

# Photometric Test Report

## Relevant Standards

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

## Prepared For

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## Project Number

**DLF2207103**

## Report Number

**DLF2207103-7a**

## 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		4626
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1156
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	134.9
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		34.3
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	6.57%
		20.00%	277V	11.38%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.996
		0.9	277V	0.969
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3985±275	4016
		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		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%		47.91%
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		277
(Goniophotometer - Section 4.2)		Non-Wrost Case		120
Input Current (A)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		0.128
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.286
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		34.3
(Goniophotometer - Section 4.2)		Non-Wrost Case		34.2

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/11	TOMO-4/36W/4000K	G1
2	Goniophotometer Test	2022/7/11	TOMO-4/36W/4000K	G1
3	THD and PF Test	2022/7/11	TOMO-4/36W/4000K	G1

### Remark(If any)

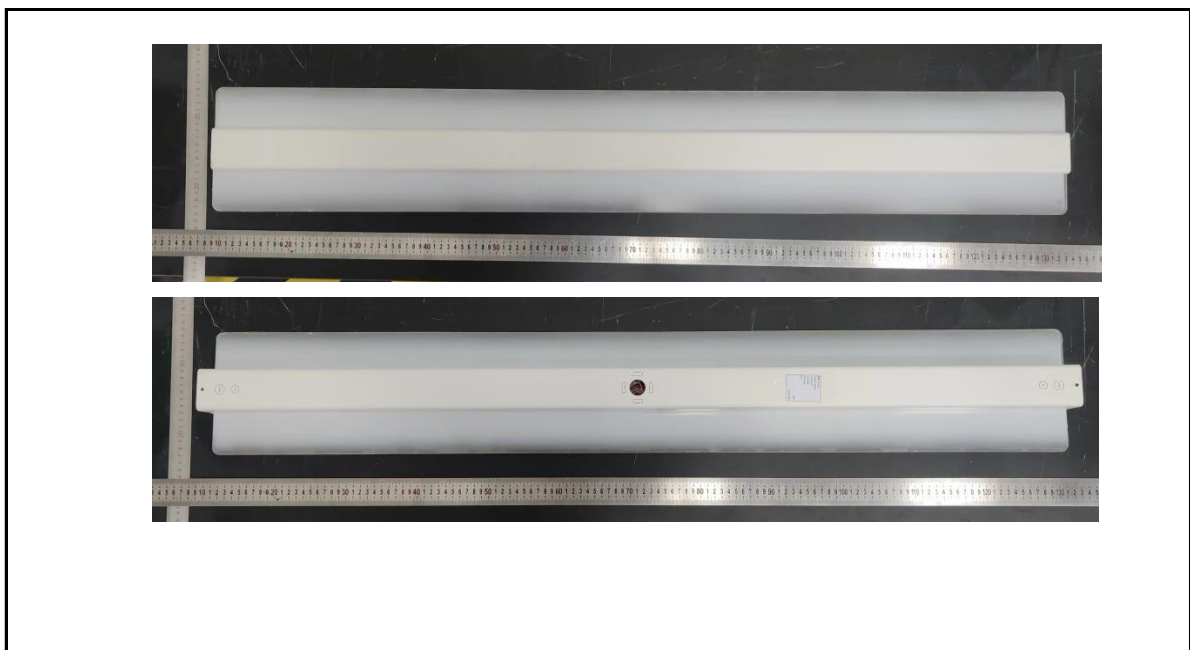
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## 3.0 Production Description

**Luminaire Description:** TOMO-4/36W/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-4/36W/4000K	Sample ID.	G1
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

