

Photometric Test Report

Relevant Standards

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

Prepared For

RAB Lighting Inc.

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DLF2211103

Report Number

DLF2211103-5a

Test Date

2022/11/16

Issue Date

2022/11/17

Prepared By



Wangzun Zhu

Approved By



Kevin Jia

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1.0 Test Summary

DLC Technical Requirements v5.1

Indoor - Troffer - 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces				
Requirement Category	Test Method	Requirements		Test value
Luminaire Output (lm) (Goniophotometer - Section 4.2)	IES LM-79-2008	2000		2997
Minimum Luminaire Efficacy (lm/W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Standard 110	Premium 125	132.6
Power (Input Wattage) (W) (Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		22.6
Total Harmonic Distortion (A%) (THD & PF - section 4.3)	ANSI C82.77:2014	20.00%	120V	8.10%
		20.00%	277V	6.37%
Power Factor (THD & PF - section 4.3)	ANSI C82.77:2014	0.9	120V	0.993
		0.9	277V	0.954
Allowable CCTs* (K) (Integrating Sphere - Section 4.1)	IES LM-79-2008	7 step	3985±275	4080
		4 step	3985±154	
Minimum CRI (Integrating Sphere - Section 4.1)	IES LM-79-2008 CIE 13.3-1995	≥80		83
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		97
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	≥75%		77.45%
Corrected UGR (X=4H, Y=8H, 70/50/20%) (Goniophotometer - Section 4.2)	CIE 190-2010	<22		20.2
SC: 0-180° (Goniophotometer - Section 4.2)	IES LM-79-2008	1.0-2.0		1.28
SC: 90-270° (Goniophotometer - Section 4.2)	IES LM-79-2008	1.0-2.0		1.28
Input Voltage (V)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		277
(Goniophotometer - Section 4.2)		Non-Worst Case		120
Input Current (A)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		0.086
(Goniophotometer - Section 4.2)		Non-Worst Case		0.185
Power (Input Wattage - W)				
(Goniophotometer - Section 4.2)	IES LM-79-2008	Worst Case		22.6
(Goniophotometer - Section 4.2)		Non-Worst Case		22.0

2.0 Test List

Test Item	Test	Test Date	Model Number	Sample No.
1	Integrating Sphere Test	2022/11/16	T34FAHE2X2/23W/4000K	E1
2	Goniophotometer Test	2022/11/16	T34FAHE2X2/23W/4000K	E1
3	THD and PF Test	2022/11/16	T34FAHE2X2/23W/4000K	E1

Remark(If any)

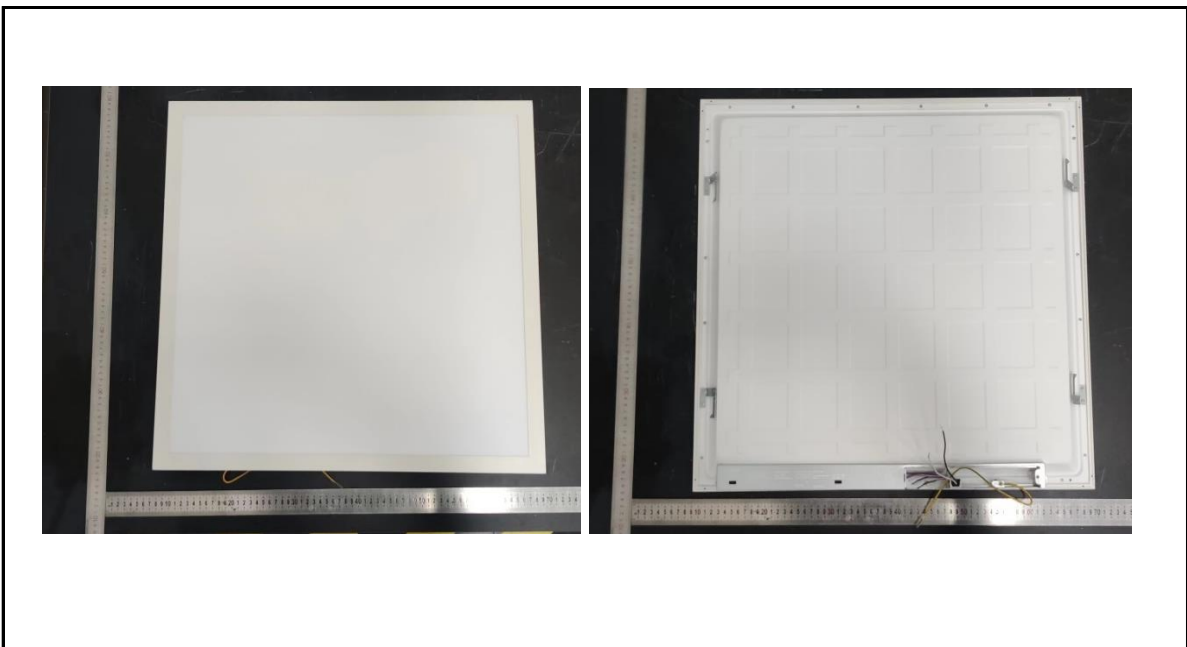
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3.0 Production Description

