

# Photometric Test Report

## Relevant Standards

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

## Prepared For

**RAB Lighting Inc.**

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## Prepared By

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## Project Number

**DLF2305110**

## Report Number

**DLF2305110-10a**

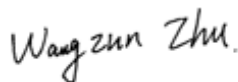
## Test Date

**2023/5/23**

## Issue Date

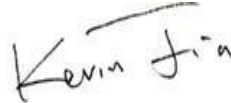
**2023/5/25**

## Prepared By



Wangzun Zhu

## Approved By



Kevin Jia

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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		1503
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		751
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	125.2
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		12.0
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	13.07%
		20.00%	277V	14.70%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.987
		0.9	277V	0.916
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	5029±355	5092
		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%		73.93%
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		0.047
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.096
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		12.0
(Goniophotometer - Section 4.2)		Non-Wrost Case		11.4

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023/5/23	CW2/11W/5000K	J1
2	Goniophotometer Test	2023/5/23	CW2/11W/5000K	J1
3	THD and PF Test	2023/5/23	CW2/11W/5000K	J1

### 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.

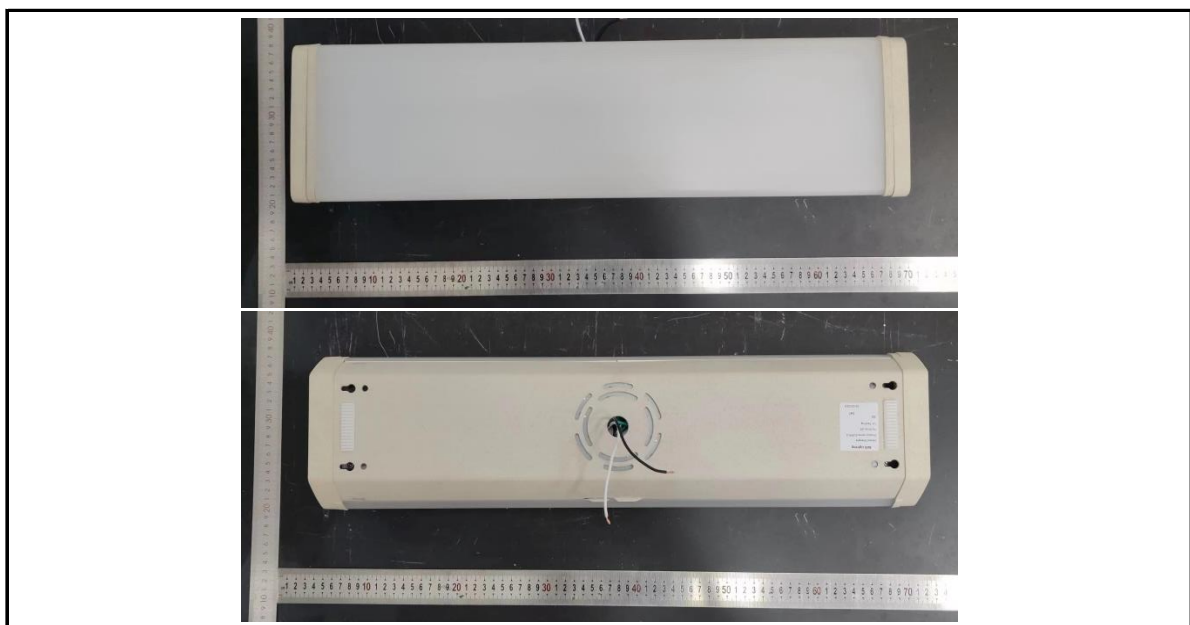
2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing 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:** CW2/11W/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.	CW2/11W/5000K	Sample ID.	J1
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
119.97	60	0.096	11.4	0.987
277.01	60	0.047	12.0	0.916

