24.92%
30-40	502.12	0 - 40	1286.69	40.86%
40-50	525.12	0 - 50	1811.81	57.54%
50-60	482.13	0 - 60	2293.94	72.85%
60-70	378.79	0 - 70	2672.73	84.88%
70-80	232.66	0 - 80	2905.39	92.26%
80-90	87.33	0 - 90	2992.72	95.04%
90-100	32.33	0 - 100	3025.05	96.06%
100-110	28.93	0 - 110	3053.98	96.98%
110-120	26.07	0 - 120	3080.05	97.81%
120-130	22.35	0 - 130	3102.40	98.52%
130-140	17.99	0 - 140	3120.39	99.09%
140-150	13.45	0 - 150	3133.84	99.52%
150-160	8.97	0 - 160	3142.81	99.80%
160-170	4.77	0 - 170	3147.58	99.96%
170-180	1.39	0 - 180	3148.97	100.00%

4.2 Goniophotometer Test

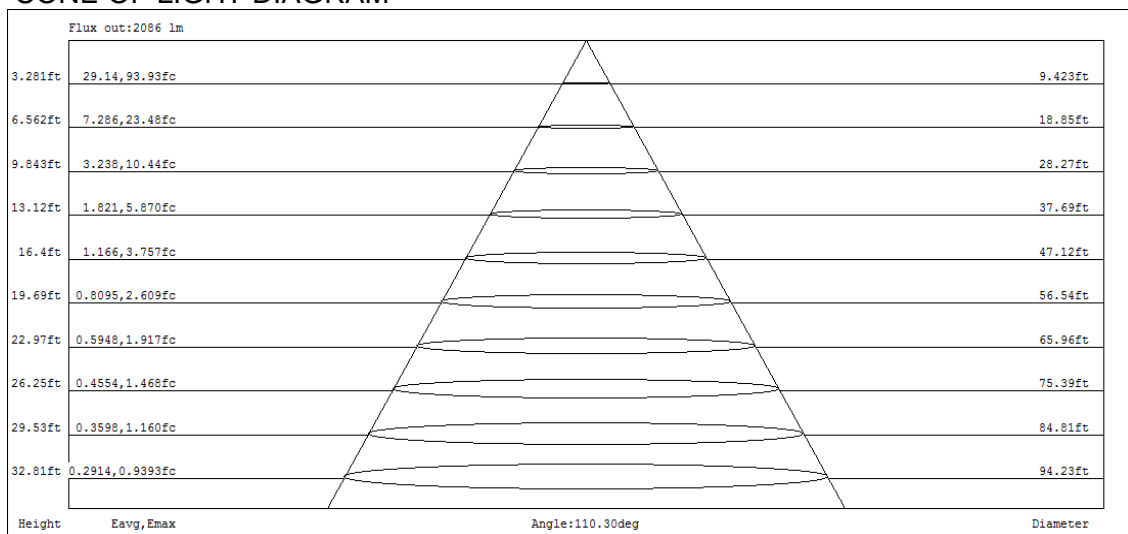
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	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/4000K	Sample ID.	O1
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	0.175	20.6	0.982	12.52%
277.02	60	0.091	22.5	0.894	15.69%

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*****