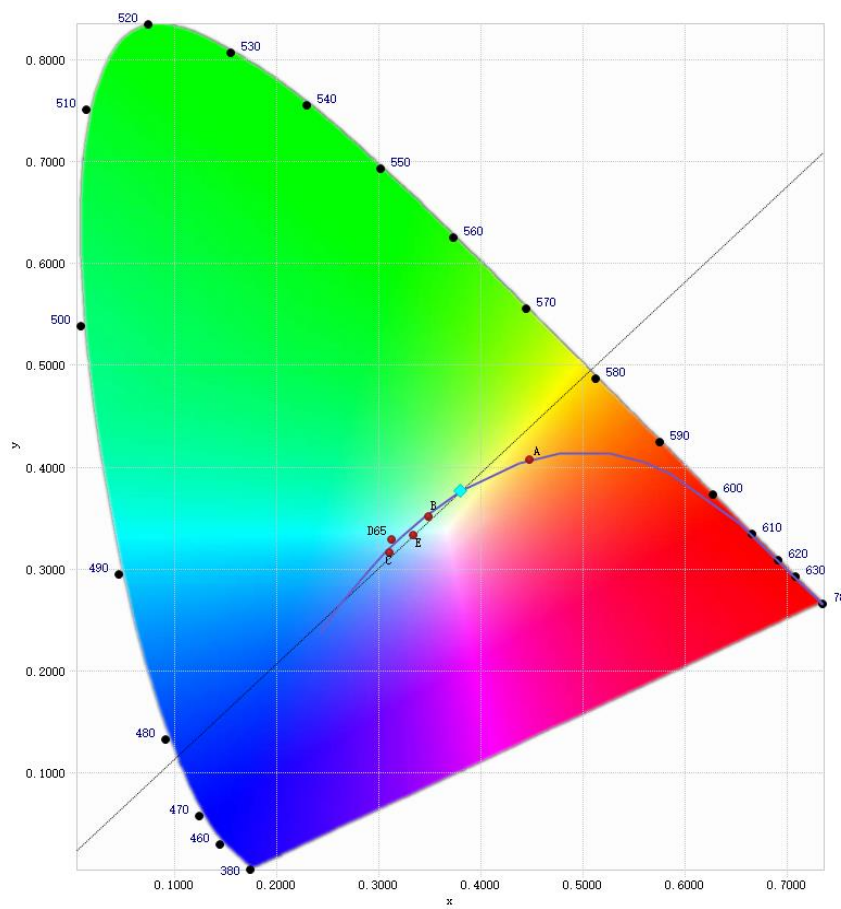
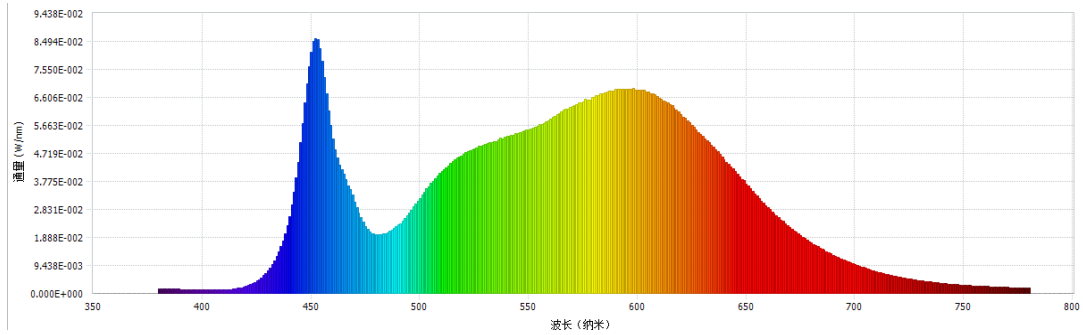
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.02	60	0.283	33.8	0.996
276.96	60	0.126	33.9	0.969

