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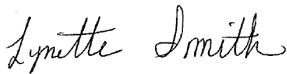
Report No. 103916546CRT-001

Shanghai Nanhua Electronics Co., Ltd.

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Standards
<i>International Civil Aviation Organization (ICAO), Aerodromes, Annex 14, Volume 1, Eighth Edition, dated July 2018</i>

Test Purpose	ICAO Testing - Low Intensity Type C
Test Dates	May 1st, 2019 through May 31st, 2019



Lynette Smith
Engineer
Lighting



Christopher W. Metcalf
Engineering Supervisor
Lighting

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Test Plan and Datasheets			
Client	Shanghai Nanhua Electronics Co., Ltd.	Engineer	Lynette Smith
Report #	103916546CRT-001	Reviewer	Christopher W. Metcalf
Product	Low Intensity Obstacle Light	Model(s)	LS730U
Standard	ICAO Annex 14, dated July 2018		

Spec	Test name	Clause	Pass Fail NA
ICAO	Photometry Low Intensity Obstacle Light - Type C	Table 6-1 & Table 6-2	Pass
ICAO	Chromaticity ICAO App. 1	1.2.3	Pass

Sample Information				
Date Rec.	Intertek ID	Description	Condition	Model No.
4/29/19	CRT1904291352-001	Low Intensity Obstruction Light	Production	LS730U

Further Sample Description	
Type:	Low Intensity Type C Light
Options:	NA
Light Source:	[1] White LED, Elec-Tech International Co., Ltd, NLW3535AVR1
Lens:	Yellow PC (Sabic 2108T), Shanghai Nanhua Electronics Co., Ltd
Approx Size:	Diameter: 4", Height: 3"
Electrical Input:	12-24VDC
LED Supply Location:	Power supply integral to flashhead
Cable:	Length: 2.3m, Diameter: 4.5mm, Yuyao Yangli Electronics Co., Ltd
Casting Material:	ADC12
Mounting:	Magnetic Installation

Sample Information

Picture(s)



Photometry

Energize each light fixture and test for compliance with the photometric requirements. Operate the fixture until stabilized before taking measurements. Test distance was 100ft.

Results

Sample	Voltage Variation	Voltage	Position	Measured	Factor	Result
CRT1904291352-001	Input Voltage*	12.1	0,0	129	NA	NA
	Input Voltage +10%	26.4	0,0	129	100%	Pass
	Input Voltage -10%	10.8	0,0	129	100%	Pass

* Distribution test voltage

Parameter	Requirement	Measured	Result
Flash Rate (FPM)	60-90 FPM	79.2 FPM	Pass
Minimum Intensity (cd)	40cd between 2 and 10 degrees V	48.8 cd	Pass
Maximum Intensity (cd)	400cd at all radials	70.8 cd	Pass
Peak Intensity	Peak Located at approximately 2.5 degrees	6.5 degrees	Pass
Beam Spread	12 degrees (>20cd)	22.0 degrees	Pass

