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INDEPENDENT TEST LABORATORY REPORT No. 31907

Description:

OPTOLUM INC - LED DOWN LIGHT, CAT# DL LO 33
WITH WHITE INTERIOR AND FROSTED PLASTIC FOCUSING LENSES
THREE LEDS. LUMINAIRE OUTPUT = 245 LMS.
ONE HIGH PERFECTION LP1013-24 DRIVER OPERATING AT 120 VAC AND 4.87 WATTS

The sample(s) was(were) tested in accordance with the following applied standards/regulations:


IES LM-41-98: Approved Method for Photometric Testing of Indoor Fluorescent Luminaire (withdrawn)

IES LM-79-08: Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products

Prepared for:

OPTOLUM
TEMPE, AZ

Approved by:

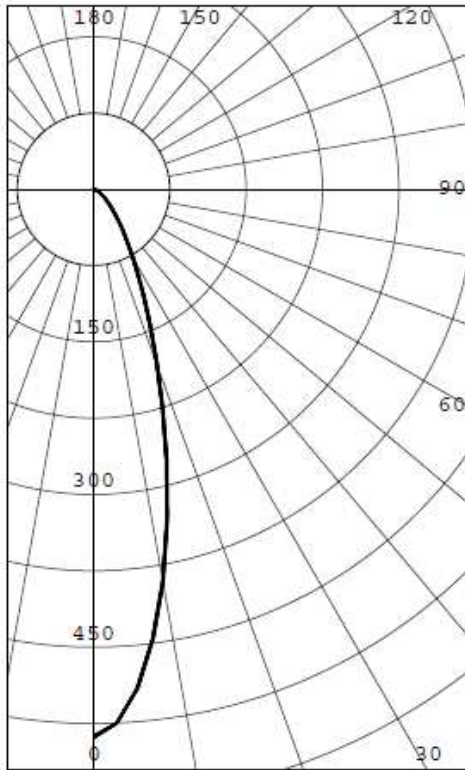
RYDER TUNNEY

STAFF ENGINEER
JUL 11, 2013

This report shall not be reproduced except in full without the written approval of the laboratory. The results in this report apply to the test sample(s) mentioned above at the time of the testing period only and are not to be used to indicate applicability to other similar products.

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INTENSITY (CANDLEPOWER) SUMMARY

| ANGLE | MEAN CP | LUMENS |
|-------|---------|--------|
| 0 | 538 | |
| 5 | 493 | 44 |
| 10 | 391 | |
| 15 | 277 | 76 |
| 20 | 181 | |
| 25 | 117 | 54 |
| 30 | 77 | |
| 35 | 51 | 32 |
| 40 | 34 | |
| 45 | 24 | 19 |
| 50 | 16 | |
| 55 | 12 | 11 |
| 60 | 8 | |
| 65 | 6 | 6 |
| 70 | 4 | |
| 75 | 2 | 2 |
| 80 | 1 | |
| 85 | 0 | 0 |
| 90 | 0 | |

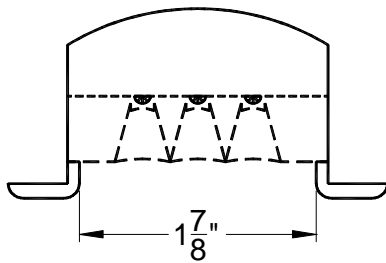
ZONAL LUMENS AND PERCENTAGES

| ZONE | LUMENS | % LUMINAIRE |
|--------|--------|-------------|
| 0-30 | 174 | 71.29 |
| 0-40 | 207 | 84.56 |
| 0-60 | 236 | 96.46 |
| 0-90 | 245 | 100.00 |
| 40-90 | 38 | 15.44 |
| 60-90 | 9 | 3.54 |
| 90-180 | 0 | 0.00 |
| 0-180 | 245 | 100.00 |

EFFICACY (LUMENS PER WATT): 50.3

*** THIS IS AN ABSOLUTE TEST ***

LUMINOUS DIAMETER: 1.875 INS



LUMINANCE SUMMARY CD./SQ.M.

S/MH: 0.5
 SC: 0.5

| ANGLE | MEAN CD/SQ M |
|-------|--------------|
| 45 | 18866 |
| 55 | 11334 |
| 65 | 7775 |
| 75 | 4871 |
| 85 | 1939 |

TESTED IN ACCORDANCE WITH IES PROCEDURES.

