LTL LUMINAIRE TESTING LABORATORY, INC.
SUSTAINING MEMBER of the IESNA
905 Harrison Street · Allentown, PA 18103 · 610-770-1044 · Fax 610-770-8912 · www.LuminaireTesting.com

Lamp Flux and Color Quality Test Report

Test Date:	October 6, 2010
LTL Test Number:	21025
Prepared For:	LEDnovation
Catalog Number:	LED-PAR38-90-1WD-IF
Lamp Description:	Cast aluminum heatsink housing, clear patterned plastic optic with frosted center section
Lamp:	One VBU 19W PAR38 LED replacement lamp with one white LED

Measured Lamp Electrical Values:

Voltage:	120.0	V
Current:	0.172	A
Watts:	19.02	W
Power Factor:	0.924	
Temperature:	24.6	°C

Measured Lamp Photometric Values:

Radiant Flux:	2903	mW
Luminous Flux:	879.8	Lumens
Lamp Efficacy:	46.3	Lumens per Watt
CCT:	3011	K
CRI (Ra):	82.0	
Chromaticity (x):	0.4329	
Chromaticity (y):	0.3972	
Chromaticity (u'):	0.2509	
Chromaticity (v'):	0.5180	
Duv:	-0.0023	

Approved by: MG

Testing was performed in accordance with IES LM-79-2008

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Test Date: October 6, 2010

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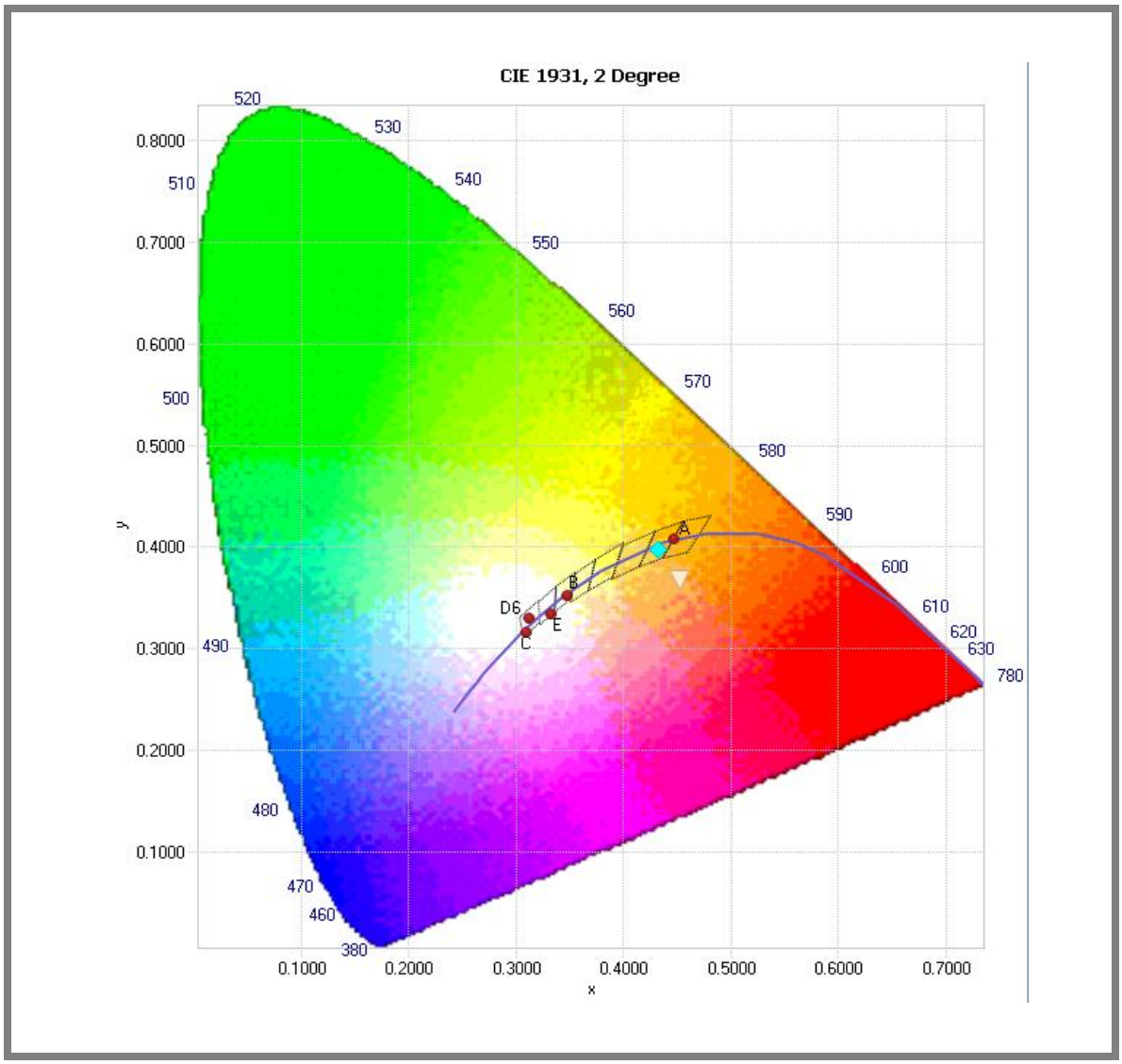
Chromaticity Coordinates						
x	y	u	v	u'	v'	Duv
0.4329	0.3972	0.2509	0.3454	0.2509	0.5180	-0.0023



