



NVLAP Lab Code 500077-0

Report Number: PL08620-003A
Model: CR24-40L-ACK-CMA-EB10W
Date: 7/25/2016

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

Prepared For:

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Product Information

Manufacturer	Cree Inc
Model Number (SKU)	CR24-40L-ACK-CMA-EB10W
Serial Number	JJ33Q52418
LED Type	XTE AWT

Product Description

2x4 troffer. Linear light engine. Linear finned heat sink below LEDs. Two frosted plastic lenses. White metal trim plate

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	3973.0	3891.4	lm
Efficacy	95.39	93.45	lm/W
Correlated Color Temperature (CCT)	3986	K	
Color Rendering Index (CRI)	96		
R ₉	74		
Duv	0.001609		
S/P Ratio*	1.80		

Electrical Measurements	Sphere		Goniophotometer		
	120V	277V	120V	277V	
Input Wattage	41.65	41.40	41.64	41.37	W
Input Current	0.35	0.17	0.35	0.17	A
Input Voltage	120.00	277.01	120.01	277.06	V
Power Factor	0.989	0.883	0.991	0.878	
Off-State Power	0	0	0	0	W
Total Harmonic Distortion (Voltage)	0.06	0.06	0.10	0.06	%
Total Harmonic Distortion (Amperage)	7.68	14.52	6.46	13.87	%

Note: All photometric measurements taken at 120VAC.

Luminous Intensity Distribution	Goniophotometer	
Center Beam Candlepower (Max Candela)	1332.7	Cd
Horizontal Angle	65	°
Vertical Angle	2.5	°
Zonal Lumens (0° – 30°)	1055.1 (27.1)	lm (%)
Zonal Lumens (0° – 40°)	1754.2 (45.1)	lm (%)
Zonal Lumens (0° – 60°)	3155.5 (81.1)	lm (%)
Zonal Lumens (60° – 90°)	735.9 (18.9)	lm (%)
Color Angular Uniformity	0.00055	

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	97	62	min
Total Operating Time (Stabilization + Test)	97	82	min
Ambient Temperature	25.6	25.5	°C

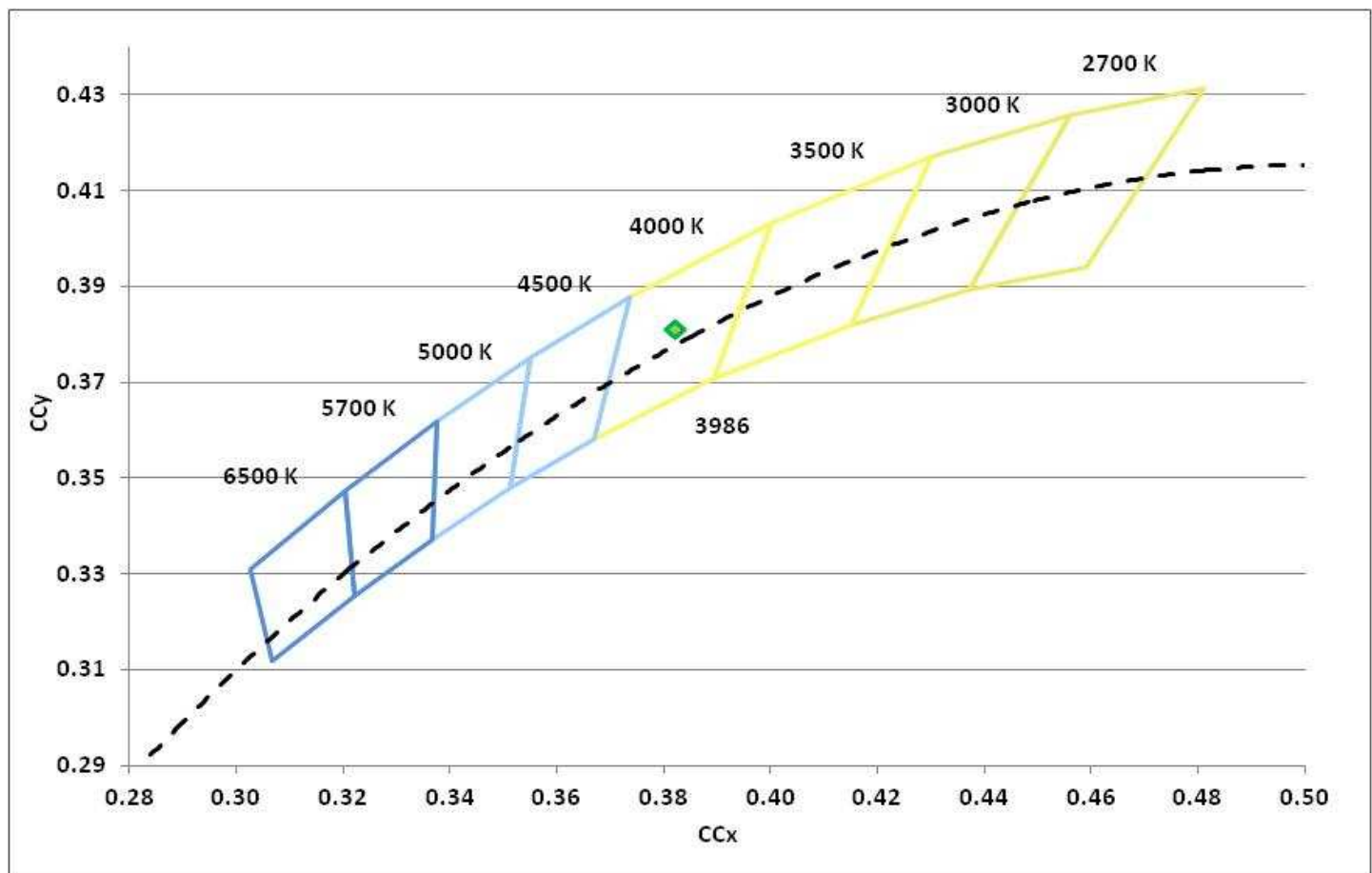
Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3821	0.3812	0.2244	0.3359	0.2244	0.5038	0.001609

Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
96	98	98	92	96	99	96	98	92	74	90	94	78	99	94

Chromaticity Diagram



Spectral Distribution

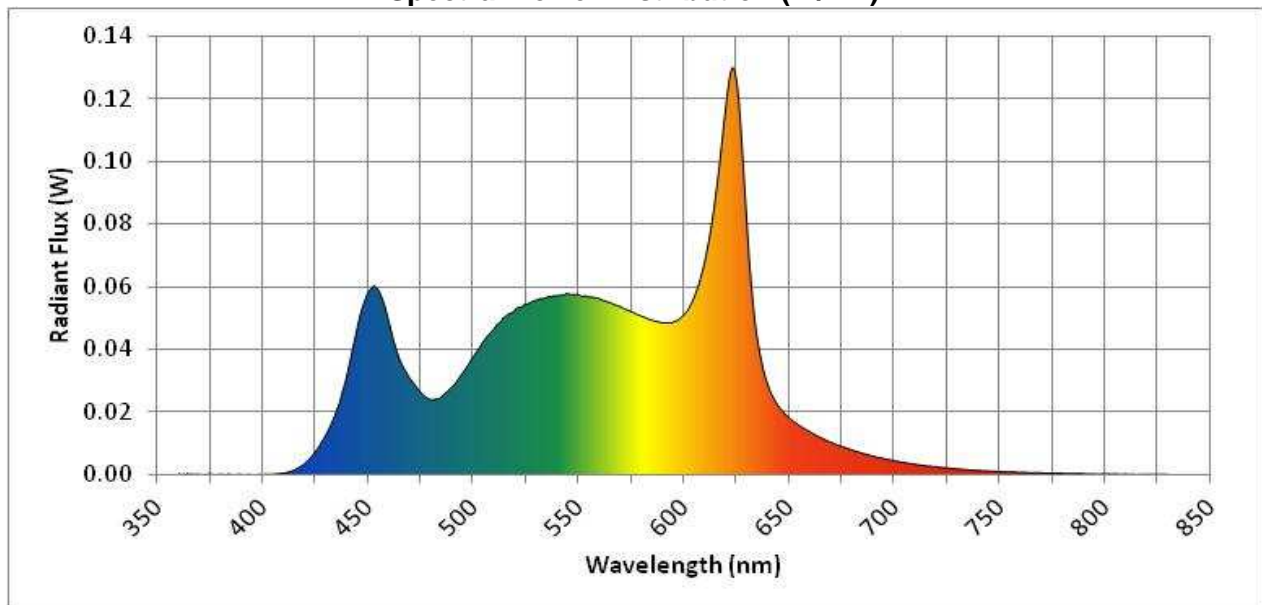
$\lambda(\text{nm})$	W/nm
360	0.000386
370	0.000063
380	0.000178
390	0.000151
400	0.000143
410	0.000572
420	0.003898
430	0.013136
440	0.032599
450	0.058449
460	0.048086
470	0.030549
480	0.023993
490	0.028318
500	0.037926
510	0.046975
520	0.053077

