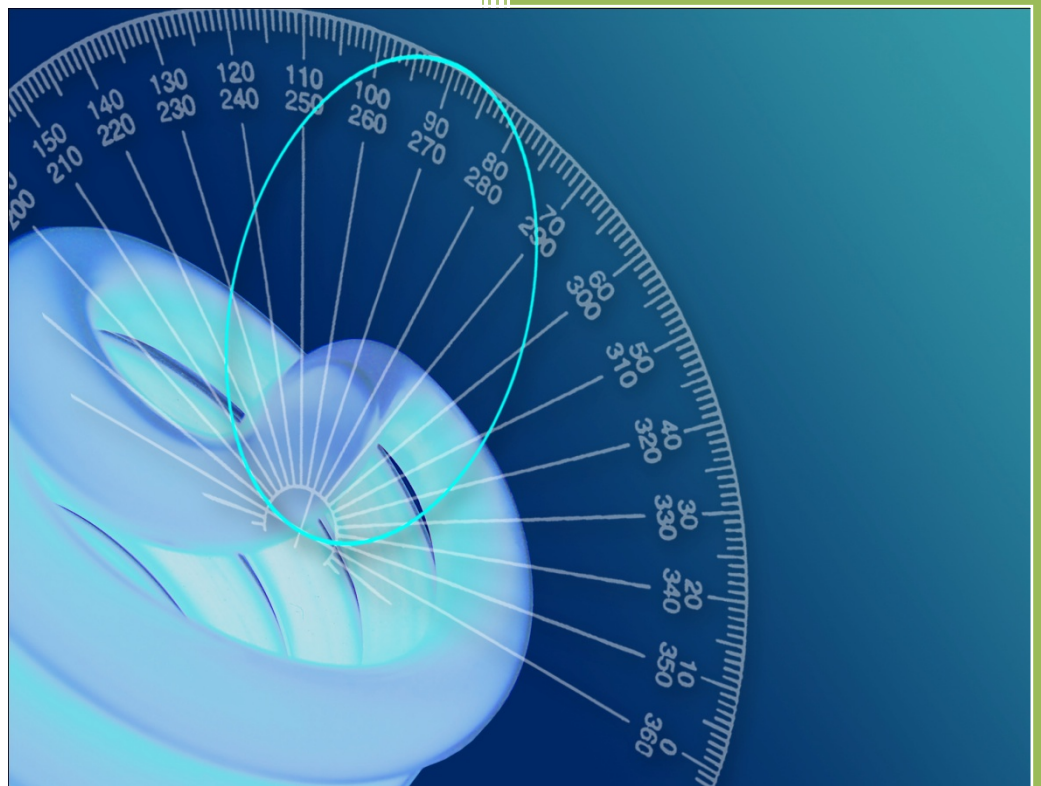


Photometric Test Report



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/DC16195	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: LTSP40CW	

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: LTSP40CW	Luminaire Type: CEILING PANEL
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230.0	Current (mA)= 183
Power (Watts)= 40.28	Power factor= 0.956

Integrating Sphere Test

Date of Test: 23/09/2016	Ambient Temperature: 25°C
Measurement Filename: LTSP40CW	
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): 3313	
CIE 1931 Chromaticity Cx: 0.3553	CIE 1931 Chromaticity Cy: 0.3750
CRI (%): 80.43	CCT (K): 4731

