RAB LIGHTING

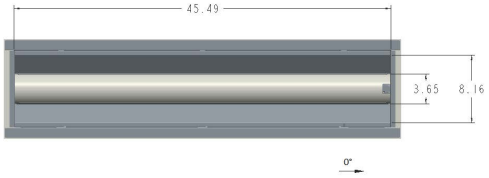
NVLAP LAB CODE: 201058-0

170 Ludlow Ave, Northvale, NJ 07647 • 888 722-1000 • rabweb.com

REPORT NUMBER: RAB04172 PAGE: 1 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10
LUMINAIRE: WHITE PAINTED SHEET METAL HOUSING, 2 WHITE CIRCUIT BOARDS EACH WITH 40 LEDS, MATTE WHITE POLYCARBONATE LENS IN THE CENTER, ROUGH SURFACE FACING OUT. FIXTURE WAS MOUNTED IN FLECO TXF131A232MV UL E43814 HOUSING.
LAMPS: EIGHTY LIGHT EMITTING DIODES (LEDS), VERTICAL BASE-UP POSITION.
(SEE PAGE 2 FOR MORE INFORMATION)

CANDELA DISTRIBUTION

	0.0	22.5	45.0	67.5	90.0	FLUX
0	738	738	738	738	738	
5	741	741	739	729	724	70
15	721	719	713	700	695	200
25	677	673	662	643	637	304
35	614	608	590	563	554	367
45	527	519	499	469	455	381
55	426	414	394	370	352	351
65	332	319	286	259	241	285
75	223	214	189	148	133	191
85	64	64	67	56	40	66
90	1	1	1	1	3	



ZONAL LUMEN SUMMARY

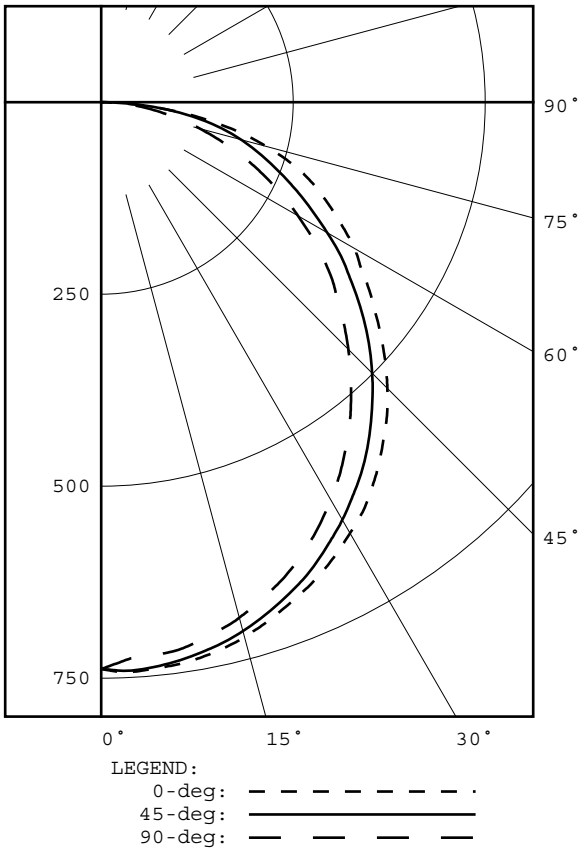
ZONE	LUMENS	%FIXT
0- 30	574	25.9
0- 40	940	42.5
0- 60	1672	75.5
0- 90	2215	100.0
90-180	0	0.0
0-180	2215	100.0

TOTAL INPUT WATTS = 19.5
EFFICACY = 113.6 Lm/W
CIE TYPE - DIRECT

PLANE	: 0-DEG	90-DEG
SPACING CRITERIA	: 1.3	1.2
PLANE	: 0-DEG	90-DEG
LUMINOUS LENGTH	:45.490	8.160

LUMINANCE DATA IN CANDELA/SQ METER

ANGLE IN DEG	AVERAGE 0-DEG	AVERAGE 45-DEG	AVERAGE 90-DEG
45	3111.	2946.	2686.
55	3100.	2867.	2562.
65	3279.	2825.	2380.
75	3596.	3048.	2145.
85	3065.	3209.	1916.



