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## Energy Star Test Report

For

**Espen Technology, Inc.**

**(Brand Name: Espen)**

12257 FLORENCE AVE SANTA FE SPRINGS, CA 90670 USA

**Model name(s): VEKR9.5D/9T/40W-10V**

**Report Type:** Testing and Report According to ENERGY STAR® Program  
Requirements Product Specification for Luminaires (Light  
Fixtures) - Version 2.2

**Type of  
Luminaire:** Downlights

**Report Date:** 2019-12-13  
Ningbo TengLi Testing Co., Ltd

**Prepared By:** 2nd floor, Block B, Ningbo Testing and Certification Base,  
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Ningbo, Zhejiang

Test & Report By:

*Xeon Ren*

Engineer: Xeon Ren

Review By:

*Johnson Sun*

Manager: Johnson Sun

Note: 1.The results contained in this report pertain only to the tested samples.

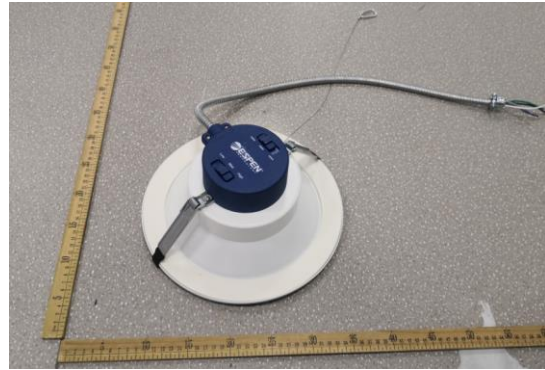
2.This report does not imply product certification, approval, or endorsement by A2LA, or any  
agency of the Federal Government.



| 1.1 Product Information:                                                |                            |     |
|-------------------------------------------------------------------------|----------------------------|-----|
| Model Number                                                            | VEKR9.5D/9T/40W-10V        |     |
| Remark                                                                  | N/A                        |     |
| Representative (Tested) Model                                           | VEKR9.5D/9T/40W-10V        |     |
| Model Difference                                                        | N/A                        |     |
| SKU (if available)                                                      | N/A                        |     |
| Type of Luminaire<br>(for integral lamps, list base type and lamp type) | Downlights                 |     |
| LED Manufacturer                                                        | Seoul Semiconductor Co.LTD |     |
| LED Model                                                               | SAWxA32E-xx                |     |
| Dimming                                                                 | Dimmable                   |     |
| Sample Number                                                           | STD190468NB-D1             |     |
| Date of Receipt                                                         | Dec.10, 2019               |     |
| Luminaire Aperture (for downlights)                                     | --                         | in. |
| Luminaire Length                                                        | --                         | mm  |
| Luminaires Width                                                        | --                         | mm  |
| Number of Units (modular products)                                      | N/A                        | s   |

| 1.2 Rated Values:         |                   |
|---------------------------|-------------------|
| Rated Voltage / Frequency | 120Vac,60 Hz      |
| Nominal Power             | 40W               |
| Rated Initial Lamp Lumen  | --                |
| Declared CCT              | 3000K,3500K,4000K |

### 1.3 Product Photos





#### 1.4 Test Specifications:

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test item                  | <ol style="list-style-type: none"> <li>1. Total Luminous Flux</li> <li>2. Luminous Distribution Intensity</li> <li>3. Luminous Efficacy</li> <li>4. Correlated Color Temperature</li> <li>5. Color Rendering Index</li> <li>6. Chromaticity Coordinate</li> <li>7. Electrical Parameters</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Reference Standard         | <ol style="list-style-type: none"> <li>1. IES LM-79-2008 Electrical and Photometric Measurements of Solid-State Lighting Products</li> <li>2. ANSI C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products</li> <li>3. CIE 13.3-1995 Method of Measuring and Specifying Colour Rendering Properties of Light Sources</li> <li>4. CIE 15-2004 Technical Report Colorimetry</li> <li>5. IESNA LM-16-93 Practical Guide to Colorimetry of Light Source</li> <li>6. IESNA TM-16-05 Technical Memorandum on Light Emitting Diode (LED) Sources and Systems</li> <li>7. UL1993 4<sup>th</sup> Edition, Self-Ballasted Lamps and Lamp Adapters</li> <li>8. ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) – Version 2.2</li> </ol> |
| Reference Work Instruction | QD25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Remark                     | <p>Below test and data are not covered by A2LA accreditation:</p> <ul style="list-style-type: none"> <li>- Operating Frequency</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



## 1.5 Test Methods

### 1) Photometric and Light Distribution Measurement – Goniophotometer Method:

Photometric parameters were measured using the goniophotometer and software. The ambient temperature shall be maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ , measured at a point not more than 1 m from the sample and at the same height as the sample. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Luminous flux, luminaire efficacy, zonal lumen were calculated from the software taken at  $1^{\circ}$  vertical intervals and  $22.5^{\circ}$  horizontal intervals.

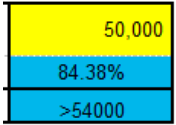
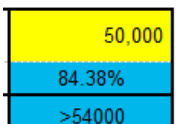
### 2) Chromaticity Measurement – Sphere-Spectroradiometer Method:

Chromaticity parameters were measured using an integrating sphere, a spectroradiometer and software. The ambient temperature condition inside the sphere was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample measurements were made using a spectroradiometer connected by a fiber optic cable and detector through the detector port of the integrating sphere. The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Chromaticity coordinates, correlated color temperature and color rendering index were calculated from the spectral power distribution taken at 5 nm intervals over the range of 380 to 780 nm.

### 3) Electrical Measurements:

Electrical parameters were measured using power meters incorporated in goniophotometer or sphere-spectroradiometer system. The ambient temperature surrounding the sample was maintained at  $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ . The sample was operated at 120 or rated Volts AC, 60Hz. It was stabilized before measurement was made. Voltage, frequency, current, power, power factor and total harmonic distortion were measured by and read from the power meter.

## 2.1 Summary of Test Result

| Criteria Item                             | The Type of Luminaires                    | Requirement (ES for Luminaires V2.2)                                                                                                                                                           | Measured Value                                                                       | Status |
|-------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------|
| Input Wattage                             | All                                       | $\leq$ Rated Wattage                                                                                                                                                                           | 37.82W                                                                               | Pass   |
| Luminous Efficacy                         | Downlights                                | $\geq 55$ lm/W                                                                                                                                                                                 | 82.66lm/W                                                                            | Pass   |
| Luminaire Minimum Light Output            | Downlights                                | $\leq 4.5''$ aperture: 345 lumens<br>$> 4.5''$ aperture: 575 lumens                                                                                                                            | 3125.8lm                                                                             | Pass   |
| Luminaire Zonal Lumen Density Requirement | Downlights                                | $\geq 75\%$ of total initial lumens within the 0-60 °zone                                                                                                                                      | 88.5                                                                                 | Pass   |
| Correlated Color Temperature (CCT)        | Solid State                               | Shall be capable of providing at least one of the following nominal correlated color temperatures (CCTs):<br>• 2700 Kelvin<br>• 3000 Kelvin<br>• 3500 Kelvin<br>• 4000 Kelvin<br>• 5000 Kelvin | 3051K<br>Duv=-0.0014                                                                 | Pass   |
| Color Rendering Index (CRI)               | Solid State                               | $R_a \geq 80$ $R_9 > 0$                                                                                                                                                                        | $R_a = 94.7$<br>$R_9 = 77$                                                           | Pass   |
| Color Angular Uniform                     | Directional Solid State Indoor Luminaires | The variation of chromaticity shall be within 0.006 from the weighted average point on the CIE 1976(u',v') diagram                                                                             | 0.0050                                                                               | Pass   |
| Lumen Maintenance                         | Solid State Option 1:                     | L70 lumen maintenance:<br>$\geq 25,000$ hours for indoor<br>$\geq 35,000$ hours for outdoor<br>$\geq 50,000$ hours for inseparable luminaires                                                  |  | Pass   |
| Light Source Life                         | Solid State                               | L70 lumen maintenance:<br>$\geq 25,000$ hours for indoor<br>$\geq 35,000$ hours for outdoor<br>$\geq 50,000$ hours for inseparable luminaires                                                  |  | Pass   |



