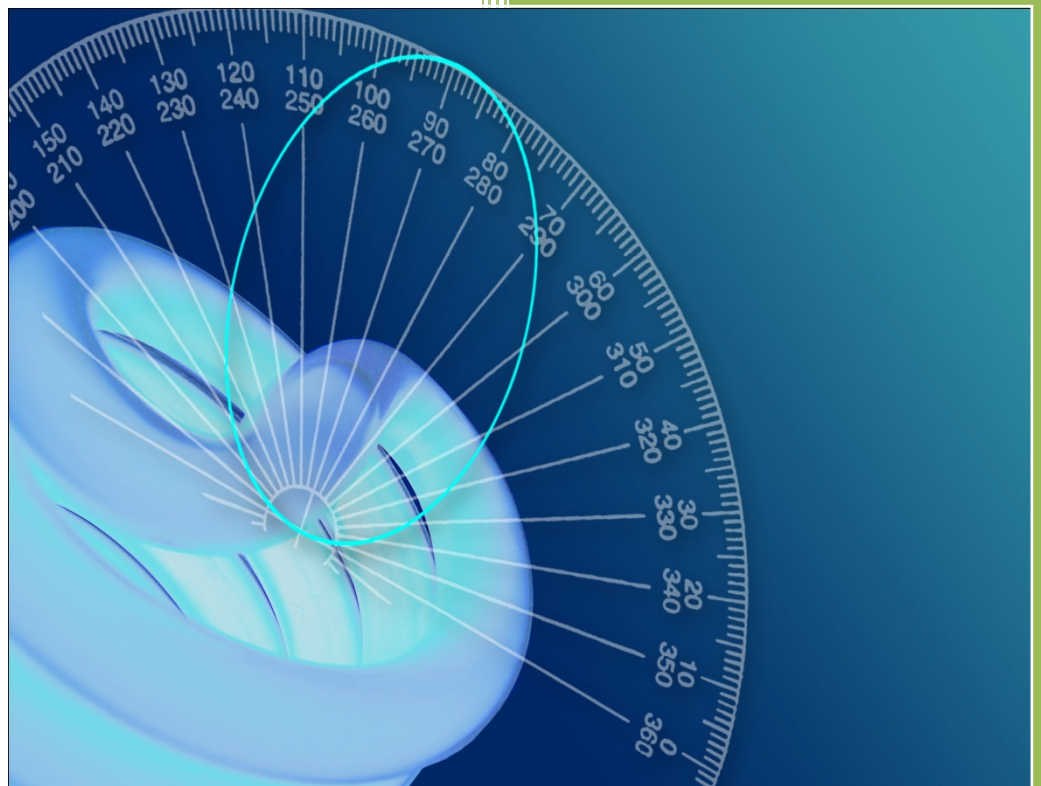


Photometric Test Report



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/DC16199	Report Date: 03/10/2016	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: Harwood House, Park Road, Melton Mowbray, Leicestershire LE13 1TX		

Client Details

Manufacturer: FAR EASTERN MANUFACTURING	Source Type: LED
Model: LTUSF100	

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: FAR EASTERN MANUFACTURING	Source Type: LED
Model: LTUSF100	Luminaire Type: DOWNLIGHT
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230.0	Current (mA)= 429
Power (Watts)= 97.67	Power factor= 0.99

Integrating Sphere Test

Date of Test: 23/09/2016	Ambient Temperature: 25°C
Measurement Filename: LTUSF100	
Instrument Used: Labsphere model 2m integrating sphere spectroradiometer AS-02949-012	
Integrating Sphere Size: 2m	Measurement Geometry ($2\pi / 4\pi$): 4π
Sample Orientation: Facing Downwards	Auxiliary Correction Applied: YES
Comments:	
Date of Last Calibration (Operating Hours): 16-09-2016 (1:31)	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: $\pm 0.67\%$ ($k=2$)	
Results	
Flux (lumens): 7690	
CIE 1931 Chromaticity Cx: 0.3153	CIE 1931 Chromaticity Cy: 0.3272
CRI (%): 77.29	CCT (K): 6370