Luminaire Description: T34FAHE2X2/23W/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.	T34FAHE2X2/23W/400 0K	Sample ID.	E1
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	0.185	22.0	0.993
276.98	60	0.086	22.6	0.954

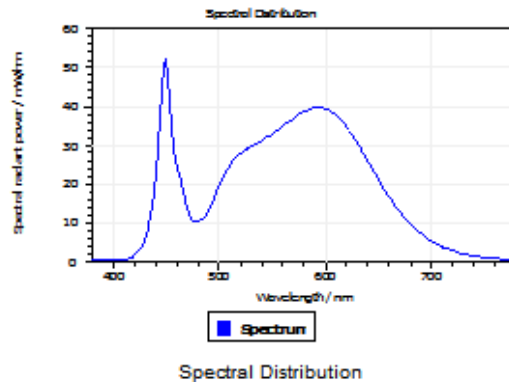
Test Result

CCT (K)	CRI	R9	Duv
4080	83	13	0.00075

Rf	Rg	IES Rcs,h1
84	97	-11%

4.1 Integrating Sphere Test

Results



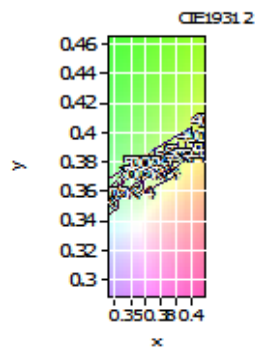
Spectral values

DominantWavelength 578.35 nm
Purity 0.263
PeakWavelength 449.18 nm
Radiant Power 7.165 W
Width50%:

Color Coordinates

Correlated Color Temperat 4080 K
x: 0.3775 u: 0.2233 u': 0.2233
y: 0.3765 v: 0.3340 v': 0.5010

CRI01	81.6	CRI09	13.1
CRI02	87.9	CRI10	71.4
CRI03	92.9	CRI11	82.8
CRI04	83.6	CRI12	59.9
CRI05	81.9	CRI13	82.9
CRI06	83.3	CRI14	96.1
CRI07	87.2	CRI15	75.8
CRI08	67.3	CRI16	74.4
ResultsCRI	83.2		



