NVLAP Lab Code 500089-0

Report Number:	PL16738-001A
Model:	CDR8-B-ALH-9ACK-10V5-xx-UNV (4000K)
Date:	03/21/2022

Cree Racine Engineering Services Testing Laboratory (RESTL) Photometric Testing and Evaluation Report

Prepared For:

Tammy Lehrmann

Cree Lighting

9201 Washington Avenue

Racine, WI 53406

Prepared By:

Meranda Hubbard, Photometric Test Technician

Approved By:

Jonathan Vollers, Technical Manager

This report contains data that are not covered by the NVLAP accreditation.

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Product Information	
Manufacturer	Cree Lighting
Model Number (SKU)	CDR8-B-ALH-9ACK-10V5-xx-UNV (4000K)
Serial Number	16738
LED Type	Smalite SL-ID2835FTA-31KAG

Product Description
CDR 8" Downlight luminare, white painted reflector, selectable CCT at full power and 4000K CCT

Driver Information (Where Applicable)
Integral

Length	Width	Height
10.25”	10.25”	6.0”

Sample

The following sample was submitted for evaluation

CREE LIGHTING
A COMPANY OF IDEAL INDUSTRIES, INC.

NVLAP TESTING
NVLAP Lab Code 500089-0

Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	5239.9	5287	lm
Efficacy	98.59	100.06	lm/W
Correlated Color Temperature (CCT)	3999	K	
Color Rendering Index (CRI)	94		
R_9	72		
Duv	0.0018		
S/P Ratio**	1.80		
CIE Type	Direct		

	Sphere		Goniophotometer		
Electrical Measurements	**120V**	**277V**	**120V**	**277V**	
Input Wattage	53.15	52.83	52.84	51.16	W
Input Current	0.444	0.197	0.442	0.191	A
Input Voltage	120.20	277.33	120.06	277.33	V
Power Factor	0.996	0.967	0.996	0.965	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.07	0.11	0.14	0.14	%
Total Harmonic Distortion (Amperage)	5.46	14.55	5.57	15.00	%

Note: All photometric measurements taken at 120VAC.

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	61	30	min
Total Operating Time (Stabilization + Test)	71	50	min
Ambient Temperature	24.20	24.5	˚C

Spacing Criteria

Spacing Criterion (0 - 180)	1.20
Spacing Criterion (90 - 270)	1.20
Spacing Criterion (Diagonal)	1.26

