RAB LIGHTING

NVLAP LAB CODE: 201058-0

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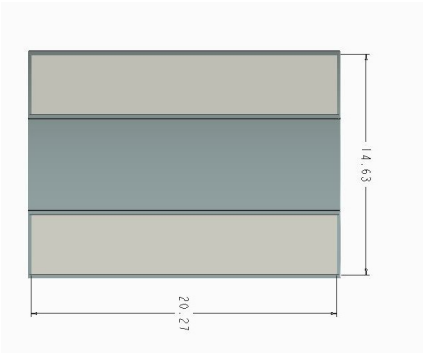
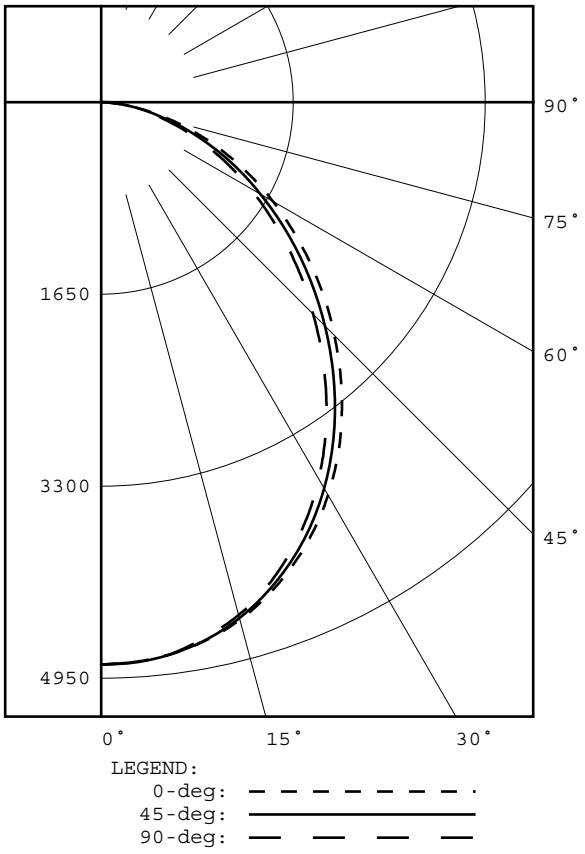
REPORT NUMBER: RAB01681 PAGE: 1 OF 9
ISSUE DATE: 01/29/16 DATE SAMPLE TESTED: 01/29/16
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RAIL95W/480
LUMINAIRE: EXTRUDED METAL HOUSING WITH HEAT SINK FINS, FOUR WHITE CIRCUIT BOARD WITH SIXTY FOUR LEDS ON EACH BOARD, METAL REFLECTOR WITH SPECULAR FINISH, FLAT TRANSLUCENT LENS WITH FROSTED SIDE IN.
LAMPS: TWO HUNDRED AND FIFTY SIX LIGHT EMITTING DIODES (LEDS).
NOTE: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED.
TOTAL INPUT WATTS = 92.154 W AT 480.0 VAC.
LED DRIVER:RD-H100-A2000-480
(SEE PAGE 2 FOR MORE INFORMATION)



CANDELA DISTRIBUTION

	0.0	22.5	45.0	67.5	90.0	FLUX
0	4832	4832	4832	4832	4832	
5	4807	4810	4810	4805	4808	456
15	4605	4600	4590	4566	4563	1291
25	4182	4168	4136	4081	4068	1898
35	3574	3546	3486	3396	3371	2170
45	2832	2800	2717	2615	2576	2091
55	2072	2034	1948	1854	1824	1742
65	1342	1303	1238	1172	1142	1229
75	666	642	605	572	554	649
85	130	132	148	158	161	177
90	6	19	40	55	59	
95	0	0	0	4	5	9
105	0	0	0	1	1	0
115	0	0	1	1	1	1
125	1	1	1	1	1	1
135	1	1	1	1	1	1
145	2	2	2	2	2	1
155	2	2	2	2	2	1
165	2	2	2	3	3	1
175	2	3	3	3	3	0
180	3	3	3	3	3	