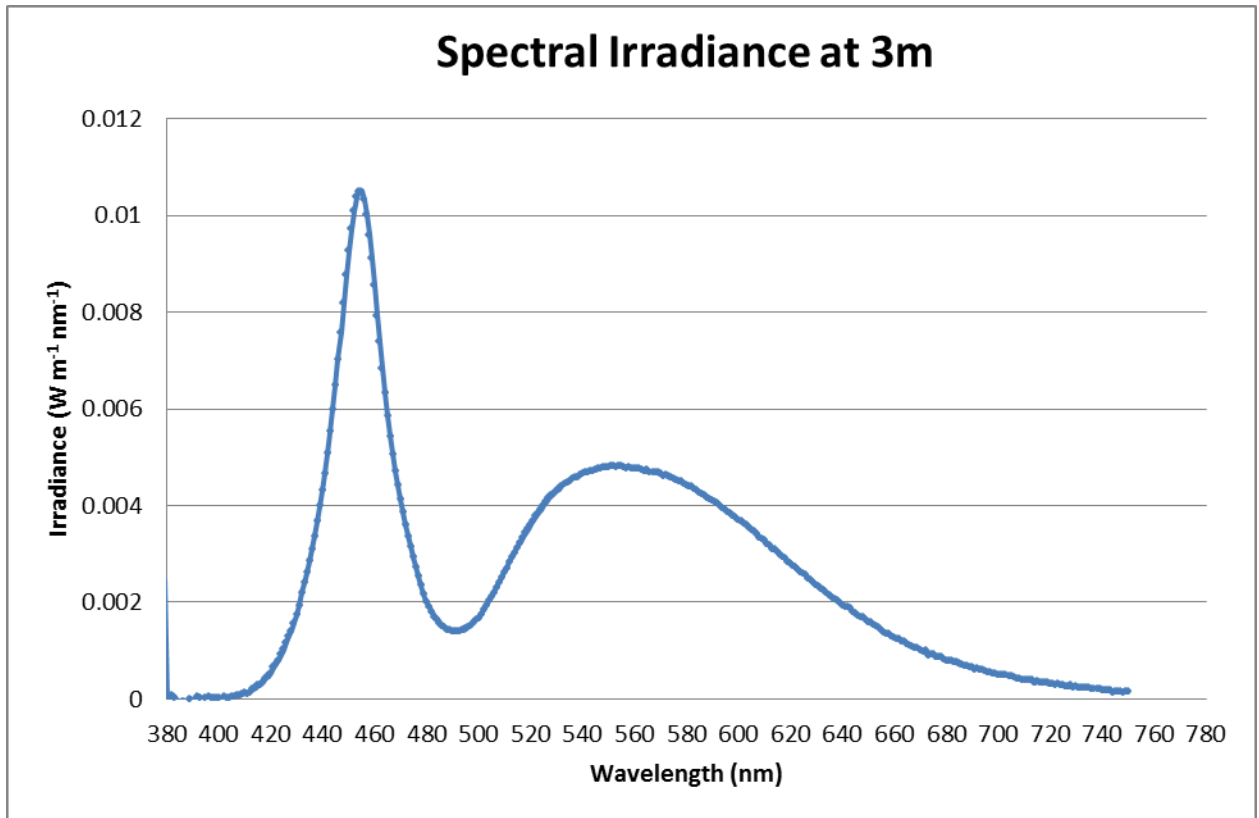


Figure 1: Spectral Irradiance



Figure 2: CIE 1931 diagram.

Goniophotometer Test		
Date of Test: 03/10/2016	Ambient Temperature: 25°C	
Measurement Filename: LTUSF100		
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: Specbos1201	Reference Photometer Serial Number: 2911670	
Traceable: to NIST standards		
Calibration Certificate Date: 11 November 2015	Sample Stabilisation Time (minutes): 45	
Reference Photometer Calibration Uncertainty: $\pm 2.4\%$ ($k=2$, 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): 7690	Peak Intensity (3° Spot, candelas): 2769.5	Efficacy (lumens/Watt): 78.7
Beam Angle (50% of max intensity C0-180, degrees): 110.4		
Photometric Filename (IES LM-63-2002): LTUSF100		
IES File – Absolute or Relative Format? ABSOLUTE		
Photometric Filename (EULUMDAT): LTUSF100		
EULUMDAT File – Absolute or Relative Format? ABSOLUTE		

