



REPORT

25800 COMMERCENTRE DRIVE, LAKE FOREST, CA 92630

Project No. G102406056

Date: January 11, 2016

REPORT NO. 102406056LAX-013

TEST OF ONE VIVID 3000K 95CRI 7.5W 25 DEGREE

MODEL NO. SM16GW-07-25D-930-03-S3

RENDERED TO

SORAA INC
6500 KAISER DR
FREMONT, CA 94555-3661

TEST: 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 A2LA, NIST, or any agency of the federal government.

AUTHORIZATION: The testing performed was authorized by signed quote number Qu-00660665.

STANDARDS USED: The following American National Standards or Illuminating Engineering Society of North America Test Guides were used in part or totally to test each specimen:

IESNA LM-79 - 2008: Electrical and Photometric Measurements of Solid State Lighting

DESCRIPTION OF SAMPLE: The client submitted one production sample of model number SM16GW-07-25D-930-03-S3. The sample was received by Intertek on December 18, 2015, in undamaged condition and one sample was tested as received. The sample designation was LAN1512180812-003.

DATES OF TESTS: January 6, 2016 through January 7, 2016

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SUMMARY

| | |
|--------------|----------------------------------|
| Model No.: | SM16GW-07-25D-930-03-S3 |
| Description: | Vivid 3000K 95CRI 7.5W 25 degree |

| Criteria | Result | |
|-----------------------------|--------|------------|
| | Sphere | Goniometer |
| Total Lumen Output (Lumens) | 428.1 | 412.8 |
| Total Power (W) | 7.650 | 7.651 |
| Luminaire Efficacy (LPW) | 55.96 | 53.95 |

| Criteria | Result |
|----------------------------------------|--------|
| Power Factor | 0.761 |
| Current ATHD % | 41.04 |
| Correlated Color Temperature (CCT - K) | 3012 |
| Color Rendering Index (CRI - Ra) | 95.4 |
| Color Rendering Index (CRI - R9) | 98.6 |
| DUV | 0.001 |
| Chromaticity Coordinate (x) | 0.438 |
| Chromaticity Coordinate (y) | 0.408 |
| Chromaticity Coordinate (u') | 0.250 |
| Chromaticity Coordinate (v') | 0.523 |

EQUIPMENT LIST

| Equipment Used | Model Number | Control Number | Last Date Calibrated | Calibration Due Date |
|-------------------------------------|--------------|----------------|----------------------|----------------------|
| LapSphere 3M Integrating Sphere | CA-11821-LRT | 000830 | 01/04/16 | 02/04/16 |
| LabSphere Spectrometer | CDS-3020 | 000833 | 01/04/16 | 02/04/16 |
| California Instruments Power Supply | CSW5550 | 001338 | VBU | VBU |
| Yokogawa Power Meter | WT333 | 001319 | 06/03/15 | 06/03/16 |
| Extech Instruments Stop Watch | 365510 | 001379 | 11/19/15 | 11/19/16 |
| Temperature Humidity Meter | 971 | 001180 | 05/26/15 | 05/26/16 |
| DC Power Supply | LPS-100-0833 | 000836 | 05/07/15 | 05/07/16 |
| LSI High Speed Mirror Goniometer | 6440T | 000943 | 01/07/16 | 02/07/16 |
| Elgar Power Supply | CW1251 | 000944 | VBU | VBU |
| Yokogawa Power Analyzer | WT210 | 000945 | 12/04/15 | 12/04/16 |
| Temperature Humidity Meter | 971 | 001180 | 05/26/15 | 05/26/16 |
| Extech Instruments Stop Watch | 9/23/2900 | 001379 | 11/19/15 | 11/19/16 |
| Tape Measure | C1-25 | 000915 | 12/04/15 | 12/04/16 |



TEST METHODS

Seasoning in Sample Orientation – LED Products

No seasoning was performed in accordance with IESNA LM-79.

Photometric and Electrical Measurements – Integrating Sphere Method

A Labsphere CDS 3020 Spectrometer and Three Meter 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. Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

The calibration of the sphere spectrometer 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 each sample.

