BESTWAY COMPLIANCE CO., LTD.

Unit 301, Building 3, No. 178, Fenggang Section, Dongshen Road, Fenggang Town,
Dongguan, Guangdong, People's Repulic of China
Tel: (+86)0769-82699983

LM-79-19 Test Report

For

RAB LIGHTING Inc

(Brand Name: RAB LIGHTING)

Room 609, Building C, MixC, No. 1799 Wuzhong Road

Minhang District, Shanghai, China

Xiao Xiang,15921313292, gary.xiao@rablighting.com

Model name(s): FR2X2[Blank, /E, /LCB]

Report Type:	Testing and Report According to IES LM-79-2019
Type of Luminaire:	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces
Report Date:	2024-09-30

Test & Report By:

Ferrum Li

Engineer: Ferrum Li

Review By:

Garman Mo

Manager: Garman Mo

Note: 1.The results contained in this report pertain only to the tested samples.

2.This report does not imply product certification, approval, or endorsement by A2LA or any agency of the Federal Government.

1.1 Product Information:		
Model Number	FR2X2[Blank, /E, /LCB]	
Remark	The [Blank, /E, /LCB] can be E=emergency backup, LCB=smart controller or Blank=no emergency backup and smart controller provided.	
Representative (Tested) Model	FR2X2(0%,3000K) FR2X2(50%,4000K) FR2X2(100%,6500K)	
Model Difference	N/A	
SKU (if available)	--	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	
LED Manufacturer	Bridgelux Inc.	
LED Model	BXEN-30E-21L-3F BXEN-65E-21L-3F	
Integral Controls Availability	Yes	
Dimming	Continuous	
Sample Number	JDE240618-A1	
Date of Receipt	2024-09-25	
Luminaire Aperture (for downlights)	--	in.
Luminaire Length	--	mm
Luminaire Width	--	mm
Number of Units (modular products)	N/A	s

1.2 Rated Values:	
Rated Voltage / Frequency	120-277Vac, 50/60Hz
Nominal Power	20W/25W/30W/35W/40W (Power adjustable)
Rated Initial Lamp Lumen	--
Declared CCT	3000K/3500K/4000K/5000K/6500K (Color Tunable)

1.3 Test Specifications:

Test item	1. Total Luminous Flux 2. Luminous Distribution Intensity 3. Luminous Efficacy 4. Correlated Color Temperature 5. Color Rendering Index 6. Chromaticity Coordinate 7. Electrical Parameters
Reference Standard	1. IES LM-79-2019 Optical and Electrical Measurements of Solid-State Lighting Products 2. ANSI C78.377-2015 Specifications for the Chromaticity of Solid State Lighting Products 3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources 4. CIE 15-2004 Technical Report Colorimetry 5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source 6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems
Reference Work Instruction	QD25

1.4 Test Methods

1) Photometric and Light Distribution Measurement – Goniophotometer Method: Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at 25 °C ±1.2 °C, measured at a point not more than 1.5 m from the sample and at the same height as the sample. The humidity should be maintained between 10% and 65%. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at 1 °vertical intervals and 22.5 °horizontal intervals.
2) Chromaticity Measurement – Sphere-Spectroradiometer Method: Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at 25 ºC ±1.2 ºC. The humidity should be maintained between 10% and 65%. 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 sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.
3) Electrical Measurements: Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at 25 ºC ±1.2 ºC. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

2.1 Summary of Test Result

Criteria Item	Measured Value		Compliance	Requirement (DLC V5.1)	
Minimum Total Luminous	4955.0		Pass	>=2000(-10%)	
Minimum Luminous Efficacy	128.97		Pass	Standard: >= 110(-3%)	Premium: >= 125(-3%)
Minimum Power Factor	0.9672		Pass	>= 0.9(-3%)	
Maximum THD %	12.04		Pass	<= 20(+5)	
Minimum CRI	83.3		Pass	>= 80(-1)	
Minimum R9	17		Pass	>= 0(-1)	
Minimum Rg	95		Pass	>= 89(-1)	
Minimum Rf	83		Pass	>= 70(-1)	
Rcs, h1(%)	-12		Pass	-12%-23%(-1%)	
CCT (K)	3000K	3047	Pass	<=6500K	
	4000K	4210			
	6500K	6615			
Zonal Lumen Requirement(%)	0-60 °	73.6	Pass	>=75(-3)	
SC: 0-180 °	1.21		Pass	1.0-2.0(±0.1)	
SC: 90-270 °	1.20		Pass	1.0-2.0(±0.1)	
Corrected UGR	21.4		Pass	Premium: <22.0	

2.2 Electrical, Photometric and Chromaticity Measurements

Test date	2024-09-27	**Test Ambient:**	25±1 ℃
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X2(0%,3000K)	**Total Operating Time (min)**	75

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-A1	120.0	60	0.3291	39.39	0.9972	5.82
	277.3	60	0.1414	37.92	0.9672	12.04

Photometric Measurement – Goniophotometer Method(Test Distance:26.000m):

