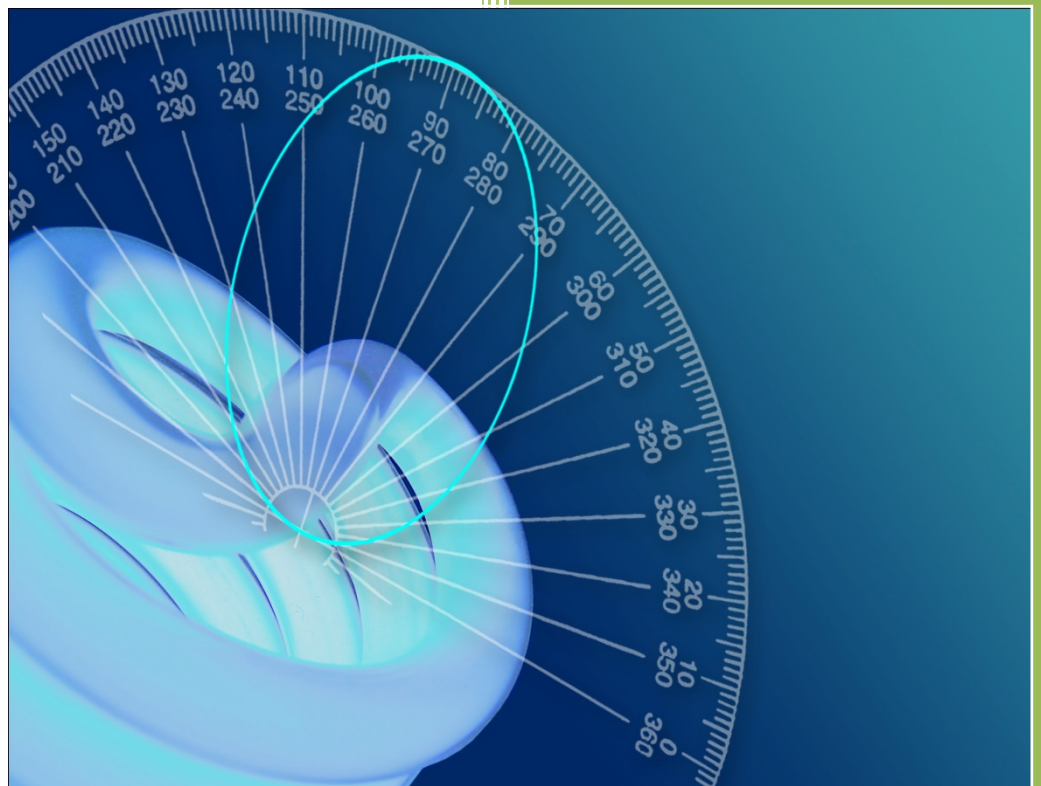


Photometric Test Report



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/DC16196	Report Date: 30/09/2016	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: TLC Southern Ltd	Source Type: LED
Model: LTSP40DL	

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: LTSP40DL	Luminaire Type: CEILING PANEL
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230	Current (mA)= 178
Power (Watts)= 39.05	Power factor= 0.954

Integrating Sphere Test

Date of Test: 23/09/2016	Ambient Temperature: 25°C
Measurement Filename: LTSP40DL	
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): 3260	
CIE 1931 Chromaticity Cx: 0.3236	CIE 1931 Chromaticity Cy: 0.3475
CRI (%): 82.54	CCT (K): 5880

