

**Report Number:** PL18134-001A  
**Model:** OSQP-C-2L-40K7-3R-UL (Light Engine)  
**Issue Date:** 02/05/2024

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

**Prepared For:**

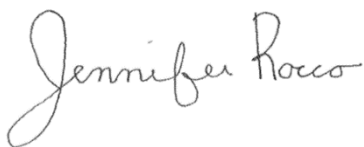
Tammy Lehrmann

Cree Lighting

9201 Washington Avenue

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**Prepared By:**



Jennifer Rocco, Photometric Test Technician

**Approved By:**



Meranda Hubbard, Photometric Test Technician

## Product Information

Manufacturer	Cree Lighting
Model Number (SKU)	OSQP-C-2L-40K7-3R-UL (Light Engine)
Serial Number	18134
LED Type	SSC STW7C12C-E0

## Product Description

OSQP-C Pathway Luminaire (Light Engine), 2L Lumen Package, 4000K 70CRI, Type 3M Rotatable Optics

## Driver Information (Where Applicable)

Signify XI030C080V054BSJ1

Length	Width	Height
9.5"	9.5"	6.9"

## Sample

The following sample was submitted for evaluation



Key Photometric Data	Sphere Output	Goniophotometer	
Luminous Flux	1588.3	1572.0	lm
Efficacy	147.60	150.86	lm/W
Correlated Color Temperature (CCT)	4089	K	
Color Rendering Index (CRI)	72		
R <sub>9</sub>	-38		
Duv	-0.0003		
TM-30 R <sub>f</sub> *	74		
TM-30 R <sub>g</sub> *	93		
TM-30 R <sub>cs,h1</sub> *	-18.1%		
S/P Ratio*	1.57		

Electrical Measurements	Sphere		Goniophotometer		
	120V	277V	120V	277V	
Input Wattage	10.76	12.69	10.42	-	W
Input Current	0.099	0.051	0.094	-	A
Input Voltage	120.16	277.58	120.21	-	V
Power Factor	0.907	0.891	0.920	-	
Off-State Power	0	0	0	-	W
Total Harmonic Distortion (Voltage)	0.07	0.12	0.20	-	%
Total Harmonic Distortion (Amperage)	14.47	18.12	15.51	-	%

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

Luminous Intensity Distribution	Goniophotometer	
Max Candela	946.995	Cd
Angle of Max Candela (Horizontal)	60	°
Angle of Max Candela (Vertical)	63	°

Key Test Parameters	Sphere Output	Goniophotometer	
Stabilization Time	36	30	min
Total Operating Time (Stabilization + Test)	46	50	min
Ambient Temperature	24.68	24.8	°C

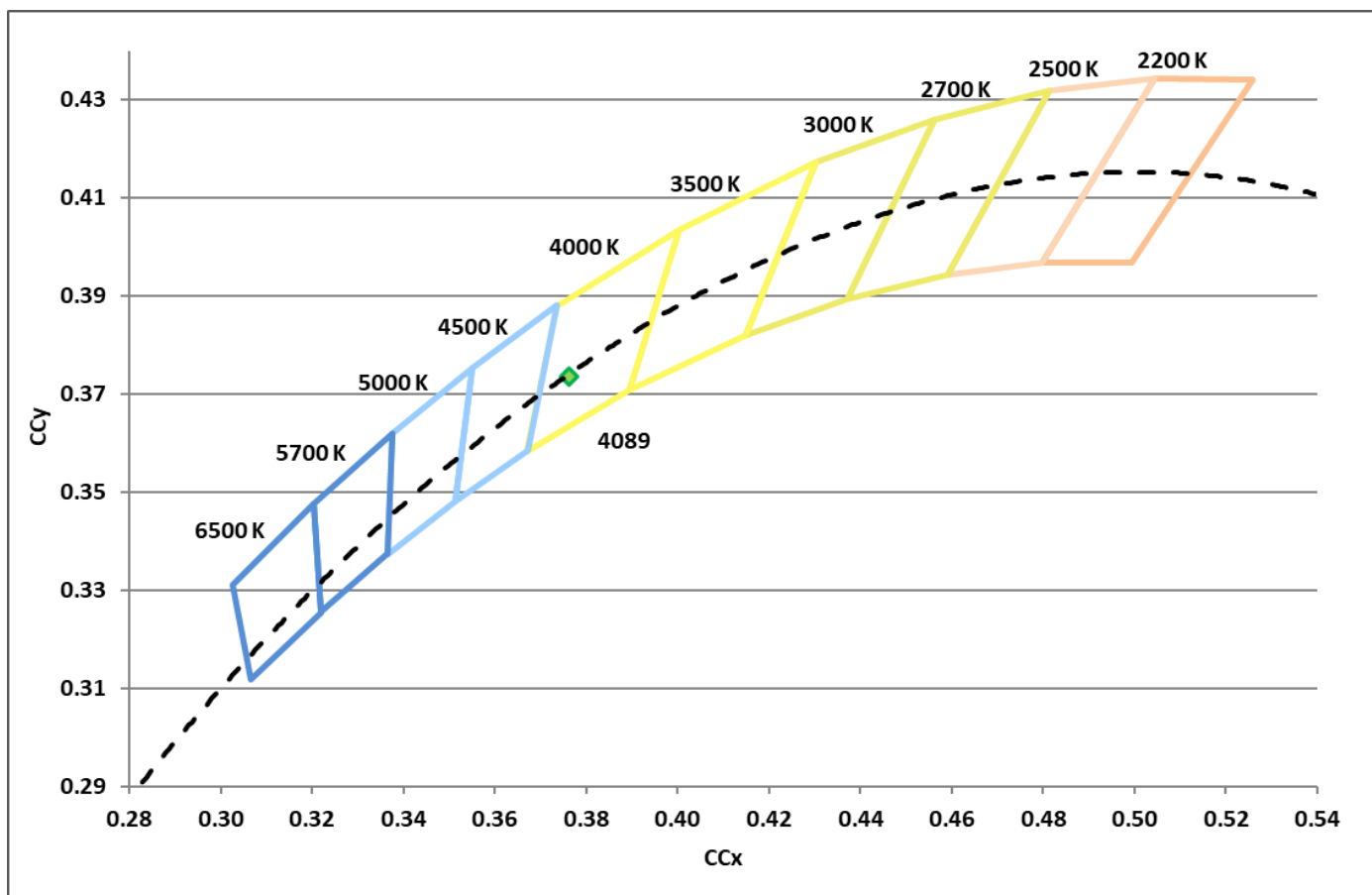
## Chromaticity Coordinates

x	y	u	v	u'	v'	Duv
0.3764	0.3735	0.2237	0.3330	0.2237	0.4995	-0.0003

## Color Rendering Index Details

Ra	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14
72	68	80	88	70	69	71	80	49	-38	52	66	42	71	94

## Chromaticity Diagram



NOTE: The Chromaticity Diagram shown above references table A1 specification for 7-step quadrangles referenced in ANSI C78.377-2017.