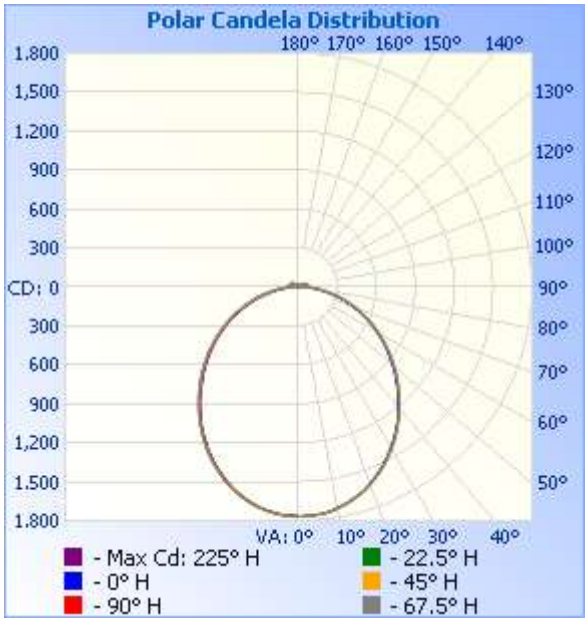
Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	5080.5	4955.0
Luminous Efficacy (lm/W)	128.97	130.68
Zonal lumens in the 0-60 °zone (%)	73.6	--
SC: 0-180 °	1.21	--
SC: 90-270 °	1.20	--
Corrected UGR(Crosswise)	21.3	--
Corrected UGR(Endwise)	21.4	--
Beam Angle (°)	105.1	--
Center Beam Candle Power (cd)	1766	--

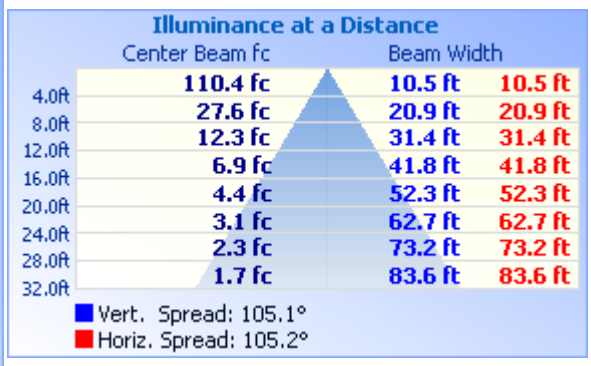
Zonal Lumen Tabulation

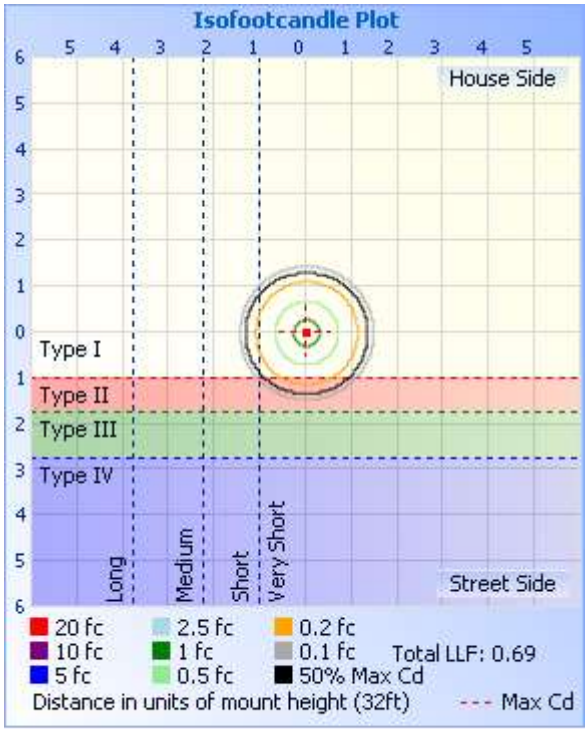
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1,341.3	26.4%
0-40	2,164.5	42.6%
0-60	3,740.6	73.6%
60-90	1,097.4	21.6%
70-100	555.7	10.9%
90-120	159.0	3.1%
0-90	4,838.0	95.2%
90-180	242.1	4.8%
0-180	5,080.1	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	166.8	3.3%	90-100	37.5	0.7%
10-20	472.9	9.3%	100-110	66.6	1.3%
20-30	701.7	13.8%	110-120	54.9	1.1%
30-40	823.1	16.2%	120-130	38.1	0.8%
40-50	831.9	16.4%	130-140	22.6	0.4%
50-60	744.3	14.7%	140-150	13.1	0.3%
60-70	579.3	11.4%	150-160	6.6	0.1%
70-80	363.9	7.2%	160-170	2.1	0%
80-90	154.2	3.0%	170-180	0.6	0%

