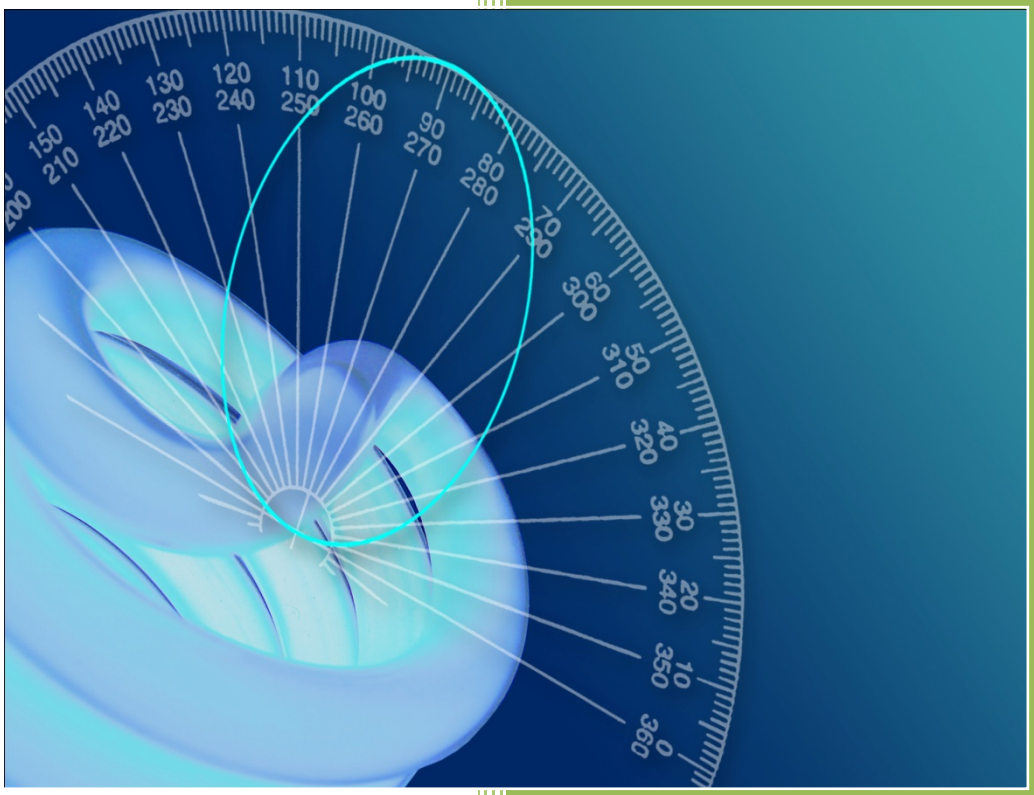
PHOTOMETRIC & OPTICAL TESTING

Photometric Test Report



Photometric and Optical Testing Services
Cheltenham Film and Photographic Studios
Hatherley Lane
Cheltenham
Gloucestershire
GL51 6PN
UK
Tel: 01242 701300

Photometric Test Report

Report Number: POTS/DC16109	Report Date: 18/05/2016	Prepared By: D CHAMBERS
Test Laboratory: Photometric and Optical Testing Services, Cheltenham Film and Photographic Studios, Hatherley Lane, Cheltenham, Gloucestershire, GL51 6PN		
Company Registration Number: Registered in England & Wales No. OC352911		
Registered Address: Thistle Down Barn, Holcot Lane, Sywell, Northampton, NN6 0BG		

Client Details

Company: SIGNAL HOUSE LIGHTING	Email: b.gregory@signalhouse.co.uk
Address: Unit 3, Cherrycourt Way, Leighton Buzzard, LU7 4UH	

Test Method(s) Used

POTS Standard Operating Procedure:	INTEGRATING SPHERE PROCEDURE POTS016
POTS Standard Operating Procedure:	NFMS OPERATION GUIDE
Standard:	LM79 08

Details of Product Tested

Manufacturer: SIGNAL HOUSE LIGHTING	Source Type: LED
Model: AMENITY LANTERN	Luminaire Type: DOWNLIGHT
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230.0	Current (mA)= 1043
Power (Watts)= 232.1	Power factor= 0.968

