

# Photometric Test Report

## Relevant Standards

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

## Prepared For

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## Project Number

**DLF2207103**

## Report Number

**DLF2207103-11a**

## Test Date

**2022/7/11**

## Issue Date

**2022/7/15**

## 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	1500		6413
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1603
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	133.3
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		48.1
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	7.07%
		20.00%	277V	11.26%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.996
		0.9	277V	0.989
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3985±275	4011
		4 step	3985±154	
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		14
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		96
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%		47.97%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		24.0
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		0.402
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.174
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		48.1
(Goniophotometer - Section 4.2)		Non-Wrost Case		47.7

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/11	TOMO-4/48W/4000K	K1
2	Goniophotometer Test	2022/7/11	TOMO-4/48W/4000K	K1
3	THD and PF Test	2022/7/11	TOMO-4/48W/4000K	K1

### Remark(If any)

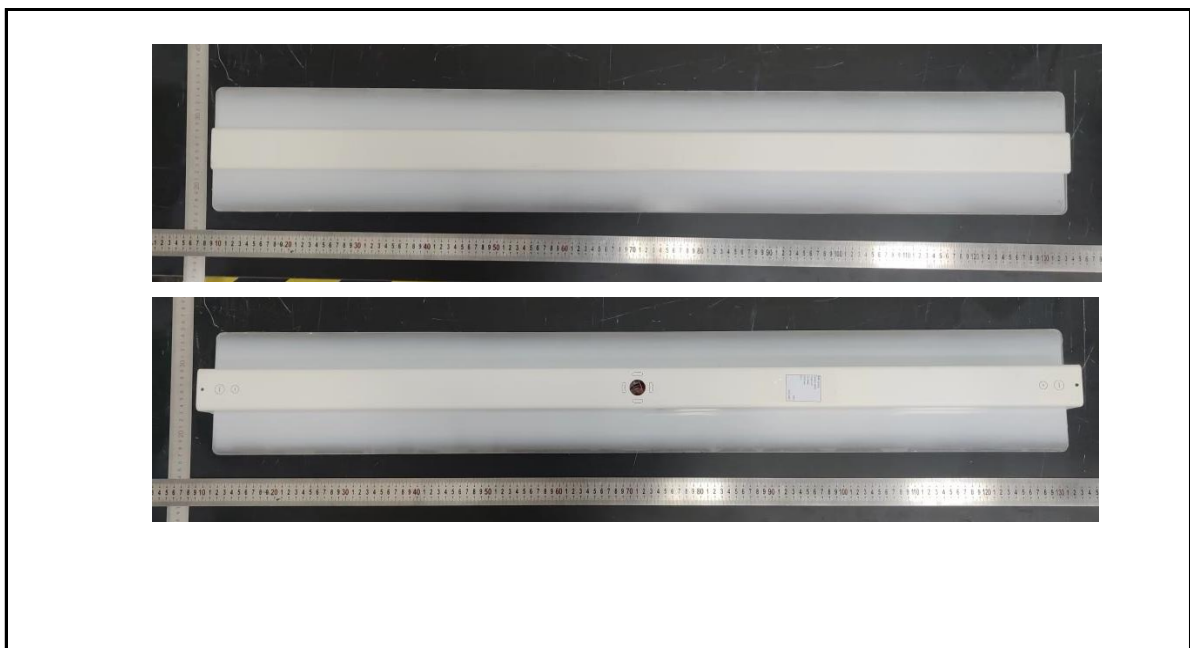
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## 3.0 Production Description

**Luminaire Description:** TOMO-4/48W/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.	TOMO-4/48W/4000K	Sample ID.	K1
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

