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Report No. 103749749CRT-001

Shanghai Nanhua Electronics Co. Ltd.

Building #9
1755 Wenbei Rd
Jiading
Shanghai 201802, China

Standards

International Civil Aviation Organization (ICAO), Aerodromes, Annex 14, Volume 1, Eighth Edition, dated July 2018

Test Purpose	Performance Testing - Low Intensity Type A Obstacle Light
Test Dates	December 19, 2018 - December 26, 2018

Jennifer Barnoski
Project Engineer
Lighting

Christopher W. Metcalf
Engineering Supervisor
Lighting

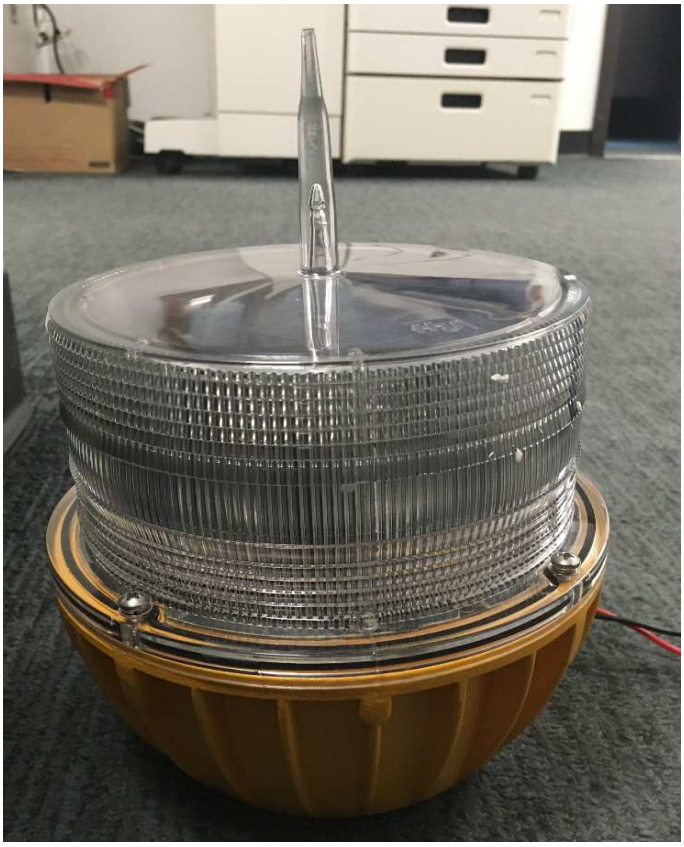
Test Plan and Datasheets			
Client	Shanghai Nanhua Electronics Co. Ltd.	Engineer	Jennifer Barnoski
Report #	103749749CRT-001	Reviewer	Christopher W. Metcalf
Product	Low Intensity Obstacle Light	Model(s)	LT101
Standard	ICAO, Annex 14, Volume 1, dated July 2018		

Spec	Test name	Clause	Pass Fail NA
ICAO	Photometry	Tbl. 6-1	Pass
ICAO	Chromaticity	App. 1	Pass

Sample Information				
Date Rec.	**Intertek ID**	**Description**	**Condition**	**Model No.**
12/14/18	CRT1812140922-001	Low Intensity Type A Light	Production	LT101

Further Sample Description	
Type:	Low Intensity Type A
Options:	NA
Light Source:	LED: (1) Red, Osram, GA CSSPM1.23-KT-W
Lens:	Clear Polycarbonate, Sabic 2180T
Approx Size:	6" ø x 10"
Electrical Input:	3.6VDC (solar powered)
LED Supply Location:	Internal to enclosure
Casting Material:	Aluminum Alloy
Mounting:	1" threaded hole on bottom

Picture(s)



Photometry

Energize each light fixture and test for compliance with the photometric requirements. Operate the fixture until stabilized before taking measurements. Each light will be measured independently while steady burning.

