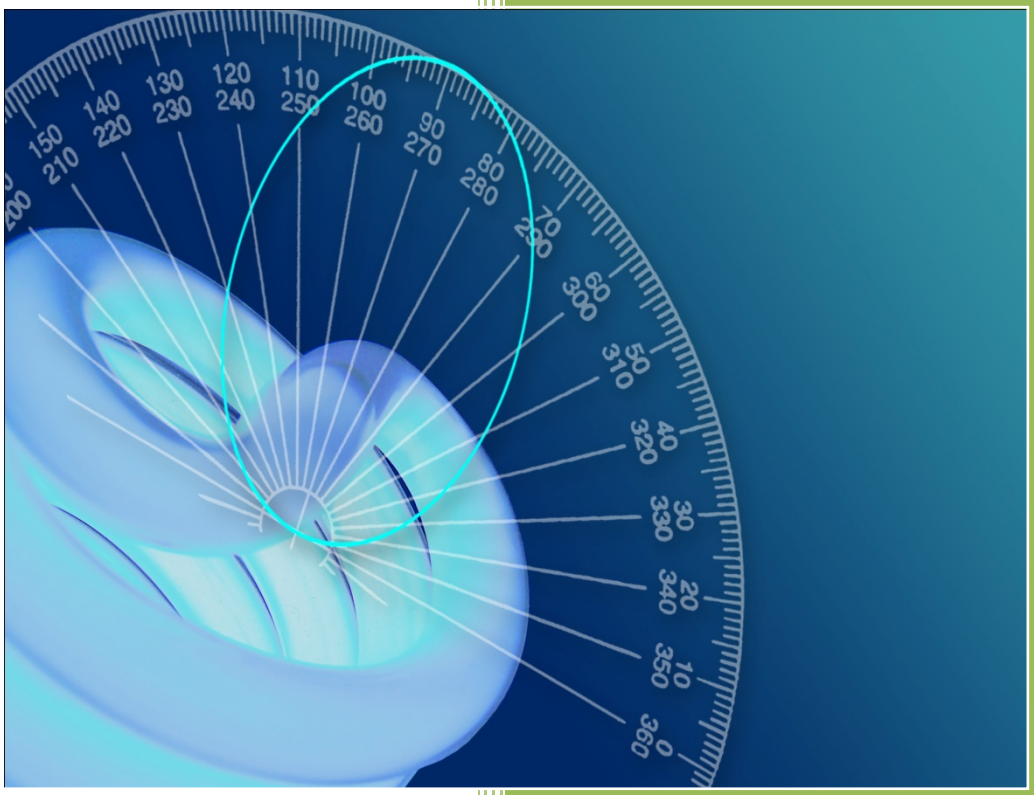
PHOTOMETRIC & OPTICAL TESTING

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/DC16198	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: TLC Southern Ltd	Source Type: LED
Model: LTSP40W	

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: LTSP40W	Luminaire Type: CEILING PANEL
Power Supply Used: Kikusui PCR1000M Voltage Stabiliser S/N SM01191	
Voltage(AC V) = 230	Current (mA)= 176
Power (Watts)= 38.6	Power factor= 0.953

Integrating Sphere Test

Date of Test: 23/09/2016	Ambient Temperature:25°C
Measurement Filename: LTSP40W	
Instrument Used: Labsphere model 2m integrating sphere spectroradiometer AS-02949-012	
Integrating Sphere Size: 2m	Measurement Geometry (2π / 4π): 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: ± 0.67% (*k=2)*	

Results

Flux (lumens): 3081	
CIE 1931 Chromaticity Cx: 0.3795	CIE 1931 Chromaticity Cy: 0.3774
CRI (%):83.58	CCT (K): 4028

