



IESNA LM79-2008 Test Report

TÜV SÜD America

Photometric Testing and Evaluation in Accordance with LM79-2008

Report Prepared for:

Jeremy Parsons

Test Engineer

Lighting Science Group Corporation

1227 South Patrick Drive, Bldg. 2A

Satellite Beach, FL 32937

USA

Telephone: (321) 615-0524

Sample Tested: PAR30 Coastal Lamp
Manufacturer: Lighting Science Group Corporation

Technical Report Number: JI1305542-LM79
Report Issue Date: May 29th 2013
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Report Prepared by:

Byrd Evans

TÜV SÜD Project Handler

Report Reviewed by:

Bryan Cubitt

TÜV SÜD Program Manager

TÜV SÜD America, Inc.

5945 Cabot Parkway, Suite 100,
Alpharetta GA 30005

Telephone: 678-341-5900 www.tuvamerica.com

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Lab Code: 500065-0

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Report# JI305542-LM79

May 29, 2013

Summary of Key Test Results

Model# **PAR30 Coastal Lamp**
 Manufacturer **LSGC**
 TÜV Sample# **764-1**
 Date of Test **May 28th 2013**



Notes:

Tested in LBU orientation (Lamp-Base-Up)

| Parameter | Measured Result |
|-----------------------------|-------------------------|
| Luminous Flux | 93.7 Lumens |
| Input Power | 12.26 Watts |
| Efficacy | 7.64 Lumens/Watt |
| C.C.T. | 1417 K |
| C.R.I. (R _a) | -17.6 |
| Beam Angle | 27.4° |
| Stabilization Time | 70 minutes |
| In-Situ Temp Test (ISTMT)** | Not tested |

The above results are recorded / derived from measurements in accordance with LM79-08

**ISTMT in accordance with "Energy Star Program Requirements for Integral LED Lamps – Version 1.4".

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Alpharetta GA 30005

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Test Results –

The following results were obtained after stabilization of the sample in accordance with the requirements set forth in section 5.0 of IES LM79-2008. Stability is achieved when the variation of 3 readings of light output and electrical power over a period of 30 minutes, taken 15 minutes apart, is less than 0.5%.

| Photometric Results | PAR30 Coastal Lamp | |
|---|--------------------|-----------------|
| | Integrating Sphere | Goniophotometer |
| Total Luminous Flux (Lumens) | 93.7 | 92.6 |
| Luminous Efficacy (Lumens/Watt) | 7.64 | 7.54 |
| Total Radiant Flux (Watts) | 0.208 | - |
| Correlated Color Temperature (CCT) | 1417 | - |
| Color Rendering Index (CRI – R _a) | -17.6 | - |
| R ₉ Value | -360.2 | - |
| Chromaticity (Chroma x / Chroma y) | 0.6039 / 0.3953 | - |
| Chromaticity (Chroma u / Chroma v) | 0.3696 / 0.3629 | - |
| Chromaticity (Chroma u' / Chroma v') | 0.3696 / 0.5443 | - |
| D _{uv} Value | 0.00291 | - |

| Electrical Results | PAR30 Coastal Lamp | |
|--------------------------|--------------------|-----------------|
| | Integrating Sphere | Goniophotometer |
| Input Power (Watts) | 12.26 | 12.28 |
| Input Voltage (Volts AC) | 119.99 | 120.16 |
| Input Current (Amps) | 0.103 | 0.100 |
| Power Factor | 0.990 | 0.999 |
| Input Frequency (Hertz) | 60.0 | 60.0 |
| A-THD (Current %) | 3.66 % | 3.32 % |

| Additional Parameters | PAR30 Coastal Lamp | |
|---|------------------------------------|-----------------------|
| | Integrating Sphere | Goniophotometer |
| Stabilization Time (Light and Power) | 70 minutes | 65 minutes |
| Test Geometry Configuration | 4π | Type C |
| Spectroradiometer | Labsphere CDS1100 | Gigahertz Optik P9801 |
| Ambient Temperature | 25.4 °C | 24.5 °C |
| ISTMT (In-Situ Temperature Measurement) | Not tested | |
| Spacing Criteria | N/A (0° – 180°) / N/A (90° – 270°) | |