**Spectral Distribution**

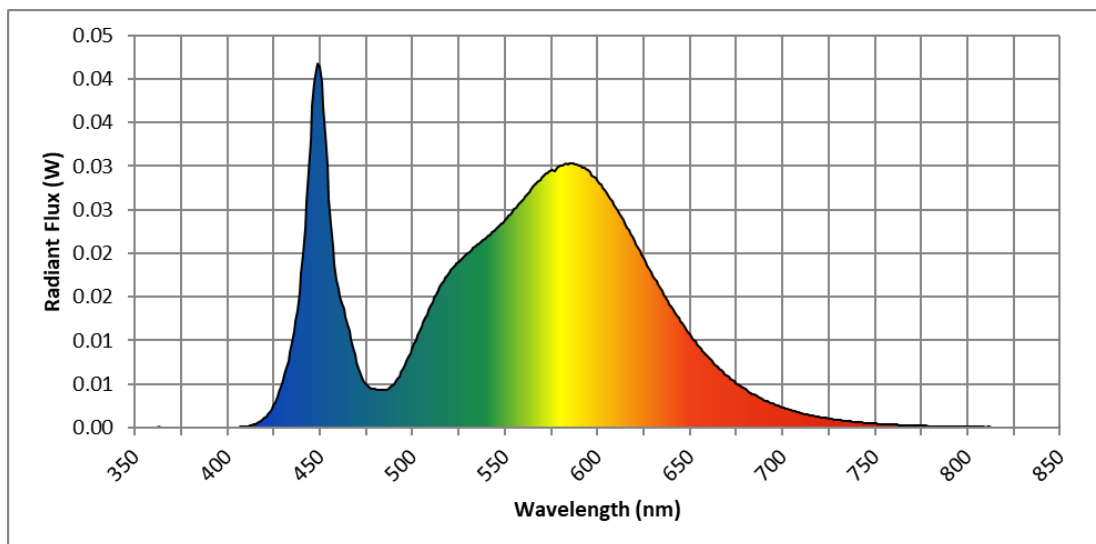
$\lambda$ (nm)	W/nm
360	0.000021
370	0.000016
380	0.000024
390	0.000013
400	0.000006
410	0.000157
420	0.001082
430	0.005411
440	0.017693
450	0.041390
460	0.015960
470	0.007554
480	0.004397
490	0.004991
500	0.009046
510	0.013958
520	0.017820

$\lambda$ (nm)	W/nm
530	0.020027
540	0.021835
550	0.023761
560	0.026235
570	0.028674
580	0.030076
590	0.030012
600	0.028363
610	0.025176
620	0.021445
630	0.017502
640	0.013839
650	0.010665
660	0.008109
670	0.006000
680	0.004395
690	0.003222

$\lambda$ (nm)	W/nm
700	0.002335
710	0.001696
720	0.001218
730	0.000893
740	0.000639
750	0.000462
760	0.000341
770	0.000243
780	0.000177
790	0.000123
800	0.000093
810	0.000057
820	0.000046
830	0.000035

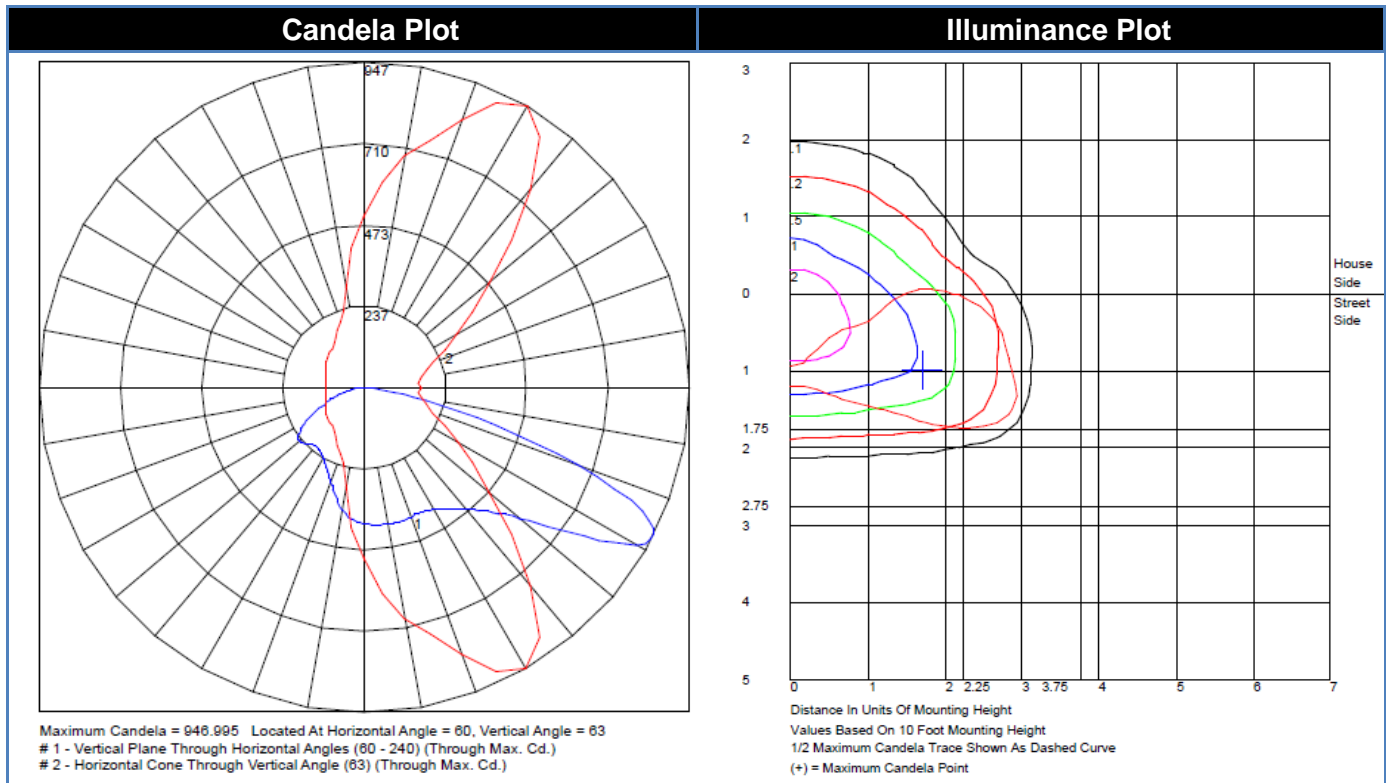
<b>Dominant Wavelength</b>	578	nm
<b>Peak Wavelength</b>	437	nm

