

# 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

**DLF2305110-1a**

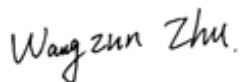
## Test Date

**2023/5/19**

## Issue Date

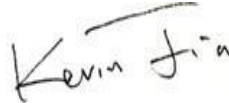
**2023/5/22**

## 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		3027
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1513
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	130.5
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		23.2
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	1.30%
		20.00%	277V	8.98%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.998
		0.9	277V	0.967
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3465±245	3476
		4 step	3465±124	
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		15
Minimum Rf (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥70		84
Minimum Rg (Integrating Sphere - Section 4.1)	ANSI/IES TM-30-18	≥89		98
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%		73.57%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		23.8
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		0.087
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.194
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		23.2
(Goniophotometer - Section 4.2)		Non-Wrost Case		23.2

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023/5/19	CW2/22W/3500K	A1
2	Goniophotometer Test	2023/5/19	CW2/22W/3500K	A1
3	THD and PF Test	2023/5/19	CW2/22W/3500K	A1

### 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.

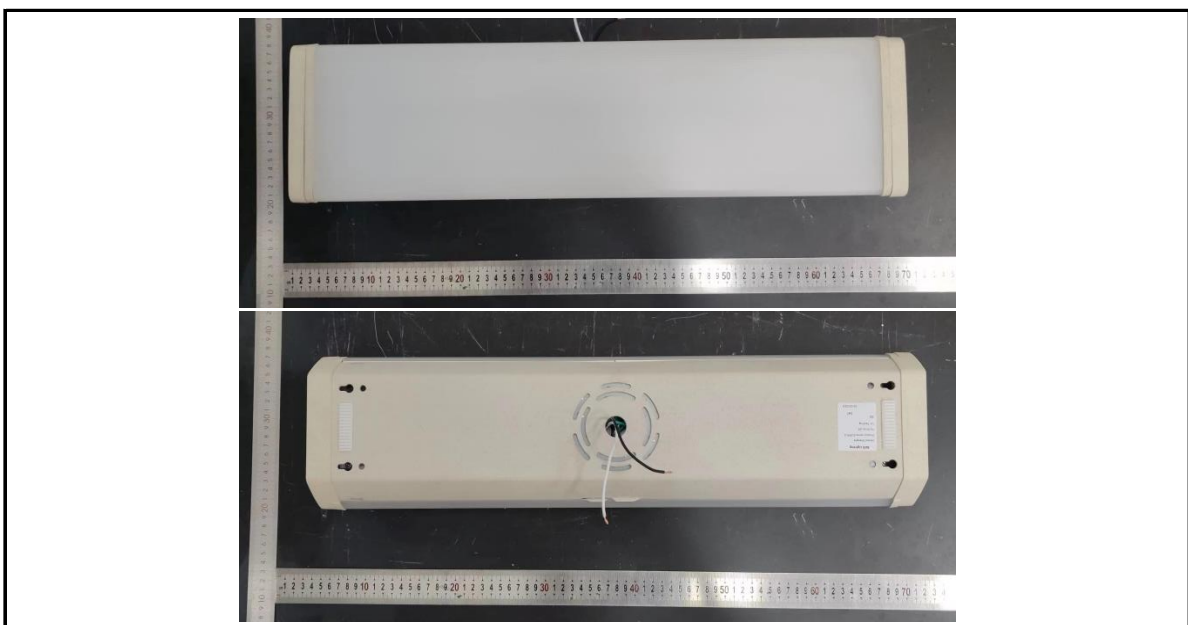
2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing 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:** CW2/22W/3500K

**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.	CW2/22W/3500K	Sample ID.	A1
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  $\pm 0.2$  percent under load.