Integrating Sphere Test

Date of Test: 17/05/2016	Ambient Temperature:25°C
Measurement Filename: AMENITY LANTERN	
Instrument Used: Labsphere model 2m integrating sphere spectroradiometer AS-02949-012	
Integrating Sphere Size: 2m	Measurement Geometry (2π / 4π): 4π
Sample Orientation: Horizontal	Auxiliary Correction Applied: YES
Comments:	
Date of Last Calibration (Operating Hours): 07-04-2016 (1:21)	Spectral Flux Standard Lamp Used: SCL-600
Standard Lamp Serial Number: L123	Traceable: to NIST standards
Calibration Certificate Number: SCL-600-L123	Calibration Certificate Date: 29/01/2014
Calibration Lamp Uncertainty: ± 0.67% (*k=2)*	

Results

Flux (lumens): 24090	
CIE 1931 Chromaticity Cx: 0.3920	CIE 1931 Chromaticity Cy: 0.3917
CRI (%):74.65	CCT (K): 3813

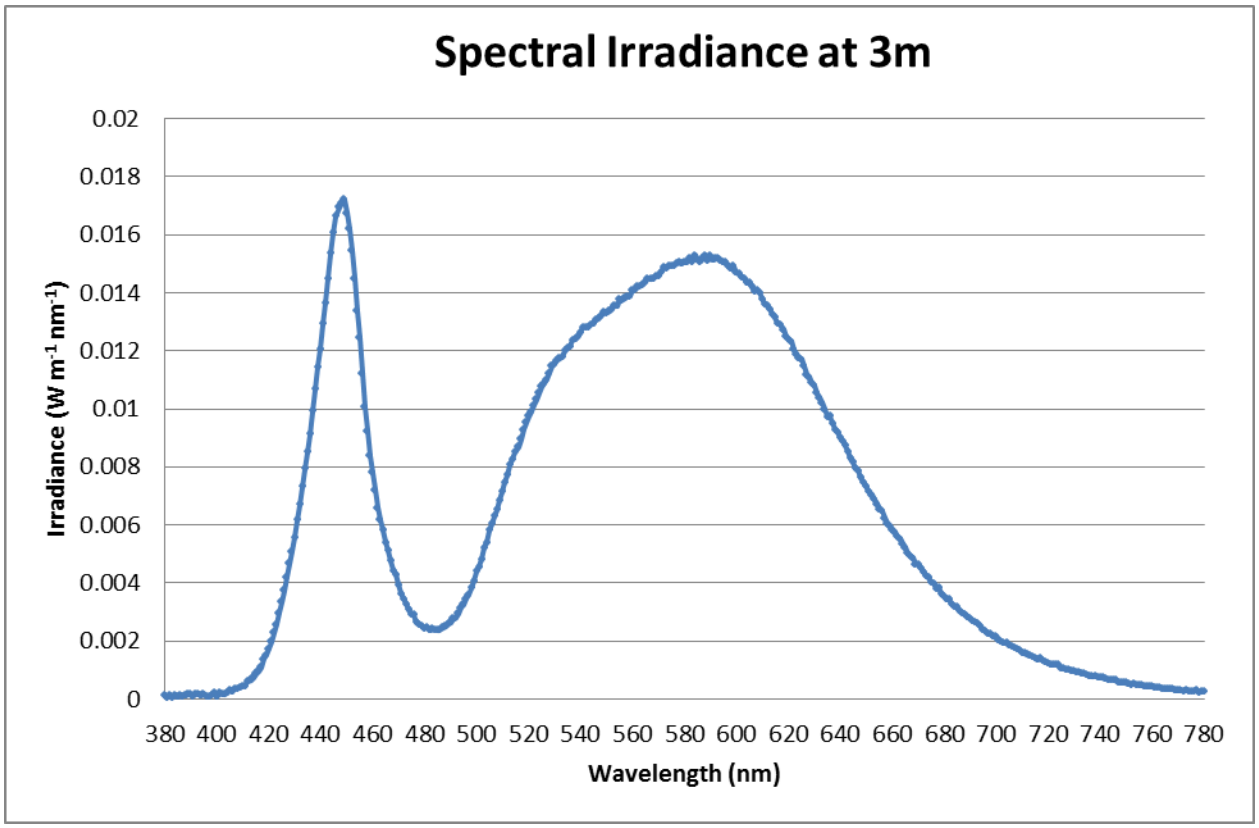


Figure 1: Spectral Irradiance

Figure 2: CIE 1931 diagram.