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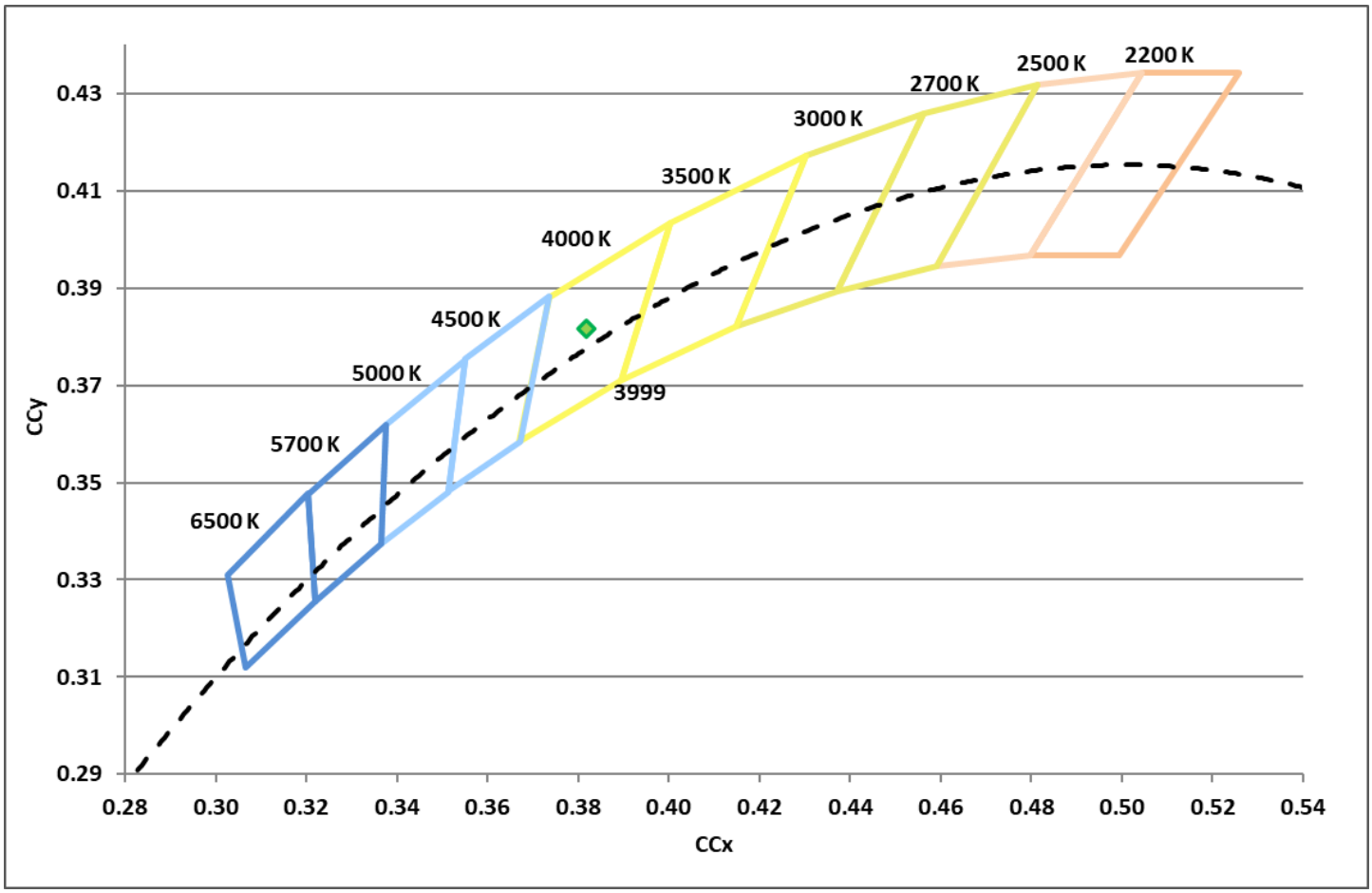
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3818	0.3815	0.2241	0.3359	0.2241	0.5039	0.0018

Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
94	94	97	97	92	92	93	95	88	72	90	92	69	95	98

Chromaticity Diagram



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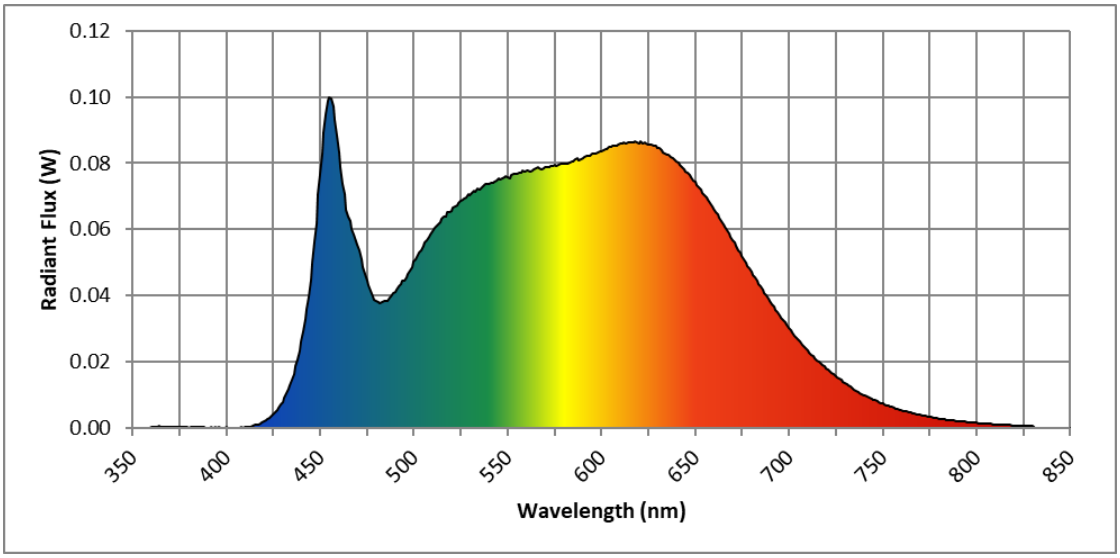
Spectral Distribution