|                              |                               |                                                                                                                                                                                                                                             |                            |      |
|------------------------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------|
| Color Maintenance            | Solid State Indoor Luminaires | $\Delta u'v' \leq 0.007$                                                                                                                                                                                                                    | Max.0.0035 in LM-80 report | Pass |
| Source Start Time            | Solid State                   | <750 ms                                                                                                                                                                                                                                     | 384ms                      | Pass |
| Power Factor                 | Solid State                   | Total luminaire input power $\leq 5$ watts: PF $\geq 0.5$<br>Total luminaire input power > 5 watts: PF $\geq 0.7$                                                                                                                           | 0.9871                     | Pass |
| Transient Protection         | Solid State                   | The line transient shall consist of seven strikes of a 100 kHz ring wave, 2.5 kV level, for both common mode and differential mode.                                                                                                         | Survival                   | Pass |
| Standby Power Consumption    | All Luminaires                | Luminaires shall not draw power in the off state.                                                                                                                                                                                           | 0W                         | Pass |
| Operating Frequency          | Solid State                   | Frequency $\geq 120$ Hz                                                                                                                                                                                                                     | 120.37Hz                   | Pass |
| Light Source Replaceability  | Solid State                   | LED light engines or retrofit kits shall make use of electrical interconnects that allow for consumer replacement of the engine or kit without the cutting of wires or the use of solder.                                                   | Pin connector              | Pass |
| Driver Replaceability        | Solid State: Directional      | Drivers shall be accessible and removable by an electrician without the cutting of wires and without damage to the luminaire housing, trim, decorative elements or the carpentry (e.g., ceilingdrywall) to which the luminaire is attached. | N/A                        | N/A  |
| Maximum Measured Driver Case | Solid State                   | shall not exceed the driver manufacturer's maximum recommended temperature                                                                                                                                                                  | 55.2 °C                    | Pass |



|                                        |                             |                                                                                                                                                                                                   |                                        |      |
|----------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------|
| Temperature                            |                             | during in situ operation.<br>$\leq 105\text{ }^{\circ}\text{C}$                                                                                                                                   |                                        |      |
| Maximum In-Situ Source Temperature     | Solid State                 | Maximum permitted Ts temperature for<br>L70 $\geq$ 50,000 hrs<br>$\leq 105\text{ }^{\circ}\text{C}$                                                                                               | 65.1 $^{\circ}\text{C}$                | Pass |
| Electronic Driver Safety               | Solid State:<br>Directional | Demonstrate compliance with<br>ANSI/UL 1310-2010,<br>ANSI/UL 2108-2004,<br>ANSI/UL 8750-2009, as applicable.                                                                                      | Driver safety report has been verified | Pass |
| Dimming                                | Solid State                 | The luminaire and its components shall provide continuous dimming from 100% to 20% of total light output.<br>Luminaire shall not emit noise above 24dBA at 1 meter or less at the minimum output. | Validated                              | Pass |
| Warranty Requirements                  | Solid State                 | incorporating replaceable drivers: $\geq 3$ years<br>incorporating non-replaceable drivers: $\geq 5$ years                                                                                        | 5 years                                | Pass |
| Lighting Toxics Reduction Requirements | Solid State                 | Luminaires and lamps shall not exceed:<br>1000 ppm: Mercury, Lead, Hexavalent Chromium, PBB and PBDE<br>100 ppm: Cadmium                                                                          | RoHS report has been verified          | Pass |
| CCT                                    | Solid State                 | Packaging shall clearly describe the nominal color designation in units of Kelvin (e.g. 2700K, 3000K).                                                                                            | 3000K,3500K, 4000K                     | Pass |



|                                                                                                        |                       |
|--------------------------------------------------------------------------------------------------------|-----------------------|
| <b>2.2.1 Electrical, Photometric and Chromaticity Measurements</b><br>(Refer to Work Instruction QD25) | <b>IES LM-79 2008</b> |
|--------------------------------------------------------------------------------------------------------|-----------------------|

|                             |                          |                          |                          |
|-----------------------------|--------------------------|--------------------------|--------------------------|
| <b>Test Date:</b>           | 2019-12-13               | <b>Test Ambient:</b>     | 25 deg C                 |
| <b>Sample No.</b>           | <b>3000K 23W setting</b> | <b>3000K 31W setting</b> | <b>3000K 40W setting</b> |
| STD190468NB-D1              |                          |                          |                          |
| Test Voltage (V)            | 120.0                    | 120.0                    | 120.0                    |
| Frequency (Hz)              | 60                       | 60                       | 60                       |
| CCT (K)                     | 3041                     | 3041                     | 3051                     |
| Duv                         | -0.0018                  | -0.0019                  | -0.0014                  |
| Chromaticity (x, y)         | x=0.4315 y=0.3978        | x=0.4314 y=0.3975        | x=0.4315 y=0.3988        |
| Chromaticity (u', v')       | u'=0.2498 v'=0.5181      | u'=0.2498 v'=0.5179      | u'=0.2493 v'=0.5185      |
| Color Rendering Index (CRI) | 95.1                     | 94.9                     | 94.7                     |
| R9                          | 78                       | 77                       | 77                       |
| Total Luminous (lm)         | 2001                     | 2574                     | 3125.8                   |
| Power(W)                    | 22.27                    | 30.15                    | 37.82                    |
| Luminous Efficacy (lm/W)    | 89.85                    | 85.37                    | 82.66                    |



|                  |                                       |                          |         |
|------------------|---------------------------------------|--------------------------|---------|
| Test date        | 2019-12-13                            | Test Ambient:            | 25.0 °C |
| Test Orientation | As intended                           | Stabilization Time (min) | 90      |
| Model Number     | VEKR9.5D/9T/40W-10V 3000K 40W setting |                          |         |

#### Electrical Measurement:

| Sample No.     | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|----------------|---------------|-----------------|-------------|-----------|--------------|
| STD190468NB-D1 | 120.1         | 60.01           | 0.3189      | 37.82     | 0.9871       |
|                | 277.03        | 60.01           | 0.1400      | 37.51     | 0.9672       |

#### Sphere-Spectroradiometer Method:

| Parameter                   | Result  |
|-----------------------------|---------|
| Test Voltage (V)            | 120.0   |
| Frequency (Hz)              | 60      |
| Color Rendering Index (CRI) | 94.7    |
| R9                          | 77      |
| CCT (K)                     | 3051    |
| Duv                         | -0.0014 |