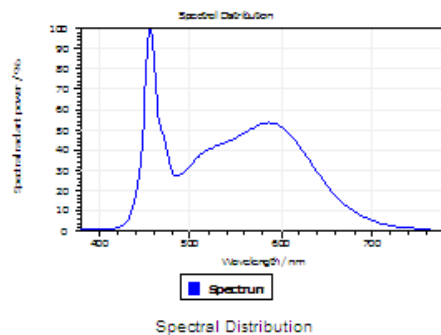
#### Test Result

CCT (K)	CRI	R9	Duv
5092	84	10	0.00095

Rf	Rg	IES Rcs,h1
83	92	-13%

## 4.1 Integrating Sphere Test

### Results

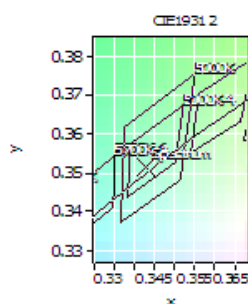


### Spectral values

DominantWavelength 570.33 nm  
Purity 0.083  
PeakWavelength 456.28 nm  
Radiant Power 4.258 W  
Width50%:

### Color Coordinates

Correlated Color Temperat 5092 K  
x: 0.3427 u: 0.2098 u': 0.2098  
y: 0.3516 v: 0.3229 v': 0.4843  
CRI01 84.0 CRI09 10.0  
CRI02 94.5 CRI10 85.4  
CRI03 93.8 CRI11 79.6  
CRI04 79.8 CRI12 62.1  
CRI05 83.4 CRI13 87.9  
CRI06 89.0 CRI14 97.4  
CRI07 83.6 CRI15 78.4  
CRI08 65.0 CRI16 72.7  
ResultsCRI 84.1



PlanckDistance 9.5E-004

## 4.1 Integrating Sphere Test

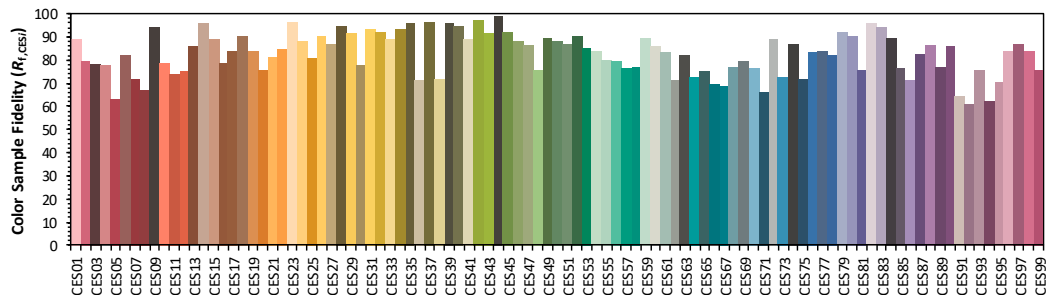
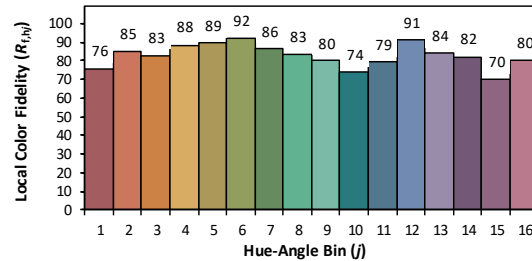
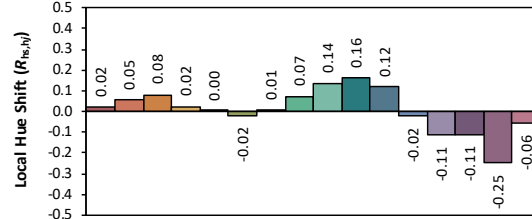
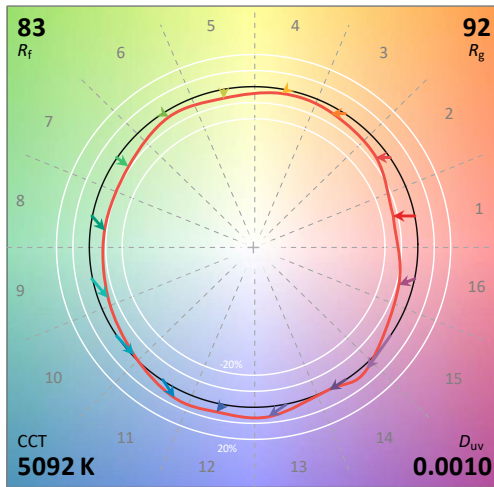
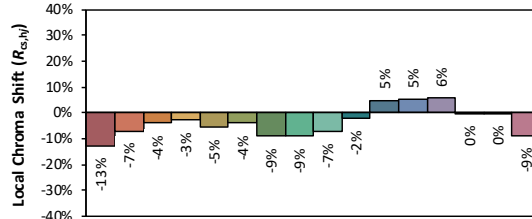
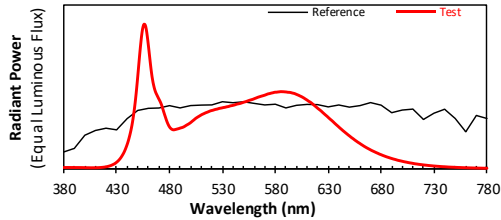
### IES TM-30-18 Color Rendition Report

