

# 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

**DLF2305110-14a**

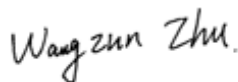
## Test Date

**2023/5/24**

## Issue Date

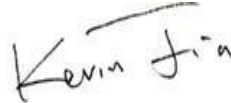
**2023/5/25**

## 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		4709
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1177
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	145.3
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		32.4
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	7.90%
		20.00%	277V	10.58%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.993
		0.9	277V	0.940
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3985±275	4045
		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		16
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%		72.77%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		22.8
Input Voltage (V)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		120
(Goniophotometer - Section 4.2)		Non-Wrost Case		277
Input Current (A)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		0.272
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.124
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		32.4
(Goniophotometer - Section 4.2)		Non-Wrost Case		32.3

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2023/5/24	CW4/33W/4000K	N1
2	Goniophotometer Test	2023/5/24	CW4/33W/4000K	N1
3	THD and PF Test	2023/5/24	CW4/33W/4000K	N1

### 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.

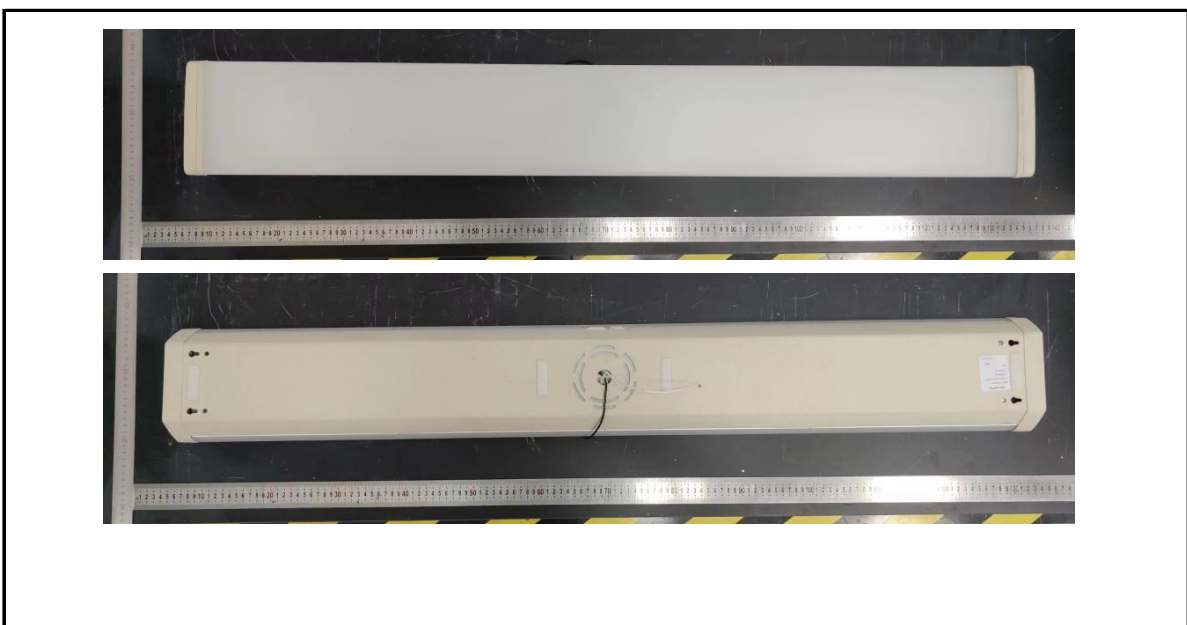
2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing 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:** CW4/33W/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.	CW4/33W/4000K	Sample ID.	N1
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
120.00	60	0.271	32.3	0.993
276.94	60	0.124	32.2	0.940