Checked	P.ALBERS
Approved	D.WANG-MUNSON

REPORT NUMBER: RAB04172 PAGE: 2 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10

ADDITIONAL INFORMATION

NOTE: THIS REPORT WITH THE USE OF THE NVLAP LOGO SHALL NOT BE USED BY THE CLIENT TO CLAIM PRODUCT CERTIFICATION, APPROVAL, OR ENDORSEMENT BY NVLAP, NIST, OR ANY AGENCY OF THE FEDERAL GOVERNMENT.
NOTE: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED.
TOTAL INPUT WATTS = 19.512 W AT 277.0 VAC.
LED DRIVER: RDF25U7-39
TEST PROCEDURE: IESNA LM-79-08
LM-80 DATA AVAILABLE FROM MANUFACTURER FOR SOLID STATE SOURCE
AMBIENT: 25.0
ACCREDITED LABORATORY CODE 201058-0

REPORT NUMBER: RAB04172 PAGE: 3 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10

PLANE	:	0-DEG 90-DEG
BEAM ANGLE (50%)	:	121.9 X 106.4 DEGREES
FIELD ANGLE (10%)	:	168.8 X 162.0 DEGREES

REPORT NUMBER: RAB04172 PAGE: 4 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10

CANDELA DISTRIBUTION

	0.0	22.5	45.0	67.5	90.0
0.0	738	738	738	738	738
2.5	743	743	741	730	727
5.0	741	741	739	729	724
7.5	739	740	735	725	721
10.0	735	734	729	718	714
12.5	729	728	722	710	705
15.0	721	719	713	700	695
17.5	711	709	702	687	682
20.0	700	698	690	674	669
22.5	689	686	677	659	654
25.0	677	673	662	643	637
27.5	663	659	645	625	618
30.0	648	643	628	605	598
32.5	633	626	609	584	577
35.0	614	608	590	563	554
37.5	594	588	569	541	531
40.0	572	565	546	517	506
42.5	551	542	523	493	481
45.0	527	519	499	469	455
47.5	502	494	474	444	429
50.0	476	468	448	419	402
52.5	450	441	421	393	379
55.0	426	414	394	370	352
57.5	401	391	369	343	324
60.0	381	368	340	316	296
62.5	356	343	312	288	269
65.0	332	319	286	259	241
67.5	309	294	260	231	214
70.0	285	270	236	202	186
72.5	256	244	212	174	159
75.0	223	214	189	148	133
77.5	188	182	163	123	108
80.0	149	146	134	101	83
82.5	108	106	102	80	61
85.0	64	64	67	56	40
87.5	22	22	28	30	20
90.0	1	1	1	1	3

REPORT NUMBER: RAB04172 PAGE: 5 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10

ZONAL LUMEN SUMMARY

0- 5	18.
5- 10	52.
10- 15	85.
15- 20	115.
20- 25	141.
25- 30	162.
30- 35	178.
35- 40	188.
40- 45	192.
45- 50	190.
50- 55	181.
55- 60	169.
60- 65	153.
65- 70	132.
70- 75	109.
75- 80	82.
80- 85	50.
85- 90	15.

REPORT NUMBER: RAB04172 PAGE: 6 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10

5-DEGREE ZONAL LUMEN SUMMARY

0- 5	18
5- 10	52
10- 15	85
15- 20	115
20- 25	141
25- 30	162
30- 35	178
35- 40	188
40- 45	192
45- 50	190
50- 55	181
55- 60	169
60- 65	153
65- 70	132
70- 75	109
75- 80	82
80- 85	50
85- 90	15
90- 95	0
95-100	0
100-105	0
105-110	0
110-115	0
115-120	0
120-125	0
125-130	0
130-135	0
135-140	0
140-145	0
145-150	0
150-155	0
155-160	0
160-165	0
165-170	0
170-175	0
175-180	0

10-DEGREE ZONAL LUMEN SUMMARY

0- 10	70
0- 20	270
0- 30	574
0- 40	940
0- 50	1322
0- 60	1672
0- 70	1957
0- 80	2149
0- 90	2214
0-100	2215
0-110	2215
0-120	2215
0-130	2215
0-140	2215
0-150	2215
0-160	2215
0-170	2215
0-180	2215

