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Horticultural Lighting Test Report

Relevant Standards
IES LM-79-2008, ANSI C82.77-10-2014, CIE 13.3-1995
CIE 15-2004, ANSI C78.377-2017, IES TM-30-2018
IES LM-58-2013

Prepared For
Grower's Choice
1500 S. Milliken Ave., Ontario, CA 91761
United States

Catalog Number
ROI-E200
Order Number
13270585
Test Number
13270585.06

Test Date

2020-10-06

Prepared By

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William Escobar, Technician

Approved By

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Eric Gaudreau, Engineering Leader

The results contained in this report pertain only to the tested sample.
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Laboratory results may not be representative of field performance
Ballast factors have not been applied

Testing was performed in a 3-meter integrating sphere using the 4π geometry method.

Absorption correction was employed for Sphere measurement



Luminaire Description: Black rectangular metal housing with gold linear metal LED bars
Lamp: 864 White LEDs
Mounting: Pendant
Ballast/Driver: Two (2) Horti Right HR 100-54B

Luminaire



Luminaire Characteristics

Luminous Length: 41.50 in.
Luminous Width: 21.00 in.

Summary of Results

Integrating Sphere

PPF (400-700nm): 510.62 $\mu\text{mol}/\text{sec}$
PPF Efficacy: 2.4608 $\mu\text{mol}/\text{J}$

Distribution

Total Luminaire Output: 33840 Lumens
Luminaire Efficacy: 163.3 lm/w
Maximum Candela: 10837 Candela

Electrical Data at 277 VAC

Test Temperature: 25.8 $^{\circ}\text{C}$
Voltage: 277.0 VAC
Current: 0.7550 A
Power: 201.5 W
Power Factor: 0.963
Frequency: 60 Hz
Current THD: 9.44 %



Horticultural Lighting - Integrating Sphere

Integrating Sphere Test Conditions

Temperature	Voltage	Current	Power	Power Factor	Frequency	Current THD
25.7 °C	120.0 VAC	1.735 A	207.5 W	0.996	60 Hz	6.58 %

Summary of Results

Radiant Flux	115.20 Watts	Radiant Efficiency:	55.5 %
Luminous Flux:	35600 Lumens	Luminous Efficacy:	171.57 lm/W
PPF (400-700nm):	510.62 $\mu\text{mol}/\text{sec}$	PPF Efficacy:	2.4608 $\mu\text{mol}/\text{J}$
R/FR:	7.83	PSS:	0.84

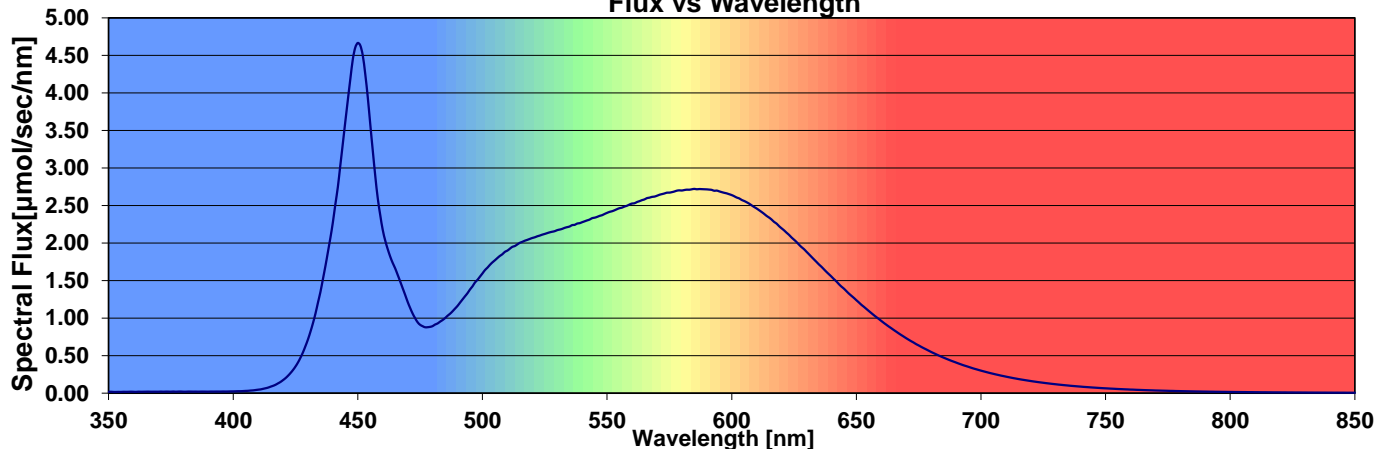
Lumens to $\mu\text{mol}/\text{sec}$ conversion factor: 0.014343 $\mu\text{mol}/\text{sec}/\text{lm}$