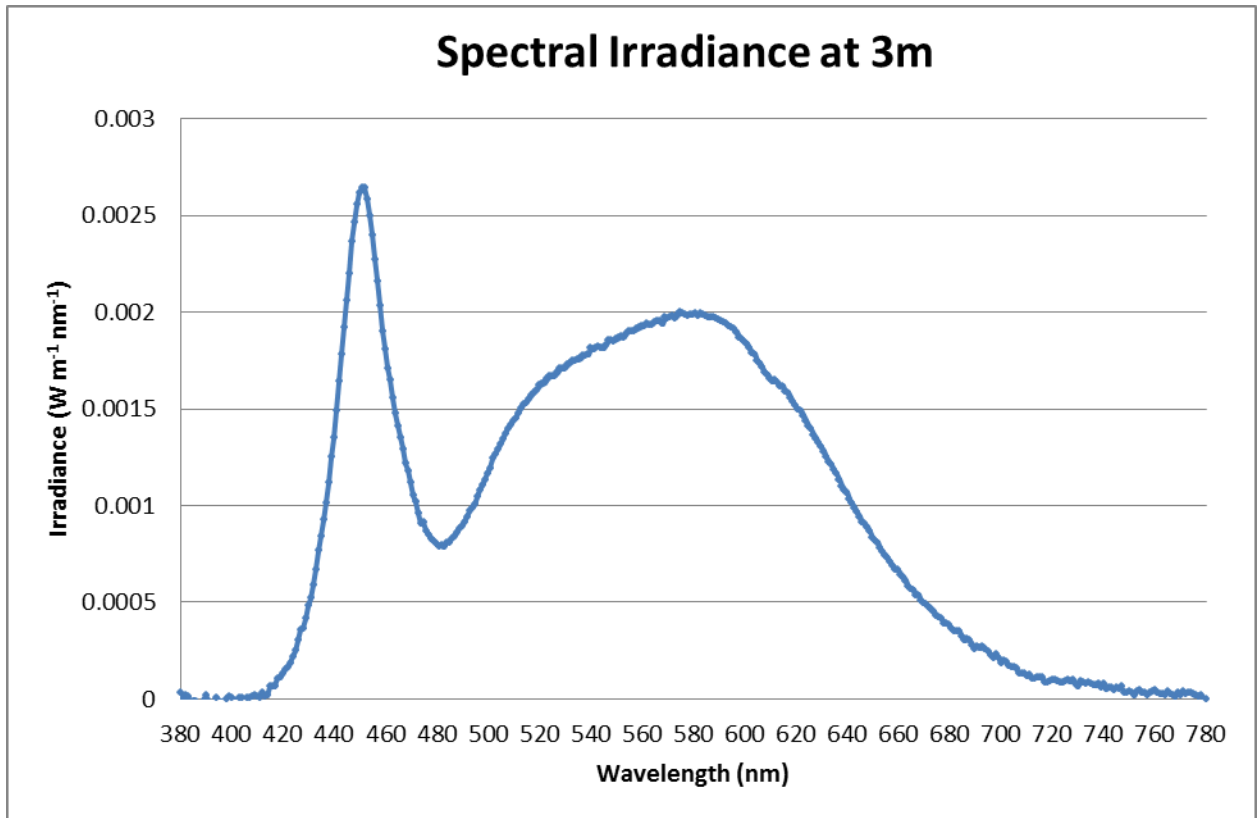


Figure 1: Spectral Irradiance

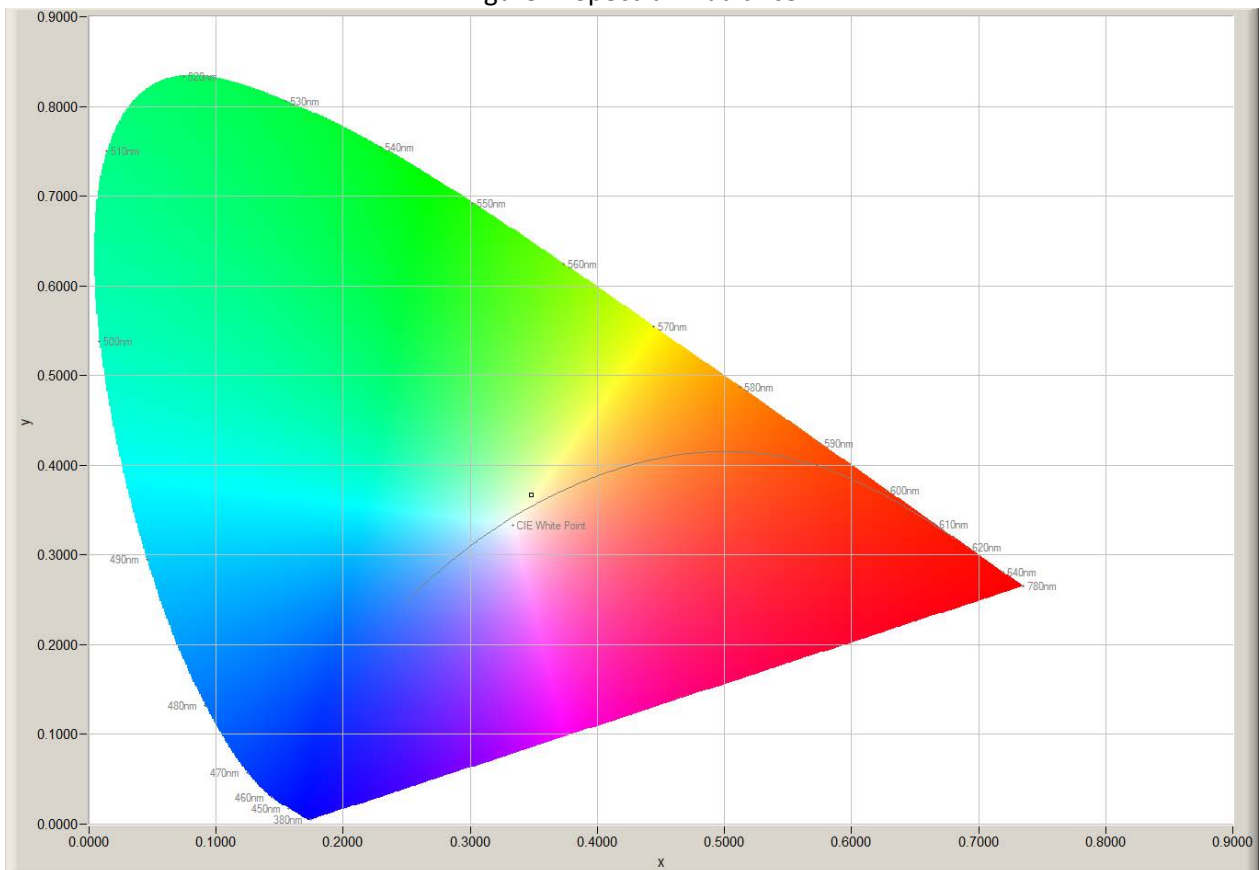


Figure 2: CIE 1931 diagram.

Goniophotometer Test		
Date of Test: 29/09/2016	Ambient Temperature: 25°C	
Measurement Filename: LTSP40CW		
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):3313	Peak Intensity (3° Spot, candelas): 1180.9	Efficacy (lumens/Watt):82.2
Beam Angle (50% of max intensity C0-180, degrees): 113.4		
Photometric Filename (IES LM-63-2002): LTSP40CW		
IES File – Absolute or Relative Format? ABSOLUTE		
Photometric Filename (EULUMDAT): LTSP40CW		
EULUMDAT File – Absolute or Relative Format? ABSOLUTE		