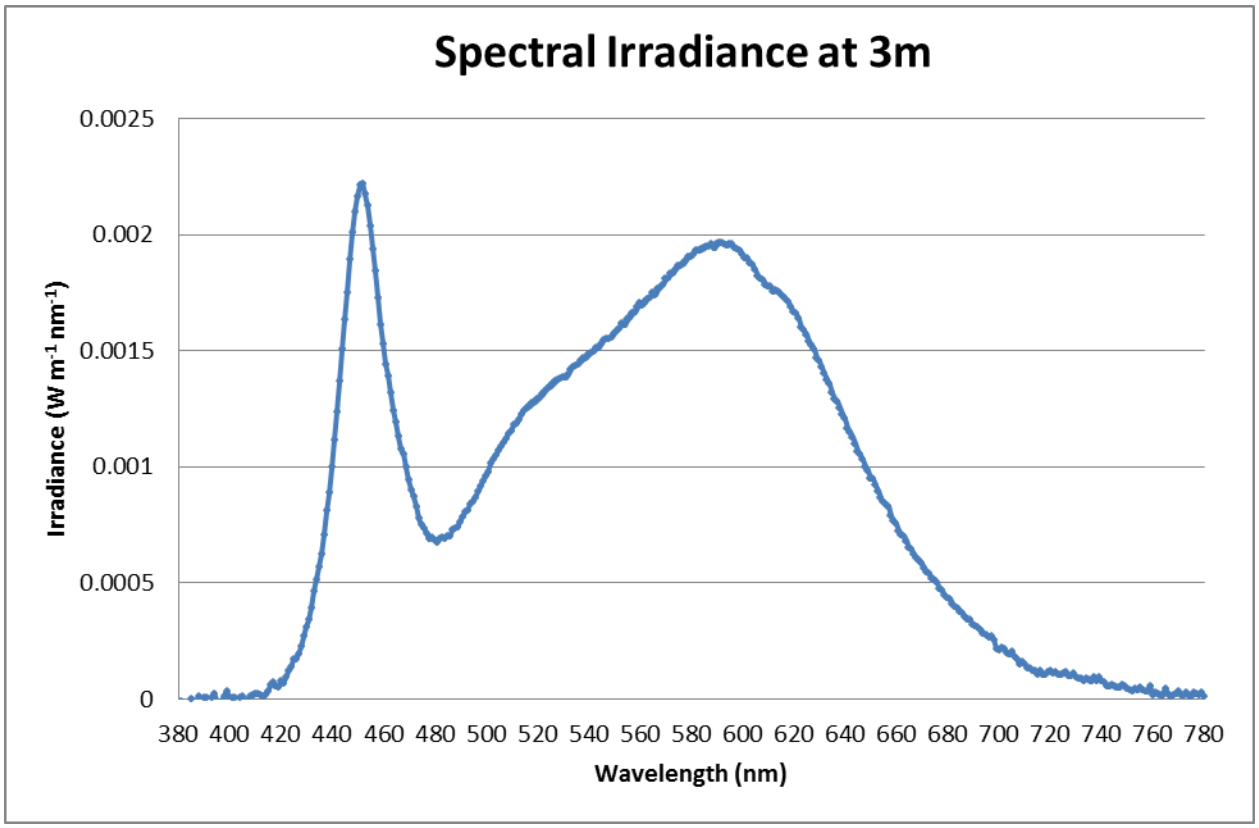


Figure 1: Spectral Irradiance

Figure 2: CIE 1931 diagram.

Goniophotometer Test		
Date of Test: 03/10/2016	Ambient Temperature: 25°C	
Measurement Filename: LTSP40W		
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: ± 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):3081	Peak Intensity (3° Spot, candelas): 1102.8	Efficacy (lumens/Watt): 79.8
Beam Angle (50% of max intensity C0-180, degrees): 112.5		
Photometric Filename (IES LM-63-2002): LTSP40W		
IES File – Absolute or Relative Format? ABSOLUTE		
Photometric Filename (EULUMDAT): LTSP40W		
EULUMDAT File – Absolute or Relative Format? ABSOLUTE		