Photon Flux Summary versus Wavelength Bands

	Wavelength Range [nm]	Photon Flux [$\mu\text{mol}/\text{sec}$]	Total Photon Flux/ % of Total
UV	350 - 359	0.175323	0.9915 $\mu\text{mol}/\text{sec}$ 0.19%
	360 - 369	0.190726	
	370 - 379	0.204545	
	380 - 389	0.204898	
	390 - 399	0.215995	
Blue	400 - 409	0.304663	139.8032 $\mu\text{mol}/\text{sec}$ 26.81%
	410 - 419	0.870838	
	420 - 429	3.591236	
	430 - 439	13.235342	
	440 - 449	34.673699	
	450 - 459	36.663278	
	460 - 469	17.117558	
	470 - 479	9.798190	
	480 - 489	9.968912	
	490 - 499	13.579454	
Green	500 - 509	17.491265	235.0281 $\mu\text{mol}/\text{sec}$ 45.07%
	510 - 519	19.863260	
	520 - 529	21.150742	
	530 - 539	22.181696	
	540 - 549	23.320525	
	550 - 559	24.563497	
	560 - 569	25.750307	
	570 - 579	26.691867	
	580 - 589	27.135572	
	590 - 599	26.879384	

	Wavelength Range [nm]	Photon Flux [$\mu\text{mol}/\text{sec}$]	Total Photon Flux/ % of Total
Red	600 - 609	25.650604	135.6519 $\mu\text{mol}/\text{sec}$ 26.01%
	610 - 619	23.480634	
	620 - 629	20.589580	
	630 - 639	17.331771	
	640 - 649	14.082450	
	650 - 659	11.105840	
	660 - 669	8.553142	
	670 - 679	6.467155	
	680 - 689	4.823211	
	690 - 699	3.567503	
Far Red	700 - 709	2.623518	9.4923 $\mu\text{mol}/\text{sec}$ 1.82%
	710 - 719	1.923817	
	720 - 729	1.410678	
	730 - 739	1.035606	
	740 - 749	0.763222	
	750 - 759	0.566888	
	760 - 769	0.422707	
	770 - 779	0.317749	
	780 - 789	0.241776	
	790 - 799	0.186350	
IR	800 - 809	0.147038	0.5072 $\mu\text{mol}/\text{sec}$ 0.10%
	810 - 819	0.116429	
	820 - 829	0.095192	
	830 - 839	0.077739	
	840 - 850	0.070838	

Flux vs Wavelength





Horticultural Lighting - Definition of Terms

Radiant Flux: The measured radiant power of the test item in units of watts from 350nm to 850 nm.

Luminous Flux: The measured radiant power of the test item in units of lumens from 380nm to 780 nm.

PPF (400-700nm): Photosynthetic Photon Flux - Flux from 400 to 700 nm expressed in units of $\mu\text{mol}/\text{sec}$
This wavelength range has been identified as important to photosynthetic processes.

R/FR: Ratio of Red to Far Red light - The ratio of R to FR light (R:FR) influences growth attributes of floriculture crops including branching and elongation of stems and leaves. It also controls flowering in plants that are sensitive to day length.

Radiant Efficiency: The ratio of light flux in watts to electrical input power in watts expressed in percent.

Luminous Efficacy: The ratio of light flux in lumens to electrical input power in watts expressed in lm/W .

PPF Efficacy: The ratio of photosynthetic photon flux to electrical input power in watts expressed in $\mu\text{mol}/\text{J}$.

PSS: Phytochrome photostationary state - The ratio of the concentration of the phytochrome P_R isoform of phytochrome to the total concentration of both the P_R and P_{FR} isoforms. Related to the R/FR metric.

PPFD: Photosynthetic Photon Flux Density - Flux per unit area expressed in $\mu\text{mol}/\text{sec}/\text{m}^2$.

Lumens to $\mu\text{mol}/\text{sec}$ conversion factor: Multiply flux in lumens by this factor to convert to PPF in units of $\mu\text{mol}/\text{sec}$. This conversion factor can also be used to convert illuminance in lux to photosynthetic photon flux density (PPFD).