Goniophotometer Test		
Date of Test: 18/05/2016	Ambient Temperature: 25°C	
Measurement Filename: AMENITY LANTERN		
Instrument Used: Radiant Imaging NFMS0800 Goniometer with ProMetric PM-1200N-1 Imaging Photometer		
Photometer Working Distance: 3m	Measurement Geometry: Near-Field	
Comments:		
Reference Photometer Used: Specbos1211	Reference Photometer Serial Number: 2014754	
Traceable: to NIST standards		
Calibration Certificate Date: 18 June 2015	Sample Stabilisation Time (minutes): 60	
Reference Photometer Calibration Uncertainty: ± 2.4% (*k=2*, 20-200 lux, CIE illuminant A source)		
Scan Set Up		
Direction	**Range**	**Increment**
Inclination Zone 1	0-90°	3°
Azimuth	0-360°	10°
Results		
Integrated Luminous Flux (lumens):24090	Peak Intensity (3° Spot, candelas): 9624.7	Efficacy (lumens/Watt): 104
Beam Angle (50% of max intensity C0-180, degrees): 105.9		
Photometric Filename (IES LM-63-2002): AMENITY LANTERN		
IES File – Absolute or Relative Format? ABSOLUTE		
Photometric Filename (EULUMDAT): AMENITY LANTERN		
EULUMDAT File – Absolute or Relative Format? ABSOLUTE		