Source: DLF2305110-10a

Manufacturer: RAB Lighting Inc.

Date: 2023/5/23

Model: CW2/11W/5000K



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

$x$  0.3427  
 $y$  0.3516  
 $u'$  0.2098  
 $v'$  0.4843

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	4.12E-04	485	1.13E-02	590	2.21E-02	695	2.56E-03
385	4.14E-04	490	1.17E-02	595	2.19E-02	700	2.20E-03
390	4.04E-04	495	1.24E-02	600	2.14E-02	705	1.87E-03
395	3.94E-04	500	1.33E-02	605	2.07E-02	710	1.60E-03
400	3.61E-04	505	1.46E-02	610	1.98E-02	715	1.35E-03
405	3.34E-04	510	1.55E-02	615	1.87E-02	720	1.16E-03
410	3.40E-04	515	1.62E-02	620	1.74E-02	725	9.83E-04
415	4.14E-04	520	1.68E-02	625	1.61E-02	730	8.39E-04
420	6.03E-04	525	1.72E-02	630	1.48E-02	735	7.17E-04
425	1.03E-03	530	1.76E-02	635	1.34E-02	740	6.16E-04
430	1.92E-03	535	1.79E-02	640	1.20E-02	745	5.24E-04
435	3.69E-03	540	1.83E-02	645	1.07E-02	750	4.55E-04
440	7.05E-03	545	1.87E-02	650	9.50E-03	755	3.97E-04
445	1.34E-02	550	1.91E-02	655	8.33E-03	760	3.43E-04
450	2.66E-02	555	1.96E-02	660	7.29E-03	765	2.94E-04
455	4.08E-02	560	2.02E-02	665	6.31E-03	770	2.56E-04
460	3.56E-02	565	2.07E-02	670	5.47E-03	775	2.20E-04
465	2.40E-02	570	2.12E-02	675	4.74E-03	780	1.95E-04
470	2.00E-02	575	2.17E-02	680	4.08E-03		
475	1.59E-02	580	2.20E-02	685	3.49E-03		
480	1.21E-02	585	2.22E-02	690	3.00E-03		



## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	CW2/11W/5000K	Sample ID.	J1
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	277.02	60	0.047	12.0	0.916
NON-WROST CASE	120.01	60	0.096	11.4	0.987

