

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

DLF2207110

Report Number

DLF2207110-11a

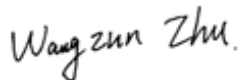
Test Date

2022/7/30

Issue Date

2022/7/31

Prepared By



Wangzun Zhu

Approved By



Kevin Jia

The results contained in this report pertain only to the tested sample.

This report shall not be reproduced, except in full, without written approval of Deliver Co., Ltd.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP.

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		3222
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1611
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	133.7
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		24.1
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	7.42%
		20.00%	277V	9.75%
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	3972
		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%		-12%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		48.86%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		24.7
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		0.202
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.086
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		24.1
(Goniophotometer - Section 4.2)		Non-Wrost Case		23.7

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/30	TOMO-2/24W/4000K	K1
2	Goniophotometer Test	2022/7/30	TOMO-2/24W/4000K	K1
3	THD and PF Test	2022/7/30	TOMO-2/24W/4000K	K1

Remark(If any)

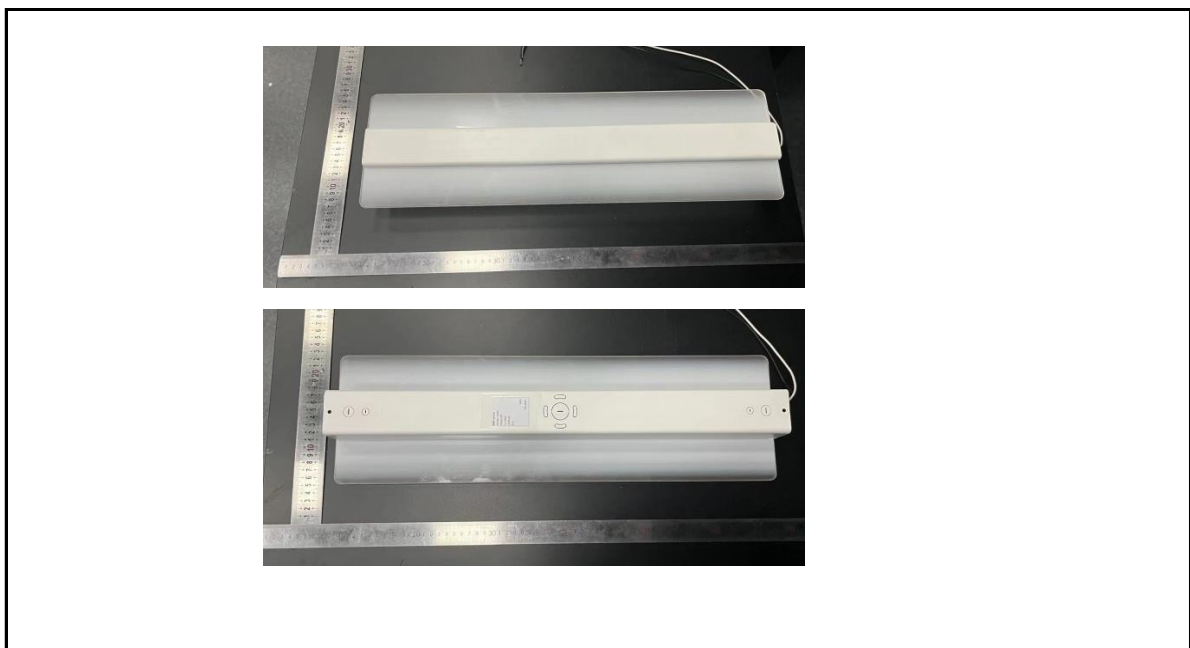
- 1、 This report shall not be used by the client to claim product endorsement by NVLAP, NIST or any agency of the US government.
- 2、 The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without 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: TOMO-2/24W/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-2/24W/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 ± 0.2 percent under load.