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



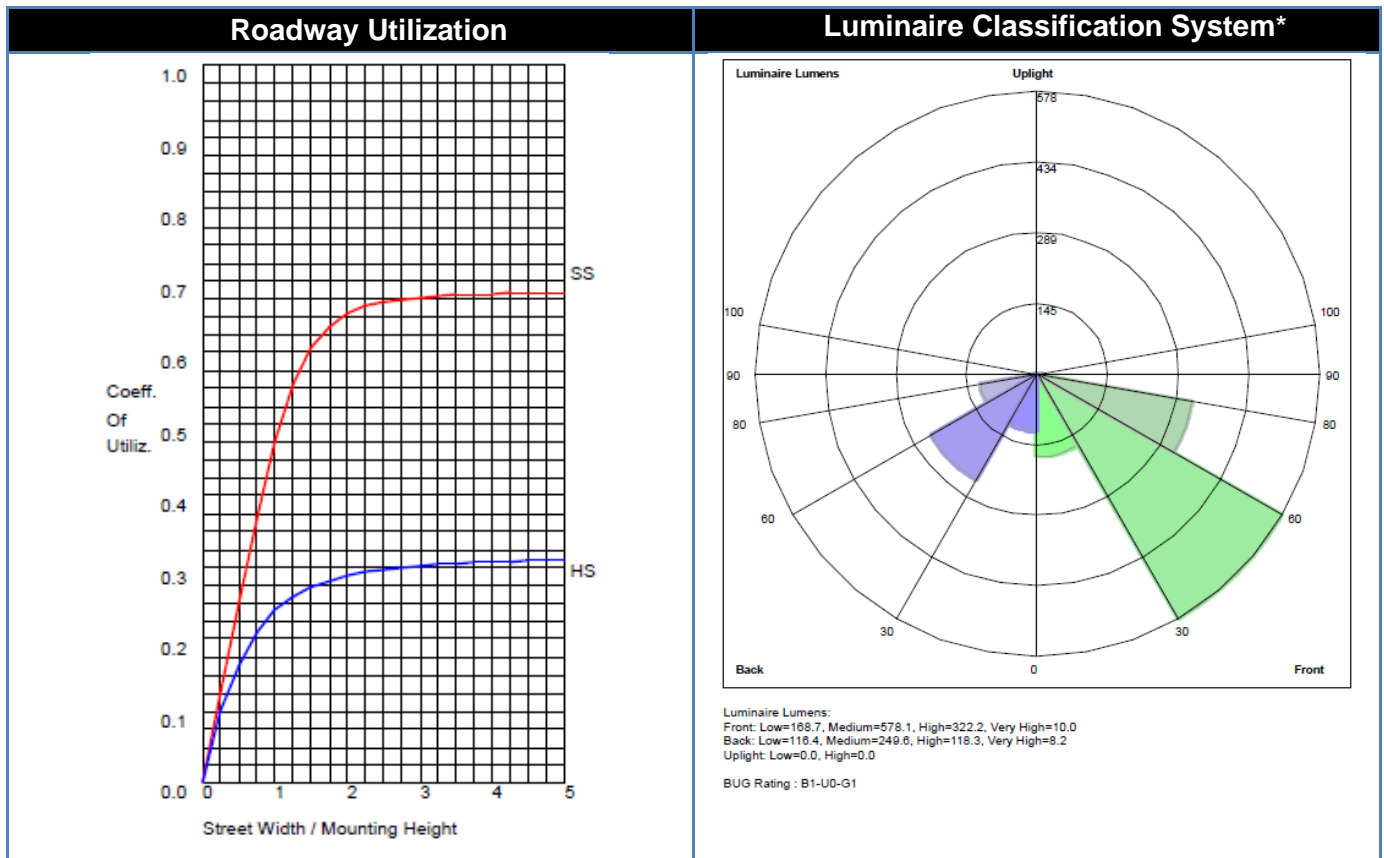
**Zonal Lumen Summary**

Zone	Lumens	% of Total	Zone	Lumens
0-20	136.7	8.7	0-10	36.8
0-30	285.2	18.1	10-20	100.0
0-40	488.0	31.1	20-30	148.4
0-60	1112.9	70.8	30-40	202.9
0-80	1553.3	98.8	40-50	277.0
0-90	1571.5	100.0	50-60	347.8
10-90	1534.8	97.7	60-70	311.0
20-40	351.3	22.4	70-80	129.4
20-50	628.3	40.0	80-90	18.2
40-70	935.9	59.6	90-100	0.0
60-80	440.5	28.0	100-110	0.0
70-80	129.4	8.2	110-120	0.0
80-90	18.2	1.2	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		
<b>Total</b>	<b>1571.5 LM</b>	<b>100%</b>		



Roadway Summary	Lumens	% Lamp
Distribution	TYPE II SHORT	
Downward Street Side	1079.0	68.7
Downward House Side	492.6	31.3
Downward Total	1571.6	100.0
Upward Street Side	0.0	0.0
Upward House Side	0.0	0.0
Upward Total	0.0	0.0
Total Lumens	1571.6	100

Luminaire Classification System (LCS)	Lumens	% Luminaire
FL - Front Low (0-30)	168.7	10.7
FM - Front Medium (30-60)	578.1	36.8
FH - Front High (60-80)	322.2	20.5
FVH - Front Very High (80-90)	10.0	0.6
BL - Back Low (0-30)	116.4	7.4
BM - Back Medium (30-60)	249.6	15.9
BH - Back High (60-80)	118.3	7.5
BVH - Back Very High (80-90)	8.2	0.5
UL - Uplight Low (90-100)	0.0	0.0
UH - Uplight High (100-180)	0.0	0.0
BUG Rating*	B1-U0-G1	





**Candela Tabulations**

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
0	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6
1	397.5	397.7	397.5	397.1	397.0	396.9	396.9	397.2	397.4	397.4	397.4	398.3	398.6	398.9	399.0
2	399.2	399.5	399.3	398.8	398.6	398.6	398.5	398.7	398.8	398.6	398.5	399.3	399.4	399.6	399.6
3	400.9	401.2	400.9	400.4	400.2	400.1	399.9	400.0	400.1	399.9	399.7	400.3	400.3	400.4	400.3
4	402.5	402.7	402.3	401.9	401.5	401.4	401.2	401.2	401.2	400.9	400.7	401.2	401.1	401.0	400.7
5	403.9	404.2	403.8	403.3	403.0	402.8	402.6	402.5	402.3	401.9	401.5	402.0	401.7	401.4	400.9
6	405.4	405.6	405.2	404.7	404.3	404.0	403.9	403.7	403.5	402.8	402.2	402.4	402.0	401.5	400.9
7	406.7	406.8	406.4	405.9	405.5	405.2	405.0	404.8	404.5	403.7	403.0	402.9	402.3	401.6	400.9
8	407.8	407.5	407.1	406.8	406.4	406.2	406.0	405.7	405.4	404.6	403.8	403.6	402.8	401.9	401.0
9	408.3	408.0	407.6	407.2	407.0	406.8	406.6	406.5	406.2	405.3	404.4	404.2	403.3	402.1	400.8
10	408.4	408.0	407.8	407.4	407.2	407.1	407.1	406.9	406.7	406.0	405.1	404.8	403.6	402.1	400.4
11	408.3	407.6	407.6	407.3	407.2	407.4	407.4	407.5	407.4	406.7	405.8	405.5	404.0	402.2	400.1
12	407.7	407.0	406.8	406.8	406.9	407.3	407.8	408.0	408.1	407.4	406.5	405.9	404.4	402.2	399.7
13	406.7	405.8	405.9	406.1	406.5	407.3	407.9	408.4	408.6	407.8	406.9	406.3	404.3	401.8	398.8
14	405.6	405.0	405.1	405.5	406.0	407.2	408.2	408.8	409.0	408.3	407.3	406.4	404.1	401.1	397.8
15	404.9	404.5	404.7	405.2	405.8	407.1	408.3	409.3	409.5	408.9	407.8	406.7	404.1	400.7	396.6
16	404.3	404.2	404.5	405.1	405.9	407.2	408.6	409.6	410.0	409.3	408.1	406.8	403.9	399.9	395.3
17	404.1	404.2	404.6	405.3	406.3	407.7	409.1	410.0	410.3	409.6	408.2	406.6	403.2	398.9	393.7
18	404.0	403.9	404.4	405.5	406.7	408.4	409.9	410.6	410.5	409.8	408.1	406.3	402.6	397.8	392.0
19	403.4	403.3	404.0	405.1	406.8	408.9	410.5	411.2	411.2	410.1	408.2	406.1	402.1	396.7	390.4
20	403.0	403.0	403.6	405.0	406.8	409.2	410.9	411.7	411.9	410.4	408.4	406.0	401.6	395.8	388.7
21	402.9	402.9	403.9	405.2	407.2	409.6	411.4	412.5	412.4	410.9	408.4	405.7	400.9	394.7	386.8
22	403.0	403.1	404.2	406.0	408.2	410.5	412.2	413.3	413.3	411.7	409.0	405.8	400.6	393.5	384.9
23	403.3	403.7	404.7	406.9	409.4	412.0	413.6	414.2	414.3	412.9	410.1	406.6	400.9	393.1	383.5
24	404.0	404.6	405.8	408.3	411.2	413.9	415.5	416.0	415.8	414.4	411.5	407.8	401.4	392.8	382.5
25	405.1	405.8	407.3	410.1	413.3	416.1	417.9	418.5	418.0	416.1	413.1	409.2	402.2	392.6	381.6
26	406.5	407.4	409.1	412.2	415.7	418.7	420.6	421.1	420.7	418.4	415.2	411.1	403.4	392.9	380.9
27	408.3	409.7	411.4	414.7	418.5	421.6	423.5	424.2	423.7	421.5	417.8	413.5	405.2	393.7	380.7
28	410.5	412.2	413.9	417.6	421.4	424.7	426.7	427.4	427.0	424.8	421.0	416.1	407.4	395.0	380.9
29	412.8	414.6	416.6	420.5	424.5	428.0	429.9	430.9	430.9	428.6	424.4	418.9	409.7	396.4	381.2
30	415.5	417.5	419.6	423.9	427.9	431.4	433.3	434.5	434.8	432.8	428.5	422.2	412.4	398.2	381.9
31	418.4	420.5	422.7	427.5	431.5	435.0	437.0	438.8	439.2	437.5	433.1	426.2	415.5	400.8	383.4
32	421.3	423.6	426.1	431.0	435.3	438.8	441.0	443.1	443.9	442.5	437.8	430.5	419.0	403.6	385.2
33	424.2	426.6	429.5	434.8	439.2	442.8	445.3	447.7	449.1	447.9	442.9	435.3	422.6	406.8	387.2
34	428.0	430.3	433.1	439.0	443.7	447.3	449.9	452.7	454.7	453.4	448.6	440.6	427.1	410.5	389.9
35	431.7	434.2	437.2	443.6	448.8	452.1	455.0	458.2	460.7	459.7	454.5	446.3	432.3	414.5	393.3
36	435.9	438.4	441.6	448.3	453.9	457.4	460.6	464.1	467.0	466.1	460.7	452.4	437.9	418.5	396.9