Photometric Data







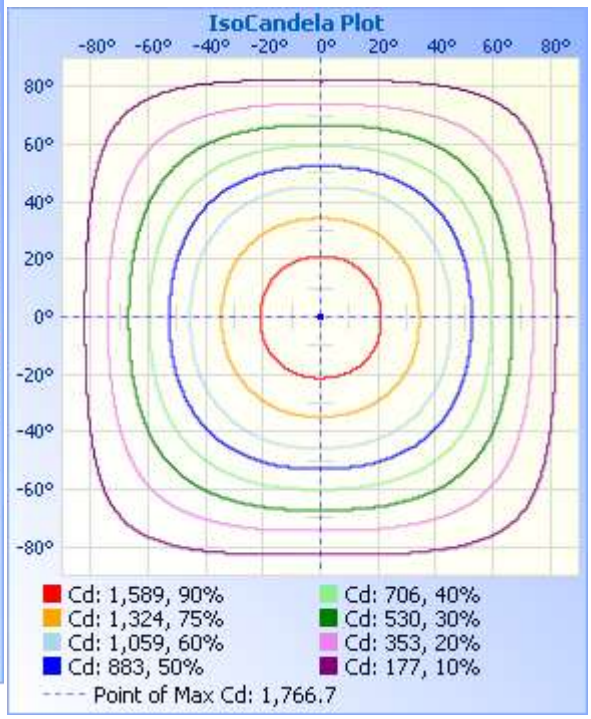


Table--1 UNIT: cd

C (DEG) / γ (DEG)	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5			
0	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766	1766			
5	1756	1754	1754	1758	1757	1758	1758	1757	1758	1757	1755	1757	1755	1757	1759	1754			
10	1723	1727	1725	1730	1728	1728	1733	1729	1728	1732	1726	1726	1726	1724	1729	1726			
15	1668	1675	1675	1680	1677	1684	1686	1679	1680	1682	1678	1680	1673	1672	1678	1677			
20	1597	1605	1608	1612	1609	1613	1617	1612	1611	1616	1611	1610	1604	1604	1608	1609			
25	1515	1520	1522	1526	1524	1532	1535	1531	1528	1527	1527	1524	1513	1518	1525	1522			
30	1412	1420	1424	1429	1424	1433	1436	1433	1431	1432	1429	1428	1412	1421	1425	1423			
35	1301	1310	1316	1320	1317	1325	1329	1325	1321	1322	1318	1317	1307	1311	1313	1313			
40	1181	1193	1198	1204	1196	1207	1211	1207	1203	1205	1203	1202	1189	1193	1195	1196			
45	1057	1072	1079	1083	1075	1087	1091	1087	1080	1085	1084	1081	1064	1073	1076	1074			
50	938	951	957	962	952	965	969	966	954	963	961	960	940	953	952	953			
55	812	826	835	837	828	841	846	840	835	841	839	834	819	828	831	829			
60	689	703	711	713	703	717	722	715	710	717	717	711	696	705	710	704			
65	564	580	589	590	579	593	600	592	584	593	593	587	571	582	586	580			
70	441	457	467	467	457	470	477	470	459	470	472	466	447	458	465	459			
75	321	338	349	347	337	352	359	349	340	351	353	345	328	340	345	339			
80	211	228	238	236	225	240	246	239	226	239	242	234	217	230	234	229			
85	121	137	145	142	130	146	152	143	131	144	148	140	126	139	143	137			
90	5.58	7.83	10.8	19.1	34.6	42.3	45.2	40.7	52.6	35.9	18.7	8.30	5.74	5.47	5.22	5.13			
95	70.3	49.8	35.7	40.5	12.8	27.1	30.2	46.4	44.3	44.8	34.0	46.0	53.8	48.8	41.1	53.0			
100	66.0	66.6	63.5	61.0	58.6	60.8	62.7	65.9	64.5	65.7	63.6	64.3	60.4	64.6	67.2	67.5			
105	62.8	62.9	63.2	47.8	50.4	62.4	69.5	68.7	60.6	67.6	69.9	64.8	56.7	65.5	70.4	68.9			
110	56.5	59.3	63.0	52.7	34.2	52.6	69.0	66.1	56.5	65.1	69.9	62.4	52.6	63.0	70.0	65.7			
115	53.0	56.0	59.9	51.3	34.6	50.5	61.0	62.6	52.5	61.3	66.6	56.5	45.5	56.1	67.3	61.4			
120	49.6	51.2	55.6	32.7	39.6	39.7	56.8	54.7	48.5	56.8	61.5	37.7	20.5	36.2	62.6	57.3			
125	45.0	47.4	28.1	40.2	32.0	41.0	28.3	48.6	44.1	51.9	29.3	44.8	38.5	43.2	27.9	52.5			
130	40.5	13.6	38.3	39.8	33.9	39.2	39.0	40.4	40.1	36.7	44.0	27.9	34.9	27.7	44.0	18.9			
135	4.53	32.5	23.4	35.6	30.6	35.6	34.5	33.9	3.62	34.5	39.2	36.4	30.8	35.3	38.9	34.7			
140	27.5	29.5	26.7	27.1	12.4	26.9	18.2	31.2	25.5	29.5	18.4	33.0	28.1	32.2	19.4	30.1			
145	6.10	9.48	24.8	16.2	16.2	18.9	24.5	25.8	22.7	24.3	21.8	28.1	24.4	22.6	23.5	9.44			
150	13.4	19.0	20.3	15.4	15.2	16.6	19.4	19.2	5.09	15.8	20.1	18.6	17.4	17.8	18.0	18.2			
155	14.9	15.1	17.5	16.1	14.9	14.9	16.9	14.5	13.9	14.7	16.1	9.62	8.96	11.1	16.4	16.3			
160	9.87	10.6	7.94	11.3	8.84	10.9	11.5	11.3	8.75	10.4	11.0	8.99	7.59	8.42	10.9	11.6			
165	5.65	6.38	7.23	8.33	6.48	9.22	5.88	8.86	4.00	4.11	4.39	8.25	7.48	4.82	6.06	5.50			
170	7.75	7.32	7.74	7.52	6.02	7.21	8.43	7.52	5.92	5.72	5.38	6.14	5.37	5.57	4.93	6.88			
175	6.31	5.74	6.29	6.40	6.65	6.02	6.69	6.41	5.34	5.01	4.74	5.04	4.11	5.20	4.68	5.50			
180	5.01	4.65	4.84	4.31	5.11	4.20	5.13	5.32	5.20	5.01	4.74	5.13	4.74	5.20	4.58	5.41			