The sample was measured using 4π 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
120.01	60	0.200	23.9	0.996
277.00	60	0.086	23.5	0.989

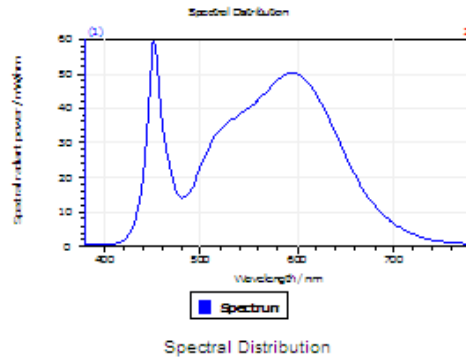
Test Result

CCT (K)	CRI	R9	Duv
3972	84	13	0.00075

Rf	Rg	IES Rcs,h1
84	95	-12%

4.1 Integrating Sphere Test

Results

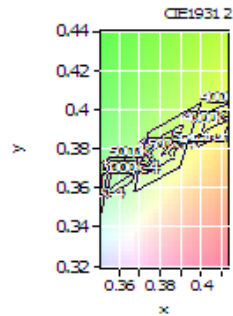


Spectral values

DominantWavelength 578.78 nm
Purity 0.286
PeakWavelength 451.86 nm
Radiant Power 8.798 W
Width50%:

Color Coordinates

Correlated Color Temperat 3972 K
x: 0.3822 u: 0.2252 u': 0.2252
y: 0.3795 v: 0.3354 v': 0.5030
CRI01 82.3 CRI09 12.6
CRI02 89.4 CRI10 74.5
CRI03 94.6 CRI11 82.0
CRI04 83.0 CRI12 59.5
CRI05 82.0 CRI13 84.1
CRI06 85.0 CRI14 97.1
CRI07 87.1 CRI15 76.3
CRI08 66.4 CRI16 73.8
ResultsCRI 83.7



PlanckDistance 7.5E-004

4.1 Integrating Sphere Test

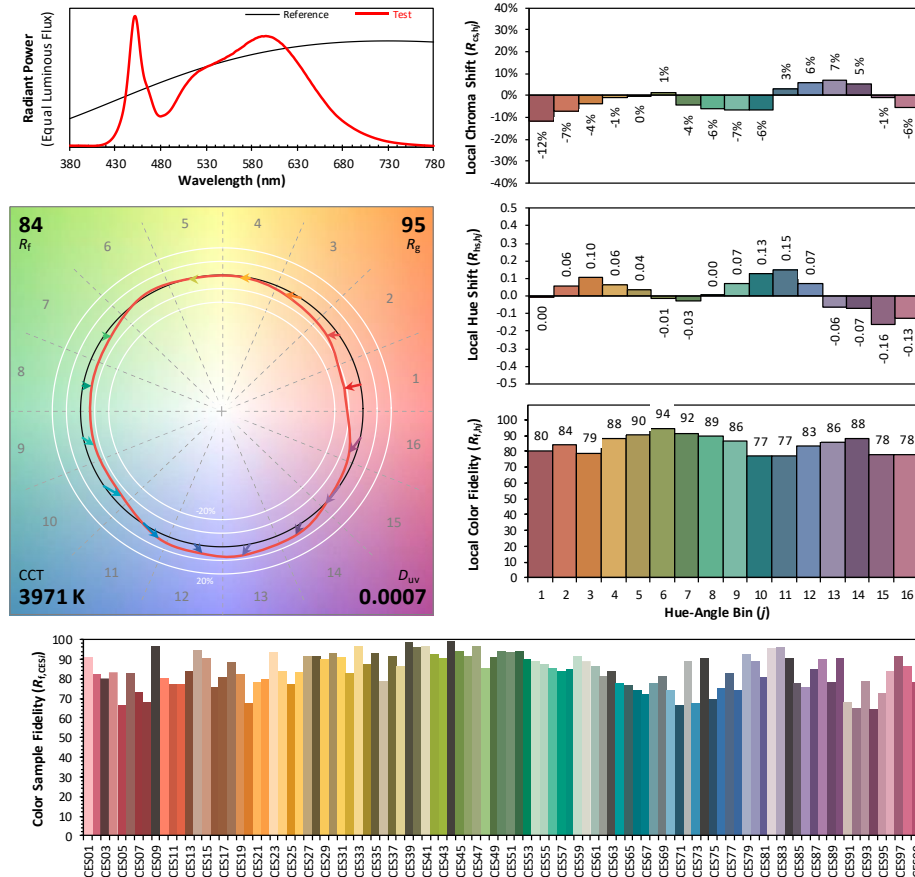
IES TM-30-18 Color Rendition Report

Source: DLF2207110-11a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/30

Model: TOMO-2/24W/4000K



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

x 0.3822
 y 0.3795
 u' 0.2252
 v' 0.5030

CIE 13.3-1995
(CRI)