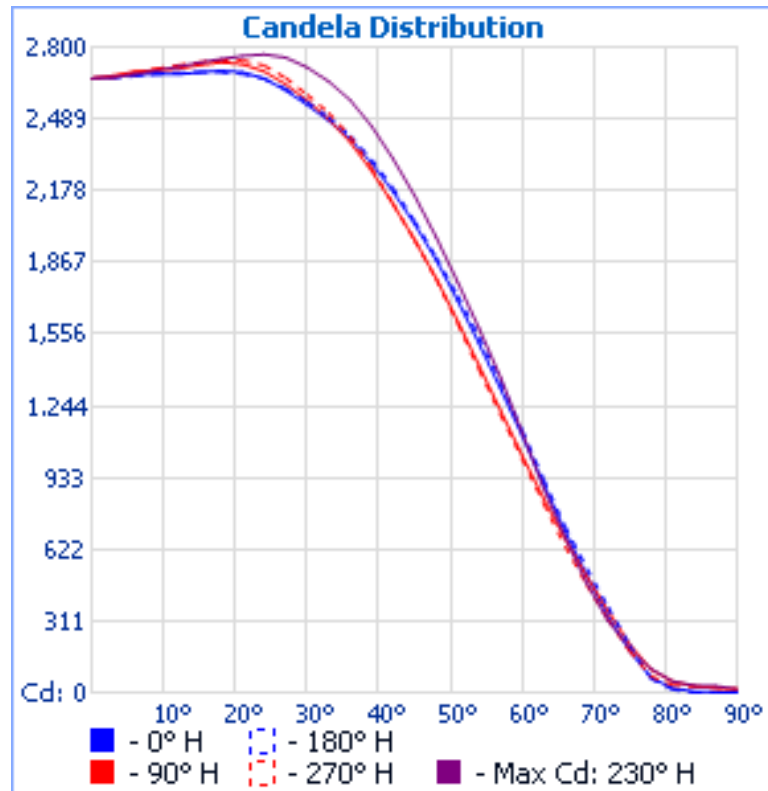


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

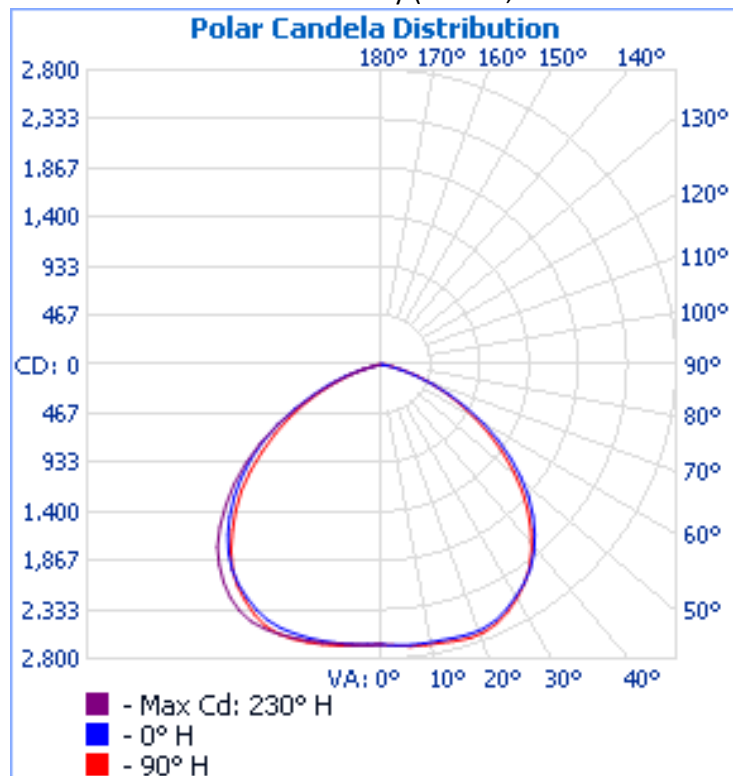


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

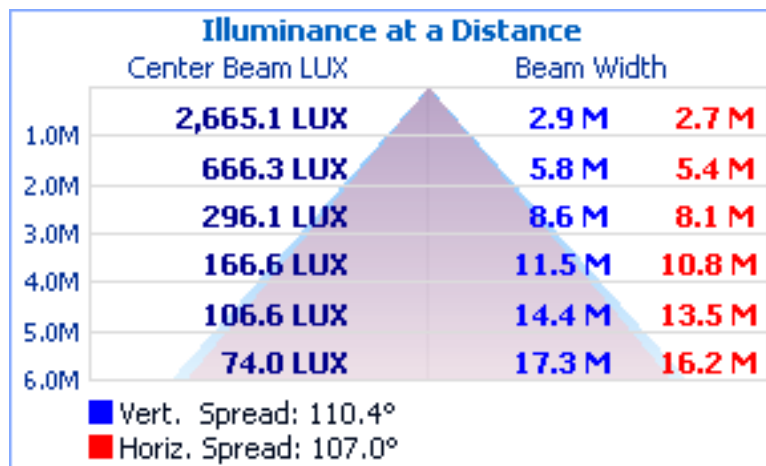


Figure 5. Cone diagram for mounting height of 6 metres.

Reflectance of	0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
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	25.9	27.5	26.3	27.8	28.1	25.5	27.1	25.9	27.4	27.7
	3H	26.7	28.1	27.1	28.4	28.8	26.3	27.7	26.6	28.0	28.3
	4H	26.8	28.1	27.2	28.5	28.8	26.4	27.7	26.8	28.0	28.4
	6H	26.8	28.0	27.2	28.3	28.7	26.4	27.6	26.8	27.9	28.3
	8H	26.7	27.9	27.1	28.3	28.7	26.3	27.5	26.7	27.8	28.2
	12H	26.7	27.8	27.1	28.2	28.6	26.3	27.4	26.7	27.8	28.2