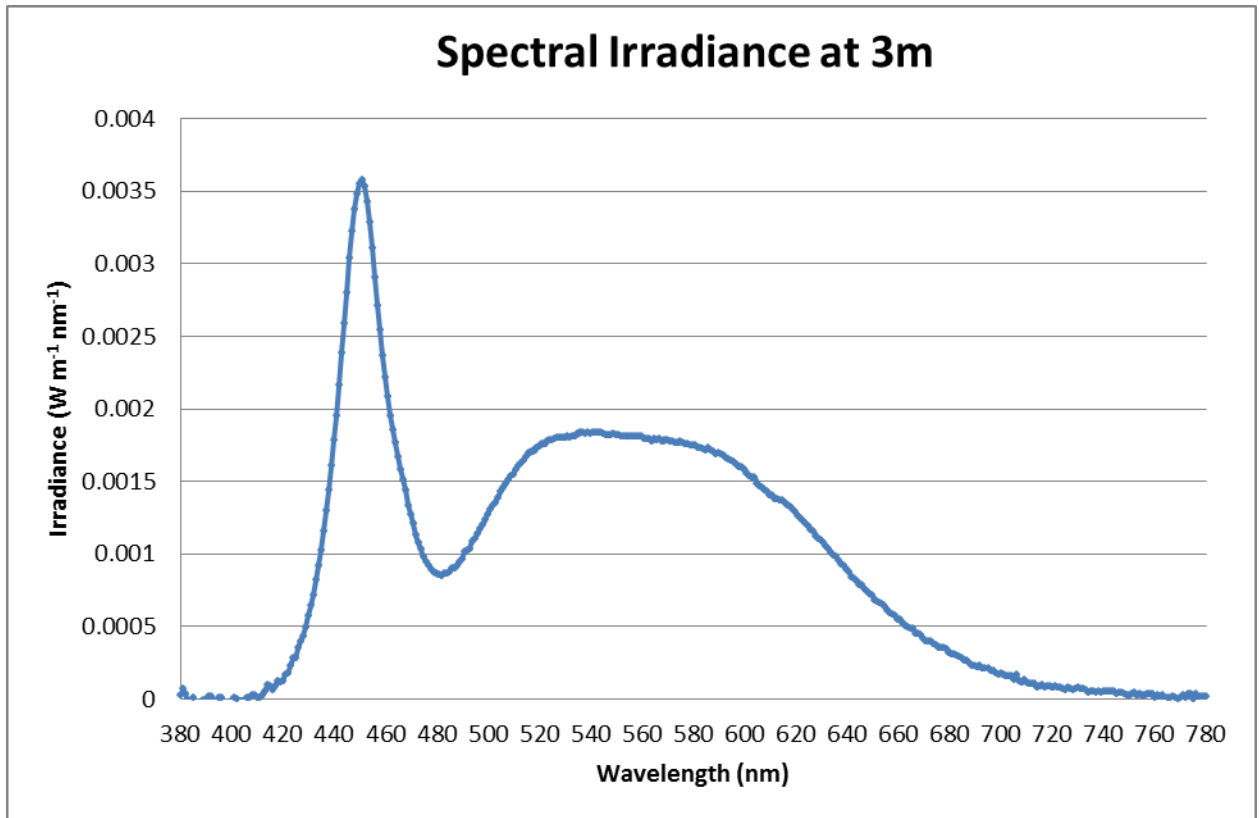


Figure 1: Spectral Irradiance



Figure 2: CIE 1931 diagram.

Goniophotometer Test		
Date of Test: 29/09/2016	Ambient Temperature: 25°C	
Measurement Filename: LTSP40DL		
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): 60	
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):3260	Peak Intensity (3° Spot, candelas): 1163.9	Efficacy (lumens/Watt): 83.48
Beam Angle (50% of max intensity C0-180, degrees): 112		
Photometric Filename (IES LM-63-2002): LTSP40DL		
IES File – Absolute or Relative Format? ABSOLUTE		
Photometric Filename (EULUMDAT): LTSP40DL		
EULUMDAT File – Absolute or Relative Format? ABSOLUTE		