#### Test Result

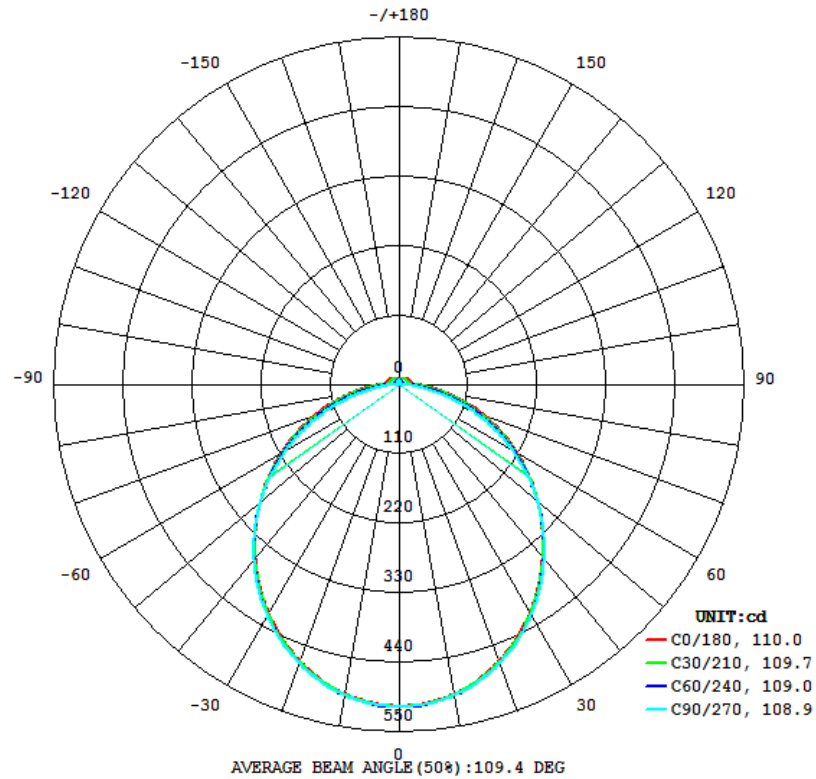
Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
1503	168.8	159.0	110.0	108.9	125.2