R_a 83
 R_g 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-2/24W/4000K	Sample ID.	K1
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° C ± 1° 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 ±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° vertical intervals and 10° horizontal intervals.

Test Conditions

Condition	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
WROST CASE	120.03	60	0.202	24.1	0.995
NON-WROST CASE	277.03	60	0.086	23.7	0.991

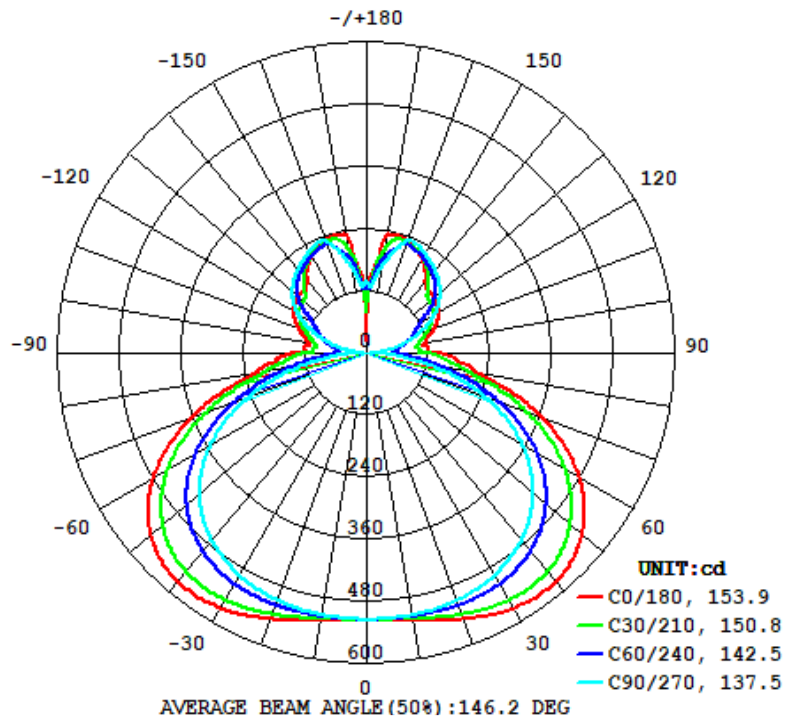
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
3222	358.2	360.0	153.9	137.5	133.7

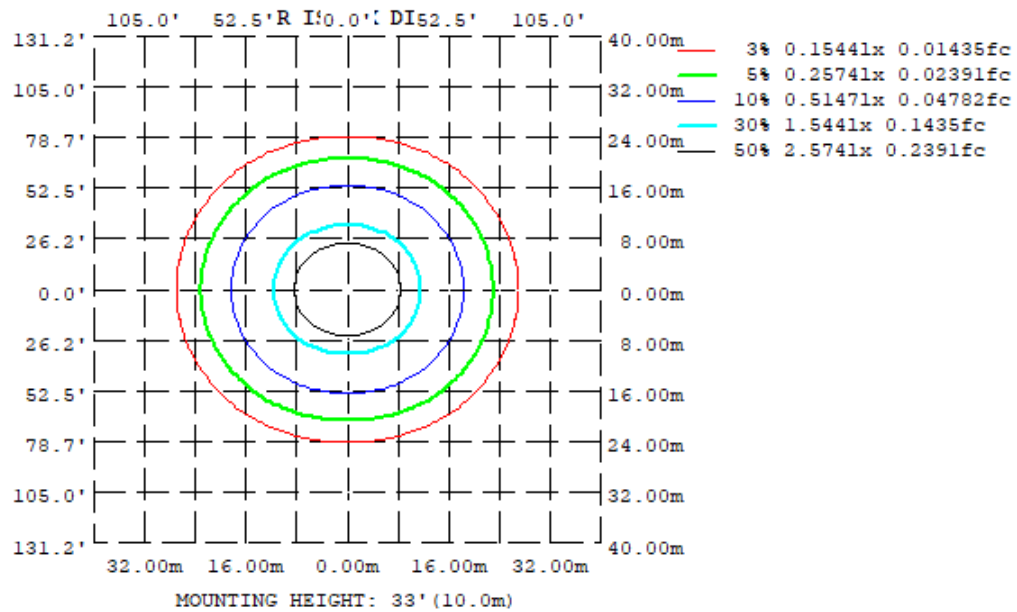
Zonal Lumen Requirement (0°-60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
48.86%	24.7	2.00	1611