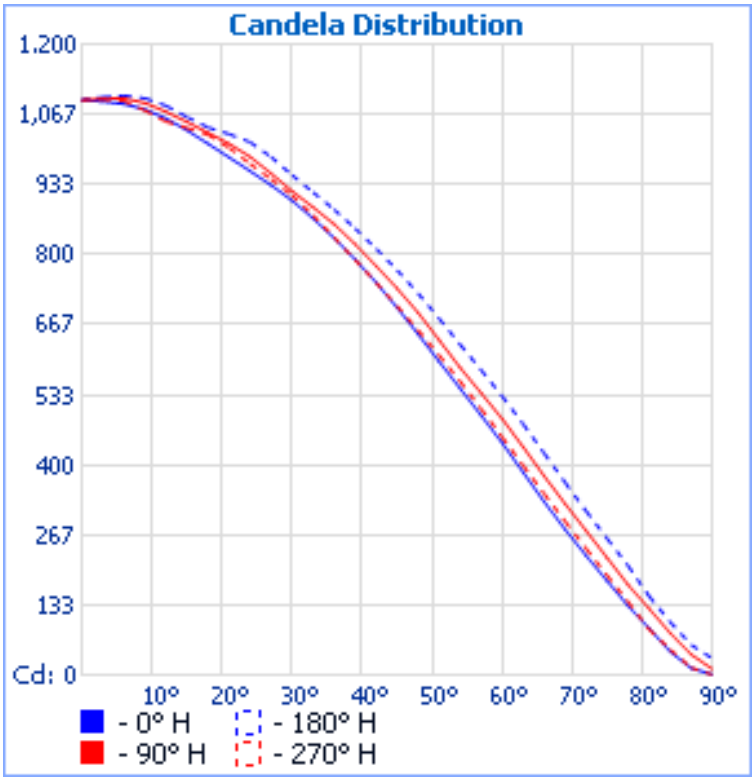


Figure 3: Far-Field Luminous Intensity (C0-180, Cartesian Coordinates)

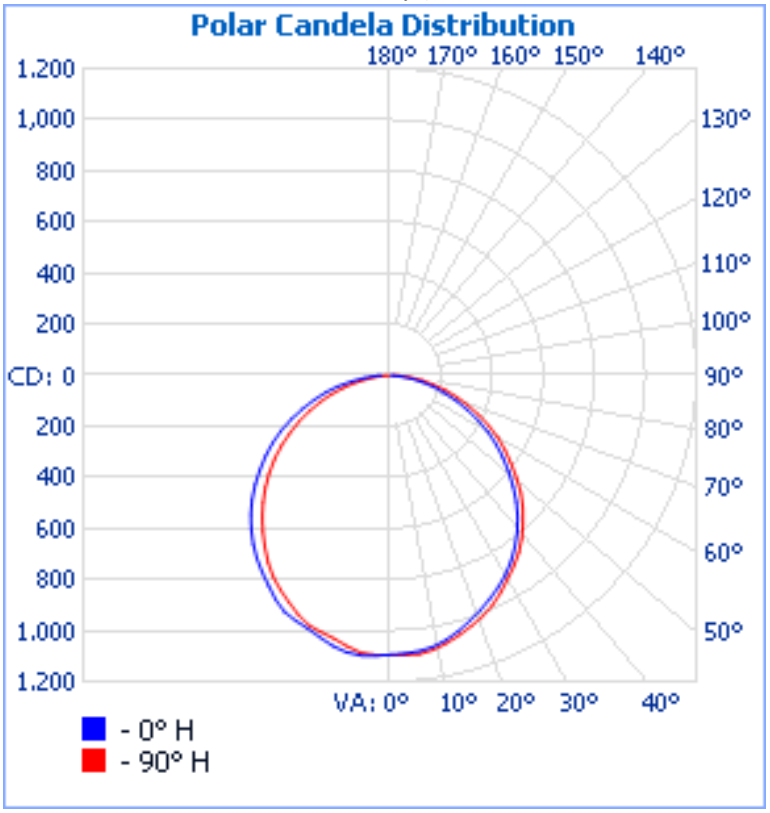


Figure 4: Far-Field Luminous Intensity (C0-180, C90-270, Polar Coordinates)

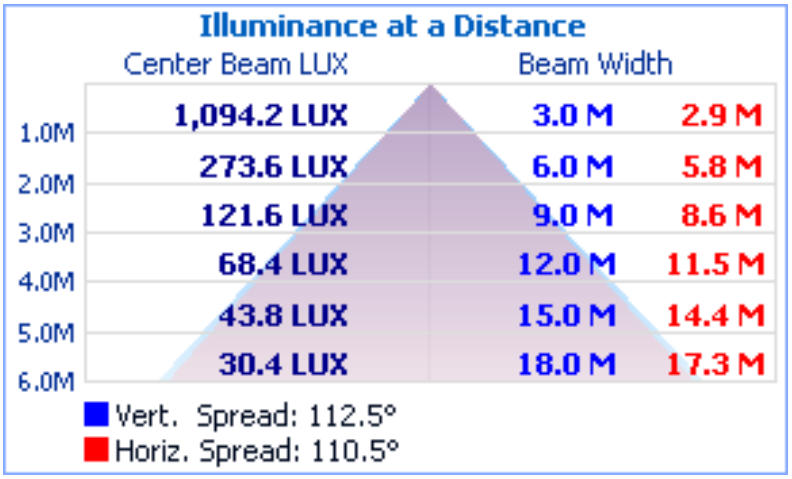


Figure 5. Cone diagram for mounting height of 6 metres.