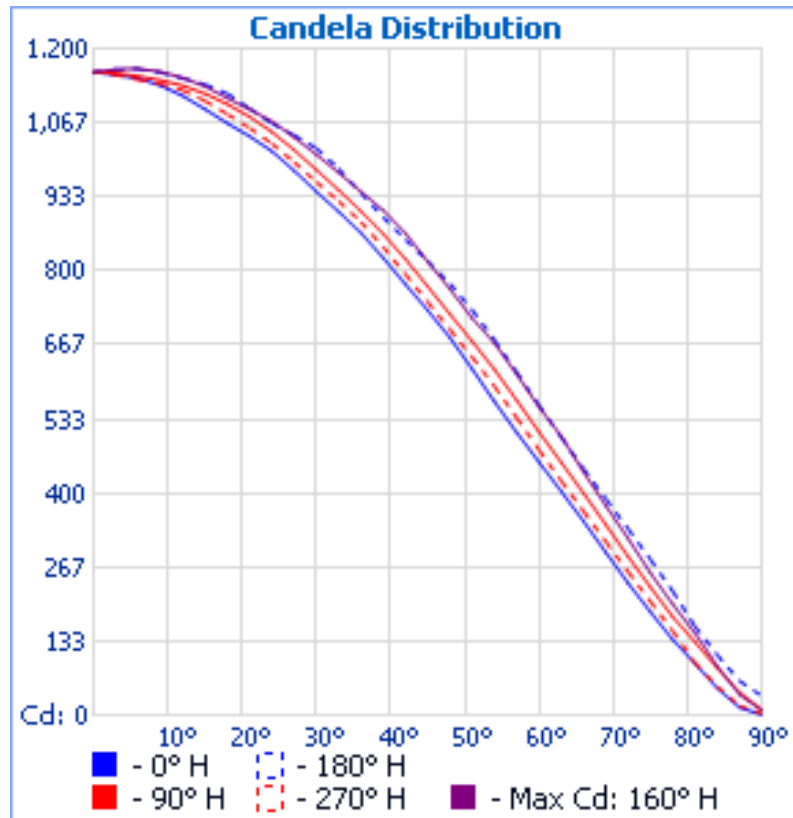


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

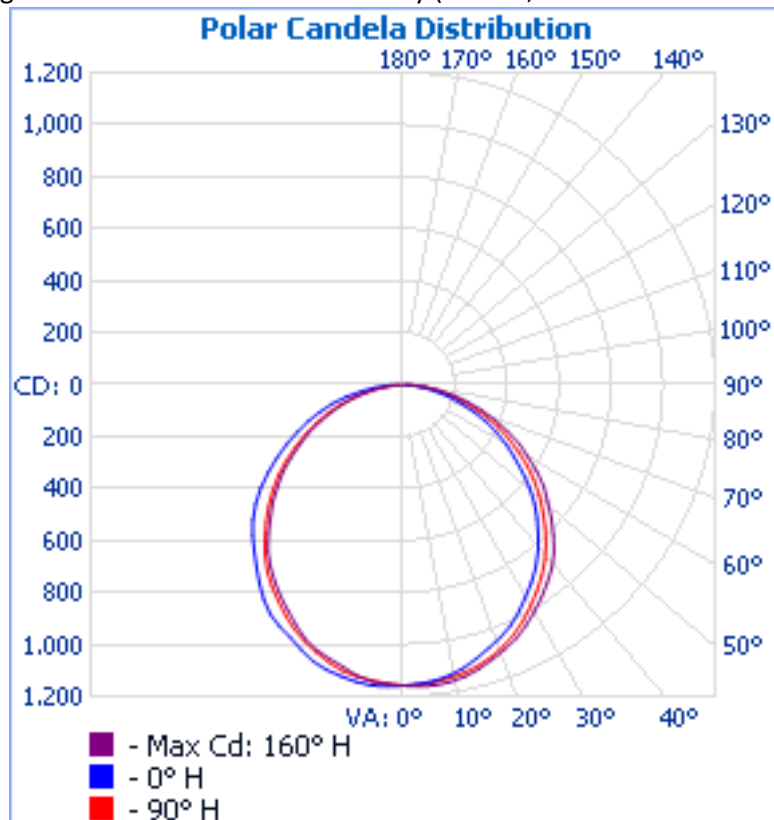


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

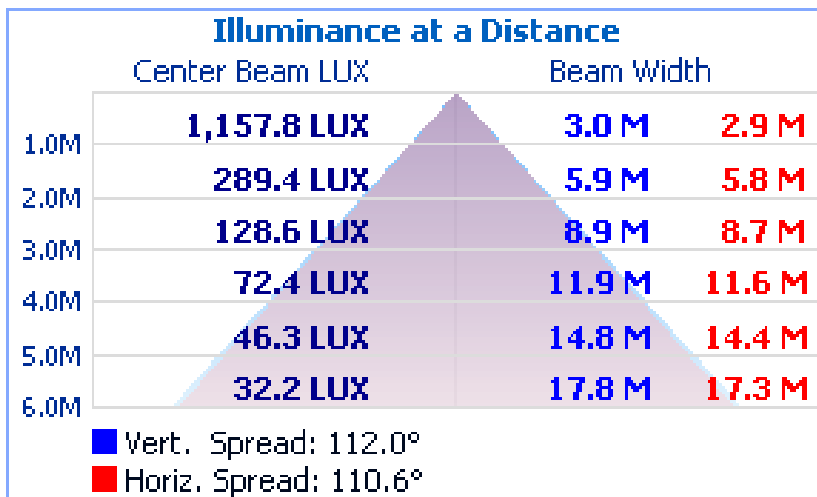


Figure 5. Cone diagram for mounting height of 6 metres.

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	16.2	17.8	16.5	18.1	18.4	16.3	18.0	16.7	18.3	18.6
	3H	17.6	19.1	18.0	19.5	19.8	17.9	19.4	18.3	19.7	20.1
	4H	18.2	19.6	18.6	20.0	20.3	18.5	19.9	18.9	20.3	20.6
	6H	18.6	19.9	19.1	20.3	20.7	18.9	20.2	19.3	20.6	21.0
	8H	18.7	20.0	19.1	20.4	20.8	19.0	20.3	19.4	20.7	21.1
	12H	18.8	20.0	19.2	20.4	20.8	19.0	20.3	19.5	20.6	21.1