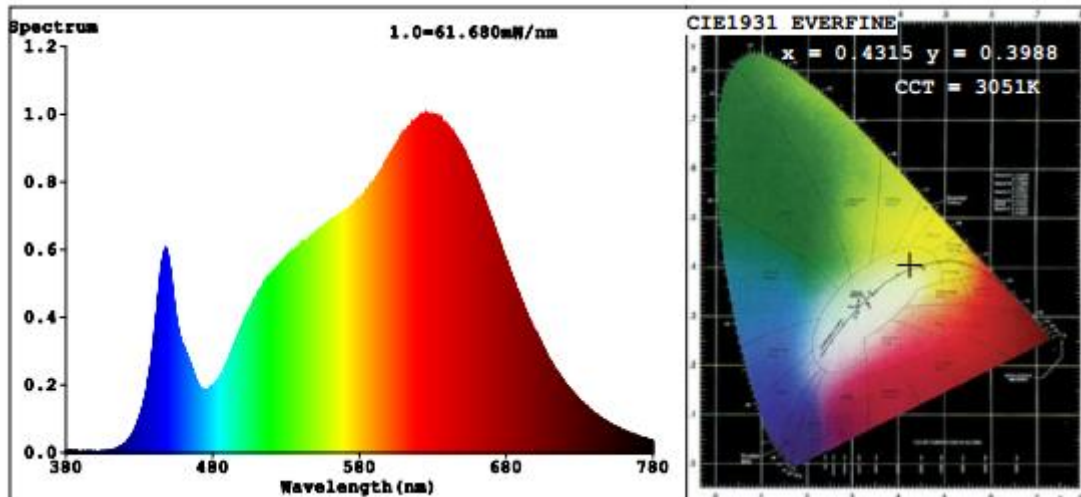
#### Goniophotometer Method:

| Parameter                     | Result |
|-------------------------------|--------|
| Test Voltage (V)              | 120.0  |
| Frequency (Hz)                | 60     |
| Total Luminous (lm)           | 3125.8 |
| Luminous Efficacy (lm/W)      | 82.66  |
| Beam Angle °                  | 102.8  |
| Center Beam Candle Power (cd) | 1312   |

#### Sphere-Spectroradiometer Method:

| Parameter                | Result |
|--------------------------|--------|
| Test Voltage (V)         | 277.0  |
| Frequency (Hz)           | 60     |
| Total Luminous (lm)      | 3017   |
| Luminous Efficacy (lm/W) | 80.43  |

## Spectral Power Distribution and Chromaticity Diagram

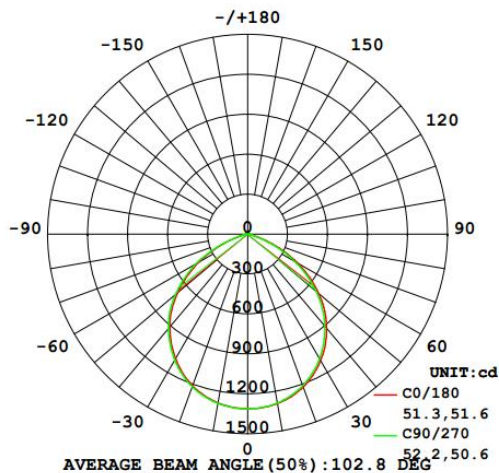


## Colorimetric Parameters

Chromaticity Coordinate:  $x=0.4315$   $y=0.3988$   $u'=0.2493$   $v'=0.5185$   
 CCT=3051K(Duv=-0.0014) Dominant WL:Ld =583.1nm WL:Lc = --nm Purity=49.2%  
 Ratio:R=24.4% G=72.9% B=2.7% Peak WL:Lp=625.2nm FWHM=170.7nm  
 Render Index:Ra=94.7 AvgR=92.6 TM30:Rf=92 Rg=103

|        |        |        |        |        |        |               |
|--------|--------|--------|--------|--------|--------|---------------|
| R1 =96 | R2 =96 | R3 =94 | R4 =95 | R5 =96 | R6 =95 | R7 =95        |
| R8 =90 | R9 =77 | R10=90 | R11=95 | R12=84 | R13=96 | R14=96 R15=94 |

## Zonal Lumen Tabulation



| Zonal Lumen Summary |         |             |
|---------------------|---------|-------------|
| Zone                | Lumens  | % Luminaire |
| 0-30                | 1,012.8 | 32.4%       |
| 0-40                | 1,641.7 | 52.5%       |
| 0-60                | 2,766.9 | 88.5%       |
| 60-90               | 358.5   | 11.5%       |
| 70-100              | 77.7    | 2.5%        |
| 90-120              | 0.0     | 0%          |
| 0-90                | 3,125.4 | 100%        |
| 90-180              | 0.0     | 0%          |
| 0-180               | 3,125.4 | 100%        |

| Lumens Per Zone |        |         |         |        |         |
|-----------------|--------|---------|---------|--------|---------|
| Zone            | Lumens | % Total | Zone    | Lumens | % Total |
| 0-10            | 124.2  | 4.0%    | 90-100  | 0.0    | 0%      |
| 10-20           | 355.2  | 11.4%   | 100-110 | 0      | 0%      |
| 20-30           | 533.4  | 17.1%   | 110-120 | 0      | 0%      |
| 30-40           | 628.9  | 20.1%   | 120-130 | 0      | 0%      |
| 40-50           | 623.6  | 20.0%   | 130-140 | 0      | 0%      |
| 50-60           | 501.5  | 16.0%   | 140-150 | 0      | 0%      |
| 60-70           | 280.8  | 9.0%    | 150-160 | 0      | 0%      |
| 70-80           | 67.6   | 2.2%    | 160-170 | 0      | 0%      |
| 80-90           | 10.1   | 0.3%    | 170-180 | 0      | 0%      |



Table--1 UNIT: cd

| C (DEG)<br>γ (DEG) | 0    | 22.5 | 45   | 67.5 | 90   | 112.5 | 135  | 157.5 | 180  | 202.5 | 225  | 247.5 | 270  | 292.5 | 315  | 337.5 |  |
|--------------------|------|------|------|------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|--|
| 0                  | 1312 | 1312 | 1312 | 1312 | 1312 | 1312  | 1312 | 1312  | 1312 | 1312  | 1312 | 1312  | 1312 | 1312  | 1312 | 1312  |  |
| 5                  | 1307 | 1307 | 1306 | 1306 | 1306 | 1304  | 1306 | 1305  | 1306 | 1306  | 1306 | 1306  | 1307 | 1307  | 1308 | 1308  |  |
| 10                 | 1292 | 1292 | 1289 | 1290 | 1288 | 1286  | 1287 | 1286  | 1288 | 1288  | 1288 | 1291  | 1292 | 1292  | 1293 | 1292  |  |
| 15                 | 1264 | 1263 | 1260 | 1259 | 1256 | 1254  | 1255 | 1255  | 1256 | 1258  | 1259 | 1261  | 1262 | 1263  | 1264 | 1264  |  |
| 20                 | 1221 | 1220 | 1217 | 1215 | 1211 | 1209  | 1209 | 1209  | 1211 | 1214  | 1215 | 1218  | 1219 | 1220  | 1222 | 1221  |  |
| 25                 | 1165 | 1163 | 1160 | 1157 | 1152 | 1150  | 1151 | 1150  | 1153 | 1156  | 1159 | 1161  | 1163 | 1164  | 1167 | 1166  |  |
| 30                 | 1096 | 1094 | 1090 | 1087 | 1080 | 1077  | 1078 | 1078  | 1082 | 1086  | 1089 | 1092  | 1094 | 1096  | 1098 | 1098  |  |
| 35                 | 1015 | 1013 | 1008 | 1003 | 996  | 993   | 994  | 994   | 1000 | 1004  | 1008 | 1011  | 1014 | 1016  | 1019 | 1018  |  |
| 40                 | 923  | 920  | 914  | 908  | 902  | 899   | 899  | 901   | 909  | 915   | 918  | 922   | 924  | 925   | 928  | 927   |  |
| 45                 | 817  | 814  | 808  | 800  | 794  | 791   | 792  | 794   | 807  | 814   | 819  | 823   | 827  | 828   | 829  | 828   |  |
| 50                 | 697  | 692  | 685  | 678  | 672  | 668   | 670  | 674   | 688  | 695   | 702  | 706   | 710  | 710   | 711  | 709   |  |
| 55                 | 567  | 562  | 555  | 547  | 541  | 538   | 541  | 545   | 559  | 568   | 575  | 581   | 583  | 584   | 583  | 580   |  |
| 60                 | 431  | 424  | 416  | 407  | 403  | 401   | 403  | 410   | 423  | 432   | 440  | 446   | 449  | 449   | 448  | 443   |  |
| 65                 | 288  | 281  | 273  | 265  | 260  | 258   | 261  | 266   | 281  | 290   | 298  | 304   | 307  | 307   | 305  | 300   |  |
| 70                 | 151  | 144  | 138  | 132  | 128  | 127   | 128  | 133   | 145  | 151   | 157  | 162   | 165  | 166   | 164  | 161   |  |
| 75                 | 54.1 | 51.3 | 48.4 | 46.2 | 44.9 | 44.7  | 45.4 | 46.9  | 51.1 | 53.7  | 56.3 | 58.7  | 60.6 | 61.1  | 60.7 | 58.9  |  |
| 80                 | 22.1 | 21.4 | 20.6 | 20.0 | 19.6 | 19.5  | 19.7 | 20.1  | 21.3 | 22.0  | 22.7 | 23.3  | 23.7 | 23.7  | 23.6 | 23.2  |  |
| 85                 | 8.99 | 8.52 | 8.02 | 7.58 | 7.28 | 7.12  | 7.18 | 7.41  | 8.36 | 8.81  | 9.29 | 9.70  | 10.2 | 10.2  | 10.2 | 9.88  |  |
| 90                 | 0.03 | 0.01 | 0.01 | 0.00 | 0.03 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.03  | 0.14 | 0.16  | 0.22 | 0.12  |  |
| 95                 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 100                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 105                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 110                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 115                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 120                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 125                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 130                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 135                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 140                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 145                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 150                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 155                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 160                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 165                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 170                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 175                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |
| 180                | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  | 0.00 | 0.00  |  |



