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RADIOMETRIC TESTING RESULTS VER 1.2

REPORT DATE: 9/28/2016 SOLAR LIGHT CO. INC

Date of measurements: 8/16/2016

This experiment was designed to assess the Peak Beam Intensity of production searchlights manufactured by PEAK BEAM SYSTEMS, INC., in compliance with the methods defined by the **ANSI/NEMA FL 1 -2009** *Flashlight Basic Performance Standard.*

The SOLAR LIGHT testing laboratory apparatus was used to evaluate MBS-410 Handheld Searchlights and MBS-430-Y Remote-Controlled Searchlights in accordance with the above standard.

APPARATUS AND INSTRUMENTATION

Silicone Detector:
MODEL PMA 2130 S/N15217. Cal Date 8/15/16 [NIST traceable].
Radiometer:
MODEL PMA2100 S/N 4337, Cal Date 2/15/2016.
The measurement setup was carried out in a large, unlit indoor hall with a diagonal dimension exceeding 26 meters.

TEST DEVICES:

MBS-410 Handheld Maxa Beam Searchlight	
	Serial Number
1	M19090 G3-26
2	M19091 G3-26
3	M19092 G3-26

MBS-430-Y Remote Maxa Beam Searchlight	
	Serial Number
1	M18506 G3-26
2	M18507 G3-26
3	M18508 G3-26

RELEVANT DEFINITIONS PER ANSI FL-1

1.2.2 Peak Beam Intensity

Peak Beam Intensity is the maximum luminous intensity typically along the central axis of a cone of light. The value is reported in candela and does not change with distance.

The section of relevance from the standard is Section 2, ***Test Methods***.

2.1 GENERAL

2.1.1 Lab Conditions

T = 22 ± 3°C and R.H. 50% - 80%
Ambient light was < 1 lux.
Light measuring equipment was annually calibrated traceable to NIST, and within the calibration interval.

2.1.2 Sampling Selection

Samples were representative of final production products.

2.3 PEAK BEAM INTENSITY

2.3.1 Purpose

Determine the peak beam intensity of the device's beam pattern within 30 s - 120 s of operation.

2.3.2 Power Source:

MBS-410: Powered by a fully charged *MBP-1308* 7.5 AH Lithium Iron Phosphate (LiFePO4) battery via a *MBA-8105-L* 5' coiled power cord.

MBS-430-Y: Powered by a *MBP-4000-L* 13.5V searchlight power supply via a *MBA-8210-L* 10' power cord (controlled by a *MBA-8406* remote handle with 6' cord).

2.3.3 Conditions

All conditions defined in **Section 2.1.1 Lab Conditions** were met
Measurements conducted at highest output level: High Beam Setting (85 W)
Measurements conducted at the beam angle that maximized beam intensity: Spot/Narrow Beam

2.3.4 Apparatus

A timing device and measuring device were used to set experiment parameters
Light measuring device
- Minimum aperture area = 100 mm²
- Actual aperture diameter = 19 mm
- Actual aperture area = 283.5 mm²

2.3.5 Procedures

The light measuring device was placed 25 meters from the front lens surface of the device to be tested. This distance was at least 10 times the largest dimension of the device lens or output height or width.

The light measuring device was used to identify and record the highest indicated value for each searchlight under test. Measurements were taken within 30 s - 120 s of initial activation.

2.3.6 Final Calculations

(Surface Light Intensity) x (Distance)² = Peak Beam Intensity***

Where:
Surface light intensity is in lux (lux = lumens/meters²)
Distance is in meters (m)
Peak beam intensity is in candela (candela = lumens/steradian)

The published figure shall be average of the results of the **three** devices tested for each model.

****Note that the units do not agree in this equation unless the assumption is made that the solid angle inherent in the unit of candela is equal to 1. Additional information about the units of light measurement are provided below****

A review of light measurement units not explicitly covered in ANSI/NEMA FL-1:

Luminous flux / luminous power	Φ_v	**lumen** (= cd · sr)	lm
Luminous intensity	I_v	**candela** (= lumen/sr)	cd

Luminous flux (in lumens) is a measure of the total amount of light a lamp puts out. The luminous intensity (in candelas) is a measure of how bright the beam in a particular direction is. If a lamp has a 1 lumen bulb and the optics of the lamp are set up to focus the light evenly into a 1 steradian beam, then the beam would have a luminous intensity of 1 candela. If the optics were changed to concentrate the beam into 1/2 steradian then the source would have a luminous intensity of 2 candelas. The resulting beam is narrower and brighter, however the luminous flux remains the same.

Put in another way, if a light source emits one candela of luminous intensity uniformly across a solid angle of one steradian, the total luminous flux emitted into that angle is one lumen (1 cd·1 sr = 1 lm). Alternatively, an isotropic one-candela light-source emits a total luminous flux of exactly 4π lumens. If the source were partially covered by an ideal absorbing hemisphere, that system would radiate half as much luminous flux—only 2π lumens. The luminous intensity would still be one candela in those directions that are not obscured.

RESULTS

Model Number	Serial Number	Maximum Surface Intensity (lux)	Distance² at 25 m	Peak Beam Intensity (candela)
MBS-410	M19090 G3-26	19,726	625	12,328,750
MBS-410	M19091 G3-26	20,235	625	12,646,875
MBS-410	M19092 G3-26	20,387	625	12,741,875
			Average	**12,572,500**

Model Number	Serial Number	Maximum Surface Intensity (lux)	Distance² at 25 m	Peak Beam Intensity (candela)
MBS-430-Y	M18506 G3-26	22,030	625	13,768,750
MBS-430-Y	M18507 G3-26	18,720	625	11,700,000
MBS-430-Y	M18508 G3-26	25,635	625	16,021,875
			Average	**13,830,208**

In accordance with the methods and reporting procedures described by **ANSI/NEMA FL 1-2009** the MBS-410 and MBS-430-Y meet or exceed the manufacturer's published Peak Beam Intensity of 12,000,000 candelas. The average Peak Beam Intensity for the MBS-410 was 12,572,500 candelas. The average Peak Beam Intensity for the MBS-430-Y was 13,830,208 candelas.

REFERENCE DOCUMENTATION

ANSI/NEMA FL 1 -2009

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