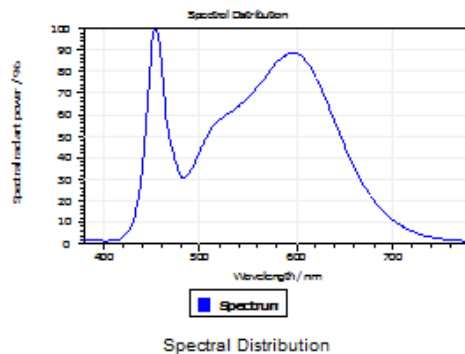
#### Test Result

CCT (K)	CRI	R9	Duv
4045	85	16	0.0023

Rf	Rg	IES Rcs,h1
85	95	-11%

## 4.1 Integrating Sphere Test

### Results

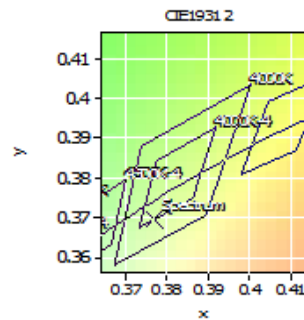


#### Spectral values

DominantWavelength 580.34 nm  
Purity 0.241  
PeakWavelength 454.09 nm  
Radiant Power 12.23 W  
Width50%:

#### Color Coordinates

Correlated Color Temperat 4045 K  
x: 0.3770 u: 0.2257 u': 0.2257  
y: 0.3697 v: 0.3319 v': 0.4979  
CRI01 84.4 CRI09 15.5  
CRI02 93.4 CRI10 83.6  
CRI03 95.2 CRI11 81.8  
CRI04 82.2 CRI12 66.3  
CRI05 84.3 CRI13 87.2  
CRI06 89.6 CRI14 98.2  
CRI07 84.5 CRI15 78.4  
CRI08 65.2 CRI16 74.5  
ResultsCRI 84.8