PlanckDistance 7.5E-004

4.1 Integrating Sphere Test

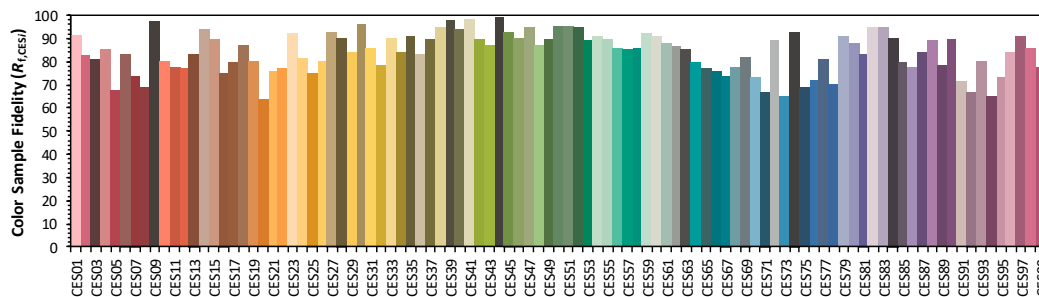
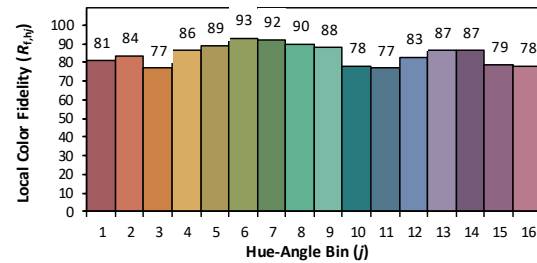
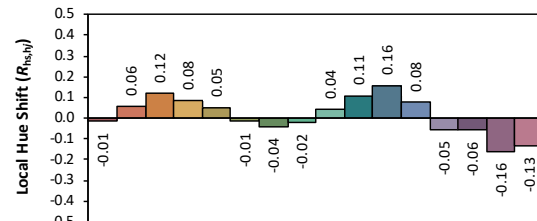
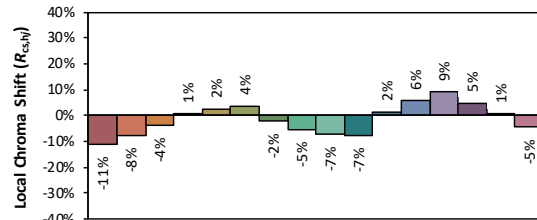
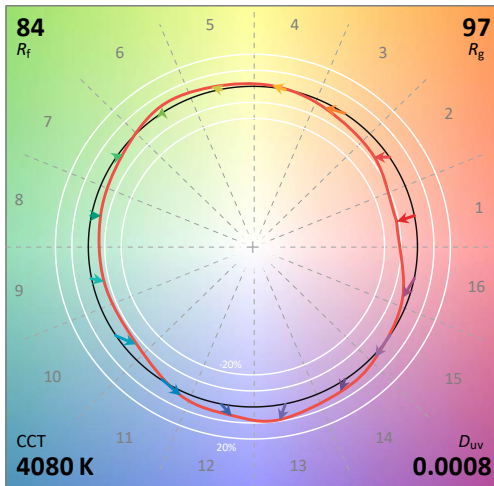
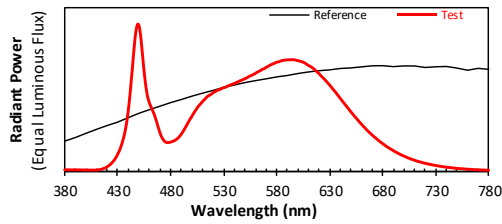
IES TM-30-18 Color Rendition Report

Source: DLF2211103-5a

Manufacturer: RAB Lighting Inc.

Date: 2022/11/16

Model: T34FAHE2X2/23W/4000K



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

x 0.3775
 y 0.3765
 u' 0.2233
 v' 0.5010

CIE 13.3-1995
(CRI)

R_a 84
 R_g 18

4.0 LM-79 Measurement and Test Results

4.2 Goniophotometer Test

Model No.	T34FAHE2X2/23W/4 000K	Sample ID.	E1
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	276.95	60	0.086	22.6	0.950
NON-WROST CASE	120.01	60	0.185	22.0	0.989