|                                                                                                        |                       |
|--------------------------------------------------------------------------------------------------------|-----------------------|
| <b>2.2.2 Electrical, Photometric and Chromaticity Measurements</b><br>(Refer to Work Instruction QD25) | <b>IES LM-79 2008</b> |
|--------------------------------------------------------------------------------------------------------|-----------------------|

|                         |                     |                                 |         |
|-------------------------|---------------------|---------------------------------|---------|
| <b>Test date</b>        | 2019-12-13          | <b>Test Ambient:</b>            | 25.0 °C |
| <b>Test Orientation</b> | As intended         | <b>Stabilization Time (min)</b> | 90      |
| <b>Model Number</b>     | VEKR9.5D/9T/40W-10V | 3500K 40W setting               |         |

**Electrical Measurement:**

| Sample No.     | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|----------------|---------------|-----------------|-------------|-----------|--------------|
| STD190468NB-D1 | 119.94        | 60              | 0.3124      | 36.77     | 0.9814       |
|                | 277.06        | 60              | 0.1358      | 36.35     | 0.9663       |

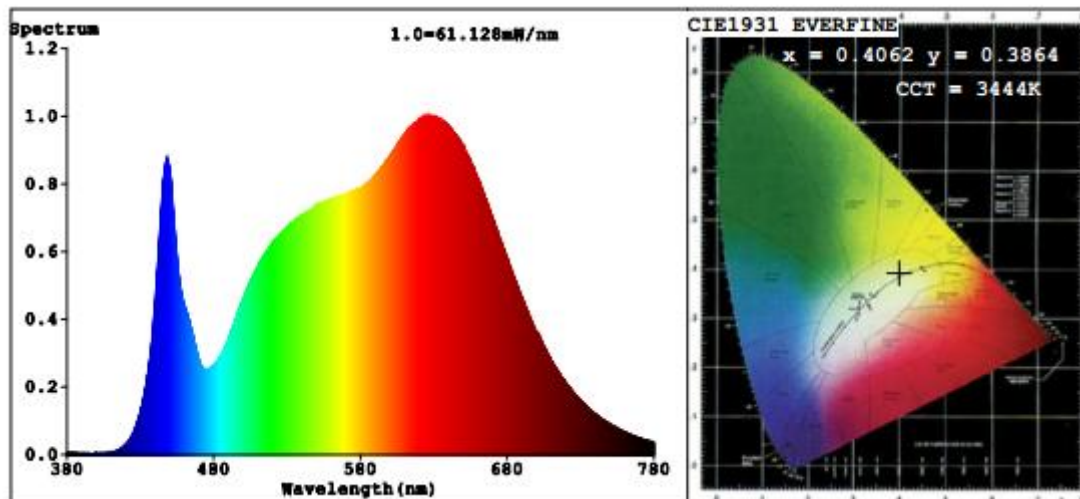
**Sphere-Spectroradiometer Method:**

| Parameter                   | Result  |
|-----------------------------|---------|
| Test Voltage (V)            | 120.0   |
| Frequency (Hz)              | 60      |
| Color Rendering Index (CRI) | 95.6    |
| R9                          | 86      |
| CCT (K)                     | 3444    |
| Duv                         | -0.0021 |
| Total Luminous (lm)         | 3373    |
| Luminous Efficacy (lm/W)    | 91.73   |

**Sphere-Spectroradiometer Method:**

| Parameter                | Result |
|--------------------------|--------|
| Test Voltage (V)         | 277.0  |
| Frequency (Hz)           | 60     |
| Total Luminous (lm)      | 3327   |
| Luminous Efficacy (lm/W) | 91.53  |

## Spectral Power Distribution and Chromaticity Diagram



## Colorimetric Parameters

Chromaticity Coordinate:  $x=0.4062$   $y=0.3864$   $u'=0.2381$   $v'=0.5096$   
CCT=3444K (Duv=-0.0021) Dominant WL:Ld =582.0nm WL:Lc = --nm Purity=37.9%  
Ratio:R=22.5% G=74.2% B=3.3% Peak WL:Lp=627.8nm FWHM=183.0nm  
Render Index:Ra=95.6 AvgR=93.8 TM30:Rf=93 Rg=103

|        |        |        |        |        |        |               |
|--------|--------|--------|--------|--------|--------|---------------|
| R1 =98 | R2 =97 | R3 =93 | R4 =95 | R5 =97 | R6 =94 | R7 =96        |
| R8 =95 | R9 =86 | R10=90 | R11=94 | R12=81 | R13=98 | R14=95 R15=97 |



|                                                                                                        |                       |
|--------------------------------------------------------------------------------------------------------|-----------------------|
| <b>2.2.3 Electrical, Photometric and Chromaticity Measurements</b><br>(Refer to Work Instruction QD25) | <b>IES LM-79 2008</b> |
|--------------------------------------------------------------------------------------------------------|-----------------------|

|                         |                     |                                 |         |
|-------------------------|---------------------|---------------------------------|---------|
| <b>Test date</b>        | 2019-12-13          | <b>Test Ambient:</b>            | 25.0 °C |
| <b>Test Orientation</b> | As intended         | <b>Stabilization Time (min)</b> | 90      |
| <b>Model Number</b>     | VEKR9.5D/9T/40W-10V | 4000K 40W setting               |         |

**Electrical Measurement:**

| Sample No.     | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) | Power Factor |
|----------------|---------------|-----------------|-------------|-----------|--------------|
| STD190468NB-D1 | 119.93        | 60              | 0.3177      | 37.34     | 0.9801       |
|                | 276.98        | 60              | 0.1388      | 37.35     | 0.9712       |