PlanckDistance 2.3E-003

## 4.1 Integrating Sphere Test

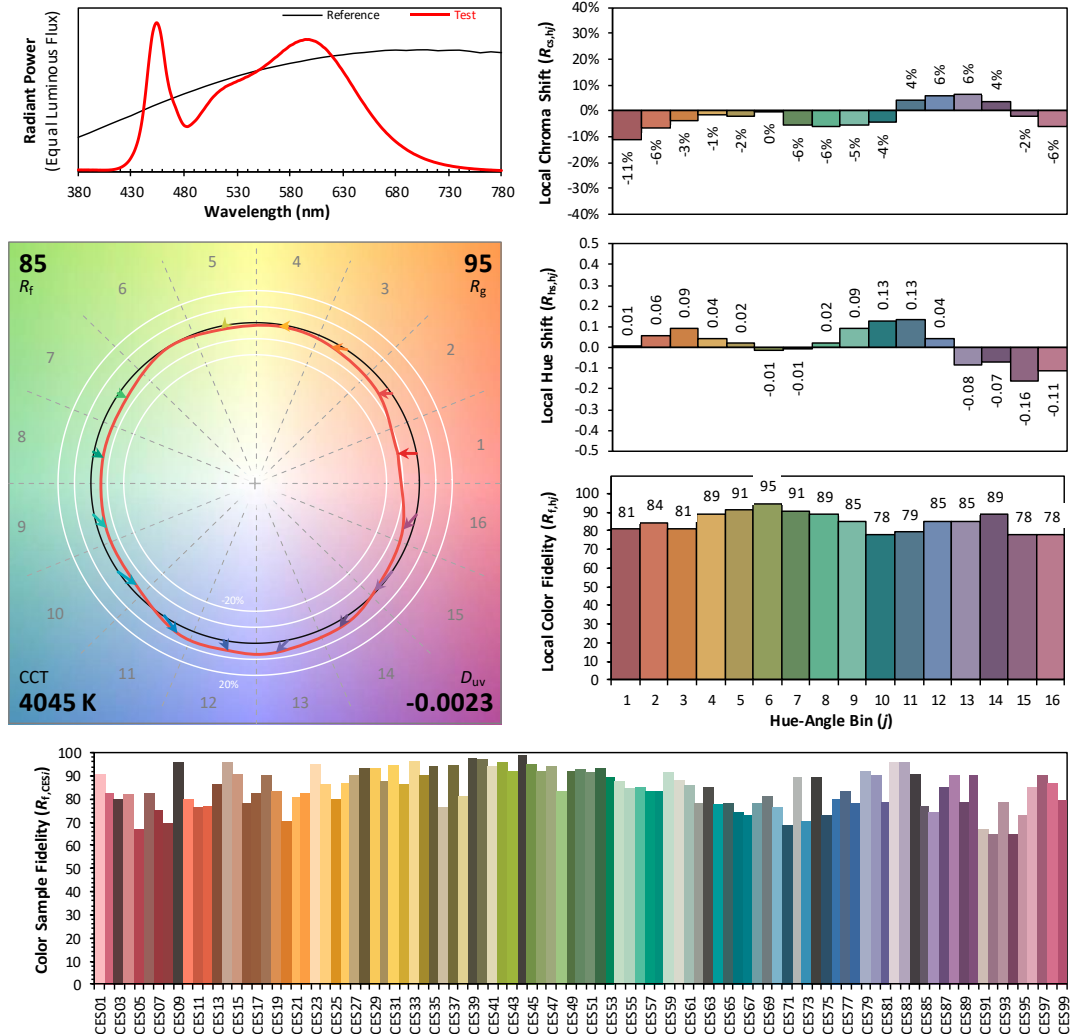
### IES TM-30-18 Color Rendition Report

Source: DLF2305110-14a

Manufacturer: RAB Lighting Inc.

Date: 2023/5/24

Model: CW4/33W/4000K



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

$x$  0.3770  
 $y$  0.3697  
 $u'$  0.2257  
 $v'$  0.4979

CIE 13.3-1995  
(CRI)

$R_a$  86  
 $R_g$  21

#### 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	1.07E-03	485	2.42E-02	590	6.89E-02	695	1.01E-02
385	1.04E-03	490	2.65E-02	595	6.95E-02	700	8.69E-03
390	1.03E-03	495	3.00E-02	600	6.92E-02	705	7.41E-03
395	1.01E-03	500	3.38E-02	605	6.83E-02	710	6.30E-03
400	9.28E-04	505	3.76E-02	610	6.63E-02	715	5.37E-03
405	9.37E-04	510	4.07E-02	615	6.39E-02	720	4.59E-03
410	1.03E-03	515	4.31E-02	620	6.06E-02	725	3.90E-03
415	1.42E-03	520	4.49E-02	625	5.70E-02	730	3.35E-03
420	2.31E-03	525	4.62E-02	630	5.29E-02	735	2.83E-03
425	4.12E-03	530	4.75E-02	635	4.88E-02	740	2.43E-03
430	7.57E-03	535	4.87E-02	640	4.43E-02	745	2.08E-03
435	1.38E-02	540	5.00E-02	645	3.99E-02	750	1.80E-03
440	2.60E-02	545	5.15E-02	650	3.57E-02	755	1.53E-03
445	4.87E-02	550	5.32E-02	655	3.16E-02	760	1.33E-03
450	7.19E-02	555	5.50E-02	660	2.79E-02	765	1.14E-03
455	7.79E-02	560	5.71E-02	665	2.43E-02	770	9.89E-04
460	6.53E-02	565	5.94E-02	670	2.12E-02	775	8.49E-04
465	4.67E-02	570	6.16E-02	675	1.84E-02	780	7.42E-04
470	3.66E-02	575	6.40E-02	680	1.59E-02		
475	2.94E-02	580	6.62E-02	685	1.38E-02		
480	2.44E-02	585	6.77E-02	690	1.18E-02		



## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	CW4/33W/4000K	Sample ID.	N1
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	120.07	60	0.272	32.4	0.993
NON-WROST CASE	277.02	60	0.124	32.3	0.940