Results

Sample	Voltage Variation	Voltage	Position	Measured	Factor	Result
CRT1812140922-001	Input Voltage*	3.60VDC	0,0	8.028	NA	Pass
	Input Voltage +10%	3.96VDC	0,0	7.949	0.990	Pass
	Input Voltage -10%	3.24VDC	0,0	8.015	0.998	Pass

* Distribution test voltage

Luminouse Intensity (cd)												
Vertical Position (deg.)	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
26.0	0.6	0.6	0.5	0.4	0.8	0.7	0.7	3.0	0.8	0.7	0.8	0.8
25.5	0.7	0.7	0.3	0.2	0.8	0.7	1.1	3.7	0.7	0.9	0.9	0.5
25.0	0.7	0.6	0.4	0.4	0.7	0.8	0.9	4.4	0.5	1.0	0.9	0.4
24.5	0.7	0.5	0.6	0.6	0.7	0.8	0.7	5.1	0.4	0.9	0.9	0.7
24.0	0.7	0.6	0.7	0.7	0.9	0.8	0.6	5.8	0.6	0.7	0.8	1.0
23.5	0.8	0.8	0.7	0.6	1.0	0.9	0.9	6.5	0.8	0.8	0.9	1.0
23.0	0.9	0.9	0.6	0.5	1.0	0.9	1.1	7.2	0.9	1.0	1.1	0.9
22.5	0.9	0.9	0.6	0.6	1.0	1.0	1.3	7.9	0.8	1.2	1.2	0.7
22.0	1.0	0.9	0.7	0.7	1.0	1.0	1.2	8.6	0.7	1.3	1.2	0.7
21.5	1.0	0.8	0.9	0.9	1.0	1.1	1.1	9.2	0.6	1.3	1.2	1.0
21.0	1.0	0.8	1.0	1.1	1.1	1.2	1.0	9.9	0.8	1.3	1.3	1.3
20.5	1.2	1.0	1.1	1.1	1.3	1.3	1.1	10.6	1.1	1.3	1.3	1.5
20.0	1.4	1.2	1.1	1.1	1.5	1.4	1.4	11.3	1.3	1.4	1.5	1.6
19.5	1.5	1.5	1.1	1.2	1.6	1.5	1.7	12.0	1.5	1.7	1.8	1.7
19.0	1.7	1.6	1.2	1.3	1.7	1.7	2.0	12.7	1.5	2.0	2.0	1.7
18.5	1.8	1.7	1.3	1.5	1.8	1.8	2.1	13.4	1.6	2.4	2.1	1.7
18.0	2.0	1.8	1.6	1.8	1.9	2.1	2.2	14.1	1.6	2.5	2.3	2.0
17.5	2.1	1.9	1.8	2.0	2.1	2.4	2.2	14.8	1.8	2.7	2.4	2.5
17.0	2.5	2.3	2.0	2.3	2.4	2.7	2.2	15.5	2.2	2.8	2.6	2.9
16.5	3.0	2.7	2.4	2.5	2.7	3.0	2.9	16.2	2.6	2.9	3.1	3.4
16.0	3.6	3.1	2.7	2.7	3.0	3.5	3.5	16.9	3.0	3.8	3.8	3.9
15.5	4.1	3.6	3.1	3.0	3.5	3.9	4.1	17.6	3.6	4.8	4.5	4.4
15.0	5.0	4.5	3.6	3.6	4.0	4.3	4.8	18.2	4.3	5.8	5.2	4.9
14.5	5.9	5.4	4.5	4.4	4.5	4.9	5.5	18.8	5.0	6.8	6.0	5.8
14.0	6.8	6.3	5.5	5.1	5.1	6.0	6.3	18.5	5.6	7.9	6.8	6.9
13.5	7.8	7.4	6.5	5.9	6.2	7.1	7.0	18.2	6.9	8.9	7.7	8.0
13.0	9.3	8.9	7.6	7.1	7.3	8.1	8.0	17.9	8.1	10.0	8.8	9.1
12.5	10.8	10.4	8.8	8.2	8.5	9.2	9.3	17.6	9.3	12.2	10.6	11.0
12.0	12.2	12.0	10.0	9.3	9.9	10.4	10.6	17.3	11.1	14.8	12.5	13.2
11.5	14.7	14.6	11.3	10.9	12.3	11.5	11.9	17.0	14.1	17.4	14.3	15.4
11.0	18.3	18.1	14.2	13.4	14.7	12.7	14.7	16.7	17.2	20.0	16.7	17.7
10.5	21.9	21.6	17.6	15.8	17.1	15.4	17.9	16.4	20.2	23.0	19.5	21.0
10.0	25.5	25.1	20.9	18.2	20.1	18.8	21.1	16.1	22.0	26.1	22.3	24.3
9.5	25.5	26.1	24.1	20.2	23.6	22.2	24.0	15.9	22.5	29.2	25.1	27.7
9.0	24.8	26.8	24.1	22.0	27.1	25.0	24.1	15.6	23.1	30.5	22.6	29.6
8.5	24.1	27.5	24.1	23.7	30.5	23.3	24.2	15.3	23.6	26.1	19.2	25.3
8.0	23.5	27.6	24.1	25.5	27.3	21.7	24.3	15.0	21.9	21.7	15.7	21.1
7.5	23.7	25.1	23.7	22.6	23.0	20.1	24.1	14.7	19.5	17.2	14.2	16.9
7.0	23.9	22.7	22.4	19.3	18.7	20.2	23.4	14.4	17.2	21.6	21.4	19.6
6.5	24.0	20.2	21.0	16.0	15.6	22.6	22.7	14.1	16.5	34.3	28.7	30.8
6.0	29.2	25.6	19.7	15.5	27.3	24.9	22.0	13.8	29.0	47.0	35.9	41.9

