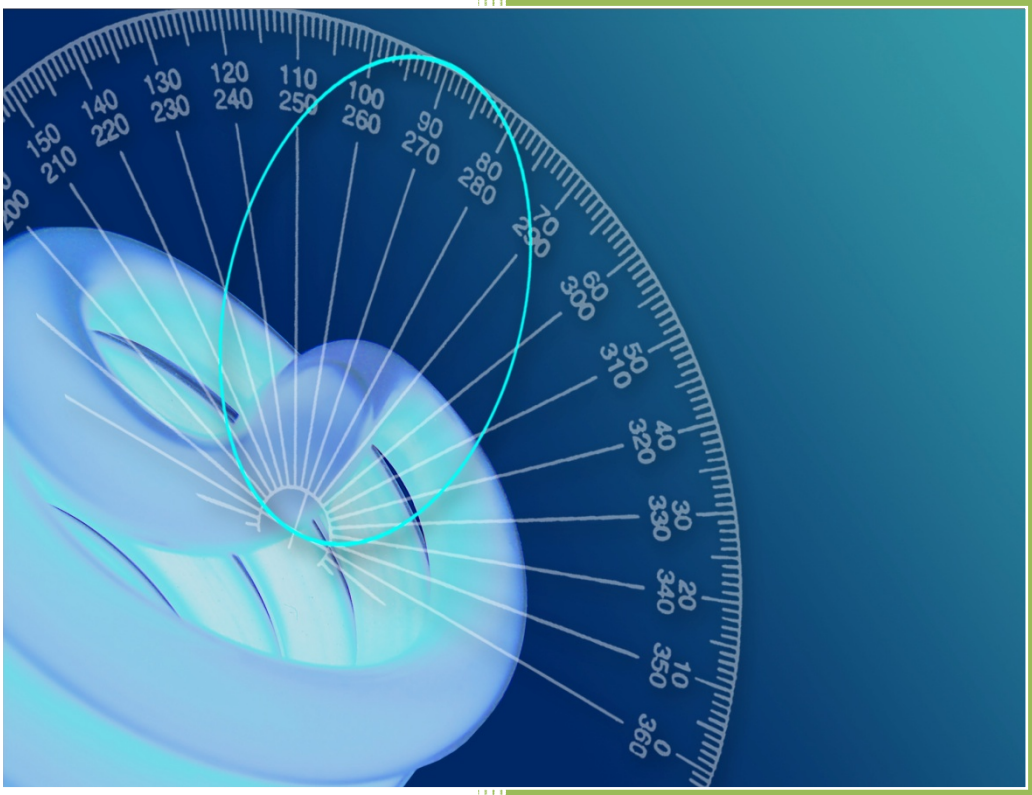
PHOTOMETRIC & OPTICAL TESTING

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/DC14154	Report Date: 07/07/2014	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: 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:	LM 79 08

Details of Product Tested

Manufacturer: TLC Southern Ltd	Source Type: DOWNLIGHT
Model: 14W LED POLO	Luminaire Type: LED
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230.0	Current (mA)= 67
Power (Watts)= 14.66	Power factor= 0.951

Integrating Sphere Test

Date of Test: 07/07/2014	Ambient Temperature:25°C
Measurement Filename: 14W LED POLO	
Instrument Used: Labsphere model CSLMS HALOGEN 4060 integrating sphere spectroradiometer	
Integrating Sphere Size: 1m	Measurement Geometry (2π / 4π): 4π
Sample Orientation: Horizontal	Auxiliary Correction Applied: YES
Comments:	
Date of Last Calibration (Operating Hours): 01-07-2014 (03:37)	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: 19th February 2010
Calibration Lamp Uncertainty: ± 0.67% (*k=2)*	

Results

Flux (lumens): 1072	
CIE 1931 Chromaticity Cx: 0.3440	CIE 1931 Chromaticity Cy: 0.3545
CRI (%):84.86	CCT (K): 5049