**Candela Tabulations (Continued)**

	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
0	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6	396.6
1	399.5	400.2	399.8	398.2	399.4	399.2	398.2	397.2	396.7	395.9	395.2	394.0	393.6	393.3	392.7
2	400.0	400.5	399.9	398.2	399.1	398.7	397.4	396.1	395.3	394.3	393.2	391.8	391.1	390.4	389.7
3	400.5	400.8	399.9	398.0	398.6	397.9	396.3	394.7	393.7	392.3	390.9	389.1	388.0	387.0	385.9
4	400.7	400.9	399.9	397.7	398.1	397.0	395.0	393.1	391.6	389.7	387.9	385.6	384.1	382.4	380.5
5	400.9	400.8	399.5	397.1	397.2	395.9	393.4	391.2	389.1	386.7	384.1	381.1	378.8	376.4	373.5
6	400.6	400.4	399.0	396.3	396.2	394.5	391.8	389.0	386.4	383.4	380.0	375.9	372.9	369.6	366.0
7	400.4	400.0	398.4	395.3	395.0	392.9	389.8	386.7	383.4	379.6	375.1	370.1	365.8	361.1	356.8
8	400.3	399.6	397.7	394.4	393.7	391.3	387.8	384.1	379.8	374.8	369.3	362.9	357.3	351.6	346.4
9	399.8	398.8	396.6	393.2	392.1	389.4	385.4	380.9	375.6	369.7	362.9	354.8	348.3	341.4	335.6
10	399.1	397.9	395.4	391.5	390.2	387.1	382.6	377.3	370.9	363.6	355.7	346.6	338.9	331.2	325.6
11	398.3	396.8	393.9	389.7	387.9	384.4	379.1	372.6	365.4	356.6	347.5	337.7	329.3	321.8	316.1
12	397.3	395.3	392.2	387.5	385.3	381.2	375.2	367.7	359.1	349.2	338.8	328.7	320.2	312.8	307.2
13	396.0	393.6	390.0	384.9	382.2	377.6	370.9	362.3	352.5	341.6	330.6	320.0	311.9	304.6	299.1
14	394.4	391.3	387.1	381.6	378.5	373.3	365.9	356.5	345.6	333.9	322.7	312.2	304.2	297.3	291.6
15	392.6	388.9	384.3	378.2	374.5	368.9	360.6	350.2	338.4	326.3	314.7	304.5	296.6	289.7	283.6
16	390.7	386.4	381.3	374.5	370.4	364.2	355.4	343.7	331.2	318.6	306.8	296.9	289.2	281.7	275.4
17	388.4	383.4	377.8	370.6	366.0	359.2	349.7	337.1	324.1	311.2	299.3	289.7	281.8	273.9	267.1
18	386.0	380.3	373.9	366.2	361.2	354.0	343.5	330.2	316.5	303.5	292.1	282.3	274.2	266.1	259.1
19	383.6	377.1	370.3	362.0	356.4	348.6	337.2	323.3	308.7	295.7	284.8	274.8	266.5	258.1	251.1
20	381.2	374.0	366.4	357.7	351.9	343.2	331.2	316.5	301.6	288.7	277.7	267.5	258.8	250.3	243.0
21	378.7	370.7	362.2	353.2	346.7	337.7	324.8	309.6	295.0	281.9	270.8	260.5	251.6	242.8	235.7
22	376.0	367.2	358.0	348.6	341.7	332.0	318.2	302.9	288.1	275.2	264.1	253.6	244.6	236.0	228.9
23	373.8	364.2	354.4	344.4	337.0	326.8	312.2	296.5	281.5	268.9	257.8	247.2	237.9	229.7	222.4
24	372.0	361.6	351.3	340.7	332.7	321.9	307.2	290.9	275.9	263.2	252.1	241.5	231.9	223.5	216.3
25	370.1	359.2	348.0	336.8	328.4	317.2	301.9	285.6	270.6	258.1	246.9	236.4	226.6	218.0	210.7
26	368.5	356.8	344.8	332.8	323.9	312.6	296.6	280.3	265.7	253.3	241.9	231.4	221.5	212.6	205.6
27	367.4	355.0	342.3	329.5	320.1	308.2	292.0	275.6	261.0	248.8	237.3	226.6	216.5	207.6	200.6
28	366.7	353.4	340.0	326.5	316.8	304.5	287.9	271.6	257.0	244.9	233.3	222.1	211.9	203.0	196.4
29	365.9	351.9	337.5	323.4	313.2	300.7	283.8	267.7	253.4	241.2	229.7	218.0	207.6	198.9	192.7
30	365.5	350.6	335.4	320.8	310.1	297.1	280.1	264.0	250.0	237.9	226.1	213.9	203.5	195.1	189.2
31	365.9	350.2	334.0	318.8	307.6	294.2	277.0	260.8	247.2	235.0	222.6	210.1	199.7	191.7	186.4
32	366.8	349.8	333.0	317.3	305.7	291.7	274.1	258.2	244.8	232.4	219.3	206.5	196.4	188.9	184.6
33	367.5	349.9	332.2	316.1	303.9	289.1	271.3	255.7	242.8	230.0	216.5	203.5	193.7	187.0	183.6
34	368.9	350.4	332.1	315.3	302.6	287.2	269.1	253.7	241.0	227.8	213.8	200.9	191.8	186.2	183.7
35	371.3	351.9	332.7	315.3	302.3	286.0	267.5	252.4	239.8	226.0	211.5	198.8	190.6	186.1	184.2
36	374.0	353.5	333.9	315.9	302.3	285.1	266.3	251.6	239.1	224.5	209.9	197.7	190.3	186.6	185.2

**Candela Tabulations (Continued)**

	150	155	160	165	170	175	180
0	396.6	396.6	396.6	396.6	396.6	396.6	396.6
1	392.1	391.9	391.7	391.8	391.9	392.0	391.0
2	388.9	388.4	388.0	387.8	387.9	388.0	386.5
3	384.7	384.0	383.4	382.7	382.6	382.7	380.1
4	379.1	377.7	376.7	375.6	375.0	375.0	371.1
5	371.4	369.8	368.0	366.4	365.4	365.1	360.4
6	362.7	360.5	357.8	356.0	354.4	354.1	348.8
7	352.7	349.7	346.4	344.0	342.5	341.5	336.0
8	341.7	337.7	334.1	331.7	330.0	328.9	324.1
9	330.4	326.3	322.9	320.6	319.0	317.8	313.8
10	320.2	316.3	313.0	310.9	309.3	308.3	304.9
11	311.1	307.0	304.0	301.8	300.4	299.4	296.0
12	302.1	298.3	295.4	293.3	291.8	290.7	287.3
13	294.3	290.2	287.2	284.9	283.2	282.1	278.6
14	286.6	282.4	278.9	276.5	274.7	273.5	270.1
15	278.6	274.1	270.2	267.6	265.5	264.6	260.7
16	269.9	265.3	261.4	258.2	256.0	255.3	251.2
17	261.3	256.8	252.7	249.0	247.0	246.0	241.7
18	253.3	248.4	243.9	240.3	237.8	236.7	232.4
19	245.0	240.0	235.2	231.4	228.7	227.4	223.1
20	236.8	231.7	226.7	222.8	219.9	218.3	214.3
21	229.4	223.9	219.0	215.0	212.1	210.5	206.7
22	222.4	216.8	211.9	207.8	205.3	203.5	200.4
23	215.7	210.2	205.4	201.5	199.2	197.5	195.1
24	209.8	204.2	199.6	196.2	194.1	192.6	190.9
25	204.3	199.2	195.0	192.0	190.2	189.0	187.6
26	199.5	195.0	191.3	188.6	187.0	186.0	185.0
27	195.3	191.3	188.0	185.6	184.2	183.5	182.9
28	191.6	188.1	185.4	183.3	182.2	181.6	181.2
29	188.4	185.6	183.5	181.9	180.9	180.5	180.4
30	185.8	183.8	182.2	181.0	180.6	180.3	180.5
31	183.9	182.5	181.7	181.1	181.0	180.8	181.5
32	182.8	182.3	182.1	182.1	182.2	182.0	183.0
33	182.7	182.9	183.6	183.7	183.9	183.8	185.0
34	183.2	184.2	185.7	186.1	186.2	186.3	187.5
35	184.3	186.1	188.5	189.3	189.3	189.1	189.9
36	185.9	188.6	191.7	192.7	192.4	191.5	191.5

