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Unit 301, Building 3, No. 178, Fenggang Section, Dongshen Road, Fenggang Town,
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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):
FR2X4[Blank, /E, /LCB]

Report Type:	Testing and Report According to IES LM-79-2019
Type of Luminaire:	2x4 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	FR2X4[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	FR2X4(0%,3000K) FR2X4(50%,4000K) FR2X4(100%,6500K)	
Model Difference	N/A	
SKU (if available)	--	
Type of Luminaire (for integral lamps, list base type and lamp type)	2x4 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-C1	
Date of Receipt	2024-09-23	
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	30W/35W/40W/45W/50W (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	6086.7		Pass	>=3000(-10%)	
Minimum Luminous Efficacy	130.56		Pass	Standard: >= 110(-3%)	Premium: >= 125(-3%)
Minimum Power Factor	0.9689		Pass	>= 0.9(-3%)	
Maximum THD %	13.31		Pass	<= 20(+5)	
Minimum CRI	83.4		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	3054	Pass	<=6500K	
	4000K	4200			
	6500K	6639			
Zonal Lumen Requirement(%)	0-60 °	72.3	Pass	>=75(-3)	
SC: 0-180 °	1.24		Pass	1.0-2.0(±0.1)	
SC: 90-270 °	1.26		Pass	1.0-2.0(±0.1)	
Corrected UGR	20.3		Pass	Premium: <22.0	

2.2 Electrical, Photometric and Chromaticity Measurements

Test date	2024-09-25	**Test Ambient:**	25±1 ℃
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X4(0%,3000K)	**Total Operating Time (min)**	75

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-C1	120.0	60	0.3967	47.46	0.9971	6.02
	277.0	60	0.1719	46.13	0.9689	13.31

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

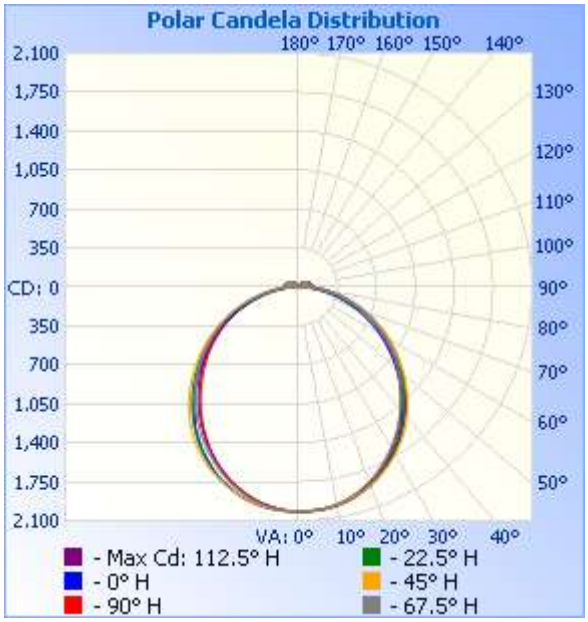
Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	6196.9	6086.7
Luminous Efficacy (lm/W)	130.56	131.95
Zonal lumens in the 0-60 °zone (%)	72.3	--
SC: 0-180 °	1.24	--
SC: 90-270 °	1.26	--
Corrected UGR(Crosswise)	19.3	--
Corrected UGR(Endwise)	20.3	--
Beam Angle (°)	109.4	--
Center Beam Candle Power (cd)	2014	--