The sample was measured using  $4\pi$  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
120.02	60	0.194	23.2	0.998
277.04	60	0.087	23.2	0.967

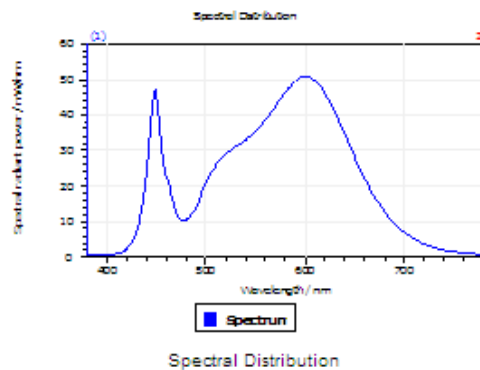
#### Test Result

CCT (K)	CRI	R9	Duv
3476	84	15	0.0024

Rf	Rg	IES Rcs,h1
84	98	-11%

## 4.1 Integrating Sphere Test

### Results

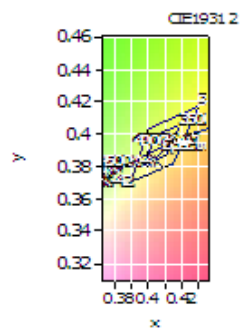


#### Spectral values

DominantWavelength 582.06 nm  
Purity 0.368  
PeakWavelength 600.41 nm  
Radiant Power 8.282 W  
Width50%:

#### Color Coordinates

Correlated Color Temperat 3476 K  
x: 0.4041 u: 0.2374 u': 0.2374  
y: 0.3847 v: 0.3390 v': 0.5086  
CRI01 83.2 CRI09 14.7  
CRI02 90.1 CRI10 77.0  
CRI03 95.3 CRI11 84.1  
CRI04 84.0 CRI12 69.0  
CRI05 83.5 CRI13 84.7  
CRI06 87.0 CRI14 97.5  
CRI07 85.5 CRI15 77.1  
CRI08 65.2 CRI16 75.6  
ResultsCRI 84.2



