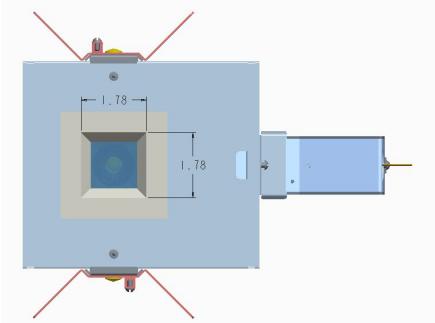
170 Ludlow Ave, Northvale, NJ 07647 • 888 722-1000 • rabweb.com

NVLAP LAB CODE: 201058-0

REPORT NUMBER: RAB01221 PAGE: 1 OF 7
ISSUE DATE: 09/30/15 DATE SAMPLE TESTED: 09/30/15
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RDLED2S8-20YYHC-TW (2" Square recessed downlight - narrow beam - >90 High CRI)
LUMINAIRE: FABRICATED METAL UPPER HOUSING AND BALLAST HOUSING, CAST WHITE PAINTED FINNED METAL HEAT SINK, 1 WHITE CIRCUIT BOARD WITH ONE LED, MOLDED PLASTIC REFLECTOR WITH SPECULAR FINISH, HOLOGRAPHIC FLAT PLASTIC LENS, CAST WHITE PAINTED METAL LOWER HOUSING.
LAMP: ONE WHITE MULTI-CHIP LIGHT EMITTING DIODES (LEDS), VERTICAL BASE-UP POSITION.
NOTE: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED.
TOTAL INPUT WATTS: 8.3703 W AT 120.0 VOLTS
TEST PROCEDURE: IESNA LM-79-08
TEST DISTANCE: 28.25 FEET
PREPARED FOR: RAB LIGHTING INC.
LED DRIVER:RD-008-E1-A0200
ACCREDITED LABORATORY CODE 201085-0

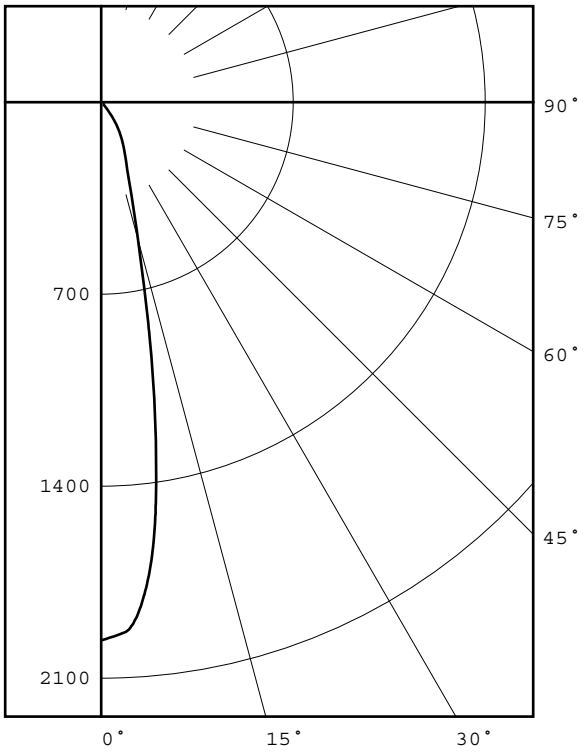


DEG	CANDELA	LUMENS
0	1962	
5	1803	150
15	521	156
25	200	94
35	85	53
45	13	12
55	5	5
65	3	3
75	1	1
85	0	0
90	0	

ZONAL LUMEN SUMMARY

ZONE	LUMENS	%FIXT
0- 30	400	84.2
0- 40	453	95.5
0- 60	470	99.0
0- 90	474	100.0
90-180	0	0.0
0-180	474	100.0

TOTAL INPUT WATTS = 8.4
EFFICACY = 56.4 Lm/W
CIE TYPE - DIRECT
LUMINAIRE SPACING CRITERION = 0.4



Checked	X.CAO
Approved	D.WANG-MUNSON

REPORT NUMBER: RAB01221 PAGE: 2 OF 7
ISSUE DATE: 09/30/15 DATE SAMPLE TESTED: 09/30/15
PREPARED FOR: RAB LIGHTING INC.

BEAM ANGLE (50%) : 21.9 DEGREES
FIELD ANGLE (10%): 50.7 DEGREES

REPORT NUMBER: RAB01221 PAGE: 3 OF 7
ISSUE DATE: 09/30/15 DATE SAMPLE TESTED: 09/30/15
PREPARED FOR: RAB LIGHTING INC.