ZONAL LUMEN SUMMARY

ZONE	LUMENS	%FIXT
0- 30	3646	31.1
0- 40	5816	49.6
0- 60	9650	82.3
0- 90	11705	99.9
90-120	10	0.1
90-130	11	0.1
90-150	12	0.1
90-180	14	0.1
0-180	11719	100.0

TOTAL INPUT WATTS = 92.2
EFFICACY = 127.1 Lm/W
CIE TYPE - DIRECT

PLANE	: 0-DEG	90-DEG
SPACING CRITERIA	: 1.2	1.2

Checked	*X.CAO*
Approved	*D.WANG-MUNSON*

REPORT NUMBER: RAB01681 PAGE: 2 OF 9
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ADDITIONAL INFORMATION

TEST PROCEDURE: IESNA LM-79-08
TEST DISTANCE: 28.25 FEET
ACCREDITED LABORATORY CODE 201058-0
LM-80 DATA AVAILABLE FROM MANUFACTURER FOR SOLID STATE SOURCE

REPORT NUMBER: RAB01681 PAGE: 3 OF 9
ISSUE DATE: 01/29/16 DATE SAMPLE TESTED: 01/29/16
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PLANE	: 0-DEG	90-DEG
BEAM ANGLE (50%)	: 101.0 X	94.3 DEGREES
FIELD ANGLE (10%)	: 156.0 X	153.1 DEGREES

REPORT NUMBER: RAB01681 PAGE: 4 OF 9
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PLANE	: 0-DEG	90-DEG
LUMINOUS LENGTH	:20.270	14.630

LUMINANCE DATA IN CANDELA/SQ METER

ANGLE IN DEG	AVERAGE 0-DEG	AVERAGE 45-DEG	AVERAGE 90-DEG
45	20926.	20076.	19034.
55	18875.	17745.	16615.
65	16591.	15306.	14119.
75	13445.	12213.	11184.
85	7793.	8872.	9652.

REPORT NUMBER: RAB01681 PAGE: 5 OF 9
ISSUE DATE: 01/29/16 DATE SAMPLE TESTED: 01/29/16
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CANDELA DISTRIBUTION

	0.0	22.5	45.0	67.5	90.0
0.0	4832	4832	4832	4832	4832
5.0	4807	4810	4810	4805	4808
10.0	4733	4733	4730	4715	4713
15.0	4605	4600	4590	4566	4563
20.0	4418	4408	4388	4348	4345
25.0	4182	4168	4136	4081	4068
30.0	3899	3879	3832	3757	3740
35.0	3574	3546	3486	3396	3371
40.0	3213	3180	3110	3009	2977
45.0	2832	2800	2717	2615	2576
50.0	2454	2410	2330	2229	2196
55.0	2072	2034	1948	1854	1824
60.0	1705	1663	1581	1508	1473
65.0	1342	1303	1238	1172	1142
70.0	994	962	909	858	837
75.0	666	642	605	572	554
80.0	372	359	345	331	328
85.0	130	132	148	158	161
90.0	6	19	40	55	59
95.0	0	0	0	4	5
100.0	0	0	0	0	0
105.0	0	0	0	1	1
110.0	0	0	0	0	0
115.0	0	0	1	1	1
120.0	1	1	1	1	1
125.0	1	1	1	1	1
130.0	1	1	1	1	1
135.0	1	1	1	1	1
140.0	1	1	1	1	2
145.0	2	2	2	2	2
150.0	2	2	2	2	2
155.0	2	2	2	2	2
160.0	2	2	2	3	3
165.0	2	2	2	3	3
170.0	2	2	3	3	3
175.0	2	3	3	3	3
180.0	3	3	3	3	3