4H	2H	26.4	27.7	26.8	28.1	28.4	26.1	27.4	26.5	27.7	28.1
	3H	27.2	28.3	27.6	28.7	29.1	26.8	28.0	27.3	28.3	28.8
	4H	27.4	28.3	27.8	28.7	29.2	27.0	28.0	27.5	28.4	28.9
	6H	27.3	28.2	27.8	28.6	29.1	27.0	27.8	27.5	28.3	28.7
	8H	27.3	28.1	27.8	28.5	29.0	27.0	27.8	27.4	28.2	28.7
	12H	27.3	28.0	27.7	28.4	28.9	27.0	27.7	27.4	28.1	28.6
8H	4H	27.3	28.1	27.8	28.6	29.1	27.0	27.8	27.5	28.3	28.7
	6H	27.3	28.0	27.8	28.4	28.9	27.0	27.6	27.5	28.1	28.6
	8H	27.3	27.9	27.8	28.4	28.9	27.0	27.6	27.5	28.1	28.6
	12H	27.3	27.8	27.8	28.3	28.8	27.0	27.5	27.5	28.0	28.5
12H	4H	27.3	28.1	27.8	28.5	29.0	27.0	27.7	27.5	28.2	28.7
	6H	27.3	27.9	27.8	28.4	28.9	27.0	27.6	27.5	28.1	28.6
	8H	27.3	27.8	27.8	28.3	28.8	27.0	27.5	27.5	28.0	28.5