5.5	45.8	40.1	27.6	27.8	39.0	27.3	34.4	13.5	41.4	59.8	45.4	53.0
5.0	62.3	54.7	41.7	40.0	50.7	41.3	53.9	13.2	53.9	71.6	58.0	66.2
4.5	78.9	69.2	55.7	52.2	63.2	58.8	73.4	13.0	62.7	83.1	70.5	79.8
4.0	88.5	77.2	69.8	62.5	77.0	76.2	92.9	12.7	67.8	94.7	83.0	93.5
3.5	94.0	84.5	75.9	70.2	90.9	93.0	97.2	12.4	72.9	104.0	82.2	105.5
3.0	99.5	91.8	82.0	77.8	104.7	92.5	101.0	12.1	77.9	91.1	76.0	94.1
2.5	105.0	96.2	88.1	85.5	102.8	91.9	104.7	11.8	69.9	78.2	69.8	82.8
2.0	84.7	77.5	87.4	76.9	91.5	91.4	101.8	11.5	54.9	65.4	63.6	71.4
1.5	61.9	58.9	67.6	62.0	80.2	85.6	79.1	11.2	40.0	52.3	48.9	58.4
1.0	39.1	40.2	47.7	47.2	68.9	64.1	56.3	10.9	25.1	38.9	33.6	43.4
0.5	20.6	25.6	27.8	32.8	53.0	42.6	33.6	10.6	19.3	25.6	18.3	28.3
0.0	16.9	20.5	17.2	25.6	36.8	21.1	19.8	10.4	15.1	12.2	8.1	13.2
-0.5	13.1	15.4	13.8	18.5	20.6	11.4	16.4	10.1	10.9	8.2	7.4	8.4
-1.0	9.3	10.3	10.4	11.4	8.0	9.7	13.0	9.8	7.3	7.7	6.7	7.6
-1.5	7.1	7.7	6.9	6.5	7.4	8.1	9.7	9.1	6.6	7.3	6.0	6.8
-2.0	6.4	6.8	5.9	6.1	6.9	6.5	8.0	8.2	5.8	6.8	5.4	5.9
-2.5	5.6	5.9	5.6	5.8	6.3	5.8	7.0	7.2	5.1	6.1	4.9	5.5
-3.0	4.9	5.0	5.3	5.4	5.7	5.2	6.1	6.3	4.6	5.4	4.3	5.2
-3.5	4.4	4.6	4.9	4.9	5.1	4.5	5.1	5.5	4.2	4.7	3.8	4.8
-4.0	4.1	4.2	4.3	4.2	4.5	4.0	4.7	4.8	3.8	4.0	3.5	4.4
-4.5	3.7	3.9	3.6	3.5	3.9	3.6	4.2	4.0	3.4	3.7	3.2	3.9
-5.0	3.3	3.6	3.0	2.9	3.5	3.3	3.8	3.4	3.0	3.4	2.8	3.3
-5.5	3.0	3.2	2.6	2.8	3.1	3.0	3.4	3.2	2.6	3.1	2.5	2.8
-6.0	2.6	2.7	2.5	2.7	2.8	2.7	3.1	3.0	2.2	2.8	2.4	2.5
-6.5	2.2	2.3	2.5	2.6	2.5	2.4	2.8	2.8	1.8	2.6	2.3	2.5
-7.0	2.0	2.1	2.4	2.4	2.3	2.1	2.5	2.5	1.9	2.4	2.2	2.5
-7.5	2.1	2.2	2.3	2.1	2.2	1.8	2.4	2.2	2.1	2.2	2.1	2.5
-8.0	2.1	2.4	2.0	1.8	2.1	1.8	2.4	2.0	2.2	2.2	2.0	2.3
-8.5	2.2	2.5	1.7	1.5	2.0	1.9	2.4	1.8	2.1	2.2	2.0	2.1
-9.0	1.9	2.1	1.6	1.7	1.9	2.0	2.3	1.9	1.8	2.2	1.9	1.8
-9.5	1.7	1.8	1.7	1.8	1.9	1.9	2.1	2.0	1.5	2.1	1.8	1.8
-10.0	1.4	1.5	1.8	2.0	1.8	1.6	1.9	1.9	1.5	1.9	1.7	1.9