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
73.93%	21.3	2.00	751

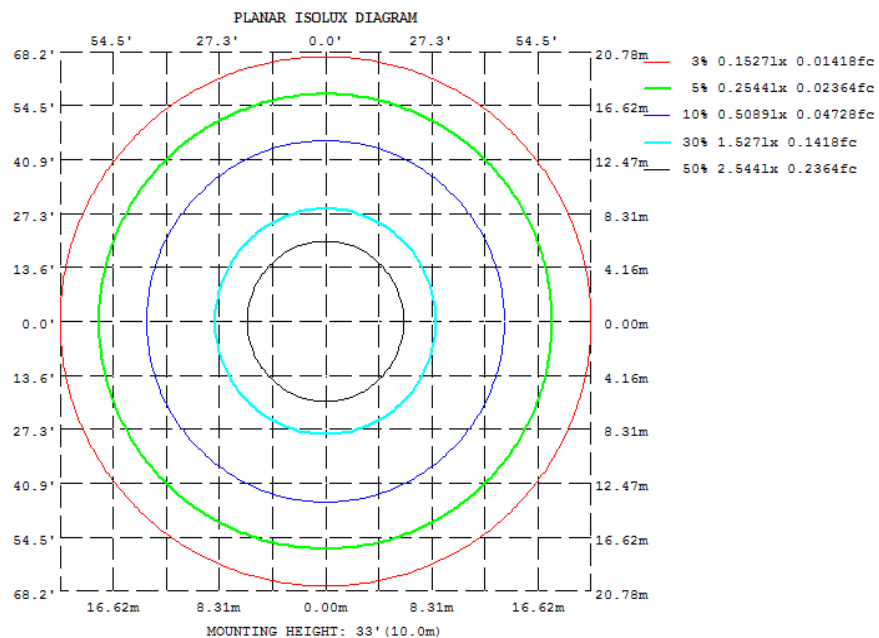


## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### Isolux Plot



## 4.2 Goniophotometer Test

### Zonal Lumen Summary

$\gamma$	C0	C45	C90	C135	C180	C225	C270	C315
10	497.7	498.8	499.4	498.8	497.7	498.8	499.4	498.8
20	465.7	467.3	468.8	467.3	465.7	467.3	468.8	467.3
30	417.3	419.3	421.5	419.3	417.3	419.3	421.5	419.3
40	356.8	358.5	360.5	358.5	356.8	358.5	360.5	358.5
50	289.7	289.2	289.2	289.2	289.7	289.2	289.2	289.2
60	218.3	214.8	210.2	214.8	218.3	214.8	210.2	214.8
70	145.0	137.6	127.0	137.6	145.0	137.6	127.0	137.6
80	76.76	65.35	47.42	65.35	76.76	65.35	47.42	65.35
90	27.92	16.80	0.0550	16.80	27.92	16.80	0.0550	16.80
100	22.71	13.72	0.5932	13.72	22.71	13.72	0.5932	13.72
110	20.99	13.09	1.972	13.09	20.99	13.09	1.972	13.09
120	19.20	12.52	3.611	12.52	19.20	12.52	3.611	12.52
130	17.15	11.82	5.253	11.82	17.15	11.82	5.253	11.82
140	14.91	11.16	6.731	11.16	14.91	11.16	6.731	11.16
150	12.89	10.34	7.940	10.34	12.89	10.34	7.940	10.34
160	10.90	9.555	8.465	9.555	10.90	9.555	8.465	9.555
170	9.390	7.849	6.563	7.849	9.390	7.849	6.563	7.849
180	2.246	4.933	5.603	4.933	2.246	4.933	5.603	4.933
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				
3H	16.1	17.6	16.5	18.0	18.4	16.5	18.0	17.0	18.5	18.9
4H	17.6	19.0	18.1	19.4	19.9	18.4	19.8	18.9	20.3	20.7
6H	18.1	19.5	18.6	19.9	20.4	19.2	20.5	19.7	21.0	21.5
8H	18.4	19.7	18.9	20.1	20.6	19.9	21.1	20.4	21.6	22.1
12H	18.5	19.7	19.0	20.2	20.7	20.2	21.3	20.7	21.8	22.3
	18.5	19.6	19.0	20.1	20.7	20.4	21.5	20.9	22.0	22.5
4H 2H	16.7	18.0	17.2	18.4	18.9	17.1	18.4	17.5	18.8	19.3
3H	18.5	19.6	19.0	20.1	20.6	19.2	20.3	19.7	20.8	21.3
4H	19.1	20.1	19.6	20.6	21.2	20.1	21.1	20.6	21.6	22.2
6H	19.5	20.4	20.1	20.9	21.5	20.9	21.8	21.5	22.3	22.9
8H	19.6	20.4	20.1	21.0	21.5	21.3	22.1	21.8	22.6	23.2
12H	19.6	20.4	20.2	20.9	21.5	21.6	22.3	22.1	22.9	23.4
8H 4H	19.5	20.3	20.0	20.8	21.4	20.3	21.2	20.9	21.7	22.3
6H	20.0	20.6	20.5	21.2	21.8	21.3	22.0	21.8	22.5	23.1
8H	20.1	20.7	20.7	21.3	21.9	21.7	22.3	22.3	22.9	23.5
12H	20.2	20.7	20.8	21.3	22.0	22.1	22.7	22.7	23.2	23.9
12H 4H	19.5	20.2	20.1	20.8	21.4	20.4	21.1	20.9	21.6	22.2
6H	20.1	20.7	20.7	21.2	21.9	21.3	21.9	21.9	22.5	23.1
8H	20.2	20.8	20.8	21.4	22.0	21.8	22.3	22.3	22.9	23.6
Maximum UGR = 23.9										