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	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665
3	2673	2674	2676	2676	2677	2678	2678	2678	2678	2678	2677	2676	2675	2674	2672	2670	2669	2668	2667
6	2682	2685	2687	2690	2692	2694	2694	2695	2695	2695	2695	2695	2693	2691	2687	2683	2680	2677	2675
9	2683	2688	2696	2703	2707	2708	2707	2704	2702	2702	2705	2710	2713	2711	2706	2701	2694	2688	2684
12	2684	2693	2707	2717	2718	2719	2719	2716	2709	2707	2715	2726	2730	2725	2718	2713	2706	2696	2690
15	2692	2704	2719	2727	2724	2723	2730	2733	2728	2723	2728	2739	2741	2731	2722	2718	2710	2698	2693
18	2698	2710	2725	2734	2732	2728	2736	2744	2741	2735	2735	2743	2749	2739	2730	2725	2712	2696	2691
21	2692	2705	2723	2741	2750	2745	2739	2742	2735	2727	2732	2742	2754	2753	2744	2735	2714	2694	2685
24	2665	2682	2707	2733	2762	2758	2736	2724	2705	2695	2708	2723	2741	2752	2746	2732	2707	2681	2664
27	2614	2638	2669	2706	2745	2744	2713	2682	2651	2641	2655	2679	2711	2736	2734	2712	2674	2643	2621
30	2551	2576	2619	2665	2697	2693	2661	2623	2584	2570	2584	2623	2666	2702	2705	2678	2627	2587	2563
33	2483	2508	2555	2612	2639	2628	2587	2545	2511	2489	2508	2552	2600	2644	2656	2628	2569	2534	2497
36	2403	2426	2470	2538	2562	2548	2502	2450	2420	2390	2418	2461	2520	2566	2581	2557	2493	2464	2417
39	2299	2321	2371	2416	2450	2441	2390	2339	2293	2264	2293	2349	2412	2463	2475	2443	2400	2349	2314
42	2175	2192	2244	2283	2319	2301	2257	2188	2137	2120	2139	2193	2281	2333	2352	2316	2271	2208	2189
45	2035	2050	2097	2129	2162	2140	2091	2021	1973	1966	1981	2026	2119	2178	2194	2166	2118	2071	2046
48	1878	1897	1942	1961	1991	1965	1911	1855	1807	1798	1818	1868	1941	1999	2019	2000	1962	1928	1889
51	1703	1737	1758	1788	1806	1779	1729	1674	1639	1614	1649	1694	1754	1804	1836	1823	1778	1770	1723
54	1514	1550	1590	1567	1588	1579	1518	1486	1446	1419	1452	1506	1545	1601	1622	1600	1604	1581	1543
57	1319	1354	1378	1354	1373	1367	1313	1282	1251	1224	1258	1300	1342	1390	1410	1387	1388	1376	1348
60	1117	1148	1147	1133	1138	1140	1103	1079	1051	1031	1061	1094	1122	1159	1173	1162	1166	1162	1140
63	907	934	947	913	890	908	904	885	860	844	867	897	914	923	923	939	975	957	925
66	701	717	712	701	683	693	699	694	675	667	674	705	710	713	716	730	746	759	721
69	509	521	519	482	483	489	506	517	509	506	503	527	518	515	515	512	546	572	540
72	333	349	339	321	327	325	348	362	366	355	362	370	362	351	356	352	377	396	372
75	182	198	193	193	196	208	215	222	225	211	225	240	227	223	218	222	225	225	208
78	65	65	87	111	115	105	124	113	109	101	109	115	127	124	120	119	105	93	62
81	21	19	51	58	61	60	63	62	51	50	53	59	64	65	64	60	53	44	14
84	5	3	26	29	28	27	30	31	28	28	31	30	33	34	33	36	32	30	1
87	4	2	19	21	19	21	27	24	25	21	27	26	26	28	25	27	26	27	1
90	1	1	18	16	15	14	24	19	25	13	18	19	19	19	17	22	19	17	0