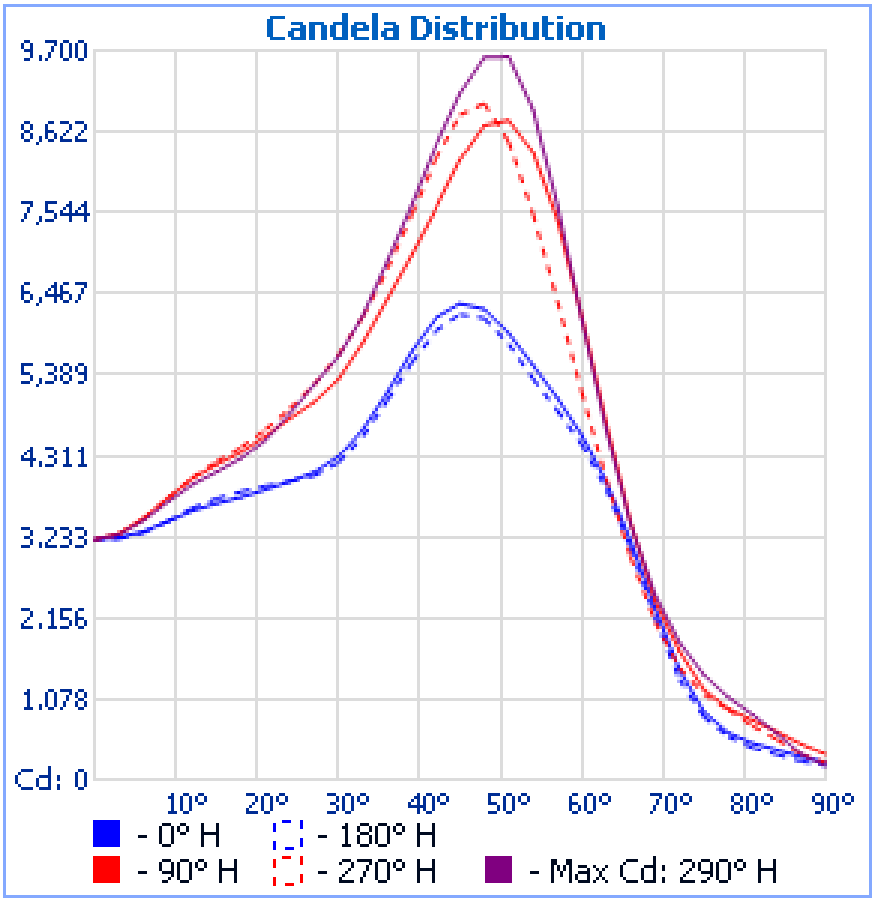


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

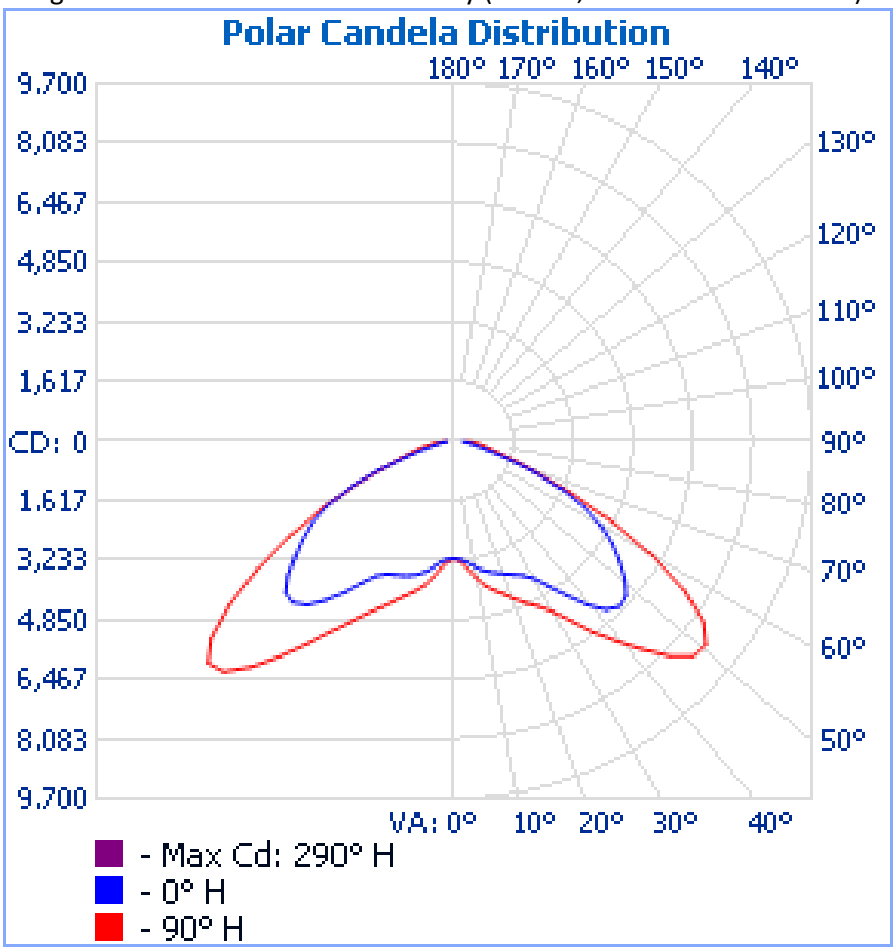


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

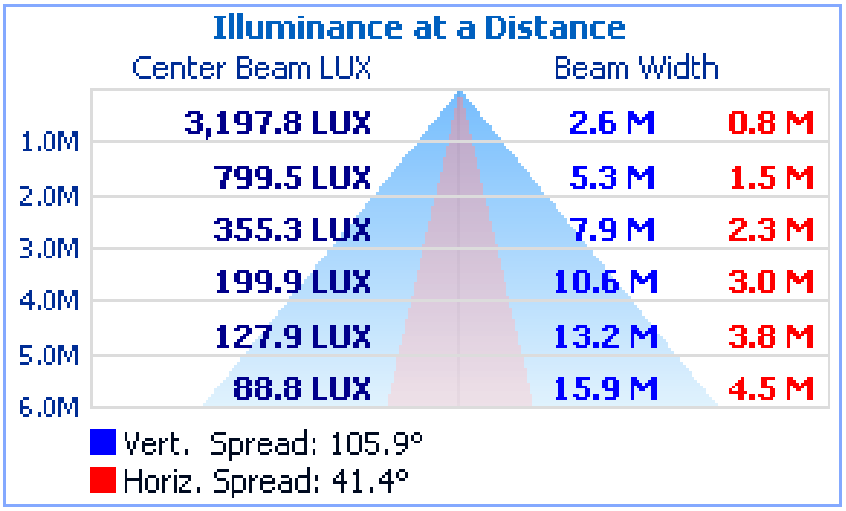


Figure 5. Cone diagram for mounting height of 6 metres.