REPORT NUMBER: RAB01681 PAGE: 6 OF 9
ISSUE DATE: 01/29/16 DATE SAMPLE TESTED: 01/29/16
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ZONAL LUMEN SUMMARY

0- 5	115.
5- 10	341.
10- 15	552.
15- 20	739.
20- 25	892.
25- 30	1006.
30- 35	1074.
35- 40	1096.
40- 45	1075.
45- 50	1017.
50- 55	927.
55- 60	815.
60- 65	686.
65- 70	543.
70- 75	396.
75- 80	253.
80- 85	130.
85- 90	47.
90- 95	8.
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	1.
145-150	1.
150-155	1.
155-160	0.
160-165	0.
165-170	0.
170-175	0.
175-180	0.

REPORT NUMBER: RAB01681 PAGE: 7 OF 9
ISSUE DATE: 01/29/16 DATE SAMPLE TESTED: 01/29/16
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5-DEGREE ZONAL LUMEN SUMMARY

0- 5	115
5- 10	341
10- 15	552
15- 20	739
20- 25	892
25- 30	1006
30- 35	1074
35- 40	1096
40- 45	1075
45- 50	1017
50- 55	927
55- 60	815
60- 65	686
65- 70	543
70- 75	396
75- 80	253
80- 85	130
85- 90	47
90- 95	8
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	1
145-150	1
150-155	1
155-160	0
160-165	0
165-170	0
170-175	0
175-180	0

10-DEGREE ZONAL LUMEN SUMMARY

0- 10	456
0- 20	1748
0- 30	3646
0- 40	5816
0- 50	7908
0- 60	9650
0- 70	10878
0- 80	11527
0- 90	11705
0-100	11714
0-110	11714
0-120	11715
0-130	11715
0-140	11716
0-150	11717
0-160	11718
0-170	11719
0-180	11719

REPORT NUMBER: RAB01681 PAGE: 8 OF 9
ISSUE DATE: 01/29/16 DATE SAMPLE TESTED: 01/29/16

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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	109	105	101	97	107	103	99	96	98	95	93	94	92	90	91	89	87	85
2	100	92	86	80	97	90	84	79	87	82	77	83	79	76	80	77	74	72
3	92	81	74	67	89	80	73	67	77	71	66	74	69	64	72	67	63	61
4	84	73	64	58	82	71	63	57	69	62	57	66	61	56	64	59	55	53
5	78	65	57	50	76	64	56	50	62	55	49	60	54	49	58	53	48	46
6	72	59	50	44	70	58	50	44	56	49	43	55	48	43	53	47	43	41
7	67	54	45	39	65	53	45	39	51	44	39	50	43	38	49	43	38	36
8	62	49	41	35	61	48	40	35	47	40	35	46	39	35	45	39	34	32
9	58	45	37	32	57	45	37	32	43	36	31	42	36	31	41	35	31	29
10	55	42	34	29	53	41	34	29	40	33	29	39	33	29	38	33	28	27

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.

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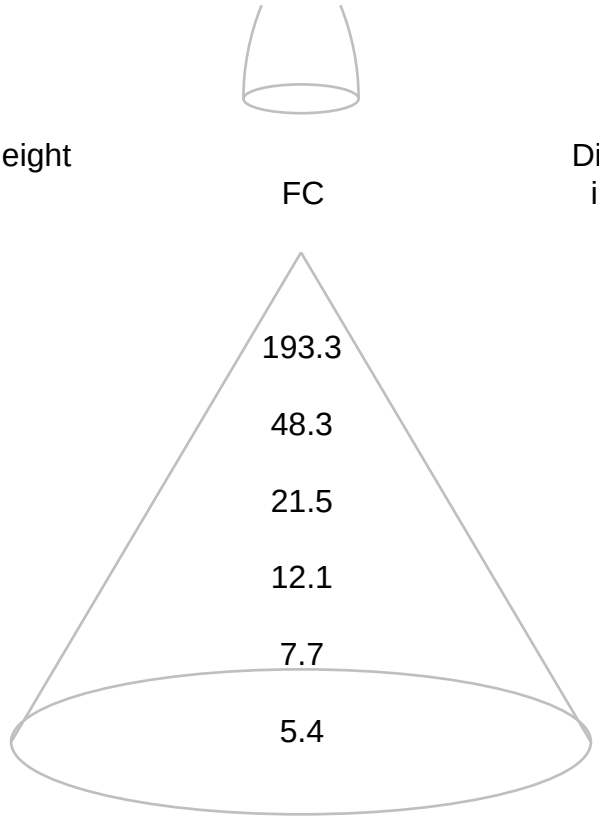
CONE OF LIGHT DIAGRAM