Cable Length:	NA	Calibration Factor:	2.45*10 ⁻¹²	Input:	12.05 VDC							
Flash Duration (sec):	0.300	Neutral Density Filter:	NA									
Flash Period (sec.):	0.758											
Effective Intensity (cd)												
Vertical Position (deg.)	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
19.0	X	X	X	X	X	X	X	X	19.2	19.2	X	X
18.5	19.6	X	X	X	X	X	X	X	20.0	21.2	X	19.2
18.0	21.2	X	X	X	X	X	X	X	21.2	22.4	X	20.4
17.5	22.4	X	19.2	X	X	X	X	X	23.6	23.2	X	22.4
17.0	23.6	19.6	20.4	X	18.4	X	X	19.2	24.0	24.4	X	24.0
16.5	25.6	22.0	22.4	X	20.0	18.4	19.6	20.0	24.8	26.0	X	25.2
16.0	26.8	23.2	24.0	X	22.4	20.0	21.2	22.0	26.8	27.2	19.6	26.0
15.5	28.8	26.0	26.0	19.6	24.4	22.4	22.8	24.0	28.0	28.8	20.8	26.8
15.0	30.4	26.8	27.6	24.8	25.6	24.0	24.8	25.6	29.2	30.0	22.4	28.8
14.5	32.8	28.8	29.2	22.8	27.6	25.6	26.4	26.4	30.4	31.6	24.8	30.4
14.0	35.2	30.4	30.8	24.8	29.2	27.6	29.2	28.4	32.0	34.0	26.8	32.0
13.5	37.2	32.4	32.8	27.6	31.2	28.8	31.6	30.8	33.6	35.2	28.8	33.6
13.0	39.2	34.4	34.4	30.0	32.8	32.0	34.4	33.2	34.8	37.6	30.8	34.8
12.5	41.6	36.4	36.8	33.2	35.6	33.6	36.4	34.8	36.8	39.6	34.0	37.6
12.0	43.6	39.2	39.6	37.2	38.4	36.8	39.6	38.0	38.4	41.6	36.0	38.8
11.5	46.8	42.4	43.2	41.6	42.8	40.0	44.0	40.8	41.6	45.2	38.0	40.8
11.0	49.6	46.0	46.0	46.0	46.0	43.6	47.2	43.6	45.6	40.8	42.8	44.0
10.5	54.0	49.6	49.6	49.2	49.6	48.4	51.6	48.8	49.6	44.4	45.6	47.6
10.0	57.2	53.2	53.6	53.6	52.4	51.6	54.8	52.0	53.2	48.8	50.0	51.6
9.5	60.4	56.8	56.0	56.8	56.0	55.2	58.4	55.6	56.8	52.4	53.2	54.0
9.0	63.2	60.0	60.4	60.4	59.2	58.8	61.6	58.4	58.4	56.4	56.8	56.4
8.5	65.2	62.8	62.0	63.2	62.4	62.4	64.8	62.0	61.2	60.0	59.6	59.2
8.0	65.2	64.4	64.0	66.0	63.2	65.2	67.6	65.6	60.8	60.8	61.2	60.8
7.5	64.8	65.6	65.2	66.4	63.2	67.2	68.8	67.6	61.2	62.4	62.8	61.6
7.0	64.0	66.4	66.0	66.8	64.4	69.2	68.8	67.6	61.2	62.0	63.6	62.8
6.5	62.8	67.2	66.8	66.8	63.2	70.8	68.4	68.8	60.8	62.4	64.4	62.4

6.0	62.4	67.2	67.2	67.2	63.2	70.4	68.8	69.2	60.8	62.8	64.4	62.4
5.5	61.6	66.8	68.0	67.2	62.4	69.6	68.0	69.6	60.8	62.0	62.4	62.4
5.0	61.2	66.0	66.4	67.6	61.6	68.8	67.2	69.2	62.0	62.8	61.6	62.0
4.5	61.2	65.2	68.0	66.8	61.6	68.4	66.4	69.2	62.4	62.0	62.0	61.2
4.0	61.2	64.8	66.8	66.4	62.0	67.2	65.6	69.2	61.6	62.8	60.8	60.0
3.5	60.8	63.6	66.4	65.6	61.2	66.0	64.4	68.0	61.6	62.0	60.0	59.2
3.0	60.0	64.0	65.2	64.8	60.8	65.6	63.2	67.2	60.8	60.8	58.8	58.8
2.5	58.8	63.2	64.8	64.4	61.2	64.0	62.8	66.8	60.8	58.8	58.8	56.0
2.0	58.4	62.8	64.0	64.0	60.8	62.8	61.2	64.8	60.0	58.0	57.2	55.2
1.5	58.4	62.4	64.4	63.2	60.0	62.0	59.6	64.4	59.6	57.6	57.2	54.4
1.0	58.0	61.6	64.0	63.2	60.0	61.2	59.2	63.2	58.8	56.4	56.8	53.6
0.5	57.6	60.8	64.0	62.0	59.6	61.2	58.4	62.4	58.0	55.6	55.2	52.0
0.0	56.8	58.8	62.8	61.2	59.6	61.2	58.8	61.6	58.4	53.6	54.0	51.2
-0.5	56.4	57.6	60.8	59.2	59.6	60.8	58.0	60.8	57.2	52.0	52.4	48.8
-1.0	56.0	55.2	59.2	58.8	57.6	59.6	57.6	59.2	55.2	50.4	50.4	48.4
-1.5	53.2	53.2	56.4	56.0	55.6	58.0	56.0	57.6	53.6	49.6	47.6	45.6
-2.0	50.4	51.2	53.6	54.0	53.6	56.0	54.4	55.6	50.8	47.2	44.4	43.6
-2.5	46.4	48.0	51.2	52.4	51.6	53.6	51.6	53.2	47.6	42.8	41.6	40.0
-3.0	44.4	44.4	47.6	50.0	47.6	51.6	49.6	50.0	44.0	39.6	39.2	36.0
-3.5	42.4	41.6	44.8	46.4	46.0	49.2	47.2	46.8	41.2	36.8	36.4	33.6
-4.0	39.6	39.2	42.0	42.8	42.8	47.2	44.0	44.0	38.0	33.2	33.6	30.8
-4.5	37.2	37.2	38.4	41.6	40.0	43.6	40.8	41.2	36.0	30.8	31.2	28.8
-5.0	35.2	34.4	36.4	39.2	37.2	40.8	38.4	38.4	34.0	29.2	28.0	26.4
-5.5	32.8	32.4	33.6	36.0	35.2	38.8	35.6	35.2	31.6	26.8	26.8	24.0
-6.0	30.4	28.8	30.4	34.4	32.4	35.6	32.4	32.4	28.8	24.4	24.0	22.0
-6.5	27.6	27.2	28.0	30.4	28.4	32.4	29.2	29.2	25.6	21.6	21.2	19.6
-7.0	25.6	24.8	25.2	29.2	26.4	29.6	27.2	26.8	23.2	19.2	19.2	X
-7.5	23.6	23.2	24.8	26.4	23.6	26.8	21.2	24.8	20.8	X	X	X
-8.0	22.0	22.4	22.4	24.4	22.4	25.2	23.2	22.0	18.0	X	X	X
-8.5	21.2	21.2	20.8	21.6	20.8	23.6	21.6	20.8	X	X	X	X
-9.0	20.0	19.2	19.2	21.2	19.2	22.0	18.4	19.2	X	X	X	X
-9.5	19.6	X	X	19.6	X	21.2	X	X	X	X	X	X
-10.0	X	X	X	X	X	19.6	X	X	X	X	X	X