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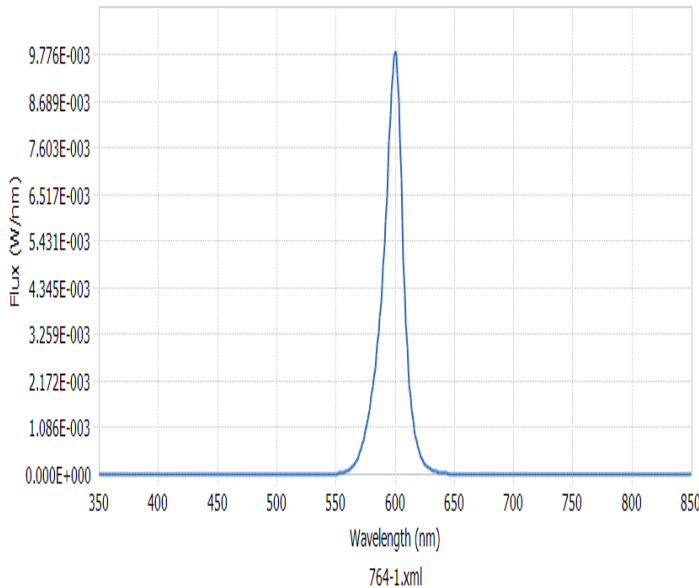
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Spectral Flux and Chromaticity Diagram

Spectral Flux

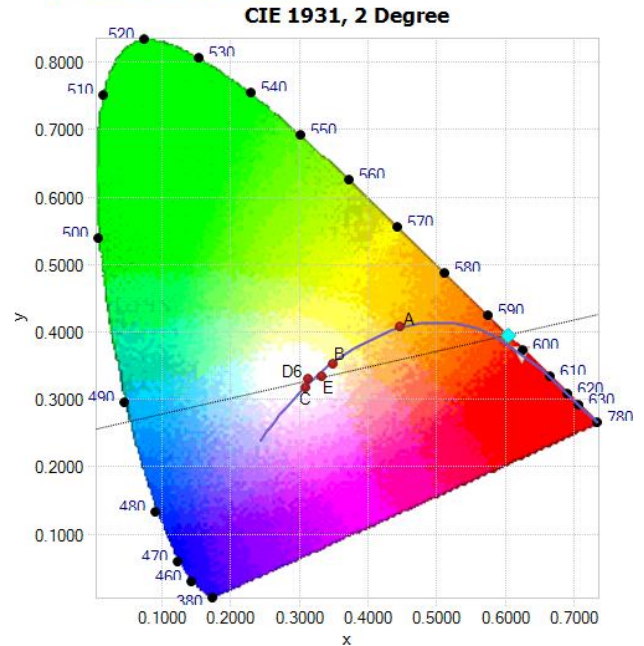
Chromaticity Diagram

▼ SPECTRAL FLUX GRAPH:



**Spectral response of the Radiant Flux
(350nm to 850nm)**

▼ CHROMATICITY DIAGRAM:



Tristimulus values (from page 5):

$$x / y = 0.6039 / 0.3953$$

The locations on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Zonal Lumen Summary

| Zone | Lumens | % Lamp / Luminaire |
|----------|--------|--------------------|
| 0 - 60 | 87.2 | 94.2 % |
| 60 - 90 | 5.4 | 5.8 % |
| 0 - 90 | 92.6 | 100 % |
| 90 - 180 | 0.0 | 0.0 % |
| 0 - 180 | 92.6 | 100 % |

