# DLC Solid-State Lighting Technical Requirements Tables Version 5.1

The Solid-State Lighting Technical Requirement Tables contain the complete set of minimum technical specifications that products must meet to be qualified on the DLC QPL. The tables in this document are organized separately from those in the SSL V5.1 Technical Requirements policy document and the numbering of the following tables does not correlate between the two documents. Please review the requirements carefully for your specific product type before submitting a product application. Products listed on the QPL under the V5.1 Technical Requirements version meet these requirements.

Applications to qualify products under the V5.1 requirements are accepted beginning July 1, 2020.

***This version of the Technical Requirement Tables contains corrections and clarifications made to the originally released document, which are displayed as* Policy Clarifications and Updates *at the end of this document.***

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# DLC Solid-State Lighting Categories, General Applications, and Primary Use Designations (PUD)

***Table 1:*** *Categories, General Applications, and Primary Use Designations (PUD)*

| # | Category | General Application | Primary Use Designations (PUD) |
|---|---|---|---|
| 1 | Outdoor | Low Output | • Outdoor Pole/Arm-Mounted Area and Roadway Luminaires<br>• Outdoor Pole/Arm-Mounted Decorative Luminaires<br>• Outdoor Full-Cutoff Wall-Mounted Area Luminaires<br>• Outdoor Non-Cutoff and Semi-Cutoff Wall-Mounted Area Luminaires<br>• Bollards<br>• Parking Garage Luminaires<br>• Fuel Pump Canopy Luminaires<br>• Landscape/Accent Flood and Spot Luminaires<br>• Architectural Flood and Spot Luminaires<br>• Stairwell and Passageway Luminaires<br>• Specialty: _____ |
| 2 | | Mid Output | |
| 3 | | High Output | |
| 4 | | Very High Output | |
| 5 | Indoor | Interior Directional | • Wall Wash Luminaires<br>• Track or Mono-Point Luminaires<br>• Specialty: _____ |
| 6 | | Case Lighting | • Display Case Luminaires<br>• Horizontal Refrigerated Case Luminaires<br>• Vertical Refrigerated Case Luminaires<br>• Specialty: _____ |
| 7 | | Troffer | • 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces<br>• 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces<br>• 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces<br>• Specialty: _____ |
| 8 | | Linear Ambient | • Direct Linear Ambient Luminaires<br>• Linear Ambient Luminaires w/ Indirect component<br>• Specialty: _____ |
| 9 | | High-Bay | • High Bay Luminaires (Commercial and Industrial)<br>• High Bay Aisle Luminaires<br>• Specialty: _____ |
| 10 | | Low-Bay | • Low Bay Luminaires (Commercial and Industrial)<br>• Specialty: _____ |
| 11 | Outdoor Retrofit Kit | Low Output | • Retrofit Kits for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires<br>• Retrofit Kits for Outdoor Pole/Arm-Mounted Decorative Luminaires<br>• Retrofit Kits for Large Outdoor Pole/Arm-Mounted Area and Roadway Luminaires<br>• Retrofit Kits for Outdoor Full-Cutoff Wall-Mounted Area Luminaires<br>• Retrofit Kits for Parking Garage Luminaires<br>• Retrofit Kits for Fuel Pump Canopy Luminaires |
| 12 | | Mid Output | |
| 13 | | High Output | |
| 14 | | Very High Output | |
| 15 | Indoor Retrofit Kit | Troffer | • Linear Retrofit Kits for 2x2 Luminaires<br>• Integrated Retrofit Kits for 2x2 Luminaires<br>• Linear Retrofit Kits for 1x4 Luminaires<br>• Integrated Retrofit Kits for 1x4 Luminaires<br>• Linear Retrofit Kits for 2x4 Luminaires<br>• Integrated Retrofit Kits for 2x4 Luminaires |

