



NVLAP Lab Code 500077-0

**Report Number:** PL08597-001A  
**Model:** ZR24M-40L-35K-10V-FD  
**Date:** 6/21/2016

## Cree Engineering Services Testing Laboratory (CESTL) Photometric Testing and Evaluation Report

**Prepared For:**

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**Prepared By:**

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**Approved By:**

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**Product Information**

<b>Manufacturer</b>	Cree Inc
<b>Model Number (SKU)</b>	ZR24M-40L-35K-10V-FD
<b>Serial Number</b>	WK191A02903
<b>LED Type</b>	XH-G2

**Product Description**

2 x 4 Troffer with a white painted aluminum reflector and body, and curved diffuse lens.

**Driver Information (Where Applicable)**

Integral

Length	Width
48"	24"

**Sample**

The following sample was submitted for evaluation





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Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	4051.0	4009.1	lm
Efficacy	131.14	129.79	lm/W
Correlated Color Temperature (CCT)	3436	K	
Color Rendering Index (CRI)	83		
R <sub>9</sub>	15		
Duv	0.000258		
S/P Ratio*	1.47		

Electrical Measurements	Sphere		Goniophotometer		
	120V	277V	120V	277V	
Input Wattage	30.89	30.59	30.89	30.56	W
Input Current	0.26	0.12	0.26	0.12	A
Input Voltage	120.10	277.02	119.97	277.07	V
Power Factor	0.991	0.927	0.990	0.924	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.04	0.05	0.06	0.06	%
Total Harmonic Distortion (Amperage)	8.03	17.47	8.24	17.26	%

**Note:** All photometric measurements taken at 120VAC.

Luminous Intensity Distribution	Goniophotometer	
Maximum Candela	1279.4	Cd
Horizontal Angle of Max Candela	67.5	°
Vertical Angle of Max Candela	2.5	°
Zonal Lumens (0° – 30°)	984.5 (24.6)	lm (%)
Zonal Lumens (0° – 40°)	1619.3 (40.4)	lm (%)
Zonal Lumens (0° – 60°)	2927.8 (73)	lm (%)
Zonal Lumens (60° – 90°)	1081.3 (27)	lm (%)
Color Angular Uniformity	NA	

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	36	30	min
Total Operating Time (Stabilization + Test)	36	50	min
Ambient Temperature	25.4	25.2	°C



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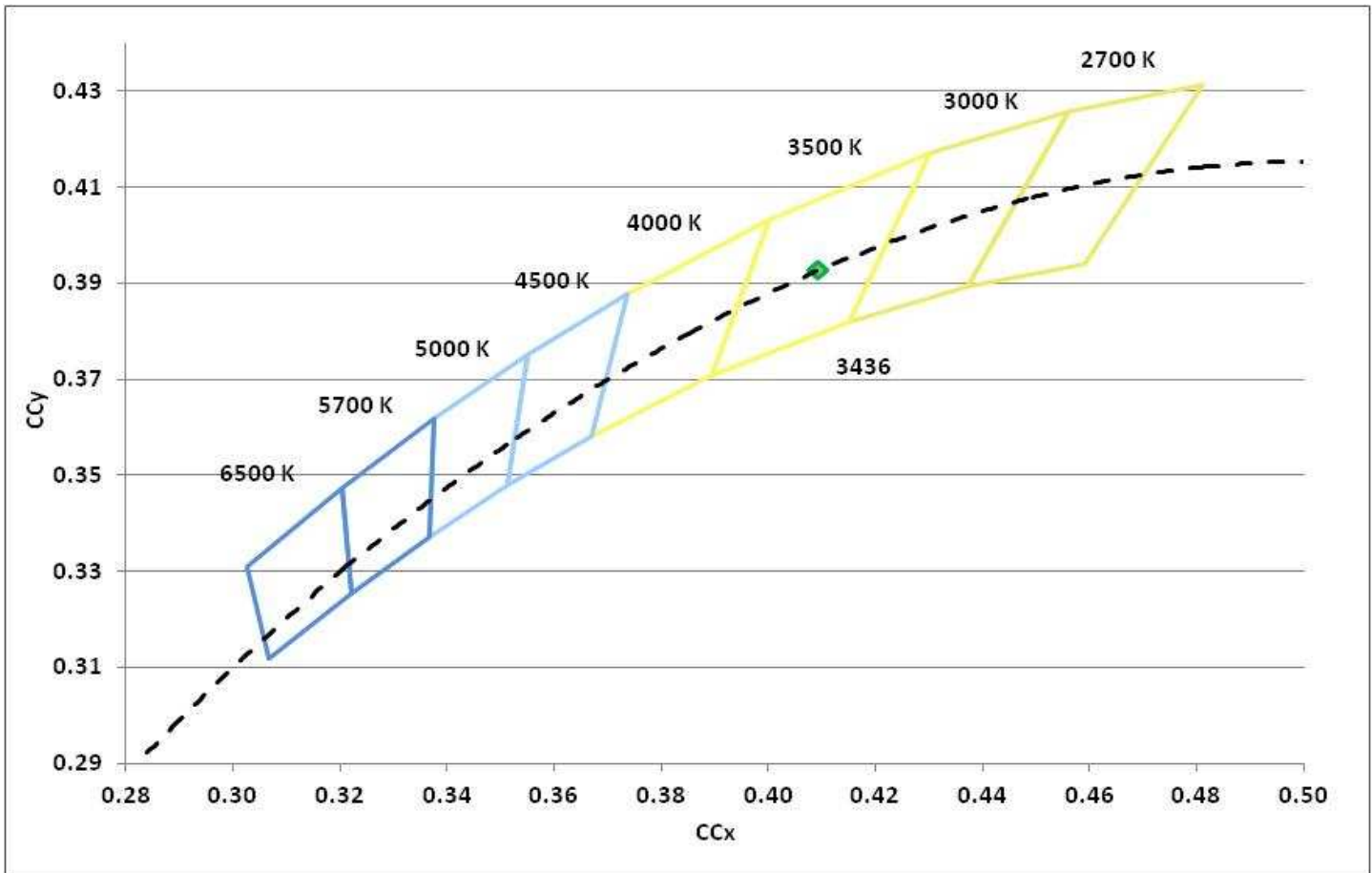
### Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.4091	0.3931	0.2372	0.3419	0.2372	0.5128	0.000258

### Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
83	81	88	93	82	81	83	86	66	15	71	81	62	83	96

### Chromaticity Diagram



**Spectral Distribution**

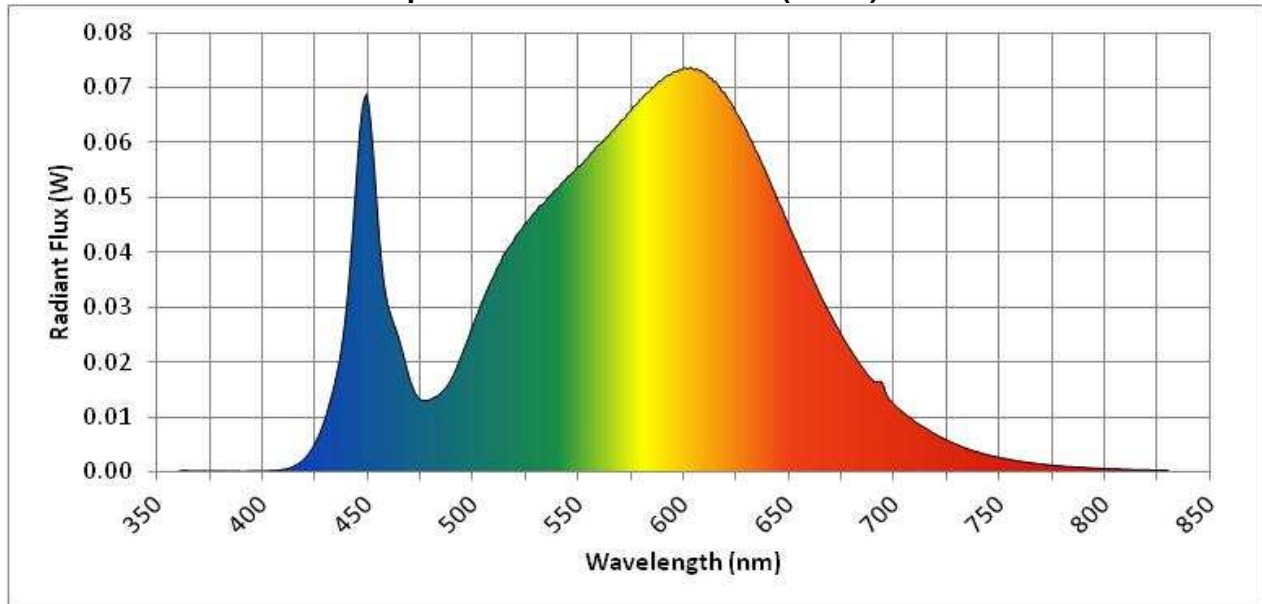
$\lambda$ (nm)	W/nm
360	0.000219
370	0.000199
380	0.000156
390	0.000130
400	0.000157
410	0.000453
420	0.002608
430	0.010456
440	0.031708
450	0.067137
460	0.029339
470	0.016449
480	0.013329
490	0.017416
500	0.027133
510	0.036046
520	0.043031