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	48.14	0 - 10	48.14	3.20%
10-20	136.97	0 - 20	185.11	12.32%
20-30	205.22	0 - 30	390.33	25.97%
30-40	244.25	0 - 40	634.58	42.22%
40-50	250.73	0 - 50	885.31	58.91%
50-60	225.75	0 - 60	1111.06	73.93%
60-70	174.02	0 - 70	1285.08	85.51%
70-80	104.95	0 - 80	1390.03	92.49%
80-90	38.99	0 - 90	1429.02	95.08%
90-100	14.79	0 - 100	1443.81	96.07%
100-110	13.32	0 - 110	1457.13	96.95%
110-120	12.11	0 - 120	1469.24	97.76%
120-130	10.55	0 - 130	1479.79	98.46%
130-140	8.68	0 - 140	1488.47	99.04%
140-150	6.65	0 - 150	1495.12	99.48%
150-160	4.61	0 - 160	1499.73	99.79%
160-170	2.53	0 - 170	1502.26	99.96%
170-180	0.65	0 - 180	1502.91	100.00%

## 4.2 Goniophotometer Test

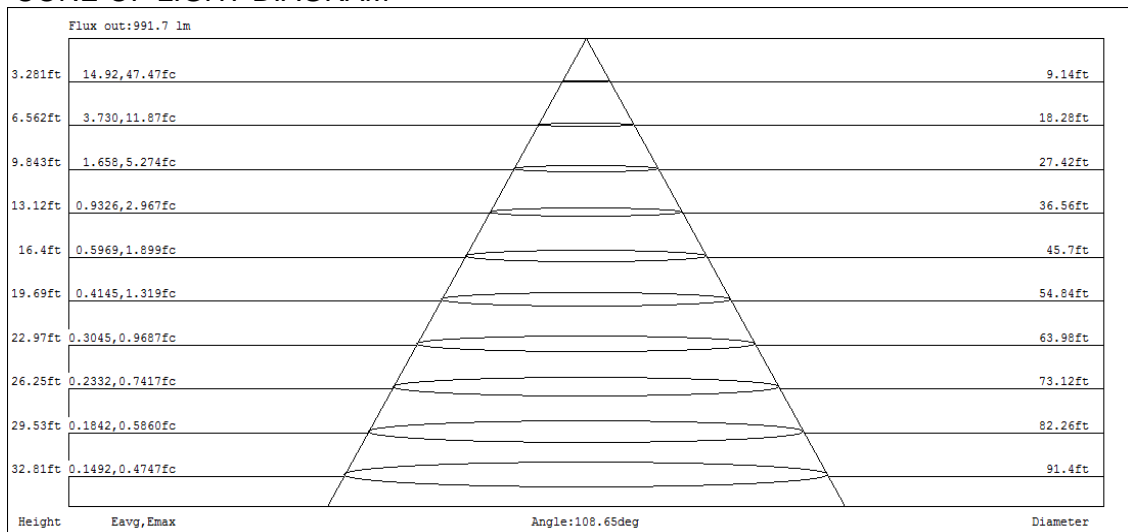
### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### 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	98	98	98	95
1	107	102	98	94	104	100	96	92	94	91	88	90	87	85	85	83	81	79
2	97	89	82	76	94	87	80	75	82	77	73	78	74	70	75	71	68	65
3	89	78	70	63	86	76	69	62	72	66	61	69	64	59	66	61	57	55
4	81	69	60	54	79	68	59	53	64	57	52	61	55	50	59	54	49	47
5	75	62	53	46	72	60	52	46	58	50	45	55	49	44	53	47	43	41
6	69	56	47	40	67	54	46	40	52	45	39	50	43	38	48	42	38	36
7	64	50	42	36	62	49	41	35	47	40	35	46	39	34	44	38	33	31
8	60	46	37	32	58	45	37	31	43	36	31	42	35	30	40	34	30	28
9	56	42	34	28	54	41	34	28	40	33	28	38	32	27	37	31	27	25
10	52	39	31	26	51	38	31	26	37	30	25	36	29	25	34	29	25	23

### CONE OF LIGHT DIAGRAM



## 4.0 LM-79 Measurement and Test Results

### 4.3 THD and PF Test

Model No.	CW2/11W/5000K	Sample ID.	J1
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
119.97	60	0.096	11.4	0.987	13.07%
277.01	60	0.047	12.0	0.916	14.70%

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