Reflectance of Ceiling		0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
Wall		0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3
Floor Cavity		0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Room dimension				View endwise (C0)					View crosswise (C90)		
x	y										
2H	2H	21.7	23.5	22.1	23.8	24.1	24.1	25.9	24.5	26.2	26.6
	3H	22.9	24.5	23.2	24.8	25.2	24.7	26.4	25.1	26.7	27.0
	4H	23.1	24.6	23.5	25.0	25.3	24.9	26.4	25.3	26.8	27.1
	6H	23.2	24.6	23.6	25.0	25.4	25.1	26.5	25.5	26.9	27.3
	8H	23.2	24.6	23.6	25.0	25.4	25.1	26.5	25.5	26.9	27.3
	12H	23.3	24.6	23.7	25.0	25.4	25.2	26.5	25.6	26.9	27.3
4H	2H	22.9	24.5	23.3	24.8	25.2	24.7	26.2	25.1	26.6	26.9
	3H	24.0	25.3	24.4	25.7	26.1	25.5	26.8	25.9	27.2	27.6
	4H	24.3	25.4	24.7	25.8	26.3	25.8	26.9	26.2	27.3	27.8
	6H	24.4	25.4	24.9	25.9	26.3	26.0	27.0	26.5	27.5	27.9
	8H	24.5	25.5	25.0	25.9	26.3	26.1	27.1	26.6	27.5	28.0
	12H	24.6	25.5	25.1	25.9	26.4	26.3	27.2	26.7	27.6	28.1
8H	4H	24.5	25.5	25.0	25.9	26.4	25.8	26.8	26.3	27.2	27.7
	6H	24.7	25.5	25.2	26.0	26.5	26.2	27.0	26.6	27.4	27.9
	8H	24.9	25.6	25.4	26.1	26.6	26.4	27.1	26.9	27.6	28.1
	12H	25.1	25.7	25.6	26.2	26.7	26.6	27.2	27.1	27.7	28.2
12H	4H	24.6	25.5	25.0	25.9	26.4	25.8	26.7	26.3	27.2	27.7
	6H	24.9	25.6	25.4	26.1	26.6	26.2	26.9	26.7	27.4	27.9
	8H	25.0	25.6	25.6	26.2	26.7	26.5	27.1	27.0	27.6	28.1

Distance between luminaires: 0.25

Due to missing symmetry characteristics the values apply only to the indicated line of sight.