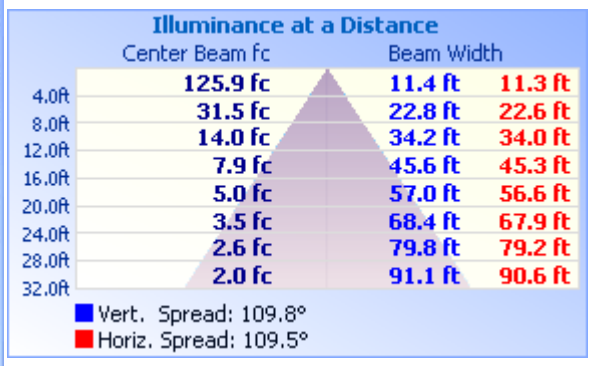
Zonal Lumen Tabulation

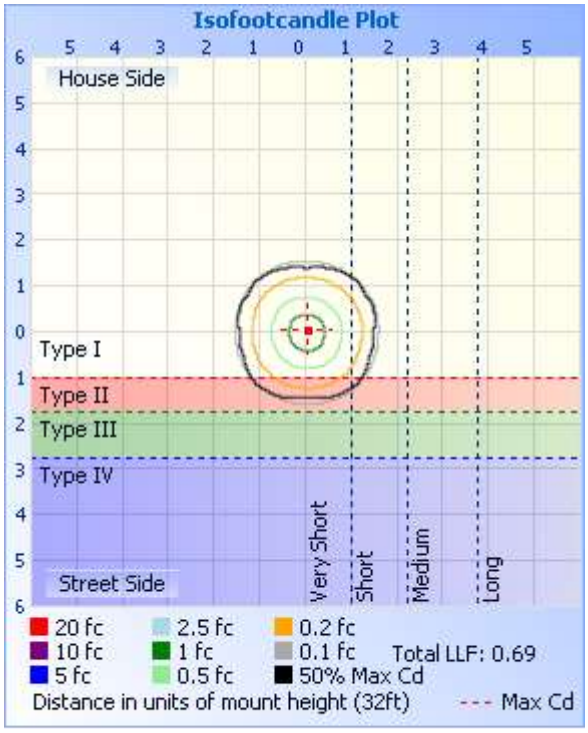
Zonal Lumen Summary		
Zone	Lumens	% Luminaire
0-30	1,561.5	25.2%
0-40	2,547.2	41.1%
0-60	4,483.1	72.3%
60-90	1,389.3	22.4%
70-100	722.9	11.7%
90-120	222.4	3.6%
0-90	5,872.3	94.8%
90-180	324.3	5.2%
0-180	6,196.6	100%

Lumens Per Zone					
Zone	Lumens	% Total	Zone	Lumens	% Total
0-10	190.8	3.1%	90-100	59.6	1%
10-20	546.4	8.8%	100-110	90.3	1.5%
20-30	824.2	13.3%	110-120	72.5	1.2%
30-40	985.7	15.9%	120-130	49.7	0.8%
40-50	1,014.9	16.4%	130-140	26.0	0.4%
50-60	921.0	14.9%	140-150	15.6	0.3%
60-70	725.9	11.7%	150-160	7.5	0.1%
70-80	461.9	7.5%	160-170	2.5	0%
80-90	201.4	3.2%	170-180	0.6	0%