2.3 Electrical, Photometric and Chromaticity Measurements

Test date	2024-09-27	Test Ambient:	25±1 ºC
Test Orientation	As intended	Stabilization Time (min)	60
Model Number	FR2X2(0%,3000K)	Total Operating Time (min)	61

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-A1	120.0	60	0.3304	39.59	0.9985	5.73
	277.0	60	0.1421	38.11	0.9685	11.94

Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1342) (4π geometry):

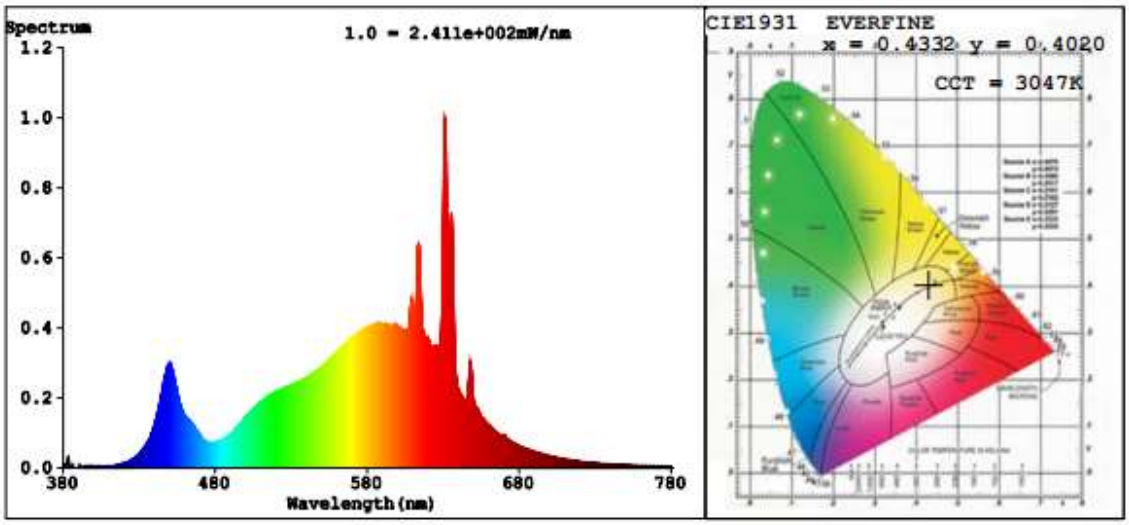
Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	3047
Duv	-0.0003
Chromaticity (x, y)	x=0.4332 y=0.4020
Chromaticity (u', v')	u'=0.2490 v'=0.5200

Parameter	Result
Color Rendering Index (CRI)	83.3
R9	17
Rg	97
Rf	83
Rcs,h1(%)	-11

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	5125	4998
Luminous Efficacy (lm/W)	129.45	131.15

Spectral Power Distribution & Chromaticity Diagram



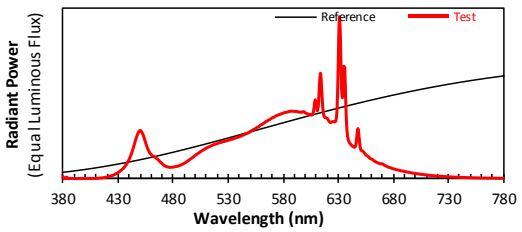
Special Color Rendering Indices

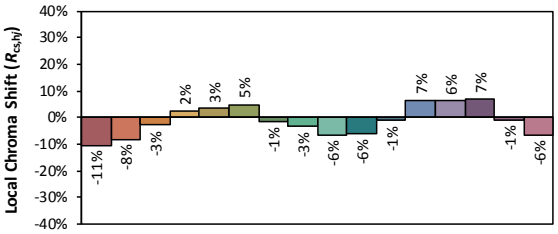
R1 =82	R2 =90	R3 =96	R4 =82	R5 =81	R6 =87	R7 =85	
R8 =64	R9 =17	R10=76	R11=80	R12=68	R13=83	R14=98	R15=76