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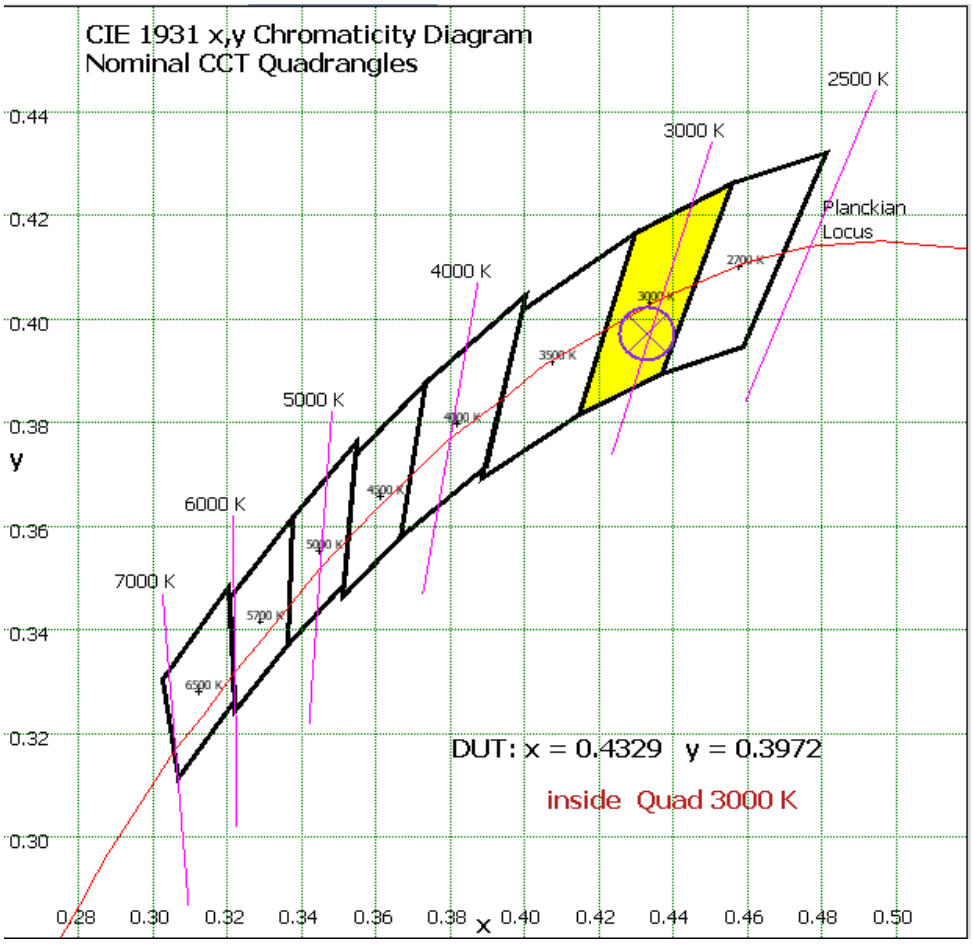