**Candela Tabulations (Continued)**

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
37	440.7	443.1	446.3	452.9	459.2	462.8	466.7	470.5	473.5	472.8	467.2	458.5	443.7	423.3	400.8
38	446.4	449.0	451.6	458.3	465.1	469.2	473.5	477.6	480.8	480.1	474.5	465.3	450.0	429.1	405.5
39	452.6	455.3	457.5	464.3	471.2	475.7	480.5	485.3	488.3	487.9	482.4	472.9	457.1	435.3	410.9
40	458.9	461.2	463.0	469.8	477.4	482.7	487.9	493.4	496.4	496.1	490.7	481.0	464.3	441.6	416.5
41	465.5	467.0	468.4	475.0	483.7	490.3	496.1	501.9	504.8	504.5	499.5	489.1	472.1	448.8	422.7
42	471.5	472.9	473.7	480.3	489.7	498.0	504.9	510.6	513.7	513.6	508.9	498.3	480.9	456.9	430.0
43	477.0	478.3	479.1	485.6	495.5	505.4	513.7	520.4	523.1	523.4	519.0	508.3	490.2	465.8	437.8
44	481.8	483.0	484.3	490.9	501.1	512.4	522.6	530.1	532.8	533.3	529.6	519.0	500.5	475.2	446.4
45	485.6	486.8	489.0	495.9	506.9	519.3	531.3	540.4	543.8	543.8	540.8	531.1	512.3	485.5	455.8
46	488.4	489.0	492.4	500.1	512.0	525.9	540.3	551.2	555.7	555.4	552.6	543.9	525.2	497.0	466.7
47	489.1	488.9	493.4	502.2	515.7	531.6	548.7	561.5	567.1	567.5	565.1	557.5	539.4	510.1	478.6
48	487.1	486.3	492.1	502.0	517.5	536.4	555.8	570.6	578.3	580.0	578.4	572.4	555.1	524.7	492.7
49	482.6	481.0	487.7	499.2	516.9	539.1	561.7	579.1	589.6	593.2	593.6	589.7	573.4	542.2	508.9
50	475.4	472.4	480.4	493.2	513.7	539.2	565.4	586.5	600.3	607.4	609.6	608.6	594.0	561.9	526.2
51	465.5	462.0	471.0	485.8	507.9	536.5	566.6	592.2	610.4	621.4	627.0	628.7	616.9	583.8	547.0
52	452.5	448.9	459.1	475.6	499.4	530.7	564.7	595.5	619.5	635.2	645.4	651.4	642.6	609.6	571.2
53	435.8	432.0	443.9	461.6	487.7	521.7	559.5	596.3	627.0	648.9	666.0	677.9	672.3	639.3	598.6
54	416.8	412.7	426.1	445.1	473.2	509.3	551.3	592.8	631.6	661.8	687.9	706.5	705.0	671.6	626.7
55	395.7	392.9	406.8	426.4	456.0	493.5	538.9	585.8	632.8	673.1	710.4	736.9	740.3	706.4	657.8
56	370.7	369.6	384.7	404.0	434.9	474.2	522.3	574.8	630.1	681.8	732.4	769.9	778.3	745.0	690.9
57	344.0	342.0	358.3	377.1	409.7	451.3	501.8	559.2	622.7	686.9	751.1	802.4	818.7	783.4	723.8
58	317.3	313.9	330.1	348.8	381.7	426.9	478.9	539.8	610.5	686.9	766.2	832.9	855.3	821.6	754.1
59	288.7	284.5	299.2	318.0	352.0	400.2	453.0	516.7	593.7	682.3	778.0	858.5	889.4	856.1	780.6
60	258.7	250.5	264.7	284.3	317.5	369.7	423.2	488.3	571.6	672.2	784.1	880.6	917.8	883.4	801.7
61	225.8	215.1	229.8	248.5	281.8	333.3	388.3	456.9	545.3	655.3	781.9	893.3	936.7	902.2	816.9
62	193.4	185.9	198.6	216.1	247.0	296.2	351.7	423.7	515.1	633.6	772.7	896.4	946.7	913.5	826.6
63	165.9	158.9	171.1	185.9	212.7	257.8	313.7	386.6	480.9	606.1	754.6	890.3	947.0	914.9	829.0
64	144.0	136.6	146.8	159.3	181.2	221.2	274.6	345.4	442.9	570.2	727.3	874.2	938.7	904.7	822.0
65	126.0	120.8	128.3	138.8	157.5	192.0	238.8	307.3	405.7	532.3	694.3	849.6	918.4	886.3	803.8
66	111.2	108.7	114.0	122.8	138.6	167.6	207.7	272.6	368.1	494.1	654.6	815.9	889.7	855.7	774.4
67	99.6	96.9	101.1	107.7	120.9	145.2	180.4	237.6	328.8	451.7	608.4	771.7	845.8	815.5	735.5
68	89.5	87.5	90.4	95.5	106.4	126.1	156.9	205.3	289.7	404.2	558.9	718.7	790.0	764.8	690.0
69	81.6	80.9	83.0	86.7	95.5	111.4	137.2	179.8	253.2	355.8	502.3	658.7	729.3	705.7	638.0
70	75.7	74.6	76.4	79.2	85.6	98.7	119.7	155.3	216.9	308.1	435.2	589.6	662.3	642.4	583.6
71	69.6	67.9	70.0	72.0	77.9	87.8	104.6	132.2	184.4	261.8	370.2	516.2	594.1	580.6	527.7
72	63.4	62.3	64.2	66.1	71.6	79.9	93.1	114.0	157.4	220.9	315.6	450.1	530.2	522.0	471.2
73	57.2	55.9	58.0	59.9	65.5	73.3	82.8	98.5	132.7	185.2	265.8	385.2	464.5	463.6	417.0