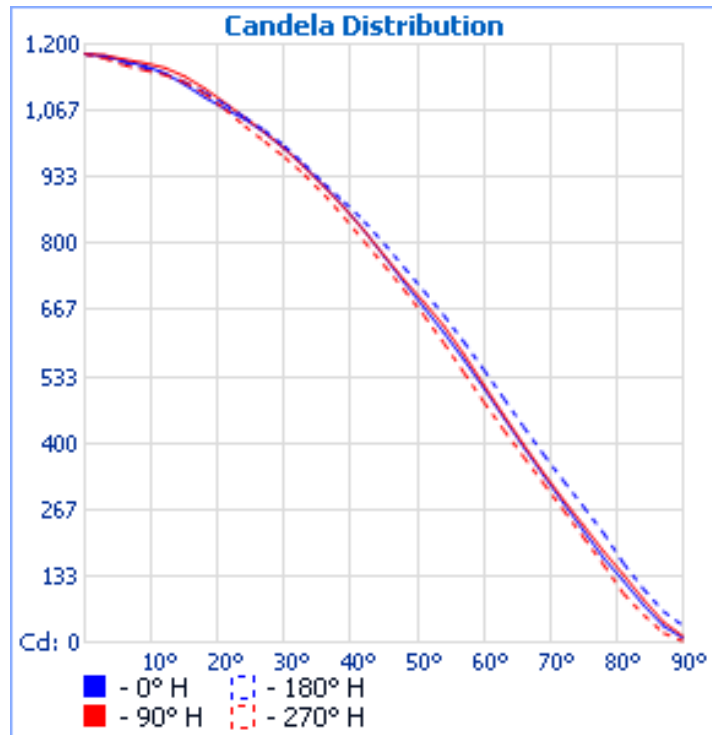


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

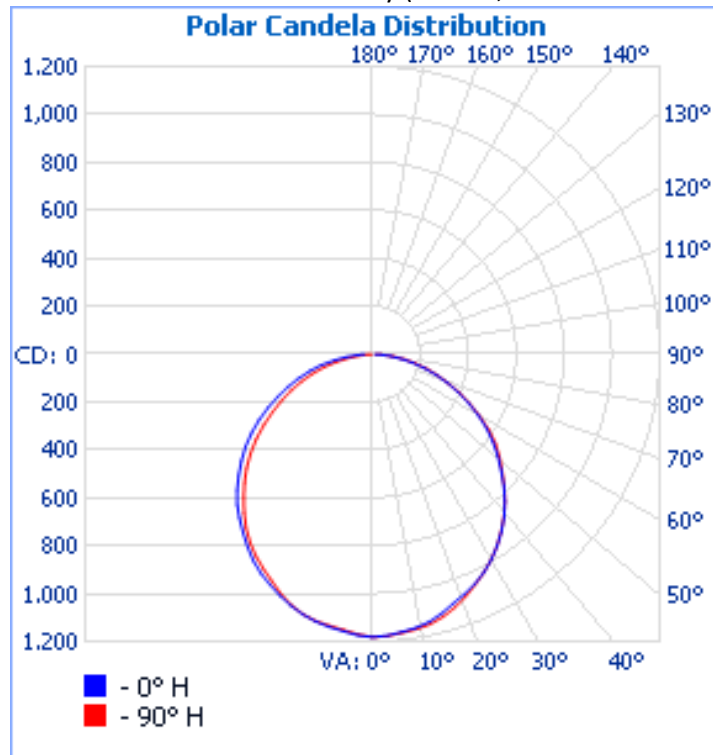


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

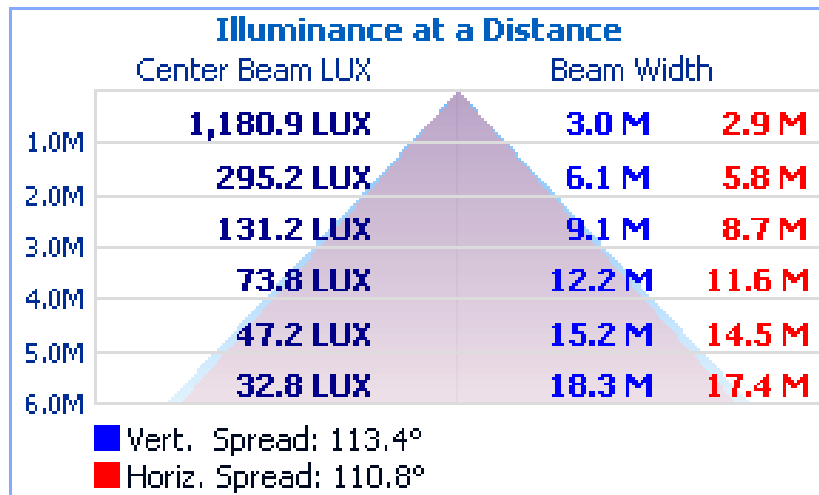


Figure 5. Cone diagram for mounting height of 6 metres.

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	16.6	18.3	17.0	18.6	18.9	16.4	18.1	16.8	18.4	18.7
	3H	18.2	19.7	18.6	20.1	20.4	17.9	19.4	18.3	19.8	20.1
	4H	18.9	20.3	19.3	20.6	21.0	18.6	20.0	19.0	20.3	20.7
	6H	19.4	20.7	19.8	21.1	21.4	19.0	20.3	19.4	20.7	21.1
	8H	19.5	20.8	19.9	21.2	21.6	19.1	20.4	19.5	20.7	21.1
	12H	19.6	20.8	20.0	21.2	21.6	19.1	20.4	19.6	20.7	21.2
4H	2H	17.4	18.8	17.8	19.1	19.5	17.2	18.6	17.6	18.9	19.3
	3H	19.1	20.3	19.5	20.7	21.1	18.9	20.1	19.3	20.5	20.9
	4H	19.9	21.0	20.4	21.4	21.9	19.6	20.7	20.1	21.1	21.6
	6H	20.5	21.5	21.0	21.9	22.4	20.2	21.1	20.6	21.6	22.0
	8H	20.8	21.7	21.2	22.1	22.6	20.3	21.2	20.8	21.6	22.1
	12H	21.0	21.8	21.4	22.2	22.7	20.4	21.2	20.9	21.7	22.2
8H	4H	20.2	21.1	20.7	21.6	22.0	19.9	20.8	20.4	21.3	21.7
	6H	21.0	21.7	21.5	22.2	22.7	20.6	21.3	21.1	21.8	22.3
	8H	21.4	22.0	21.9	22.5	23.0	20.8	21.5	21.4	22.0	22.5
	12H	21.6	22.2	22.2	22.7	23.2	21.0	21.5	21.5	22.0	22.5
12H	4H	20.3	21.1	20.8	21.6	22.1	20.0	20.8	20.5	21.3	21.8
	6H	21.1	21.8	21.6	22.3	22.8	20.7	21.3	21.2	21.9	22.3
	8H	21.5	22.1	22.0	22.6	23.1	20.9	21.5	21.5	22.0	22.5