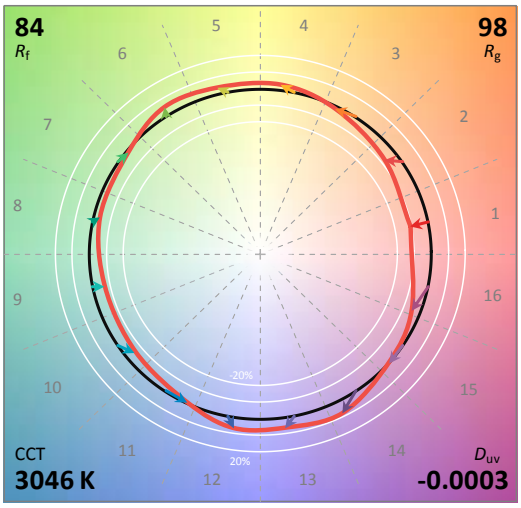
TM30

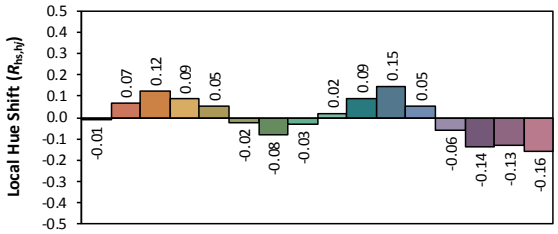
ANSI/IES TM-30-18 Color Rendition Report

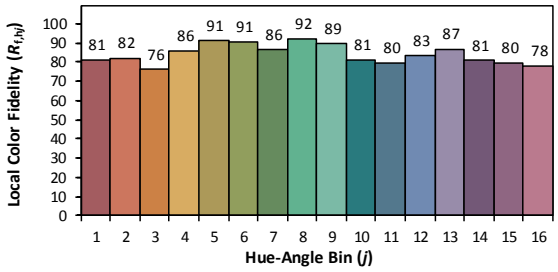
Source:	BXEN-30E-21L-3F	**Manufacturer:**	RAB LIGHTING Inc
Date:	2024-09-27	**Model:**	FR2X2 (0%, 3000K)

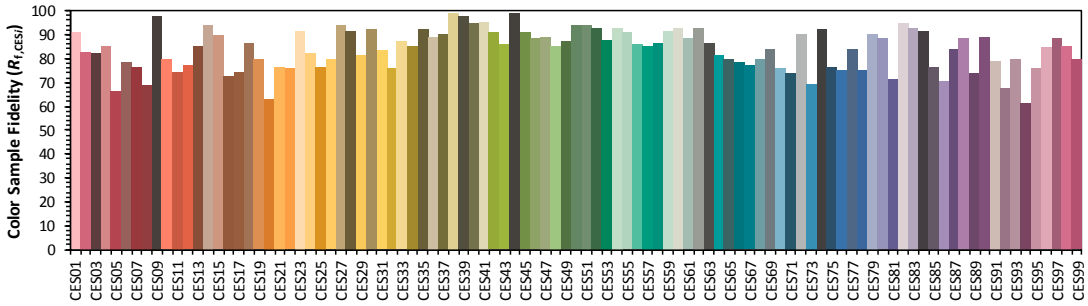












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4332
y	0.4019
u'	0.2491
v'	0.5200

CIE 13.3-1995 (CRI)

R_a	83
R_9	17

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

2.4 Electrical, Photometric and Chromaticity Measurements

Test date	2024-09-27	**Test Ambient:**	25±1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X2(50%,4000K)	**Total Operating Time (min)**	61

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-A1	120.0	60	0.3235	38.76	0.9986	5.72
	277.0	60	0.1391	37.31	0.9686	11.93

Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1344) (4π geometry):

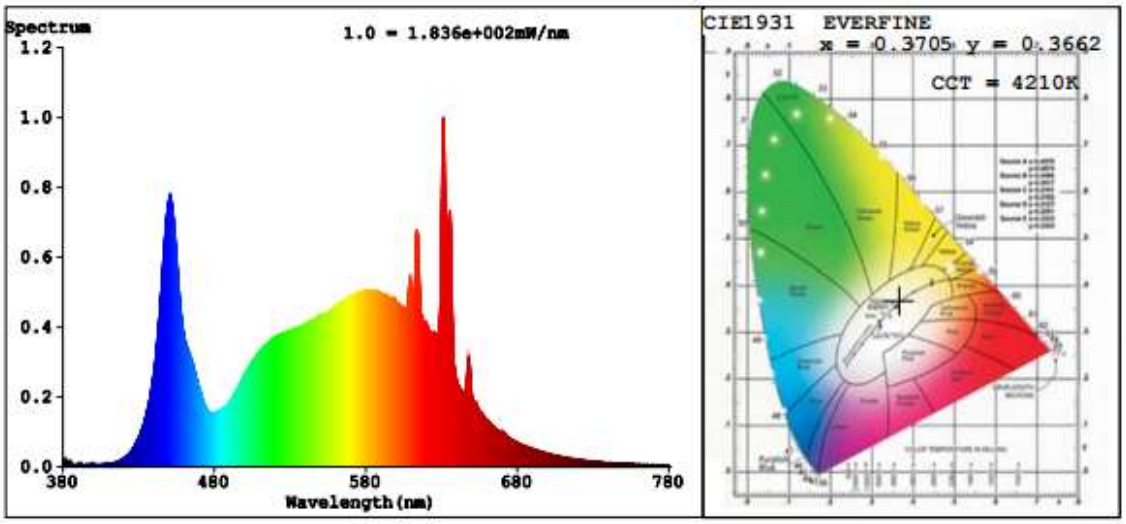
Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	4210
Duv	-0.0020
Chromaticity (x, y)	x=0.3705 y=0.3662
Chromaticity (u', v')	u'=0.2227 v'=0.4954

