

LightLab
INTERNATIONAL

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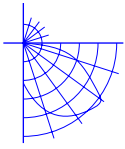
Report of Test

LL13943b

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Client Shanghai Nanhua Electronics Company Limited

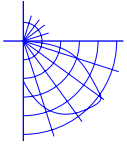
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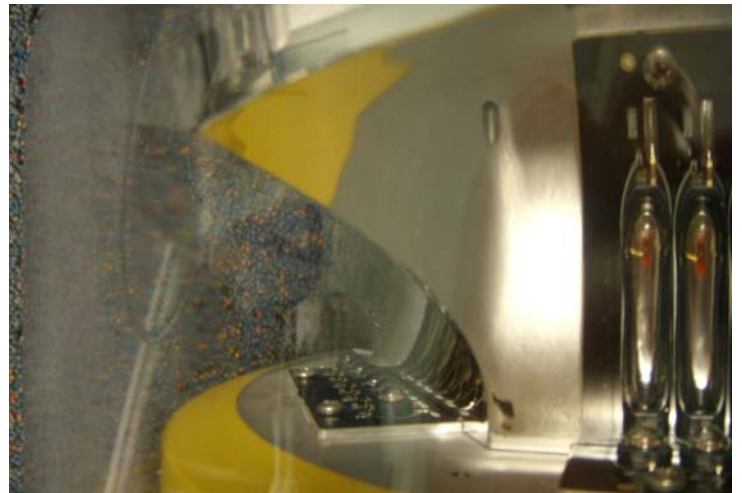
Device Tested One Medium Intensity Type C obstacle light. Cat No. LM001. The device comprises a yellow finished cast aluminium flanged mount supporting an optical assembly.

The assembly comprises a cast aluminium base, clear plastic lens, moulded reflector, DC supply and six LED modules. The lens is secured with four screws and incorporates a sealing gasket. The reflector is formed from a plastic substrate with specular metalised finish and has six facets with a vertical profile that approximate a parabola section. The DC supply is marked JSJ55-A2S-130HL. Each LED module contains seven circular surface mount LEDs mounted at 9 mm centres. Three of the modules are marked "BERG 2607", three are marked "BERG 3807".



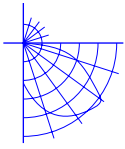


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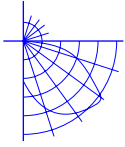
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Reference Documents	<p>(a) ICAO International Standards and Recommended Practices, Aerodromes, Annex 14, Volume 1, Fourth Edition - July 2004.</p> <p>(b) ICAO Doc 9157 AN/901, Aerodrome Design Manual, Part 4 Visual Aids, Fourth Edition - 2004.</p>
Nature of Tests	To determine the luminous intensity distribution and chromaticity coordinates of the device and its conformance to the requirements of applicable sections of the reference documents.
Procedure	<p>The device was operated at 240 Vac 50 Hz from a stabilised ac source. The photometric output of the device was monitored until stability and then the tests were performed.</p> <p>The device was mounted on an A-α format goniophotometer with a photometric test distance of 23.8m. The device was tested with the lower surface of the flanged mount horizontal and with the horizontal optical plane passing through the centre of the reflectors. The reference 0° plane is nominally in the direction of the identification plate on the column of the device.</p> <p>Photometric testing was conducted in accordance with the requirements of the reference documents. Luminous intensity values were recorded in a fine grid comprising 2 degree steps in azimuth and 0.25 degree steps between the elevations of +/- 15 degrees. The luminous intensity values were sampled with a $V(\lambda)$ corrected silicon cell. Electrical parameters were recorded during the testing cycle and are summarised in Table 1. For compliance determination the grid was reduced to 30 degree steps in azimuth and 1 degree steps in elevation (refer Table 4) except for the determination of Beam Spread where the fine grid data was used. The test results have been compared with the specified limits listed in Table 6-3 of reference document (a).</p> <p>The spectral distribution of the sample was measured using a spectrometer from which the CIE tri-chromaticity coordinates were calculated.</p>
Instrumentation	<p>In the course of testing the following instruments were used:</p> <ul style="list-style-type: none">LightLab Model A100 goniophotometerKeithley Model 486 PicoammeterUDT PhotocellVoltech PM100 wattmeterPhoto Research PR670 spectrometer
Sample Selection	The laboratory has not exercised control over the selection of samples to be tested. All testing is performed on the understanding that the significance of the report is limited to the extent to which the test sample is representative of production units.



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Conformance

- (1) Colorimetric requirements – Meets requirements
Refer Table 3 of this report

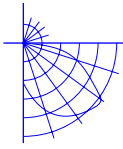
- (2) Flash rate – Meets requirements
Device emitted a steady light when energised

- (3) Peak Intensity requirements – Meets requirements
Refer Table 2 of this report

- (4) Vertical beam spread - Meets requirements
Refer Table 2 of this report

- (5) Intensity at given elevation angles – Meets requirements
Refer Table 2 of this report

In summary, the tested device meets the requirements for luminous intensity and colorimetry for a Type C Medium Intensity Fixed Obstacle Light defined in reference document (a).