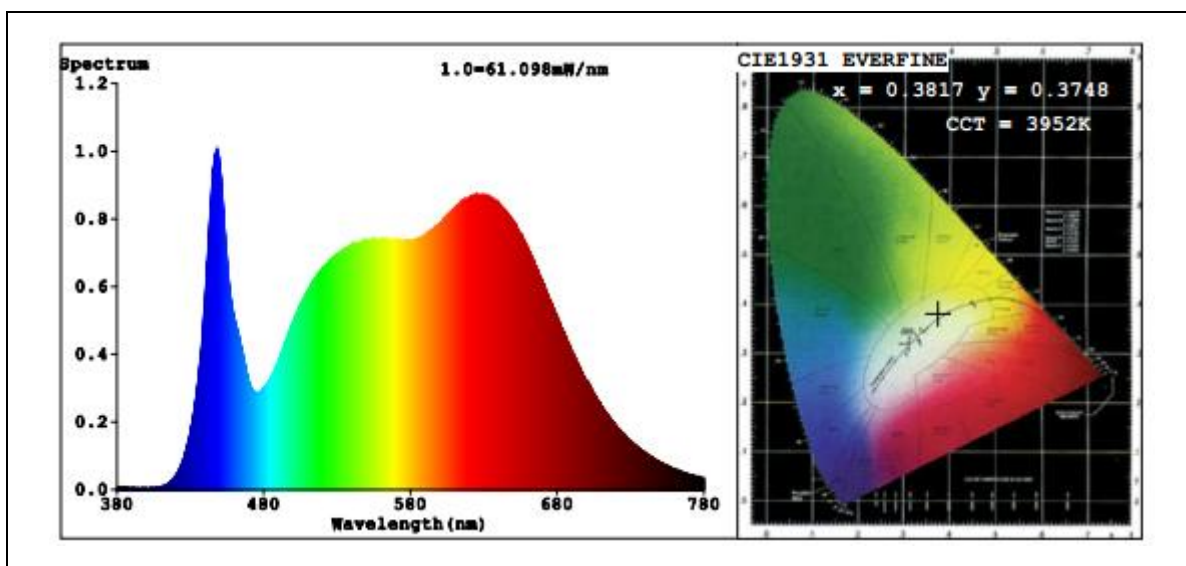
**Sphere-Spectroradiometer Method:**

| Parameter                   | Result  |
|-----------------------------|---------|
| Test Voltage (V)            | 120.0   |
| Frequency (Hz)              | 60      |
| Color Rendering Index (CRI) | 95.0    |
| R9                          | 89      |
| CCT (K)                     | 3952    |
| Duv                         | -0.0013 |
| Total Luminous (lm)         | 3251    |
| Luminous Efficacy (lm/W)    | 87.06   |

**Sphere-Spectroradiometer Method:**

| Parameter                | Result |
|--------------------------|--------|
| Test Voltage (V)         | 277.0  |
| Frequency (Hz)           | 60     |
| Total Luminous (lm)      | 3263   |
| Luminous Efficacy (lm/W) | 87.36  |

## Spectral Power Distribution and Chromaticity Diagram



## Colorimetric Parameters

Chromaticity Coordinate:  $x=0.3817$   $y=0.3748$   $u'=0.2267$   $v'=0.5009$   
CCT=3952K (Duv=-0.0013) Dominant WL:Ld =580.0nm WL:Lc = --nm Purity=27.0%  
Ratio:R=20.5% G=75.7% B=3.9% Peak WL:Lp=448.1nm FWHM=21.0nm  
Render Index:Ra=95.0 AvgR=93.2 TM30:Rf=93 Rg=103

|        |        |        |        |        |        |               |
|--------|--------|--------|--------|--------|--------|---------------|
| R1 =98 | R2 =96 | R3 =91 | R4 =95 | R5 =96 | R6 =93 | R7 =96        |
| R8 =96 | R9 =89 | R10=88 | R11=94 | R12=77 | R13=97 | R14=95 R15=98 |



|                                     |                                                                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>2.3 Color Spatial Uniformity</b> | <b>IES LM-79 2008</b><br><b>ENERGY STAR® Program Requirements</b><br><b>Product Specification for Luminaires (Light Fixtures) - Version 2.2</b> |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|

### Test Data:

|                |                       |              |         |
|----------------|-----------------------|--------------|---------|
| Test date      | 2019-12-13            | Test Ambient | 25.1 °C |
| Sample No.     | Maximum $\Delta u'v'$ |              |         |
| STD190468NB-D1 | 0.0050                |              |         |

| Gamma\ C | CIE u' | CIE v' | du'v'  | CIE u' | CIE v' | du'v'  |
|----------|--------|--------|--------|--------|--------|--------|
| -52      | 0.2461 | 0.5181 | 0.005  | 0.2464 | 0.5181 | 0.0048 |
| -51      | 0.2462 | 0.5182 | 0.0049 | 0.2466 | 0.5183 | 0.0045 |
| -50      | 0.2465 | 0.5183 | 0.0046 | 0.2469 | 0.5184 | 0.0042 |
| -49      | 0.2466 | 0.5184 | 0.0044 | 0.2472 | 0.5186 | 0.0038 |
| -48      | 0.2471 | 0.5186 | 0.0039 | 0.2473 | 0.5187 | 0.0037 |
| -47      | 0.2472 | 0.5187 | 0.0038 | 0.2477 | 0.5189 | 0.0032 |
| -46      | 0.2474 | 0.5188 | 0.0035 | 0.2478 | 0.519  | 0.0031 |
| -45      | 0.2475 | 0.5189 | 0.0034 | 0.248  | 0.5191 | 0.0029 |
| -44      | 0.2479 | 0.5191 | 0.003  | 0.2483 | 0.5193 | 0.0025 |
| -43      | 0.2481 | 0.5192 | 0.0027 | 0.2484 | 0.5194 | 0.0024 |
| -42      | 0.2482 | 0.5193 | 0.0026 | 0.2486 | 0.5195 | 0.0021 |
| -41      | 0.2483 | 0.5194 | 0.0025 | 0.2489 | 0.5196 | 0.0018 |
| -40      | 0.2485 | 0.5195 | 0.0022 | 0.249  | 0.5197 | 0.0017 |
| -39      | 0.2485 | 0.5196 | 0.0022 | 0.2491 | 0.5198 | 0.0016 |
| -38      | 0.2489 | 0.5197 | 0.0018 | 0.2492 | 0.5198 | 0.0015 |
| -37      | 0.249  | 0.5198 | 0.0017 | 0.2493 | 0.5199 | 0.0013 |
| -36      | 0.2491 | 0.5199 | 0.0015 | 0.2495 | 0.52   | 0.0011 |
| -35      | 0.2492 | 0.5199 | 0.0014 | 0.2496 | 0.5201 | 0.001  |
| -34      | 0.2493 | 0.52   | 0.0013 | 0.2497 | 0.5201 | 0.0009 |
| -33      | 0.2493 | 0.52   | 0.0013 | 0.2497 | 0.5202 | 0.0009 |
| -32      | 0.2494 | 0.52   | 0.0012 | 0.2498 | 0.5202 | 0.0008 |
| -31      | 0.2495 | 0.5201 | 0.0011 | 0.2498 | 0.5202 | 0.0008 |
| -30      | 0.2496 | 0.5201 | 0.001  | 0.2499 | 0.5203 | 0.0006 |
| -29      | 0.2496 | 0.5202 | 0.0009 | 0.2501 | 0.5204 | 0.0004 |
| -28      | 0.2497 | 0.5202 | 0.0009 | 0.2501 | 0.5204 | 0.0004 |
| -27      | 0.2497 | 0.5202 | 0.0009 | 0.2502 | 0.5204 | 0.0003 |
| -26      | 0.2497 | 0.5202 | 0.0009 | 0.2502 | 0.5204 | 0.0003 |
| -25      | 0.2499 | 0.5203 | 0.0006 | 0.2502 | 0.5204 | 0.0003 |
| -24      | 0.2499 | 0.5203 | 0.0006 | 0.2502 | 0.5205 | 0.0003 |