Parameter	Result
Color Rendering Index (CRI)	85.8
R9	29
Rg	98
Rf	85
Rcs,h1(%)	-11

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	5500	5364
Luminous Efficacy (lm/W)	141.90	143.77

Spectral Power Distribution & Chromaticity Diagram



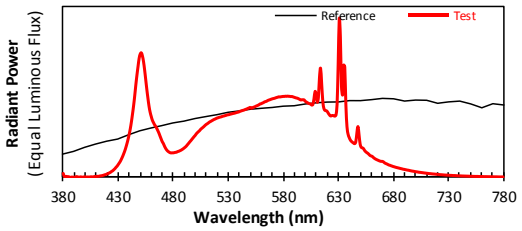
Special Color Rendering Indices

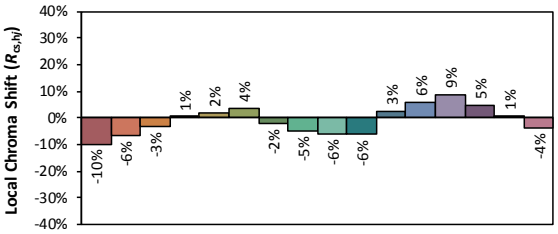
R1 =85	R2 =90	R3 =93	R4 =85	R5 =85	R6 =86	R7 =88	
R8 =73	R9 =29	R10=76	R11=85	R12=62	R13=86	R14=96	R15=81

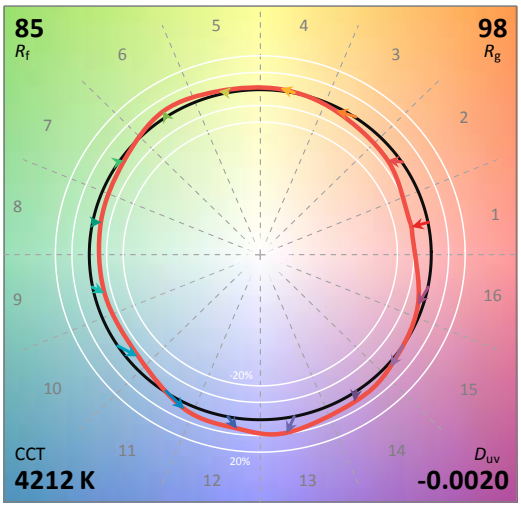
TM30

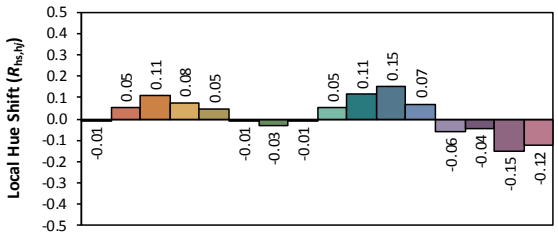
ANSI/IES TM-30-18 Color Rendition Report

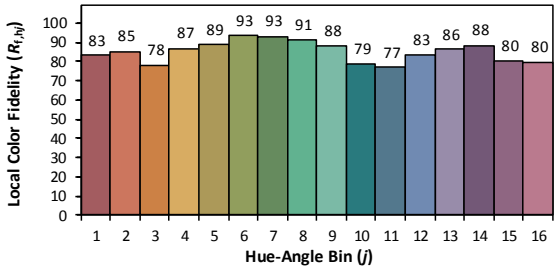
Source:	BXEN-30E-21L-3F BXEN-65E-21L-3F	**Manufacturer:**	RAB LIGHTING Inc
Date:	2024-09-27	**Model:**	FR2X2(50%, 4000K)

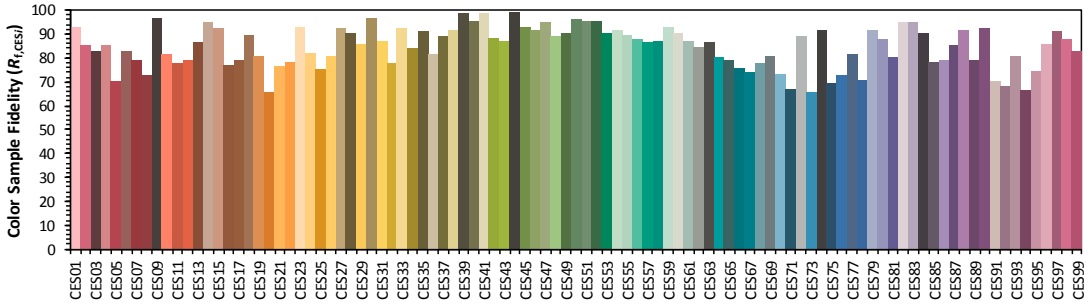












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3704
y	0.3661
u'	0.2227
v'	0.4953

