



Revised Issue Date: April 18, 2016
Issue Date: March 31, 2016
Project No. G102485468
Quote No.: 00662823

Contact: Stella Su
Email: stella@nanhua.com
Phone No. 86 02 13912686 8850

Report No. 102485468CRT-001

NANHUA Electronics Co., Ltd.

Building #9
1755 Wenbei Road, Jiading
Shanghai 201802 China

Standards

*International Civil Aviation Organization Standards and Recommended Practices (ICAO), Annex 14, Aerodromes
Volume 1 (Aerodrome Design and Operations), Sixth Edition July 2013*

<i>Test Purpose</i>	ICAO Compliance Testing
<i>Product</i>	Low Intensity, Type A and Type B Obstacle Light
<i>Test Dates</i>	3/28/2016
<i>Revision Note</i>	Updated company name and address.

Kyle J. Michael
Senior Associate Engineer
Lighting

Christopher W Metcalf
Engineering Supervisor
Lighting

This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.

Test Plan and Datasheets			
Client	NANHUA Electronics Co., Ltd.	Engineer	Kyle Michael
Project	G102485468	Reviewer	Christopher Metcalf
Product	ICAO Type A/ Type B Obstacle Light	Model(s)	See Sample Page
Standard	International Civil Aviation Organization Standards and Recommended Practices (ICAO), Annex 14, Aerodromes Volume 1 (Aerodrome Design and Operations), Sixth Edition July 2013		

Spec	Test name	Clause	Pass Fail NA
ICAO	Photometry: Type A and Type B	6.2.1.2	Pass
ICAO	Chromaticity (Appendix 1 Para. 2.1.1)	2.1.1	Pass

Sample Information				
Date Rec.	Intertek ID	Description	Condition	Model No.
2/22/2016	CRT1602221312-001	ICAO Type A/B Obstacle Light	Production	LS810

Further Sample Description	
Type:	ICAO Type A/ Type B Low Intensity Obstacle Light
Light Source:	(1) Red XLampXPE2 LED
Lens:	Plastic- LUX2180T
Electrical Input:	110-240VAC 50/60 Hz 48VDC
Casting Material:	Aluminum
Mounting:	See Picture Below

Catalog Number:	LS810
-----------------	-------



Section 6.2.1.2: Photometry

Energize each light fixture and test for compliance with the photometric requirements. Photometric axes will be established with the horizontal axis passing through the center of the fixture and parallel to the runway centerline at grade and the vertical axis running through the center of the fixture and perpendicular to the ground plane. Operate the fixture for (FAA: 15 minutes / ICAO until stabilized) before taking measurements. Each light will be measured independently while steady burning.

Results: ICAO- Para. 6.2.1.2 Table 6-1 and Table 6-2

Frequency Variation						
Sample	Input Voltage	Hz	Position	Measured	Factor	Result
CRT1602221312-001	110VAC	60 Hz	0,0	43.30	n/a	n/a
	110VAC	50 Hz	0,0	43.13	1.00	Pass
	240VAC	50 Hz	0,0	43.04	0.99	Pass
	240VAC	60 Hz	0,0	43.20	1.00	Pass
	48VDC	n/a	0,0	43.53	1.01	Pass

Sample	CRT1602221312-001	Test	Initial	Powered by	AC
Type	ICAO Type A/B Obstacle Light	Input	110VAC	Measured Input Voltage	109.9
Lamp	LED	Color	Red	Hz	60Hz