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	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665	2665
3	2667	2667	2667	2668	2670	2671	2672	2672	2673	2673	2673	2672	2672	2672	2672	2673	2673
6	2675	2675	2677	2680	2683	2686	2689	2691	2691	2690	2687	2684	2682	2680	2680	2680	2681
9	2684	2685	2689	2694	2699	2704	2707	2709	2708	2705	2701	2696	2692	2690	2688	2685	2682
12	2692	2697	2704	2709	2716	2722	2725	2725	2722	2720	2716	2711	2707	2704	2702	2694	2685
15	2699	2709	2718	2726	2734	2741	2744	2740	2735	2735	2734	2730	2724	2720	2714	2702	2692
18	2701	2716	2727	2738	2749	2756	2757	2749	2744	2746	2750	2748	2741	2732	2720	2704	2695
21	2694	2712	2731	2750	2763	2763	2756	2746	2744	2748	2754	2757	2755	2744	2725	2701	2690
24	2672	2697	2728	2762	2770	2759	2738	2720	2721	2724	2735	2749	2759	2750	2721	2689	2669
27	2636	2667	2717	2760	2756	2734	2699	2668	2668	2667	2689	2725	2747	2741	2704	2656	2626
30	2586	2628	2686	2731	2714	2680	2642	2601	2595	2592	2631	2677	2705	2705	2669	2612	2567
33	2524	2570	2631	2675	2652	2603	2560	2526	2516	2511	2557	2601	2632	2644	2612	2552	2505
36	2445	2493	2553	2587	2572	2517	2457	2428	2415	2416	2464	2510	2541	2560	2534	2472	2430
39	2342	2401	2436	2468	2459	2402	2342	2297	2277	2293	2350	2399	2439	2455	2417	2374	2323
42	2218	2275	2313	2343	2317	2263	2188	2142	2121	2141	2193	2272	2315	2335	2291	2242	2189
45	2081	2126	2168	2194	2158	2098	2016	1982	1964	1979	2022	2103	2152	2174	2144	2093	2046
48	1932	1970	2005	2021	1977	1923	1849	1813	1795	1807	1852	1909	1961	1992	1982	1946	1897
51	1771	1781	1826	1825	1782	1739	1669	1633	1603	1628	1667	1718	1769	1807	1806	1766	1741
54	1580	1609	1597	1602	1581	1529	1478	1428	1401	1425	1473	1506	1570	1596	1584	1595	1555
57	1374	1395	1377	1389	1368	1323	1270	1230	1207	1229	1262	1298	1357	1380	1368	1377	1349
60	1165	1166	1145	1152	1129	1096	1059	1032	1016	1032	1049	1082	1124	1135	1137	1145	1132
63	962	966	916	893	888	882	858	839	822	835	849	877	888	882	906	942	920
66	758	731	702	676	676	674	667	647	637	640	660	669	673	675	690	703	710
69	557	530	482	472	476	479	492	473	470	467	488	474	467	473	468	500	518
72	367	358	320	316	311	321	336	326	318	325	333	317	303	315	304	329	346
75	186	203	194	190	194	188	194	190	181	190	191	186	185	185	176	177	194
78	50	93	101	96	104	85	84	73	71	67	80	90	98	97	80	68	65
81	8	37	51	47	50	43	41	33	35	33	39	45	49	51	41	37	20
84	1	10	31	28	32	28	29	25	26	28	22	28	26	26	18	15	7
87	0	2	29	26	30	26	24	23	23	25	29	24	23	19	10	8	5
90	0	0	21	17	16	13	16	16	19	19	18	15	20	19	4	4	2

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

Zone	Lumens	% Total
0-5	64.2	0.80%
05-10	191.9	2.50%
10-15	322.4	4.10%
15-20	450.7	5.80%
20-25	569.8	7.30%
25-30	678.7	8.70%
30-35	762.1	9.80%
35-40	807.9	10.40%
40-45	818.3	10.50%
45-50	788.8	10.10%
50-55	709.1	9.10%
55-60	595.9	7.70%
60-65	459.2	5.90%
65-70	301.4	3.90%
70-75	165	2.10%
75-80	64.8	0.80%
80-85	18.8	0.20%
85-90	10.3	0.10%

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	1.1	1.06	1.02	0.99	1.08	1.04	1	0.87	1	0.97	0.94	0.96	0.93	0.91	0.92	0.9	0.89	0.87
2	1.01	0.94	0.87	0.82	0.98	0.92	0.86	0.75	0.88	0.83	0.79	0.85	0.81	0.78	0.82	0.79	0.76	0.74
3	0.92	0.83	0.75	0.69	0.9	0.81	0.74	0.65	0.78	0.72	0.67	0.76	0.7	0.66	0.73	0.69	0.65	0.63
4	0.85	0.74	0.65	0.59	0.83	0.72	0.65	0.56	0.7	0.63	0.58	0.68	0.62	0.57	0.65	0.6	0.56	0.54
5	0.78	0.66	0.57	0.51	0.76	0.65	0.57	0.49	0.63	0.56	0.5	0.61	0.54	0.5	0.59	0.53	0.49	0.47
6	0.72	0.59	0.51	0.44	0.7	0.58	0.5	0.43	0.57	0.49	0.44	0.55	0.48	0.44	0.53	0.48	0.43	0.41
7	0.67	0.54	0.45	0.39	0.65	0.53	0.45	0.38	0.51	0.44	0.39	0.5	0.43	0.39	0.49	0.43	0.38	0.36
8	0.62	0.49	0.41	0.35	0.61	0.48	0.4	0.34	0.47	0.4	0.35	0.46	0.39	0.34	0.45	0.39	0.34	0.32
9	0.58	0.45	0.37	0.31	0.57	0.44	0.37	0.31	0.43	0.36	0.31	0.42	0.36	0.31	0.41	0.35	0.31	0.29
10	0.54	0.41	0.34	0.28	0.53	0.41	0.33	0.28	0.4	0.33	0.28	0.39	0.33	0.28	0.38	0.32	0.28	0.26