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	524.0	518.7	513.5	518.7	524.0	518.7	513.5	518.7
20	546.1	527.6	508.7	527.6	546.1	527.6	508.7	527.6
30	569.2	533.2	495.9	533.2	569.2	533.2	495.9	533.2
40	574.4	523.6	470.1	523.6	574.4	523.6	470.1	523.6
50	547.0	487.1	423.3	487.1	547.0	487.1	423.3	487.1
60	477.5	413.7	348.9	413.7	477.5	413.7	348.9	413.7
70	360.8	302.8	242.4	302.8	360.8	302.8	242.4	302.8
80	217.9	174.9	113.2	174.9	217.9	174.9	113.2	174.9
90	135.7	87.07	8.460	87.07	135.7	87.07	8.460	87.07
100	114.3	86.31	41.48	86.31	114.3	86.31	41.48	86.31
110	141.3	112.4	102.6	112.4	141.3	112.4	102.6	112.4
120	163.7	136.2	155.5	136.2	163.7	136.2	155.5	136.2
130	172.9	157.0	188.9	157.0	172.9	157.0	188.9	157.0
140	180.9	197.4	210.1	197.4	180.9	197.4	210.1	197.4
150	216.6	219.0	226.6	219.0	216.6	219.0	226.6	219.0
160	233.8	229.9	230.0	229.9	233.8	229.9	230.0	229.9
170	231.6	192.0	168.2	192.0	231.6	192.0	168.2	192.0
180	24.54	109.5	139.7	109.5	24.54	109.5	139.7	109.5
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					
	16.7	17.9	17.4	18.7	19.6	18.3	19.5	19.0	20.3	21.2	
3H	18.8	19.9	19.6	20.7	21.6	20.8	21.9	21.6	22.7	23.6	
4H	19.7	20.7	20.4	21.5	22.4	21.9	22.9	22.7	23.7	24.7	
6H	20.3	21.2	21.0	22.0	23.0	22.9	23.8	23.6	24.6	25.6	
8H	20.5	21.4	21.3	22.2	23.2	23.4	24.3	24.2	25.1	26.1	
12H	20.6	21.5	21.4	22.3	23.3	24.0	24.8	24.7	25.6	26.6	
4H 2H	17.7	18.7	18.5	19.5	20.5	18.9	19.9	19.7	20.7	21.7	
3H	20.0	20.9	20.8	21.7	22.7	21.6	22.5	22.4	23.4	24.3	
4H	20.9	21.8	21.7	22.6	23.6	22.9	23.7	23.7	24.5	25.5	
6H	21.7	22.4	22.5	23.3	24.3	24.1	24.8	24.9	25.6	26.6	
8H	22.0	22.6	22.8	23.5	24.5	24.7	25.4	25.5	26.2	27.2	
12H	22.1	22.7	23.0	23.6	24.6	25.4	26.0	26.2	26.9	27.9	
8H 4H	21.6	22.2	22.4	23.1	24.1	23.2	23.9	24.0	24.7	25.7	
6H	22.5	23.1	23.4	24.0	25.0	24.6	25.2	25.4	26.0	27.0	
8H	22.9	23.4	23.7	24.3	25.3	25.4	25.9	26.3	26.8	27.8	
12H	23.1	23.6	24.0	24.4	25.5	26.3	26.8	27.2	27.6	28.7	
12H 4H	21.7	22.3	22.5	23.2	24.2	23.2	23.8	24.1	24.7	25.7	
6H	22.8	23.3	23.6	24.1	25.2	24.7	25.2	25.5	26.0	27.1	
8H	23.2	23.7	24.1	24.5	25.6	25.6	26.0	26.4	26.9	28.0	