REPORT NUMBER: RAB04172 PAGE: 7 OF 8
ISSUE DATE: 03/20/18 DATE SAMPLE TESTED: 03/20/18

CATALOG NUMBER: RTLED1X4-19NHC/D10

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	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	108	103	98	94	105	100	96	92	96	93	90	92	89	87	89	86	84	82
2	98	89	82	76	95	87	80	75	83	78	73	80	75	71	77	73	70	68
3	89	78	69	62	86	76	68	62	73	66	61	70	65	60	68	63	59	56
4	81	69	60	53	79	67	59	52	65	57	52	62	56	51	60	55	50	48
5	75	61	52	45	72	60	51	45	58	50	44	56	49	44	54	48	43	41
6	69	55	46	39	67	54	45	39	52	45	39	51	44	38	49	43	38	36
7	64	50	41	35	62	49	41	35	48	40	34	46	39	34	45	38	34	32
8	59	46	37	31	58	45	37	31	43	36	31	42	35	30	41	35	30	28
9	55	42	33	28	54	41	33	28	40	33	28	39	32	27	38	32	27	25
10	52	39	31	25	51	38	30	25	37	30	25	36	29	25	35	29	25	23

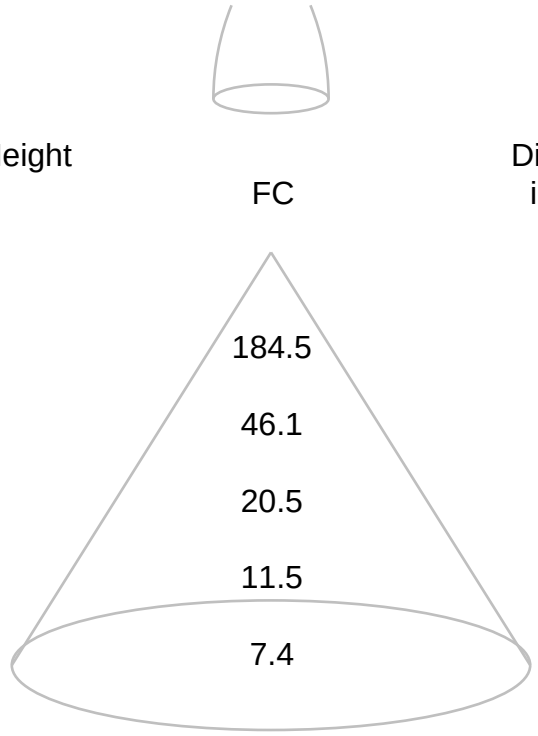
ALL CANDELA, LUMENS, LUMINANCE, AND VCP VALUES IN THIS REPORT ARE BASED ON ABSOLUTE PHOTOMETRY. THE COEFFICIENT OF UTILIZATION VALUES ARE BASED ON THE TOTAL ABSOLUTE LUMEN OUTPUT OF THIS LUMINAIRE SAMPLE.

REPORT NUMBER: RAB04172
ISSUE DATE: 03/20/18
CATALOG NUMBER: RTLED1X4-19NHC/D10

DATE SAMPLE TESTED: 03/20/18

CONE OF LIGHT DIAGRAM

(diameter shown is where fc value is half the fc at nadir)



Mounting Height in feet	FC	Diameter in feet
2.0	184.5	2.5
4.0	46.1	5.0
6.0	20.5	7.6
8.0	11.5	10.1
10.0	7.4	12.6

Note: The candela values used to generate this diagram were obtained by averaging the photometric data into a single plane.

NVLAP LAB CODE: 201058-0

170 Ludlow Ave, Northvale, NJ 07647 • 888 722-1000 • rabweb.com

REPORT NUMBER: RAB04176
DATE: 3/21/2018
PREPARED FOR: RAB LIGHTING INC.RC LIGHTING
CATALOG NUMBER: RTLED1X4-19NHC/D10

ADDRESS: 170 LUDLOW AVE, NORTHVALE, NJ 07067

LUMINAIRE: WHITE PAINTED SHEET METAL HOUSING, 2 WHITE CIRCUIT BOARDS EACH WITH 40 LEDS, MATTE WHITE POLYCARBONATE LENS IN THE CENTER, ROUGH SURFACE FACING OUT. FIXTURE WAS MOUNTED IN FLECO TXF131A232MV UL E43814 HOUSING.

LAMP: EIGHTY LIGHT EMITTING DIODES (LEDS), VERTICAL BASE-UP POSITION.

DRIVER: RDF25U7-39

OBJECT OF TEST: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED AT THE RATED INPUT VOLTAGES (277.0 AND 120.0 VAC, 60Hz) TO THE TEST SAMPLE.