CIE 13.3-1995 (CRI)

R_a	86
R_9	29

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

2.5 Electrical, Photometric and Chromaticity Measurements

Test date	2024-09-27	**Test Ambient:**	25±1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X2(100%,6500 K)	**Total Operating Time (min)**	61

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-A1	120.0	60	0.3268	39.17	0.9987	5.71
	277.0	60	0.1405	37.71	0.9687	11.92

Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1340) (4π geometry):

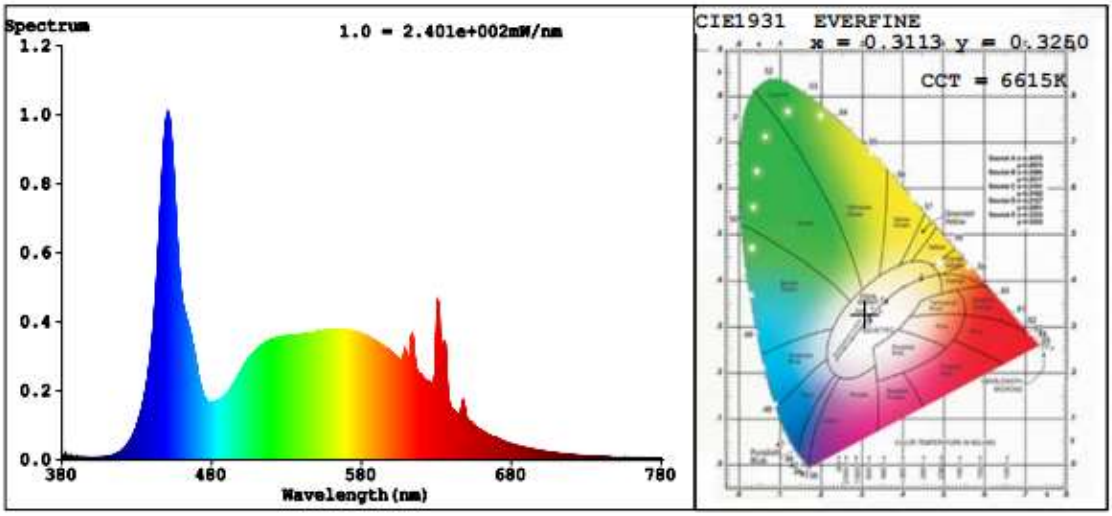
Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	6615
Duv	0.0018
Chromaticity (x, y)	x=0.3113 y=0.3250
Chromaticity (u', v')	u'=0.1984 v'=0.4660

Parameter	Result
Color Rendering Index (CRI)	83.9
R9	18
Rg	95
Rf	83
Rcs,h1(%)	-12

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	5328	5196
Luminous Efficacy (lm/W)	136.02	137.79

Spectral Power Distribution & Chromaticity Diagram



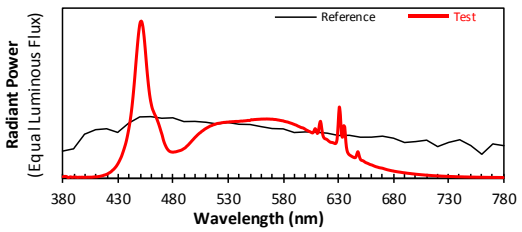
Special Color Rendering Indices

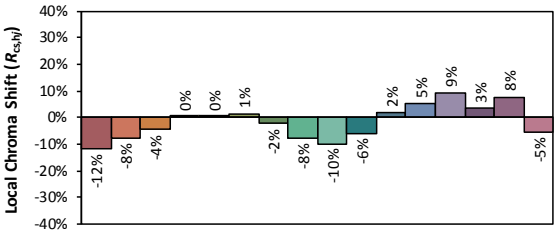
R1 =83	R2 =87	R3 =89	R4 =84	R5 =83	R6 =81	R7 =89	
R8 =74	R9 =18	R10=69	R11=84	R12=55	R13=84	R14=94	R15=79

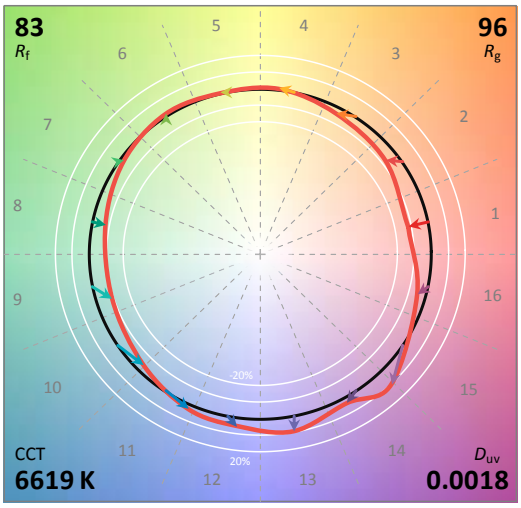
TM30

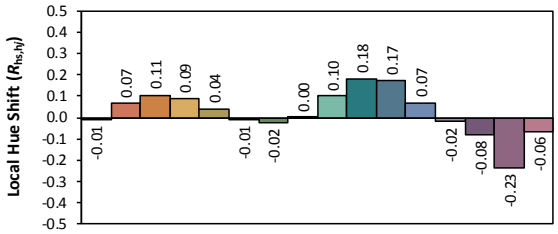
ANSI/IES TM-30-18 Color Rendition Report