Table 1. UGR values

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
0	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198
3	3227	3228	3234	3238	3249	3261	3269	3275	3280	3279	3279	3272	3263	3253	3238	3225	3219	3212	3211
6	3306	3309	3313	3335	3368	3402	3429	3459	3476	3483	3479	3463	3434	3406	3368	3329	3299	3292	3289
9	3440	3445	3453	3496	3549	3607	3668	3713	3740	3752	3744	3721	3681	3627	3575	3520	3467	3449	3443
12	3580	3587	3611	3661	3725	3819	3902	3969	4001	4008	3997	3962	3895	3821	3747	3699	3649	3616	3614
15	3679	3708	3758	3839	3938	4033	4108	4159	4193	4193	4180	4132	4064	3987	3919	3853	3783	3739	3741
18	3761	3809	3916	4009	4111	4187	4257	4320	4354	4364	4324	4269	4189	4116	4074	4002	3912	3824	3832
21	3859	3909	4020	4132	4227	4306	4400	4492	4562	4583	4499	4407	4322	4247	4212	4140	4016	3915	3907
24	3968	4006	4102	4228	4345	4457	4628	4733	4794	4816	4733	4629	4536	4405	4352	4254	4108	4000	3972
27	4091	4137	4242	4369	4510	4658	4898	5027	5031	5034	5066	4958	4788	4592	4508	4367	4218	4089	4046
30	4304	4360	4488	4591	4742	4943	5234	5344	5319	5340	5447	5309	5113	4869	4718	4520	4401	4262	4223
33	4674	4707	4826	4886	5028	5322	5667	5776	5727	5824	5808	5744	5548	5216	4942	4723	4674	4592	4581
36	5168	5162	5254	5259	5444	5791	6177	6319	6287	6405	6246	6304	6027	5594	5243	5027	5066	5029	5061
39	5709	5647	5643	5737	5957	6355	6813	6910	7016	6987	6911	6896	6599	6080	5669	5501	5489	5476	5561
42	6146	6030	5960	6092	6428	6929	7406	7646	7872	7597	7763	7596	7239	6663	6156	5884	5904	5842	5974
45	6340	6175	6098	6308	6809	7417	8336	8449	8696	8243	8589	8351	7938	7168	6574	6132	6121	6016	6195
48	6265	6113	6026	6297	6954	7707	8981	9177	9257	8712	9141	9055	8537	7500	6722	6174	6077	5970	6145
51	5950	5911	5708	5968	6825	7836	9232	9453	9299	8778	9284	9440	8910	7619	6575	5932	5793	5733	5805
54	5521	5552	5226	5263	6379	7892	9032	9118	8817	8355	8998	9148	8925	7543	6156	5344	5395	5349	5344
57	5086	5041	4507	4551	5806	7765	8488	8226	7893	7456	8091	8275	8534	7217	5645	4691	4807	4926	4923
60	4595	4399	3768	3826	5073	7032	7622	6933	6501	6174	6717	7049	7819	6792	4972	3974	4114	4435	4470
63	3969	3690	3206	3144	4246	5973	6548	5507	5085	4762	5163	5606	6869	6138	4205	3277	3477	3819	3870
66	3188	2929	2631	2567	3472	4763	5196	4157	3744	3433	3645	4196	5628	5238	3561	2658	2744	3056	3092
69	2287	2146	2132	2013	2539	3517	3917	3106	2627	2383	2394	3092	4249	4032	2746	2030	2142	2218	2175
72	1474	1433	1622	1543	1788	2446	2715	2300	1869	1721	1781	2280	3023	2804	1983	1540	1598	1453	1348
75	917	959	1075	1100	1255	1709	1950	1705	1322	1212	1371	1686	2034	1868	1347	1100	1047	907	851
78	637	655	713	765	887	1181	1385	1286	1039	959	1069	1300	1449	1249	959	757	662	598	589
81	499	521	579	640	729	934	1092	1060	865	804	866	1051	1114	941	691	526	483	428	432
84	407	442	453	537	563	708	826	829	694	653	701	806	873	713	470	396	369	340	340
87	310	312	356	416	424	534	521	545	517	485	552	564	577	527	391	284	263	260	248
90	235	189	225	256	260	295	309	347	349	343	380	358	373	347	258	183	148	160	191