λ(nm)	W/nm	λ(nm)	W/nm	λ(nm)	W/nm
360	0.000296	530	0.070436	700	0.030329
370	0.000295	540	0.073648	710	0.023393
380	0.000138	550	0.075724	720	0.018014
390	0.000022	560	0.077810	730	0.013547
400	0.000185	570	0.078863	740	0.010003
410	0.000246	580	0.079723	750	0.007355
420	0.002103	590	0.081478	760	0.005435
430	0.007937	600	0.083557	770	0.003960
440	0.026042	610	0.085875	780	0.002875
450	0.076661	620	0.085856	790	0.002094
460	0.083044	630	0.084413	800	0.001529
470	0.055224	640	0.080341	810	0.001130
480	0.038348	650	0.074254	820	0.000813
490	0.040981	660	0.066082	830	0.000600
500	0.050129	670	0.056874		
510	0.059574	680	0.047091		
520	0.065677	690	0.038366		

Dominant Wavelength	578	nm
Peak Wavelength	455	nm

Spectral Power Distribution (W/nm)



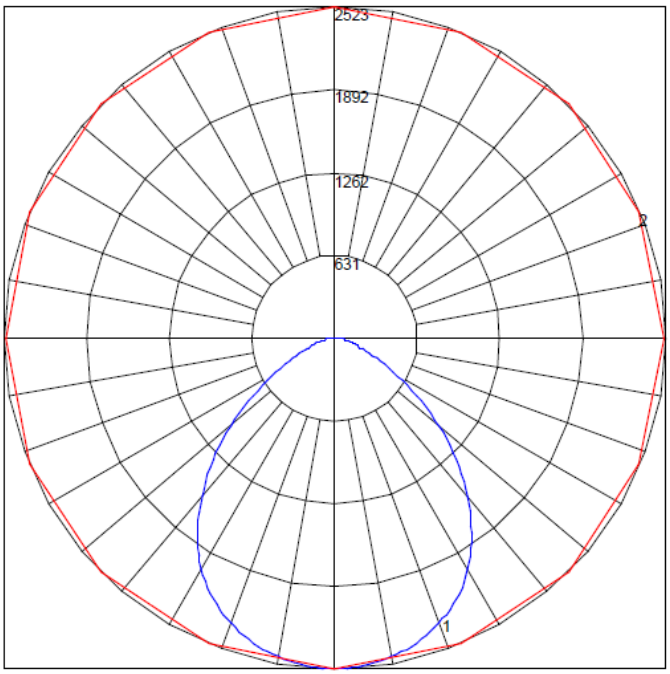
Zonal Lumen Summary

Zone	Lumens	% of Total	Zone	Lumens
0-20	915.62	17.3	0-10	238.01
0-30	1924.12	36.4	10-20	677.61
0-40	3058.44	57.8	20-30	1008.5
0-60	4750.81	89.9	30-40	1134.33
0-80	5236.28	99	40-50	1008.83
0-90	5286.87	100	50-60	683.54
10-90	5048.86	95.5	60-70	326.69
20-40	2142.83	40.5	70-80	158.78
20-50	3151.65	59.6	80-90	50.59
40-70	2019.05	38.2	90-100	0.0
60-80	485.47	9.2	100-110	0.0
70-80	158.78	3	110-120	0.0
80-90	50.59	1	120-130	0.0
90-110	0.0	0.0	130-140	0.0
90-120	0.0	0.0	140-150	0.0
90-130	0.0	0.0	150-160	0.0
90-150	0.0	0.0	160-170	0.0
90-180	0.0	0.0	170-180	0.0
110-180	0.0	0.0		
Total	**5286.9**	**100**		

Luminance Data (Cd./Sq.M)

Average in Degrees	Average 0-Deg	Average 45-Deg	Average 90-Deg
45	50957	51213	51191
55	36430	36664	36710
65	20171	20568	20844
75	15953	16008	16023
85	14099	14147	14023

Candela Plots



Maximum Candela = 2523.105 Located At Horizontal Angle = 90, Vertical Angle = 1
1 - Vertical Plane Through Horizontal Angles (90 - 270) (Through Max. Cd.)
2 - Horizontal Cone Through Vertical Angle (1) (Through Max. Cd.)

Coefficients of Utilization

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	111	107	103	100	108	104	101	98	100	98	95	96	94	92	93	91	90	88