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INTENSITY(CANDLEPOWER) DATA
IN 2.5 DEGREE STEPS

| ANGLE | INTENSITY (CANDLEPOWER) | LUMENS |
|-------|----------------------------|--------|
| 0.0 | 538 | |
| 2.5 | 525 | |
| 5.0 | 493 | 44 |
| 7.5 | 446 | |
| 10.0 | 391 | |
| 12.5 | 334 | |
| 15.0 | 277 | 76 |
| 17.5 | 225 | |
| 20.0 | 181 | |
| 22.5 | 145 | |
| 25.0 | 117 | 54 |
| 27.5 | 95 | |
| 30.0 | 77 | |
| 32.5 | 62 | |
| 35.0 | 51 | 32 |
| 37.5 | 42 | |
| 40.0 | 34 | |
| 42.5 | 28 | |
| 45.0 | 24 | 19 |
| 47.5 | 20 | |
| 50.0 | 16 | |
| 52.5 | 14 | |
| 55.0 | 12 | 11 |
| 57.5 | 10 | |
| 60.0 | 8 | |
| 62.5 | 7 | |
| 65.0 | 6 | 6 |
| 67.5 | 5 | |
| 70.0 | 4 | |
| 72.5 | 3 | |
| 75.0 | 2 | 2 |
| 77.5 | 2 | |
| 80.0 | 1 | |
| 82.5 | 1 | |
| 85.0 | 0 | 0 |
| 87.5 | 0 | |
| 90.0 | 0 | |

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AVERAGE LUMINANCE DATA

CD./SQ.M (FOOTLAMBERTS)

| ANGLE | LUMINANCE |
|-------|-----------------|
| 0 | 302099 (88172) |
| 30 | 49740 (14517) |
| 40 | 25217 (7360) |
| 45 | 18866 (5506) |
| 50 | 14366 (4192) |
| 55 | 11334 (3308) |
| 60 | 9213 (2689) |
| 65 | 7775 (2269) |
| 70 | 6431 (1877) |
| 75 | 4871 (1421) |
| 80 | 3111 (908) |
| 85 | 1939 (566) |

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COEFFICIENTS OF UTILIZATION

ZONAL CAVITY METHOD

EFFECTIVE FLOOR CAVITY REFLECTANCE = .20

| CC WALL | 90 | | | | 80 | | | | 70 | | | | 50 | | | | 30 | | | | 10 | | | | 0 | |
|------------|----|-------|------|------|-----|-------|------|------|-----|-------|------|------|-----|-------|------|------|-------|-------|------|-------|------|-------|------|------|-----|------|
| | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 70 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 50 | 30 | 10 | 0 | |
| RCR | 0 | 1.221 | .221 | .221 | .22 | 1.191 | .191 | .191 | .19 | 1.161 | .161 | .161 | .16 | 1.111 | .111 | .111 | .11 | 1.061 | .061 | .061 | .06 | 1.021 | .021 | .021 | .02 | 1.00 |
| | 1 | 1.161 | .131 | .111 | .09 | 1.141 | .111 | .091 | .07 | 1.121 | .091 | .071 | .05 | 1.051 | .041 | .02 | 1.011 | .000 | .99 | 0.980 | .970 | .96 | 0.94 | | | |
| | 2 | 1.111 | .071 | .030 | .99 | 1.091 | .051 | .010 | .98 | 1.071 | .031 | .000 | .97 | 1.000 | .970 | .95 | 0.970 | .950 | .93 | 0.940 | .930 | .91 | 0.90 | | | |
| | 3 | 1.061 | .000 | .960 | .92 | 1.040 | .990 | .950 | .91 | 1.030 | .980 | .940 | .91 | 0.950 | .920 | .89 | 0.930 | .900 | .88 | 0.910 | .880 | .86 | 0.85 | | | |
| | 4 | 1.020 | .950 | .900 | .86 | 1.000 | .940 | .890 | .86 | 0.990 | .930 | .890 | .85 | 0.910 | .870 | .84 | 0.890 | .860 | .83 | 0.870 | .840 | .82 | 0.81 | | | |
| | 5 | 0.980 | .900 | .840 | .81 | 0.960 | .890 | .840 | .80 | 0.950 | .880 | .830 | .80 | 0.860 | .820 | .79 | 0.850 | .810 | .79 | 0.830 | .800 | .78 | 0.77 | | | |
| | 6 | 0.940 | .860 | .800 | .77 | 0.930 | .850 | .800 | .76 | 0.910 | .840 | .790 | .76 | 0.830 | .790 | .75 | 0.810 | .780 | .75 | 0.800 | .770 | .74 | 0.73 | | | |
| | 7 | 0.900 | .810 | .760 | .73 | 0.890 | .810 | .760 | .72 | 0.880 | .800 | .750 | .72 | 0.790 | .740 | .71 | 0.780 | .740 | .71 | 0.770 | .730 | .71 | 0.69 | | | |
| | 8 | 0.870 | .780 | .720 | .69 | 0.860 | .770 | .720 | .69 | 0.840 | .760 | .720 | .68 | 0.750 | .710 | .68 | 0.750 | .710 | .68 | 0.740 | .700 | .67 | 0.66 | | | |
| | 9 | 0.830 | .740 | .690 | .65 | 0.820 | .740 | .690 | .65 | 0.810 | .730 | .690 | .65 | 0.720 | .680 | .65 | 0.720 | .670 | .65 | 0.710 | .670 | .64 | 0.63 | | | |
| | 10 | 0.800 | .710 | .660 | .62 | 0.790 | .710 | .660 | .62 | 0.780 | .700 | .660 | .62 | 0.690 | .650 | .62 | 0.690 | .650 | .62 | 0.680 | .640 | .62 | 0.61 | | | |