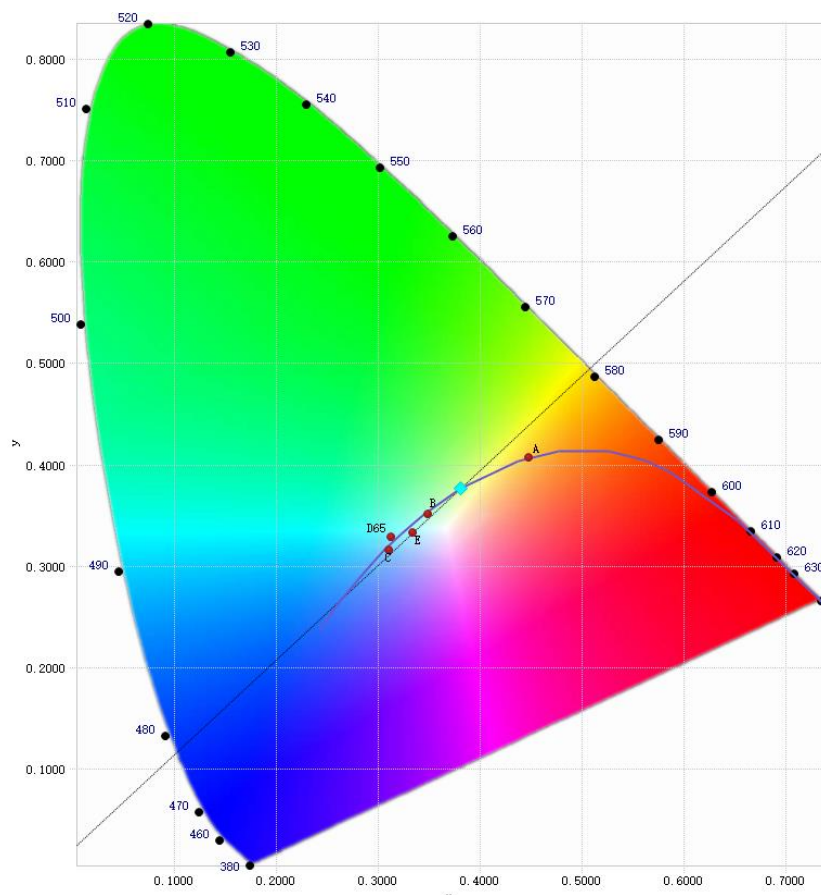
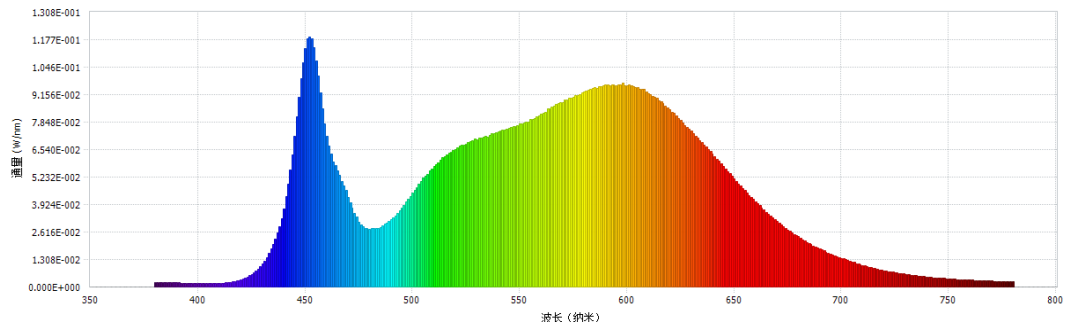
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.06	60	0.403	48.2	0.996
277.04	60	0.174	47.8	0.989