#### Test Result

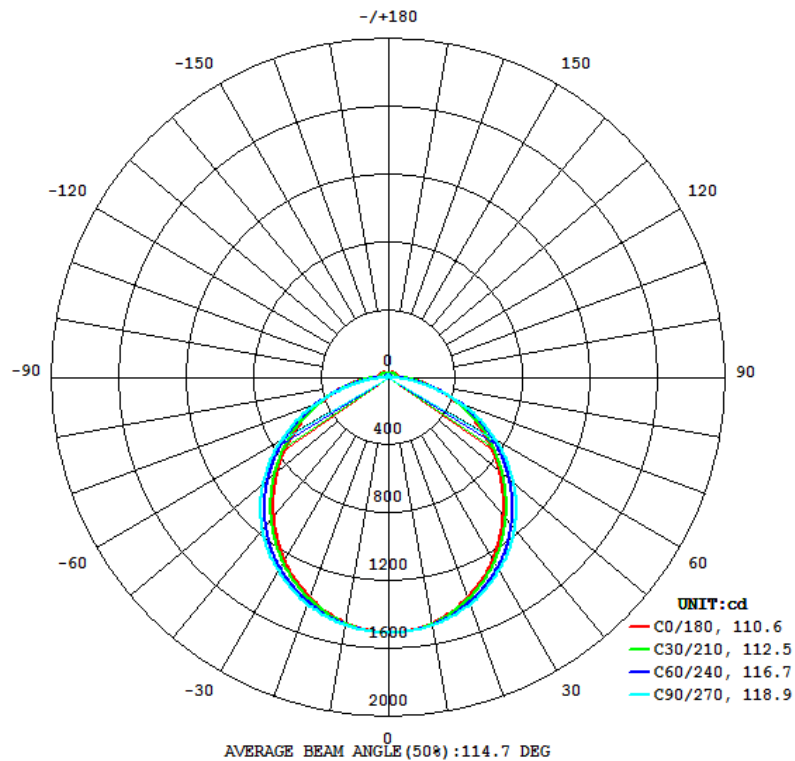
Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
4709	169.2	162.5	110.6	118.9	145.3