**Candela Tabulations (Continued)**

	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
37	377.1	355.9	335.7	317.2	303.0	284.7	265.2	251.3	238.6	223.6	208.9	197.3	190.7	187.4	186.3
38	381.0	359.2	338.4	319.3	304.6	285.0	265.2	251.6	238.4	223.0	208.3	197.3	191.5	188.2	188.1
39	385.7	363.3	341.9	322.3	307.0	286.3	265.8	252.6	238.7	222.7	208.2	197.7	192.3	189.3	190.5
40	390.8	367.9	346.2	326.1	310.3	288.3	267.1	254.1	239.2	222.7	208.7	198.8	193.2	191.3	193.4
41	396.8	373.1	351.0	330.9	314.3	290.8	268.9	256.1	239.8	223.4	210.0	200.2	194.3	193.8	196.4
42	403.6	379.3	356.9	336.5	319.3	294.1	271.4	258.3	241.0	225.0	211.7	201.5	196.2	196.6	199.1
43	410.9	386.2	363.8	342.7	325.1	298.0	274.4	261.0	242.8	227.4	213.8	203.0	198.4	199.1	200.9
44	418.7	394.3	372.0	350.2	331.9	302.8	278.3	264.1	244.9	230.3	216.2	204.7	200.6	200.9	201.7
45	428.2	403.5	381.0	359.2	340.0	308.3	282.6	267.7	247.6	233.5	218.3	206.6	202.5	202.0	201.7
46	438.8	413.6	390.7	368.6	348.2	313.7	286.8	271.1	250.6	236.5	220.0	208.3	204.0	202.3	200.0
47	450.2	424.9	401.1	378.4	356.3	318.8	291.2	274.4	253.7	239.4	221.3	209.8	204.8	201.8	196.7
48	463.2	438.2	413.3	388.7	364.7	324.3	295.8	277.5	256.7	241.7	222.4	211.2	205.1	200.1	192.0
49	478.8	452.8	425.6	399.1	373.4	329.9	300.0	280.4	259.4	243.1	222.9	211.9	204.6	196.8	183.9
50	495.3	467.5	437.8	408.9	381.3	335.2	303.4	282.8	261.6	244.0	223.1	211.7	202.5	190.1	174.6
51	513.2	483.7	451.0	419.3	388.8	339.6	306.6	285.1	263.4	244.4	223.4	210.2	197.0	181.2	165.8
52	534.4	502.0	466.0	430.6	396.0	343.8	309.9	287.0	264.6	243.9	222.0	205.4	187.5	171.3	158.7
53	558.4	521.3	482.6	442.0	402.4	347.5	312.1	287.5	264.3	241.3	217.3	195.9	176.9	164.0	154.3
54	582.5	541.5	499.4	453.7	408.5	350.5	312.4	286.1	262.2	237.0	209.2	184.6	169.1	160.3	150.6
55	607.3	563.8	517.5	465.9	415.2	352.8	310.6	283.5	258.8	230.8	199.2	175.8	164.3	157.8	148.4
56	634.6	588.3	536.6	478.2	421.9	353.9	307.5	279.8	254.2	223.2	190.7	170.5	161.6	155.2	147.1
57	662.0	611.2	554.5	489.5	427.0	353.1	303.1	274.7	248.8	215.9	184.5	167.0	159.3	152.7	146.5
58	686.9	632.9	572.0	499.5	430.6	350.5	297.7	268.1	242.3	209.3	179.4	163.9	157.0	150.6	145.9
59	709.6	652.9	587.1	507.7	432.8	346.6	290.2	259.9	234.7	202.6	174.8	160.6	154.2	148.9	145.0
60	727.2	668.2	597.5	511.9	432.3	340.6	279.2	248.7	225.4	195.3	170.0	157.6	151.5	147.3	143.2
61	739.2	679.0	603.5	511.6	428.3	332.3	265.6	235.2	213.6	187.0	165.0	154.5	148.8	145.4	141.0
62	745.9	685.1	605.7	507.3	421.5	320.3	248.4	219.1	200.2	177.4	159.4	151.0	146.3	143.0	138.3
63	745.8	684.5	601.9	498.3	410.7	303.6	229.6	202.7	185.6	166.8	153.3	146.8	143.6	140.4	135.2
64	738.0	677.5	593.0	485.4	396.2	283.5	211.3	187.5	171.4	156.0	146.8	142.3	140.1	137.0	131.9
65	721.3	664.1	579.3	469.4	378.7	260.2	192.9	172.0	157.8	145.4	139.7	137.6	136.0	133.0	127.8
66	695.5	641.9	558.3	448.0	357.1	234.8	173.8	156.5	144.8	135.4	132.5	132.3	131.2	128.3	123.6
67	662.8	611.0	529.6	421.8	331.4	210.1	156.8	142.5	132.8	126.5	125.0	126.8	125.8	123.2	119.1
68	622.2	572.8	494.3	392.0	303.5	187.9	142.6	130.5	122.3	118.5	117.9	120.7	119.8	117.7	114.4
69	574.5	527.1	453.4	359.3	274.0	167.7	128.3	118.6	112.6	111.1	110.9	114.0	113.6	111.6	109.1
70	524.0	480.6	411.4	326.6	246.4	150.5	114.9	106.9	103.4	103.8	104.4	107.4	106.7	105.1	103.7
71	473.2	433.3	370.3	294.6	221.3	135.4	103.8	97.1	95.4	96.8	97.9	100.7	99.6	98.8	98.2
72	421.2	385.2	328.6	262.0	196.2	120.8	92.9	87.6	87.8	90.2	91.5	94.0	91.8	91.7	92.0
73	369.5	338.8	289.0	230.6	173.0	107.2	82.9	78.8	80.2	83.5	84.9	87.3	84.7	84.6	84.0

**Candela Tabulations (Continued)**

	150	155	160	165	170	175	180
37	188.2	191.7	194.8	195.7	194.6	193.1	192.6
38	191.3	195.0	197.6	197.8	196.1	194.0	193.3
39	194.6	198.0	199.6	198.8	196.5	194.3	193.2
40	197.4	200.1	200.5	198.8	196.0	193.6	191.9
41	199.7	201.1	200.2	197.6	194.5	191.7	189.4
42	201.1	201.2	198.7	194.9	191.2	187.9	184.8
43	201.6	199.8	195.0	189.8	185.5	182.3	178.1
44	200.8	196.3	189.4	183.2	178.9	175.2	169.6
45	198.0	190.6	182.1	175.3	170.3	166.4	159.9
46	193.4	183.2	173.5	166.1	160.3	156.3	150.2
47	186.7	174.8	164.3	156.6	151.1	147.6	143.2
48	178.1	165.9	155.2	148.3	144.3	141.7	139.1
49	169.2	157.2	147.5	142.6	140.2	138.3	137.2
50	161.0	150.1	142.5	139.5	137.8	136.6	135.6
51	153.8	145.4	139.8	137.7	136.0	134.6	133.2
52	148.3	142.3	137.8	135.6	133.6	132.1	130.7
53	144.6	140.1	136.1	133.4	131.2	129.5	128.3
54	142.2	138.5	134.5	131.7	129.1	127.2	125.8
55	141.1	137.1	133.1	130.2	127.1	125.1	123.3
56	140.4	135.9	131.6	128.8	125.2	123.0	120.9
57	139.6	134.4	130.2	127.0	123.1	120.9	118.7
58	138.6	132.7	128.5	124.8	121.1	118.7	116.5
59	137.4	130.9	126.3	122.3	118.7	116.4	114.8
60	135.6	128.8	123.8	119.8	116.3	114.7	113.5
61	133.4	126.4	121.4	117.4	114.4	113.1	112.6
62	130.7	123.8	119.0	115.3	113.0	111.6	111.0
63	127.7	121.1	116.6	113.7	111.5	109.9	108.5
64	124.5	118.3	114.1	111.7	109.8	108.0	105.7
65	121.1	115.4	111.7	109.6	107.3	104.7	102.1
66	117.6	112.5	109.0	106.5	103.7	100.3	97.7
67	114.0	109.1	105.4	102.3	98.9	95.8	93.0
68	110.3	105.6	100.4	97.3	94.1	91.3	88.5
69	106.4	100.6	94.7	92.7	89.9	87.2	84.5
70	101.7	95.1	89.0	88.6	85.7	82.6	79.0
71	95.5	88.4	84.2	83.6	80.1	76.4	71.2
72	88.0	81.5	79.3	77.2	72.8	68.4	62.2
73	79.8	76.0	73.6	69.1	63.5	59.7	55.8