4H	2H	16.9	18.3	17.3	18.7	19.0	17.1	18.5	17.5	18.9	19.2
	3H	18.6	19.8	19.0	20.2	20.6	18.8	20.0	19.2	20.4	20.8
	4H	19.3	20.4	19.8	20.8	21.3	19.6	20.6	20.0	21.1	21.5
	6H	19.9	20.8	20.3	21.2	21.7	20.1	21.0	20.5	21.5	21.9
	8H	20.0	20.9	20.5	21.4	21.8	20.2	21.1	20.7	21.5	22.0
	12H	20.2	21.0	20.6	21.4	21.9	20.3	21.1	20.8	21.6	22.1
8H	4H	19.7	20.6	20.1	21.0	21.5	19.9	20.8	20.3	21.2	21.7
	6H	20.3	21.1	20.8	21.6	22.1	20.5	21.2	21.0	21.7	22.2
	8H	20.7	21.3	21.2	21.8	22.3	20.8	21.4	21.3	21.9	22.4
	12H	20.9	21.4	21.4	21.9	22.4	20.9	21.4	21.4	21.9	22.4
12H	4H	19.7	20.6	20.2	21.0	21.5	19.9	20.7	20.4	21.2	21.7
	6H	20.5	21.2	21.0	21.7	22.1	20.6	21.3	21.1	21.8	22.3
	8H	20.8	21.4	21.3	21.9	22.4	20.8	21.4	21.4	21.9	22.4