Photometric Data







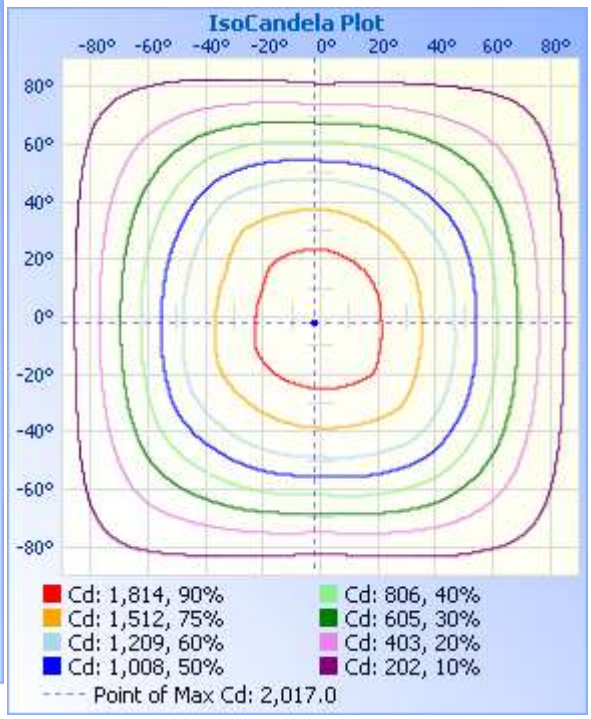


Table--1 UNIT: cd

γ (DEG) \ C (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	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015	2015			
5	2001	2000	1999	2002	2007	2007	2008	2008	2010	2015	2015	2011	2012	2010	2011	2006			
10	1965	1964	1967	1973	1984	1986	1985	1979	1985	1995	1996	1990	1990	1991	1988	1975			
15	1904	1908	1916	1924	1939	1946	1946	1928	1936	1954	1958	1951	1951	1952	1952	1924			
20	1825	1833	1846	1857	1876	1885	1891	1859	1864	1895	1898	1890	1889	1894	1899	1853			
25	1734	1741	1757	1768	1798	1807	1819	1766	1777	1816	1815	1806	1810	1817	1832	1761			
30	1626	1636	1651	1663	1698	1708	1734	1662	1677	1721	1712	1704	1709	1721	1750	1662			
35	1503	1521	1531	1545	1585	1598	1633	1549	1558	1611	1596	1587	1598	1608	1649	1550			
40	1374	1396	1400	1419	1451	1473	1515	1425	1431	1490	1465	1461	1461	1484	1527	1432			
45	1237	1267	1264	1283	1309	1338	1381	1300	1295	1361	1328	1324	1317	1350	1390	1308			
50	1105	1134	1125	1141	1156	1197	1238	1170	1159	1225	1188	1180	1158	1207	1242	1179			
55	970	995	980	994	998	1048	1087	1034	1025	1083	1042	1033	1005	1057	1092	1040			
60	832	853	836	846	843	896	935	897	888	936	895	880	850	904	939	899			
65	694	711	692	695	687	744	781	754	747	786	746	726	695	748	779	754			
70	556	567	547	544	531	588	623	608	606	636	597	574	539	590	621	605			
75	421	426	407	399	381	435	471	469	467	486	451	426	389	434	465	460			
80	295	296	275	262	240	289	325	331	334	344	313	286	248	288	319	319			
85	194	190	169	149	124	166	201	213	219	222	195	166	131	167	198	204			
90	5.75	5.63	5.48	8.15	23.1	64.0	98.6	120	136	127	97.7	59.4	15.4	4.78	4.96	5.01			
95	131	109	66.0	48.6	48.5	47.3	62.7	54.0	24.2	54.5	59.7	54.4	58.3	65.6	79.1	106			
100	126	112	84.1	63.7	43.4	66.2	84.6	105	121	109	82.2	70.0	52.8	75.8	97.3	118			
105	119	110	85.9	64.2	41.0	65.5	87.0	102	111	107	84.4	69.5	48.4	74.4	99.3	113			
110	111	102	81.7	54.3	29.6	56.2	84.2	96.5	104	100	78.2	62.7	41.6	63.5	93.2	106			
115	104	95.9	76.5	51.8	31.1	53.6	79.3	90.4	97.1	92.8	76.5	53.8	38.0	58.8	90.8	100			
120	94.9	88.2	69.2	33.0	31.1	42.6	73.9	83.5	89.5	84.8	73.3	49.5	16.0	44.7	85.5	92.5			
125	85.9	79.5	28.9	36.2	17.2	35.5	32.3	77.2	81.0	77.6	30.8	41.8	32.7	43.7	37.8	83.1			
130	76.2	22.6	49.7	34.5	22.5	35.9	51.6	66.6	71.7	67.8	51.1	29.0	23.6	31.3	59.0	19.2			
135	3.38	35.6	44.5	29.9	23.2	31.0	48.2	54.3	3.97	52.0	44.9	31.5	16.5	32.2	42.7	57.3			
140	49.1	45.5	16.3	26.3	10.9	27.2	17.4	46.2	48.4	46.1	14.5	28.5	23.6	30.5	31.9	45.3			
145	12.2	9.13	30.8	20.7	13.4	22.0	33.0	37.7	42.3	39.0	28.7	22.2	14.3	15.3	34.2	10.5			
150	28.7	29.4	20.2	7.92	7.30	13.3	27.0	29.3	5.43	27.3	22.8	18.7	9.48	9.16	23.7	30.1			
155	27.6	18.7	15.5	6.93	7.94	11.5	16.9	24.3	26.1	25.2	19.2	3.87	7.59	9.43	13.0	19.6			
160	16.5	13.1	7.09	8.76	9.08	8.98	12.2	17.7	14.1	18.2	14.8	4.79	7.37	6.48	16.4	16.2			
165	5.51	5.86	9.31	9.95	6.43	10.4	8.03	13.9	5.35	5.41	3.49	8.39	7.32	7.14	11.6	8.77			
170	10.9	7.95	8.41	7.57	7.03	8.50	10.1	10.6	9.66	8.51	6.51	6.18	5.29	4.89	7.04	8.38			
175	7.23	6.63	5.49	4.89	5.01	5.17	6.80	7.13	6.29	6.09	4.70	4.25	3.38	4.10	4.33	5.02			
180	4.77	4.29	3.80	3.33	3.74	3.91	4.44	4.00	5.12	4.62	3.90	3.60	3.56	4.10	4.32	4.91			