THE ABOVE COEFFICIENTS HAVE BEEN CALCULATED BASED ON LUMINAIRE LUMENS
 BECAUSE IN AN ABSOLUTE TEST THE BARE LAMP LUMENS ARE UNKNOWN.
 LIGHTING DESIGN CALCULATIONS MADE USING THESE COEFFICIENTS SHOULD
 THEREFORE USE THE LUMINAIRE LUMENS IN THE CALCULATION FORMULA

LUMINAIRE INPUT WATTS 4.9

LABORATORY RESULTS MAY NOT BE REPRESENTATIVE OF FIELD PERFORMANCE.
 BALLAST AND FIELD FACTORS HAVE NOT BEEN APPLIED.

TEST DISTANCE EXCEEDS FIVE TIMES THE GREATEST
 LUMINOUS OPENING OF LUMINAIRE.

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ELECTRICAL MEASUREMENTS

| | | |
|----------------------------|-------|----------|
| INPUT VOLTAGE: | 120.0 | VOLTS AC |
| INPUT CURRENT: | 0.042 | AMPS |
| INPUT POWER: | 4.9 | WATTS |
| POWER FACTOR: | 96.6 | PERCENT |
| TOTAL HARMONIC DISTORTION: | 22.34 | PERCENT |
| OFF STATE POWER: | 0.00 | WATTS |

| | | |
|----------------------------|-------|----------|
| INPUT VOLTAGE: | 277.0 | VOLTS AC |
| INPUT CURRENT: | 0.030 | AMPS |
| INPUT POWER: | 6.4 | WATTS |
| POWER FACTOR: | 76.29 | PERCENT |
| TOTAL HARMONIC DISTORTION: | 26.88 | PERCENT |

LIGHT OUTPUT

| | | |
|-----------|------|------|
| LUMENS: | 245 | lm |
| EFFICACY: | 50.3 | lm/W |

SPECTRAL MEASUREMENTS

| | | |
|------------------------|--------|----|
| X: | 0.4330 | |
| Y: | 0.3969 | |
| u/u': | 0.2511 | |
| v: | 0.3453 | |
| v': | 0.5179 | |
| Duv: | 0.0024 | |
| CRI (R _a): | 85.1 | |
| CRI (R _g): | 28.5 | |
| CCT: | 3007 | K |
| RADIANT FLUX: | 798 | mW |