$\lambda(\text{nm})$	W/nm
530	0.055912
540	0.057357
550	0.057512
560	0.056189
570	0.053779
580	0.050624
590	0.048566
600	0.051284
610	0.068683
620	0.118675
630	0.078553
640	0.028423
650	0.018241
660	0.013757
670	0.010408
680	0.007937
690	0.006016

$\lambda(\text{nm})$	W/nm
700	0.004513
710	0.003398
720	0.002632
730	0.001946
740	0.001438
750	0.001059
760	0.000846
770	0.000638
780	0.000513
790	0.000401
800	0.000324
810	0.000280
820	0.000190
830	0.000130

Dominant Wavelength	578	nm
Peak Wavelength:	623	nm

Spectral Power Distribution (W/nm)





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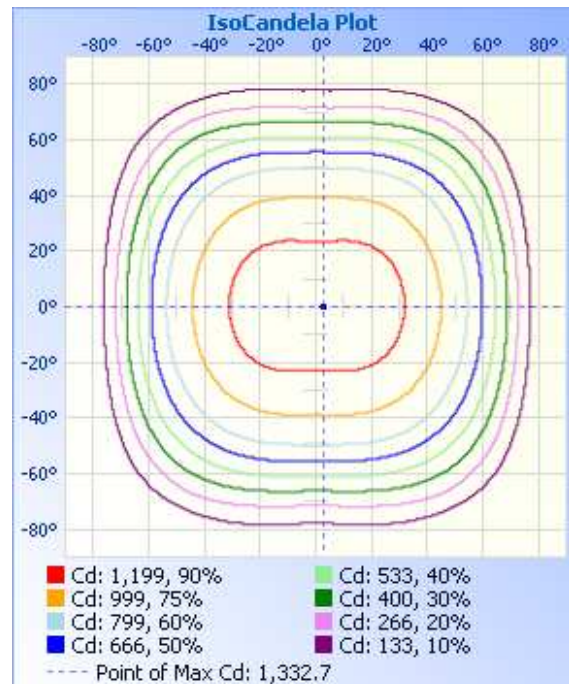
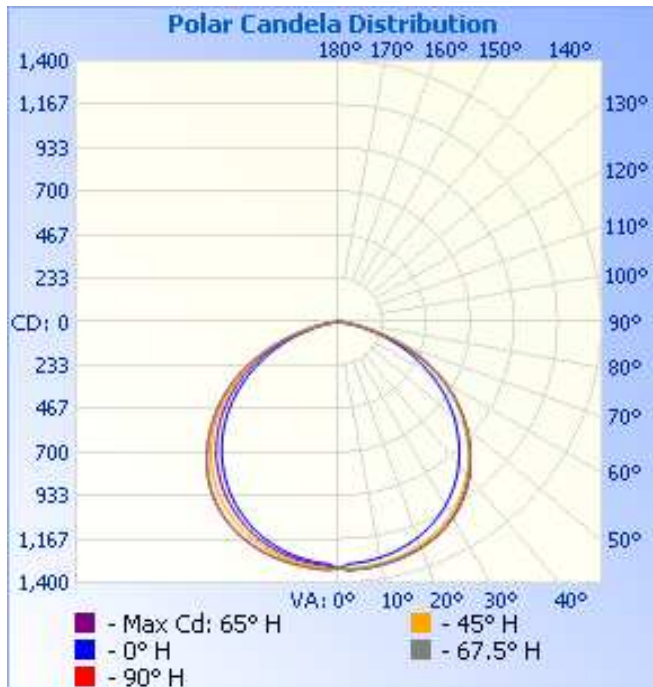
Zonal Lumen Summary **