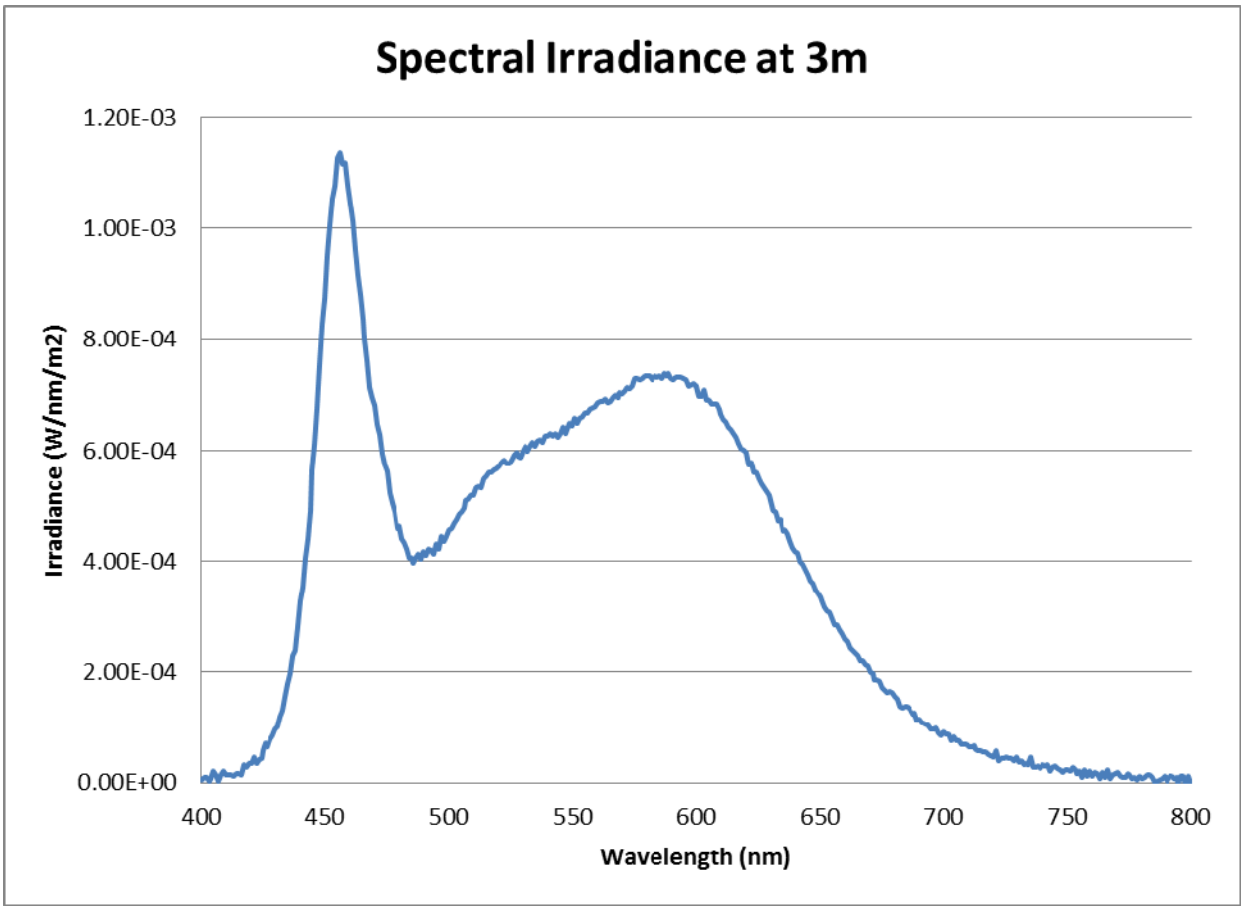


Figure 1: Spectral Irradiance

Figure 2: CIE 1931 diagram.

