

Photometric Test Report

Relevant Standards

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

Prepared For

RAB Lighting Inc.

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DLF2207103

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2022/7/11

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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		5929
Lumen/ft (Goniophotometer - Section 4.2)	IES LM-79-2008	≥375		1482
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 115	Premium 130	122.0
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		48.6
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	6.86%
		20.00%	277V	11.68%
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	3045±175	2912
		4 step	3045±100	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		82
Minimum R9 (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥0		3
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%		-12%
Zonal Lumen Requirement (0°-60°) (Goniophotometer - Section 4.2)	IES LM-79-2008	≥40%		47.99%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		23.7
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		0.406
(Goniophotometer - Section 4.2)		Non-Wrost Case		0.176
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Wrost Case		48.6
(Goniophotometer - Section 4.2)		Non-Wrost Case		48.3

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/7/11	TOMO-4/48W/3000K	I1
2	Goniophotometer Test	2022/7/11	TOMO-4/48W/3000K	I1
3	THD and PF Test	2022/7/11	TOMO-4/48W/3000K	I1

Remark(If any)

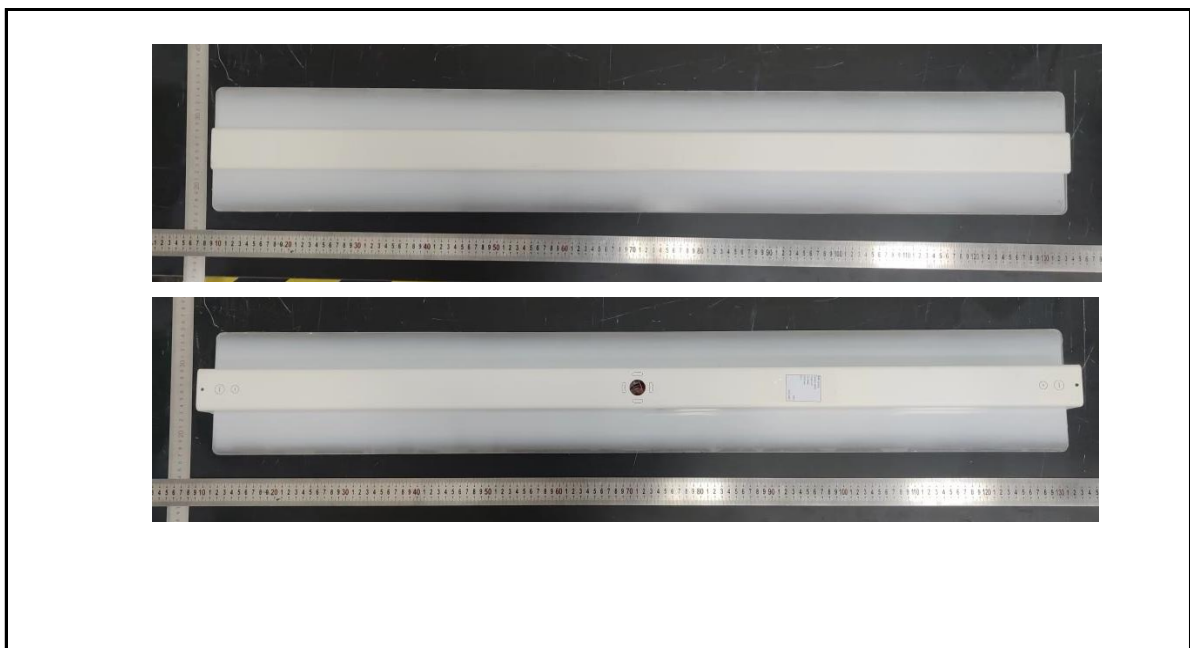
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3.0 Production Description

Luminaire Description: TOMO-4/48W/3000K

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/3000K	Sample ID.	I1
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