2	102	95	89	84	100	93	88	83	90	85	82	87	83	80	84	81	78	76
3	94	85	78	72	92	84	77	72	81	75	71	78	73	69	76	72	68	66
4	87	77	69	63	85	75	68	63	73	67	62	71	65	61	69	64	60	58
5	81	69	61	55	79	68	61	55	66	60	54	64	58	54	63	57	53	51
6	75	63	55	49	73	62	54	49	60	54	48	59	53	48	57	52	48	46
7	70	58	50	44	68	57	49	44	55	48	43	54	48	43	53	47	43	41
8	65	53	45	40	64	52	45	39	51	44	39	50	44	39	49	43	39	37
9	61	49	41	36	60	48	41	36	47	40	36	46	40	36	45	39	35	34
10	58	45	38	33	56	45	38	33	44	37	33	43	37	33	42	36	32	31

Candela Tabulations

	0	22.5	45	67.5	90
0	2520.9	2520.9	2520.9	2520.9	2520.9
1	2514.3	2517.1	2522.6	2522.9	2523.1
2	2515.3	2517.4	2519.2	2521.5	2521.6
3	2509.9	2513.7	2515.5	2517.0	2518.9
4	2506.7	2509.5	2512.5	2513.5	2512.8
5	2502.2	2504.7	2508.1	2509.5	2510.7
6	2493.2	2498.8	2499.9	2502.5	2504.5
7	2490.5	2490.7	2493.3	2496.0	2496.9
8	2478.8	2485.1	2487.6	2487.7	2490.0
9	2473.1	2474.6	2476.1	2479.8	2479.4
10	2460.5	2465.6	2468.3	2469.4	2469.4
11	2452.4	2453.7	2456.0	2457.8	2461.5
12	2438.1	2443.2	2443.3	2448.1	2444.7
13	2426.7	2429.7	2432.3	2433.6	2435.6
14	2412.2	2414.8	2416.9	2420.4	2420.5
15	2398.3	2401.1	2404.0	2405.7	2407.0
16	2382.5	2384.7	2387.8	2389.6	2391.7
17	2365.6	2369.1	2371.7	2373.1	2372.7
18	2346.7	2351.9	2353.5	2354.5	2355.3
19	2329.1	2330.6	2334.4	2335.9	2337.2
20	2307.7	2311.5	2314.7	2314.4	2316.7
21	2286.8	2288.9	2290.8	2294.1	2293.8
22	2264.8	2268.1	2270.0	2271.3	2271.0
23	2241.9	2244.4	2246.2	2249.5	2250.1
24	2218.0	2220.5	2220.9	2223.1	2224.1
25	2191.4	2194.6	2194.4	2197.5	2196.4
26	2164.4	2166.6	2167.5	2168.6	2169.4
27	2131.6	2137.0	2137.2	2138.6	2140.1
28	2101.7	2103.9	2102.6	2106.0	2108.9
29	2065.3	2068.0	2068.2	2069.0	2070.1
30	2028.1	2032.5	2033.5	2035.1	2036.7
31	1990.5	1993.9	1995.2	1995.4	1995.5
32	1948.8	1953.0	1955.0	1952.6	1955.5
33	1907.5	1910.6	1912.1	1913.0	1910.7
34	1862.5	1866.5	1869.2	1868.1	1868.8
35	1817.5	1819.8	1821.8	1822.1	1821.3
36	1770.0	1772.4	1773.4	1774.0	1774.1