#### Test Result

CCT (K)	CRI	R9	Duv
4011	84	14	0.0002

Rf	Rg	IES Rcs,h1
84	96	-11%

## 4.1 Integrating Sphere Test



## 4.1 Integrating Sphere Test

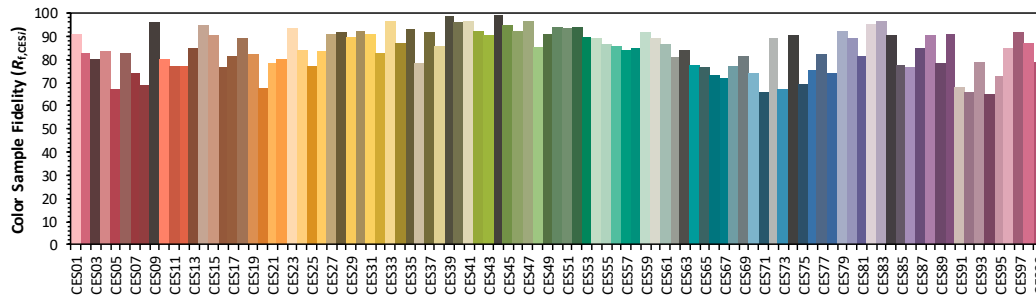
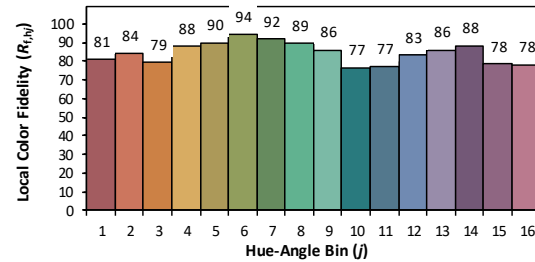
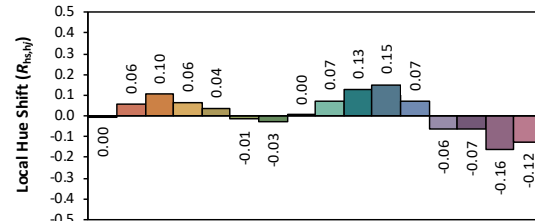
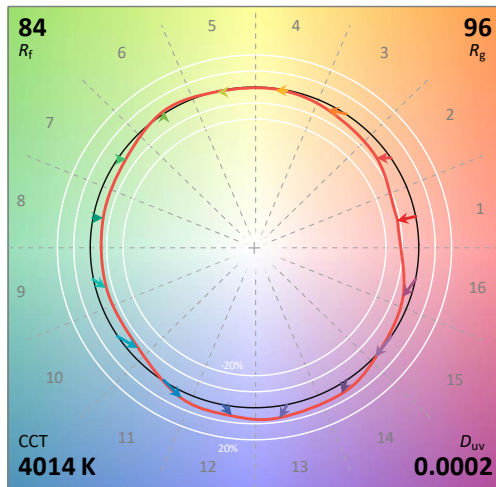
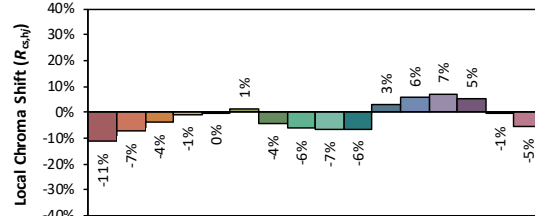
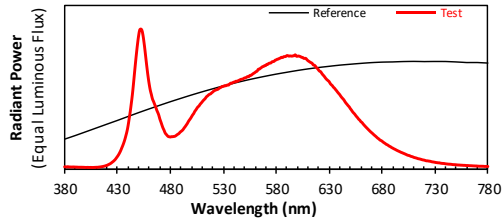
### IES TM-30-18 Color Rendition Report

Source: DLF2207103-11a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/11

Model: TOMO-4/48W/4000K



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

$x$  0.3800  
 $y$  0.3768  
 $u'$  0.2248  
 $v'$  0.5015

CIE 13.3-1995  
(CRI)

$R_a$  85  
 $R_g$  19

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	TOMO-4/48W/4000K	Sample ID.	K1
Operate 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 parameters 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	120.06	60	0.402	48.1	0.996
NON-WROST CASE	277.00	60	0.174	47.7	0.989

#### Test Result

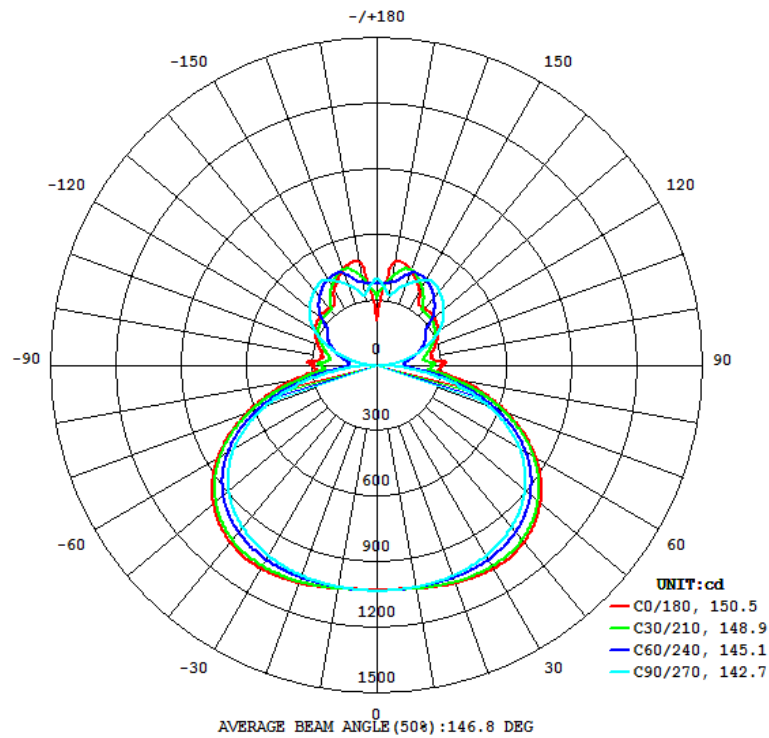
Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
6413	360.0	360.0	150.5	142.7	133.3

