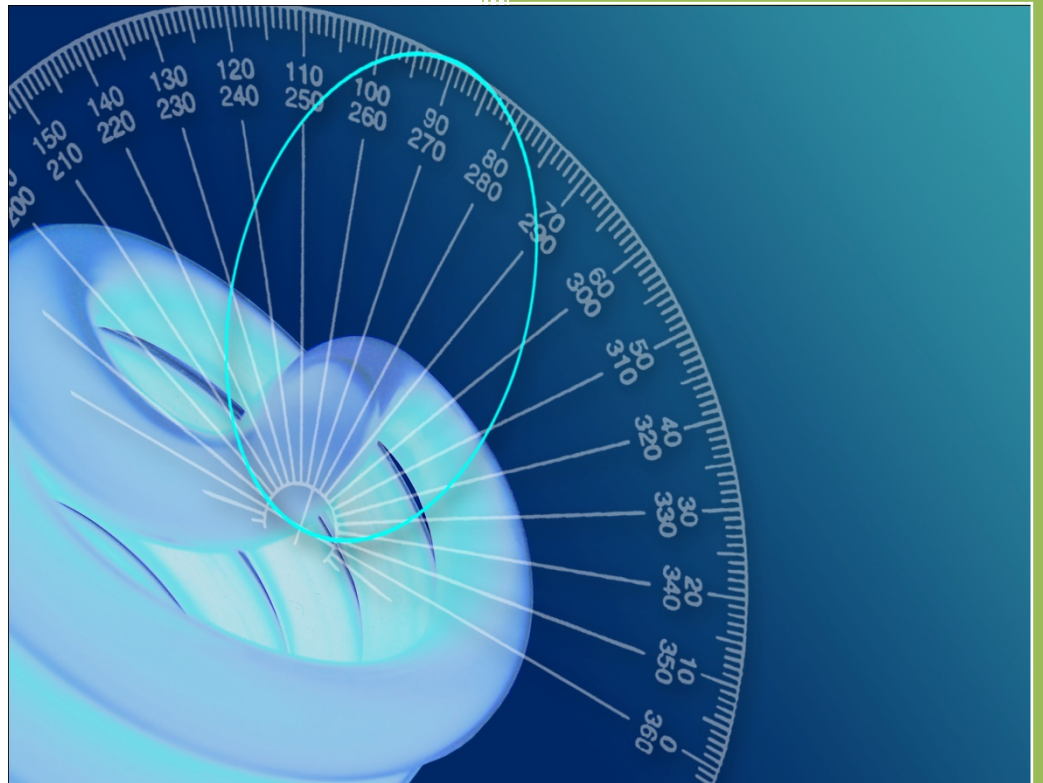


Photometric Test Report



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/DC16203	Report Date: 05/10/2016	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

Company: TLC Southern Ltd	
Address: The TLC Building, 5 Newton Road, Crawley, West Sussex, RH10 9TS	

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: TLC Southern Ltd	Source Type: LED
Model: LTLD8DL	Luminaire Type: SPOTLIGHT
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230.0	Current (mA)= 48
Power (Watts)= 9.971	Power factor= 0.903

Integrating Sphere Test

Date of Test: 27/09/2016	Ambient Temperature: 25°C
Measurement Filename: LTLD8DL	
Instrument Used: Labsphere model CSLMS HALOGEN 4060 integrating sphere spectroradiometer	
Integrating Sphere Size: 1m	Measurement Geometry ($2\pi / 4\pi$): 4π
Sample Orientation: Horizontal	Auxiliary Correction Applied: YES
Comments:	
Date of Last Calibration (Operating Hours): 05-09-2016 (05:01)	Spectral Flux Standard Lamp Used: SCL-1400
Standard Lamp Serial Number: K75	Traceable: to NIST standards
Calibration Certificate Number: DM-02008-001	Calibration Certificate Date: 19 th February 2010
Calibration Lamp Uncertainty: $\pm 0.67\%$ ($k=2$)	
Results	
Flux (lumens): 850.2	
CIE 1931 Chromaticity Cx: 0.3339	CIE 1931 Chromaticity Cy: 0.3491
CRI (%): 83.22	CCT (K): 5438