Goniophotometer Test	
Date of Test: 07/07/2014	Ambient Temperature: 25°C
Measurement Filename: 14W LED POLO	
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 Number: 2129 WK-L 2014-02
Calibration Certificate Date: 13 February 2014	Sample Stabilisation Time (minutes): 66
Reference Photometer Calibration Uncertainty: ± 2.4% (*k=2*, 20-200 lux, CIE illuminant A source)	

Scan Set Up		
Direction	Range	Increment
Inclination Zone 1	0-180°	3°
Azimuth	0-360°	10°
Results		
Integrated Luminous Flux (lumens):1072	Peak Intensity (3° Spot, candelas): 364.3	Efficacy (lumens/Watt): 73.1
Beam Angle (50% of max intensity C0-180, degrees): 109.5		
Photometric Filename (IES LM-63-2002): 14W LED POLO		
IES File – Absolute or Relative Format? RELATIVE		
Photometric Filename (EULUMDAT): 14W LED POLO		
EULUMDAT File – Absolute or Relative Format? RELATIVE		

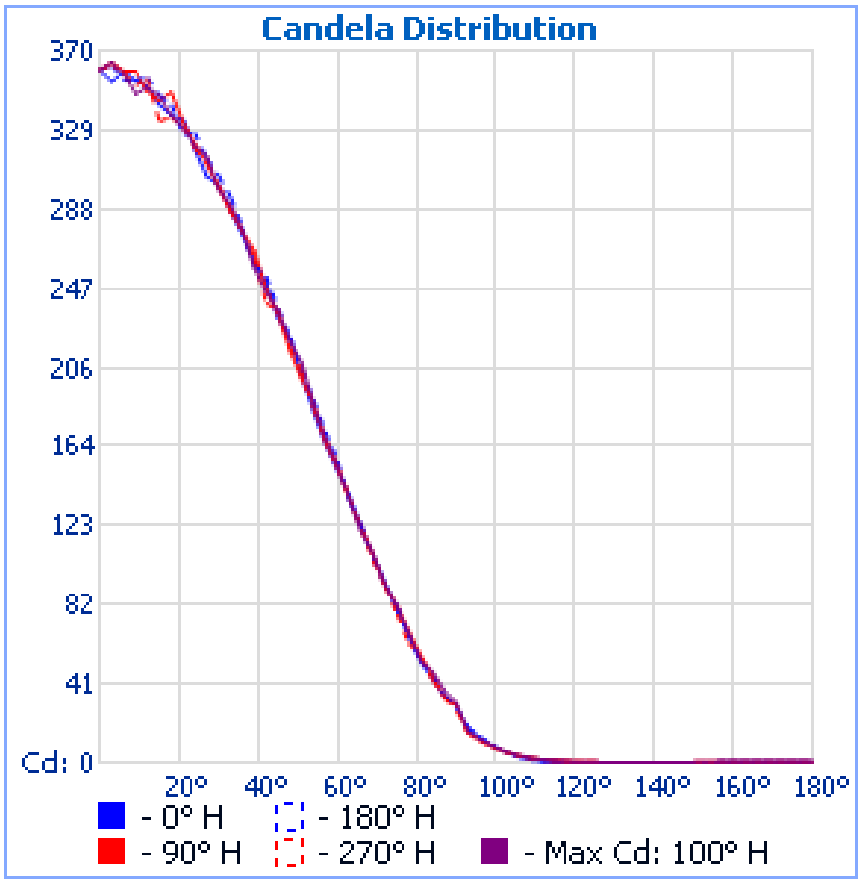


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

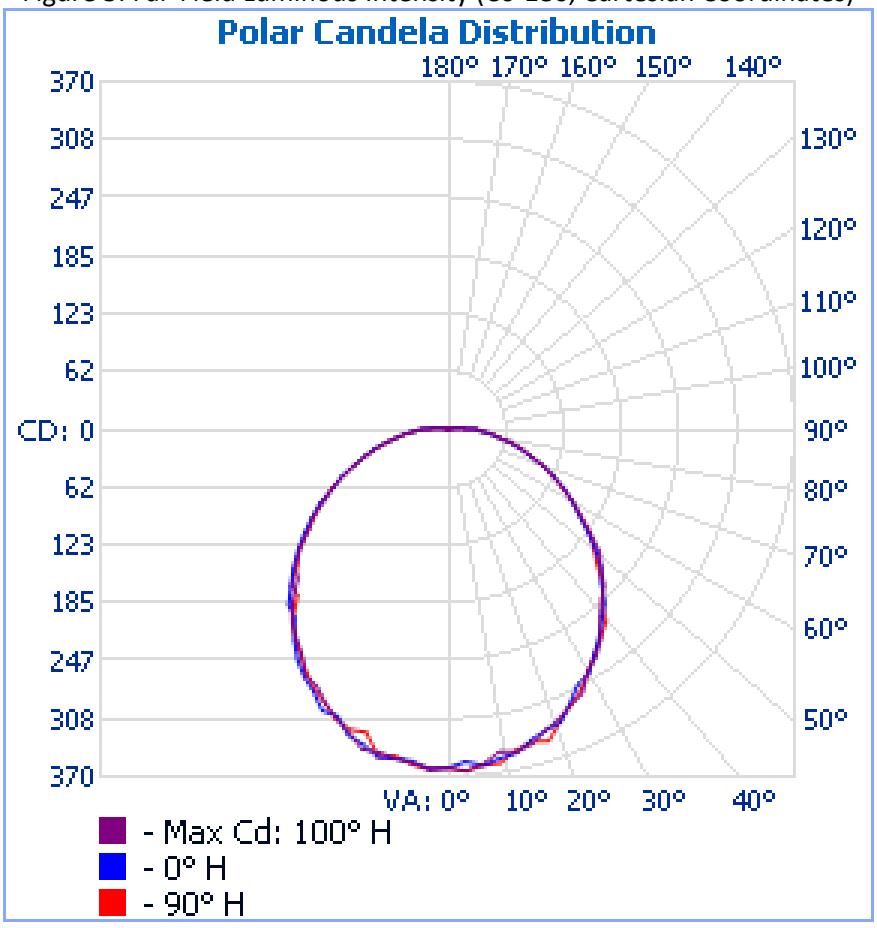


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

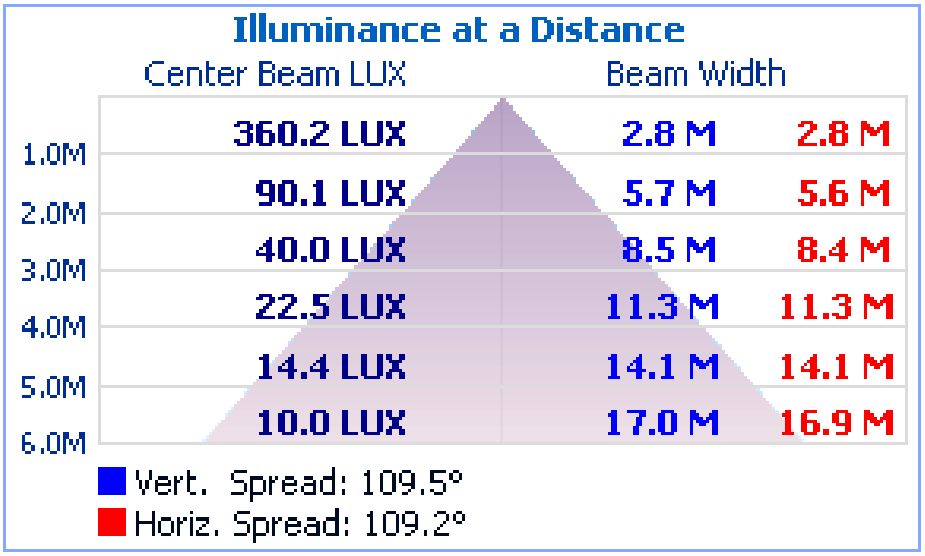


Figure 5. Cone diagram for mounting height of 6 metres.