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Test Date: October 6, 2010

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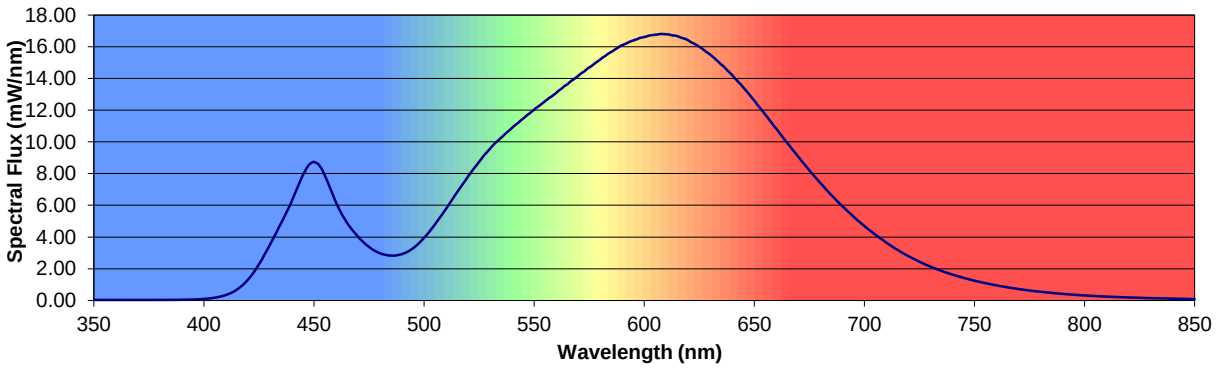
Spectral Power Distribution

λ(nm)	mW	λ(nm)	mW	λ(nm)	mW	λ(nm)	mW	λ(nm)	mW
350	0.03	400	0.09	450	8.74	500	3.95	550	12.03
351	0.03	401	0.11	451	8.68	501	4.10	551	12.15
352	0.03	402	0.12	452	8.59	502	4.26	552	12.25
353	0.03	403	0.13	453	8.40	503	4.44	553	12.35
354	0.03	404	0.15	454	8.18	504	4.62	554	12.46
355	0.03	405	0.17	455	7.85	505	4.80	555	12.57
356	0.03	406	0.20	456	7.55	506	4.99	556	12.68
357	0.03	407	0.23	457	7.21	507	5.19	557	12.79
358	0.03	408	0.26	458	6.87	508	5.38	558	12.87
359	0.03	409	0.30	459	6.52	509	5.58	559	12.98
360	0.03	410	0.34	460	6.19	510	5.78	560	13.08
361	0.03	411	0.39	461	5.89	511	5.99	561	13.21
362	0.03	412	0.45	462	5.62	512	6.19	562	13.31
363	0.03	413	0.52	463	5.35	513	6.40	563	13.42
364	0.03	414	0.59	464	5.13	514	6.62	564	13.55
365	0.03	415	0.68	465	4.90	515	6.82	565	13.62
366	0.03	416	0.78	466	4.70	516	7.02	566	13.75
367	0.03	417	0.89	467	4.52	517	7.22	567	13.86
368	0.03	418	1.01	468	4.35	518	7.42	568	13.95
369	0.03	419	1.15	469	4.18	519	7.61	569	14.06
370	0.03	420	1.31	470	4.03	520	7.83	570	14.16
371	0.03	421	1.47	471	3.87	521	8.00	571	14.29
372	0.03	422	1.64	472	3.74	522	8.20	572	14.38
373	0.03	423	1.84	473	3.60	523	8.38	573	14.47
374	0.03	424	2.05	474	3.48	524	8.56	574	14.60
375	0.03	425	2.28	475	3.38	525	8.74	575	14.69
376	0.03	426	2.49	476	3.27	526	8.92	576	14.78
377	0.03	427	2.75	477	3.18	527	9.10	577	14.89
378	0.03	428	3.00	478	3.10	528	9.26	578	15.00
379	0.03	429	3.25	479	3.03	529	9.42	579	15.09
380	0.03	430	3.50	480	2.97	530	9.57	580	15.19
382	0.03	432	4.04	482	2.88	532	9.88	582	15.39
383	0.03	433	4.30	483	2.86	533	10.01	583	15.50
384	0.03	434	4.58	484	2.84	534	10.13	584	15.59
385	0.03	435	4.86	485	2.83	535	10.26	585	15.67
386	0.03	436	5.12	486	2.82	536	10.39	586	15.75
387	0.04	437	5.40	487	2.83	537	10.52	587	15.86
388	0.04	438	5.69	488	2.86	538	10.64	588	15.93
389	0.04	439	5.97	489	2.89	539	10.76	589	16.03
390	0.04	440	6.30	490	2.92	540	10.89	590	16.10
391	0.04	441	6.63	491	2.97	541	11.01	591	16.16
392	0.05	442	6.95	492	3.03	542	11.12	592	16.22
393	0.05	443	7.28	493	3.10	543	11.23	593	16.29
394	0.05	444	7.61	494	3.20	544	11.36	594	16.35
395	0.06	445	7.91	495	3.29	545	11.47	595	16.40
396	0.06	446	8.17	496	3.40	546	11.59	596	16.44
397	0.07	447	8.42	497	3.52	547	11.71	597	16.49
398	0.08	448	8.59	498	3.65	548	11.80	598	16.56
399	0.09	449	8.69	499	3.80	549	11.92	599	16.58