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	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181
3	1176	1177	1176	1177	1177	1177	1178	1178	1178	1178	1178	1177	1177	1176	1176	1176	1175	1175	1175
6	1166	1166	1167	1168	1168	1167	1168	1169	1169	1169	1169	1169	1168	1167	1166	1166	1164	1163	1163
9	1157	1157	1159	1160	1159	1158	1159	1160	1162	1162	1162	1160	1158	1156	1155	1154	1154	1153	1152
12	1142	1145	1151	1153	1151	1148	1147	1148	1151	1153	1152	1149	1146	1144	1144	1142	1141	1141	1141
15	1119	1123	1134	1138	1134	1130	1128	1128	1131	1136	1136	1134	1130	1128	1126	1123	1122	1121	1124
18	1094	1100	1109	1116	1112	1109	1106	1104	1108	1112	1116	1115	1111	1107	1103	1100	1095	1100	1104
21	1072	1075	1083	1092	1090	1086	1084	1083	1083	1083	1089	1092	1087	1080	1077	1076	1072	1076	1080
24	1050	1050	1054	1059	1059	1054	1051	1057	1058	1054	1059	1060	1054	1049	1046	1047	1049	1051	1054
27	1023	1027	1022	1026	1029	1020	1015	1024	1025	1023	1028	1025	1022	1020	1016	1021	1023	1023	1027
30	991	998	987	989	998	988	984	995	988	991	997	993	988	989	987	997	999	990	996
33	955	958	950	949	962	956	951	961	952	954	961	956	949	951	955	967	969	957	959
36	915	911	913	911	917	920	911	916	915	914	920	916	907	907	914	930	928	923	921
39	873	865	877	868	870	879	868	872	874	872	876	874	866	867	873	880	889	887	884
42	827	821	829	825	829	834	829	827	830	826	827	828	829	829	838	836	848	847	845
45	775	778	776	777	782	782	784	781	782	777	779	783	782	782	797	792	800	803	800
48	722	732	730	731	731	728	733	734	731	728	730	736	726	730	749	750	748	755	753
51	672	681	679	684	681	679	681	682	679	683	681	682	675	682	697	705	693	708	705
54	622	624	628	626	627	630	624	628	624	635	625	626	626	635	641	645	651	657	656
57	568	567	565	571	574	576	571	571	569	578	572	570	579	583	590	589	601	605	603
60	511	508	507	515	515	519	516	514	513	517	518	516	521	526	535	536	543	551	547
63	451	452	461	460	456	461	464	459	458	456	462	459	464	470	472	482	492	495	490
66	392	396	401	404	403	403	405	404	400	397	401	401	409	416	416	423	429	434	432
69	335	339	341	339	345	345	344	349	341	340	340	347	352	355	357	358	370	373	377
72	280	280	287	286	292	293	287	295	286	286	285	294	295	297	302	303	313	314	324
75	224	225	231	235	234	241	230	238	231	235	232	237	238	243	244	248	254	259	273
78	170	172	179	183	180	184	180	181	178	183	180	182	185	188	190	195	197	204	220
81	124	128	140	141	142	142	138	140	132	136	133	137	135	139	139	141	143	143	159
84	76	88	87	92	87	87	91	88	85	87	86	85	86	87	85	91	86	96	108
87	33	42	41	40	43	40	39	40	39	42	40	39	39	41	40	38	35	44	63
90	9	11	12	9	11	10	10	10	9	12	10	8	9	10	9	8	8	11	33