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Test Results

Supply/Environmental Measurements	Value
Supply current	0.458 mA
Supply voltage	240.0 Vac
Supply wattage	50.7 W
Ambient temperature	24.9 °C
Voltage measured at output terminals of DC supply	120.4 Vdc

Table 1

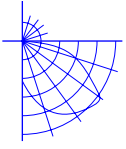
Luminous intensity values at the peak, 0° and -1° elevations, beam spread			
Parameter	Measured value (cd)	Requirement (cd)	Result
Peak luminous intensity	1779	>= 1500 cd <= 2500 cd	Pass
Minimum luminous intensity at 0° elevation	1505	>= 1500 cd	Pass
Minimum luminous intensity at -1° elevation	1122	>= 750 cd	Pass
Maximum luminous intensity at -1° elevation	1412	<= 1875 cd	Pass
Minimum beam spread (occurs in 30° azimuthal plane)	3.2	>= 3°	Pass

Table 2

Colorimetry			
Measurement location	Measured CIE (x,y) coords		Result
	x	y	
Upper extent of beam, (3° elevation)	0.705	0.295	Pass
Middle of beam, (0° elevation)	0.706	0.294	Pass
Lower extent of beam, (-3° elevation)	0.705	0.295	Pass
Requirements : $y < 0.335$, $y > 0.98 - x$			

Table 3



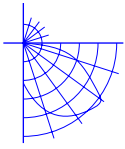


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Elevation (degrees)	Azimuthal angle (degrees rotation from reference plane)																								
	-180	-150	-120	-90	-60	-30	0	30	60	90	120	150	180	-180	-150	-120	-90	-60	-30	0	30	60	90	120	150
15	66	66	67	67	65	65	63	67	65	68	67	64	66	66	65	62	62	61	61	65	68	67	61	63	62
14	62	65	62	67	60	65	61	63	61	65	63	63	62	62	62	59	59	61	63	65	65	61	62	62	59
13	59	65	58	62	59	61	58	62	61	63	62	62	62	62	61	58	56	58	63	65	65	59	59	62	59
12	61	59	59	58	52	57	52	55	53	58	55	58	56	58	53	58	56	58	63	65	65	56	58	62	61
11	51	55	50	54	50	53	50	52	53	53	52	53	53	53	48	53	53	53	58	63	65	50	53	58	61
10	48	53	48	52	46	50	47	49	45	52	48	52	50	52	48	52	50	53	58	63	65	46	53	58	61
9	45	51	46	50	46	48	44	48	45	48	45	49	48	48	43	48	46	48	53	63	65	43	49	52	48
8	44	47	45	48	44	46	43	47	43	46	43	46	46	46	43	48	46	48	53	63	65	42	46	52	45
7	43	52	47	51	44	45	43	47	43	46	43	46	46	46	43	48	46	48	53	63	65	41	44	52	43
6	45	66	61	73	57	58	55	90	77	55	45	50	45	45	44	44	45	48	53	63	65	41	44	52	43
5	67	101	100	118	106	91	102	148	129	96	85	76	67	67	67	67	67	67	67	67	67	67	67	67	67
4	141	157	189	187	182	172	214	243	246	174	157	134	141	141	141	141	141	141	141	141	141	141	141	141	141
3	294	299	364	319	340	314	404	385	401	335	303	283	294	294	294	294	294	294	294	294	294	294	294	294	294
2	666	594	697	588	580	531	663	626	702	711	713	637	666	666	666	666	666	666	666	666	666	666	666	666	666
1	1144	1115	1142	1046	933	1009	1144	1193	1259	1185	1178	1131	1144	1144	1144	1144	1144	1144	1144	1144	1144	1144	1144	1144	1144
0	1592	1586	1639	1634	1749	1701	1700	1779	1641	1505	1663	1602	1592	1592	1592	1592	1592	1592	1592	1592	1592	1592	1592	1592	1592
-1	1320	1246	1254	1133	1412	1334	1233	1182	1175	1122	1395	1335	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320	1320
-2	662	607	596	533	600	612	530	358	435	531	612	591	662	662	662	662	662	662	662	662	662	662	662	662	662
-3	208	176	140	196	197	193	161	97	95	222	210	209	208	208	208	208	208	208	208	208	208	208	208	208	208
-4	77	60	62	74	66	90	74	53	56	92	74	83	77	77	77	77	77	77	77	77	77	77	77	77	77
-5	47	44	42	44	44	41	42	38	38	45	45	47	47	47	47	47	47	47	47	47	47	47	47	47	47
-6	34	34	34	34	33	31	31	29	29	35	36	35	34	34	34	34	34	34	34	34	34	34	34	34	34
-7	28	27	27	26	26	24	24	24	22	27	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28
-8	21	21	20	20	20	19	19	19	18	19	19	18	21	21	21	21	21	21	21	21	21	21	21	21	21
-9	15	16	15	16	16	16	15	14	13	14	13	14	15	15	15	15	15	15	15	15	15	15	15	15	15
-10	11	12	11	13	11	11	10	8	7	9	9	10	11	11	11	11	11	11	11	11	11	11	11	11	11
-11	8	7	8	8	7	7	6	5	5	6	6	7	8	8	8	8	8	8	8	8	8	8	8	8	8
-12	6	6	6	6	6	5	5	4	4	4	4	5	6	6	6	6	6	6	6	6	6	6	6	6	6
-13	5	5	5	5	4	4	4	3	3	3	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5
-14	4	4	4	4	4	4	4	3	3	3	3	4	5	5	5	5	5	5	5	5	5	5	5	5	5
-15	4	4	4	4	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4

Table 4





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Uncertainties At the 95% confidence level with a confidence factor $k = 2$, the estimated uncertainties in measurement for this test are:

Temperature	$\pm 1^\circ$ Celsius
Luminous Intensity	$\pm 4.0\%$
Voltage	$\pm 0.5\%$
Current	$\pm 0.5\%$
Power	$\pm 0.8\%$
CIE Trichromatic Co-ordinates	± 0.003 units

Authorised
Signatory

(P. Lawrance)

Date of Test 25th August 2010
Date of Report 28th August 2010

Document Revision 1.0