Ambient temperature was measured equal to the height of the sample mounted on the Goniometer equipment. Each sample was operated at input rated voltage in its designated orientation. Each sample was allowed to stabilize for at least thirty minutes before measurements were made. Electrical measurements including voltage, current, and power were measured using the Yokogawa Power Analyzer.

Some graphics were created with Photometrics Plus software.

RESULTS OF TEST

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

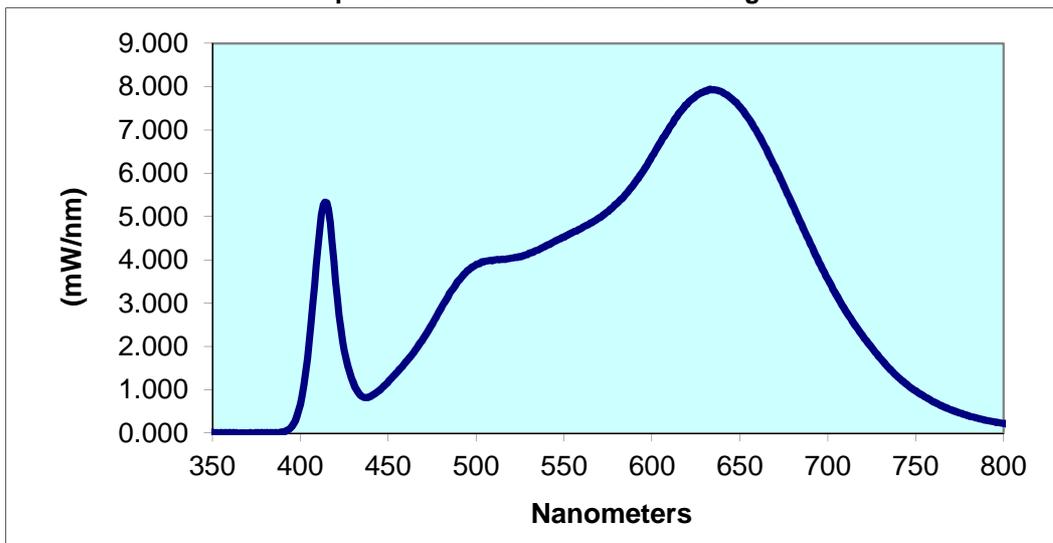
| Intertek Sample No. | Base Orientation | Input Voltage {Vac} | Input Current (mA) | Input Power (Watts) | Input Power Factor | Current ATHD (%) | Luminous Flux (Lumens) | Lumen Efficacy (LPW) |
|---------------------|------------------|---------------------|--------------------|---------------------|--------------------|------------------|------------------------|----------------------|
| LAN1512180812-003 | UP | 230.1 | 43.68 | 7.650 | 0.761 | 41.04 | 428.1 | 55.96 |

| Correlated Color Temperature (K) | CRI -Ra | CRI -R9 | DUV | CIE 31' Chromaticity Coordinate | CIE 31' Chromaticity Coordinate (y) | CIE 76' Chromaticity Coordinate (u') | CIE 76' Chromaticity Coordinate (v') |
|----------------------------------|---------|---------|-------|---------------------------------|-------------------------------------|--------------------------------------|--------------------------------------|
| 3012 | 95.4 | 98.6 | 0.001 | 0.438 | 0.408 | 0.250 | 0.523 |