| # | Category | General Application | Primary Use Designations (PUD) |
|---|---|---|---|
| 16 | | Linear Ambient | • Retrofit Kits for Direct Linear Ambient Luminaires |
| 17 | | High-Bay | • Retrofit Kits for High Bay Luminaires (Commercial and Industrial) |
| 18 | | Low-Bay | • Retrofit Kits for Low Bay Luminaires (Commercial and Industrial) |
| 19 | Linear Replacement Lamps | 2’ T8 Lamps | • Replacement Lamps ("Plug and Play") (UL Type A)<br>• Internal Driver/Line Voltage (UL Type B) Lamps<br>• 1-Lamp External Driver (UL Type C) Lamps<br>• 2-lamp External Driver (UL Type C) Lamps<br>• 3-lamp External Driver (UL Type C) Lamps<br>• 4-lamp External Driver (UL Type C) Lamps<br>• Dual Mode Internal Driver (UL Type A or B) |
| 20 | | 4’ T8 Lamps | |
| 21 | | 4’ T5 Lamps | |
| 22 | | 3’ T8 Lamps | • Replacement Lamps ("Plug and Play") (UL Type A)<br>• Internal Driver/Line Voltage (UL Type B) Lamps<br>• 1-Lamp External Driver (UL Type C) Lamps<br>• 2-lamp External Driver (UL Type C) Lamps<br>• Dual Mode Internal Driver (UL Type A or B) |
| 23 | | 8’ T8 Lamps | |
| 24 | | 4’ T5HO Lamps | • Replacement Lamps ("Plug and Play") (UL Type A)<br>• Internal Driver/Line Voltage (UL Type B) Lamps<br>• 1-Lamp External Driver (UL Type C) Lamps<br>• 2-Lamp External Driver (UL Type C) Lamps<br>• 3-lamp External Driver (UL Type C) Lamps<br>• 4-lamp External Driver (UL Type C) Lamps<br>• 6-lamp External Driver (UL Type C) Lamps<br>• Dual Mode Internal Driver (UL Type A or B) |
| 25 | | U-Bend Lamps | • Replacement Lamps ("Plug and Play") (UL Type A)<br>• Internal Driver/Line Voltage Lamp-Style Retrofit Kits (UL Type B)<br>• 1-Lamp External Driver (UL Type C) Lamps<br>• 2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)<br>• 3-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)<br>• Dual Mode Internal Driver (UL Type A or B) |
| 26 | Mogul Screw-Base (E39/E40) Replacements for HID Lamps | Outdoor – Low Output | • Replacement Lamps for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires (UL Type B)<br>• Replacement Lamps for Outdoor Pole/Arm-Mounted Decorative Luminaires (UL Type B)<br>• Replacement Lamps for Outdoor Full-Cutoff Wall-Mounted Area Luminaires (UL Type B)<br>• Replacement Lamps for Parking Garage Luminaires (UL Type B)<br>• Replacement Lamps for Fuel Pump Canopy Luminaires (UL Type B)<br>• Replacement Lamps for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires (UL Type C)<br>• Replacement Lamps for Outdoor Pole/Arm-Mounted Decorative Luminaires (UL Type C)<br>• Replacement Lamps for Outdoor Full-Cutoff Wall-Mounted Area Luminaires (UL Type C)<br>• Replacement Lamps for Parking Garage Luminaires (UL Type C)<br>• Replacement Lamps for Fuel Pump Canopy Luminaires (UL Type C) |
| 27 | | Outdoor – Mid Output | |
| 28 | | Outdoor – High Output | |
| 29 | | Outdoor – Very High Output | |
| 30 | | High-Bay | • Replacement Lamps for High Bay Luminaires (UL Type B)<br>• Replacement Lamps for High Bay Luminaires (UL Type C) |
| 31 | | Low-Bay | • Replacement Lamps for Low Bay Luminaires (UL Type B)<br>• Replacement Lamps for Low Bay Luminaires (UL Type C) |

| # | Category | General Application | Primary Use Designations (PUD) |
|---|---|---|---|
| 32 | Four Pin-Base Replacement Lamps for CFLs | Vertically Mounted Lamps | • Replacement Lamps ("Plug and Play") (UL Type A) |
| 33 | | Horizontally Mounted Lamps | |
| 34 | | 2G11 Base Lamps | • Replacement Lamps ("Plug and Play") (UL Type A)<br>• Internal Driver/Line Voltage (UL Type B) Lamps<br>• 2-lamp External Driver (UL Type C) Lamps<br>• 3-lamp External Driver (UL Type C) Lamps<br>• Dual Mode Internal Driver (UL Type A or B) |