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



Mounting Height in feet	FC	Diameter in feet
5.0	193.3	5.9
10.0	48.3	11.8
15.0	21.5	17.7
20.0	12.1	23.6
25.0	7.7	29.5
30.0	5.4	35.4

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

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REPORT NUMBER: RAB01682
DATE: 1/29/2016
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RAIL95W/480

ADDRESS: 170 LUDLOW AVE, NORTHVALE, NJ 07647

LUMINAIRE: EXTRUDED METAL HOUSING WITH HEAT SINK FINS, FOUR WHITE CIRCUIT BOARD WITH SIXTY FOUR LEDS ON EACH BOARD, METAL REFLECTOR WITH SPECULAR FINISH, FLAT TRANSLUCENT LENS WITH FROSTED SIDE IN.

LAMP: TWO HUNDRED AND FIFTY SIX LIGHT EMITTING DIODES (LEDS).

DRIVER: RD-H100-A2000-480

OBJECT OF TEST: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED AT THE RATED INPUT VOLTAGES (480.0 AND 347.0 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	3/9/16
OCEAN OPTICS QE65PRO Spectroradiometer	1/25/17
RAB 2.0 meter Diameter Integrating Sphere, 4PI Geometry	1/25/17

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 (347.0 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

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RESULTS:

PHOTOMETRIC	
Total Integrated Flux (lumens)	11719 *
SPECTRORADIOMETRIC	
Observer	CIE 1931 2 degree
Chromaticity Ordinate x	0.3453
Chromaticity Ordinate y	0.3540
Observer	CIE 1976 2 degree
Chromaticity Ordinate u'	0.2106
Chromaticity Ordinate v'	0.4859
Correlated Color Temp CCT (K)	4999
ANSI C78.377-2008 Duv	0.001
Total Radiant Flux (milliWatts)	35335 *
ELECTRICAL	
Input Voltage (Volts AC)	480.0
Input Current (Amps AC)	0.209
Input Power (Watts)	92.2
Input Power Factor (%)	91.8
Input Current THD (%)	11.3
Input Voltage THD (%)	0.2
EFFICACY (Lumens/Watt)	127.1
ELECTRICAL AT MAX NONIMAL INPUT	
Input Voltage (Volts AC)	347.0
Input Current (Amps AC)	0.269
Input Power (Watts)	90.8
Input Power Factor (%)	97.5
Input Current THD (%)	10.5
Input Voltage THD (%)	0.2
Off-State Power (Watts)	0.0

COLOR RENDERING INDICES	CRI
Ra (Average 1-8)	74
R1 Light greyish red	72
R2 Dark greyish yellow	78
R3 Strong yellowish green	82
R4 Moderate yellowish green	75
R5 Light bluish green	73
R6 Light blue	70
R7 Light violet	83
R8 Light reddish purple	61
R9 Strong red	-18
R10 Strong yellow	48
R11 Strong green	72
R12 Strong blue	43
R13 Light yellowish pink (skin)	73
R14 Moderate olive green (leaf)	90

*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.