INSTRUMENTS:	Calibration Due:
GWINSTEK PROGRAMMABLE AC POWER SOURCE APS-7100	N/A
CHROMA PROGRAMMABLE DIGITAL POWER METER MODEL 66202	3/05/19
OCEAN OPTICS QE65PRO Spectroradiometer	02/22/19
RAB 2.0 meter Diameter Integrating Sphere, 4PI Geometry	02/22/19

OBJECT OF TEST: Measure the Absolute Flux in lumens*, Total Radiant Flux*, Spectral Power Distribution (SPD), Correlated Color Temperature (CCT), Color Rendering Indices (CRIa,1-14), Chromaticity Coordinates (x,y; u'v'), ANSI C78.377 Duv, and electrical data including ANSI C82.77-2002 Power Factor (PF), and Total Harmonic Distortion (THD) to the test sample. Measure electrical data including Total Harmonic Distortion (THD) at maximum nominal rated input voltage. Report Off-State Power.

PROCEDURE: The test sample was mounted inside the integrating sphere, energized, and allowed to stabilize. After stabilization occurred, measurements were taken. In order to measure mean performance, multiple data sets were recorded and averaged. Readings were taken with the test sample operating at 60 HZ input in a 25 +/-1 degree Celsius free air ambient and in accordance with IESNA LM-79-08. Electrical data was also recorded at maximum nominal rated input voltage (120.0 VAC). All data are traceable to the National Institute of Standards and Technology. Off-State Power was reported with no voltage applied to the sample.

*NOTE: Proper calibration of integrating spheres for measuring total flux output of non-directional samples will produce reliable, repeatable results within the calibration tolerances of the equipment used. However, measurement of test samples with significant self absorption and/or directional output, even when these effects are compensated for, are likely to have a greater variation in results compared to the flux output calculated from a goniophotometric exploration since these artifacts do not affect the goniophotometric results.

RESULTS: (continued subsequent pages)

Checked X.CAO

Approved D.WANG-MUNSON
Lighting Engineer

RAB LIGHTING

NVLAP LAB CODE: 201058-0

170 Ludlow Ave, Northvale, NJ 07647 • 888 722-1000 • rabweb.com

REPORT NUMBER: RAB04176
DATE: 3/21/2018
PREPARED FOR: RAB LIGHTING INC.RC LIGHTING
CATALOG NUMBER: RTLED1X4-19NHC/D10

RESULTS:

PHOTOMETRIC	
Total Integrated Flux (lumens)	2215 *
SPECTRORADIOMETRIC	
Observer	CIE 1931 2 degree
Chromaticity Ordinate x	0.3808
Chromaticity Ordinate y	0.3787
Observer	CIE 1976 2 degree
Chromaticity Ordinate u'	0.2246
Chromaticity Ordinate v'	0.5025
Correlated Color Temp CCT (K)	4004
ANSI C78.377-2008 Duv	0.001
Total Radiant Flux (milliWatts)	7717 *
ELECTRICAL	
Input Voltage (Volts AC)	277.0
Input Current (Amps AC)	0.079
Input Power (Watts)	19.5
Input Power Factor (%)	89.4
Input Current THD (%)	13.2
Input Voltage THD (%)	0.2
EFFICACY (Lumens/Watt)	113.6
ELECTRICAL AT MAX NONIMAL INPUT	
Input Voltage (Volts AC)	120.0
Input Current (Amps AC)	0.159
Input Power (Watts)	18.8
Input Power Factor (%)	98.6
Input Current THD (%)	11.6
Input Voltage THD (%)	0.2
Off-State Power (Watts)	0.0