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	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158
3	1153	1153	1152	1153	1152	1153	1153	1154	1155	1156	1157	1159	1160	1161	1162	1162	1163	1163	1162
6	1146	1145	1144	1143	1143	1143	1144	1146	1148	1150	1153	1155	1158	1160	1162	1163	1164	1164	1163
9	1134	1133	1133	1131	1130	1131	1133	1136	1140	1143	1147	1150	1153	1155	1157	1158	1159	1158	1157
12	1115	1116	1117	1117	1118	1119	1121	1124	1129	1133	1136	1139	1143	1146	1148	1147	1148	1148	1147
15	1091	1092	1097	1100	1101	1103	1104	1107	1114	1119	1118	1119	1124	1129	1130	1131	1132	1134	1136
18	1066	1068	1072	1078	1079	1083	1083	1086	1095	1100	1097	1093	1100	1109	1110	1111	1111	1117	1119
21	1042	1044	1048	1054	1057	1061	1062	1065	1072	1078	1079	1075	1080	1088	1090	1090	1091	1093	1093
24	1015	1017	1020	1022	1029	1035	1036	1041	1046	1050	1060	1058	1054	1061	1065	1064	1069	1069	1065
27	980	987	987	989	994	1002	1004	1010	1015	1018	1027	1027	1023	1031	1039	1038	1041	1047	1044
30	942	952	951	951	953	961	963	974	981	982	988	992	993	998	1009	1010	1009	1018	1021
33	907	910	911	914	918	925	919	934	941	946	953	955	963	966	975	978	977	982	984
36	869	864	869	878	882	890	881	896	898	908	919	913	928	932	935	943	943	942	940
39	824	821	831	833	838	848	841	856	856	867	877	872	882	890	893	899	909	901	897
42	776	777	785	789	793	798	800	807	811	822	827	828	835	840	854	855	868	859	856
45	729	726	737	742	748	747	755	758	767	772	776	783	789	792	814	808	817	816	818
48	680	675	692	694	704	698	709	712	722	722	725	737	742	745	765	762	767	768	777
51	623	629	638	643	659	651	660	663	673	673	676	686	691	699	706	714	715	720	729
54	565	579	586	582	603	601	604	612	615	622	626	633	632	653	648	655	670	667	676
57	509	523	526	531	547	549	551	559	558	567	577	576	579	599	599	599	614	612	618
60	456	465	472	484	490	495	497	504	503	510	524	517	526	537	544	540	555	553	558
63	403	410	427	435	433	438	445	450	451	455	468	461	473	475	483	483	503	496	500
66	349	356	368	381	382	383	390	395	398	400	406	406	414	419	427	429	438	440	444
69	293	301	313	319	325	328	333	341	344	343	346	349	355	360	366	367	377	383	389
72	238	247	263	267	276	278	280	286	290	286	291	294	301	303	310	311	318	327	336
75	186	196	209	217	225	227	227	230	235	231	236	238	242	246	250	255	256	269	281
78	136	150	159	168	175	173	178	177	180	177	183	185	187	188	193	200	200	210	224
81	93	107	125	131	136	134	139	138	134	132	133	139	137	140	139	145	148	145	160
84	49	69	77	84	84	86	90	88	88	85	84	87	88	88	83	94	89	98	109
87	14	31	35	36	43	42	43	40	43	42	41	37	38	40	37	38	38	46	62
90	1	9	9	10	11	10	10	9	12	10	11	10	8	7	9	8	9	11	35

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	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158	1158
3	1162	1161	1159	1158	1157	1155	1154	1153	1152	1152	1152	1153	1153	1153	1154	1153	1153
6	1162	1161	1158	1155	1152	1150	1147	1145	1144	1145	1146	1148	1149	1149	1149	1149	1147
9	1155	1153	1150	1147	1145	1142	1139	1138	1137	1137	1137	1138	1138	1136	1134	1134	1133
12	1143	1140	1137	1136	1134	1131	1128	1127	1125	1123	1121	1120	1118	1116	1110	1110	1112
15	1132	1127	1123	1121	1119	1116	1113	1109	1106	1102	1100	1097	1095	1091	1089	1092	1091
18	1119	1112	1107	1103	1100	1096	1094	1089	1082	1078	1074	1072	1071	1066	1069	1074	1073
21	1099	1096	1087	1083	1077	1072	1070	1066	1057	1049	1048	1048	1045	1041	1042	1048	1047
24	1074	1073	1059	1057	1051	1039	1037	1036	1029	1018	1019	1020	1017	1013	1008	1012	1013
27	1043	1038	1028	1027	1023	1008	1001	999	996	986	989	988	980	982	977	975	978
30	1007	999	994	991	987	977	968	962	960	953	956	949	936	944	943	941	942
33	973	966	960	957	948	943	934	928	926	916	916	910	901	907	908	905	898
36	940	933	928	922	907	905	895	892	888	873	872	869	865	863	867	866	853
39	901	897	886	882	863	860	852	845	843	826	829	818	821	817	815	825	814
42	855	852	842	838	820	813	802	792	794	777	783	772	776	777	771	773	773
45	807	803	793	787	775	762	751	743	744	729	737	729	726	728	724	720	724
48	758	758	742	735	724	710	703	697	694	681	688	683	672	674	673	674	672
51	709	707	693	684	669	659	653	648	644	634	632	631	621	626	622	620	624
54	657	658	639	631	615	606	604	593	592	581	577	574	569	576	565	571	571
57	604	599	589	576	562	554	550	540	535	528	523	522	519	524	512	512	515
60	550	540	534	516	506	496	490	486	478	472	470	468	467	462	460	455	457
63	495	488	476	458	448	439	434	430	422	418	418	414	413	401	410	407	399
66	439	425	418	405	389	381	378	370	367	364	364	359	359	354	358	348	342
69	382	368	354	343	329	322	320	311	312	309	310	304	301	302	296	294	288
72	325	312	296	286	276	268	263	257	258	254	257	253	247	252	244	244	237
75	266	251	237	227	222	213	208	205	205	200	203	201	200	200	197	193	187
78	207	191	182	171	164	160	155	155	152	149	149	153	151	151	152	145	138
81	139	129	120	111	105	100	101	96	95	95	100	101	104	105	109	105	94
84	93	72	70	59	56	55	54	56	52	54	54	57	57	60	64	59	57
87	45	26	22	22	18	19	15	19	18	19	16	19	21	26	23	23	21
90	13	5	4	3	1	2	1	2	3	2	2	3	3	5	4	5	4