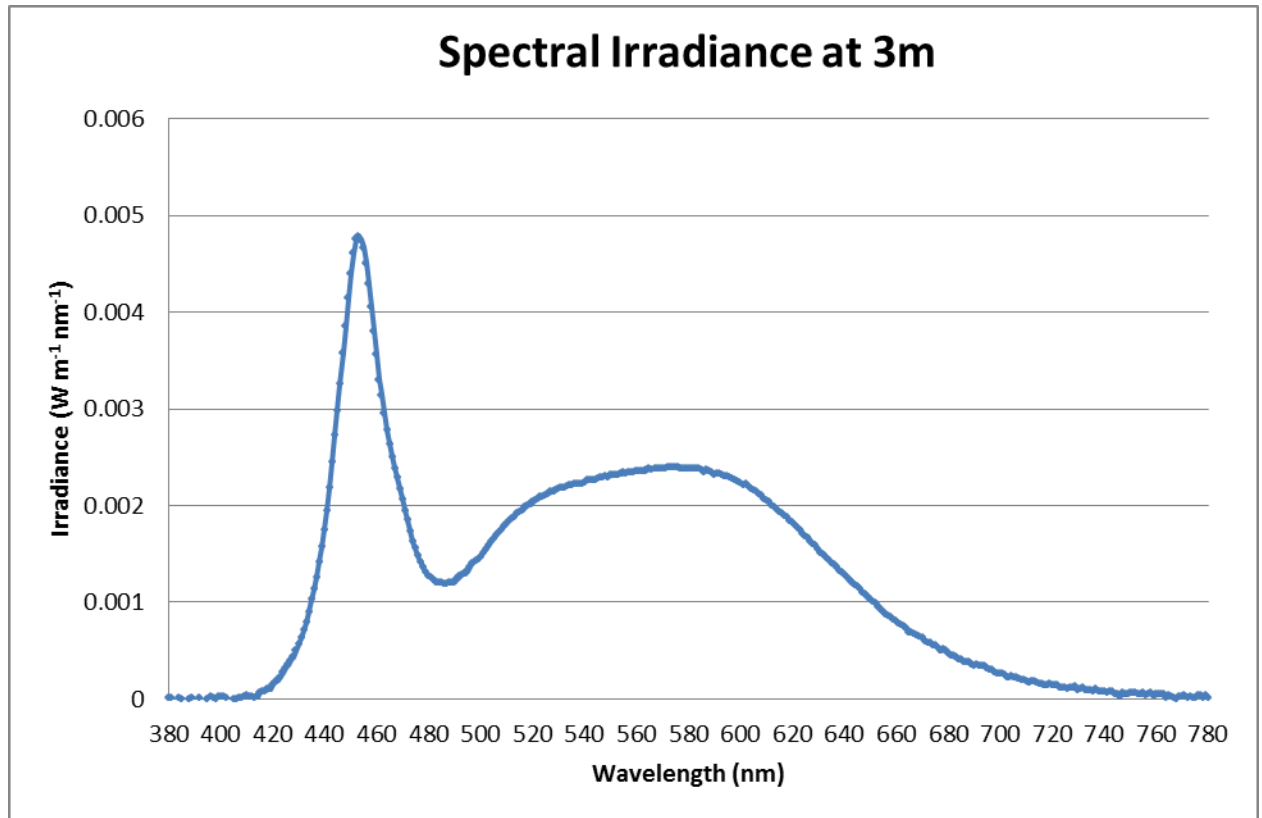


Figure 1: Spectral Irradiance



Figure 2: CIE 1931 diagram.