Maximum UGR = 28.7

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

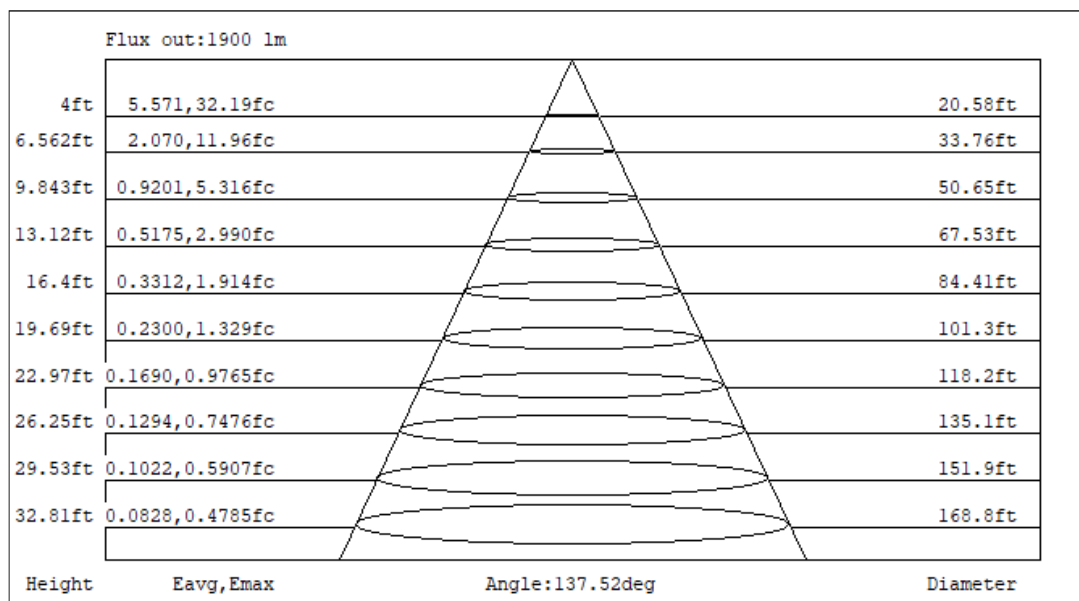
	Zonal (lm)		Total (lm)	Percent
0-10	49.32	0 - 10	49.32	1.53%
10-20	148.40	0 - 20	197.72	6.14%
20-30	245.83	0 - 30	443.55	13.76%
30-40	332.55	0 - 40	776.10	24.08%
40-50	392.40	0 - 50	1168.50	36.26%
50-60	405.82	0 - 60	1574.32	48.86%
60-70	357.67	0 - 70	1931.99	59.96%
70-80	247.97	0 - 80	2179.96	67.65%
80-90	131.87	0 - 90	2311.83	71.74%
90-100	83.60	0 - 100	2395.43	74.34%
100-110	101.89	0 - 110	2497.32	77.50%
110-120	129.74	0 - 120	2627.06	81.53%
120-130	142.81	0 - 130	2769.87	85.96%
130-140	140.97	0 - 140	2910.84	90.33%
140-150	130.23	0 - 150	3041.07	94.37%
150-160	103.80	0 - 160	3144.87	97.59%
160-170	62.04	0 - 170	3206.91	99.52%
170-180	15.47	0 - 180	3222.38	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-2/24W/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
120.01	60	0.200	23.9	0.996	7.42%
277.00	60	0.086	23.5	0.989	9.75%

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*****