CANDELA DISTRIBUTION

	0.0
0.0	1962
2.5	1936
5.0	1803
7.5	1516
10.0	1120
12.5	760
15.0	521
17.5	377
20.0	290
22.5	237
25.0	200
27.5	173
30.0	147
32.5	118
35.0	85
37.5	56
40.0	34
42.5	20
45.0	13
47.5	9
50.0	8
52.5	6
55.0	5
57.5	5
60.0	4
62.5	4
65.0	3
67.5	3
70.0	2
72.5	2
75.0	1
77.5	1
80.0	0
82.5	0
85.0	0
87.5	0
90.0	0

REPORT NUMBER: RAB01221 PAGE: 4 OF 7
ISSUE DATE: 09/30/15 DATE SAMPLE TESTED: 09/30/15
PREPARED FOR: RAB LIGHTING INC.

ZONAL LUMEN SUMMARY

0- 5	45.
5- 10	104.
10- 15	92.
15- 20	64.
20- 25	50.
25- 30	44.
30- 35	34.
35- 40	19.
40- 45	8.
45- 50	4.
50- 55	3.
55- 60	2.
60- 65	2.
65- 70	1.
70- 75	1.
75- 80	0.
80- 85	0.
85- 90	0.

REPORT NUMBER: RAB01221 PAGE: 5 OF 7
ISSUE DATE: 09/30/15 DATE SAMPLE TESTED: 09/30/15
PREPARED FOR: RAB LIGHTING INC.

5-DEGREE ZONAL LUMEN SUMMARY

0- 5	45
5- 10	104
10- 15	92
15- 20	64
20- 25	50
25- 30	44
30- 35	34
35- 40	19
40- 45	8
45- 50	4
50- 55	3
55- 60	2
60- 65	2
65- 70	1
70- 75	1
75- 80	0
80- 85	0
85- 90	0

10-DEGREE ZONAL LUMEN SUMMARY

0- 10	150
0- 20	305
0- 30	400
0- 40	453
0- 50	465
0- 60	470
0- 70	473
0- 80	474
0- 90	474

REPORT NUMBER: RAB01221 PAGE: 6 OF 7
ISSUE DATE: 09/30/15 DATE SAMPLE TESTED: 09/30/15

PREPARED FOR: RAB LIGHTING INC.

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	114	112	110	108	112	110	108	106	106	104	103	102	101	100	99	98	97	95
2	110	106	103	100	108	104	101	99	101	99	96	98	96	94	95	94	92	91
3	106	100	96	93	104	99	95	92	97	94	91	94	92	90	92	90	88	87
4	102	96	91	88	100	95	90	87	93	89	86	91	88	85	89	86	84	83
5	98	91	87	83	97	91	86	83	89	85	82	87	84	81	86	83	81	80
6	95	88	83	79	93	87	82	79	85	82	79	84	81	78	83	80	78	76
7	91	84	79	76	90	83	79	76	82	78	75	81	78	75	80	77	75	74
8	88	81	76	73	87	80	76	73	79	75	73	79	75	72	78	74	72	71
9	86	78	73	70	85	78	73	70	77	73	70	76	72	70	75	72	69	68
10	83	75	71	68	82	75	71	68	74	70	68	74	70	67	73	70	67	66

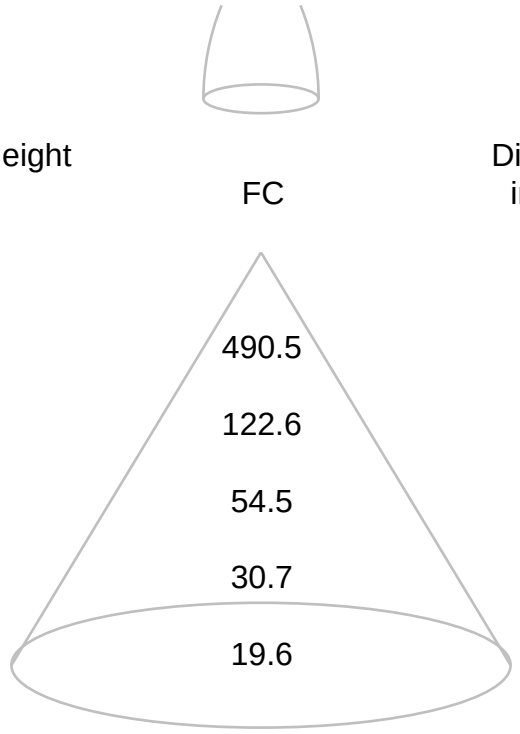
ALL CANDELA, LUMENS, LUMINANCE, AND VCP VALUES IN THIS REPORT ARE BASED ON ABSOLUTE PHOTOMETRY. THE COEFFICIENT OF UTILIZATION VALUES ARE BASED ON THE TOTAL ABSOLUTE LUMEN OUTPUT OF THIS LUMINAIRE SAMPLE.