2.3 Electrical, Photometric and Chromaticity Measurements

Test date	2024-09-25	**Test Ambient:**	25±1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X4(0%,3000K)	**Total Operating Time (min)**	61

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-C1	120.0	60	0.3990	47.81	0.9985	5.93
	277.0	60	0.1729	46.47	0.9703	13.20

Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1469) (4π geometry):

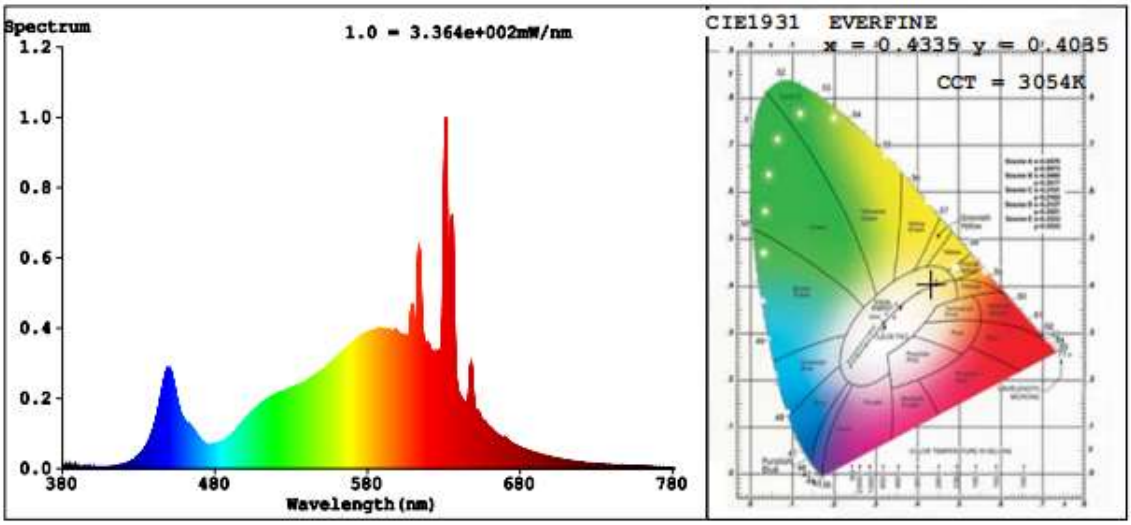
Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	3054
Duv	0.0002
Chromaticity (x, y)	x=0.4335 y=0.4035
Chromaticity (u', v')	u'=0.2486 v'=0.5206

Parameter	Result
Color Rendering Index (CRI)	83.4
R9	17
Rg	97
Rf	84
Rcs,h1(%)	-11

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	6255	6144
Luminous Efficacy (lm/W)	130.83	132.21

Spectral Power Distribution & Chromaticity Diagram



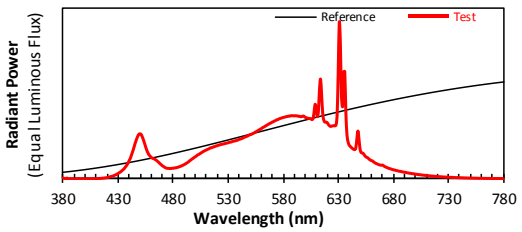
Special Color Rendering Indices

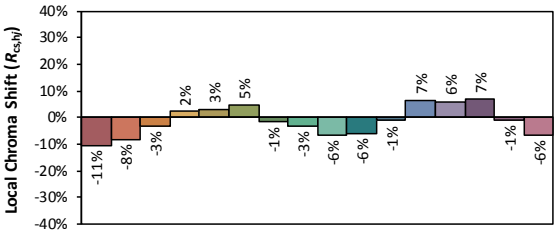
R1 =82	R2 =89	R3 =96	R4 =82	R5 =81	R6 =87	R7 =85	
R8 =64	R9 =17	R10=75	R11=81	R12=67	R13=83	R14=98	R15=76