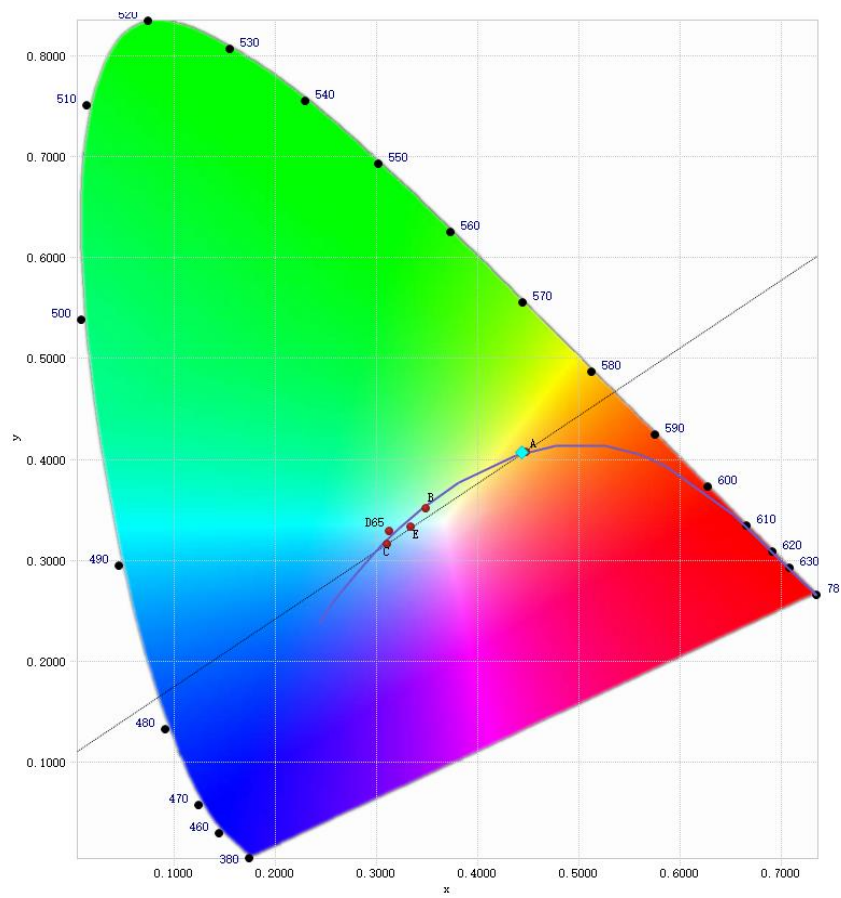
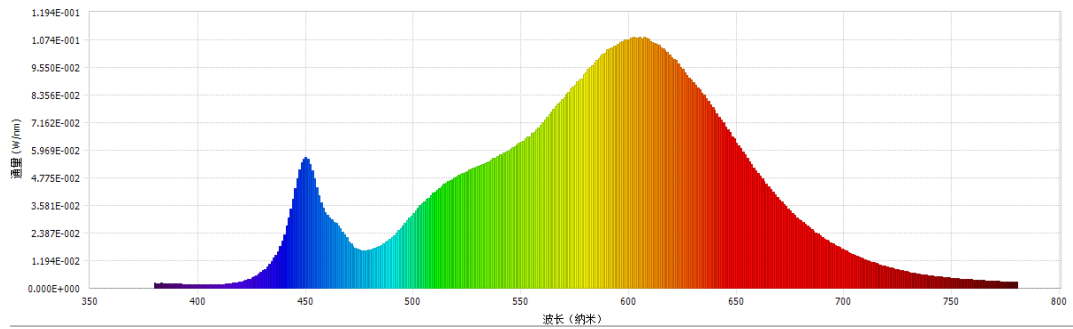
Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor
120.06	60	0.408	48.8	0.996
277.03	60	0.176	48.1	0.989