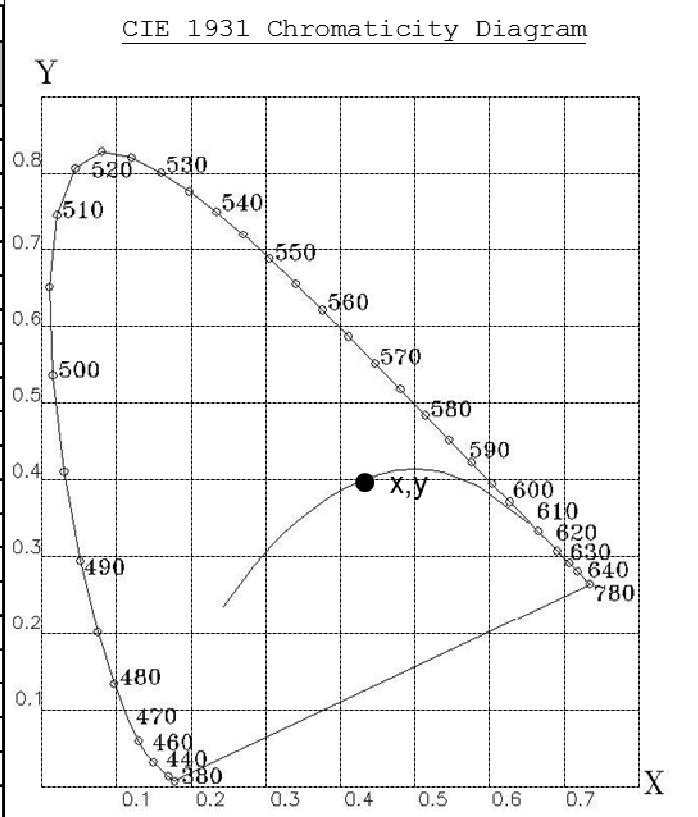
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Tabulated Spectral Power Distribution

| Wavelength [nm] | [mW/nm] | Wavelength [nm] | [mW/nm] |
|-----------------|---------|-----------------|---------|
| 380 | 0.01014 | 590 | 4.51651 |
| 390 | 0.01709 | 600 | 4.72682 |
| 400 | 0.02171 | 610 | 4.79031 |
| 410 | 0.05784 | 620 | 4.67058 |
| 420 | 0.21483 | 630 | 4.39634 |
| 430 | 0.68427 | 640 | 3.98116 |
| 440 | 1.73790 | 650 | 3.48583 |
| 450 | 2.79686 | 660 | 2.94806 |
| 460 | 1.57778 | 670 | 2.42612 |
| 470 | 1.03710 | 680 | 1.94566 |
| 480 | 0.85324 | 690 | 1.53145 |
| 490 | 1.03537 | 700 | 1.18099 |
| 500 | 1.48344 | 710 | 0.89901 |
| 510 | 1.94696 | 720 | 0.67958 |
| 520 | 2.31891 | 730 | 0.50691 |
| 530 | 2.60578 | 740 | 0.37762 |
| 540 | 2.88103 | 750 | 0.28040 |
| 550 | 3.16195 | 760 | 0.21031 |
| 560 | 3.49541 | 770 | 0.15609 |
| 570 | 3.85029 | 780 | 0.05792 |
| 580 | 4.21264 | | |



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LUMINOUS OPENING



SIDE VIEW



All testing was conducted in accordance with LM-79-08,

Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products as published by the Illuminating Engineering Society of North America (IESNA).

The condition of the item tested was new. Stabilization time before testing meets the stabilization requirements of LM-79-08.

The test results (luminous distribution and flux) were obtained by using a Lighting Sciences series 6000 Type C Moving Mirror Goniophotometer

- The photometric reference standard used is a set of three incandescent luminous intensity standard lamps calibrated and traceable to the U.S. National Institute of Standards and Technology.

The test results (colorimetric and luminous flux) were obtained by using a Labsphere Model LMS-760 Integrating Sphere. 4π geometry was used. Correction factors were applied for self-absorption.

- The colorimetric & photometric reference standard used is an incandescent spectral flux standard lamp calibrated and traceable to the U.S. National Institute of Standards and Technology.

Power measurements were obtained with a Yokogawa WT210 power analyzer.

Ambient temperature during testing was $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$, measured using an Omega model DP460.

Calibration certificates are on file at the laboratories of Lighting Sciences Inc.

The results in this report apply to the test sample(s) mentioned in this report at the time of the testing period only and are not to be used to indicate applicability to other similar products.