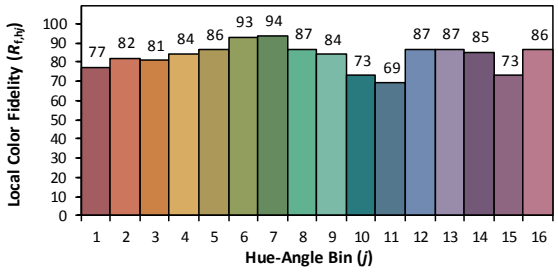
Source:	BXEN-65E-21L-3F	**Manufacturer:**	RAB LIGHTING Inc
Date:	2024-09-27	**Model:**	FR2X2(100%, 6500K)

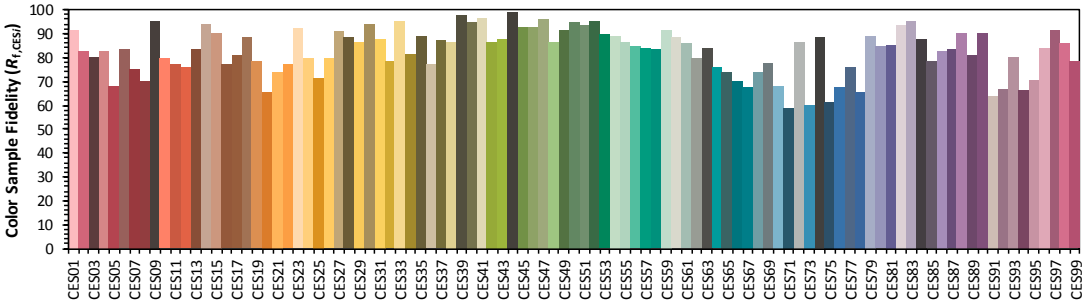












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3112
y	0.3248
u'	0.1984
v'	0.4659

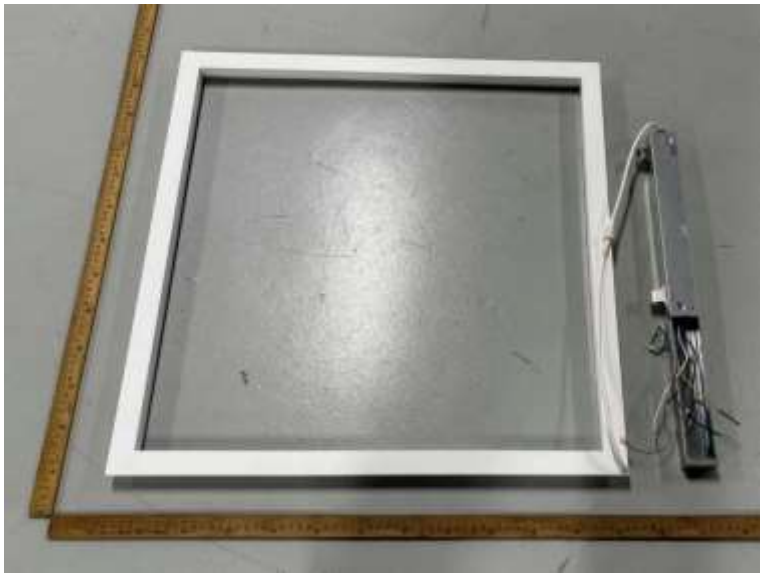
CIE 13.3-1995 (CRI)	
R_a	84
R_9	18

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

3. Test Equipment

Equipment ID	Equipment Name	Last Calibration Date	Next Calibration Date
ST-R-S-451	2 meter Integrating Sphere	Verified by D204 standard lamp	
ST-R-S-455	Spectral analysis system HAAS-1200	Verified by D204 standard lamp	
ST-R-S-452	Standard Lamp D204	2023-06-26	2026-06-25
ST-R-S-453	Power Meter for Integrating Sphere	2024-05-29	2025-05-28
ST-R-S-467	Hygrothermograph	2024-06-06	2025-06-05
ST-R-355	Goniophotometer system	Verified by D908S standard lamp	
ST-R-359	Standard Lamp D908S	2022-07-19	2025-07-18
ST-R-357	AC Power Source	2024-01-29	2025-01-28
ST-R-S-422	Power Meter for Goniophotometer	2024-05-29	2025-05-28
ST-R-S-354	hygrothermograph for Goniophotometer	2024-05-29	2025-05-28
Uncertainty: Photometric Measurement (Sphere):2.94%, k=2 Chromaticity Measurement(Sphere):52.28K, k=2 Photometric Measurement(Goniophotometer): 2.94%, k=2			

4. Product Photo



******** END OF REPORT ********