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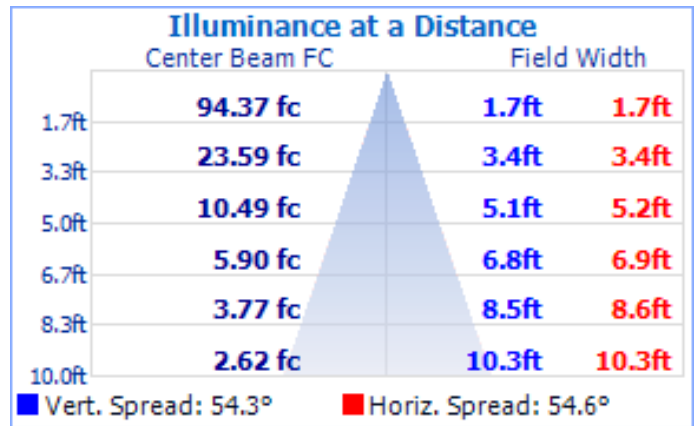
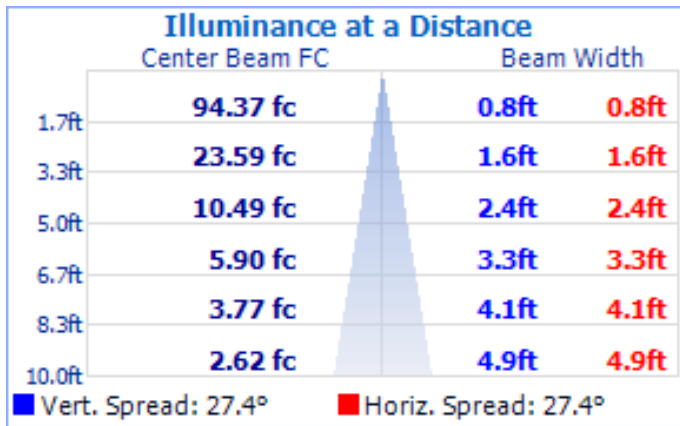


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Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.

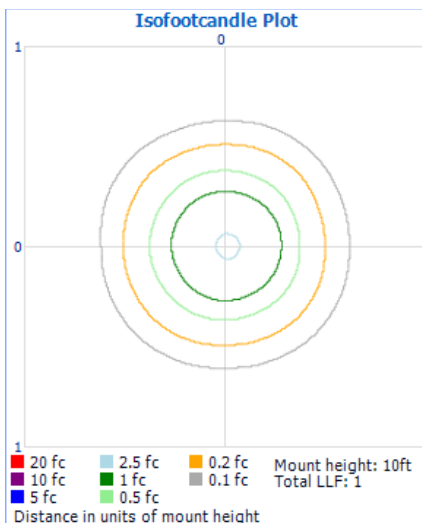


Beam Angle = 27.4°

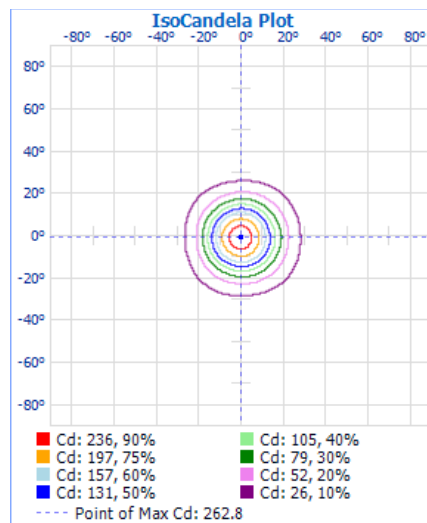
Field Angle = 54.3°

Test Results – Candela Plots

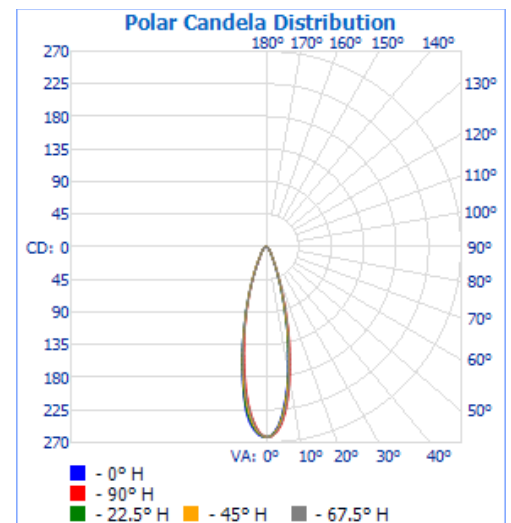
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela



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Test Results – Candela Tabulation

The table below displays the tabulated Candela measurements from the IES file:

Horizontal (lateral) angles are shown in **red** across the top of the table, in increments of 22.5°.