|     |        |        |        |        |        |        |
|-----|--------|--------|--------|--------|--------|--------|
| -23 | 0.25   | 0.5203 | 0.0005 | 0.2503 | 0.5205 | 0.0002 |
| -22 | 0.25   | 0.5203 | 0.0005 | 0.2503 | 0.5205 | 0.0002 |
| -21 | 0.25   | 0.5203 | 0.0005 | 0.2503 | 0.5205 | 0.0002 |
| -20 | 0.25   | 0.5203 | 0.0005 | 0.2505 | 0.5205 | 0      |
| -19 | 0.2501 | 0.5204 | 0.0004 | 0.2505 | 0.5205 | 0      |
| -18 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -17 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -16 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -15 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -14 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -13 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -12 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -11 | 0.2502 | 0.5204 | 0.0003 | 0.2505 | 0.5205 | 0      |
| -10 | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5205 | 0      |
| -9  | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5205 | 0      |
| -8  | 0.2504 | 0.5204 | 0.0001 | 0.2505 | 0.5205 | 0      |
| -7  | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5205 | 0      |
| -6  | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5205 | 0      |
| -5  | 0.2504 | 0.5204 | 0.0001 | 0.2505 | 0.5205 | 0      |
| -4  | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5204 | 0.0001 |
| -3  | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5204 | 0.0001 |
| -2  | 0.2503 | 0.5204 | 0.0002 | 0.2505 | 0.5204 | 0.0001 |
| -1  | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 0   | 0.2505 | 0.5205 | 0      | 0.2505 | 0.5205 | 0      |
| 1   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 2   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 3   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 4   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 5   | 0.2503 | 0.5203 | 0.0003 | 0.2504 | 0.5204 | 0.0001 |
| 6   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 7   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 8   | 0.2503 | 0.5204 | 0.0002 | 0.2504 | 0.5204 | 0.0001 |
| 9   | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 10  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 11  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 12  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 13  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 14  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 15  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5203 | 0.0002 |
| 16  | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 17  | 0.2505 | 0.5204 | 0.0001 | 0.2504 | 0.5203 | 0.0002 |

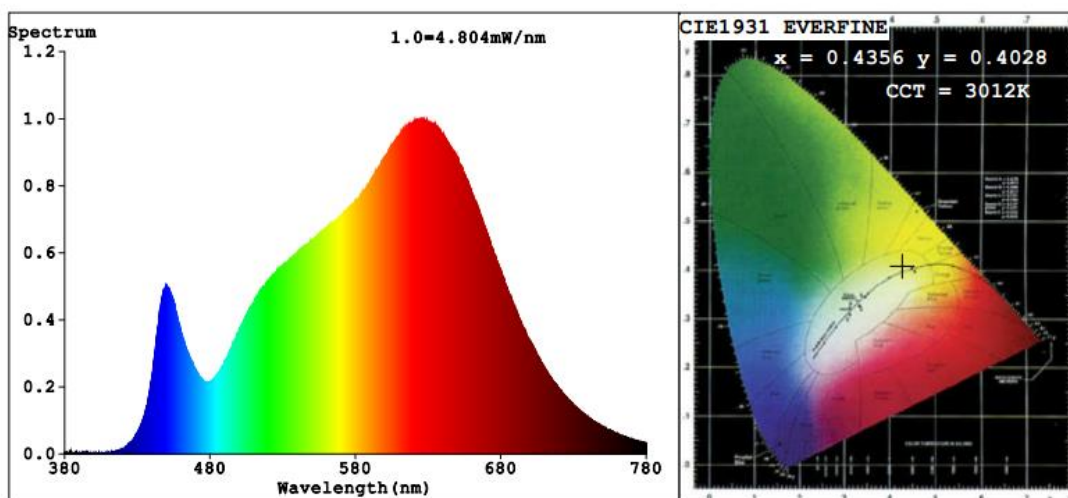


|    |        |        |        |        |        |        |
|----|--------|--------|--------|--------|--------|--------|
| 18 | 0.2504 | 0.5204 | 0.0001 | 0.2503 | 0.5203 | 0.0003 |
| 19 | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5203 | 0.0002 |
| 20 | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5204 | 0.0001 |
| 21 | 0.2504 | 0.5204 | 0.0001 | 0.2503 | 0.5203 | 0.0003 |
| 22 | 0.2504 | 0.5204 | 0.0001 | 0.2504 | 0.5203 | 0.0002 |
| 23 | 0.2504 | 0.5204 | 0.0001 | 0.2503 | 0.5203 | 0.0003 |
| 24 | 0.2504 | 0.5204 | 0.0001 | 0.2503 | 0.5203 | 0.0003 |
| 25 | 0.2504 | 0.5204 | 0.0001 | 0.2503 | 0.5203 | 0.0003 |
| 26 | 0.2504 | 0.5204 | 0.0001 | 0.2503 | 0.5203 | 0.0003 |
| 27 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 28 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 29 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 30 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 31 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 32 | 0.2505 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 33 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 34 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 35 | 0.2504 | 0.5204 | 0.0001 | 0.2501 | 0.5203 | 0.0004 |
| 36 | 0.2504 | 0.5204 | 0.0001 | 0.2502 | 0.5203 | 0.0004 |
| 37 | 0.2504 | 0.5204 | 0.0001 | 0.2501 | 0.5203 | 0.0004 |
| 38 | 0.2504 | 0.5204 | 0.0001 | 0.2501 | 0.5203 | 0.0004 |
| 39 | 0.2504 | 0.5204 | 0.0001 | 0.2501 | 0.5203 | 0.0004 |
| 40 | 0.2504 | 0.5204 | 0.0001 | 0.25   | 0.5202 | 0.0006 |
| 41 | 0.2504 | 0.5204 | 0.0001 | 0.25   | 0.5203 | 0.0005 |
| 42 | 0.2504 | 0.5204 | 0.0001 | 0.2499 | 0.5202 | 0.0007 |
| 43 | 0.2502 | 0.5204 | 0.0003 | 0.2499 | 0.5202 | 0.0007 |
| 44 | 0.2502 | 0.5204 | 0.0003 | 0.2499 | 0.5202 | 0.0007 |
| 45 | 0.2502 | 0.5204 | 0.0003 | 0.2499 | 0.5203 | 0.0006 |
| 46 | 0.2502 | 0.5204 | 0.0003 | 0.2499 | 0.5202 | 0.0007 |
| 47 | 0.2502 | 0.5204 | 0.0003 | 0.2497 | 0.5202 | 0.0009 |
| 48 | 0.2501 | 0.5204 | 0.0004 | 0.2497 | 0.5202 | 0.0009 |
| 49 | 0.2501 | 0.5203 | 0.0004 | 0.2497 | 0.5202 | 0.0009 |
| 50 | 0.2501 | 0.5203 | 0.0004 | 0.2497 | 0.5202 | 0.0009 |
| 51 | 0.2501 | 0.5203 | 0.0004 | 0.2496 | 0.5201 | 0.001  |
| 52 | 0.25   | 0.5203 | 0.0005 | 0.2496 | 0.5201 | 0.001  |

**2.4 Electrical and Photometric Measurements, with dimming**

**IES LM-79 2008  
ENERGY STAR® Program Requirements  
Product Specification for Luminaires (Light Fixtures) - Version 2.2**

|                   |                 |                     |                   |               |
|-------------------|-----------------|---------------------|-------------------|---------------|
| Test date         | 2019-12-13      |                     | Test Ambient:     | 25.1 ℃        |
| Dimmer Technology |                 |                     | Forward phase-cut |               |
| Sample No.        |                 |                     | Maximum Level     | Minimum Level |
| STD190468NB-D1    | Input:          | Light outout(Lumen) | 3023              | 65.40         |
|                   | 120.0 V / 60 Hz | Percentage          | 96.71%            | 2.09%         |