Spectral Distribution over Visible Wavelengths

| nm | mW/nm |
|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|
| 350 | 0.024 | 440 | 0.852 | 530 | 4.151 | 620 | 7.600 | 710 | 2.833 |
| 355 | 0.013 | 445 | 0.990 | 535 | 4.227 | 625 | 7.789 | 715 | 2.517 |
| 360 | 0.015 | 450 | 1.187 | 540 | 4.334 | 630 | 7.897 | 720 | 2.233 |
| 365 | 0.002 | 455 | 1.405 | 545 | 4.437 | 635 | 7.924 | 725 | 1.975 |
| 370 | 0.003 | 460 | 1.644 | 550 | 4.529 | 640 | 7.876 | 730 | 1.716 |
| 375 | 0.010 | 465 | 1.895 | 555 | 4.635 | 645 | 7.732 | 735 | 1.492 |
| 380 | 0.006 | 470 | 2.194 | 560 | 4.734 | 650 | 7.527 | 740 | 1.292 |
| 385 | 0.007 | 475 | 2.519 | 565 | 4.851 | 655 | 7.261 | 745 | 1.122 |
| 390 | 0.022 | 480 | 2.881 | 570 | 4.977 | 660 | 6.933 | 750 | 0.972 |
| 395 | 0.145 | 485 | 3.234 | 575 | 5.116 | 665 | 6.552 | 755 | 0.838 |
| 400 | 0.662 | 490 | 3.526 | 580 | 5.303 | 670 | 6.142 | 760 | 0.727 |
| 405 | 2.092 | 495 | 3.751 | 585 | 5.519 | 675 | 5.708 | 765 | 0.629 |
| 410 | 4.326 | 500 | 3.891 | 590 | 5.773 | 680 | 5.273 | 770 | 0.541 |
| 415 | 5.314 | 505 | 3.967 | 595 | 6.057 | 685 | 4.820 | 775 | 0.465 |
| 420 | 3.513 | 510 | 3.994 | 600 | 6.390 | 690 | 4.375 | 780 | 0.403 |
| 425 | 1.913 | 515 | 4.009 | 605 | 6.729 | 695 | 3.949 | | |
| 430 | 1.170 | 520 | 4.043 | 610 | 7.065 | 700 | 3.550 | | |
| 435 | 0.846 | 525 | 4.073 | 615 | 7.364 | 705 | 3.178 | | |

Spectral Data Over Visible Wavelengths



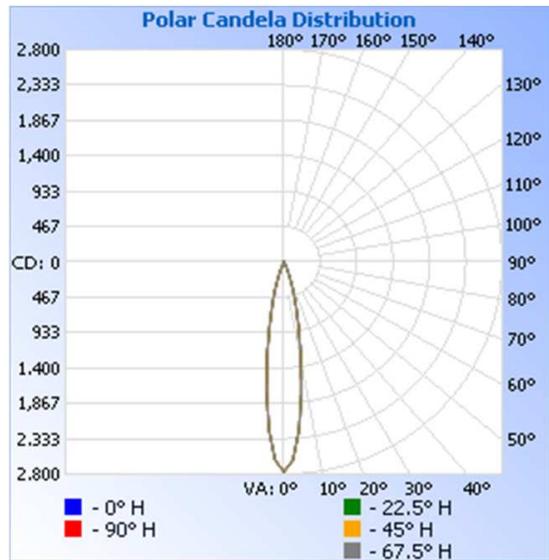
RESULTS OF TEST (cont'd)

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

| Intertek Sample No. | Base Orientation | Input Voltage {Vac} | Input Current (mA) | Input Power (Watts) | Input Power Factor | Absolute Luminous Flux (Lumens) | Lumen Efficacy (Lumens Per Watt) |
|---------------------|------------------|---------------------|--------------------|---------------------|--------------------|---------------------------------|----------------------------------|
| LAN1512180812-003 | UP | 230.0 | 43.70 | 7.651 | 0.760 | 412.8 | 53.95 |

Intensity (Candlepower) Summary at 25°C - Candelas

| Angle | 0 | 22.5 | 45 | 67.5 | 90 |
|-------|------|------|------|------|------|
| 0 | 2766 | 2766 | 2766 | 2766 | 2766 |
| 5 | 2221 | 2221 | 2221 | 2221 | 2221 |
| 10 | 1246 | 1246 | 1246 | 1246 | 1246 |
| 15 | 575 | 575 | 575 | 575 | 575 |
| 20 | 235 | 235 | 235 | 235 | 235 |
| 25 | 61 | 61 | 61 | 61 | 61 |
| 30 | 22 | 22 | 22 | 22 | 22 |
| 35 | 14 | 14 | 14 | 14 | 14 |
| 40 | 11 | 11 | 11 | 11 | 11 |
| 45 | 11 | 11 | 11 | 11 | 11 |
| 50 | 10 | 10 | 10 | 10 | 10 |
| 55 | 8 | 8 | 8 | 8 | 8 |
| 60 | 6 | 6 | 6 | 6 | 6 |
| 65 | 5 | 5 | 5 | 5 | 5 |
| 70 | 3 | 3 | 3 | 3 | 3 |
| 75 | 2 | 2 | 2 | 2 | 2 |
| 80 | 1 | 1 | 1 | 1 | 1 |
| 85 | 1 | 1 | 1 | 1 | 1 |
| 90 | 0 | 0 | 0 | 0 | 0 |