Test Result

CCT (K)	CRI	R9	Duv
2912	82	3	0.0003

Rf	Rg	IES Rcs,h1
84	96	-12%

4.1 Integrating Sphere Test



4.1 Integrating Sphere Test

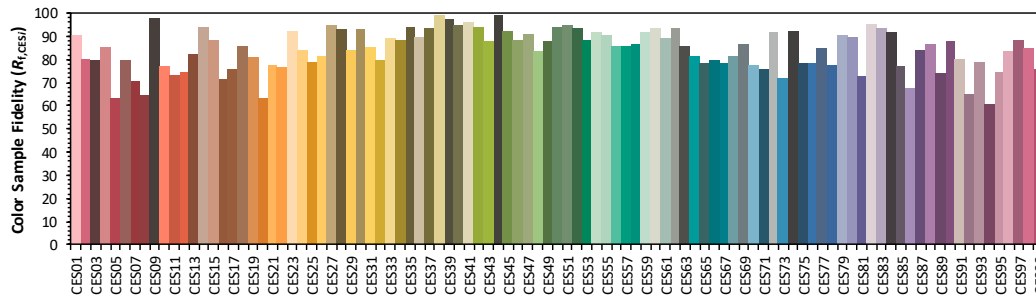
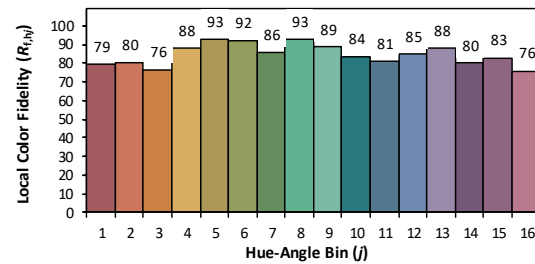
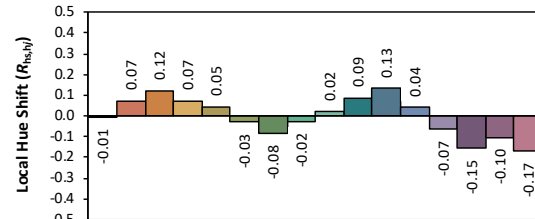
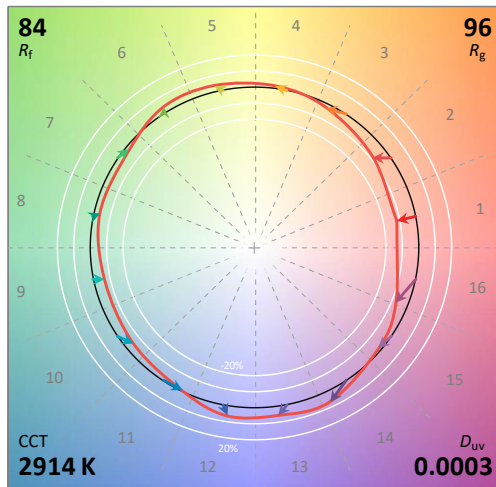
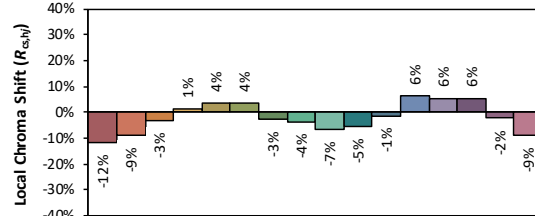
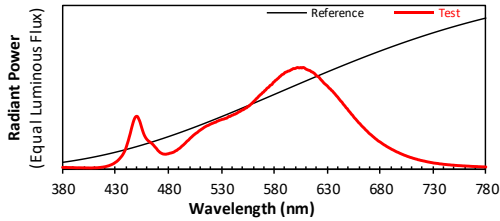
IES TM-30-18 Color Rendition Report

Source: DLF2207103-9a

Manufacturer: RAB Lighting Inc.

Date: 2022/7/11

Model: TOMO-4/48W/3000K



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

x 0.4436
 y 0.4070
 u' 0.2536
 v' 0.5235

CIE 13.3-1995
(CRI)

R_a 82
 R_g 7

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	TOMO-4/48W/3000K	Sample ID.	I1
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 ± 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	120.04	60	0.406	48.6	0.996
NON-WROST CASE	277.02	60	0.176	48.3	0.989

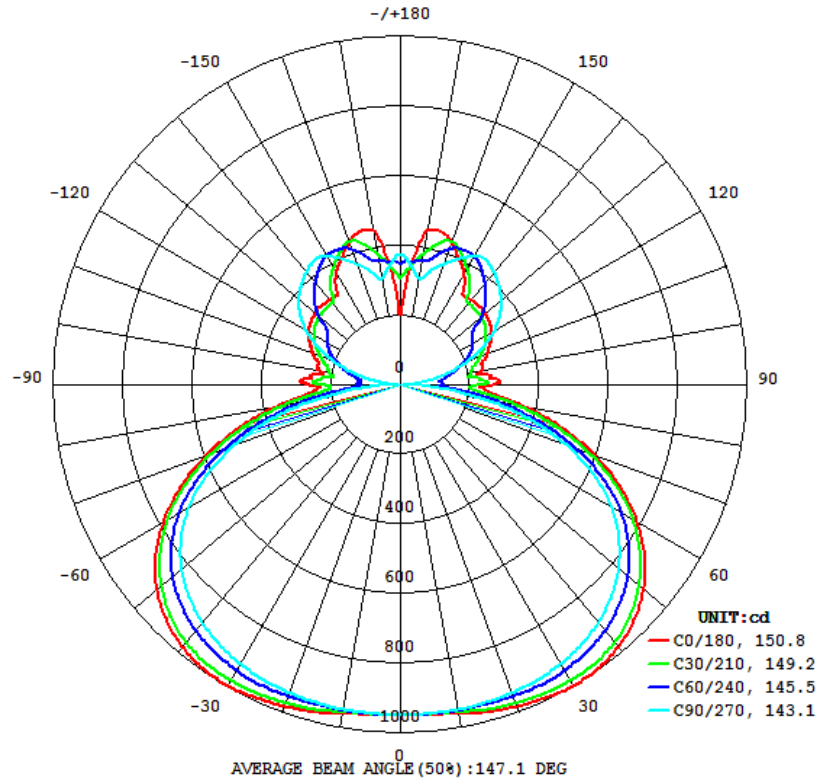
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
5929	360.0	360.0	150.8	143.1	122.0