PlankDistance 2.4E-003

## 4.1 Integrating Sphere Test

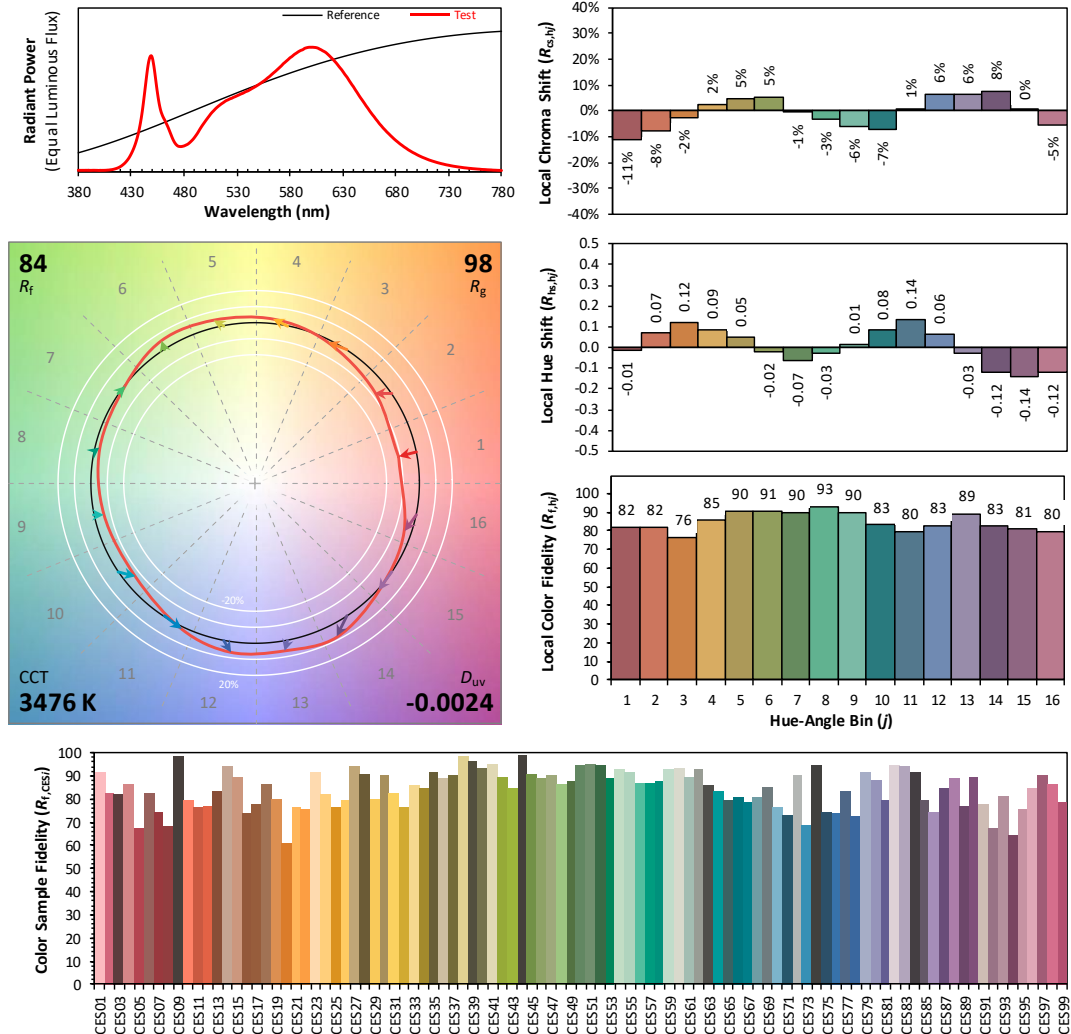
### IES TM-30-18 Color Rendition Report

Source: DLF2305110-1a

Manufacturer: RAB Lighting Inc.

Date: 2023/5/19

Model: CW2/22W/3500K



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

$x$  0.4041  
 $y$  0.3847  
 $u'$  0.2374  
 $v'$  0.5086

CIE 13.3-1995  
(CRI)

$R_a$  85  
 $R_g$  17

#### 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	6.66E-04	485	1.18E-02	590	4.94E-02	695	8.21E-03
385	6.50E-04	490	1.41E-02	595	5.04E-02	700	7.05E-03
390	6.51E-04	495	1.74E-02	600	5.07E-02	705	6.01E-03
395	6.66E-04	500	2.06E-02	605	5.05E-02	710	5.13E-03
400	6.04E-04	505	2.35E-02	610	4.96E-02	715	4.38E-03
405	6.55E-04	510	2.58E-02	615	4.82E-02	720	3.73E-03
410	8.19E-04	515	2.76E-02	620	4.61E-02	725	3.19E-03
415	1.27E-03	520	2.90E-02	625	4.37E-02	730	2.72E-03
420	2.22E-03	525	3.00E-02	630	4.09E-02	735	2.30E-03
425	4.06E-03	530	3.10E-02	635	3.79E-02	740	1.97E-03
430	7.31E-03	535	3.19E-02	640	3.47E-02	745	1.68E-03
435	1.28E-02	540	3.29E-02	645	3.13E-02	750	1.45E-03
440	2.32E-02	545	3.41E-02	650	2.82E-02	755	1.25E-03
445	4.04E-02	550	3.54E-02	655	2.51E-02	760	1.08E-03
450	4.64E-02	555	3.69E-02	660	2.22E-02	765	9.35E-04
455	3.17E-02	560	3.86E-02	665	1.94E-02	770	7.94E-04
460	2.25E-02	565	4.04E-02	670	1.70E-02	775	6.85E-04
465	1.80E-02	570	4.24E-02	675	1.48E-02	780	5.88E-04
470	1.28E-02	575	4.44E-02	680	1.28E-02		
475	1.04E-02	580	4.64E-02	685	1.11E-02		
480	1.06E-02	585	4.80E-02	690	9.60E-03		

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	CW2/22W/3500K	Sample ID.	A1
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  $\pm 0.2$  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  $0.5^{\circ}$  vertical intervals and  $10^{\circ}$  horizontal intervals.

#### Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WROST CASE	277.03	60	0.087	23.2	0.966
NON-WROST CASE	120.01	60	0.194	23.2	0.997

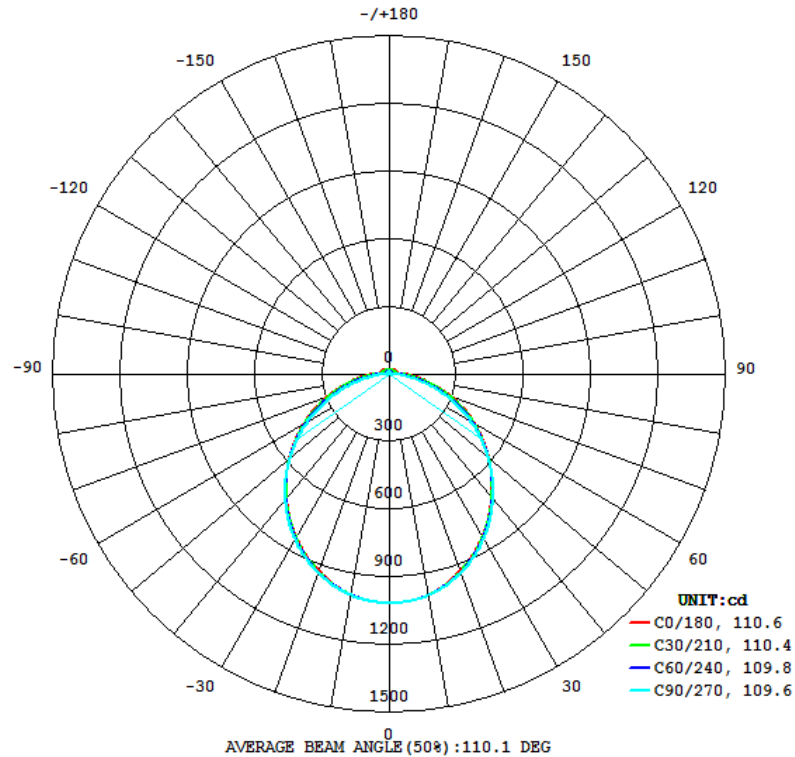
#### Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
3027	169.5	159.7	110.6	109.6	130.5

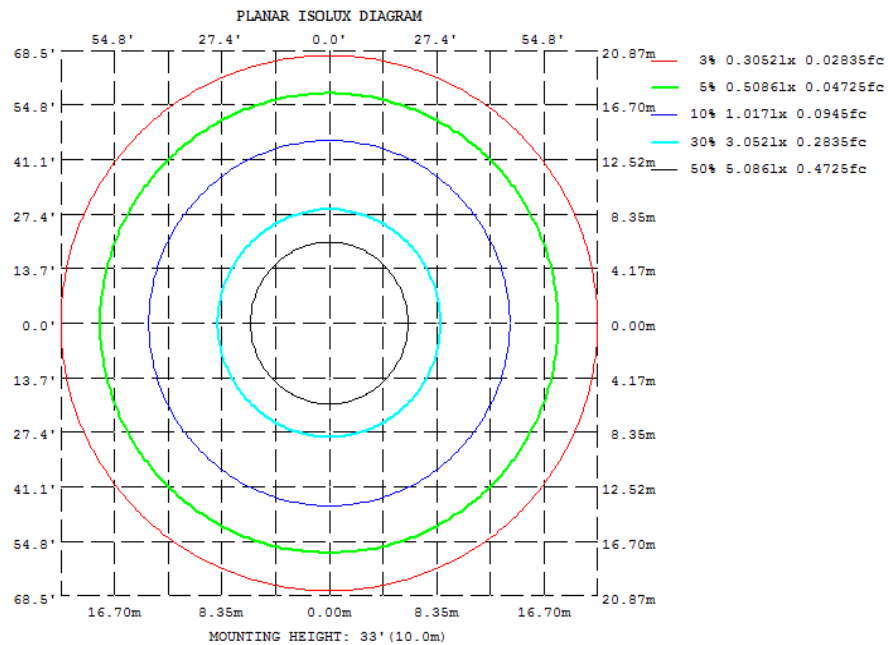
Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
73.57%	23.8	2.00	1513

## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### Isolux Plot



## 4.2 Goniophotometer Test

### Zonal Lumen Summary

$\gamma$	C0	C45	C90	C135	C180	C225	C270	C315
10	994.9	995.4	996.2	995.4	994.9	995.4	996.2	995.4
20	930.8	933.7	937.4	933.7	930.8	933.7	937.4	933.7
30	834.9	839.0	844.1	839.0	834.9	839.0	844.1	839.0
40	715.8	718.9	722.6	718.9	715.8	718.9	722.6	718.9
50	583.5	581.9	581.1	581.9	583.5	581.9	581.1	581.9
60	441.3	434.0	425.3	434.0	441.3	434.0	425.3	434.0
70	295.8	280.9	259.8	280.9	295.8	280.9	259.8	280.9
80	158.9	135.2	99.55	135.2	158.9	135.2	99.55	135.2
90	56.82	34.48	0.5502	34.48	56.82	34.48	0.5502	34.48
100	46.07	27.71	1.119	27.71	46.07	27.71	1.119	27.71
110	42.64	26.53	3.911	26.53	42.64	26.53	3.911	26.53
120	39.19	25.45	6.903	25.45	39.19	25.45	6.903	25.45
130	35.12	24.08	10.00	24.08	35.12	24.08	10.00	24.08
140	30.58	22.83	13.01	22.83	30.58	22.83	13.01	22.83
150	26.41	21.21	15.52	21.21	26.41	21.21	15.52	21.21
160	22.38	19.68	16.46	19.68	22.38	19.68	16.46	19.68
170	19.17	15.86	12.65	15.86	19.17	15.86	12.65	15.86
180	4.243	10.03	11.42	10.03	4.243	10.03	11.42	10.03
DEG	LUMINOUS INTENSITY:cd							

### UGR Table - Corrected

<b>UGR Table - Corrected</b>										
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				
	18.6	20.1	19.0	20.5	21.0	19.0	20.6	19.5	21.0	21.4
3H	20.2	21.6	20.6	22.0	22.5	21.0	22.4	21.4	22.8	23.3
4H	20.7	22.0	21.2	22.5	23.0	21.8	23.1	22.3	23.5	24.0
6H	21.0	22.2	21.5	22.7	23.2	22.5	23.7	22.9	24.1	24.6
8H	21.1	22.2	21.6	22.7	23.3	22.7	23.9	23.2	24.4	24.9
12H	21.1	22.2	21.6	22.7	23.3	23.0	24.1	23.5	24.6	25.1
4H 2H	19.2	20.5	19.7	21.0	21.5	19.6	20.9	20.1	21.3	21.8
3H	21.0	22.1	21.5	22.6	23.1	21.7	22.8	22.2	23.3	23.8
4H	21.7	22.7	22.2	23.2	23.7	22.7	23.7	23.2	24.2	24.7
6H	22.1	23.0	22.6	23.5	24.1	23.5	24.4	24.0	24.9	25.5
8H	22.2	23.0	22.7	23.6	24.1	23.8	24.7	24.4	25.2	25.8
12H	22.3	23.0	22.8	23.6	24.1	24.2	24.9	24.7	25.5	26.0
8H 4H	22.0	22.8	22.6	23.4	24.0	22.9	23.7	23.4	24.3	24.8
6H	22.6	23.3	23.1	23.8	24.4	23.9	24.5	24.4	25.1	25.7
8H	22.7	23.3	23.3	23.9	24.5	24.3	24.9	24.9	25.5	26.1
12H	22.8	23.4	23.4	23.9	24.6	24.7	25.3	25.3	25.8	26.5
12H 4H	22.1	22.8	22.6	23.4	24.0	22.9	23.7	23.5	24.2	24.8
6H	22.7	23.3	23.2	23.8	24.5	23.9	24.5	24.5	25.1	25.7
8H	22.9	23.4	23.4	24.0	24.7	24.4	24.9	25.0	25.5	26.2
Maximum UGR = 26.5										