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	15.1	16.7	15.5	17.1	17.4	15.0	16.7	15.4	17.0	17.4
	3H	16.6	18.1	17.1	18.5	18.9	16.6	18.1	17.0	18.5	18.9
	4H	17.4	18.8	17.8	19.2	19.6	17.3	18.7	17.7	19.1	19.5
	6H	18.0	19.3	18.4	19.7	20.1	17.9	19.2	18.4	19.6	20.1
	8H	18.2	19.5	18.7	19.9	20.3	18.2	19.4	18.6	19.8	20.3
	12H	18.4	19.7	18.9	20.1	20.5	18.4	19.6	18.8	20.0	20.5
4H	2H	15.8	17.2	16.2	17.5	18.0	15.7	17.1	16.1	17.5	17.9
	3H	17.5	18.7	17.9	19.1	19.6	17.5	18.7	17.9	19.1	19.6
	4H	18.4	19.5	18.8	19.9	20.4	18.3	19.4	18.8	19.9	20.4
	6H	19.1	20.1	19.6	20.5	21.0	19.1	20.0	19.6	20.5	21.0
	8H	19.4	20.3	19.9	20.8	21.3	19.4	20.3	19.9	20.8	21.3
	12H	19.8	20.6	20.3	21.1	21.6	19.7	20.6	20.3	21.1	21.6
8H	4H	18.7	19.6	19.2	20.1	20.6	18.6	19.6	19.1	20.0	20.5
	6H	19.6	20.3	20.1	20.8	21.4	19.5	20.3	20.1	20.8	21.3
	8H	20.1	20.8	20.6	21.3	21.8	20.0	20.7	20.6	21.3	21.8
	12H	20.5	21.1	21.1	21.7	22.2	20.5	21.1	21.0	21.6	22.2
12H	4H	18.7	19.6	19.3	20.1	20.6	18.7	19.5	19.2	20.0	20.6
	6H	19.7	20.4	20.3	20.9	21.5	19.7	20.4	20.2	20.9	21.4
	8H	20.2	20.8	20.8	21.4	21.9	20.2	20.8	20.7	21.3	21.9

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	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
3	354	358	360	360	361	362	362	363	364	364	364	364	362	361	361	362	362	362	362
6	360	357	355	355	360	358	356	357	356	360	358	358	358	361	359	357	355	356	355
9	354	356	356	357	353	354	358	352	356	360	348	347	362	359	351	351	361	358	355
12	352	347	355	351	350	347	353	352	348	349	351	352	346	347	346	350	344	350	356
15	342	342	347	343	345	349	345	344	342	344	347	345	345	347	343	345	348	336	347
18	337	338	339	343	341	340	340	339	338	348	337	337	339	341	330	344	347	335	342
21	334	331	330	333	324	339	329	331	330	333	330	331	332	326	327	328	328	329	327
24	319	322	319	320	326	323	325	326	320	322	321	323	324	317	317	324	322	321	328
27	305	312	317	306	310	312	309	309	312	312	316	308	313	314	311	309	310	308	314
30	300	299	297	297	298	295	298	300	303	299	298	298	303	297	300	304	295	293	305
33	287	290	289	286	283	285	289	292	287	286	290	285	281	294	288	286	278	289	294
36	274	277	274	271	275	278	275	273	279	276	277	279	277	280	278	279	267	277	278
39	261	261	262	261	258	261	264	264	261	266	258	259	264	262	259	248	254	264	259
42	250	248	252	242	246	252	254	249	243	246	245	247	250	247	243	247	244	244	253
45	231	231	233	237	238	233	237	230	230	233	235	232	236	230	228	227	225	235	236
48	220	221	219	218	220	214	213	219	222	214	219	223	214	217	215	215	217	213	221
51	202	206	203	202	200	197	200	198	199	200	208	204	199	202	197	198	200	198	205
54	183	185	187	183	181	189	187	183	187	187	187	182	184	190	183	185	186	187	189
57	166	165	168	167	168	170	175	173	172	166	169	173	169	166	169	164	169	173	172
60	152	152	153	156	153	155	155	152	153	153	154	151	155	152	153	158	151	156	157
63	139	140	141	139	134	134	137	138	130	136	137	137	141	137	142	135	140	138	136
66	124	119	122	126	120	121	122	122	127	124	120	124	124	122	125	122	121	122	124
69	108	106	105	105	103	106	107	103	105	108	108	105	107	107	108	104	107	110	106
72	94	90	92	92	93	91	93	96	94	92	93	93	92	96	95	92	91	92	92
75	79	80	78	79	81	81	82	78	81	82	81	79	81	84	80	79	76	76	81
78	67	65	66	66	65	65	68	69	66	69	68	69	67	69	66	66	68	65	67
81	53	51	57	54	54	55	56	56	55	56	54	56	59	57	56	58	54	55	53
84	44	45	46	47	47	48	48	47	45	46	48	46	47	46	46	45	43	44	45
87	34	36	36	34	34	38	37	35	38	34	38	38	37	36	37	38	34	34	35
90	30	30	27	26	29	28	29	28	31	30	31	28	31	29	30	27	30	27	29
93	18	19	19	20	19	20	19	18	17	16	16	18	19	19	19	20	19	19	19