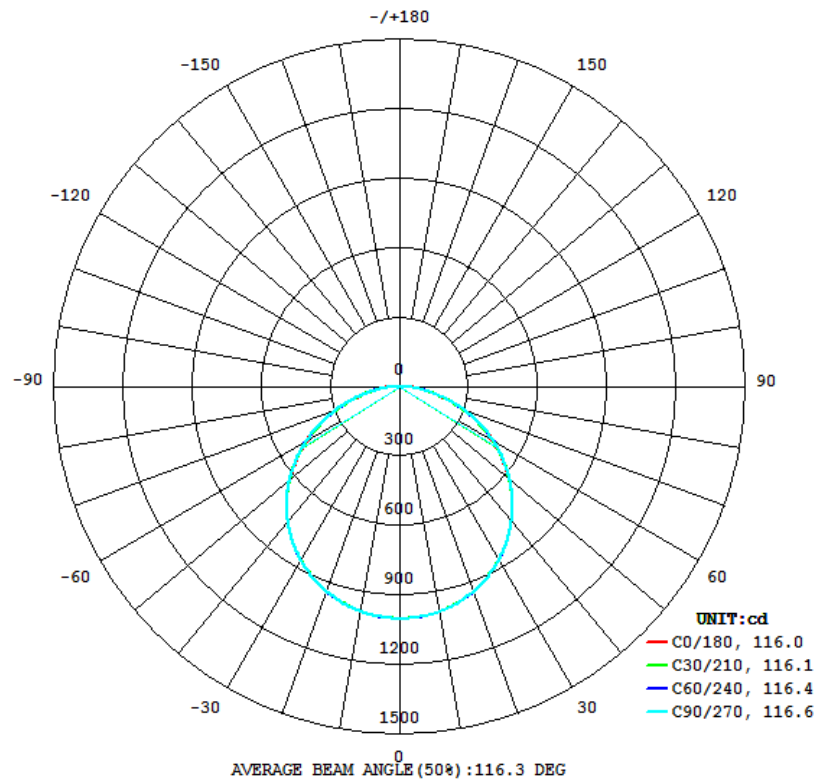
Test Result

Flux (lm)	Field Angle(10%)		Beam Angle(50%)		Luminous Efficacy (lm/W)
	C0-180	C90-270	C0-180	C90-270	
2997	163.7	164.5	116.0	116.6	132.6

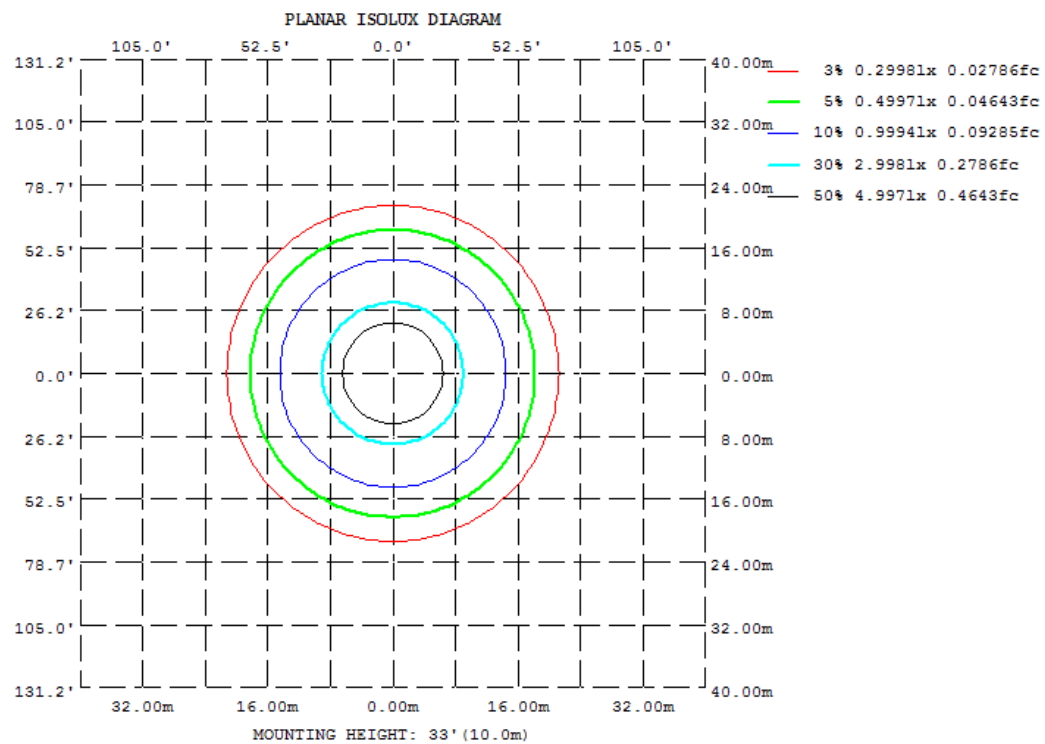
Zonal Lumen Requirement (0° - 60°)	UGR ($X=4H$, $Y=8H$, 70/50/20%)	SC: 0 - 180°	SC: 90 - 270°
77.45%	20.2	1.28	1.28