**Color Parameters:**

Chromaticity Coordinate:  $x=0.4356$   $y=0.4028$   $u'=0.2503$   $v'=0.5207$   
CCT=3012K (Duv=-0.0003) Dominant WL:  $\lambda_d=582.9\text{nm}$  Purity=51.6%  
Ratio: R=24.5% G=72.6% B=2.8% Peak WL:  $\lambda_p=626.8\text{nm}$  FWHM=166.6nm  
Render Index: Ra=95.0 CRI=92.6 AvgR=92.6 TM30: Rf=0 Rg=0  
R1 =96 R2 =97 R3 =96 R4 =96 R5 =95 R6 =96 R7 =95  
R8 =88 R9 =73 R10=92 R11=96 R12=82 R13=96 R14=97 R15=93

The luminaires [can] ~~can not~~ provide less than 20% of total light output with continuous dimmer.

| Dimmer                                     | Peak Noise Reading (dBA) | Test Condition                         | Distance between the microphone and the UUT |
|--------------------------------------------|--------------------------|----------------------------------------|---------------------------------------------|
| LEVITON MFG CO INC (E31373), Cat. No. 6681 | 23.4                     | Dimmer adjusted to lowest light output | < 1 m                                       |



|                    |                                                                                                                                       |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>2.5 Flicker</b> | <b>NEMA 77-2017<br/>ENERGY STAR® Program Requirements<br/>Product Specification for Luminaires (Light<br/>Fixtures) - Version 2.2</b> |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------------|

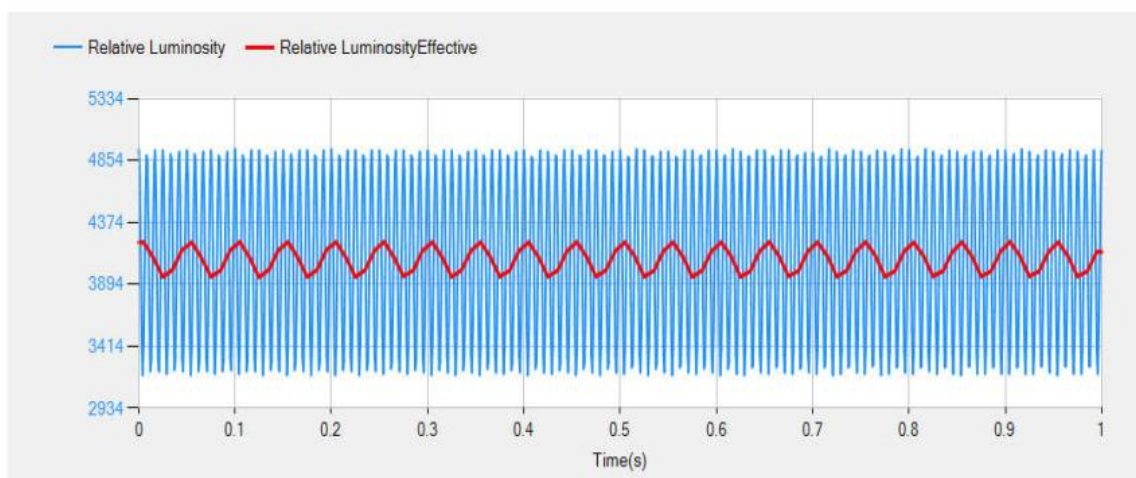
|                           |                                                            |
|---------------------------|------------------------------------------------------------|
| <b>Dimming Technology</b> | <a href="#">phase-cut</a>                                  |
| <b>Dimmer</b>             | <a href="#">LEVITON MFG CO INC (E31373), Cat. No. 6681</a> |

| Item                        | Short Term Flicker Indicator (Pst) | Stroboscopic Visibility Measure (SVM) |
|-----------------------------|------------------------------------|---------------------------------------|
| <b>Full light output</b>    | 0.050                              | 0.773                                 |
| <b>Maximum Level (100%)</b> | 0.050                              | 0.764                                 |
| <b>Minimum Level (20%)</b>  | 0.055                              | 0.228                                 |



|                                                                  |                                                                                                       |
|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| 2.6 Operating Frequency                                          | ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.2 |
| Noted: This test and data are not covered by NVLAP accreditation |                                                                                                       |

|                |                          |               |         |
|----------------|--------------------------|---------------|---------|
| Test date      | 2019-12-13               | Test Ambient: | 25.1 °C |
| Sample No.     | Operating Frequency (Hz) |               |         |
| STD190468NB-D1 | 120.37                   |               |         |

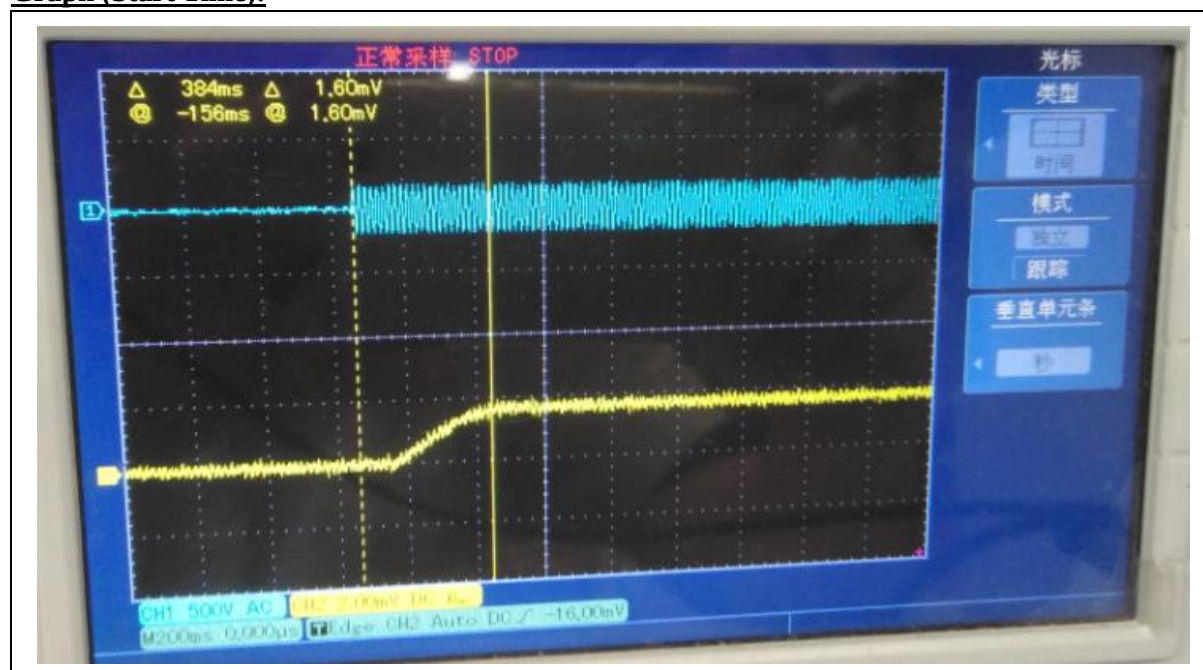




|                                                       |                                                                                                             |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 2.7 Starting Time<br>(Refer to Work Instruction QD28) | ENERGY STAR® Program Requirements Product<br>Specification for Luminaires (Light Fixtures) -<br>Version 2.2 |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|

|                |                 |               |         |
|----------------|-----------------|---------------|---------|
| Test date      | 2019-12-13      | Test Ambient: | 25.1 °C |
| Sample No.     | Start Time (ms) |               |         |
| STD190468NB-D1 | 384             |               |         |

**Graph (Start Time):**





|                                                                                 |                                                                                                            |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| <b>2.8 Transient Protection Test</b><br><i>(Refer to Work Instruction QD34)</i> | <b>ANSI/IEEE C62.41</b><br><b>ENERGY STAR® Program Requirements</b><br><b>for Luminaires – Version 2.2</b> |
|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|

