

# Photometric Test Report

## Relevant Standards

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

## Prepared For

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## Project Number

**DLF2207110**

## Report Number

**DLF2207110-7a**

## Test Date

**2022/7/30**

## Issue Date

**2022/7/31**

## 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		2398
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1199
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	133.2
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		18.0
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	6.07%
		20.00%	277V	8.46%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.998
		0.9	277V	0.975
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3985±275	3981
		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		13
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%		48.88%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		23.5
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		0.067
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.147
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		18.0
(Goniophotometer - Section 4.2)		Non-Wrost Case		17.6

## 2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/30	TOMO-2/18W/4000K	G1
2	Goniophotometer Test	2022/7/30	TOMO-2/18W/4000K	G1
3	THD and PF Test	2022/7/30	TOMO-2/18W/4000K	G1

### Remark(If any)

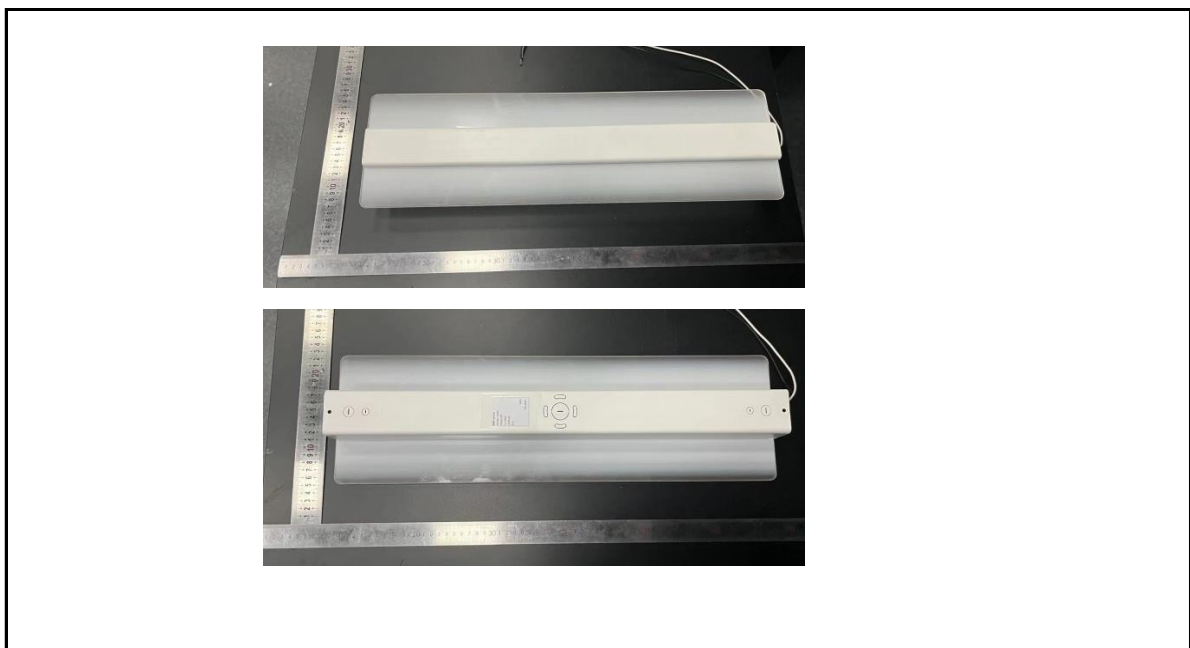
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## 3.0 Production Description

**Luminaire Description:** TOMO-2/18W/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-2/18W/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
120.00	60	0.145	17.4	0.998
277.00	60	0.066	17.9	0.975

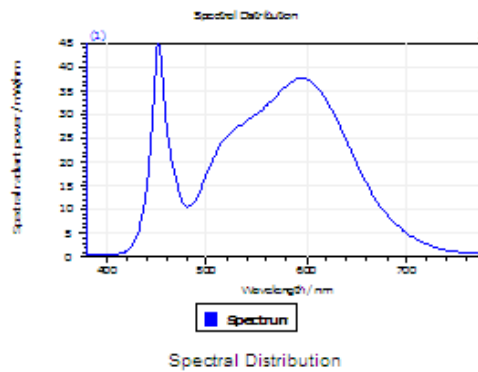
#### Test Result

CCT (K)	CRI	R9	Duv
3981	84	13	0.00074

Rf	Rg	IES Rcs,h1
84	95	-11%

## 4.1 Integrating Sphere Test

### Results



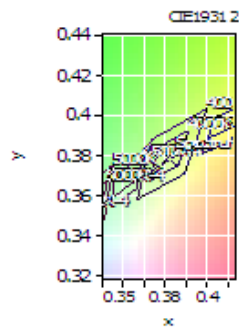
#### Spectral values

DominantWavelength 578.75 nm  
Purity 0.284  
PeakWavelength 452.00 nm  
Radiant Power 6.599 W  
Width50%:

#### Color Coordinates

Correlated Color Temperat 3981 K  
x: 0.3818 u: 0.2250 u': 0.2250  
y: 0.3792 v: 0.3352 v': 0.5029

CRI01	82.3	CRI09	12.6
CRI02	89.6	CRI10	74.8
CRI03	94.7	CRI11	81.8
CRI04	82.8	CRI12	59.6
CRI05	82.0	CRI13	84.1
CRI06	85.1	CRI14	97.2
CRI07	86.9	CRI15	76.2
CRI08	66.3	CRI16	73.7
ResultsCRI	83.7		



PlandDistance 7.4E-004

## 4.1 Integrating Sphere Test

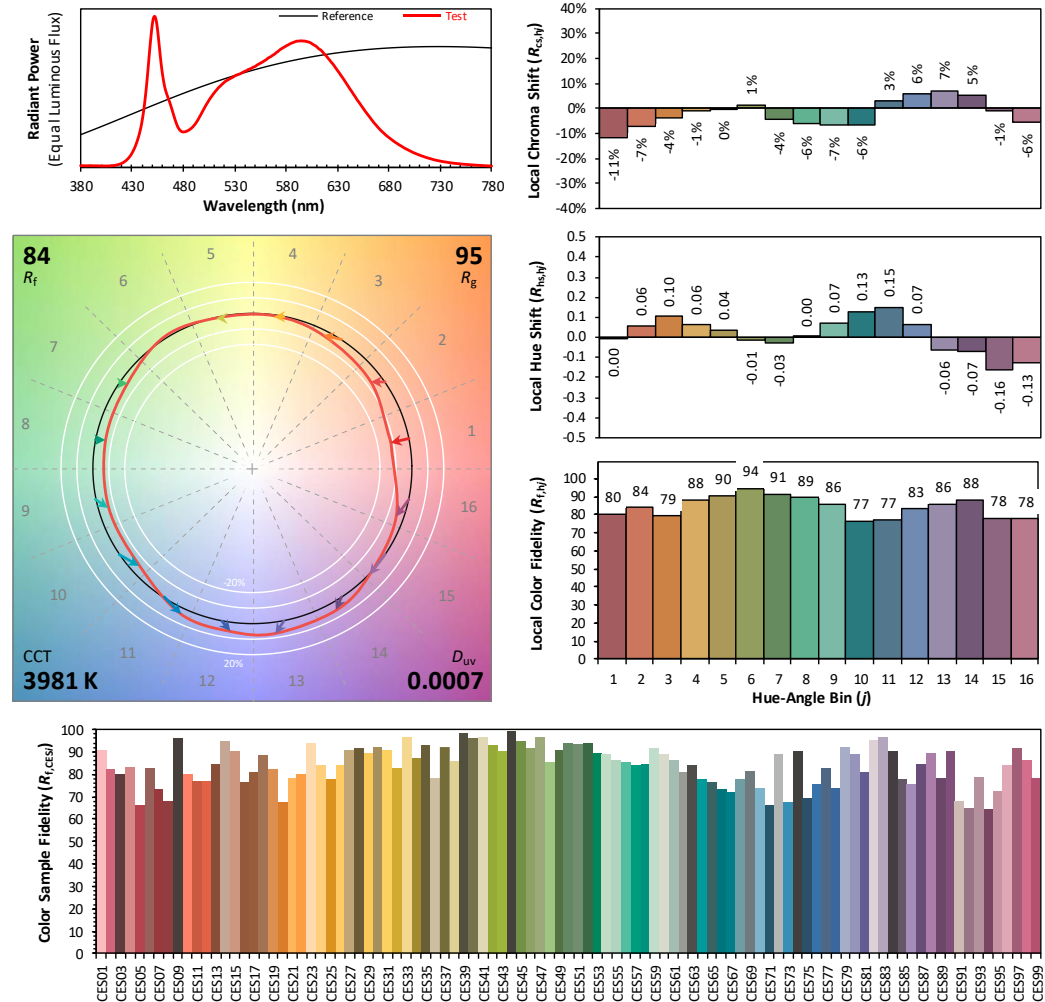
### IES TM-30-18 Color Rendition Report

Source: DLF2207110-7a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/30

Model: TOMO-2/18W/4000K



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

$x$  0.3818  
 $y$  0.3792  
 $u'$  0.2250  
 $v'$  0.5029

CIE 13.3-1995  
(CRI)