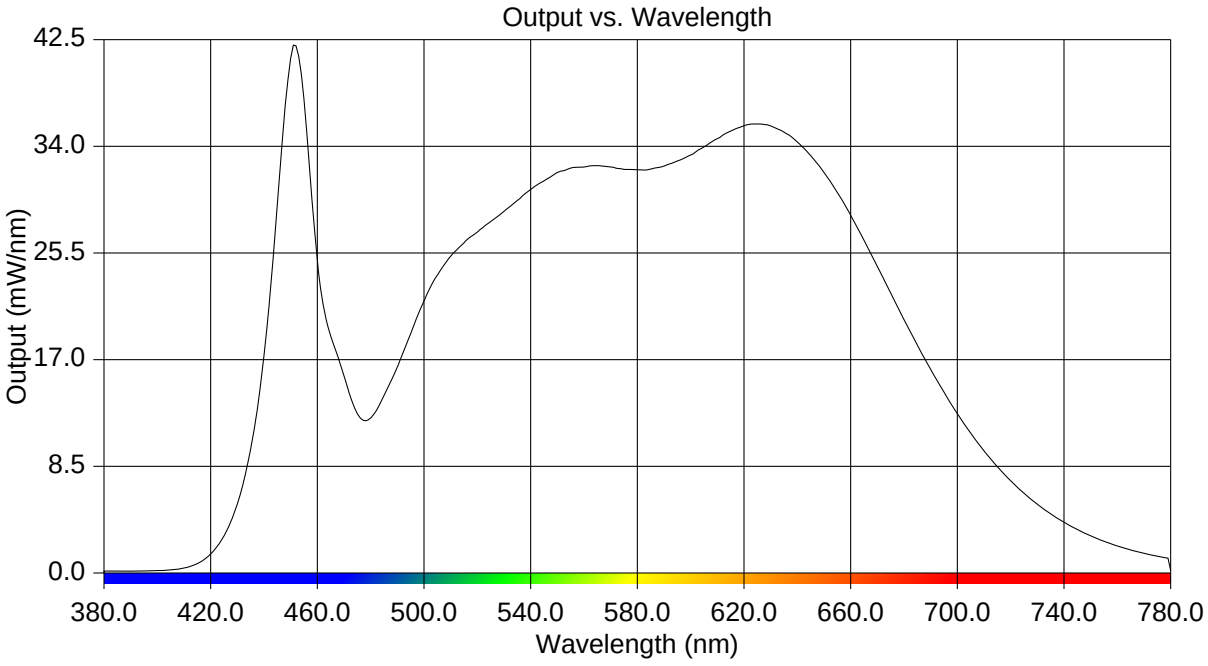
COLOR RENDERING INDICES	CRI
Ra (Average 1-8)	94
R1 Light greyish red	94
R2 Dark greyish yellow	95
R3 Strong yellowish green	93
R4 Moderate yellowish green	95
R5 Light bluish green	93
R6 Light blue	91
R7 Light violet	97
R8 Light reddish purple	92
R9 Strong red	79
R10 Strong yellow	86
R11 Strong green	94
R12 Strong blue	72
R13 Light yellowish pink (skin)	94
R14 Moderate olive green (leaf)	96

*NOTE: Proper calibration of integrating spheres for measuring total flux output of non-directional samples will produce reliable, repeatable results within the calibration tolerances of the equipment used. However, measurement of test samples with significant self absorption and/or directional output, even when these effects are compensated for, are likely to have a greater variation in results compared to the flux output calculated from a goniophotometric exploration since these artifacts do not affect the goniophotometric results.

REPORT NUMBER: RAB04176 Page 3 of 4
DATE: 3/21/2018
PREPARED FOR: RAB LIGHTING INC.RC LIGHTING
CATALOG NUMBER: RTLED1X4-19NHC/D10

RESULTS:

Wavelength	mW per nm	Wavelength	mW per nm	Wavelength	mW per nm
380	0.144	515	26.306	650	31.918
385	0.157	520	27.179	655	30.319
390	0.147	525	28.008	660	28.499
395	0.163	530	28.820	665	26.541
400	0.190	535	29.685	670	24.426
405	0.244	540	30.562	675	22.323
410	0.389	545	31.250	680	20.173
415	0.749	550	31.907	685	18.159
420	1.514	555	32.267	690	16.201
425	2.952	560	32.340	695	14.416
430	5.502	565	32.461	700	12.692
435	9.908	570	32.375	705	11.138
440	17.336	575	32.160	710	9.727
445	29.348	580	32.129	715	8.486
450	41.016	585	32.188	720	7.354
455	37.730	590	32.437	725	6.364
460	24.911	595	32.832	730	5.481
465	18.893	600	33.299	735	4.708
470	15.719	605	33.954	740	4.033
475	12.689	610	34.611	745	3.470
480	12.351	615	35.215	750	2.962
485	14.155	620	35.641	755	2.526
490	16.411	625	35.770	760	2.157
495	19.066	630	35.634	765	1.842
500	21.684	635	35.127	770	1.566
505	23.731	640	34.341	775	1.342
510	25.238	645	33.288	780	0.200



REPORT NUMBER: RAB04176
DATE: 3/21/2018
PREPARED FOR: RAB LIGHTING INC.RC LIGHTING
CATALOG NUMBER: RTLED1X4-19NHC/D10

CIE Chromaticity Diagram