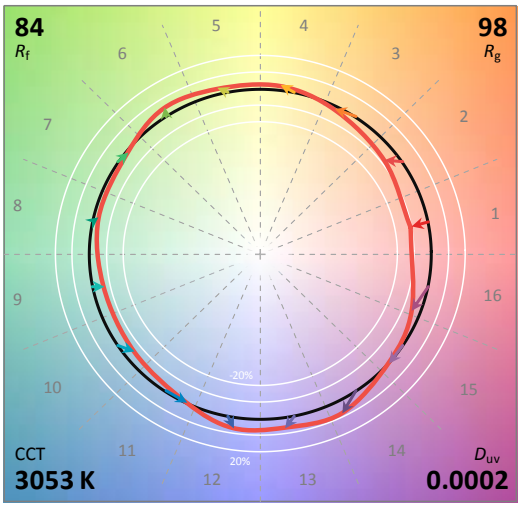
TM30

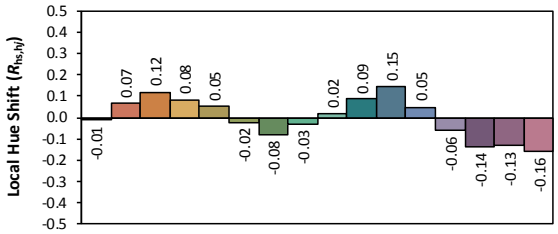
ANSI/IES TM-30-18 Color Rendition Report

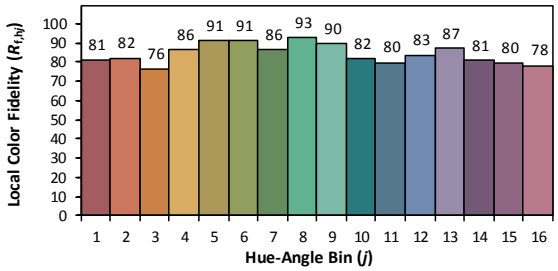
Source:	BXEN-30E-21L-3F	**Manufacturer:**	RAB LIGHTING Inc
Date:	2024-09-25	**Model:**	FR2X4(0%, 3000K)

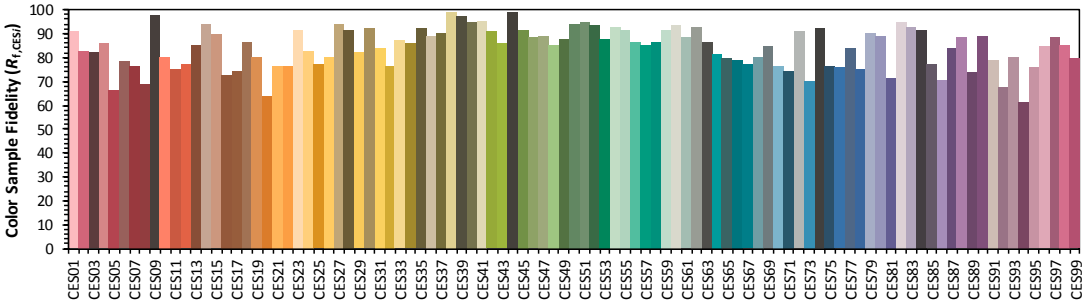












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.4335
y	0.4033
u'	0.2487
v'	0.5206

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	2024-09-25	**Test Ambient:**	25±1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X4(50%,4000K)	**Total Operating Time (min)**	61

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-C1	120.0	60	0.3914	46.89	0.9984	5.94
	277.0	60	0.1696	45.58	0.9702	13.21

Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1470) (4π geometry):

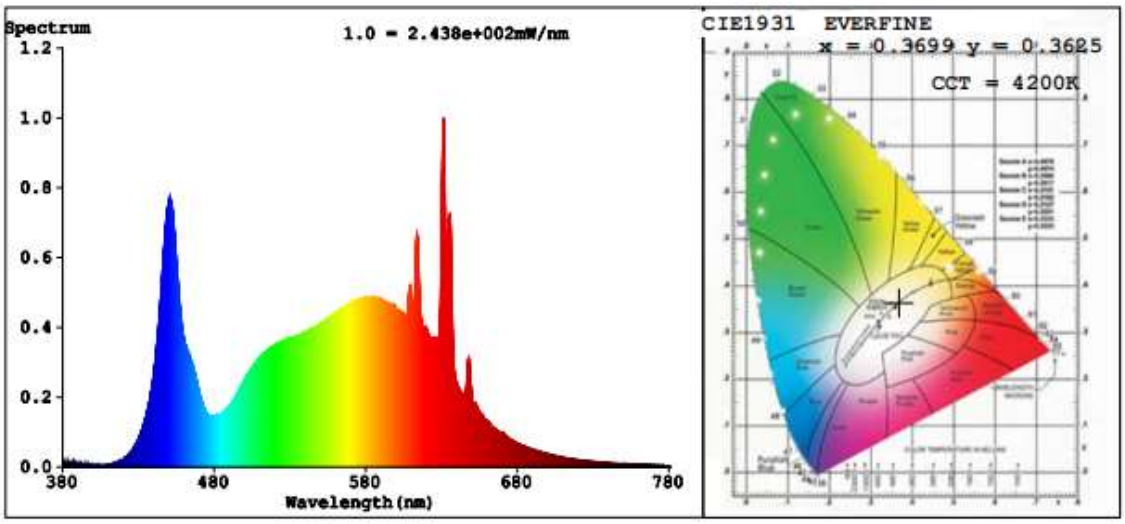
Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	4200
Duv	-0.0036
Chromaticity (x, y)	x=0.3699 y=0.3625
Chromaticity (u', v')	u'=0.2238 v'=0.4936