#### Test Result

CCT (K)	CRI	R9	Duv
4016	84	14	0.0002

Rf	Rg	IES Rcs,h1
84	95	-11%

## 4.1 Integrating Sphere Test



## 4.1 Integrating Sphere Test

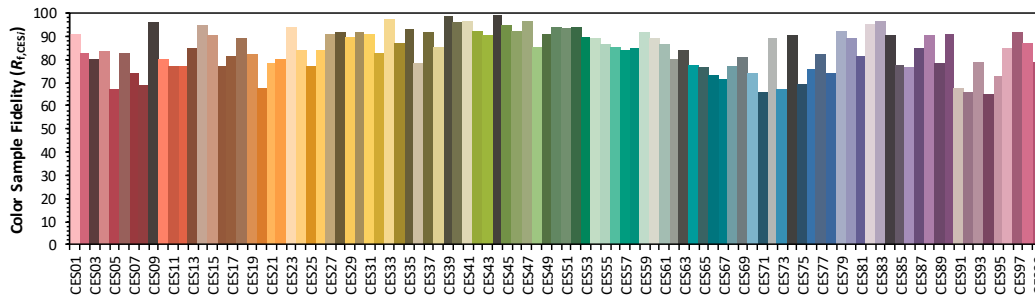
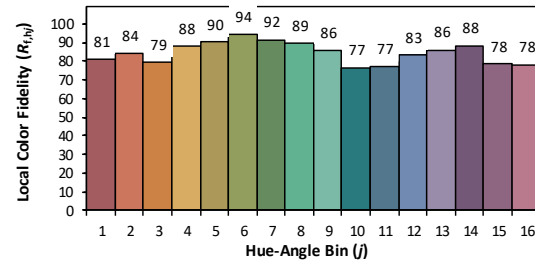
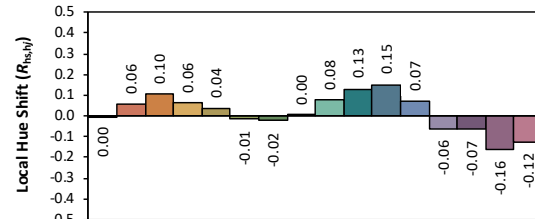
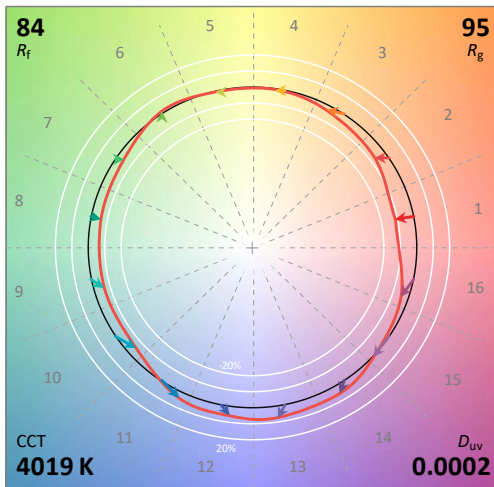
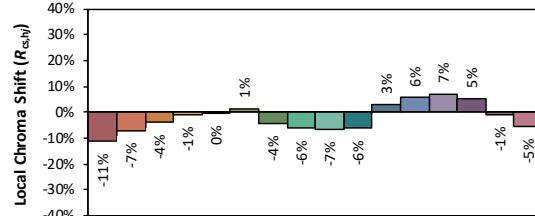
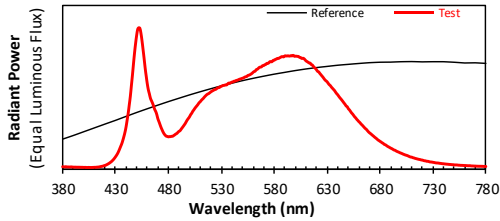
### IES TM-30-18 Color Rendition Report

Source: DLF2207103-7a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/11

Model: TOMO-4/36W/4000K



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

$x$  0.3797  
 $y$  0.3766  
 $u'$  0.2247  
 $v'$  0.5014

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-4/36W/4000K	Sample ID.	G1
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	277.03	60	0.128	34.3	0.968
NON-WROST CASE	120.02	60	0.286	34.2	0.995