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Test Date: October 6, 2010
LTL Test Number: 21025

Spectral Power Distribution

λ(nm)	mW	λ(nm)	mW	λ(nm)	mW	λ(nm)	mW	λ(nm)	mW
600	16.62	650	12.61	700	4.70	750	1.25	800	0.31
601	16.65	651	12.42	701	4.58	751	1.21	801	0.31
602	16.70	652	12.25	702	4.47	752	1.18	802	0.30
603	16.72	653	12.08	703	4.36	753	1.15	803	0.29
604	16.74	654	11.90	704	4.25	754	1.12	804	0.28
605	16.76	655	11.72	705	4.15	755	1.09	805	0.28
606	16.77	656	11.55	706	4.04	756	1.06	806	0.27
607	16.80	657	11.36	707	3.94	757	1.03	807	0.26
608	16.81	658	11.18	708	3.85	758	1.00	808	0.25
609	16.80	659	10.99	709	3.75	759	0.97	809	0.25
610	16.79	660	10.83	710	3.65	760	0.95	810	0.24
611	16.78	661	10.65	711	3.55	761	0.92	811	0.23
612	16.75	662	10.47	712	3.46	762	0.90	812	0.23
613	16.71	663	10.29	713	3.36	763	0.87	813	0.22
614	16.71	664	10.11	714	3.28	764	0.85	814	0.22
615	16.67	665	9.93	715	3.20	765	0.83	815	0.21
616	16.62	666	9.76	716	3.11	766	0.80	816	0.21
617	16.56	667	9.58	717	3.03	767	0.78	817	0.20
618	16.53	668	9.41	718	2.95	768	0.76	818	0.20
619	16.48	669	9.24	719	2.87	769	0.74	819	0.19
620	16.41	670	9.06	720	2.80	770	0.72	820	0.19
621	16.31	671	8.89	721	2.72	771	0.70	821	0.18
622	16.24	672	8.71	722	2.65	772	0.68	822	0.18
623	16.17	673	8.55	723	2.58	773	0.66	823	0.17
624	16.09	674	8.38	724	2.51	774	0.64	824	0.17
625	16.00	675	8.21	725	2.44	775	0.63	825	0.16
626	15.91	676	8.05	726	2.38	776	0.61	826	0.16
627	15.81	677	7.88	727	2.31	777	0.59	827	0.15
628	15.70	678	7.72	728	2.25	778	0.58	828	0.15
629	15.61	679	7.57	729	2.19	779	0.56	829	0.15
630	15.50	680	7.41	730	2.13	780	0.54	830	0.15
632	15.27	682	7.10	732	2.02	782	0.52	832	0.14
633	15.14	683	6.95	733	1.97	783	0.50	833	0.13
634	15.02	684	6.79	734	1.91	784	0.49	834	0.13
635	14.88	685	6.65	735	1.86	785	0.47	835	0.13
636	14.77	686	6.51	736	1.81	786	0.46	836	0.12
637	14.62	687	6.36	737	1.76	787	0.45	837	0.12
638	14.49	688	6.22	738	1.72	788	0.44	838	0.12
639	14.35	689	6.08	739	1.67	789	0.43	839	0.12
640	14.21	690	5.94	740	1.63	790	0.41	840	0.11
641	14.04	691	5.82	741	1.59	791	0.40	841	0.11
642	13.90	692	5.68	742	1.54	792	0.39	842	0.11
643	13.74	693	5.55	743	1.50	793	0.38	843	0.10
644	13.60	694	5.43	744	1.47	794	0.37	844	0.10
645	13.44	695	5.29	745	1.43	795	0.36	845	0.10
646	13.27	696	5.17	746	1.39	796	0.35	846	0.10
647	13.12	697	5.05	747	1.35	797	0.34	847	0.09
648	12.95	698	4.93	748	1.32	798	0.33	848	0.09
649	12.77	699	4.81	749	1.28	799	0.32	849	0.09
								850	0.09

Test Date: October 6, 2010

LTL Test Number: 21025

Color Rendering Index Detail								
R1	R2	R3	R4	R5	R6	R7	R8	Ra (CRI)
81.1	87.7	91.7	80.2	79.4	82.0	86.5	67.6	82.0

Color Rendering Index Detail (Expanded)								
R9	R10	R11	R12	R13	R14			
23.7	69.4	76.5	63.6	82.2	94.6			

Testing was performed in the LTL two-meter integrating sphere (Labsphere model SLMS7650) using a Labsphere model CDS1100 spectrometer and LightMtrX software.