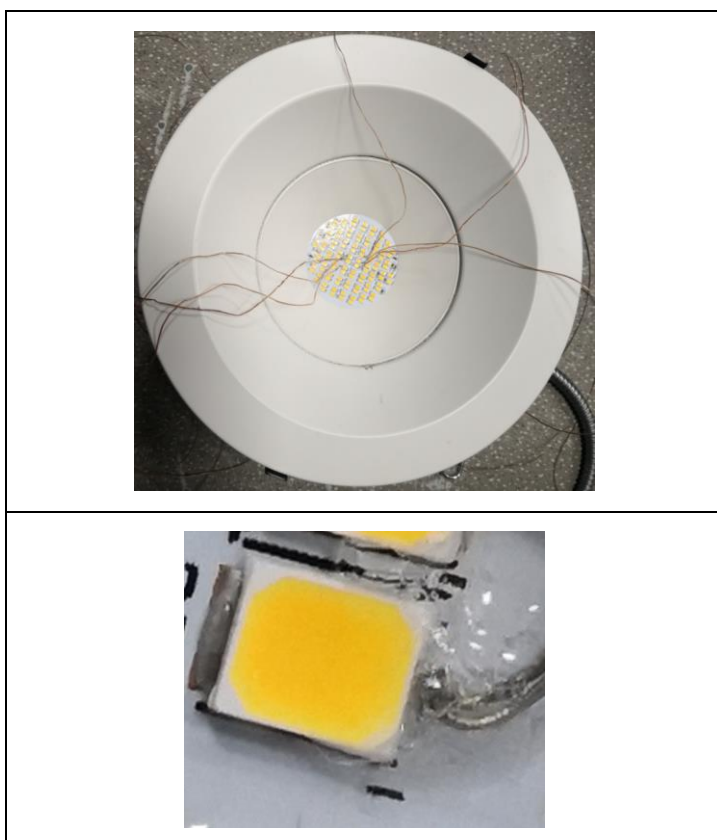
**Test voltage: 120V,60Hz**

|                   |            |                                                  |        |
|-------------------|------------|--------------------------------------------------|--------|
| <b>Test date</b>  | 2019-12-13 | <b>Test Ambient</b>                              | 25.1 ℃ |
| <b>Sample No.</b> |            | <b>Transient Protection Test - Seven Strikes</b> |        |
| STD190468NB-D1    |            | Survival                                         |        |

|                                                         |                                            |
|---------------------------------------------------------|--------------------------------------------|
| <b>2.9 In-Situ Temperature Measurement Test (ISTMT)</b> | <b>UL1598-2008, 3<sup>rd</sup> Edition</b> |
|---------------------------------------------------------|--------------------------------------------|

|                      |                   |                                                |                                                                 |
|----------------------|-------------------|------------------------------------------------|-----------------------------------------------------------------|
| Test date            | 2019-12-13        | Test Ambient                                   | 25.1 ℃                                                          |
| Input Vol./Frequency | 120 V / 60 Hz     | Output Current of Single LED(mA)               | 88.1                                                            |
| Sample No.           | LED Package Model | Maximum Measured LED Ts Point Temperature ( ℃) | Maximum permitted Ts temperature for L70 $\geq$ 50,000 hrs ( ℃) |
| STD190468NB-D1       | SAWxA32E-xx       | 65.1                                           | 105                                                             |

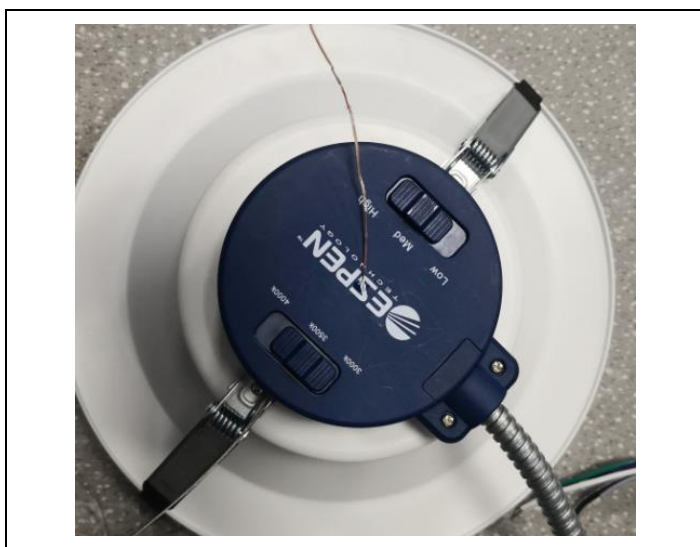
**In-Situ Picture - Ts:**



|                                                                 |                                            |
|-----------------------------------------------------------------|--------------------------------------------|
| <b>2.10 Maximum Measured Ballast or Driver Case Temperature</b> | <b>UL1598-2008, 3<sup>rd</sup> Edition</b> |
|-----------------------------------------------------------------|--------------------------------------------|

|                |                                                |                                               |         |
|----------------|------------------------------------------------|-----------------------------------------------|---------|
| Test date      | 2019-12-13                                     | Test Ambient                                  | 25.1 °C |
| Sample No.     | Maximum Measured Driver Case Temperature ( °C) | Maximum Driver Case Temperature Limited ( °C) |         |
| STD190468NB-D1 | 55.2                                           | 105                                           |         |

**In-Situ Picture - Ts:**





|                                          |                                                                                                              |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>2.11 Off-State Power Consumption:</b> | <b>ENERGY STAR® Program Requirements Product Specification for Luminaires (Light Fixtures) - Version 2.2</b> |
|------------------------------------------|--------------------------------------------------------------------------------------------------------------|

|                     |                     |                                 |         |
|---------------------|---------------------|---------------------------------|---------|
| <b>Test date</b>    | 2019-12-13          | <b>Test Ambient:</b>            | 25.0 °C |
| <b>Model Number</b> | VEKR9.5D/9T/40W-10V | <b>Stabilization Time (min)</b> | 90      |

**Electrical Measurement – when the luminaires turned off:**

| Sample No.     | Voltage (Vac) | Frequency (Hz ) | Current (A) | Power (W) |
|----------------|---------------|-----------------|-------------|-----------|
| STD190468NB-D1 | 120.0         | 60              | 0           | 0         |



### 3. Test Equipment

| Equipment ID                                                                                                                                      | Equipment Name                        | Last Calibration Date           | Next Calibration Date |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------|-----------------------|
| ST-R-702                                                                                                                                          | 2 meter Integrating Sphere            | Verified by D204 standard lamp  |                       |
| ST-R-701                                                                                                                                          | Spectral analysis system<br>HAAS-2000 | Verified by D204 standard lamp  |                       |
| ST-R-705                                                                                                                                          | D204 Standard Lamp                    | 2019-02-07                      | 2020-02-06            |
| ST-R-704                                                                                                                                          | Power Meter for<br>Integrating Sphere | 2019-01-06                      | 2020-01-05            |
| ST-R-714                                                                                                                                          | Goniophotometer system                | Verified by D908S standard lamp |                       |
| ST-R-710                                                                                                                                          | D908S Standard Lamp                   | 2019-02-12                      | 2020-02-11            |
| ST-R-711                                                                                                                                          | Power Meter for<br>Goniophotometer    | 2019-01-06                      | 2020-01-05            |
| ST-R-720                                                                                                                                          | Digital Luxmeter                      | 2019-01-06                      | 2020-01-05            |
| ST-R-622                                                                                                                                          | Oscillograph                          | 2019-01-06                      | 2020-01-05            |
| ST-R-721                                                                                                                                          | EMS61000-12C                          | 2019-01-06                      | 2020-01-05            |
| ST-R-725                                                                                                                                          | LFA-3000                              | 2019-01-06                      | 2020-01-05            |
| Uncertainty<br>Photometric Measurement (Sphere):1.74%<br>Chromaticity Measurement(Sphere):14.3K<br>Photometric Measurement(Goniophotometer):1.62% |                                       |                                 |                       |

\*\*\*\*\* END OF DATASHEET PACKAGE \*\*\*\*\*