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	16.0	17.7	16.4	18.0	18.3	16.2	17.8	16.5	18.1	18.4
	3H	17.5	19.0	17.9	19.3	19.7	17.7	19.2	18.1	19.5	19.8
	4H	18.1	19.5	18.5	19.8	20.2	18.3	19.7	18.7	20.0	20.4
	6H	18.5	19.8	18.9	20.2	20.6	18.7	20.0	19.1	20.4	20.8
	8H	18.6	19.8	19.0	20.2	20.6	18.8	20.0	19.2	20.4	20.8
	12H	18.6	19.8	19.0	20.2	20.6	18.8	20.0	19.2	20.4	20.8
4H	2H	16.8	18.2	17.2	18.6	18.9	16.9	18.3	17.3	18.7	19.0
	3H	18.4	19.7	18.9	20.0	20.4	18.6	19.8	19.0	20.2	20.6
	4H	19.2	20.3	19.6	20.7	21.1	19.3	20.4	19.8	20.8	21.3
	6H	19.7	20.6	20.1	21.1	21.5	19.8	20.8	20.3	21.2	21.7
	8H	19.9	20.8	20.3	21.2	21.7	20.0	20.9	20.4	21.3	21.8
	12H	20.0	20.8	20.4	21.2	21.7	20.1	20.9	20.5	21.3	21.8
8H	4H	19.5	20.4	20.0	20.9	21.3	19.6	20.5	20.1	21.0	21.4
	6H	20.2	20.9	20.7	21.4	21.9	20.2	21.0	20.7	21.4	21.9
	8H	20.5	21.2	21.0	21.7	22.1	20.5	21.1	21.0	21.6	22.1
	12H	20.7	21.2	21.2	21.7	22.2	20.6	21.2	21.1	21.7	22.2
12H	4H	19.6	20.4	20.0	20.8	21.3	19.7	20.5	20.2	20.9	21.4
	6H	20.3	21.0	20.8	21.5	22.0	20.4	21.0	20.9	21.5	22.0
	8H	20.6	21.2	21.2	21.7	22.2	20.6	21.1	21.1	21.6	22.1

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	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094
3	1091	1091	1092	1092	1093	1094	1095	1095	1096	1097	1097	1097	1098	1098	1098	1099	1100	1100	1100
6	1087	1087	1087	1088	1088	1089	1092	1095	1096	1097	1097	1095	1094	1093	1094	1097	1100	1102	1103
9	1076	1076	1076	1074	1074	1076	1079	1083	1087	1088	1087	1085	1082	1081	1083	1087	1092	1096	1098
12	1059	1059	1060	1060	1062	1062	1064	1066	1069	1072	1073	1073	1073	1076	1079	1081	1082	1082	1083
15	1037	1038	1043	1045	1046	1048	1048	1049	1049	1053	1058	1064	1066	1070	1074	1074	1070	1064	1062
18	1011	1018	1023	1024	1023	1027	1029	1030	1030	1032	1042	1048	1046	1050	1054	1055	1051	1048	1042
21	985	995	1000	996	995	1000	1006	1009	1009	1011	1017	1022	1017	1020	1027	1028	1029	1030	1030
24	959	968	973	965	964	971	981	985	985	986	986	991	990	995	1003	1000	1005	1010	1014
27	932	936	937	936	936	942	953	955	957	954	957	965	969	971	980	977	978	986	986
30	903	898	898	905	905	909	920	921	925	921	930	941	943	940	950	951	949	957	951
33	869	858	861	874	875	877	886	880	888	890	897	904	913	911	919	922	918	923	919
36	831	819	826	838	839	842	850	843	846	858	857	860	878	880	880	888	886	885	886
39	791	781	791	787	797	803	805	808	807	820	821	822	831	840	836	841	854	845	850
42	747	740	749	742	758	761	763	769	767	779	784	785	787	797	798	799	814	807	811
45	699	695	702	699	713	716	720	726	723	736	737	744	742	752	758	759	767	770	771
48	649	648	657	656	666	669	675	678	677	690	684	698	696	703	712	720	722	729	727
51	597	600	605	613	618	622	628	625	634	638	638	649	650	656	665	677	673	681	679
54	545	549	559	562	566	574	575	576	589	585	592	600	599	610	615	619	631	627	629
57	494	498	504	513	519	523	523	527	541	537	542	546	548	560	568	565	580	577	581
60	442	445	452	461	467	470	469	477	487	488	485	492	495	505	513	512	523	527	531
63	386	392	408	409	412	417	419	428	433	434	430	441	445	448	453	460	471	473	478
66	330	338	353	360	364	367	368	377	379	379	376	388	392	396	401	408	410	416	422
69	277	286	301	303	312	315	316	326	325	326	323	333	336	340	344	346	356	361	367
72	227	236	251	254	262	266	266	275	274	275	273	279	282	286	290	289	305	308	312
75	179	187	200	206	208	219	216	221	221	223	222	223	228	234	234	235	248	253	260
78	132	139	153	160	160	169	168	169	170	172	173	171	178	179	182	185	191	198	208
81	89	99	120	126	125	131	129	132	127	127	128	128	130	130	132	134	138	135	150
84	45	65	76	84	79	83	82	83	82	80	84	81	84	80	81	85	82	90	101
87	13	30	35	36	39	41	40	37	40	40	39	37	36	36	38	35	36	44	58
90	2	8	8	10	10	11	10	8	11	12	10	9	8	8	9	8	9	10	32