REPORT NUMBER: RAB01221
ISSUE DATE: 09/30/15
PREPARED FOR: RAB LIGHTING INC.

DATE SAMPLE TESTED: 09/30/15

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	490.5	0.7
4.0	122.6	1.5
6.0	54.5	2.2
8.0	30.7	3.0
10.0	19.6	3.7

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

NVLAP LAB CODE: 201058-0

REPORT NUMBER: RAB01209
DATE: 9/30/2015
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RDLED2S8-20YYHC-TW (2" Square recessed downlight - narrow beam - >90 High CRI)

ADDRESS: 170 LUDLOW AVE, NORTHVALE. NJ 07647

LUMINAIRE: FABRICATED METAL UPPER HOUSING AND BALLAST HOUSING, CAST WHITE PAINTED FINNED METAL HEAT SINK, 1 WHITE CIRCUIT BOARD WITH ONE LED, MOLDED PLASTIC REFLECTOR WITH SPECULAR FINISH, HOLOGRAPHIC FLAT PLASTIC LENS, CAST WHITE PAINTED METAL LOWER HOUSING.

LAMP: ONE WHITE MULTI-CHIP LIGHT EMITTING DIODES (LEDS), VERTICAL BASE-UP POSITION.

DRIVER: RD-008-E1-A0200

NOTE: DATA SHOWN IS ABSOLUTE FOR THE SAMPLE PROVIDED AT RATED INPUT VOLTAGE (120.0 VAC , 60Hz) TO THE TEST SAMPLE.

INSTRUMENTS:		Calibration Due:
	CHROMA PROGRAMMABLE AC POWER SOURCE MODEL 61602	N/A
	CHROMA PROGRAMMABLE DIGITAL POWER METER MODEL 66202	3/9/16
	OCEAN OPTICS QE65PRO Spectroradiometer	8/21/16
	RAB 2.0 meter Diameter Integrating Sphere, 4PI Geometry	8/21/16

OBJECT OF TEST: Measure the 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. Report Off-State Power.

PROCEDURE: The test sample was provided by the customer and had an unknown number of burn hours. The test sample was mounted inside the integrating sphere 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 120.0 VAC input in a 25 +/-1 degree Celsius free air ambient and in accordance with IESNA LM-79-08. 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: RAB01209
DATE: 9/30/2015
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RDLED2S8-20YYHC-TW (2" Square recessed downlight - narrow beam - >90 High CRI)

RESULTS:

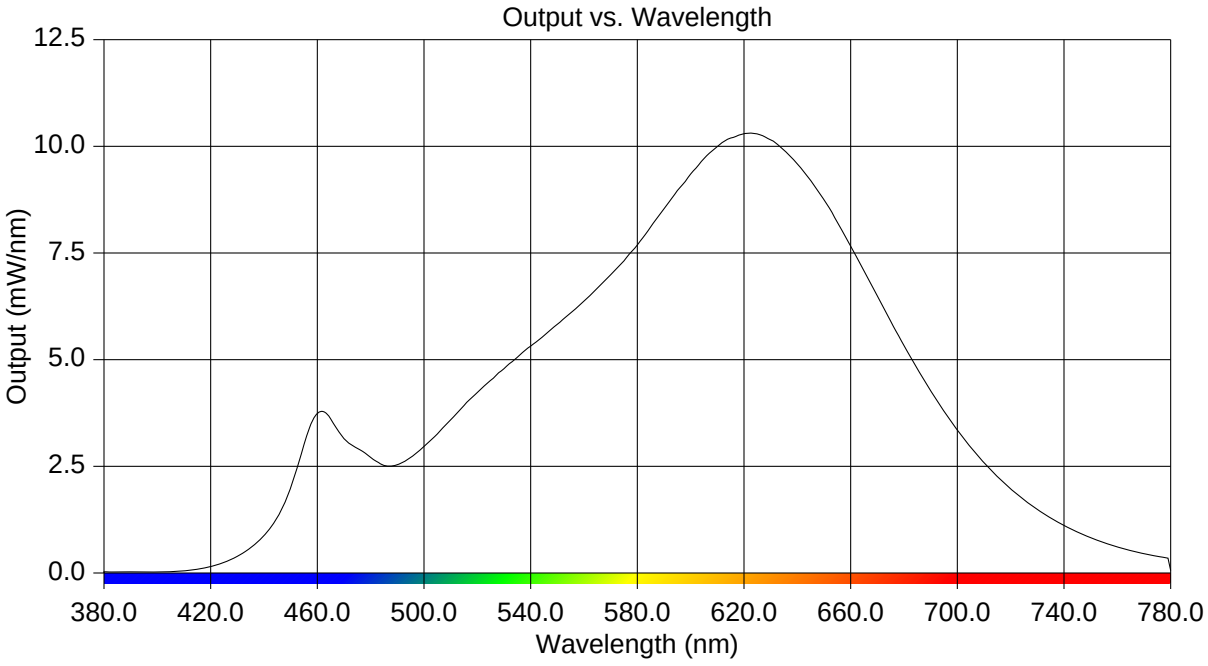
SPECTRORADIOMETRIC	
Observer	CIE 1931 2 degree
Chromaticity Ordinate x	0.4601
Chromaticity Ordinate y	0.4118
Observer	CIE 1976 2 degree
Chromaticity Ordinate u'	0.2621
Chromaticity Ordinate v'	0.5279
Correlated Color Temp CCT (K)	2705
Color Rendering Index (CRIa)	92
Color Rendering Index 1 (Light greyish red)	92
Color Rendering Index 2 (Dark greyish yellow)	98
Color Rendering Index 3 (Strong yellowish green)	98
Color Rendering Index 4 (Moderate yellowish green)	90
Color Rendering Index 5 (Light bluish green)	92
Color Rendering Index 6 (Light blue)	97
Color Rendering Index 7 (Light violet)	89
Color Rendering Index 8 (Light reddish purple)	78
Color Rendering Index 9 (Strong red)	55
Color Rendering Index 10 (Strong yellow)	93
Color Rendering Index 11 (Strong green)	91
Color Rendering Index 12 (Strong blue)	83
Color Rendering Index 13 (Light yellowish pink (skin))	94
Color Rendering Index 14 (Moderate olive green (leaf))	100
ANSI C78.377-2008 Duv	0.000
Total Radiant Flux (milliWatts)	1665 *
ELECTRICAL FOR SPECTRORADIOMETRIC TEST	
Input Voltage (Volts AC)	120.0
Input Current (Amps AC)	0.072
Input Power (Watts)	8.37
Input Power Factor (%)	97.5
Input Current THD (%)	20.0
Input Voltage THD (%)	0.2
Off-State Power (Watts)	0.0

*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: RAB01209 Page 3 of 4
DATE: 9/30/2015
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RDLED2S8-20YYHC-TW (2" Square recessed downlight - narrow beam - >90 High CRI)

RESULTS:

Wavelength	mW per nm	Wavelength	mW per nm	Wavelength	mW per nm
380	0.028	515	3.925	650	8.749
385	0.025	520	4.232	655	8.218
390	0.023	525	4.514	660	7.668
395	0.022	530	4.789	665	7.085
400	0.025	535	5.055	670	6.494
405	0.033	540	5.317	675	5.902
410	0.050	545	5.565	680	5.326
415	0.086	550	5.828	685	4.780
420	0.149	555	6.097	690	4.268
425	0.249	560	6.366	695	3.795
430	0.391	565	6.670	700	3.351
435	0.596	570	6.991	705	2.950
440	0.877	575	7.316	710	2.586
445	1.301	580	7.687	715	2.265
450	2.000	585	8.111	720	1.970
455	3.011	590	8.537	725	1.714
460	3.740	595	8.963	730	1.490
465	3.612	600	9.351	735	1.287
470	3.151	605	9.713	740	1.111
475	2.926	610	9.999	745	0.961
480	2.709	615	10.194	750	0.831
485	2.523	620	10.295	755	0.712
490	2.541	625	10.291	760	0.614
495	2.713	630	10.151	765	0.528
500	2.964	635	9.907	770	0.456
505	3.258	640	9.597	775	0.390
510	3.591	645	9.188	780	0.059



REPORT NUMBER: RAB01209 Page 4 of 4
DATE: 9/30/2015
PREPARED FOR: RAB LIGHTING INC.
CATALOG NUMBER: RDLED2S8-20YYHC-TW (2" Square recessed downlight - narrow beam - >90 High CRI)

CIE Chromaticity Diagram