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	985.2	985.6	985.8	985.6	985.2	985.6	985.8	985.6
20	939.0	939.5	939.4	939.5	939.0	939.5	939.4	939.5
30	863.0	862.5	863.2	862.5	863.0	862.5	863.2	862.5
40	756.7	757.4	758.4	757.4	756.7	757.4	758.4	757.4
50	623.8	625.5	627.3	625.5	623.8	625.5	627.3	625.5
60	467.4	470.6	473.1	470.6	467.4	470.6	473.1	470.6
70	295.6	300.9	304.1	300.9	295.6	300.9	304.1	300.9
80	127.9	133.9	136.0	133.9	127.9	133.9	136.0	133.9
90	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0
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	17.3	16.0	17.6	17.9	15.6	17.2	15.9	17.6	17.9	
4H	17.5	19.0	17.9	19.4	19.7	17.4	19.0	17.8	19.3	19.6	
6H	18.3	19.7	18.7	20.0	20.4	18.1	19.6	18.5	19.9	20.3	
8H	18.8	20.2	19.2	20.5	20.9	18.7	20.0	19.1	20.4	20.7	
12H	19.0	20.3	19.5	20.7	21.1	18.8	20.1	19.3	20.5	20.9	
	19.2	20.4	19.6	20.8	21.2	19.0	20.2	19.4	20.6	21.0	
4H											
2H	16.3	17.7	16.7	18.1	18.4	16.2	17.7	16.6	18.0	18.4	
3H	18.4	19.6	18.8	20.0	20.4	18.3	19.5	18.7	19.9	20.3	
4H	19.3	20.4	19.7	20.8	21.2	19.2	20.3	19.6	20.7	21.1	
6H	20.0	21.0	20.5	21.4	21.8	19.8	20.8	20.3	21.2	21.7	
8H	20.2	21.1	20.7	21.6	22.0	20.1	21.0	20.5	21.4	21.9	
12H	20.4	21.2	20.9	21.7	22.2	20.2	21.0	20.7	21.5	22.0	
8H											
4H	19.6	20.5	20.1	21.0	21.4	19.5	20.4	20.0	20.9	21.3	
6H	20.5	21.2	21.0	21.7	22.2	20.3	21.1	20.8	21.5	22.0	
8H	20.8	21.5	21.3	22.0	22.5	20.6	21.3	21.1	21.8	22.3	
12H	21.1	21.6	21.6	22.1	22.7	20.9	21.5	21.4	22.0	22.5	
12H											
4H	19.7	20.5	20.1	21.0	21.4	19.6	20.4	20.0	20.8	21.3	
6H	20.6	21.2	21.1	21.7	22.2	20.4	21.1	20.9	21.5	22.1	
8H	20.9	21.5	21.4	22.0	22.6	20.8	21.4	21.3	21.8	22.4	