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	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094	1094
3	1100	1099	1098	1098	1097	1097	1097	1097	1096	1096	1095	1094	1093	1092	1092	1091	1091
6	1102	1099	1095	1092	1090	1091	1091	1092	1093	1092	1091	1089	1087	1086	1086	1086	1086
9	1096	1093	1087	1081	1078	1078	1077	1075	1074	1075	1076	1076	1073	1071	1070	1073	1074
12	1084	1084	1079	1073	1069	1070	1066	1058	1053	1055	1061	1064	1060	1056	1054	1056	1058
15	1064	1068	1063	1053	1052	1056	1055	1046	1041	1040	1044	1044	1039	1033	1035	1039	1037
18	1044	1045	1042	1030	1029	1034	1034	1032	1028	1023	1017	1014	1009	1005	1013	1018	1016
21	1026	1024	1022	1011	1009	1013	1009	1007	1004	995	988	986	982	980	987	993	989
24	1007	1001	997	988	986	985	979	977	973	964	960	961	958	955	958	963	958
27	982	977	971	962	960	955	946	945	944	932	929	936	935	930	932	931	929
30	953	952	942	933	930	924	916	912	913	901	896	902	901	896	900	901	898
33	923	919	906	901	894	888	883	874	875	867	858	861	862	859	862	868	863
36	888	875	869	866	854	850	846	834	833	829	820	821	822	822	823	829	822
39	848	835	830	828	813	808	807	793	790	788	783	781	781	780	778	787	777
42	805	795	793	786	772	767	759	748	747	742	739	741	739	737	734	736	730
45	760	753	751	737	728	720	713	702	703	695	693	693	695	688	686	685	685
48	714	714	707	687	680	671	668	658	656	648	649	643	648	640	637	642	642
51	670	669	658	638	634	622	618	614	609	601	603	595	596	593	592	593	596
54	623	622	601	587	588	571	565	564	559	551	554	546	547	541	540	548	543
57	572	565	552	538	537	522	510	512	507	500	500	499	498	493	492	490	490
60	519	509	498	485	480	468	457	458	453	447	446	448	448	442	441	432	437
63	467	460	443	428	421	416	405	406	399	395	395	396	396	386	389	386	384
66	413	401	390	376	366	361	350	352	345	341	343	340	343	337	338	331	329
69	359	347	330	318	309	305	297	297	293	288	289	285	287	285	279	280	275
72	305	295	274	265	260	250	247	243	241	238	237	236	234	237	230	231	223
75	250	237	220	212	211	195	196	191	190	189	185	187	186	187	183	179	174
78	192	179	169	160	156	148	144	142	140	141	136	140	139	142	140	132	129
81	128	121	110	102	97	93	91	87	87	89	91	92	94	100	100	97	87
84	83	67	61	52	49	50	47	50	49	48	49	51	51	54	60	55	50
87	41	24	19	17	15	13	12	15	15	16	13	16	17	19	20	19	17
90	12	3	1	1	1	1	0	1	1	1	1	1	1	2	3	3	3

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

Zone	Lumens	% Total
0-5	26.3	0.80%
05-10	77.4	2.50%
10-15	126.4	4.10%
15-20	170.8	5.50%
20-25	207.5	6.70%
25-30	239.8	7.70%
30-35	263.6	8.50%
35-40	275.5	8.80%
40-45	281.1	9.00%
45-50	277.4	8.90%
50-55	261.5	8.40%
55-60	239.6	7.70%
60-65	210.7	6.80%
65-70	172.2	5.50%
70-75	132.1	4.20%
75-80	91.5	2.90%
80-85	49	1.60%
85-90	14.2	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	0.96	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	0.8	0.75	0.82	0.77	0.73	0.79	0.75	0.72	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	0.61	0.58
4	0.82	0.7	0.61	0.55	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	0.62	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