Parameter	Result
Color Rendering Index (CRI)	86.1
R9	31
Rg	98
Rf	84
Rcs,h1(%)	-11

Photometric Measurement –Sphere-Spectroradiometer Method:

Parameter	Result	
Test Voltage (V)	120	277
Frequency (Hz)	60	60
Total Luminous (lm)	6396	6282
Luminous Efficacy (lm/W)	136.40	137.82

Spectral Power Distribution & Chromaticity Diagram



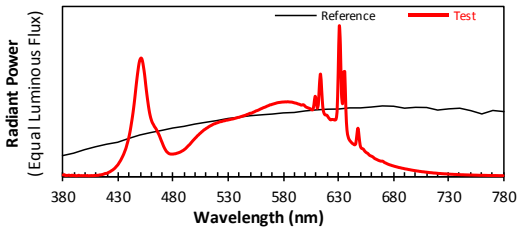
Special Color Rendering Indices

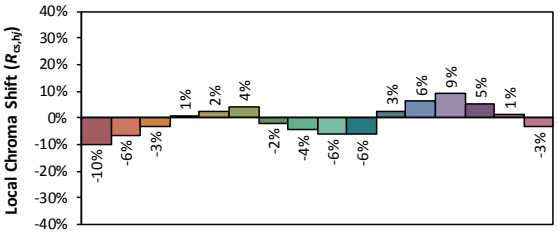
R1 =86	R2 =91	R3 =93	R4 =86	R5 =85	R6 =86	R7 =88	
R8 =73	R9 =31	R10=77	R11=85	R12=63	R13=87	R14=96	R15=82

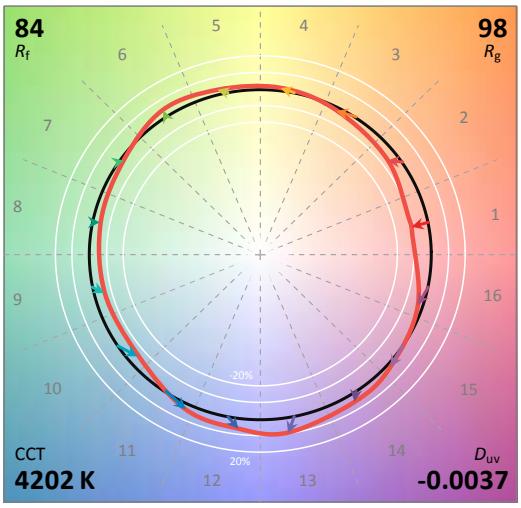
TM30

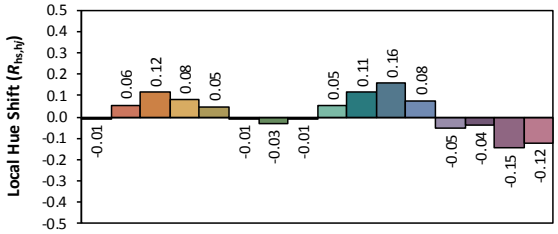
ANSI/IES TM-30-18 Color Rendition Report

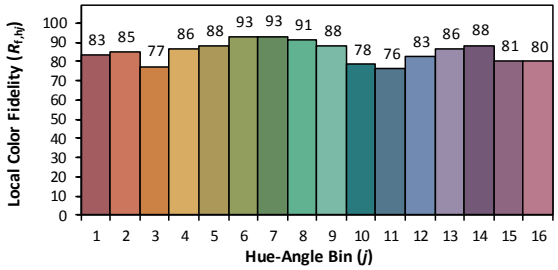
Source:	BXEN-30E-21L-3F BXEN-65E-21L-3F	**Manufacturer:**	RAB LIGHTING Inc
Date:	2024-09-25	**Model:**	FR2X4(50%, 4000K)