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
47.97%	24.0	4.00	1603

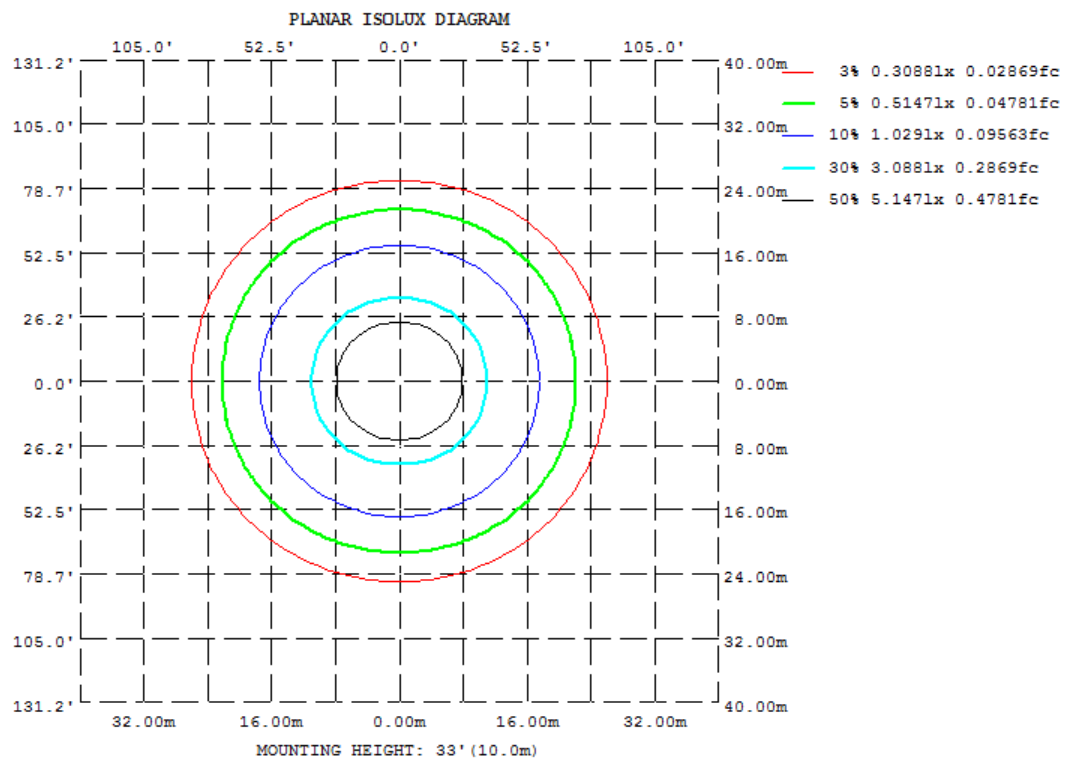


## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### Isolux Plot





## 4.2 Goniophotometer Test

### Zonal Lumen Summary

$\gamma$	C0	C45	C90	C135	C180	C225	C270	C315
10	1038	1033	1031	1033	1038	1033	1031	1033
20	1060	1044	1024	1044	1060	1044	1024	1044
30	1074	1044	1006	1044	1074	1044	1006	1044
40	1054	1019	966.4	1019	1054	1019	966.4	1019
50	983.6	950.8	891.3	950.8	983.6	950.8	891.3	950.8
60	848.3	815.8	761.8	815.8	848.3	815.8	761.8	815.8
70	642.0	607.6	551.8	607.6	642.0	607.6	551.8	607.6
80	388.0	340.5	266.9	340.5	388.0	340.5	266.9	340.5
90	307.9	211.9	10.71	211.9	307.9	211.9	10.71	211.9
100	260.4	189.3	91.03	189.3	260.4	189.3	91.03	189.3
110	288.6	244.1	226.1	244.1	288.6	244.1	226.1	244.1
120	329.9	292.4	335.9	292.4	329.9	292.4	335.9	292.4
130	347.5	314.7	407.0	314.7	347.5	314.7	407.0	314.7
140	346.6	371.8	450.5	371.8	346.6	371.8	450.5	371.8
150	400.0	440.7	453.5	440.7	400.0	440.7	453.5	440.7
160	468.2	458.8	393.4	458.8	468.2	458.8	393.4	458.8
170	485.4	402.7	333.2	402.7	485.4	402.7	333.2	402.7
180	213.4	355.8	396.6	355.8	213.4	355.8	396.6	355.8
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					UGR Viewed Endwise				
X=2H	Y=2H	17.1	18.3	17.8	19.1	20.0	17.7	18.9	18.4	19.6	20.6
	3H	19.4	20.5	20.2	21.3	22.2	20.1	21.2	20.9	22.0	23.0
	4H	20.3	21.3	21.1	22.1	23.1	21.2	22.2	22.0	23.0	24.0
	6H	21.0	22.0	21.8	22.8	23.8	22.2	23.1	23.0	23.9	24.9