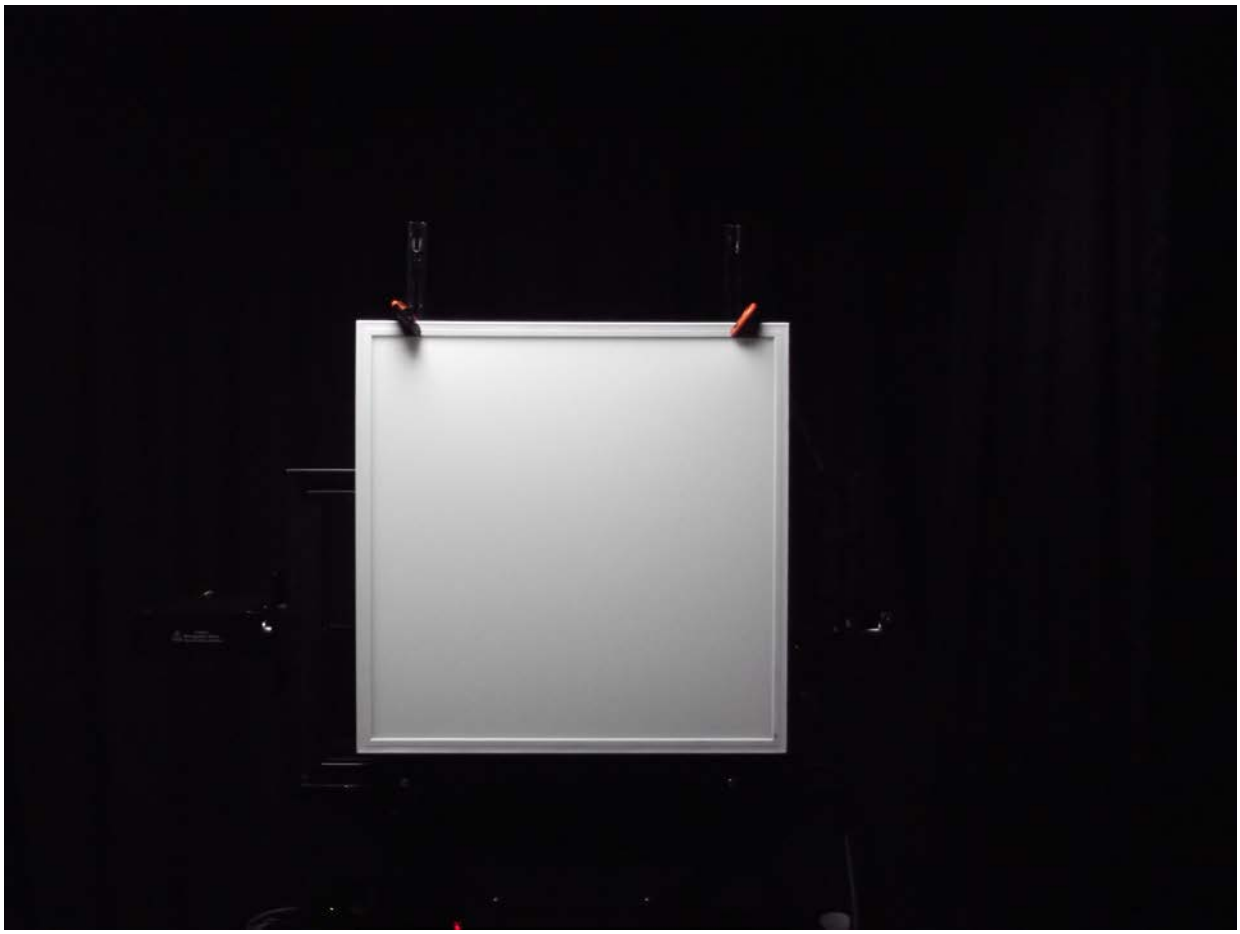


Photo 1: Luminaire on goniometer mount

Signature:

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Print Name:

D CHAMBERS

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Date:
03/10/2016

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Technical Manager
Duly authorised to sign on behalf of:
Photometric and Optical Testing Services LLP