**Candela Tabulations (Continued)**

	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70
74	50.7	48.1	50.8	52.8	58.7	66.7	74.2	84.9	109.5	152.6	222.5	322.5	399.0	403.6	362.9
75	43.9	41.8	44.1	46.2	52.1	60.3	66.9	74.5	91.7	127.1	189.2	270.6	340.0	349.0	312.1
76	37.8	36.1	38.0	40.1	45.6	53.3	59.6	66.0	76.9	107.6	160.1	225.3	284.0	296.6	265.8
77	32.2	29.9	31.7	33.8	38.3	45.8	52.5	57.5	64.6	89.8	132.5	182.4	228.6	245.0	221.4
78	26.8	24.7	26.2	27.9	31.9	38.4	45.0	50.5	55.5	74.4	109.9	147.7	183.0	195.3	180.5
79	22.3	20.6	21.6	23.2	26.2	31.5	37.9	44.2	47.4	61.2	90.3	121.2	148.1	156.1	145.4
80	18.0	16.4	17.2	18.4	20.4	24.8	30.6	36.7	39.2	49.1	70.8	95.7	117.5	122.9	116.0
81	14.3	12.6	13.3	14.1	15.5	18.7	23.3	28.4	32.2	38.0	54.4	73.3	90.2	95.2	89.9
82	11.1	10.0	10.3	10.9	12.1	14.1	17.7	22.0	25.4	29.4	40.8	55.2	67.1	70.2	66.1
83	8.3	7.5	7.7	8.1	8.8	10.1	13.0	16.2	18.6	21.5	28.1	37.9	44.9	47.9	45.6
84	6.0	5.3	5.5	5.7	6.1	7.0	8.9	10.8	12.8	14.5	18.0	23.3	27.0	29.3	28.9
85	4.3	3.9	3.9	4.1	4.5	4.9	5.8	7.0	8.6	9.3	11.3	13.9	15.9	16.1	16.9
86	3.2	2.8	2.8	3.0	3.3	3.6	4.0	4.5	5.0	5.8	6.6	7.8	8.5	8.7	9.0
87	2.3	2.0	2.1	2.3	2.5	2.7	3.0	3.1	3.3	3.7	4.1	4.5	4.8	5.1	5.3
88	1.6	1.5	1.6	1.8	2.0	2.1	2.3	2.5	2.6	2.8	3.1	3.2	3.4	3.4	3.3
89	1.1	1.1	1.3	1.4	1.6	1.7	1.9	2.0	2.1	2.2	2.3	2.4	2.6	2.5	2.2
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

**Candela Tabulations (Continued)**

	75	80	85	90	95	100	105	110	115	120	125	130	135	140	145
74	321.0	297.2	252.8	202.4	152.1	94.9	74.1	71.3	73.5	77.3	79.0	80.6	77.9	77.9	76.3
75	276.7	257.3	219.7	176.7	132.5	83.3	65.5	63.8	66.9	71.2	72.7	73.6	71.1	70.7	68.9
76	236.1	220.4	188.4	151.6	113.6	72.0	57.1	56.4	60.4	64.4	65.7	66.3	63.9	62.5	60.9
77	199.2	186.7	159.8	129.4	96.9	61.7	50.1	49.7	53.9	57.8	59.1	59.0	56.3	53.6	53.0
78	165.1	155.4	133.9	109.4	82.2	52.7	43.5	43.2	47.4	51.2	52.6	52.2	49.6	46.1	45.6
79	136.2	128.6	111.5	91.5	68.7	44.3	36.9	37.2	40.4	44.3	46.2	45.8	43.0	39.8	38.5
80	109.5	104.1	91.6	75.8	56.3	37.0	31.3	31.5	34.3	37.9	40.1	39.3	36.8	34.0	33.0
81	85.1	80.6	71.9	60.9	44.8	30.5	26.3	26.4	29.1	32.1	34.5	33.4	31.1	29.1	28.3
82	63.1	60.1	54.3	46.9	34.4	24.7	21.7	21.8	24.2	26.7	28.7	27.9	26.2	24.5	24.0
83	44.1	42.5	39.7	34.7	25.5	19.5	17.6	17.9	19.6	21.7	23.5	23.0	21.5	20.2	20.0
84	28.4	28.5	27.5	25.0	18.6	14.9	14.0	14.5	15.7	17.6	19.3	18.7	17.6	16.6	16.5
85	17.1	17.1	17.7	16.6	12.9	11.2	10.9	11.4	12.3	13.8	15.1	14.8	14.3	13.4	13.4
86	9.4	10.0	10.2	10.1	8.8	8.2	8.3	8.8	9.6	10.5	11.5	11.5	11.2	10.9	10.7
87	5.4	5.8	5.8	6.0	5.8	5.7	6.1	6.6	7.3	8.1	8.7	8.8	8.8	8.8	8.6
88	3.1	3.3	3.5	3.6	3.8	4.0	4.2	4.8	5.4	5.8	6.4	6.6	6.7	6.9	6.7
89	2.1	2.2	2.1	2.2	2.6	2.8	3.0	3.6	4.1	4.5	4.7	4.9	5.1	5.3	5.1
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0



**Candela Tabulations (Continued)**

	150	155	160	165	170	175	180
74	72.5	70.1	67.1	61.3	57.1	54.1	51.1
75	66.6	64.9	60.6	55.4	52.2	49.6	46.5
76	60.4	59.4	54.2	50.2	47.9	44.9	42.1
77	52.8	53.3	48.0	45.0	43.4	40.7	38.0
78	45.2	46.3	42.2	39.9	39.2	36.9	34.2
79	38.8	38.9	36.6	34.9	35.0	32.8	30.4
80	33.3	33.2	31.2	30.3	30.3	28.9	26.7
81	28.6	28.1	26.6	26.2	26.2	25.2	23.3
82	24.2	23.5	22.7	22.6	22.6	21.6	19.8
83	19.9	19.5	19.0	19.1	19.0	18.4	16.5
84	16.3	16.0	15.8	16.0	16.0	15.4	13.7
85	13.0	12.9	12.8	13.0	12.9	12.4	11.1
86	10.3	10.2	10.2	10.2	10.0	9.7	8.6
87	8.1	8.2	8.1	8.1	7.8	7.5	6.4
88	6.3	6.2	6.3	6.4	6.0	5.3	4.4
89	4.7	4.4	4.6	4.7	4.4	3.5	2.5
90	0.0	0.0	0.0	0.0	0.0	0.0	0.0

*NOTE: The device under test emits no detectable uplight, as defined by ANSI/IES LM-75-19.*

## Test Date(s):

Equipment	Date
3M Sphere	02-02-2024
Type C Goniophotometer	02-02-2024

## Integrating Sphere Equipment:

Description	Manufacturer	Model	Serial Number
3M Sphere	Labsphere	ILLUMIA PLUS 3020-300 4PI	1109184535
CCD Array Spectrometer	Labsphere	MC-9801:3683L	98011077
Lamp Power Supply	Labsphere	LPS-525-42	190615322
Programmable AC Source	Chroma	61602	616020003699
Power Analyzer	Xitron	XT2640	2641AD2006001

## Goniophotometer Equipment:

Description	Manufacturer	Model	Serial Number
Type C Goniophotometer	LSI / UL	6440T	6440PN2028
Spectroradiometer	Gooch & Housego	770VIS/NIR	12415212
Spectrometer	Inphora, Inc	PDET 31	130627
Programmable AC Source	Chroma	61602	616020002300
Power Analyzer	Xitron	XT2640	2641AD2006004

## 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.15:2018	Colorimetry
IES LM-58:1994	Spectroradiometric Measurements
ANSI/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.

