



REPORT

3933 US ROUTE 11, CORTLAND, NEW YORK 13045

Project No. G102710907

Date: December 22, 2016

REPORT NO. 102710907CRT-014

TEST OF ONE LED AR111 INDIRECT 3000K

MODEL NO. LED AR111 INDIRECT AR-L720-C30-B12-90-ID PART NO. 99550

RENDERED TO:

VERBATIM AMERICAS 8210 UNIVERSITY EXECUTIVE PARK DRIVE, SUITE 300 CHARLOTTE, NC 28262

<u>TESTS:</u> Electrical and Photometric tests as required to the IESNA test standard.

STATEMENT OF LIMITATION: This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

AUTHORIZATION The testing performed was authorized by signed quote number Qu-00707669.

STANDARDS USED:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting ANSI NEMA ANSLG C78.377: 2011: Specifications of the Chromaticity of Solid State Lighting Products

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number LED AR111 INDIRECT AR-L720-C30-B12-90-ID. The sample was received by Intertek on January 0, 1900 in undamaged condition and one sample was tested as received. The sample designation was .

DATE OF TESTS:

December 20, 2016 through December 21, 2016.

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SUMMARY:

| MODEL NO. LED AR111 INDIRECT AR-L720-C30-B12-90-ID | | | | | |
|----------------------------------------------------|--------------------|-----------------|--|--|--|
| DESCRIPTION: LED AR111 INDIRECT 3000K | | | | | |
| | | | | | |
| Criteria | Integrating Sphere | Goniophotometer | | | |
| Light Output (Lumens) | 692.7 | 720.2 | | | |
| Total Power (W) | 9.861 | 10.17 | | | |
| Lumen Efficacy (Lm/W) | 70.20 | 70.90 | | | |
| Power Factor () | 0.910 | 0.910 | | | |
| | | | | | |
| Criteria | Res | ults | | | |
| Current ATHD (%) | 36. | 34 | | | |
| Correlated Color Temp. (CCT-K) | 30 | 67 | | | |
| Color Rendering Index (CRI - Ra) | 90 | .9 | | | |
| CRI - R9 | 64 | .6 | | | |
| DUV () | 0.0 | 02 | | | |
| Chromaticity Coordinate (x) | 0.4 | 34 | | | |
| Chromaticity Coordinate (y) | 0.4 | 07 | | | |
| Chromaticity Coordinate (u') | 0.2 | 48 | | | |
| Chromaticity Coordinate (v) | 0.5 | 22 | | | |

EQUIPMENT LIST

| Equipment Used | Model No. | Control No. | Last Cal. | Cal. Due |
|----------------------------------------------|-------------|-------------|------------|------------|
| LSI High Speed Mirror Goniometer | 6440 | | 12/8/2016 | 1/8/2017 |
| Elgar AC Power Supply | CW1251 | | VBU | VBU |
| Sorenson DC Power Supply | XG 150-10 | | VBU | VBU |
| Yokogawa Power Analyzer | WT210 | E464 | 5/2/2016 | 5/2/2017 |
| Omega Thermometer | DPi8-C24 | M263 | 5/2/2016 | 5/2/2017 |
| M-D Building Products Digital Level | Smart Tool | L112 | 4/8/2016 | 4/8/2017 |
| NIST Luminous Intensity Standard Source | NBS10322 | N1427 | 12/12/2014 | 12/12/2016 |
| NIST Luminous Intensity Standard Source | NBS10215 | N1432 | 12/12/2014 | 12/12/2016 |
| NIST Luminous Intensity Standard Source | 960629-3 | N1428 | 12/12/2014 | 12/12/2016 |
| NIST Luminous Flux Standard Source | NBS10428 | N1424 | 12/17/2014 | 12/17/2016 |
| 2M Integrating Sphere Spectrometer System | CDS 600 | W/N308 | 12/19/2016 | 1/19/2017 |
| Yokogawa Power Analyzer | WT1600 | E475 | 7/1/2016 | 7/1/2017 |
| Extech Hygro-Thermometer | 445715 | T1550 | 1/8/2016 | 1/8/2017 |
| Fluke Digital Thermometer | 53II | N1324 | 4/7/2016 | 4/7/2017 |
| Sorensen DC Power Supply | XFR 35-35 | | VBU | VBU |
| Xantrex DC Power Supply | XTR 150-5.6 | | VBU | VBU |
| Elgar AC Power Supply | CW1251 | | VBU | VBU |
| Secondary Spectral Intensity Standard Source | BS5186 | RF5186 | 1/27/2016 | 1/27/2017 |
| Secondary Luminous Flux Standard Source | BS3616 | | 1/27/2016 | 1/27/2017 |
| Secondary Luminous Flux Standard Source | BS4116 | | 1/27/2016 | 1/27/2017 |
| Secondary Luminous Flux Standard Source | BS3612 | | 1/27/2016 | 1/27/2017 |



TEST METHODS:

<u>Seasoning in Sample Orientation – LED Products</u> No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere Model CDS 1100 CCD Array Spectroradiometer and two meter or ten foot sphere was used to measure correlated color temperature, chromaticity coordinates, and the color rendering index for each SSL unit.

Ambient temperature was measured at a position inside the sphere. Each SSL unit was operated on the client provided driver at the rated input voltage in its designated orientation. Each SSL unit was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.

The calibration of the sphere photometer-spectroradiometer system is traceable to the National Institute of Standards and Technology.

Photometric and Electrical measurements – Distribution Method

A LSI Type C High Speed Model 6440 Mirror Goniometer was used to measure the intensity (candelas) at each angle of distribution for the SSL sample.