	8H	21.2	22.2	22.0	23.0	24.0	22.6	23.5	23.4	24.4	25.3
	12H	21.4	22.3	22.2	23.1	24.1	23.1	24.0	23.9	24.8	25.8
4H	2H	18.0	19.0	18.7	19.8	20.8	18.4	19.4	19.2	20.2	21.2
	3H	20.5	21.3	21.3	22.2	23.2	21.1	21.9	21.9	22.8	23.8
	4H	21.5	22.3	22.3	23.1	24.2	22.3	23.1	23.1	23.9	24.9
	6H	22.3	23.1	23.2	23.9	24.9	23.5	24.2	24.3	25.0	26.0
	8H	22.6	23.3	23.4	24.1	25.2	24.0	24.7	24.8	25.5	26.5
	12H	22.8	23.4	23.7	24.3	25.3	24.6	25.2	25.4	26.0	27.1
8H	4H	22.0	22.7	22.8	23.5	24.6	22.7	23.4	23.5	24.2	25.2
	6H	23.0	23.6	23.9	24.5	25.5	24.0	24.6	24.9	25.5	26.5
	8H	23.4	23.9	24.3	24.8	25.9	24.7	25.2	25.6	26.1	27.2
	12H	23.7	24.2	24.6	25.0	26.1	25.5	25.9	26.3	26.8	27.9
12H	4H	22.1	22.7	23.0	23.6	24.6	22.7	23.3	23.6	24.2	25.2
	6H	23.2	23.7	24.1	24.6	25.7	24.2	24.7	25.0	25.5	26.6
	8H	23.7	24.1	24.6	25.0	26.1	24.9	25.3	25.8	26.2	27.3

Maximum UGR = 27.9

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	98.56	0 - 10	98.56	1.54%
10-20	294.66	0 - 20	393.22	6.13%
20-30	483.06	0 - 30	876.28	13.66%
30-40	647.67	0 - 40	1523.95	23.76%
40-50	761.18	0 - 50	2285.13	35.63%
50-60	791.51	0 - 60	3076.64	47.97%
60-70	706.26	0 - 70	3782.90	58.99%
70-80	497.59	0 - 80	4280.49	66.75%
80-90	247.67	0 - 90	4528.16	70.61%
90-100	195.63	0 - 100	4723.79	73.66%
100-110	221.89	0 - 110	4945.68	77.12%
110-120	271.38	0 - 120	5217.06	81.35%
120-130	293.13	0 - 130	5510.19	85.92%
130-140	282.80	0 - 140	5792.99	90.33%
140-150	255.68	0 - 150	6048.67	94.32%
150-160	205.83	0 - 160	6254.50	97.53%
160-170	122.46	0 - 170	6376.96	99.44%
170-180	36.14	0 - 180	6413.10	100.00%