Table 2a. Luminous intensity values, azimuth 0-180°

	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330	340	350
0	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198	3198
3	3216	3225	3232	3246	3259	3265	3270	3274	3272	3273	3269	3264	3259	3250	3239	3237	3230
6	3310	3332	3372	3413	3446	3461	3474	3478	3472	3465	3452	3432	3416	3388	3357	3331	3320
9	3480	3528	3603	3664	3704	3729	3743	3749	3746	3726	3698	3664	3624	3583	3535	3486	3462
12	3665	3738	3817	3871	3925	3958	3996	4020	4019	3984	3926	3861	3806	3742	3689	3635	3599
15	3829	3926	4022	4102	4150	4181	4212	4248	4233	4180	4095	4040	3997	3938	3849	3763	3708
18	3951	4102	4184	4269	4336	4388	4435	4449	4431	4359	4278	4213	4169	4116	4014	3911	3802
21	4034	4197	4285	4366	4479	4593	4662	4676	4668	4613	4525	4425	4330	4253	4160	4040	3916
24	4078	4260	4399	4498	4683	4907	4961	4937	4947	4934	4883	4759	4542	4412	4315	4164	4026
27	4141	4339	4539	4710	4976	5279	5344	5251	5267	5282	5268	5123	4823	4628	4476	4310	4135
30	4291	4475	4699	4997	5379	5692	5764	5648	5662	5663	5643	5543	5203	4894	4639	4523	4334
33	4587	4708	4928	5317	5844	6177	6325	6192	6170	6160	6186	6067	5636	5163	4814	4828	4717
36	4986	5092	5275	5733	6358	6793	7031	6891	6797	6829	6906	6672	6095	5547	5091	5231	5224
39	5393	5470	5703	6149	6892	7546	7814	7659	7522	7610	7648	7375	6636	6023	5547	5583	5700
42	5712	5739	5934	6490	7362	8188	8650	8461	8255	8386	8438	8047	7201	6463	5918	5860	6061
45	5842	5762	5954	6694	7755	8809	9257	9104	8848	8935	9132	8701	7649	6757	6144	6000	6246
48	5757	5542	5792	6657	7941	9266	9544	9284	9005	9115	9613	9163	7861	6775	6150	5988	6234
51	5475	5103	5453	6421	7907	9343	9358	8791	8501	8839	9625	9299	7826	6506	5871	5766	6002
54	5055	4617	4832	5967	7790	9026	8574	7708	7533	8068	8925	9033	7638	5939	5247	5373	5570
57	4625	3990	4168	5405	7354	8297	7278	6477	6375	6942	7648	8323	7223	5320	4556	4741	5065
60	4129	3379	3488	4624	6567	7065	5747	5212	5168	5592	6142	7205	6680	4592	3808	4011	4519
63	3441	2901	2879	3716	5385	5603	4317	3960	4008	4275	4679	5910	5777	3803	3104	3378	3885
66	2674	2332	2323	2909	3989	4022	3162	2784	2968	3080	3410	4394	4459	3119	2506	2677	3106
69	1878	1778	1685	1999	2599	2678	2332	1963	2112	2172	2466	2950	2991	2298	1882	2070	2251
72	1207	1229	1087	1336	1665	1921	1774	1509	1499	1597	1838	2029	1965	1606	1355	1509	1479
75	769	803	784	893	1166	1427	1368	1206	1151	1228	1407	1483	1407	1083	921	987	940
78	538	532	543	647	833	1045	1068	977	945	993	1110	1154	1049	813	692	667	651
81	392	390	419	458	560	667	802	734	727	760	881	879	801	668	563	538	496
84	313	268	297	310	361	424	557	560	550	562	627	639	587	533	444	416	406
87	211	158	163	156	147	208	291	339	340	363	349	341	338	358	278	275	301
90	79	51	58	34	27	65	149	193	233	202	184	172	160	210	168	160	201

Table 2b. Luminous intensity values, azimuth 190-350°

Zone	Lumens	% Total
0-5	78.6	0.30%
05-10	250.6	1.00%
10-15	457.7	1.90%
15-20	679.9	2.80%
20-25	915.5	3.80%
25-30	1,204.30	4.90%
30-35	1,558.60	6.40%
35-40	2,027.30	8.30%
40-45	2,588.30	10.60%
45-50	3,014.80	12.40%
50-55	3,104.70	12.80%
55-60	2,811.60	11.50%
60-65	2,247.20	9.20%
65-70	1,494.60	6.10%
70-75	877	3.60%
75-80	524.5	2.20%
80-85	330.3	1.40%
85-90	179.8	0.70%