Table 4. Utilisation Factor Table

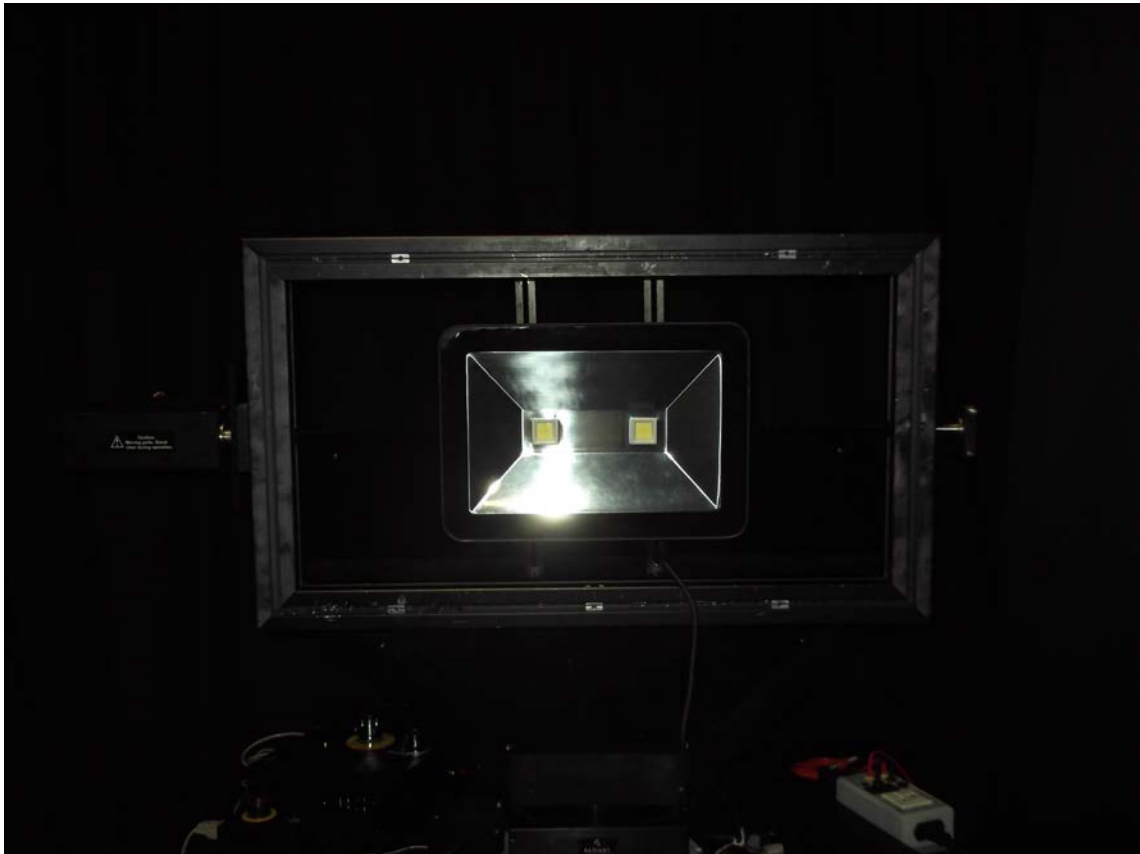


Photo 1: Luminaire on goniometer mount

Signature:

Print Name:

D CHAMBERS

Date:

03/10/2016

Technical Manager

Duly authorised to sign on behalf of:

Photometric and Optical Testing Services LLP