$\lambda$ (nm)	W/nm
530	0.047709
540	0.051781
550	0.055737
560	0.059803
570	0.064087
580	0.068104
590	0.071641
600	0.073752
610	0.072651
620	0.068653
630	0.062024
640	0.053731
650	0.044730
660	0.036375
670	0.028382
680	0.021758
690	0.016585

$\lambda$ (nm)	W/nm
700	0.012311
710	0.009140
720	0.006799
730	0.004957
740	0.003560
750	0.002616
760	0.001932
770	0.001433
780	0.001062
790	0.000823
800	0.000607
810	0.000483
820	0.000376
830	0.000299

<b>Dominant Wavelength</b>	581	nm
<b>Peak Wavelength:</b>	603	nm

**Spectral Power Distribution (W/nm)**





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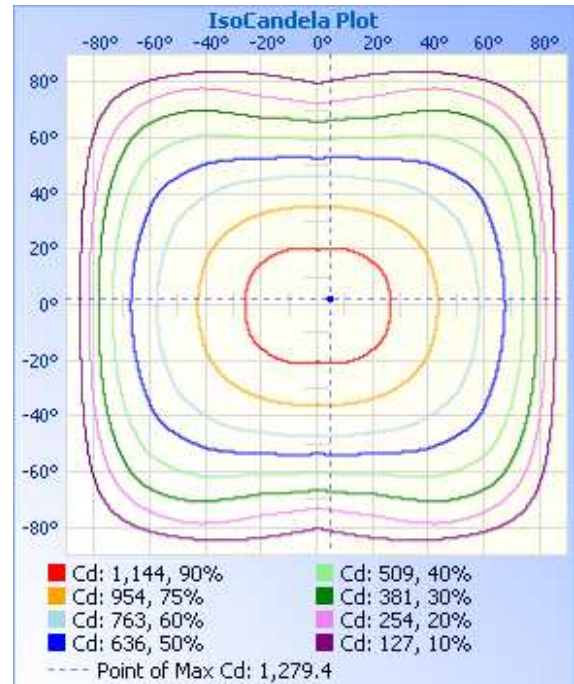
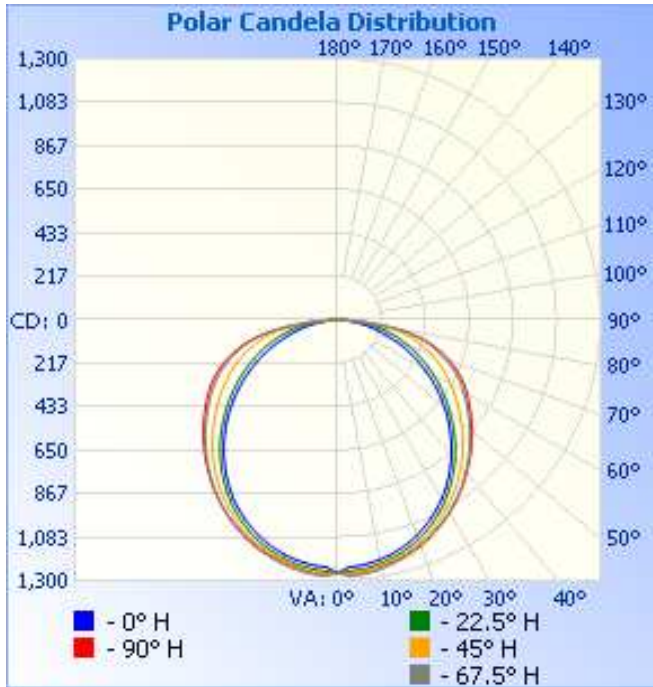
**Zonal Lumen Summary \*\***