Testing was performed using the 4π geometry method of measurement.

Absorption correction was employed for this measurement.

Electrical power was supplied to the device under test using a regulated power supply.

The device under test was allowed to reach stability according to appropriate IES standards prior to measurement.

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SUSTAINING MEMBER of the IESNA

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LTL NUMBER: 21024 DATE: 10-04-2010
PREPARED FOR: LEDNOVATION
CATALOG NUMBER: LED-PAR38-90-1WD-IF
LUMINAIRE: CAST ALUMINUM HEATSINK HOUSING, CLEAR PATTERNED PLASTIC OPTIC WITH FROSTED CENTER SECTION.
LAMP: ONE VBU 19W PAR38 LED REPLACMENT LAMP WITH ONE WHITE LED
BALLAST: LED POWER SUPPLY: INTERNAL
ELECTRICAL VALUES: 120.0 V, 0.172 A, 19.04 W, 0.924 PF
NOTE: THIS TEST WAS PERFORMED USING THE CALIBRATED PHOTODETECTOR METHOD OF ABSOLUTE PHOTOMETRY.*

Candela Distribution

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5	225	247.5	270	292.5	315	337.5	Flux
0	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	
5	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	175.3
15	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	320.5
25	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	210.3
35	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	91.5
45	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	37.2
55	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	18.2
65	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	13.4
75	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6.6
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8
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	0.0
105	0	0	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	0.0
125	0	0	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	0.0
145	0	0	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	0.0
165	0	0	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	0.0
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Zonal Lumen Summary

Zone	Lumens	% of Lamp	% of Luminaire
0-30	706.0	N/A	80.8%
0-40	797.5	N/A	91.3%
0-60	853.0	N/A	97.6%
0-90	873.8	N/A	100.0%
90-180	0.0	N/A	0.0%
0-180	873.8	N/A	100.0%

Total lumen Output 873.8 Lumens
Luminaire efficacy: 45.9 Lumens per Watt
CIE Type: Direct
Spacing Criterion: 0.55

Luminaire

Approved By: MG

*DATA WAS ACQUIRED USING THE CALIBRATED PHOTODETECTOR METHOD OF ABSOLUTE PHOTOMETRY. A UDT MODEL #211 PHOTODETECTOR AND UDT MODEL #S370 OPTOMETER COMBINATION WERE USED AS A STANDARD. A SPECTRAL MISMATCH CORRECTION FACTOR WAS EMPLOYED BASED ON THE SPECTRAL RESPONSIVITY OF THE PHOTODETECTOR AND THE SPECTRAL POWER DISTRIBUTION OF THE TEST SUBJECT.

TESTING WAS PERFORMED IN ACCORDANCE WITH IES LM-79-08.
TEST ANGULAR INCREMENTS AND REPORT FORMATTING WAS BASED ON IES LM-41-98 AND LM-46-04.

Candela Tabulation (5 degree Vertical Increments)

	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	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060	2060
5	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947	1947
10	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611	1611
15	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170	1170
20	765	765	765	765	765	765	765	765	765	765	765	765	765	765	765	765
25	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
30	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253	253
35	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141	141
40	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79	79
45	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46
50	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28	28
55	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19
60	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17
65	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
70	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
75	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
80	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
85	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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

Zonal Lumen Tabulation (5 degree zones)

Zone	Lumens	Zone	Lumens	Zone	Lumens	Zone	Lumens
0-5	47.9	45-50	14.6	90-95	0.0	135-140	0.0
5-10	127.3	50-55	10.0	95-100	0.0	140-145	0.0
10-15	163.3	55-60	8.2	100-105	0.0	145-150	0.0
15-20	157.1	60-65	7.4	105-110	0.0	150-155	0.0
20-25	124.3	65-70	6.0	110-115	0.0	155-160	0.0
25-30	86.0	70-75	4.2	115-120	0.0	160-165	0.0
30-35	56.2	75-80	2.4	120-125	0.0	165-170	0.0
35-40	35.3	80-85	0.8	125-130	0.0	170-175	0.0
40-45	22.6	85-90	0.0	130-135	0.0	175-180	0.0