96	13	14	15	15	15	15	15	14	12	12	12	13	14	15	15	14	15	14	14
99	9	10	10	11	11	11	11	10	9	9	9	10	10	11	10	10	10	10	9
102	6	7	7	7	8	8	8	7	7	6	6	7	7	7	7	7	7	6	6
105	4	4	4	5	5	5	5	5	4	4	4	5	5	5	5	5	4	4	4
108	2	3	3	3	3	3	4	3	3	3	3	3	3	3	3	3	2	2	2
111	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	1
114	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	0	0
117	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0
120	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0
123	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	0	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	0
138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147	0	0	0	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	0	0	0
153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
159	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
162	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
165	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
168	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
171	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
174	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
177	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360	360
3	363	363	361	359	358	360	363	364	363	361	361	361	360	357	354	351	351
6	356	359	357	355	353	352	353	358	359	357	355	355	359	363	361	360	360
9	358	354	359	356	354	356	352	352	352	354	357	353	353	358	353	357	362
12	344	353	357	343	346	357	351	346	356	351	350	349	349	352	346	344	349
15	346	349	340	344	344	345	339	343	334	352	346	345	342	343	347	342	342
18	334	343	337	345	332	338	336	338	336	339	330	339	341	339	342	335	340
21	330	329	337	328	329	331	328	329	330	331	331	332	329	328	327	330	328
24	318	317	323	319	320	320	320	322	320	319	322	319	322	321	321	324	319
27	314	308	308	316	307	313	318	311	312	307	308	301	310	308	309	312	309
30	299	297	303	302	292	300	292	300	300	303	304	298	298	299	301	297	292
33	285	284	284	289	289	283	290	294	287	286	292	293	289	291	289	290	292
36	276	270	268	274	278	271	275	273	276	274	267	268	273	279	274	269	274
39	259	258	259	262	256	261	256	264	263	263	258	258	262	257	262	262	263
42	251	244	245	247	248	252	244	240	239	247	247	246	250	249	245	243	239
45	228	231	233	231	233	236	236	232	235	226	232	232	232	235	237	237	231
48	220	217	215	218	218	213	217	217	216	218	213	215	210	213	218	217	213
51	205	205	197	195	201	198	204	203	204	202	198	196	199	198	196	195	207
54	190	185	187	182	185	181	183	188	184	183	187	188	187	190	185	186	187
57	172	171	169	171	167	165	173	171	168	171	169	173	171	169	169	170	166
60	153	155	151	152	147	150	151	154	154	150	151	151	153	156	153	152	156
63	137	139	137	135	138	136	135	137	138	137	137	133	137	135	142	142	135
66	123	120	122	119	124	121	117	122	122	121	117	119	120	124	124	124	119
69	106	100	104	109	106	106	104	109	105	106	106	105	105	103	107	106	104
72	94	91	92	95	93	93	94	91	92	91	91	95	93	93	89	93	94
75	79	78	77	77	80	76	77	78	77	78	79	79	80	82	79	80	78
78	66	64	64	66	63	64	68	66	63	67	66	66	66	65	64	66	65
81	53	54	55	55	54	54	55	54	55	54	55	54	54	56	59	56	56
84	43	43	42	44	43	43	42	44	43	45	45	46	44	42	46	44	47
87	35	33	34	34	35	35	34	35	34	35	34	34	36	35	33	36	34
90	30	27	27	29	28	26	28	26	27	28	28	27	30	29	30	27	27
93	18	18	18	18	19	18	17	16	16	16	17	18	18	18	18	17	17