Candela Tabulations (Continued)

	0	22.5	45	67.5	90
37	1722.7	1724.0	1727.3	1727.6	1728.0
38	1674.6	1675.2	1676.9	1678.3	1677.7
39	1621.3	1625.2	1625.1	1626.9	1626.5
40	1571.9	1573.5	1574.6	1575.2	1575.5
41	1520.9	1522.5	1523.6	1526.0	1525.6
42	1466.3	1469.5	1471.3	1472.3	1473.5
43	1412.9	1416.9	1418.2	1419.1	1419.1
44	1360.6	1365.8	1367.9	1367.4	1368.4
45	1308.8	1312.7	1315.4	1314.8	1314.8
46	1254.3	1257.3	1259.4	1259.2	1260.7
47	1200.0	1202.8	1205.3	1204.6	1204.4
48	1147.1	1148.4	1151.8	1151.0	1152.5
49	1090.7	1093.0	1094.8	1094.2	1094.4
50	1035.5	1035.0	1037.2	1037.9	1038.7
51	979.5	980.9	982.1	984.0	982.9
52	923.0	925.0	926.6	926.9	928.2
53	867.3	868.7	868.8	870.5	870.2
54	811.3	814.2	815.8	817.8	817.1
55	759.0	761.1	763.9	765.9	764.8
56	704.6	708.4	710.4	712.9	713.1
57	653.3	656.9	658.5	659.8	660.7
58	604.3	609.1	610.7	612.8	611.6
59	556.4	560.1	562.4	564.2	564.7
60	509.3	513.2	514.9	517.4	517.8
61	465.1	468.5	471.1	473.7	474.5
62	422.9	425.6	428.2	430.7	431.9
63	381.6	383.3	387.5	390.1	390.1
64	344.1	346.2	349.3	353.0	353.2
65	309.7	311.3	315.7	319.7	320.0
66	279.0	280.7	285.6	289.0	290.2
67	252.4	254.7	259.9	263.6	264.5
68	232.9	234.1	238.8	242.6	242.2
69	215.8	217.3	220.3	222.9	223.3
70	202.9	203.9	205.2	206.2	206.9
71	192.1	192.5	193.2	193.2	193.6
72	181.2	181.7	182.2	182.3	182.2
73	170.5	171.0	171.3	171.3	171.2

Candela Tabulations (Continued)

	0	22.5	45	67.5	90
74	160.4	160.9	160.9	161.0	160.9
75	150.0	150.6	150.5	150.6	150.6
76	139.8	139.9	139.9	139.7	139.7
77	129.1	129.5	129.2	129.4	129.1
78	118.9	119.0	118.9	119.0	118.7
79	108.5	108.3	108.1	108.4	108.2
80	97.8	97.7	97.5	97.5	97.6
81	87.4	87.3	87.1	87.1	86.9
82	76.5	76.4	76.3	76.3	76.2
83	65.9	65.9	65.7	65.7	65.6
84	55.2	55.6	55.3	55.1	55.0
85	44.6	44.9	44.8	44.4	44.4
86	34.3	34.6	34.4	33.9	33.8
87	24.0	24.3	24.7	24.8	24.7
88	14.2	15.5	17.0	18.6	19.2
89	8.3	8.5	11.7	13.4	14.0
90	0.0	0.0	0.0	0.0	0.0