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	96.04	0 - 10	96.04	3.17%
10-20	273.43	0 - 20	369.47	12.21%
20-30	410.11	0 - 30	779.58	25.76%
30-40	488.90	0 - 40	1268.48	41.91%
40-50	503.27	0 - 50	1771.75	58.54%
50-60	454.90	0 - 60	2226.65	73.57%
60-70	352.94	0 - 70	2579.59	85.23%
70-80	215.48	0 - 80	2795.07	92.35%
80-90	81.48	0 - 90	2876.55	95.04%
90-100	29.92	0 - 100	2906.47	96.03%
100-110	26.94	0 - 110	2933.41	96.92%
110-120	24.58	0 - 120	2957.99	97.73%
120-130	21.47	0 - 130	2979.46	98.44%
130-140	17.72	0 - 140	2997.18	99.03%
140-150	13.58	0 - 150	3010.76	99.48%
150-160	9.39	0 - 160	3020.15	99.79%
160-170	5.13	0 - 170	3025.28	99.96%
170-180	1.29	0 - 180	3026.57	100.00%

## 4.2 Goniophotometer Test

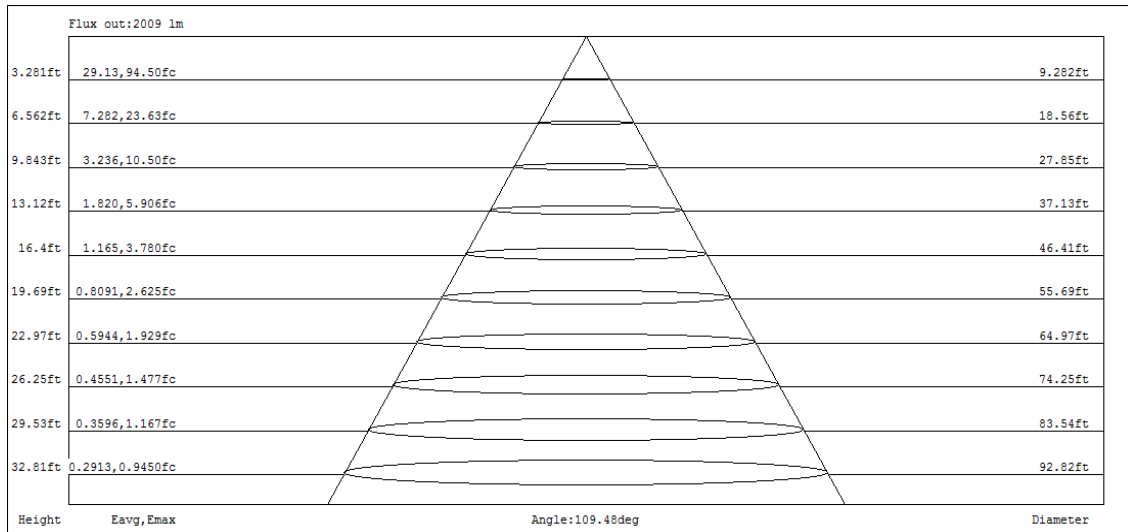
### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### 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	90	87	84	85	83	81	79
2	97	89	82	76	94	87	80	75	82	77	72	78	74	70	74	71	68	65
3	89	78	70	63	86	76	68	62	72	66	60	69	63	59	66	61	57	55
4	81	69	60	53	78	67	59	53	64	57	51	61	55	50	59	53	49	47
5	75	62	53	46	72	60	52	45	58	50	44	55	49	44	53	47	43	40
6	69	55	46	40	67	54	46	40	52	44	39	50	43	38	48	42	37	35
7	64	50	41	35	62	49	41	35	47	40	34	45	39	34	44	38	33	31
8	59	46	37	31	58	45	37	31	43	36	31	42	35	30	40	34	30	28
9	55	42	34	28	54	41	33	28	40	33	28	38	32	27	37	31	27	25
10	52	39	31	26	50	38	31	25	37	30	25	36	29	25	34	29	24	23

### CONE OF LIGHT DIAGRAM



## 4.0 LM-79 Measurement and Test Results

### 4.3 THD and PF Test

Model No.	CW2/22W/3500K	Sample ID.	A1
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
120.02	60	0.194	23.2	0.998	1.30%
277.04	60	0.087	23.2	0.967	8.98%

## 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\*\*\*\*\*