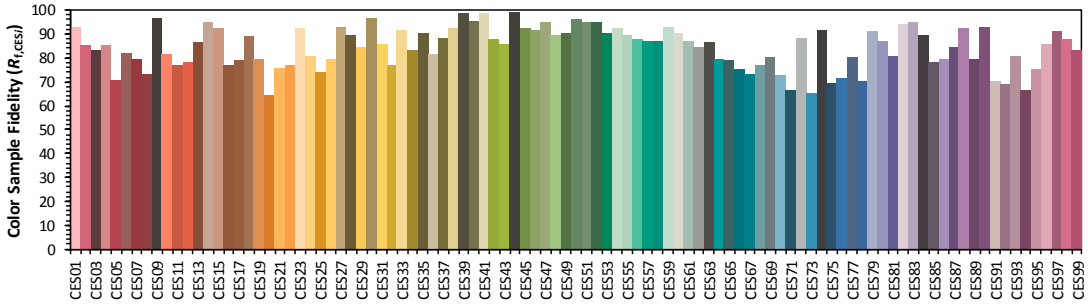












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3699
y	0.3624
u'	0.2239
v'	0.4935

CIE 13.3-1995 (CRI)

R_a	86
R_9	31

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	2024-09-25	**Test Ambient:**	25±1 ºC
Test Orientation	As intended	**Stabilization Time (min)**	60
Model Number	FR2X4(100%,6500 K)	**Total Operating Time (min)**	61

Electrical Measurement:

Sample No.	Voltage (Vac)	Frequency (Hz)	Current (A)	Power (W)	Power Factor	THD %
JDE240618-C1	120.0	60	0.3946	47.27	0.9983	5.95
	277.0	60	0.1710	45.95	0.9701	13.22

Chromaticity Measurement - Sphere-Spectroradiometer Method(Self-absorption:1.1472) (4π geometry):

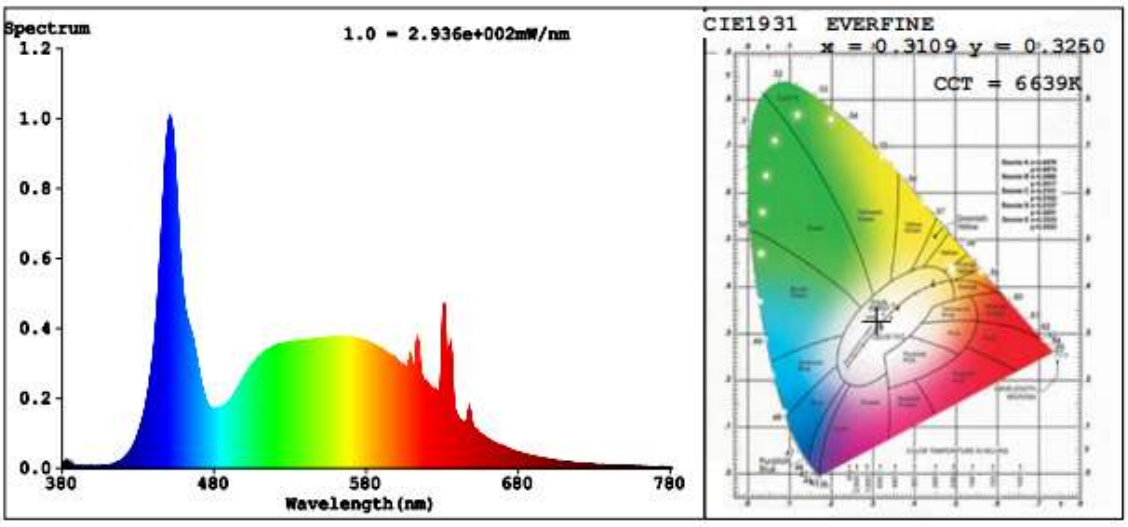
Parameter	Result
Test Voltage (V)	120
Frequency (Hz)	60
CCT (K)	6639
Duv	0.0021
Chromaticity (x, y)	x=0.3109 y=0.3250
Chromaticity (u', v')	u'=0.1981 v'=0.4659

Parameter	Result
Color Rendering Index (CRI)	84.2
R9	19
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)	6290	6178
Luminous Efficacy (lm/W)	133.07	134.45