Zone	Lumens	% of Total	Zone	Lumens	% of Total
0-5	31.6	0.8%	90-95	0	0%
5-10	93.9	2.4%	95-100	0	0%
10-15	154.0	4.0%	100-105	0	0%
15-20	210.3	5.4%	105-110	0	0%
20-25	261.0	6.7%	110-115	0	0%
25-30	304.4	7.8%	115-120	0	0%
30-35	338.3	8.7%	120-125	0	0%
35-40	360.8	9.3%	125-130	0	0%
40-45	370.5	9.5%	130-135	0	0%
45-50	366.3	9.4%	135-140	0	0%
50-55	348.2	8.9%	140-145	0	0%
55-60	316.3	8.1%	145-150	0	0%
60-65	271.2	7.0%	150-155	0	0%
65-70	213.4	5.5%	155-160	0	0%
70-75	146.1	3.8%	160-165	0	0%
75-80	77.8	2.0%	165-170	0	0%
80-85	24.9	0.6%	170-175	0	0%
85-90	2.6	0.1%	175-180	0	0%
Total			3891.4 lm	100%	

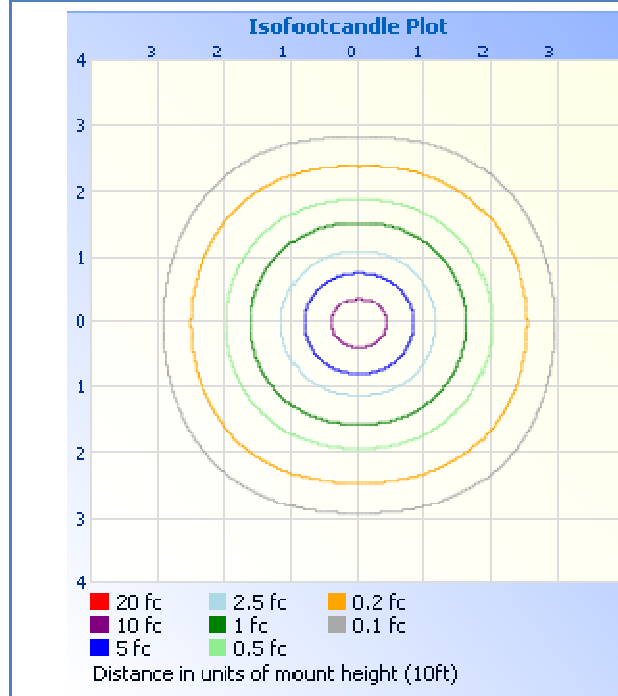
Spacing Criteria **

Spacing Criterion (0 - 180)	1.28
Spacing Criterion (90 - 270)	1.36
Spacing Criterion (Diagonal)	1.44