Maximum UGR = 22.7

4.2 Goniophotometer Test

ZONAL LUMEN SUMMARY

	Zonal (lm)		Total (lm)	Percent
0-10	94.83	0 - 10	94.83	3.16%
10-20	272.83	0 - 20	367.66	12.27%
20-30	417.12	0 - 30	784.78	26.19%
30-40	509.07	0 - 40	1293.85	43.17%
40-50	535.66	0 - 50	1829.51	61.04%
50-60	491.64	0 - 60	2321.15	77.45%
60-70	382.09	0 - 70	2703.24	90.20%
70-80	227.16	0 - 80	2930.40	97.78%
80-90	66.61	0 - 90	2997.01	100.00%
90-100	0.00	0 - 100	2997.01	100.00%
100-110	0.00	0 - 110	2997.01	100.00%
110-120	0.00	0 - 120	2997.01	100.00%
120-130	0.00	0 - 130	2997.01	100.00%
130-140	0.00	0 - 140	2997.01	100.00%
140-150	0.00	0 - 150	2997.01	100.00%
150-160	0.00	0 - 160	2997.01	100.00%
160-170	0.00	0 - 170	2997.01	100.00%
170-180	0.00	0 - 180	2997.01	100.00%

4.2 Goniophotometer Test

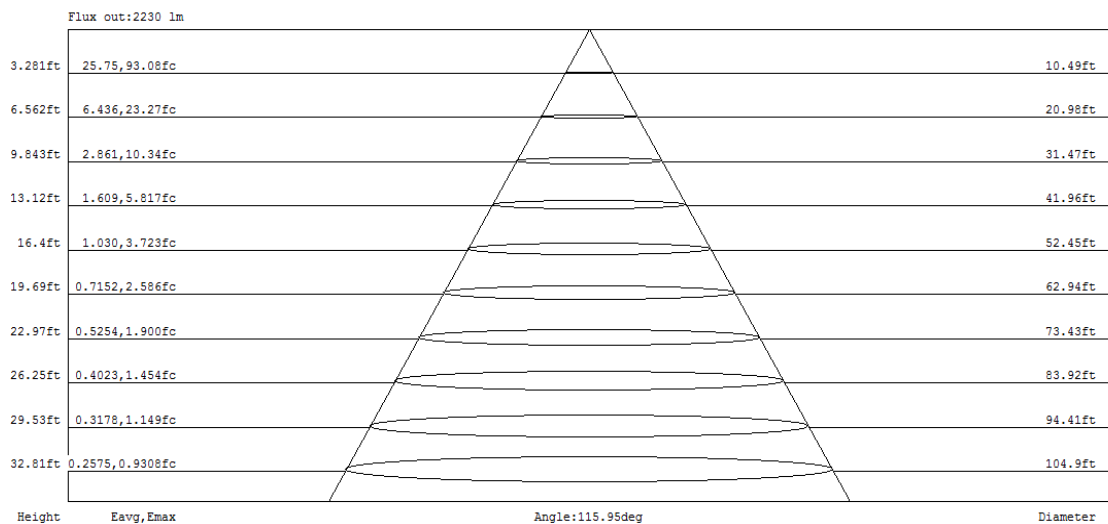
COEFFICIENTS OF UTILIZATION - ZONAL CAVITY METHOD

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	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	108	103	99	95	106	101	97	93	97	94	91	93	90	88	89	87	85	83
2	98	90	83	77	96	88	81	76	84	79	74	81	76	72	78	74	71	69
3	89	79	70	64	87	77	69	63	74	67	62	71	66	61	69	64	60	57
4	82	69	61	54	79	68	60	53	66	58	53	63	57	52	61	56	51	49
5	75	62	53	46	73	61	52	46	59	51	45	57	50	45	55	49	44	42
6	69	56	47	40	67	55	46	40	53	45	39	51	44	39	50	44	39	37
7	64	50	42	35	62	50	41	35	48	40	35	47	40	35	45	39	34	32
8	60	46	37	31	58	45	37	31	44	36	31	43	36	31	41	35	31	29
9	56	42	34	28	54	42	34	28	40	33	28	39	33	28	38	32	28	26
10	52	39	31	26	51	38	31	25	37	30	25	36	30	25	35	29	25	23

CONE OF LIGHT DIAGRAM



4.0 LM-79 Measurement and Test Results

4.3 THD and PF Test

Model No.	T34FAHE2X2/23W/4000K	Sample ID.	E1
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	0.185	22.0	0.993	8.10%
276.98	60	0.086	22.6	0.954	6.37%

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*****