96	13	13	13	14	14	13	12	12	12	12	13	14	14	14	13	13	13
99	9	9	10	10	10	10	9	8	9	9	9	10	10	9	9	9	10
102	6	6	6	7	7	7	6	6	6	6	7	7	7	7	6	6	6
105	4	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	4
108	2	2	2	3	3	3	3	3	3	3	3	3	3	3	2	2	2
111	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1
114	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
117	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0
120	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0
123	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
129	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
132	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
138	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
141	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
144	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
147	0	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	0
153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
156	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
159	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1
162	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1
165	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
168	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
171	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
174	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
177	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
180	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

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

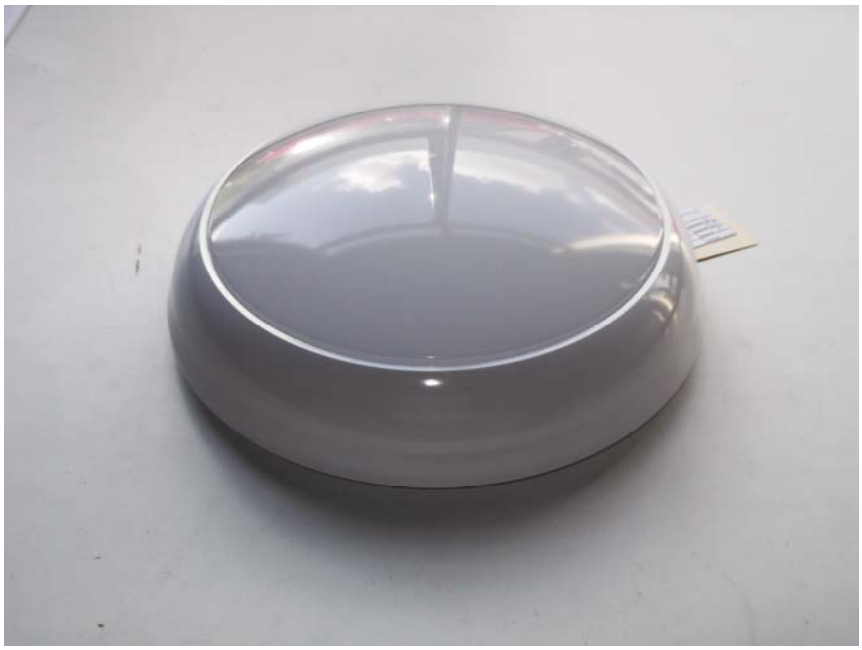


Photo 1: Luminaire for test

Signature:

_____

Print Name:

D CHAMBERS

_____

Date:
07/07/2014

_____

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

Signature:

_____

Print Name:

GH JOHN

_____

Date: 07-07-2014

_____

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