Goniophotometer Test		
Date of Test: 05/10/2016		Ambient Temperature: 25°C
Measurement Filename: LTLD8DL		
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	0-30°	2°
Inclination Zone 2	34-90°	4°
Azimuth	0-360°	10°
Results		
Integrated Luminous Flux (lumens):850.2	Peak Intensity (3° Spot, candelas): 1549.8	Efficacy (lumens/Watt): 85.3
Beam Angle (50% of max intensity C0-180, degrees): 43.2		
Photometric Filename (IES LM-63-2002): LTLD8DL		
IES File – Absolute or Relative Format? ABSOLUTE		
Photometric Filename (EULUMDAT): LTLD8DL		
EULUMDAT File – Absolute or Relative Format? ABSOLUTE		

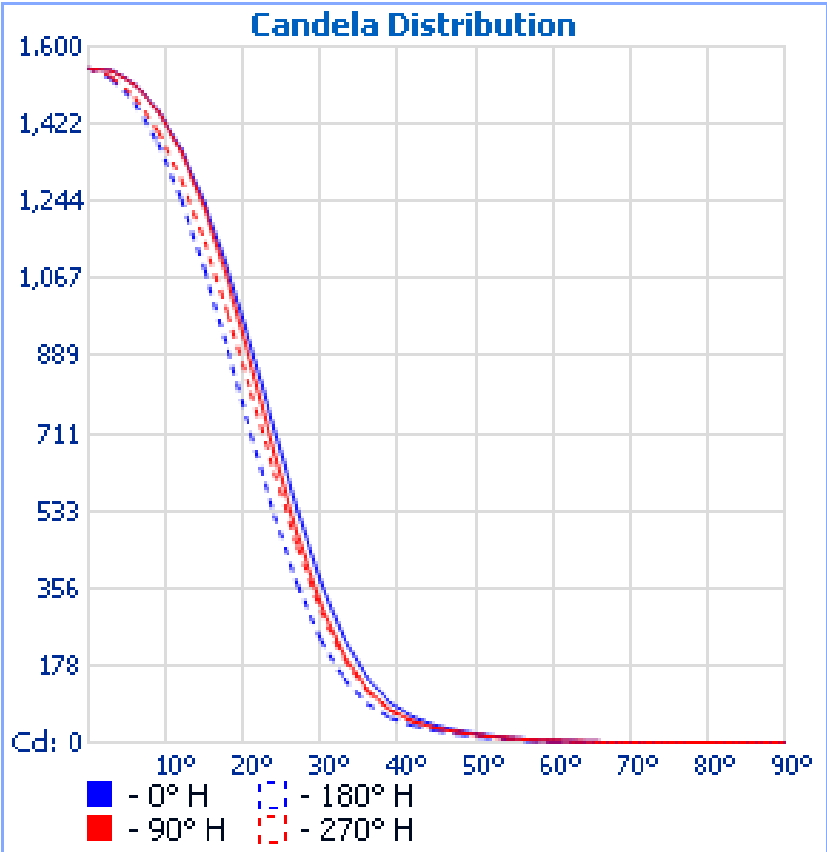


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

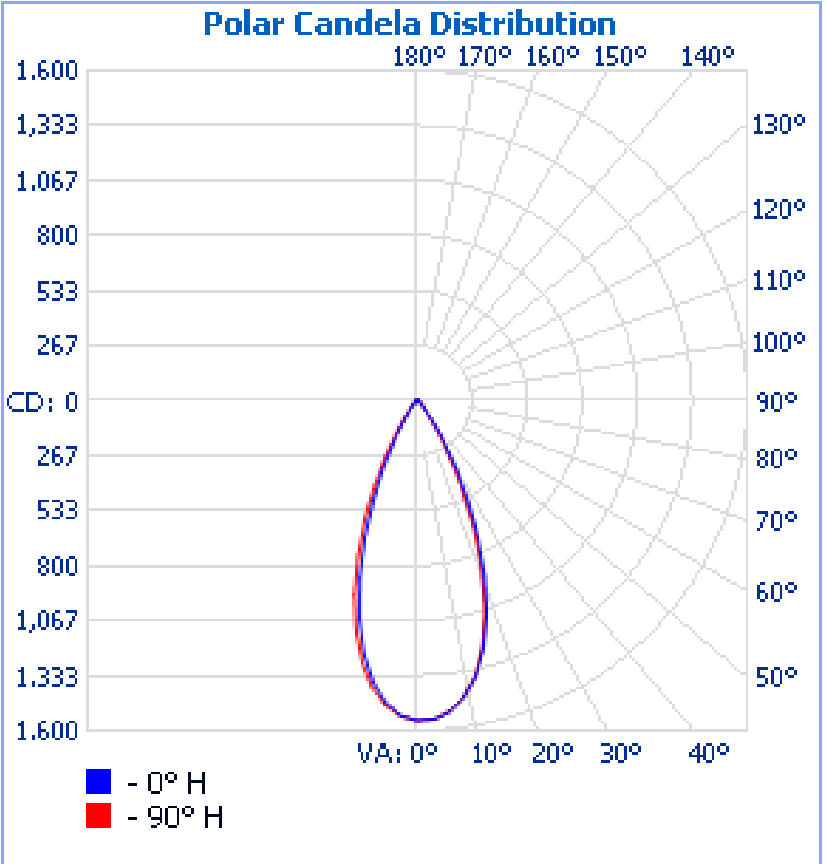


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

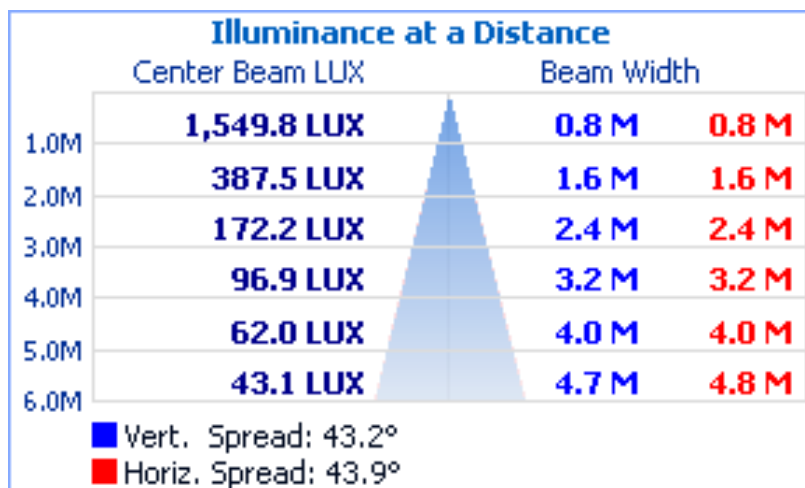


Figure 5. Cone diagram for mounting height of 6 metres.

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	20.1	20.9	20.4	21.2	21.5	18.7	19.5	19.1	19.8	20.2