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
72.77%	22.8	4.00	1177

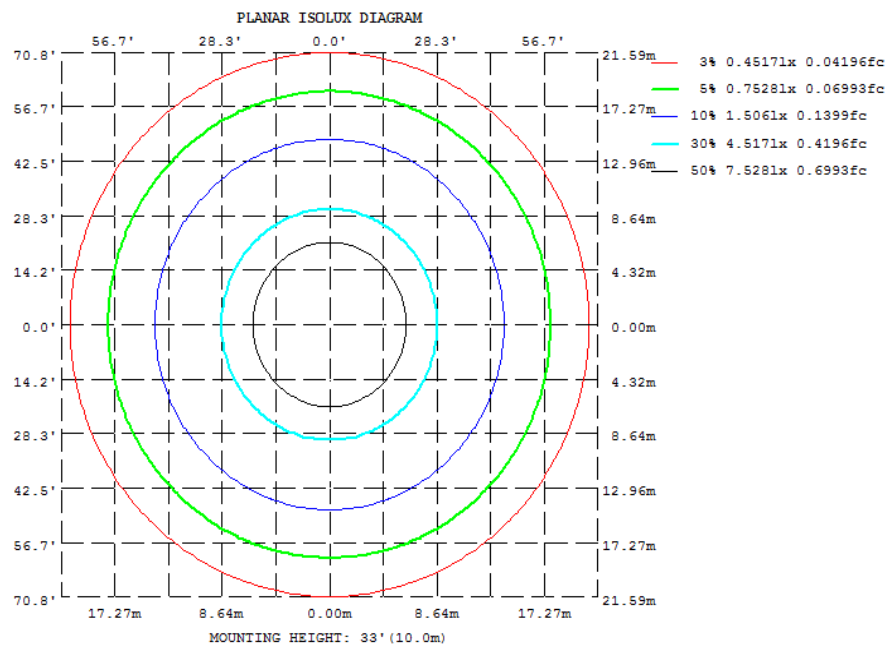


## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### Isolux Plot



## 4.2 Goniophotometer Test

### Zonal Lumen Summary

γ	C0	C45	C90	C135	C180	C225	C270	C315
10	1473	1479	1484	1479	1473	1479	1484	1479
20	1379	1399	1421	1399	1379	1399	1421	1399
30	1240	1277	1314	1277	1240	1277	1314	1277
40	1063	1111	1168	1111	1063	1111	1168	1111
50	863.7	912.8	974.6	912.8	863.7	912.8	974.6	912.8
60	651.5	691.9	738.7	691.9	651.5	691.9	738.7	691.9
70	436.1	452.9	467.9	452.9	436.1	452.9	467.9	452.9
80	231.7	219.7	182.9	219.7	231.7	219.7	182.9	219.7
90	85.92	58.52	0.7311	58.52	85.92	58.52	0.7311	58.52
100	69.28	46.90	1.919	46.90	69.28	46.90	1.919	46.90
110	64.26	44.25	6.601	44.25	64.26	44.25	6.601	44.25
120	58.83	41.38	11.91	41.38	58.83	41.38	11.91	41.38
130	52.38	37.79	16.78	37.79	52.38	37.79	16.78	37.79
140	45.03	34.31	20.86	34.31	45.03	34.31	20.86	34.31
150	38.20	31.06	22.87	31.06	38.20	31.06	22.87	31.06
160	32.08	27.40	21.03	27.40	32.08	27.40	21.03	27.40
170	27.97	23.00	18.94	23.00	27.97	23.00	18.94	23.00
180	17.49	20.66	21.70	20.66	17.49	20.66	21.70	20.66
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	18.2	19.8	18.7	20.2	20.6	17.9	19.5	18.4	19.9	20.3
4H	20.0	21.4	20.4	21.8	22.3	19.9	21.3	20.3	21.7	22.2
6H	20.6	21.9	21.0	22.3	22.8	20.7	22.0	21.2	22.5	23.0
8H	20.9	22.1	21.4	22.6	23.1	21.4	22.6	21.9	23.1	23.6
12H	21.0	22.2	21.5	22.7	23.2	21.7	22.8	22.2	23.3	23.8
	21.0	22.1	21.5	22.6	23.2	21.9	23.1	22.4	23.5	24.1
4H 2H	18.8	20.1	19.3	20.6	21.1	18.6	19.9	19.1	20.4	20.8
3H	20.8	21.9	21.3	22.4	22.9	20.7	21.8	21.2	22.3	22.9
4H	21.5	22.5	22.0	23.0	23.6	21.7	22.7	22.2	23.2	23.7
6H	22.0	22.9	22.5	23.4	24.0	22.5	23.4	23.0	23.9	24.5
8H	22.1	22.9	22.6	23.4	24.0	22.8	23.7	23.4	24.2	24.8
12H	22.1	22.9	22.7	23.4	24.0	23.2	23.9	23.7	24.5	25.1
8H 4H	21.8	22.6	22.3	23.2	23.7	22.0	22.8	22.5	23.3	23.9
6H	22.4	23.1	23.0	23.7	24.2	22.9	23.6	23.5	24.2	24.8
8H	22.6	23.2	23.1	23.8	24.4	23.3	24.0	23.9	24.6	25.2
12H	22.7	23.2	23.2	23.8	24.5	23.8	24.4	24.4	24.9	25.6
12H 4H	21.8	22.6	22.4	23.2	23.7	22.0	22.7	22.5	23.3	23.9
6H	22.5	23.1	23.1	23.7	24.3	23.0	23.6	23.6	24.1	24.8
8H	22.7	23.2	23.3	23.8	24.5	23.5	24.0	24.0	24.6	25.3
Maximum UGR = 25.6										