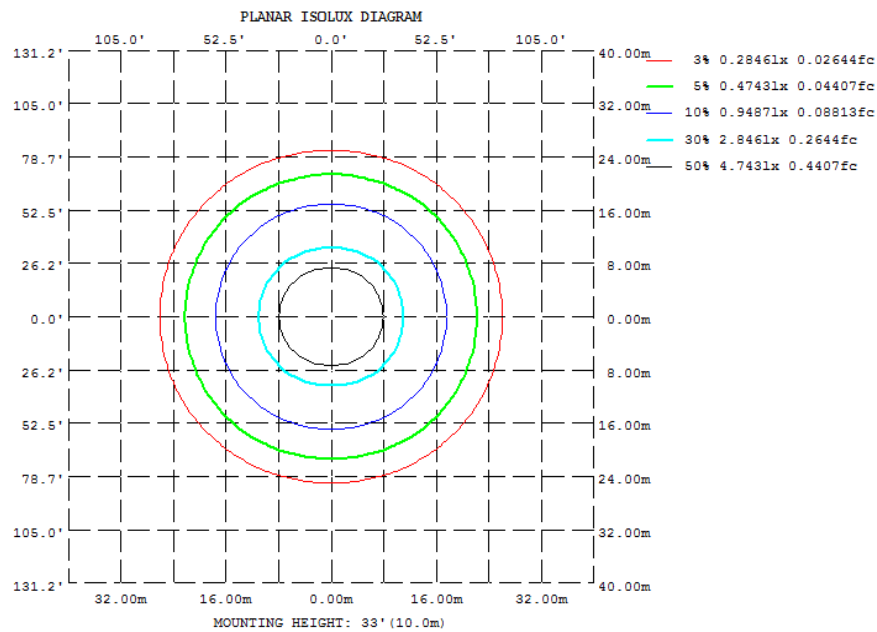
Zonal Lumen Requirement (0° - 60°)	UGR (X=4H, Y=8H, 70/50/20%)	Length(ft)	Lumen/ft
47.99%	23.7	4.00	1482

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	959.1	950.9	946.0	950.9	959.1	950.9	946.0	950.9
20	982.8	963.5	941.2	963.5	982.8	963.5	941.2	963.5
30	997.3	963.9	924.7	963.9	997.3	963.9	924.7	963.9
40	980.1	943.3	890.1	943.3	980.1	943.3	890.1	943.3
50	915.7	880.6	822.7	880.6	915.7	880.6	822.7	880.6
60	789.0	756.9	703.9	756.9	789.0	756.9	703.9	756.9
70	596.5	563.5	511.5	563.5	596.5	563.5	511.5	563.5
80	362.9	316.1	247.0	316.1	362.9	316.1	247.0	316.1
90	276.8	187.8	10.12	187.8	276.8	187.8	10.12	187.8
100	241.0	175.1	84.92	175.1	241.0	175.1	84.92	175.1
110	269.6	225.4	211.4	225.4	269.6	225.4	211.4	225.4
120	304.9	270.2	315.1	270.2	304.9	270.2	315.1	270.2
130	321.4	289.9	382.4	289.9	321.4	289.9	382.4	289.9
140	319.7	344.8	423.8	344.8	319.7	344.8	423.8	344.8
150	371.1	407.5	426.0	407.5	371.1	407.5	426.0	407.5
160	436.4	424.6	368.9	424.6	436.4	424.6	368.9	424.6
170	448.5	371.4	312.6	371.4	448.5	371.4	312.6	371.4
180	202.8	345.4	378.5	345.4	202.8	345.4	378.5	345.4
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	16.8	18.0	17.6	18.8	19.7	17.4	18.5	18.1	19.3	20.3
	3H	19.1	20.2	19.9	21.0	21.9	19.8	20.9	20.6	21.7	22.7
	4H	20.0	21.0	20.8	21.8	22.8	20.9	21.9	21.7	22.7	23.7
	6H	20.7	21.6	21.5	22.5	23.5	21.9	22.8	22.7	23.6	24.6
	8H	20.9	21.8	21.7	22.7	23.7	22.3	23.2	23.1	24.0	25.0
	12H	21.1	21.9	21.9	22.8	23.8	22.8	23.6	23.6	24.4	25.5
4H	2H	17.7	18.7	18.4	19.5	20.5	18.1	19.1	18.9	19.9	20.9
	3H	20.2	21.0	21.0	21.9	22.9	20.8	21.6	21.6	22.5	23.5
	4H	21.2	22.0	22.0	22.8	23.9	22.0	22.8	22.8	23.6	24.6
	6H	22.0	22.7	22.9	23.6	24.6	23.2	23.8	24.0	24.7	25.7
	8H	22.3	23.0	23.2	23.8	24.9	23.7	24.3	24.5	25.2	26.2
	12H	22.5	23.1	23.4	24.0	25.0	24.2	24.8	25.1	25.7	26.7
8H	4H	21.7	22.4	22.6	23.2	24.3	22.4	23.0	23.2	23.9	24.9
	6H	22.7	23.3	23.6	24.2	25.2	23.7	24.3	24.6	25.2	26.2
	8H	23.1	23.6	24.0	24.5	25.6	24.4	24.9	25.3	25.8	26.8
	12H	23.4	23.8	24.3	24.7	25.8	25.1	25.6	26.0	26.4	27.6
12H	4H	21.8	22.4	22.7	23.3	24.3	22.4	23.0	23.3	23.9	24.9
	6H	22.9	23.4	23.8	24.3	25.4	23.9	24.3	24.7	25.2	26.3
	8H	23.4	23.8	24.3	24.7	25.8	24.6	25.0	25.5	25.9	27.0