	3H	19.8	20.5	20.2	20.9	21.2	18.5	19.2	18.9	19.6	19.9
	4H	19.7	20.4	20.1	20.7	21.1	18.4	19.0	18.8	19.4	19.8
	6H	19.6	20.2	20.0	20.6	21.0	18.3	18.9	18.7	19.3	19.7
	8H	19.5	20.1	19.9	20.5	20.9	18.2	18.8	18.6	19.2	19.6
	12H	19.4	20.0	19.9	20.4	20.8	18.1	18.7	18.5	19.1	19.5
4H	2H	19.7	20.4	20.1	20.8	21.1	18.4	19.1	18.8	19.4	19.8
	3H	19.5	20.0	19.9	20.4	20.8	18.1	18.7	18.6	19.1	19.5
	4H	19.4	19.8	19.8	20.3	20.7	18.0	18.5	18.5	18.9	19.4
	6H	19.2	19.6	19.7	20.1	20.5	17.9	18.3	18.4	18.8	19.2
	8H	19.1	19.5	19.6	20.0	20.5	17.8	18.2	18.3	18.7	19.1
	12H	19.1	19.4	19.6	19.9	20.4	17.7	18.1	18.2	18.6	19.1
8H	4H	19.1	19.5	19.6	20.0	20.5	17.8	18.2	18.3	18.7	19.1
	6H	18.9	19.3	19.5	19.8	20.3	17.6	18.0	18.1	18.4	18.9
	8H	18.9	19.2	19.4	19.7	20.2	17.6	17.9	18.1	18.4	18.9
	12H	18.8	19.1	19.4	19.6	20.1	17.5	17.7	18.0	18.3	18.8
12H	4H	19.1	19.4	19.6	19.9	20.4	17.7	18.1	18.2	18.6	19.1
	6H	18.9	19.2	19.4	19.7	20.2	17.6	17.9	18.1	18.4	18.9
	8H	18.8	19.1	19.4	19.6	20.1	17.5	17.7	18.0	18.3	18.8