ICAO Low-intensity Type A (fixed obstacle)												
Min 2°-10°	23.5	20.2	19.7	15.5	15.6	20.1	22.0	10.9	16.5	17.2	14.2	16.9
Upper (°)	15	14.5	14	14	14	14	14.5	24.5	14.5	15	15	14.5
Lower (°)	-2.5	-3	-3	-3	-3.5	-3	-3.5	-3.5	-2.5	-3	-2	-3
Spread (°)	18	18	17	17	18	17	18	28	17	18	17	18

Complies: ☑ YES ☐ NO

Tested By:	Brittany James			Signature or initials:	Comp. Date	12/26/18
Reviewed By:	cwm			Signature or initials:		
Test Equipment Used:	8, 9, 10, 11, 12					
Amb (ºC):	24.5	RH%	19.5			

Chromaticity

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, and 5nm increments for incandescent. Measure the color after stabilization at rated input at the main beam center and beam extremes.

Results

Sample	Color	Input	Location	x	y	z
CRT1812140922-001	Red	3.609	(0,0)	0.684	0.315	0.000

Results

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

Boundary	Line Equation	Calc.
Purple Boundary	y ≥ 0.980 - x	0.296
Yellow Boundary	y ≤ 0.335	0.315

Complies: ☑ YES ☐ NO

Tested By:	Craig Small			Signature or initials:	Comp. Date	12/19/18
Reviewed By:	cwm			Signature or initials:		
Test Equipment Used:	1,2,3,4,5,6,7					
Amb (ºC):	24.4	RH%	16.4			

Equipment list

#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	E288	OL-750 Spectroradiometer	Optronic Labratories	11-Jan-2019
2	M282	Hygrometer	Testo	18-Apr-2019
3	E536	Digital Power Meter	Yokogowa	19-Jan-2019
4	A208	Current Transformer	Pearson Electric	27-Jun-2019
5	N721	Steel Ruler	Products Engineering Corp	12-Jul-2019
6	E499	Smart Tool	M-D Building Products	29-Jun-2019
7	N1335	Tape Measure	Stanley	19-Jan-2019
8	M308	Stopwatch	Traceable	03-Nov-2019
9	L178	Goniophotometer	Labsphere	18-Apr-2019
10	N1311	Level	Starrett	10-Sep-2019
11	M245	Multimeter	Fluke	07-May-2019
12	M273	Hygrometer	Testo	03-Dec-2019
13				
14				
15				
16				
17				
18				
19				
20				

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