Spectral Power Distribution & Chromaticity Diagram



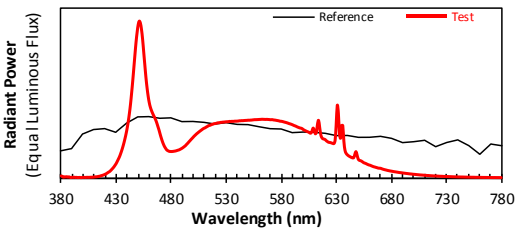
Special Color Rendering Indices

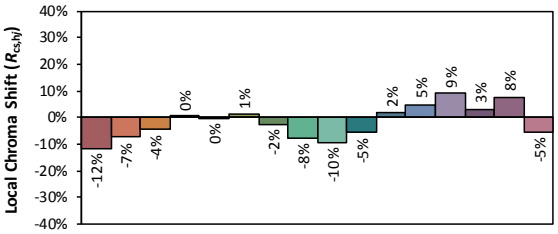
R1 =83	R2 =88	R3 =89	R4 =85	R5 =83	R6 =82	R7 =89	
R8 =74	R9 =19	R10=70	R11=84	R12=56	R13=84	R14=94	R15=80

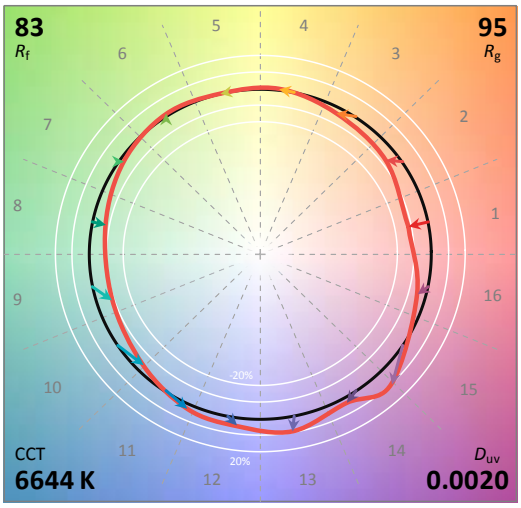
TM30

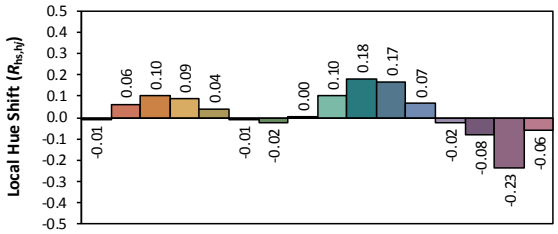
ANSI/IES TM-30-18 Color Rendition Report

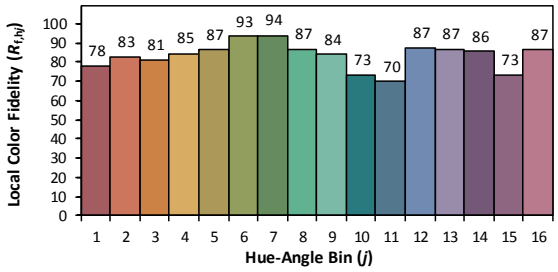
Source:	BXEN-65E-21L-3F	**Manufacturer:**	RAB LIGHTING Inc
Date:	2024-09-25	**Model:**	FR2X4(100%, 6500K)

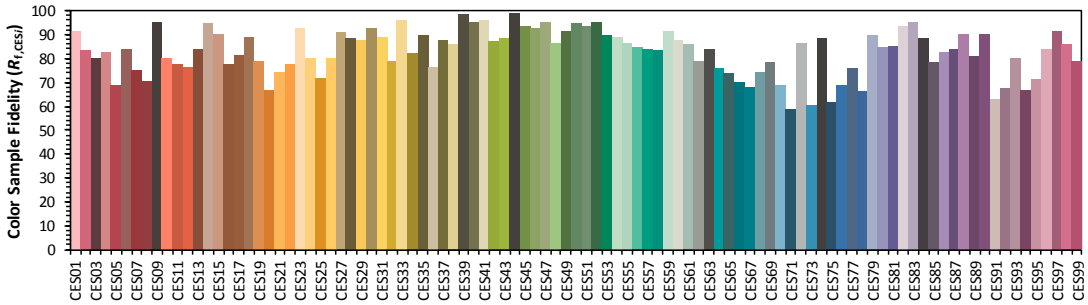












Notes: This is a recommended method for displaying ANSI/IES TM-30-18 information.

x	0.3108
y	0.3248
u'	0.1981
v'	0.4658

CIE 13.3-1995 (CRI)

R_a	84
R_9	20

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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 ********