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	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
3	1546	1546	1546	1548	1548	1547	1547	1547	1546	1544	1543	1541	1538	1536	1533	1533	1528	1528	1546
6	1514	1514	1519	1521	1520	1519	1519	1518	1515	1513	1509	1505	1501	1494	1491	1488	1482	1473	1514
9	1454	1453	1459	1455	1457	1458	1459	1459	1457	1452	1447	1439	1429	1417	1407	1395	1394	1380	1454
12	1364	1362	1363	1366	1376	1374	1372	1367	1364	1358	1349	1337	1327	1315	1305	1279	1264	1254	1364
15	1241	1237	1247	1247	1249	1253	1247	1246	1235	1229	1213	1203	1185	1173	1150	1131	1116	1091	1241
18	1089	1100	1089	1099	1090	1094	1089	1088	1083	1065	1055	1032	1008	992	964	955	926	925	1089
21	911	920	919	927	920	910	910	910	893	870	860	846	817	791	778	764	738	727	911
24	721	727	729	714	722	717	705	705	687	667	655	641	610	595	576	548	548	535	721
27	535	543	534	533	538	532	521	506	494	478	465	447	434	421	406	384	372	372	535
30	370	375	372	375	370	359	356	348	335	319	312	301	287	270	263	254	243	241	370
33	241	244	244	248	246	236	229	219	212	202	196	186	180	173	168	160	151	148	241
36	150	150	151	158	154	150	144	134	128	123	117	114	113	109	104	100	91	90	150
39	93	92	95	92	93	92	87	84	79	76	73	73	71	70	65	60	59	56	93
42	59	58	59	59	60	58	56	52	51	49	48	48	48	47	45	41	39	38	59
45	39	39	39	39	39	38	37	35	34	33	33	33	33	32	31	29	27	26	39
48	27	26	26	26	26	26	25	24	23	23	23	24	23	23	22	21	19	18	27
51	18	18	17	18	17	17	17	16	16	16	16	16	16	16	15	14	13	13	18
54	12	12	12	11	11	12	11	11	11	11	11	11	11	11	10	9	9	8	12
57	8	8	8	8	8	8	7	7	7	7	7	7	7	7	7	6	6	5	8
60	5	5	5	6	5	5	5	5	5	5	5	5	5	5	4	4	4	3	5
63	3	3	4	4	4	4	3	3	3	3	3	3	3	3	3	2	2	2	3
66	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	1	1	1	2
69	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
72	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1
75	0	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	0	0	0	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	0	0	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	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550	1550
3	1527	1525	1523	1526	1523	1524	1526	1527	1528	1531	1532	1534	1536	1537	1540	1542	1542
6	1471	1467	1471	1471	1469	1468	1473	1476	1479	1484	1488	1493	1498	1500	1505	1509	1512
9	1379	1370	1373	1365	1369	1373	1381	1390	1398	1406	1414	1421	1426	1432	1436	1439	1449
12	1250	1238	1234	1235	1252	1254	1261	1269	1282	1295	1306	1317	1330	1341	1351	1347	1351
15	1088	1072	1079	1078	1084	1099	1106	1122	1133	1153	1166	1187	1199	1214	1219	1226	1234
18	904	906	890	904	901	919	930	951	974	987	1012	1027	1039	1054	1060	1078	1076
21	710	712	710	723	727	733	753	778	793	806	833	857	865	874	893	909	908
24	525	527	530	523	543	556	567	594	608	623	646	666	671	688	700	698	720
27	364	369	364	371	387	397	408	420	437	451	468	480	495	509	518	517	524
30	237	241	241	248	254	259	273	285	296	304	319	331	337	340	352	360	362
33	148	150	153	160	164	167	173	178	188	194	202	208	215	221	231	236	236
36	91	91	94	101	104	107	110	111	114	119	123	127	135	140	144	149	144
39	58	58	61	62	66	68	69	72	72	74	77	81	83	88	88	87	91
42	39	38	40	42	45	45	46	47	48	49	50	52	55	57	59	57	58
45	27	26	27	29	30	31	31	32	32	33	34	35	37	38	39	39	38
48	18	18	19	20	20	21	21	22	22	22	23	25	25	26	27	27	26
51	12	12	12	13	14	14	15	15	15	15	16	17	17	18	18	18	17
54	8	8	8	9	9	10	10	10	10	10	11	11	11	12	12	11	12
57	5	5	5	6	6	7	7	7	6	7	7	7	7	7	8	7	7
60	3	3	3	4	4	4	4	4	4	4	4	4	4	4	5	5	5
63	2	2	2	2	2	3	2	2	2	2	2	3	2	2	3	3	3
66	1	1	1	1	2	2	2	1	1	1	1	1	1	1	2	1	2
69	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
72	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0
75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
78	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
87	0	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	0