Vertical (longitudinal) angles are shown in **blue** down the side of the table, in increments of 0.5 and 2.5°.

| | 0.0 | 22.5 | 45.0 | 67.5 | 90.0 | 112.5 | 135.0 | 157.5 | 180.0 | 202.5 | 225.0 | 247.5 | 270.0 | 292.5 | 315.0 | 337.5 | 360.0 |
|------|-----|------|------|------|------|-------|-------|-------|------------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.0 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 | 262 |
| 0.5 | 262 | 262 | 263 | 262 | 263 | 262 | 263 | 262 | 263 | 262 | 262 | 262 | 261 | 261 | 261 | 261 | 262 |
| 1.0 | 262 | 261 | 262 | 262 | 262 | 263 | 262 | 262 | 262 | 262 | 261 | 260 | 260 | 259 | 260 | 260 | 262 |
| 1.5 | 260 | 260 | 261 | 262 | 262 | 262 | 262 | 261 | 261 | 260 | 259 | 259 | 258 | 257 | 258 | 258 | 260 |
| 2.0 | 258 | 259 | 259 | 260 | 261 | 261 | 261 | 261 | 260 | 259 | 258 | 257 | 255 | 255 | 255 | 256 | 258 |
| 2.5 | 256 | 256 | 258 | 258 | 258 | 260 | 259 | 258 | 259 | 257 | 256 | 254 | 253 | 252 | 253 | 253 | 256 |
| 3.0 | 252 | 253 | 254 | 256 | 257 | 258 | 257 | 257 | 257 | 255 | 253 | 251 | 250 | 249 | 249 | 251 | 252 |
| 3.5 | 249 | 251 | 251 | 253 | 255 | 255 | 255 | 255 | 255 | 252 | 250 | 248 | 246 | 245 | 245 | 247 | 249 |
| 4.0 | 246 | 247 | 248 | 250 | 252 | 253 | 253 | 252 | 252 | 250 | 247 | 244 | 242 | 241 | 242 | 242 | 246 |
| 4.5 | 241 | 243 | 244 | 247 | 249 | 250 | 249 | 249 | 249 | 247 | 243 | 239 | 238 | 236 | 237 | 238 | 241 |
| 5.0 | 237 | 238 | 239 | 242 | 245 | 246 | 246 | 247 | 246 | 242 | 238 | 235 | 233 | 232 | 232 | 233 | 237 |
| 5.5 | 231 | 233 | 235 | 238 | 241 | 242 | 243 | 243 | 243 | 239 | 234 | 230 | 228 | 227 | 227 | 228 | 231 |
| 6.0 | 226 | 227 | 230 | 233 | 236 | 237 | 238 | 238 | 238 | 235 | 230 | 225 | 223 | 221 | 222 | 223 | 226 |
| 6.5 | 219 | 222 | 224 | 228 | 231 | 232 | 233 | 234 | 233 | 230 | 224 | 220 | 218 | 216 | 216 | 217 | 219 |
| 7.0 | 214 | 216 | 218 | 222 | 225 | 226 | 228 | 228 | 228 | 224 | 219 | 215 | 211 | 210 | 210 | 211 | 214 |
| 7.5 | 208 | 210 | 212 | 217 | 219 | 221 | 222 | 222 | 222 | 219 | 213 | 209 | 205 | 204 | 204 | 205 | 208 |
| 8.0 | 201 | 204 | 205 | 210 | 213 | 214 | 216 | 216 | 215 | 213 | 207 | 203 | 199 | 198 | 198 | 199 | 201 |
| 8.5 | 195 | 197 | 199 | 203 | 207 | 207 | 210 | 209 | 208 | 206 | 201 | 197 | 192 | 191 | 191 | 192 | 195 |
| 9.0 | 188 | 190 | 193 | 197 | 200 | 202 | 203 | 202 | 202 | 200 | 196 | 190 | 186 | 184 | 185 | 186 | 188 |