#### Test Result

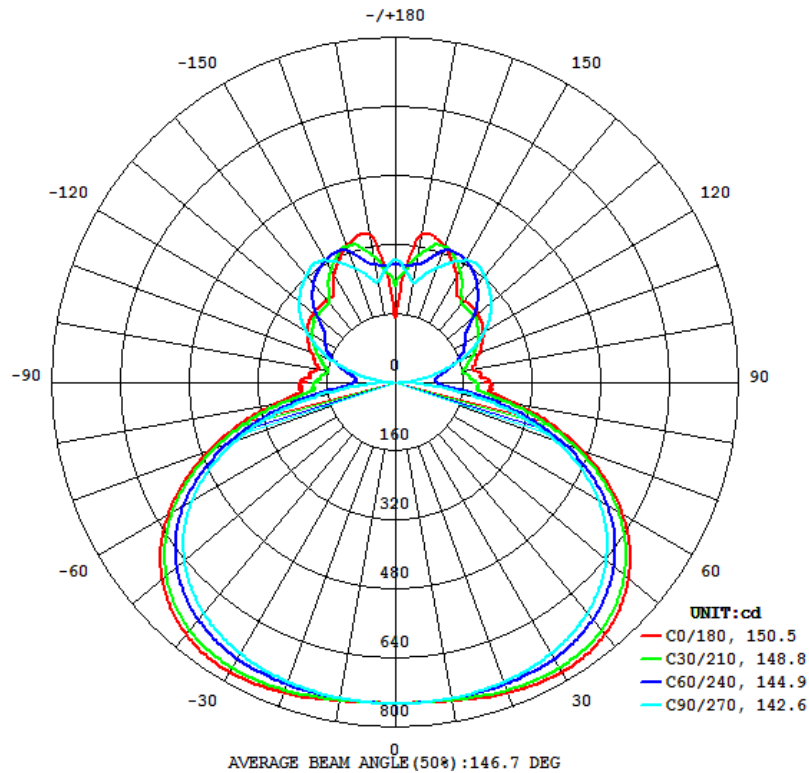
Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
4626	360.0	360.0	150.5	142.6	134.9

Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
47.91%	22.8	4.00	1156

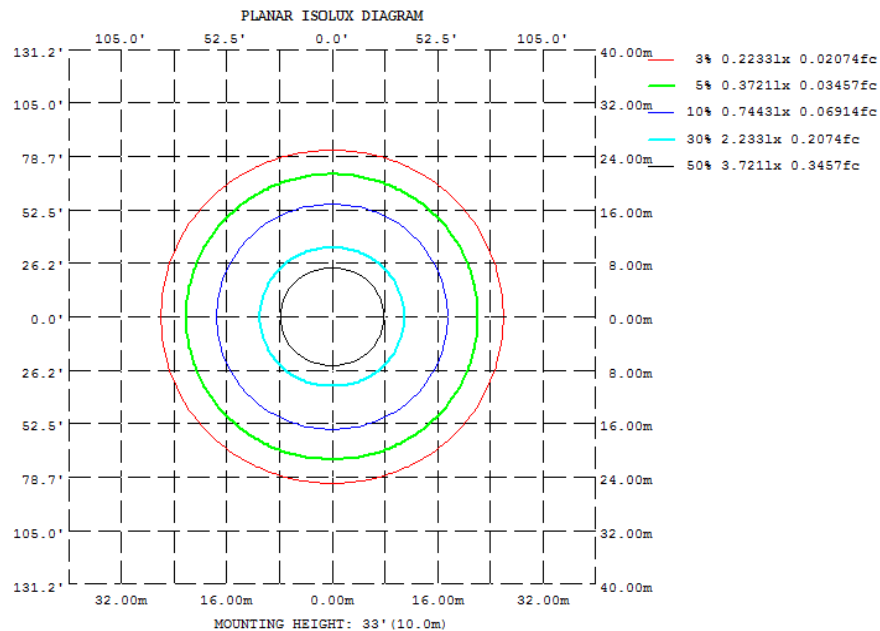


## 4.2 Goniophotometer Test

### Light Distrubtion Curve



### Isolux Plot





## 4.2 Goniophotometer Test

### Zonal Lumen Summary

γ	C0	C45	C90	C135	C180	C225	C270	C315
10	750.9	746.1	743.6	746.1	750.9	746.1	743.6	746.1
20	765.4	752.4	738.7	752.4	765.4	752.4	738.7	752.4
30	775.2	751.8	725.7	751.8	775.2	751.8	725.7	751.8
40	761.3	733.5	696.4	733.5	761.3	733.5	696.4	733.5
50	710.3	683.8	642.0	683.8	710.3	683.8	642.0	683.8
60	611.9	587.1	548.0	587.1	611.9	587.1	548.0	587.1
70	463.4	437.0	397.1	437.0	463.4	437.0	397.1	437.0
80	281.7	244.8	192.3	244.8	281.7	244.8	192.3	244.8
90	216.7	151.3	7.835	151.3	216.7	151.3	7.835	151.3
100	185.9	136.1	66.37	136.1	185.9	136.1	66.37	136.1
110	209.3	175.9	163.3	175.9	209.3	175.9	163.3	175.9
120	238.6	210.7	242.3	210.7	238.6	210.7	242.3	210.7
130	251.4	226.8	293.3	226.8	251.4	226.8	293.3	226.8
140	250.6	267.3	325.5	267.3	250.6	267.3	325.5	267.3
150	289.4	318.2	327.5	318.2	289.4	318.2	327.5	318.2
160	337.9	329.7	283.8	329.7	337.9	329.7	283.8	329.7
170	350.3	288.9	239.7	288.9	350.3	288.9	239.7	288.9
180	156.7	256.5	286.2	256.5	156.7	256.5	286.2	256.5
DEG	LUMINOUS INTENSITY:cd							

### UGR Table - Corrected

#### UGR Table - Corrected

Reflectances

Ceiling Cavity

Walls

Floor Cavity

Room Size  
X=2H Y=2H

3H  
4H  
6H  
8H  
12H

4H 2H  
3H  
4H  
6H  
8H  
12H

8H 4H  
6H  
8H  
12H

12H 4H  
6H  
8H

70	70	50	50	30	70	70	50	50	30
50	30	50	30	30	50	30	50	30	30
20	20	20	20	20	20	20	20	20	20
UGR Viewed Crosswise					UGR Viewed Endwise				
15.9	17.1	16.6	17.9	18.8	16.5	17.7	17.2	18.4	19.4
18.2	19.3	18.9	20.1	21.0	18.9	20.0	19.7	20.8	21.7
19.1	20.1	19.9	20.9	21.9	20.0	21.0	20.7	21.8	22.8
19.8	20.8	20.6	21.5	22.5	21.0	21.9	21.8	22.7	23.7
20.0	20.9	20.8	21.8	22.7	21.4	22.4	22.2	23.2	24.2
20.2	21.0	21.0	21.9	22.9	21.9	22.8	22.7	23.6	24.7
16.8	17.8	17.5	18.6	19.5	17.2	18.2	17.9	19.0	20.0
19.3	20.1	20.0	21.0	21.9	19.9	20.7	20.6	21.6	22.5
20.3	21.1	21.1	21.9	22.9	21.1	21.9	21.9	22.7	23.7
21.1	21.8	21.9	22.7	23.7	22.2	23.0	23.1	23.8	24.8
21.4	22.1	22.2	22.9	24.0	22.8	23.5	23.6	24.3	25.3
21.6	22.2	22.4	23.1	24.1	23.4	24.0	24.3	24.9	25.9
20.8	21.5	21.6	22.3	23.4	21.5	22.2	22.3	23.0	24.0
21.8	22.4	22.7	23.3	24.3	22.8	23.4	23.7	24.3	25.3
22.2	22.7	23.1	23.6	24.6	23.5	24.0	24.4	24.9	26.0
22.5	22.9	23.3	23.8	24.9	24.4	24.8	25.2	25.7	26.8
20.9	21.5	21.7	22.4	23.4	21.5	22.1	22.4	23.0	24.0
22.0	22.5	22.9	23.4	24.4	22.9	23.4	23.8	24.3	25.4
22.5	22.9	23.3	23.8	24.9	23.7	24.2	24.6	25.0	26.1