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	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181	1181
3	1174	1174	1174	1173	1173	1172	1172	1171	1171	1171	1171	1172	1173	1174	1175	1175	1176
6	1163	1164	1165	1165	1164	1163	1161	1159	1157	1157	1158	1160	1161	1163	1165	1166	1166
9	1152	1153	1153	1155	1156	1155	1153	1150	1148	1147	1146	1148	1152	1156	1158	1159	1157
12	1139	1137	1137	1140	1141	1143	1142	1141	1139	1136	1134	1135	1139	1146	1150	1149	1145
15	1124	1121	1115	1114	1118	1121	1124	1124	1124	1122	1119	1117	1118	1125	1131	1131	1122
18	1107	1100	1091	1085	1091	1095	1099	1102	1101	1102	1100	1098	1096	1098	1106	1104	1099
21	1082	1076	1065	1061	1065	1068	1073	1074	1070	1072	1075	1075	1071	1073	1079	1080	1078
24	1052	1049	1039	1036	1037	1032	1040	1043	1037	1036	1041	1044	1042	1043	1045	1054	1057
27	1023	1021	1014	1007	1004	995	1001	1009	1005	999	1008	1013	1013	1014	1012	1017	1028
30	995	991	982	970	966	962	963	972	974	966	981	980	979	984	977	976	992
33	967	956	947	938	933	934	924	928	939	935	944	937	941	949	942	937	950
36	934	913	913	904	896	898	882	882	899	898	894	892	901	907	906	901	905
39	889	872	870	863	852	846	840	839	853	853	847	850	858	859	862	867	860
42	838	828	824	821	806	796	792	795	805	802	801	808	811	812	816	821	815
45	794	784	774	776	761	749	743	747	757	753	756	756	762	760	765	767	771
48	752	742	726	728	711	703	697	696	708	704	709	702	713	710	715	717	723
51	706	692	680	678	656	656	650	648	656	655	657	654	661	657	667	665	671
54	652	645	628	626	603	603	601	597	601	598	606	601	607	598	610	620	614
57	598	587	577	571	551	550	547	547	542	543	549	545	553	547	557	561	560
60	545	528	523	510	498	491	490	492	483	488	491	488	495	494	501	498	506
63	488	481	467	450	443	433	434	435	426	433	436	435	434	435	445	445	450
66	427	423	409	398	386	376	377	375	372	376	380	378	375	381	386	386	390
69	368	364	345	337	325	320	319	316	319	317	322	318	315	323	318	333	331
72	313	307	290	279	269	266	265	260	265	261	265	264	262	271	264	280	273
75	260	247	234	222	217	209	211	207	211	207	209	209	212	215	214	221	218
78	208	189	179	170	163	158	156	157	157	156	156	158	160	163	164	167	165
81	141	127	117	110	102	99	99	99	98	100	105	106	110	115	117	123	117
84	92	70	68	56	52	54	52	56	56	57	60	61	59	63	72	72	74
87	43	26	21	20	16	17	14	20	19	19	19	22	21	26	26	29	32
90	10	6	3	2	2	0	1	3	2	3	3	3	3	5	6	8	8

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

Zone	Lumens	% Total
0-5	28.2	0.80%
05-10	82.6	2.50%
10-15	135.3	4.00%
15-20	182.7	5.50%
20-25	221.9	6.60%
25-30	256.1	7.60%
30-35	281.9	8.40%
35-40	294.9	8.80%
40-45	301.1	9.00%
45-50	297.6	8.90%
50-55	281.2	8.40%
55-60	258.1	7.70%
60-65	227.5	6.80%
65-70	186.2	5.60%
70-75	143.4	4.30%
75-80	100.4	3.00%
80-85	54.6	1.60%
85-90	16.2	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	0.97	0.84	0.97	0.94	0.91	0.93	0.91	0.88	0.9	0.87	0.85	0.83
2	0.99	0.9	0.83	0.77	0.96	0.88	0.82	0.71	0.85	0.79	0.75	0.81	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	0.61	0.69	0.64	0.6	0.58
4	0.82	0.7	0.61	0.54	0.8	0.69	0.6	0.51	0.66	0.59	0.53	0.64	0.58	0.52	0.62	0.56	0.52	0.5
5	0.76	0.63	0.53	0.47	0.73	0.61	0.53	0.45	0.59	0.52	0.46	0.57	0.51	0.45	0.55	0.5	0.45	0.43
6	0.7	0.56	0.47	0.41	0.68	0.55	0.47	0.39	0.53	0.46	0.4	0.52	0.45	0.4	0.5	0.44	0.39	0.37
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	0.44	0.37	0.32	0.43	0.36	0.32	0.42	0.36	0.31	0.29
9	0.56	0.43	0.34	0.29	0.55	0.42	0.34	0.28	0.41	0.34	0.29	0.4	0.33	0.28	0.39	0.33	0.28	0.26
10	0.53	0.39	0.31	0.26	0.51	0.39	0.31	0.26	0.38	0.31	0.26	0.37	0.3	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, flowing style and appears to read "D Chambers". The signature is positioned above a horizontal line.

Print Name:

D CHAMBERS

Date:

30/09/2016

Technical Manager

Duly authorised to sign on behalf of:

Photometric and Optical Testing Services LLP