| 9.5 | 181 | 183 | 186 | 190 | 193 | 195 | 196 | 195 | 194 | 193 | 190 | 184 | 179 | 178 | 179 | 180 | 181 |
| 10.0 | 175 | 176 | 179 | 183 | 186 | 188 | 189 | 188 | 187 | 186 | 183 | 178 | 172 | 171 | 172 | 173 | 175 |
| 10.5 | 168 | 169 | 172 | 176 | 179 | 182 | 182 | 181 | 180 | 179 | 177 | 171 | 165 | 164 | 166 | 166 | 168 |
| 11.0 | 161 | 161 | 165 | 169 | 172 | 175 | 175 | 174 | 173 | 172 | 170 | 164 | 159 | 158 | 159 | 160 | 161 |
| 11.5 | 154 | 154 | 158 | 162 | 165 | 168 | 169 | 167 | 166 | 165 | 163 | 158 | 153 | 151 | 152 | 153 | 154 |
| 12.0 | 147 | 147 | 151 | 155 | 158 | 161 | 162 | 159 | 160 | 158 | 156 | 152 | 146 | 144 | 145 | 146 | 147 |
| 12.5 | 141 | 140 | 144 | 148 | 151 | 155 | 155 | 153 | 153 | 152 | 150 | 145 | 140 | 138 | 139 | 140 | 141 |
| 13.0 | 134 | 133 | 138 | 142 | 145 | 148 | 149 | 146 | 146 | 145 | 143 | 140 | 134 | 132 | 132 | 133 | 134 |
| 13.5 | 128 | 126 | 131 | 135 | 138 | 142 | 142 | 139 | 139 | 139 | 136 | 134 | 129 | 126 | 126 | 127 | 128 |
| 14.0 | 121 | 120 | 124 | 128 | 131 | 135 | 135 | 132 | 133 | 132 | 130 | 127 | 124 | 120 | 120 | 121 | 121 |
| 14.5 | 115 | 114 | 118 | 122 | 125 | 129 | 128 | 126 | 126 | 126 | 123 | 122 | 118 | 114 | 114 | 115 | 115 |
| 15.0 | 109 | 108 | 111 | 115 | 118 | 122 | 122 | 119 | 120 | 120 | 118 | 116 | 113 | 109 | 108 | 109 | 109 |
| 17.5 | 80 | 80 | 83 | 87 | 88 | 91 | 93 | 90 | 93 | 93 | 91 | 90 | 89 | 84 | 82 | 82 | 80 |
| 20.0 | 59 | 58 | 61 | 64 | 62 | 65 | 69 | 68 | 70 | 70 | 69 | 67 | 68 | 64 | 62 | 61 | 59 |
| 22.5 | 42 | 43 | 45 | 46 | 44 | 46 | 51 | 51 | 51 | 52 | 52 | 51 | 50 | 47 | 47 | 44 | 42 |
| 25.0 | 31 | 31 | 33 | 34 | 32 | 34 | 38 | 38 | 38 | 38 | 40 | 38 | 37 | 36 | 35 | 33 | 31 |
| 27.5 | 22 | 23 | 25 | 25 | 24 | 25 | 28 | 29 | 28 | 29 | 30 | 29 | 27 | 26 | 26 | 24 | 22 |
| 30.0 | 17 | 18 | 19 | 19 | 19 | 20 | 22 | 22 | 21 | 21 | 23 | 22 | 20 | 20 | 20 | 18 | 17 |
| 32.5 | 14 | 14 | 15 | 15 | 15 | 16 | 17 | 17 | 16 | 17 | 18 | 17 | 15 | 15 | 16 | 15 | 14 |
| 35.0 | 12 | 12 | 12 | 12 | 13 | 13 | 14 | 14 | 14 | 14 | 15 | 14 | 13 | 12 | 13 | 12 | 12 |
| 37.5 | 10 | 10 | 10 | 11 | 11 | 11 | 11 | 12 | 12 | 12 | 12 | 12 | 11 | 11 | 11 | 10 | 10 |
| 40.0 | 9 | 9 | 9 | 9 | 9 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 9 | 9 | 9 | 9 |
| 42.5 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 | 9 | 8 | 8 | 8 | 8 | 8 |