Candela Plots **



Isofootcandle Plot **





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Candela Tabulations **

	0	5	15	25	35	45	55	60	62.5	65	67.5	70	72.5	75	77.5
0	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324
2.5	1300	1300	1307	1315	1321	1326	1330	1332	1332	1333	1332	1332	1332	1331	1331
5	1297	1297	1304	1313	1320	1324	1329	1330	1331	1331	1331	1330	1330	1330	1330
7.5	1292	1292	1299	1308	1315	1320	1326	1327	1327	1328	1327	1327	1327	1326	1326
10	1284	1284	1291	1301	1309	1314	1320	1322	1322	1323	1323	1322	1322	1322	1321
12.5	1274	1274	1281	1291	1300	1307	1313	1316	1316	1317	1317	1317	1316	1316	1316
15	1262	1262	1269	1280	1289	1297	1305	1307	1308	1309	1309	1309	1309	1308	1308
17.5	1248	1248	1255	1267	1277	1286	1294	1297	1298	1299	1299	1299	1299	1299	1299
20	1231	1230	1238	1251	1263	1272	1282	1285	1286	1287	1288	1288	1288	1288	1288
22.5	1212	1211	1220	1233	1246	1256	1267	1270	1272	1273	1273	1274	1274	1274	1274
25	1192	1188	1198	1213	1226	1238	1249	1253	1254	1255	1256	1257	1257	1257	1258
27.5	1166	1163	1173	1189	1204	1217	1229	1232	1234	1235	1236	1237	1237	1238	1238
30	1138	1135	1146	1163	1179	1193	1206	1209	1211	1212	1213	1213	1214	1215	1215
32.5	1108	1104	1116	1134	1151	1166	1178	1182	1184	1185	1185	1186	1187	1187	1188
35	1075	1070	1083	1102	1120	1135	1148	1152	1153	1153	1154	1155	1156	1156	1157
37.5	1037	1033	1046	1066	1086	1101	1113	1117	1118	1118	1119	1120	1121	1121	1122
40	996	994	1008	1028	1048	1064	1075	1078	1079	1080	1080	1081	1082	1082	1083
42.5	952	951	965	987	1007	1023	1034	1037	1037	1038	1038	1038	1038	1039	1039
45	905	904	920	943	963	979	989	991	991	991	991	991	992	992	992
47.5	856	856	872	895	915	931	939	941	941	941	942	942	942	942	942
50	806	806	823	845	864	879	886	888	888	888	889	889	890	890	890
52.5	751	750	768	792	812	825	832	834	834	835	835	835	835	835	836
55	694	692	710	735	756	769	777	778	778	778	778	778	778	778	778
57.5	633	632	650	676	696	711	718	719	719	719	719	719	719	719	719
60	570	570	589	615	634	650	656	657	657	657	657	658	657	656	656
62.5	506	507	525	552	571	586	592	592	592	592	591	591	590	589	588
65	442	442	461	486	507	520	526	524	523	523	522	520	519	517	515
67.5	379	378	396	420	441	454	456	452	450	448	446	444	441	438	436
70	316	315	332	355	375	386	383	376	373	370	368	366	362	359	356
72.5	257	255	270	293	309	316	307	300	294	288	285	281	277	273	269
75	199	199	213	232	245	243	229	217	210	204	199	195	192	188	184
77.5	149	147	159	176	180	170	151	139	134	129	125	121	119	116	114
80	103	101	111	121	119	100	83	75	71	68	65	63	61	59	58
82.5	64	62	68	72	61	45	33	29	26	24	23	22	21	20	19
85	32	29	32	28	18	10	6	6	5	5	5	5	4	4	4
87.5	7	6	7	4	2	2	2	2	2	2	2	2	2	2	2
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Candela Tabulations (Continued) **

	0	5	15	25	35	45	55	60	62.5	65	67.5	70	72.5	75	77.5
92.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
117.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
127.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
142.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
152.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
157.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
162.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
167.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
172.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
177.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Candela Tabulations (Continued) **