Zone	Lumens	% of Total	Zone	Lumens	% of Total
0-5	30.1	0.8%	90-95	0	0%
5-10	89.4	2.2%	95-100	0	0%
10-15	145.6	3.6%	100-105	0	0%
15-20	197.2	4.9%	105-110	0	0%
20-25	242.4	6.0%	110-115	0	0%
25-30	279.7	7.0%	115-120	0	0%
30-35	308.1	7.7%	120-125	0	0%
35-40	326.7	8.1%	125-130	0	0%
40-45	335.6	8.4%	130-135	0	0%
45-50	335.3	8.4%	135-140	0	0%
50-55	326.6	8.1%	140-145	0	0%
55-60	311.1	7.8%	145-150	0	0%
60-65	288.8	7.2%	150-155	0	0%
65-70	258.7	6.5%	155-160	0	0%
70-75	220.7	5.5%	160-165	0	0%
75-80	173.3	4.3%	165-170	0	0%
80-85	107.7	2.7%	170-175	0	0%
85-90	32.0	0.8%	175-180	0	0%
<b>Total</b>			<b>4009.1 lm</b>		<b>100%</b>

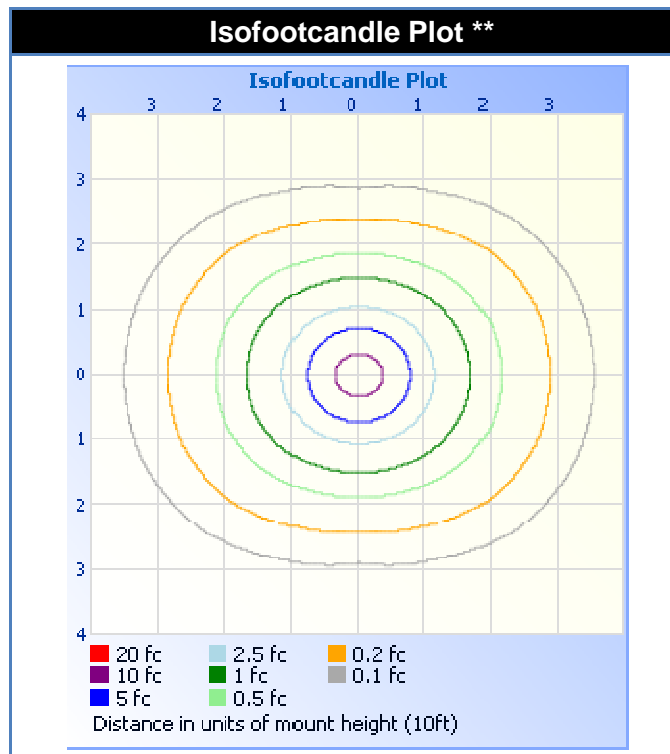
**Spacing Criteria \*\***

<b>Spacing Criterion (0 - 180)</b>	1.22
<b>Spacing Criterion (90 - 270)</b>	1.32
<b>Spacing Criterion (Diagonal)</b>	1.42

**Candela Plots \*\***



**Isofootcandle Plot \*\***





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### Candela Tabulations \*\*

	0	22.5	45	67.5	90
0	1262	1262	1262	1262	1262
2.5	1234	1255	1265	1279	1267
5	1230	1251	1261	1276	1263
7.5	1223	1243	1253	1269	1257
10	1213	1232	1244	1260	1248
12.5	1200	1219	1232	1247	1237
15	1184	1204	1217	1233	1225
17.5	1165	1185	1200	1218	1210
20	1144	1165	1181	1201	1194
22.5	1119	1141	1160	1181	1174
25	1092	1115	1136	1159	1153
27.5	1062	1086	1110	1134	1131
30	1031	1053	1081	1109	1107
32.5	995	1019	1051	1081	1081
35	958	982	1019	1051	1053
37.5	918	944	985	1021	1023
40	877	903	950	988	993
42.5	834	862	914	955	962
45	789	818	877	922	931
47.5	743	774	839	888	899
50	696	728	800	854	867
52.5	648	683	761	820	835
55	599	638	724	786	803
57.5	550	593	686	754	772
60	501	548	648	720	740
62.5	452	503	609	686	707
65	402	458	570	650	671
67.5	353	413	530	610	631
70	304	369	489	568	587
72.5	257	326	446	522	539
75	211	282	401	471	486
77.5	167	240	352	415	426
80	126	198	299	343	343
82.5	89	156	231	246	241
85	55	111	146	148	141
87.5	26	54	63	59	55
90	0	0	0	0	0





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**Candela Tabulations (Continued) \*\***