Coefficients of Utilization - Zonal Cavity Method												
Effective Floor Cavity Reflectance 20%												
Ceiling Cavity Reflectance	90				80				70			
Wall Reflectance	70	50	30	10	70	50	30	10	70	50	30	10
Room Cavity Ratio (RCR)												
0	1066	1066	1066	1066	1040	1040	1040	1040	1016	1016	1016	1016
1	1017	991.2	968.2	947.7	994.6	971.6	950.9	932.4	973.2	952.7	934.3	917.6
2	969.9	925.5	889.1	858.8	949.8	909.9	876.9	849.1	930.9	895	865.1	839.6
3	925.6	868.3	824.6	790.1	907.7	855.8	815.7	783.7	890.8	843.9	807	777.4
4	884.3	818.2	770.6	734.6	868.3	808.1	764	730.3	853.2	798.4	757.5	725.9
5	845.9	773.9	724.5	688.5	831.6	765.6	719.4	685.4	818.1	757.6	714.5	682.4
6	810.2	734.4	684.5	649.1	797.4	727.5	680.6	646.9	785.3	720.9	676.8	644.8
7	777	698.9	649.3	615	765.5	693.1	646.2	613.4	754.6	687.5	643.2	611.8
8	746.1	666.8	617.9	584.8	735.7	661.9	615.5	583.6	725.9	657.2	613.1	582.4
9	717.4	637.7	589.8	557.9	708	633.5	587.8	557	699.1	629.4	585.9	556.1
10	690.6	611	564.4	533.7	682.1	607.4	562.7	533	674.1	603.9	561.1	532.3

Ceiling Cavity Reflectance	50				30			10			0
Wall Reflectance	70	50	30	10	50	30	10	50	30	10	0
Room Cavity Ratio (RCR)											
0	970.9	970.9	970.9	970.9	929.5	929.5	929.5	891.6	891.6	891.6	873.8
1	933.6	917.5	902.8	889.4	885.1	873.6	862.9	855.3	846.4	838	822.7
2	895.8	867.1	842.5	821.3	841.3	821.4	803.9	817.5	801.5	787.2	773.2
3	859.6	821.3	790.5	765.1	800.5	774.8	753.2	781.2	759.9	741.8	728.7
4	825.5	780	745.1	717.5	763	733.3	709.2	747.1	722	701.2	688.8
5	793.3	742.5	705.1	676.4	728.4	696	670.6	715.3	687.3	664.9	653
6	763.1	708.3	669.4	640.5	696.5	662.3	636.3	685.5	655.5	632.1	620.7
7	734.6	676.9	637.4	608.6	667	631.8	605.5	657.6	626.3	602.4	591.4
8	707.9	648.2	608.4	580.1	639.7	603.9	577.7	631.7	599.5	575.4	564.7
9	682.8	621.7	582.1	554.3	614.4	578.4	552.5	607.5	574.8	550.7	540.4
10	659.3	597.3	558	530.9	590.9	554.9	529.5	585	552	528.1	518.1

Average Luminance Table (cd/m²)

	0	45	90
0	1082290	1082290	1082290
45	34510	34510	34510
55	17819	17819	17819
65	17112	17112	17112
75	12769	12769	12769
85	217	217	217

THIS TEST WAS CONDUCTED USING PHOTOMETRY TECHNIQUES ACCORDING TO STANDARD IES PROCEDURES. THE USER MUST THEREFORE USE CAUTION IN THE FOLLOWING SITUATIONS: 1) THIS TEST WAS PERFORMED USING A SPECIFIC BALLAST/LAMP COMBINATION. EXTRAPOLATION OF THESE DATA FOR OTHER BALLAST/LAMP COMBINATIONS MAY PRODUCE ERRONEOUS RESULTS. 2) THIS TEST WAS CONDUCTED IN A CONTROLLED LABORATORY ENVIRONMENT WHERE THE AMBIENT TEMPERATURE WAS HELD AT 25°C ±1°C. FIELD PERFORMANCE MAY DIFFER PARTICULARLY IN REGARDS TO CHANGE IN LUMINOUS OUTPUT AS A RESULT OF DIFFERENCE IN AMBIENT TEMPERATURE AND METHOD OF MOUNTING THE LUMINAIRE.