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	142.42	0 - 10	142.42	3.02%
10-20	407.85	0 - 20	550.27	11.69%
20-30	619.01	0 - 30	1169.28	24.83%
30-40	750.70	0 - 40	1919.98	40.77%
40-50	785.42	0 - 50	2705.40	57.45%
50-60	721.34	0 - 60	3426.74	72.77%
60-70	568.48	0 - 70	3995.22	84.85%
70-80	349.21	0 - 80	4344.43	92.26%
80-90	130.27	0 - 90	4474.70	95.03%
90-100	48.18	0 - 100	4522.88	96.05%
100-110	43.40	0 - 110	4566.28	96.97%
110-120	39.13	0 - 120	4605.41	97.81%
120-130	33.53	0 - 130	4638.94	98.52%
130-140	26.98	0 - 140	4665.92	99.09%
140-150	20.16	0 - 150	4686.08	99.52%
150-160	13.44	0 - 160	4699.52	99.80%
160-170	7.16	0 - 170	4706.68	99.96%
170-180	2.08	0 - 180	4708.76	100.00%

## 4.2 Goniophotometer Test

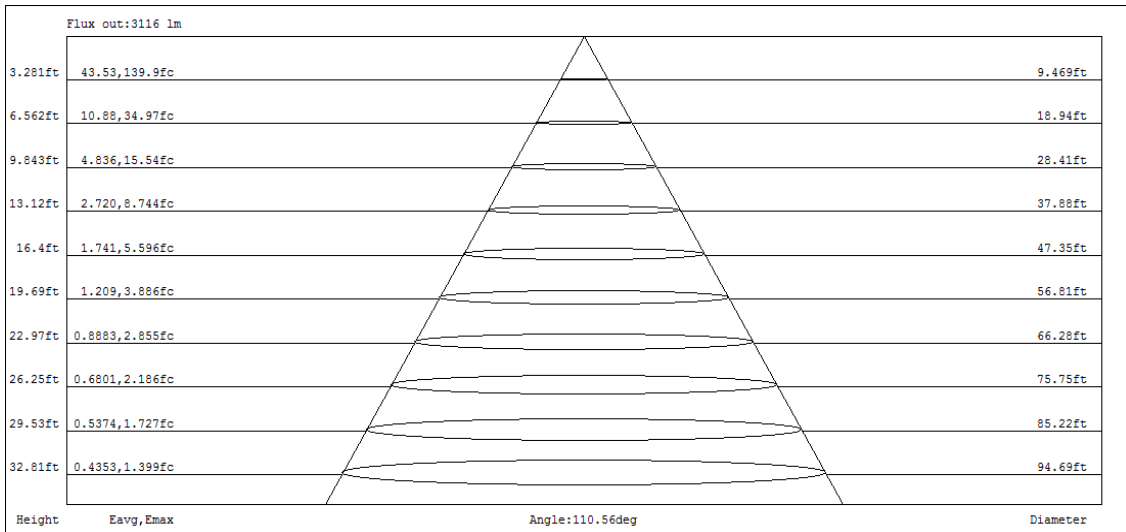
### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### 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	93	104	99	95	91	94	91	88	89	87	84	85	83	81	78
2	97	89	81	76	94	86	80	74	82	76	72	78	73	69	74	70	67	65
3	88	77	69	62	85	76	68	62	72	65	60	68	63	58	65	61	57	54
4	81	68	60	53	78	67	58	52	64	56	51	61	55	50	58	53	48	46
5	74	61	52	45	72	60	51	45	57	49	44	54	48	43	52	46	42	40
6	68	55	46	39	66	54	45	39	51	44	38	49	43	37	47	41	37	35
7	63	50	41	35	61	49	40	34	47	39	34	45	38	33	43	37	33	30
8	59	45	37	31	57	44	36	31	43	35	30	41	34	30	39	34	29	27
9	55	42	33	28	53	41	33	27	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.	CW4/33W/4000K	Sample ID.	N1
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
120.00	60	0.271	32.3	0.993	7.90%
276.94	60	0.124	32.2	0.940	10.58%

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