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

Zone	Lumens	% Total
0-5	27.7	0.80%
05-10	81.7	2.50%
10-15	133.6	4.10%
15-20	180.6	5.50%
20-25	220.1	6.70%
25-30	253.8	7.70%
30-35	278.5	8.40%
35-40	291.5	8.80%
40-45	297	9.00%
45-50	293	8.90%
50-55	276.1	8.40%
55-60	252.6	7.70%
60-65	222.4	6.70%
65-70	182.2	5.50%
70-75	140.2	4.30%
75-80	97.5	3.00%
80-85	52.7	1.60%
85-90	15.5	0.50%

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	1.09	1.04	0.99	0.95	1.06	1.01	0.98	0.84	0.97	0.94	0.91	0.93	0.91	0.88	0.9	0.88	0.86	0.83
2	0.99	0.9	0.83	0.78	0.96	0.88	0.82	0.71	0.85	0.79	0.75	0.82	0.77	0.73	0.78	0.75	0.71	0.69
3	0.9	0.79	0.71	0.64	0.87	0.78	0.7	0.6	0.75	0.68	0.63	0.72	0.66	0.62	0.69	0.65	0.6	0.58
4	0.82	0.7	0.61	0.54	0.8	0.69	0.61	0.52	0.66	0.59	0.53	0.64	0.58	0.53	0.62	0.56	0.52	0.5
5	0.76	0.63	0.54	0.47	0.73	0.61	0.53	0.45	0.59	0.52	0.46	0.57	0.51	0.46	0.56	0.5	0.45	0.43
6	0.7	0.56	0.47	0.41	0.68	0.55	0.47	0.39	0.54	0.46	0.4	0.52	0.45	0.4	0.5	0.44	0.4	0.38
7	0.65	0.51	0.42	0.36	0.63	0.5	0.42	0.35	0.49	0.41	0.36	0.47	0.4	0.35	0.46	0.4	0.35	0.33
8	0.6	0.47	0.38	0.32	0.59	0.46	0.38	0.31	0.45	0.37	0.32	0.43	0.37	0.32	0.42	0.36	0.31	0.3
9	0.56	0.43	0.35	0.29	0.55	0.42	0.34	0.28	0.41	0.34	0.29	0.4	0.33	0.29	0.39	0.33	0.28	0.27
10	0.53	0.39	0.32	0.26	0.51	0.39	0.31	0.26	0.38	0.31	0.26	0.37	0.31	0.26	0.36	0.3	0.26	0.24

Table 4. Utilisation Factor Table



Photo 1: Luminaire on goniometer mount

Signature:

A handwritten signature in black ink on a white background. The signature is written in a cursive style and appears to read "D Chambers".

Print Name:

D CHAMBERS

Date:

30/09/2016

Technical Manager

Duly authorised to sign on behalf of:

Photometric and Optical Testing Services LLP