Ambient temperature was measured equal to the height of the sample mounted on the goniometer equipment. The SSL sample was operated on the client provided driver at rated input volts in its designated orientation. The SSL sample was allowed to stabilize for at least thirty minutes before measurements were made. Stabilization procedures to LM-79 were followed. Electrical measurements including voltage, current, and power were measured using a power analyzer.



RESULTS:

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Photometric and Electrical Measurements at Ambient Temperature (25°C +/- 1°C) – Distribution Method

| | Base | Input Voltage | Input Current | Input Power | Input Power | Light Output | Lumen Efficacy |
|----------------------|-------------|------------------|------------------|----------------|----------------|-----------------|-------------------|
| Intertek Control No. | Orientation | (VAC) | (mA) | (W) | Factor () | (Lumens) | (Im/W) |
| CRT1612140822-001D | Base Up | 12.08 | 924.9 | 10.17 | 0.910 | 720.2 | 70.90 |

Intensity (Candlepower) Summary at 25°C - Candelas

| Angle | 0 | 22.5 | 45 | 67.5 | 90 |
|-------|------|------|------|------|------|
| 0 | 5136 | 5136 | 5136 | 5136 | 5136 |
| 5 | 2977 | 2973 | 2970 | 2968 | 2974 |
| 10 | 1222 | 1190 | 1202 | 1200 | 1219 |
| 15 | 822 | 818 | 813 | 808 | 847 |
| 20 | 559 | 573 | 555 | 549 | 591 |
| 25 | 372 | 392 | 377 | 367 | 399 |
| 30 | 230 | 250 | 237 | 228 | 249 |
| 35 | 132 | 147 | 138 | 129 | 143 |
| 40 | 43 | 50 | 44 | 42 | 46 |
| 45 | 9 | 10 | 8 | 8 | 10 |
| 50 | 3 | 4 | 3 | 3 | 3 |
| 55 | 0 | 0 | 0 | 0 | 0 |
| 60 | 0 | 0 | 0 | 0 | 0 |
| 65 | 0 | 0 | 0 | 0 | 0 |
| 70 | 0 | 0 | 0 | 0 | 0 |
| 75 | 0 | 0 | 0 | 0 | 0 |
| 80 | 0 | 0 | 0 | 0 | 0 |
| 85 | 0 | 0 | 0 | 0 | 0 |
| 90 | 0 | 0 | 0 | 0 | 0 |





Illumination Plots

| | Illuminance at a | Distance |
|------------------|------------------|------------|
| | Center Beam fc | Beam Width |
| 1.78 | 1,777 fc | 0.4 ft |
| 3.38 | 472 fc | 0.7 ft |
| 5.08 | 205 fc | 1.0 ft |
| 6.7 R | 114 fc | 1.4 ft |
| 8.38 | 74.6 fc | 1.7 ft |
| 0.00 | 51.4 fc | 2.1 ft |

Mounting Height: 10ft

Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

| Lumens | % Luminaire |
|--------|-------------------------------------------------------------------|
| 625.0 | 86.8 |
| 709.1 | 98.5 |
| 720.2 | 100.0 |
| 0.0 | 0.0 |
| 720.2 | 100.0 |
| 0.0 | 0.0 |
| 720.2 | 100.0 |
| | Lumens 625.0 709.1 720.2 0.0 720.2 0.0 720.2 |

Zonal Lumens and Percentages at 25°C

| Zone | Lumens | % Luminaire |
|-------|--------|-------------|
| 0-10 | 223.5 | 31.0 |
| 10-20 | 226.9 | 31.5 |
| 20-30 | 174.6 | 24.2 |
| 30-40 | 84.1 | 11.7 |
| 40-50 | 10.5 | 1.5 |
| 50-60 | 0.6 | 0.1 |
| 60-70 | 0.0 | 0.0 |
| 70-80 | 0.0 | 0.0 |
| 80-90 | 0.0 | 0.0 |



RESULTS:





435

440

445

450

455

2.236

3.511

5.543

7.475

6.429

545

550

555

560

565

mW/nm mW/nm mW/nm mW/nm nm nm nm nm 4.380 570 350 0.043 460 10.299 680 7.580 355 -0.019 465 3.476 575 10.495 685 6.787 360 0.102 470 2.889 580 10.678 690 6.121 365 0.135 475 2.379 585 10.972 695 5.524 590 700 370 0.008 480 2.337 11.160 4.829 375 0.096 485 2.655 595 11.594 705 4.328 710 380 -0.013 490 600 11.968 3.857 3.165 385 0.084 495 3.786 605 12.357 715 3.369 390 0.044 500 4.554 610 12.712 720 2.929 395 0.038 505 5.316 615 12.990 725 2.554 400 0.026 510 5.989 620 13.197 730 2.227 625 735 405 0.073 515 6.494 13.340 1.905 410 0.074 520 7.144 630 13.289 740 1.640 415 0.224 525 7.600 635 745 1.427 13.120 420 640 750 1.229 0.503 530 8.022 12.942 425 645 755 0.757 535 8.417 12.467 1.093 430 1.388 540 8.844 650 12.078 760 0.977

Spectral Distribution Over Visible Wavelengths

Spectral Data Over Visible Wavelengths

655

660

665

670

675

11.355

10.672

10.020

9.198

8.373

765

770

775

780

0.793

0.669

0.572

0.507

9.188

9.417

9.792

9.951

10.111







CONCLUSION

The results tabulated in this report are representative of the actual test samples submitted for this report only. The data is provided to the client for further evaluation. Compliance to the referenced specification requirements was not determined in this report.

In Charge Of Tests:

Mulanie Brittain

Melanie Brittain Associate Engineer Lighting Division

Attachments: IES File - CRT1612140822-001D

Report Reviewed By:

Jeffrey Davis Engineering Supervisor Lighting Division