Integrating Sphere Equipment List

Description	Manufacturer	Model	Serial Number
3M Sphere	Labsphere	ILLUMIA PLUS 3020-300 4PI	1109184535
CCD Array Spectrometer	Labsphere	MC-9801:3683L	98011077
Programmable AC Source	Chroma	61602	616020003699
Power Analyzer	Xitron	XT2640	264AD2006001

Goniophotometer Equipment List

Description	Manufacturer	Model	Serial Number
AC Power Source	Chroma	61602	616020002300
Type C Goniophotometer	LSI / UL	6440T	6440PN2028
Spectroradiometer	Gooch & Housego	770VIS/NIR	12415189
Spectrometer	Inphora, Inc	PDET 31	130627
Power Meter	Xitron	XT2640	M20140823

Test Methods Used:

Title	Description
ANSI C82.77:2002	Harmonic Emission Limits- Related Power Quality Reqt's for Lighting Equipment
CIE Pub. 13.3:1995	Method of Measuring and Specifying Color Rendering of Light Sources
CIE Pub. 15:2004	Colorimetry
IES LM-58:1994	Spectroradiometric Measurements
IES LM-79:2008	Electrical and Photometric Measurements of Solid-State Lighting Products

Reference Standard Used:

Equipment	Description
3m Sphere	Tungsten Halogen Omni-Directional 35W Calibration Lamp, Serial Number E4
Type C Goniophotometer and Spectrometer	Tungsten Halogen Omni-Directional 500W Calibration Lamp, Serial Numbers 16C293. 16C294, 16C295. For color calibration of spectrometer, 13C074.

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In the event that the recorded temperature is outside of 25 ± 1˚C, this is considered a non-standard condition.

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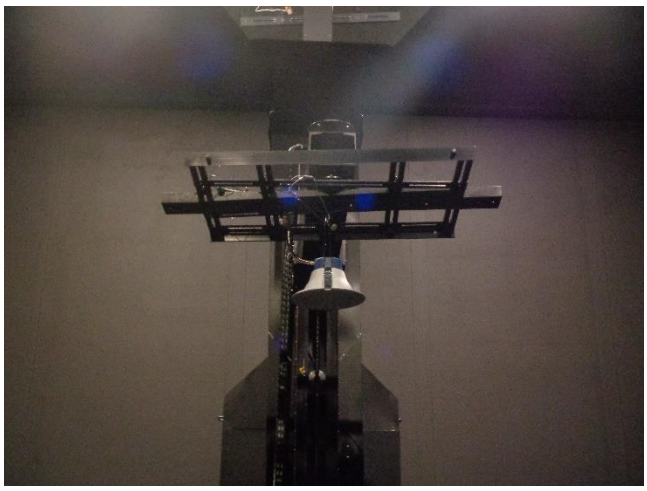
In the event that testing is subcontracted, or subcontracted equipment was used, test results in this report marked with the symbol *, or noted as “Sphere” or “Integrating Sphere” or “Goniophotometer,” were performed by the subcontracted laboratory identified in the equipment list of this report.

Additional Comments:

The photos below are intended to show the orientation and fixturing/set-up of the units under test. These are critical to understanding the results of the test given the sensitivity of many products and measurement systems to orientation and set-up considerations, and also for reproducing the conditions of the test.

Goniophotometer	Integrating Sphere
	

Document Revision History:

Each subsequent revision of this report replaces the preceding report.

Date	Rev	DCN #	Change at the time of this test	By	Approval
03/21/2022	A	DMS	Origination	M. Hubbard	J. Vollers