Maximum UGR = 27.6

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	90.68	0 - 10	90.68	1.53%
10-20	271.51	0 - 20	362.19	6.11%
20-30	445.82	0 - 30	808.01	13.63%
30-40	598.64	0 - 40	1406.65	23.73%
40-50	704.84	0 - 50	2111.49	35.61%
50-60	733.81	0 - 60	2845.30	47.99%
60-70	655.29	0 - 70	3500.59	59.04%
70-80	461.30	0 - 80	3961.89	66.83%
80-90	221.03	0 - 90	4182.92	70.55%
90-100	180.91	0 - 100	4363.83	73.60%
100-110	205.18	0 - 110	4569.01	77.07%
110-120	251.20	0 - 120	4820.21	81.30%
120-130	271.32	0 - 130	5091.53	85.88%
130-140	261.96	0 - 140	5353.49	90.30%
140-150	237.07	0 - 150	5590.56	94.30%
150-160	190.92	0 - 160	5781.48	97.52%
160-170	113.51	0 - 170	5894.99	99.43%
170-180	33.76	0 - 180	5928.75	100.00%

4.2 Goniophotometer Test

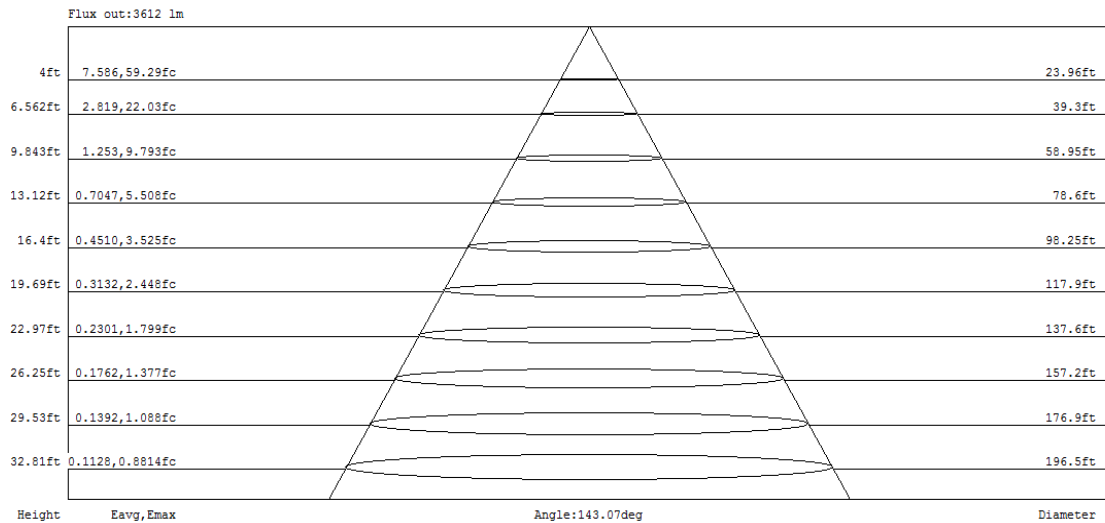
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	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	36	33	30
5	68	55	45	39	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-4/48W/3000K	Sample ID.	I1
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	0.408	48.8	0.996	6.86%
277.03	60	0.176	48.1	0.989	11.68%

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*****