To convert from footcandles to PPFD first convert the illuminance in fc to lux by multiplying by 10.7639 lux/fc and then use the lumens to $\mu\text{mol}/\text{sec}$ conversion factor.

Note: This factor applies to the measured spectral distribution only and cannot be applied to other light sources.



Distribution - Goniophotometer

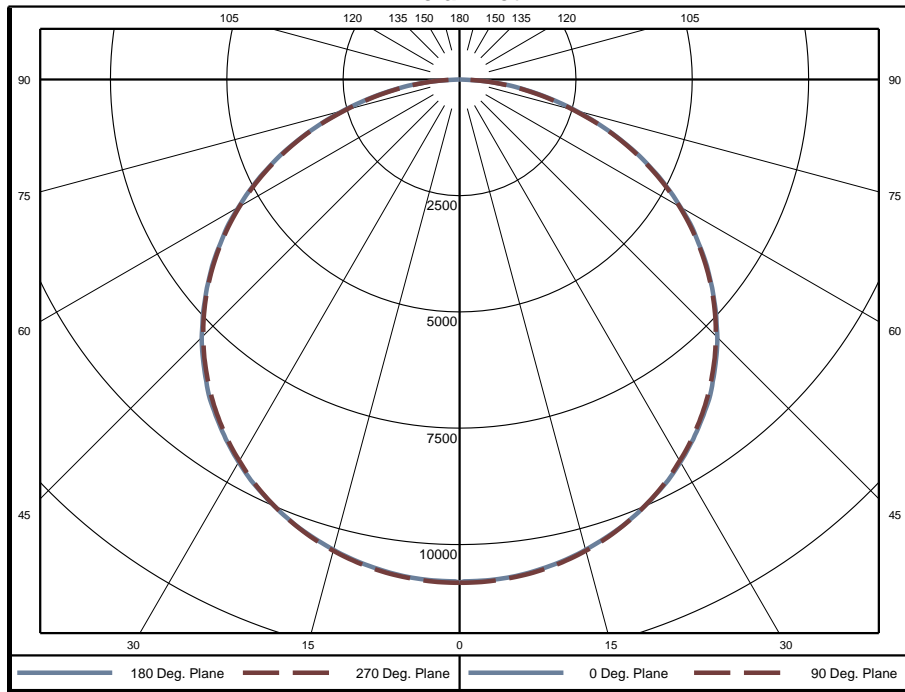
Distribution Test Conditions

Temperature	Voltage	Current	Power	Power Factor	Frequency	Current THD
25.4 °C	120.1 VAC	1.732 A	207.3 W	0.996	60 Hz	6.63 %

Summary of Results

Spacing Criteria	Total Lumen Output:	33840 Lumens
0-180: 1.31	Luminaire Efficacy:	163.3 lm/w
90-270: 1.30	Maximum Candela:	10837 Candela
Corrected UGR (Room Dimension: X=4H, Y=8H, Reflectances: 70/50/20%, S/H: 1)		
Crosswise: 27.4	Endwise: 27.4	

Polar Plot



Zonal Lumen Summary

Zone	Lumens	% of Luminaire	Zone	Lumens	% of Luminaire	Zone	Lumens	% of Luminaire
0-5	258	0.8%	60-65	2430	7.2%	120-125	0	0.0%
5-10	767	2.3%	65-70	2050	6.1%	125-130	0	0.0%
10-15	1255	3.7%	70-75	1597	4.7%	130-135	0	0.0%
15-20	1706	5.0%	75-80	1108	3.3%	135-140	0	0.0%
20-25	2109	6.2%	80-85	637	1.9%	140-145	0	0.0%
25-30	2451	7.2%	85-90	176	0.5%	145-150	0	0.0%
30-35	2721	8.0%	90-95	0	0.0%	150-155	0	0.0%
35-40	2911	8.6%	95-100	0	0.0%	155-160	0	0.0%
40-45	3010	8.9%	100-105	0	0.0%	160-165	0	0.0%
45-50	3013	8.9%	105-110	0	0.0%	165-170	0	0.0%
50-55	2918	8.6%	110-115	0	0.0%	170-175	0	0.0%
55-60	2722	8.0%	115-120	0	0.0%	175-180	0	0.0%

Zone	Lumens	% of Luminaire
0-40	14178	41.9%
0-60	25841	76.4%
0-90	33839	100.0%
90-180	0	0.0%