	0	22.5	45	67.5	90
92.5	0	0	0	0	0
95	0	0	0	0	0
97.5	0	0	0	0	0
100	0	0	0	0	0
102.5	0	0	0	0	0
105	0	0	0	0	0
107.5	0	0	0	0	0
110	0	0	0	0	0
112.5	0	0	0	0	0
115	0	0	0	0	0
117.5	0	0	0	0	0
120	0	0	0	0	0
122.5	0	0	0	0	0
125	0	0	0	0	0
127.5	0	0	0	0	0
130	0	0	0	0	0
132.5	0	0	0	0	0
135	0	0	0	0	0
137.5	0	0	0	0	0
140	0	0	0	0	0
142.5	0	0	0	0	0
145	0	0	0	0	0
147.5	0	0	0	0	0
150	0	0	0	0	0
152.5	0	0	0	0	0
155	0	0	0	0	0
157.5	0	0	0	0	0
160	0	0	0	0	0
162.5	0	0	0	0	0
165	0	0	0	0	0
167.5	0	0	0	0	0
170	0	0	0	0	0
172.5	0	0	0	0	0
175	0	0	0	0	0
177.5	0	0	0	0	0
180	0	0	0	0	0



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### Integrating Sphere Equipment List

Description	Manufacturer	Model	Serial Number
3M Sphere	Labsphere	CSTM-CSLMS-3M98-HDS	82456
CCD Array Spectrometer	Otsuka	MC-9801	98010165
Programmable AC Source	Chroma	61603	616030000761
Single Channel Power Analyzer	Xitron	2801	28011110008
Aux Lamp Power Supply	Labsphere	LPS-100-0833	1002104538

### Goniophotometer Equipment List

Description	Manufacturer	Model	Serial Number
AC Power Source	Adaptive	FC210	2300229
AC Power Source	Elgar	CW1251	1126A06399
Type C Goniophotometer	LSI / UL	6440T	6440TE0192T
Spectroradiometer	Gooch & Housego	770VIS/NIR	11414155
Power Meter	Yokogawa	WT210	91L220953

### Test Methods Used:

Title	Description
ANSI C82.77:2002	Harmonic Emission Limits- Related Power Quality Req't'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-65:2001	Single-Ended Compact Fluorescent Lamps – Life Test Performance
IES LM-79:2008	Electrical and Photometric Measurements of Solid-State Lighting Products

### Reference Standard Used:

Equipment	Description
3m Sphere	Tungsten Halogen Omni-Directional 75W Calibration Lamp, Serial Number K142
Type C Goniophotometer	Tungsten Halogen Omni-Directional 500W Calibration Lamp, Serial Number 97A

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The results contained in this report pertain only to the tested sample.

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\* Items marked with a single asterisk are not covered by the NVLAP accreditation.

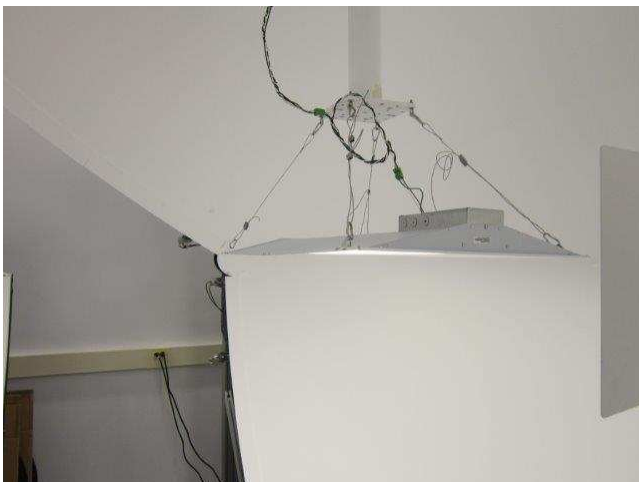
In the event that the recorded temperature is outside of  $25 \pm 1^\circ\text{C}$ , this is considered a non-standard condition.

\*\* In the event that testing is subcontracted, test results in this report marked with the symbol \*\*, or noted as "Goniophotometer", were performed by the subcontracted laboratory identified in the footer on the first page of this report. Subcontracted testing is strictly goniophotometer based. All other tests are performed using an integrating sphere.

The goniophotometer information in the equipment list, report items marked with \*\*, or results specifically identified as "Goniophotometer", are the actual equipment used, and test results produced, by the subcontracted laboratory.

**Additional Comments:** This luminaire was tested in the base up orientation.

**Sphere picture**



**Goniophotometer Picture**





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**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
06/21/16	A	DMS	Origination	A. Gressel	C. McLaurin