	80	82.5	85	87.5	90	95	105	115	125	135	145	155	165	175	180
0	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324	1324
2.5	1331	1331	1332	1332	1332	1331	1330	1331	1329	1324	1319	1312	1304	1298	1300
5	1329	1330	1331	1331	1331	1330	1329	1329	1326	1320	1315	1308	1300	1293	1296
7.5	1326	1326	1327	1327	1327	1326	1325	1325	1321	1315	1310	1302	1294	1287	1289
10	1321	1322	1322	1322	1322	1321	1320	1320	1316	1309	1303	1294	1285	1278	1280
12.5	1316	1316	1317	1317	1317	1315	1313	1312	1308	1301	1293	1284	1274	1266	1268
15	1308	1309	1310	1310	1310	1308	1305	1303	1297	1290	1282	1272	1261	1252	1254
17.5	1299	1300	1301	1301	1301	1299	1296	1293	1286	1277	1268	1257	1245	1236	1238
20	1288	1289	1290	1290	1290	1288	1284	1280	1273	1262	1252	1240	1227	1217	1218
22.5	1275	1275	1276	1276	1276	1274	1269	1266	1257	1245	1233	1220	1206	1196	1196
25	1258	1259	1259	1259	1259	1257	1253	1248	1239	1226	1212	1197	1183	1173	1171
27.5	1239	1239	1240	1240	1240	1238	1233	1228	1218	1203	1189	1172	1157	1146	1144
30	1216	1216	1217	1217	1216	1215	1209	1203	1193	1178	1163	1144	1129	1117	1114
32.5	1189	1189	1190	1189	1189	1188	1182	1175	1165	1150	1134	1114	1097	1085	1082
35	1157	1158	1158	1158	1158	1156	1151	1144	1135	1119	1102	1082	1063	1051	1046
37.5	1122	1123	1123	1123	1123	1121	1116	1109	1100	1085	1066	1046	1026	1013	1008
40	1084	1084	1084	1084	1083	1081	1077	1071	1062	1047	1028	1008	987	973	966
42.5	1040	1040	1040	1040	1040	1037	1034	1028	1020	1006	988	966	944	929	923
45	992	993	994	993	993	991	987	982	975	962	943	922	898	883	877
47.5	943	943	944	943	943	941	937	932	925	914	896	874	850	835	829
50	890	890	891	891	891	889	885	880	873	863	846	825	800	783	776
52.5	836	836	836	836	836	834	830	826	819	809	792	770	746	728	721
55	779	778	778	778	778	776	773	769	761	751	735	713	688	670	663
57.5	718	718	718	718	718	716	713	709	702	691	675	653	628	609	603
60	655	655	654	654	654	653	650	647	641	631	614	592	566	547	540
62.5	587	586	586	586	586	584	583	583	578	568	551	529	503	484	476
65	514	512	511	511	511	510	511	514	512	503	486	464	439	420	412
67.5	434	432	430	430	430	430	432	440	443	437	422	400	376	357	349
70	354	351	349	348	348	349	354	362	370	370	358	336	313	295	287
72.5	265	262	260	259	258	258	267	282	297	300	294	275	253	237	229
75	180	179	177	176	175	174	182	198	218	231	230	216	197	183	176
77.5	111	110	108	107	107	106	112	124	141	158	168	162	146	134	127
80	56	55	54	54	53	53	57	64	76	90	107	110	100	90	85
82.5	18	18	17	17	16	16	18	22	28	38	52	63	59	53	49
85	4	4	4	4	4	4	4	4	5	7	13	22	26	24	21
87.5	1	1	1	1	1	1	1	1	2	2	2	2	4	4	3
90	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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Candela Tabulations (Continued) **

	80	82.5	85	87.5	90	95	105	115	125	135	145	155	165	175	180
92.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
97.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
102.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
105	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
107.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
112.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
115	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
117.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
122.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
127.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
135	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
140	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
142.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
145	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
150	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
152.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
155	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
157.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
160	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
162.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
165	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
167.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
170	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
172.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
175	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
177.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
180	0	0	0	0	0	0	0	0	0	0	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

Disclaimers:

This report must not be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST or any agency of the federal government.

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

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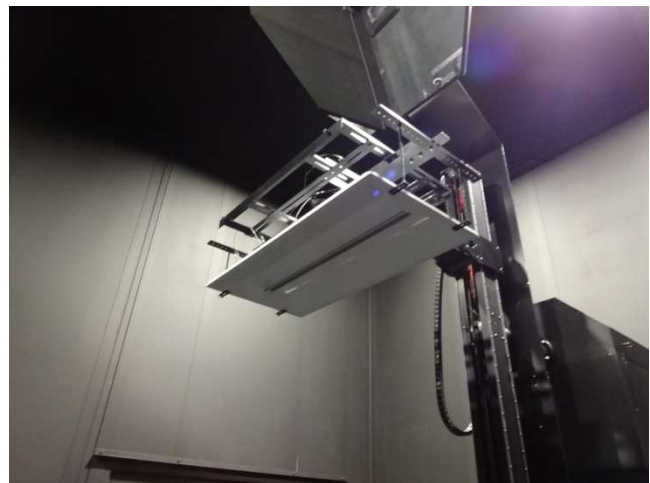
* Items marked with a single asterisk are not covered by the NVLAP accreditation.

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
7/25/16	A	DMS	Origination	A. Gressel	C. McLaurin