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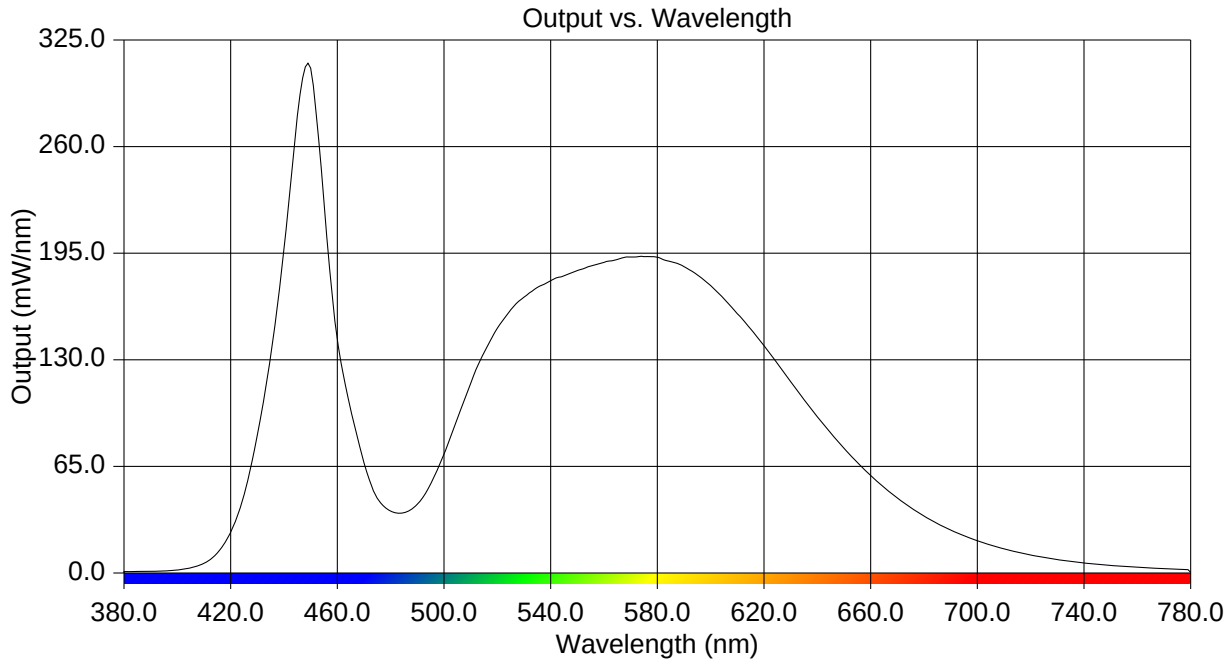
RESULTS:

Wavelength	mW per nm	Wavelength	mW per nm	Wavelength	mW per nm
380	0.829	515	134.283	650	76.000
385	0.882	520	149.174	655	67.395
390	1.019	525	160.302	660	59.463
395	1.257	530	168.094	665	52.193
400	1.891	535	174.022	670	45.687
405	3.069	540	178.065	675	39.891
410	5.932	545	181.017	680	34.730
415	12.192	550	184.289	685	30.079
420	24.782	555	186.964	690	26.144
425	47.633	560	189.280	695	22.735
430	84.120	565	191.001	700	19.648
435	132.648	570	192.549	705	16.990
440	196.054	575	192.778	710	14.668
445	278.533	580	192.457	715	12.664
450	307.671	585	189.803	720	10.970
455	225.950	590	186.707	725	9.460
460	142.171	595	181.734	730	8.192
465	99.573	600	175.109	735	7.103
470	67.120	605	167.039	740	6.167
475	45.787	610	157.973	745	5.312
480	37.616	615	148.707	750	4.618
485	36.743	620	138.329	755	3.988
490	41.933	625	127.941	760	3.465
495	54.180	630	116.450	765	3.024
500	72.501	635	105.668	770	2.624
505	93.871	640	95.259	775	2.273
510	115.489	645	85.229	780	0.346



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CIE Chromaticity Diagram