Candela Tabulation
Horizontal Angle (Degrees)

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5
0	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810	10810
5	10760	10770	10770	10800	10780	10800	10770	10770	10760	10770	10770	10800	10780	10800	10770	10770
10	10650	10650	10660	10690	10670	10690	10660	10650	10650	10650	10660	10690	10670	10690	10660	10650
15	10460	10470	10480	10510	10480	10510	10480	10470	10460	10470	10480	10510	10480	10510	10480	10470
20	10220	10210	10220	10250	10220	10250	10220	10210	10220	10210	10220	10250	10220	10250	10220	10210
25	9886	9877	9887	9906	9880	9906	9887	9877	9886	9877	9887	9906	9880	9906	9887	9877
30	9493	9469	9476	9496	9461	9496	9476	9469	9493	9469	9476	9496	9461	9496	9476	9469
35	9016	8991	8993	9012	8979	9012	8993	8991	9016	8991	8993	9012	8979	9012	8993	8991
40	8466	8441	8442	8449	8419	8449	8442	8441	8466	8441	8442	8449	8419	8449	8442	8441
45	7836	7810	7805	7808	7790	7808	7805	7810	7836	7810	7805	7808	7790	7808	7805	7810
50	7108	7108	7093	7097	7080	7097	7093	7108	7108	7108	7093	7097	7080	7097	7093	7108
55	6329	6327	6308	6313	6301	6313	6308	6327	6329	6327	6308	6313	6301	6313	6308	6327
60	5481	5460	5448	5453	5455	5453	5448	5460	5481	5460	5448	5453	5455	5453	5448	5460
65	4566	4533	4515	4532	4540	4532	4515	4533	4566	4533	4515	4532	4540	4532	4515	4533
70	3592	3555	3540	3562	3569	3562	3540	3555	3592	3555	3540	3562	3569	3562	3540	3555
75	2584	2561	2557	2544	2534	2544	2557	2561	2584	2561	2557	2544	2534	2544	2557	2561
80	1626	1615	1598	1589	1577	1589	1598	1615	1626	1615	1598	1589	1577	1589	1598	1615
85	727	722	755	739	713	739	755	722	727	722	755	739	713	739	755	722
90	0	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	0
100	0	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	0
110	0	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	0
120	0	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	0
130	0	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	0
140	0	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	0
150	0	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	0
160	0	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	0
170	0	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	0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Average Luminance (cd/m²)
Horizontal Angle (Degrees)

	0	45	90
0	19230	19230	19230
45	19710	19630	19590
55	19620	19560	19540
65	19220	19000	19110
75	17760	17570	17420
85	14830	15410	14550



Coefficients of Utilization - Zonal Cavity Method

Effective Floor Cavity Reflectance 20%

Ceiling Cavity Reflectance	80				70				50			30			10			0
Wall Reflectance	70	50	30	10	70	50	30	10	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio (RCR)	** Values are expressed as percent of total lumen output delivered to the task surface **																	
0	119	119	119	119	116	116	116	116	111	111	111	106	106	106	102	102	102	100
1	108	103	99	95	105	101	97	93	97	93	90	93	90	87	89	87	85	83
2	98	89	82	76	95	87	81	75	84	78	74	81	76	72	77	74	70	68
3	89	78	70	63	86	76	69	62	73	67	61	71	65	60	68	63	59	57
4	81	69	60	53	79	67	59	52	65	58	52	63	56	51	60	55	50	48
5	75	61	52	45	72	60	51	45	58	50	44	56	49	44	54	48	43	41
6	69	55	46	39	67	54	45	39	52	44	39	51	44	38	49	43	38	36
7	64	50	41	35	62	49	40	34	47	40	34	46	39	34	45	38	34	32
8	59	45	37	31	58	45	36	31	43	36	30	42	35	30	41	35	30	28
9	55	42	33	28	54	41	33	27	40	32	27	39	32	27	38	31	27	25
10	52	38	30	25	50	38	30	25	37	30	25	36	29	25	35	29	24	23

Beam and Field Information	
CIE Type:	Direct
Center Beam Intensity:	10810 Candela
Central Cone Intensity:	10801 Candela
Beam Flux:	25983.6 Lumens
Beam Angle (0-180):	120.8 Degrees
Beam Angle (90-270):	120.5 Degrees
Field Angle (0-180):	166.5 Degrees
Field Angle (90-270):	165.5 Degrees