$R_a$  84  
 $R_9$  11

Colors are for visual orientation purposes only. Created with the ANSI/IES TM-30-18 Calculator Version 2.0

## 4.0 LM-79 Measurement and Test Results

### 4.2 Goniophotometer Test

Model No.	TOMO-2/18W/4000K	Sample ID.	G1
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	277.06	60	0.067	18.0	0.973
NON-WROST CASE	120.06	60	0.147	17.6	0.997

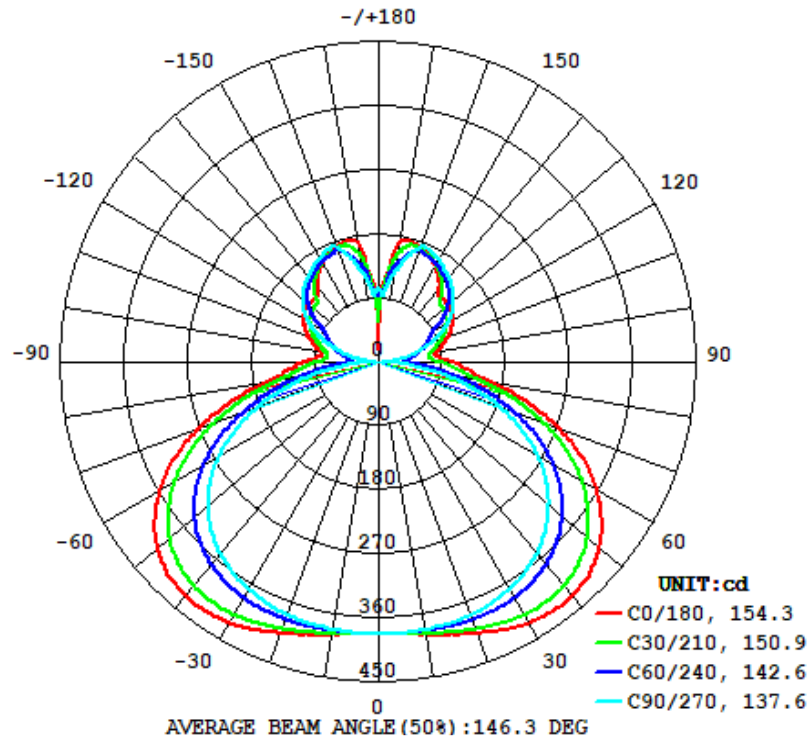
#### Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
2398	358.1	360.0	154.3	137.6	133.2

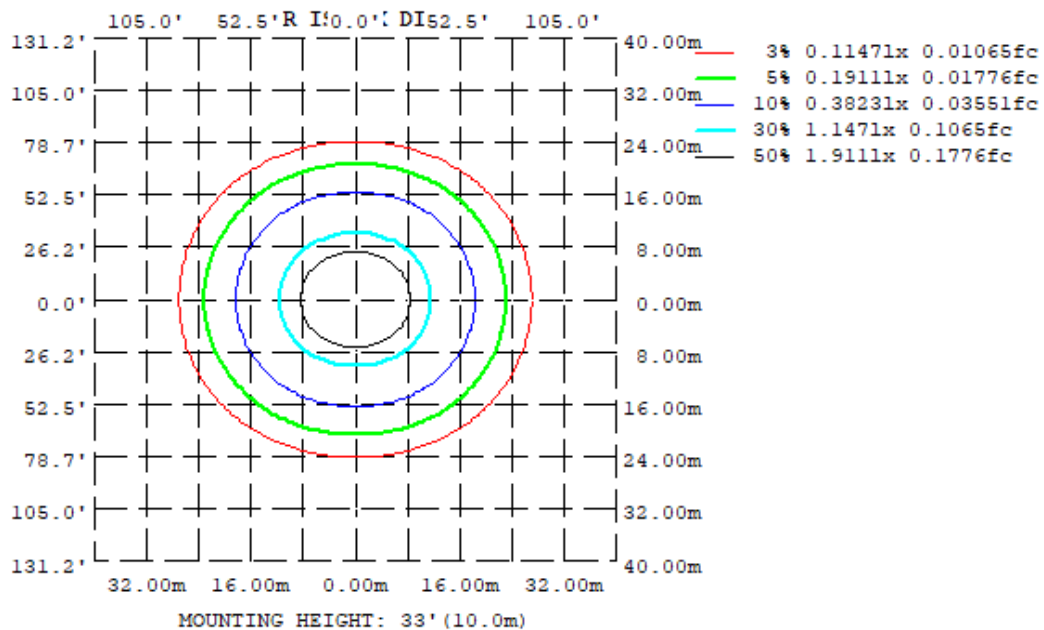
Zonal Lumen Requirement ( $0^{\circ}$ - $60^{\circ}$ )	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
48.88%	23.5	2.00	1199