Vertical Position (deg.)	Luminous Intensity (cd)											
	Horizontal Position (deg.)											
	0	30	60	90	120	150	180	210	240	270	300	330
20	3.1	2.2	2.3	3.4	3.5	2.4	2.5	3.9	4.2	2.9	2.8	3.4
19	3.2	2.5	2.6	3.6	3.5	2.6	2.8	3.8	3.4	2.9	3.0	3.3
18	3.2	2.7	2.7	3.1	3.4	2.7	3.0	3.6	3.2	3.0	3.3	3.2
17	3.1	3.0	2.8	3.0	3.4	2.9	3.2	3.9	3.5	3.1	3.8	3.1
16	3.4	3.8	3.1	3.2	4.0	3.2	3.5	4.8	4.0	3.5	4.7	3.5
15	4.5	5.1	3.5	3.6	5.3	3.8	4.4	6.4	5.7	4.6	6.3	4.5
14	6.2	9.1	5.2	4.6	8.9	5.2	5.9	9.8	7.3	6.5	9.6	6.2
13	10.0	13.3	6.9	6.8	13.3	8.5	9.2	14.3	11.2	10.1	14.2	9.6
12	20.0	17.8	13.7	15.3	17.4	18.6	17.7	19.4	20.5	18.4	19.0	18.8
11	28.2	21.6	21.3	22.1	21.0	26.8	28.1	28.5	33.3	28.8	25.7	28.8
10	45.3	33.4	38.1	38.7	34.7	48.5	50.9	46.7	53.9	49.1	43.6	49.3
9	61.5	56.7	58.9	57.7	55.0	63.0	67.8	59.4	67.8	64.5	57.6	67.4
8	70.5	65.5	74.0	69.2	62.8	70.3	70.8	61.7	66.9	62.8	59.7	70.2
7	70.1	65.5	73.6	71.2	64.5	70.0	69.7	65.4	68.7	63.0	62.4	65.6
6	70.8	67.2	72.4	71.9	67.5	72.1	68.0	71.0	69.7	64.8	67.1	65.2
5	70.7	72.4	70.0	71.0	71.3	71.5	66.2	75.6	68.8	64.8	68.6	66.5
4	66.7	72.6	65.4	68.5	73.9	67.7	66.3	72.9	66.8	62.6	64.1	66.2
3	62.0	66.2	61.2	64.3	72.3	64.7	63.2	66.7	62.8	58.7	54.9	62.5
2	56.3	56.3	55.2	59.2	64.9	60.8	58.8	57.1	55.6	51.5	45.3	54.3
1	47.1	46.5	48.7	51.9	54.7	55.8	51.8	48.2	47.1	43.5	38.6	43.3
0	43.3	39.6	43.0	45.5	47.3	50.2	46.7	42.5	41.1	38.3	34.7	40.2
-1	35.6	35.4	38.5	40.7	40.1	44.9	40.3	33.9	32.2	29.8	27.8	33.7
-2	27.4	27.8	31.6	32.8	33.8	37.5	33.3	27.2	25.2	23.2	23.0	25.8
-3	20.6	22.8	25.0	26.8	27.4	28.3	25.3	21.5	19.1	17.4	18.2	19.2
-4	15.9	18.0	18.6	20.0	21.5	20.6	18.8	16.8	15.3	13.7	13.9	14.1
-5	12.8	14.0	14.6	16.0	17.0	16.2	14.3	14.2	12.7	10.8	11.8	11.6
-6	8.3	11.6	11.0	12.9	13.7	12.3	9.4	9.0	7.6	6.8	7.2	7.5
-7	7.3	7.1	7.3	7.9	8.5	8.1	7.6	7.7	7.2	6.0	6.7	7.0
-8	6.8	6.7	6.5	7.2	8.3	6.4	6.1	6.9	6.1	5.1	4.7	6.5
-9	4.7	4.9	4.4	6.5	6.1	4.8	3.9	5.1	4.3	3.4	3.6	4.3
-10	3.5	3.4	3.2	4.5	4.2	3.5	3.2	3.6	2.9	2.7	2.9	3.5

ICAO Low-intensity Type A (fixed obstacle) Min ≥10 cd between 2° - 10°, Min Beam Spread 10°												
Min 2°-10°	70.8	72.6	74.0	71.9	73.9	72.1	70.8	75.6	69.7	64.8	68.6	70.2
Upper (°)	14	15	14	13	15	14	14	15	15	14	15	14
Lower (°)	-8	-8	-8	-9	-9	-8	-8	-9	-8	-8	-7	-8
Spread (°)	22	23	22	22	24	22	22	24	23	22	22	22
Pass/Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

ICAO Low-intensity Type B (fixed obstacle) Min ≥ 32 cd between 2° - 10°, Min Beam Spread 10°												
Min 2°-10°	70.8	72.6	74.0	71.9	73.9	72.1	70.8	75.6	69.7	64.8	68.6	70.2
Upper (°)	12	12	11	11	12	12	12	12	12	12	12	12
Lower (°)	-3	-4	-4	-5	-5	-5	-4	-4	-3	-3	-3	-3
Spread (°)	15	16	15	16	17	17	16	16	15	15	15	15
Pass/Fail	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

ICAO REQ. Table 6-2					
	Min		Max		Vert. Beam Spread
	Min Beam	Intensity	Min Beam	Intensity	Intensity
Type A	2°-10°	10 cd	n/a	10°	5 cd
Type B	2°-10°	32 cd	n/a	10°	16 cd

Complies: YES NO

Tested By:	Matthew Benninger	Signature or initials:	mb	Comp. Date	3/31/16
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>		
Test Equipment Used:	6,7,8,9,10	Sample:	CRT1602221312-001		
Amb (°C):	23.3	RH%:	26		

Section 2.1.1: 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 a 15 minute warm-up period at rated input at the main beam center and beam extremes.

Results

Sample	Color	Input	Location	x	y	z	Pass/Fail
CRT1602221312-001	Red	120VAC	0,2	0.700	0.300	0.000	Pass
			0,6	0.700	0.300	0.000	Pass
			0,10	0.699	0.300	0.000	Pass

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	$y \geq 0.980 - x$	0.280
Yellow Boundary	$y \leq 0.335$	0.300

Complies: YES NO

Tested By:	Nichole Farley	Signature or initials:	NF	Comp. Date	3/28/16
Reviewed By:	cwm	Signature or initials:	<i>cwm</i>		
Test Equipment Used:	1,2,3,4,5	Sample:	CRT1602221312-001		
Amb (°C):	27	RH%	26		

Equipment list				
#	Intertek ID No.	Description	Manufacturer	Calibration Due
1	N721	Steel Rule	---	6/16/2016
2	E288	OL-750 Spectroradiometer	Optronics	4/1/2016
3	C450	Temp/RH Indicator	Fisher Scientific	9/1/2016
4	E499	Smart Tool	M&D	4/6/2016
5	E537	Power Meter	Yokagowa	12/16/2016
6	O109	Goniometer	Optronics	10/6/2016
7	O114	5M Photometer	Optronics	10/26/2016
8	O112	Power Supply	Optronics	11/17/2016
9	T1364	Hygro-Thermometer	Extech	1/20/2017
10	M135	Multimeter	Fluke	19-Nov-2016
11				
12				
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