**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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**Exceptions:**

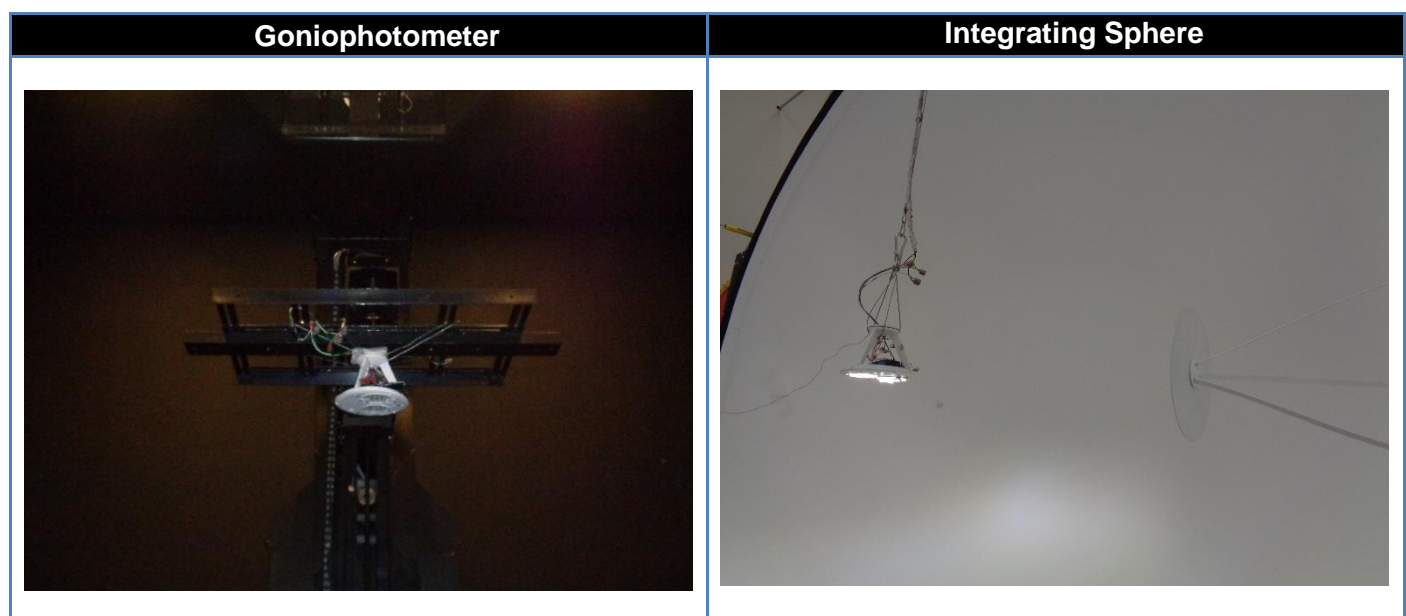
Data in this report tested under Non-Standard Conditions (i.e. temperature outside the allowed acceptance interval for the equipment/test) are identified with (~).

Data in this report not covered by the NVLAP accreditation, are identified with (\*).

In the event testing is subcontracted, subcontracted equipment was used, or performed by the subcontracted laboratory identified in the equipment list of this report, test results in this report marked with the symbol (^).

**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.



**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
02/05/2024	A	DMS	Origination	J. Rocco	M. Hubbard

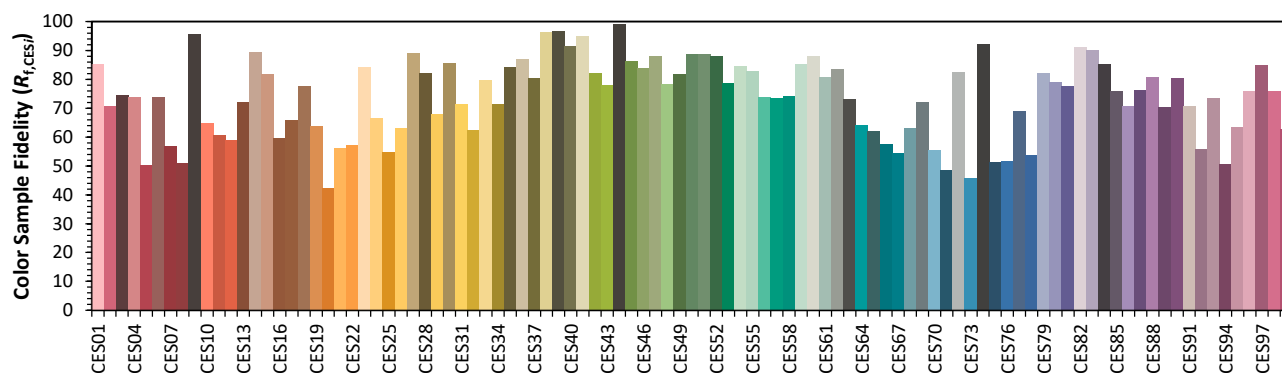
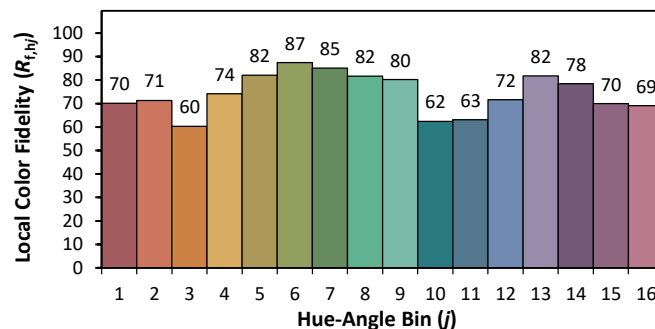
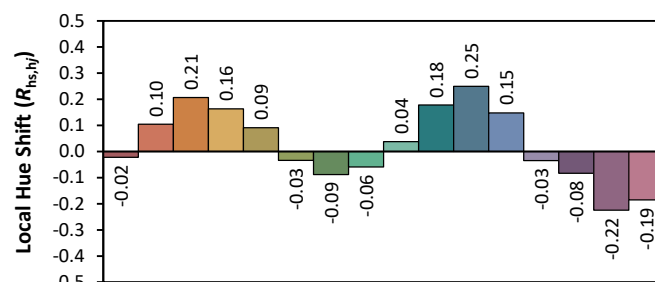
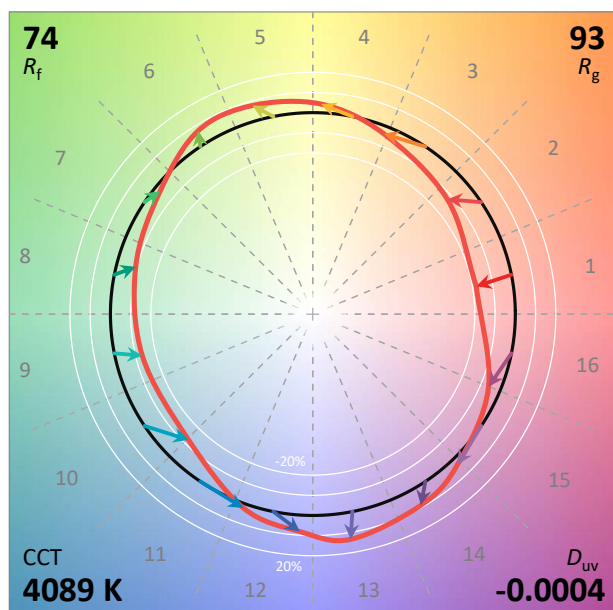
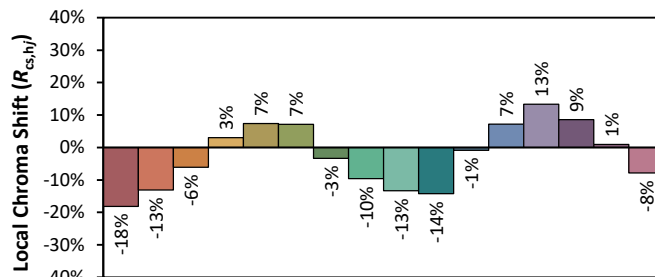
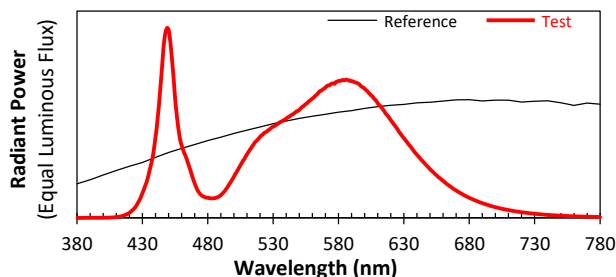
## ANSI/IES TM-30-18 Color Rendition Report

Source: OSQP-C-2L-40K7-3R-UL (Light Engine)

Manufacturer: Cree Lighting

Date: 2/5/2024

Test: PL18134-001



Notes:

x 0.3764

y 0.3734

u' 0.2238

v' 0.4995

CIE 13.3-1995  
(CRI)

R<sub>a</sub> 72

R<sub>g</sub> -38