## 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	388.8	385.5	381.6	385.5	388.8	385.5	381.6	385.5
20	405.8	392.3	378.6	392.3	405.8	392.3	378.6	392.3
30	423.3	396.5	369.4	396.5	423.3	396.5	369.4	396.5
40	427.6	389.8	349.9	389.8	427.6	389.8	349.9	389.8
50	408.1	363.1	315.5	363.1	408.1	363.1	315.5	363.1
60	356.8	309.0	259.7	309.0	356.8	309.0	259.7	309.0
70	270.3	226.0	180.7	226.0	270.3	226.0	180.7	226.0
80	156.8	127.6	84.40	127.6	156.8	127.6	84.40	127.6
90	106.2	66.78	6.277	66.78	106.2	66.78	6.277	66.78
100	82.34	63.81	30.96	63.81	82.34	63.81	30.96	63.81
110	105.4	83.85	76.40	83.85	105.4	83.85	76.40	83.85
120	122.6	101.7	115.7	101.7	122.6	101.7	115.7	101.7
130	128.9	115.1	140.3	115.1	128.9	115.1	140.3	115.1
140	134.6	147.3	156.8	147.3	134.6	147.3	156.8	147.3
150	161.2	163.1	169.3	163.1	161.2	163.1	169.3	163.1
160	174.2	171.5	171.7	171.5	174.2	171.5	171.7	171.5
170	171.8	143.2	125.7	143.2	171.8	143.2	125.7	143.2
180	18.12	81.82	103.8	81.82	18.12	81.82	103.8	81.82
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										
X=2H Y=2H	UGR Viewed Crosswise					UGR Viewed Endwise				
3H	15.6	16.8	16.3	17.6	18.5	17.2	18.4	18.0	19.2	20.1
4H	17.7	18.8	18.5	19.6	20.6	19.8	20.9	20.5	21.6	22.6
6H	18.6	19.6	19.3	20.4	21.3	20.8	21.9	21.6	22.7	23.6
8H	19.2	20.2	19.9	20.9	21.9	21.8	22.7	22.5	23.5	24.5
12H	19.4	20.3	20.2	21.1	22.1	22.2	23.1	23.0	24.0	24.9
	19.5	20.4	20.3	21.2	22.2	22.8	23.7	23.6	24.5	25.5
4H	2H	16.6	17.7	17.4	18.4	19.4	17.8	18.9	18.6	19.6
	3H	18.9	19.8	19.7	20.6	21.6	20.6	21.5	21.3	22.3
	4H	19.9	20.7	20.6	21.5	22.5	21.8	22.6	22.6	23.4
	6H	20.6	21.3	21.4	22.2	23.2	23.0	23.7	23.8	24.5
	8H	20.9	21.5	21.7	22.4	23.4	23.5	24.2	24.3	25.0
	12H	21.0	21.6	21.9	22.5	23.5	24.2	24.8	25.0	25.7
8H	4H	20.5	21.2	21.3	22.0	23.0	22.1	22.8	22.9	23.6
	6H	21.4	22.0	22.3	22.9	23.9	23.5	24.0	24.3	24.9
	8H	21.8	22.3	22.6	23.2	24.2	24.2	24.7	25.0	25.6
	12H	22.0	22.5	22.9	23.3	24.4	25.1	25.5	25.9	26.4
12H	4H	20.6	21.2	21.4	22.1	23.1	22.2	22.8	23.0	23.6
	6H	21.6	22.2	22.5	23.0	24.1	23.6	24.1	24.4	24.9
	8H	22.1	22.5	22.9	23.4	24.5	24.3	24.8	25.2	25.7