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| Test Results – Candela Tabulation cont'd | | | | | | | | | | | | | | | | | |
|--|-----|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 0.0 | 22.5 | 45.0 | 67.5 | 90.0 | 112.5 | 135.0 | 157.5 | 180.0 | 202.5 | 225.0 | 247.5 | 270.0 | 292.5 | 315.0 | 337.5 | 360.0 |
| 45.0 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 7 | 8 | 7 | 7 | 7 | 7 |
| 47.5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | 6 | 6 |
| 50.0 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | 5 | 5 | 5 |
| 52.5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 |
| 55.0 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | 4 |
| 57.5 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| 60.0 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 3 | 3 | 3 | 3 | 3 |
| 62.5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 65.0 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| 67.5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 |
| 70.0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 72.5 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 75.0 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 77.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 1 |
| 80.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 82.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 85.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 87.5 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| 90.0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Maximum Candela =262.8 at Horizontal 180.0°, Vertical: 0.5°



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TÜV SÜD Photometric Testing Information

Testing is performed in accordance with the procedures outlined in IESNA LM79-2008. The sample is evaluated for photometric and electrical characteristics using an integrating sphere and a goniophotometer, located in an accredited, temperature and humidity-controlled, draft free photometric laboratory.

Sphere Geometry

The integrating spheres used for measurement utilize a “ 4π geometry” configuration in accordance with section 9 of IES LM-79-2008 and is applicable for all types of SSL products (directional and non-directional light projections). The spectroradiometer is an array-type detector manufactured and calibrated by Labsphere (Model# CDS1100).

Self-Absorption Correction

The integrating sphere uses self-absorption correction to eliminate errors due to mismatches between the standard reference lamp and the test samples being measured. This auxiliary correction lamp is a halogen type lamp powered by a calibrated Lamp Power Supply manufactured and calibrated by Labsphere (model LPS150). Ambient temperature is measured using a thermocouple located inside the integrating sphere at the same height as the sample under test (UUT) and not more than 1 meter in horizontal distance away from the sample (section 2.2 of LM79-2008). The thermocouple is located behind a baffle in order to eliminate any direct optical radiation from the sample under test.

Sample Stabilization

The sample (UUT) is placed inside the integrating sphere and powered by a regulated and conditioned alternating or direct current supply. The stabilization times shown on the results pages of this report denote the time of the 3rd measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization in accordance with section 5.0 of LM79-2008.

Sphere Calibration

The integrating sphere is calibrated using a quartzline halogen lamp with the following specifications:

Manufacturer: EYE Lighting International

Model# J94/JD28V75W

Voltage = 28.0 Volts DC

Wattage = 75.0 Watts

Calibration Current = 2.679 Amperes

Luminous Flux = 1685 Lumens

Calibration Date = 2-17-2011 (calibrated by Labsphere – NIST traceable).

Continued.....

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TÜV SÜD Photometric Testing Information (continued)

Goniophotometer

The Goniophotometer is a Type C optical measurement system in accordance with section 9.3.1 of IESNA LM79-2008.

Goniophotometer Calibration

The Goniophotometer is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

- Manufacturer: General Electric
- Part Number: CSB-110
- Lamp Number: 105-A
- Voltage: 16.71 Volts DC
- Wattage: 150.0 Watts
- Calibration Current: 4.847 Amperes
- Luminous Intensity: 166.3 Candelas
- Calibration Date: 11-07-2011 (NIST traceable)

TÜV SÜD Test Equipment List:

| TÜV SÜD Sphere System – contains the following: | | | |
|--|-----------------------|--------------|----------------------|
| Description | Manufacturer / Model# | TÜV SÜD Ref# | Calibration Due Date |
| Integrating Sphere | Labsphere LM760 | SPH003 | weekly |
| Spectroradiometer | Labsphere CDS1100 | ATLE0048 | 9/7/2016 |
| Power Analyzer | Yokogawa WT210 | ATLE0058 | 3/7/2014 |
| Power Source | Chroma 61602 | AC003 | N/A |
| Thermometer | Fluke 52-II | ATLE0008 | 11/17/2013 |
| TÜV SÜD Goniophotometer System – contains the following: | | | |
| Goniophotometer | M.E. GONC01 | GON001 | weekly |
| Spectroradiometer | Gigahertz Optik P9801 | GIG001 | weekly |
| Power Analyzer | Yokogawa WT210 | ATLE0031 | 11/16/2013 |
| Power Source | Chroma 61602 | AC006 | N/A |

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 5945 Cabot Parkway, Suite 100,
 Alpharetta GA 30005
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