Maximum UGR = 26.8

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	71.15	0 - 10	71.15	1.54%
10-20	212.51	0 - 20	283.66	6.13%
20-30	348.25	0 - 30	631.91	13.66%
30-40	466.62	0 - 40	1098.53	23.75%
40-50	548.14	0 - 50	1646.67	35.60%
50-60	569.64	0 - 60	2216.31	47.91%
60-70	508.04	0 - 70	2724.35	58.90%
70-80	358.04	0 - 80	3082.39	66.64%
80-90	183.22	0 - 90	3265.61	70.60%
90-100	141.41	0 - 100	3407.02	73.66%
100-110	160.13	0 - 110	3567.15	77.12%
110-120	195.72	0 - 120	3762.87	81.35%
120-130	211.56	0 - 130	3974.43	85.92%
130-140	204.10	0 - 140	4178.53	90.34%
140-150	184.53	0 - 150	4363.06	94.32%
150-160	148.32	0 - 160	4511.38	97.53%
160-170	88.18	0 - 170	4599.56	99.44%
170-180	26.02	0 - 180	4625.58	100.00%

## 4.2 Goniophotometer Test

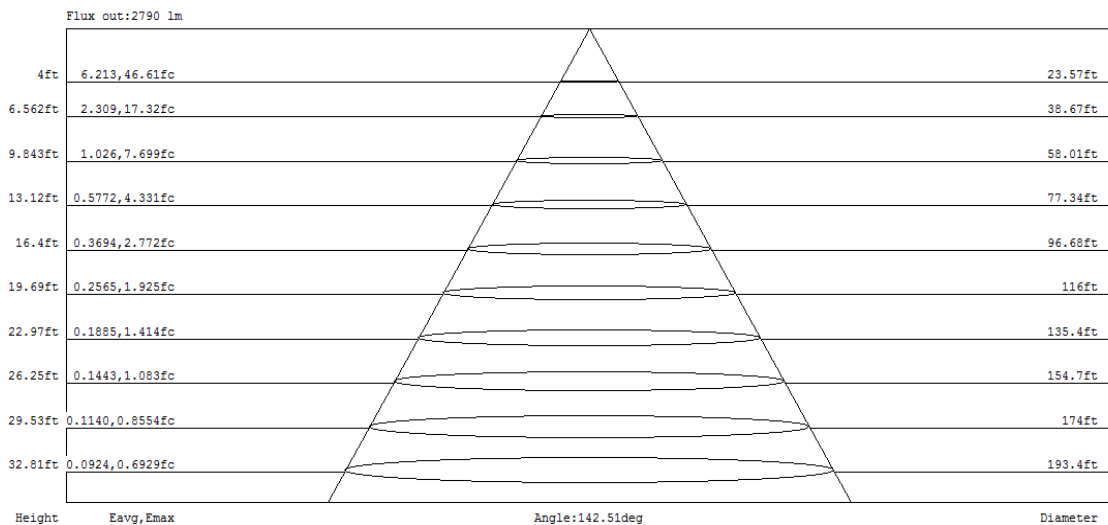
### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

#### 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	76	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	36	33	30
5	68	54	45	38	63	52	43	37	46	39	34	41	35	31	36	32	28	25
6	62	49	39	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-4/36W/4000K	Sample ID.	G1
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	0.283	33.8	0.996	6.57%
276.96	60	0.126	33.9	0.969	11.38%

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