Maximum UGR = 27.5

## 4.2 Goniophotometer Test

### ZONAL LUMEN SUMMARY

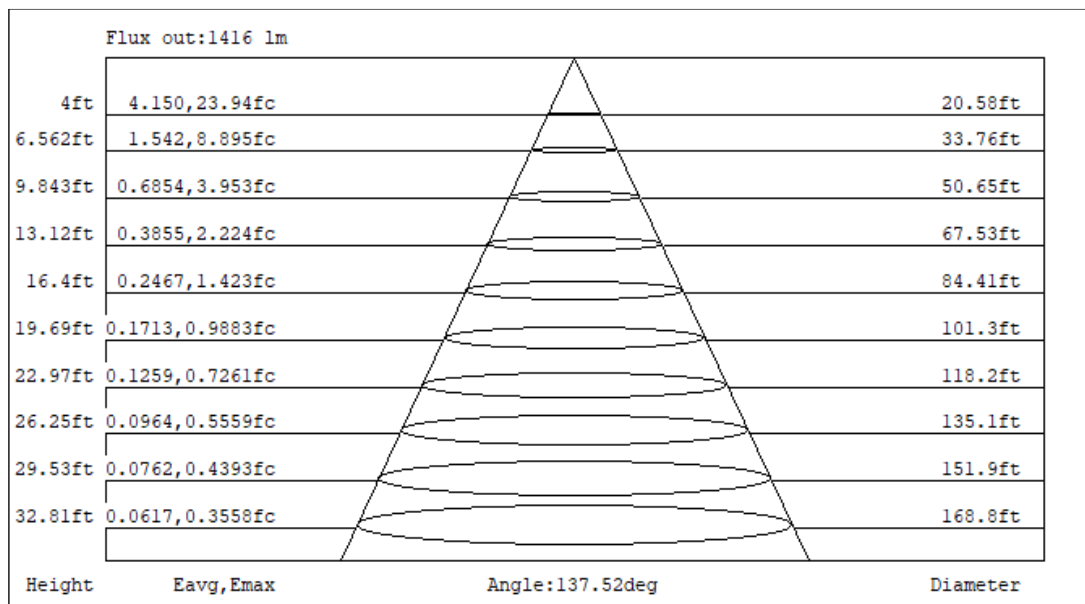
	Zonal (lm)		Total (lm)	Percent
0-10	36.63	0 - 10	36.63	1.53%
10-20	110.28	0 - 20	146.91	6.13%
20-30	182.79	0 - 30	329.70	13.75%
30-40	247.51	0 - 40	577.21	24.07%
40-50	292.36	0 - 50	869.57	36.26%
50-60	302.67	0 - 60	1172.24	48.88%
60-70	267.04	0 - 70	1439.28	60.01%
70-80	184.79	0 - 80	1624.07	67.72%
80-90	95.27	0 - 90	1719.34	71.69%
90-100	62.39	0 - 100	1781.73	74.29%
100-110	75.77	0 - 110	1857.50	77.45%
110-120	96.92	0 - 120	1954.42	81.49%
120-130	106.55	0 - 130	2060.97	85.94%
130-140	104.98	0 - 140	2165.95	90.31%
140-150	97.16	0 - 150	2263.11	94.37%
150-160	77.38	0 - 160	2340.49	97.59%
160-170	46.23	0 - 170	2386.72	99.52%
170-180	11.53	0 - 180	2398.25	100.00%

## 4.2 Goniophotometer Test

### COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	85	85	85	76	76	76	72
1	101	95	90	86	95	90	86	82	81	77	74	72	69	67	64	62	60	56
2	90	82	74	68	85	77	71	65	69	64	59	62	57	54	55	51	48	45
3	82	71	62	55	77	67	59	53	60	54	48	53	48	44	47	43	40	36
4	74	62	53	46	70	59	50	44	52	46	40	47	41	37	41	37	33	30
5	68	55	45	39	64	52	43	37	46	39	34	41	36	31	37	32	28	25
6	62	49	40	33	58	46	38	32	42	34	29	37	31	27	33	28	24	22
7	57	44	35	29	54	42	33	28	37	30	25	34	28	23	30	25	21	19
8	53	40	31	25	50	38	30	24	34	27	22	31	25	21	27	22	19	16
9	49	36	28	22	47	34	27	21	31	24	20	28	22	18	25	20	17	15
10	46	33	25	20	44	31	24	19	29	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-2/18W/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
120.00	60	0.145	17.4	0.998	6.07%
277.00	60	0.066	17.9	0.975	8.46%

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