## 4.2 Goniophotometer Test

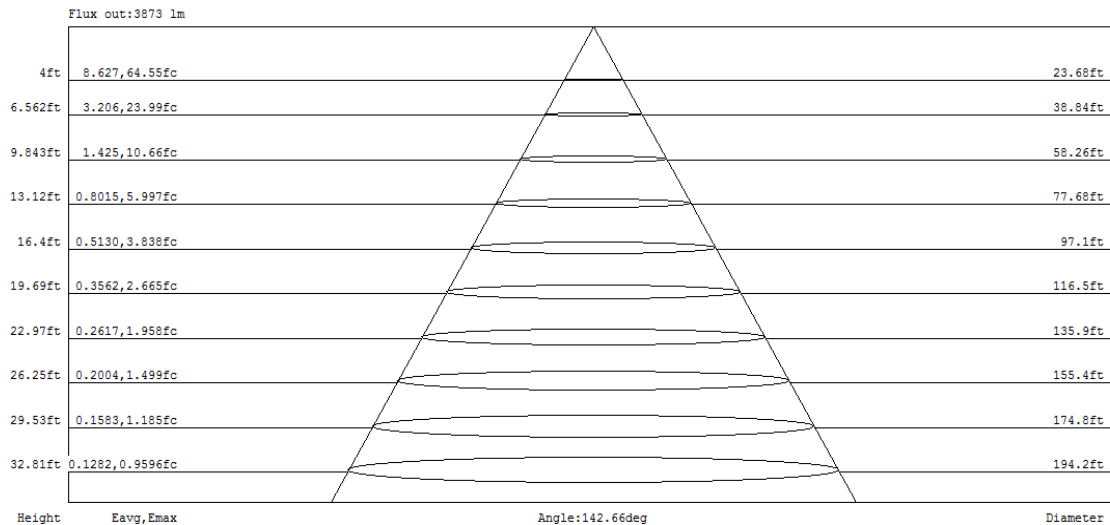
### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### 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	112	112	112	112	106	106	106	106	95	95	95	84	84	84	75	75	75	71
1	100	95	90	86	95	90	86	82	80	77	74	71	69	66	63	61	59	55
2	90	81	74	68	85	77	70	65	69	63	59	61	57	53	54	51	48	44
3	82	70	62	55	77	67	59	53	59	53	48	53	48	44	47	43	39	36
4	74	62	53	46	69	58	50	44	52	45	40	46	41	36	41	37	33	30
5	68	55	45	39	63	52	43	37	46	39	34	41	35	31	36	32	28	25
6	62	49	40	33	58	46	38	32	41	34	29	37	31	27	33	28	24	21
7	57	44	35	29	54	41	33	27	37	30	25	33	27	23	30	25	21	19
8	53	39	31	25	50	38	30	24	34	27	22	30	25	20	27	22	19	16
9	49	36	28	22	46	34	27	21	31	24	20	28	22	18	25	20	17	14
10	46	33	25	20	43	31	24	19	28	22	18	26	20	16	23	18	15	13

### CONE OF LIGHT DIAGRAM



## 4.0 LM-79 Measurement and Test Results

### 4.3 THD and PF Test

Model No.	TOMO-4/48W/4000K	Sample ID.	K1
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
120.06	60	0.403	48.2	0.996	7.07%
277.04	60	0.174	47.8	0.989	11.26%

## 5.0 Equipment Information

Test Equipment			
Equipment ID	Equipment Name	Last Calibration Date	Calibration Due Date
DLF107	Integrating Sphere System	2021/12/26	2022/12/25
DLF108	Auxiliary Lamp	2021/12/26	2022/12/25
DLF122	Measurement Standard Lamp Standard Lamp Type: 220 V, 0.4720 A, Tungsten, Omni-derectional	2021/12/26	2022/12/25
DLF116	AC Power Source	2021/12/26	2022/12/25
DLF113	Power Meter	2021/12/26	2022/12/25
DLF112	Temperature Recorder	2021/12/26	2022/12/25
DLF114	Temperature & Humidity Datalogger	2021/12/26	2022/12/25
DLF101	Goniophotometer	2021/12/26	2022/12/25
DLF125	Standard Lamp Standard Lamp Type: 76.58 V, 6.7875 A, Tungsten, Omni-derectional	2021/12/26	2022/12/25
DLF104	AC Power Source	2021/12/26	2022/12/25
DLF507	DC Power Source	2021/12/26	2022/12/25
DLF102	Power Meter	2021/12/26	2022/12/25
DLF111	Temperature & Humidity Datalogger	2021/12/26	2022/12/25
DLF119	Power Meter	2021/12/26	2022/12/25
DLF031	Temperature data logger	2021/12/26	2022/12/25
DLF022	Digital power meter	2021/12/26	2022/12/25
DLF003	Temperature & Humidity Datalogger	2021/12/26	2022/12/25

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