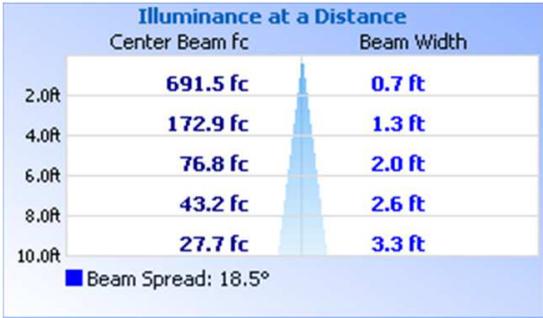


RESULTS OF TEST (cont'd)

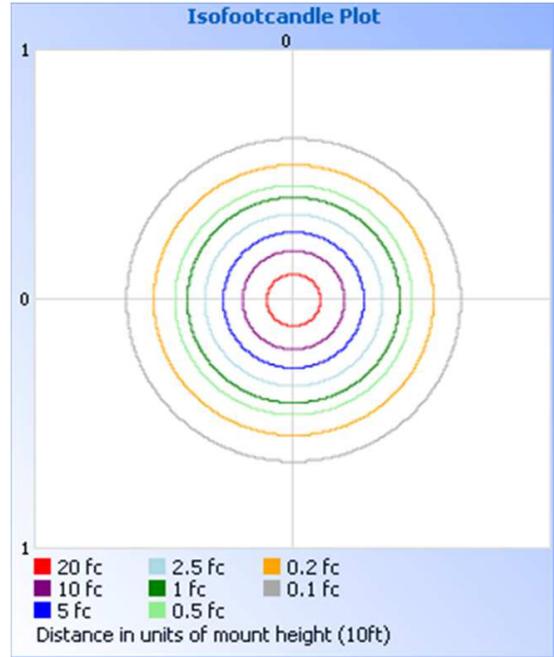
Illumination Plots

Mounting Height: 10 ft.

Illuminance - Cone of Light



Isoillumination Plot



Zonal Lumen Summary and Percentages at 25°C

| Zone | Lumens | % Luminaire |
|--------|--------|-------------|
| 0-30 | 380.4 | 92.1 |
| 0-40 | 389.8 | 94.4 |
| 0-60 | 405.2 | 98.1 |
| 60-90 | 7.6 | 1.8 |
| 0-90 | 412.8 | 100.0 |
| 90-180 | 0.1 | 0.0 |
| 0-180 | 412.8 | 100.0 |

Zonal Lumens and Percentages at 25°C

| Zone | Lumens | % Luminaire |
|--------|--------|-------------|
| 0-10 | 177.7 | 43.1 |
| 10-20 | 165.8 | 40.2 |
| 20-30 | 36.9 | 8.9 |
| 30-40 | 9.5 | 2.3 |
| 40-50 | 8.5 | 2.1 |
| 50-60 | 6.8 | 1.7 |
| 60-70 | 4.6 | 1.1 |
| 70-80 | 2.2 | 0.5 |
| 80-90 | 0.8 | 0.2 |
| 90-100 | 0.1 | 0.0 |

Flood Summary at 25°C

| | Efficiency (%) | Horizontal Lumens | Horizontal Spread (°) | Vertical Spread (°) |
|-----------|----------------|-------------------|-----------------------|---------------------|
| Field 10% | 82 | 338.4 | 38.7 | 38.7 |
| Beam 50% | 38.8 | 160.3 | 18.5 | 18.5 |
| Total | 100.2 | 413.5 | | |

PICTURE (not to scale)



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.

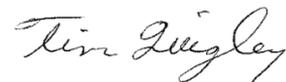
In Charge Of Tests:



Kenda Branch
Lighting Performance Team Lead
Lighting Division

Attachment: None

Report Reviewed By:



Timothy Quigley
Engineer
Lighting Division