ICAO Low-intensity Type C (Mobile Obstacle)

Min 2°-10°	57.2	53.2	53.6	53.6	52.4	51.6	54.8	52.0	53.2	48.8	50.0	51.6
Upper (°)	18	16.5	17	15	16	15.5	16	16	18	18.5	15.5	18
Lower (°)	-8.5	-8.5	-8.5	-9	-8.5	-9.5	-8.5	-8.5	-7.5	-6.5	-6.5	-6
Spread (°)	27	25	26	24	25	25	25	25	26	25	22	24
Max	65.2	67.2	68.0	67.6	64.4	70.8	68.8	69.6	62.4	62.8	64.4	62.8

Complies: YES NO

Tested By:	Brittany James	Signature or initials:	<i>Bj</i>
Engineer:	Lynette Smith	Signature or initials:	<i>Lynette Smith</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Test Equipment Used:	1, 2, 3, 4, 5, 6, 7	Sample No:	CRT1904291352-001
Amb (°C):	25.5	RH%	33.8
		Completion Date:	5/15/2019

Chromaticity ICAO

Wherever a color is referred to in this annex, the specifications for that color given in Appendix 1 shall apply.

Test the fixture with the lamp, filter and optical system for color of light emitted. Chromaticity Coordinates are to be calculated from a spectral distribution measured in 2nm increments for LEDs.

Results - ICAO LED Yellow

Sample	Color	Input	Location	x	y	z	(P/F)
CRT1904291352-001	Yellow	12.06	(0,6)	0.540	0.445	0.014	P

The aviation yellow must be per ICAO Annex 14, Volume 1, Appendix 1, Colors for Aeronautical Ground Lights, within the following chromaticity boundaries

Boundary	Line Equation	Calc.
Red Boundary	$y \geq 0.387$	0.445
White Boundary	$y \geq 0.980 - x$	0.440
Green Boundary	$y \leq 0.727x + 0.054$	0.447

Complies: YES NO

Tested By:	Brittany James	Signature or initials:	<i>BJ</i>
Engineer:	Lynette Smith	Signature or initials:	<i>Lynette Smith</i>
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>
Test Equipment Used:	1, 2, 4, 5, 6, 7, 8	Sample No:	CRT1904291352-001
Amb (°C):	25.9	RH%	54.6
		Completion Date:	5/31/2019

Equipment list				
#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	L178	100ft. Lab Goniophotometer	Labsphere	08-May-2020
2	E538	Oscilloscope	Tektronix	07-Sep-2019
3	L061	IL1700 Radiometer	International Light	14-May-2020
4	N1311	Precision Bubble Level	Starrett	10-Sep-2019
5	M308	Stopwatch	Traceable	03-Nov-2019
6	M135	Multimeter	Fluke	11-Jan-2020
7	M310	Hygro-Thermometer	Testo	16-Nov-2019
8	M292	OL750S Spectroradiometer	Gooch & Housego	30-Jun-2019
9				
10				
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19				

Note: For measurement uncertainty, refer to the calibration certificates for all the test equipment located in the equipment files