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

Zone	Lumens	% Total
0-5	36.7	4.30%
05-10	103.5	12.00%
10-15	151.8	17.60%
15-20	171.2	19.90%
20-25	152.2	17.70%
25-30	108.7	12.60%
30-35	65.6	7.60%
35-40	33	3.80%
40-45	17.6	2.00%
45-50	10.3	1.20%
50-55	5.7	0.70%
55-60	3	0.30%
60-65	1.5	0.20%
65-70	0.6	0.10%
70-75	0.3	0.00%
75-80	0.1	0.00%
80-85	0	0.00%
85-90	0	0.00%

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	1.14	1.12	1.09	1.07	1.12	1.09	1.07	0.95	1.05	1.04	1.02	1.02	1	0.99	0.98	0.97	0.96	0.95
2	1.09	1.05	1.01	0.98	1.07	1.03	1	0.9	1	0.97	0.95	0.97	0.95	0.93	0.94	0.93	0.91	0.89
3	1.04	0.99	0.94	0.91	1.03	0.97	0.93	0.85	0.95	0.91	0.89	0.92	0.9	0.87	0.9	0.88	0.86	0.84
4	1	0.93	0.88	0.85	0.98	0.92	0.88	0.81	0.9	0.86	0.83	0.88	0.85	0.82	0.86	0.84	0.81	0.8
5	0.96	0.88	0.83	0.79	0.94	0.87	0.83	0.77	0.86	0.81	0.78	0.84	0.8	0.78	0.83	0.79	0.77	0.76
6	0.92	0.84	0.78	0.75	0.9	0.83	0.78	0.73	0.82	0.77	0.74	0.8	0.76	0.73	0.79	0.76	0.73	0.72
7	0.88	0.8	0.74	0.71	0.87	0.79	0.74	0.69	0.78	0.73	0.7	0.77	0.73	0.7	0.76	0.72	0.69	0.68
8	0.84	0.76	0.71	0.67	0.83	0.75	0.7	0.66	0.74	0.7	0.67	0.73	0.69	0.66	0.72	0.69	0.66	0.65
9	0.81	0.72	0.67	0.64	0.8	0.72	0.67	0.63	0.71	0.67	0.63	0.7	0.66	0.63	0.69	0.66	0.63	0.62
10	0.78	0.69	0.64	0.61	0.77	0.69	0.64	0.6	0.68	0.64	0.6	0.67	0.63	0.6	0.67	0.63	0.6	0.59