Table 3. Zonal Flux Table

Effective Floor Cavity Reflectance: 20%																		
RCC %:	***80***				***70***				***50***			***30***			***10***			***0***
RW %:	70	50	30	0	70	50	30	0	50	30	20	50	30	20	50	30	20	0
RCR: 0	1.19	1.19	1.19	1.19	1.16	1.16	1.16	1	1.11	1.11	1.11	1.06	1.06	1.06	1.02	1.02	1.02	1
1	1.08	1.03	0.98	0.94	1.05	1	0.96	0.83	0.96	0.93	0.89	0.92	0.89	0.87	0.89	0.86	0.84	0.82
2	0.97	0.88	0.81	0.74	0.94	0.86	0.79	0.68	0.82	0.77	0.72	0.79	0.74	0.7	0.76	0.72	0.68	0.66
3	0.87	0.76	0.67	0.6	0.85	0.74	0.66	0.55	0.71	0.64	0.58	0.68	0.62	0.57	0.65	0.6	0.56	0.53
4	0.79	0.66	0.56	0.48	0.76	0.64	0.55	0.46	0.62	0.54	0.47	0.59	0.52	0.47	0.57	0.51	0.46	0.44
5	0.71	0.57	0.47	0.4	0.69	0.56	0.47	0.38	0.54	0.46	0.39	0.52	0.45	0.39	0.5	0.44	0.38	0.36
6	0.65	0.5	0.41	0.34	0.63	0.49	0.4	0.32	0.48	0.39	0.33	0.46	0.38	0.33	0.44	0.38	0.32	0.3
7	0.6	0.45	0.35	0.29	0.58	0.44	0.35	0.28	0.42	0.34	0.28	0.41	0.33	0.28	0.39	0.33	0.28	0.26
8	0.55	0.4	0.31	0.25	0.53	0.4	0.31	0.24	0.38	0.3	0.24	0.37	0.29	0.24	0.36	0.29	0.24	0.22
9	0.51	0.36	0.27	0.21	0.49	0.36	0.27	0.21	0.35	0.27	0.21	0.33	0.26	0.21	0.32	0.26	0.21	0.19
10	0.47	0.33	0.25	0.19	0.46	0.33	0.24	0.18	0.31	0.24	0.19	0.3	0.23	0.19	0.3	0.23	0.18	0.17

Table 4. Utilisation Factor Table

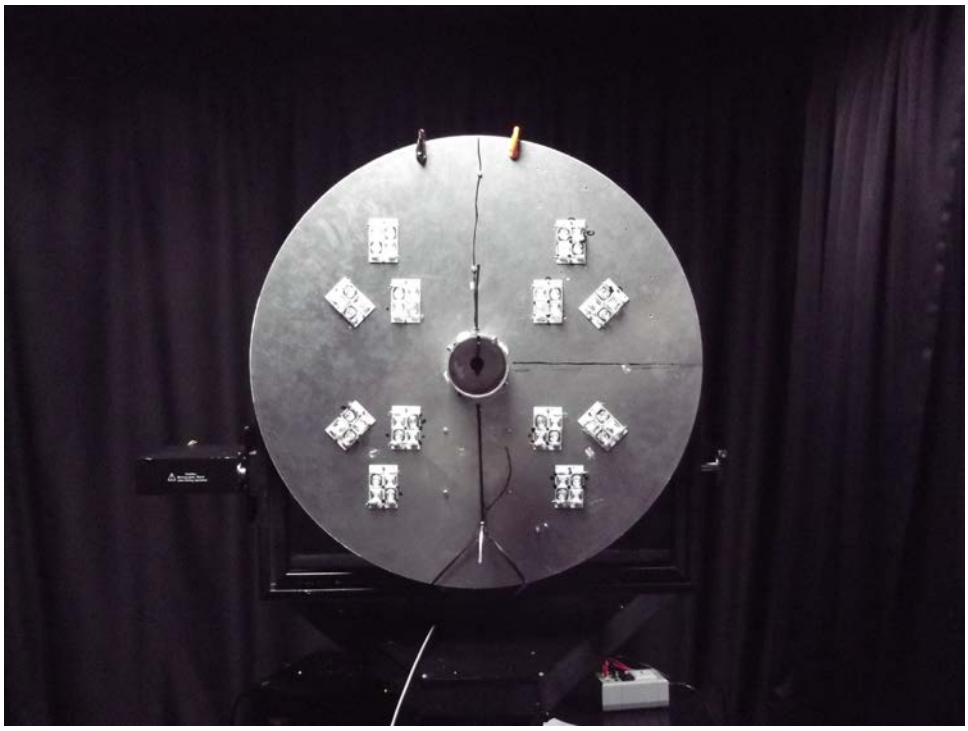


Photo 1: Luminaire on goniometer mount

Signature:

_____

Print Name:

D CHAMBERS

_____

Date:
18/05/2016

_____

Test Engineer
Duly authorised to sign on behalf of:
Photometric and Optical Testing Services LLP

Checked by:

Signature:

_____

Print Name:

G John

_____

Date: 18-05-2016

_____

Technical Director
Duly authorised to sign on behalf of:
Photometric and Optical Testing Services LLP