Table 4. Utilisation Factor Table

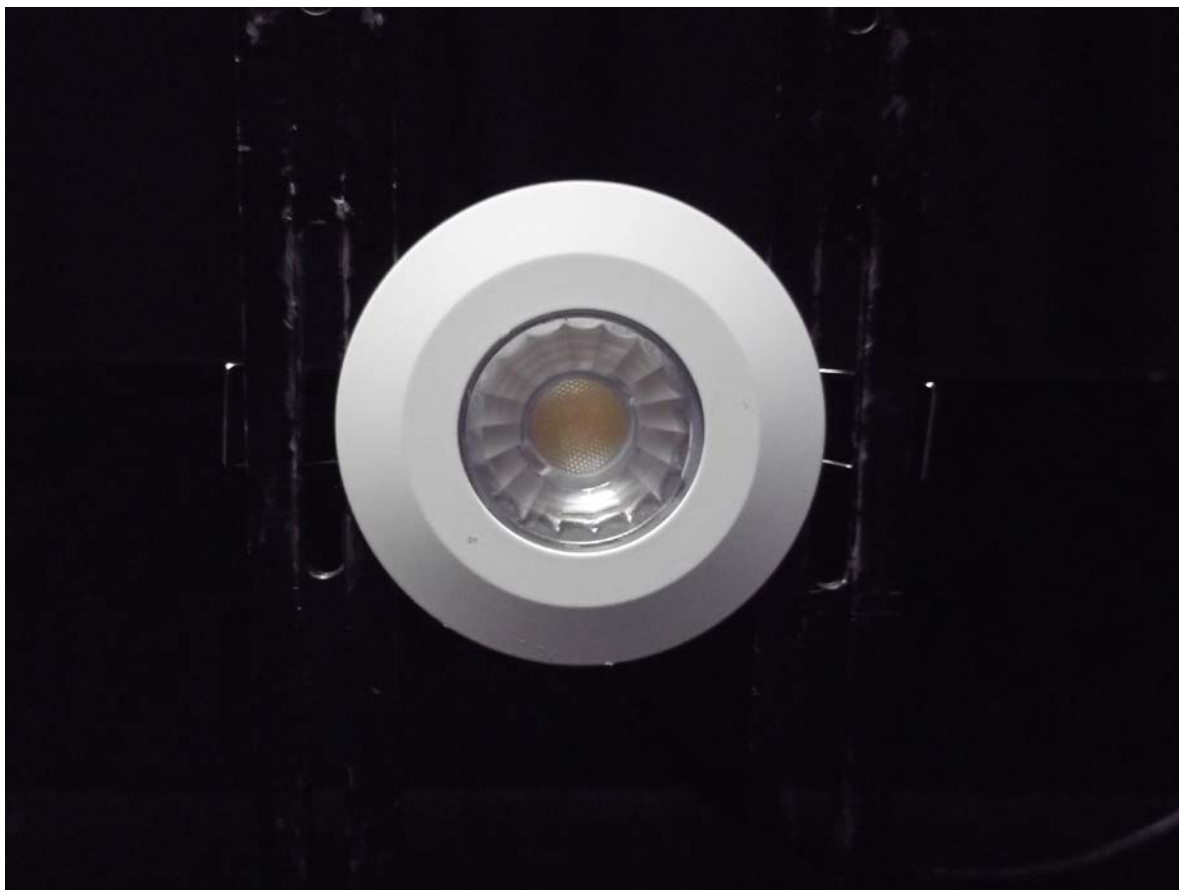


Photo 1: Luminaire on goniometer mount

Signature:

Print Name:

D CHAMBERS

Date:

05/10/2016

Technical Manager

Duly authorised to sign on behalf of:

Photometric and Optical Testing Services LLP