Table 1 Notes:

1. Luminaires may not qualify for DLC Premium using "Specialty: _____" as the Primary Use Designation.
2. Retrofit Kits, Screw-based Replacement Lamps, and G24q-base Four-Pin Replacement Lamps must be tested in reference luminaires, per the policies for those products. See Retrofit Kit Policy, Screw-base Replacement Lamp Policy, and Four-pin Base Replacement Lamps for CFLs Policy for details.
3. Retrofit Kits applications must designate one of the Primary Use Designations listed.

## Minimum Light Output and Minimum Efficacy Requirements: Luminaires and Retrofit Kits

***Table 2:*** *Efficacy Requirements for DLC Standard and DLC Premium Luminaires and Retrofit Kits*[1]

| Category | General Application | Minimum Light Output (lm)[2] | Minimum Efficacy (lm/W) | |
|---|---|---|---|---|
| | | | DLC Standard | DLC Premium |
| Outdoor Luminaires | Low Output | 250-5,000 | 105 | 120 |
| | Mid Output | 5,000-10,000 | 105 | 120 |
| | High Output | 10,000-30,000 | 105 | 120 |
| | Very High Output | ≥30,000 | 105 | 120 |
| Indoor Luminaires | Interior Directional | ≥250 | 80 | 95 |
| | Case Lighting | ≥50 lm/ft | 95 | 110 |
| | Troffer | ≥1,500 | 110 | 125 |
| | Linear Ambient | ≥375 lm/ft | 115 | 130 |
| | High-Bay | ≥10,000 | 120 | 135 |
| | Low-Bay | 5,000-10,000 | 115 | 130 |
| Outdoor Retrofit Kits[1] | Low Output | 250-5,000 | 105 | 120 |
| | Mid Output | 5,000-10,000 | 105 | 120 |
| | High Output | ≥10,000 | 105 | 120 |
| | Very High Output | ≥30,000 | 105 | 120 |

[1] Retrofit Kits applications must designate one of the Primary Use Designations listed.
[2] Minimum Light Output requirements vary by Primary Use Designation (PUD); please refer to **Table 5** for specific requirements.

| Category | General Application | Minimum Light Output (lm)[2] | Minimum Efficacy (lm/W) | |
|---|---|---|---|---|
| | | | DLC Standard | DLC Premium |
| Indoor Retrofit Kits[1] | Troffer | ≥1,500 | 110 | 125 |
| | Linear Ambient | ≥375 lm/ft | 115 | 130 |
| | High-Bay | ≥10,000 | 120 | 135 |
| | Low-Bay | 5,000-10,000 | 115 | 130 |

## Minimum Light Output and Minimum Efficacy Requirements: Lamps

***Table 3:*** *Efficacy Requirements for DLC Standard Linear Replacement Lamps and Four Pin-Base Replacement Lamps for CFLs [In-Luminaire and Bare-Lamp]*

| Category | General Application | Minimum Light Output (lm) | | Minimum Efficacy (lm/W) | |
|---|---|---|---|---|---|
| | | In-Luminaire | Bare-Lamp | In-Luminaire | Bare-Lamp |
| Linear Replacement Lamps | 2’ T8 Lamps | n/a | 800 | n/a | 120 |
| | 3’ T8 Lamps | | 1,200 | | 120 |
| | 4’ T8 Lamps | | 1,600 | | 120 |
| | 4’ T5 Lamps | | 1,600 | | 120 |
| | 4’ T5HO Lamps | | 3,200 | | 120 |
| | 8’ T8 Lamps | | 3,200 | | 120 |
| | U-Bend Lamps | | 1,400 | | 120 |
| Four Pin-Base Replacement Lamps for CFLs | Vertically Mounted Lamps | 1 lamp: 575 | 675 | 75 | 85 |
| | Horizontally Mounted Lamps | 2 lamps: 800 | 675 | 75 | 85 |
| | 2G11 Base Lamps | n/a | 1,900 | n/a | 120 |

***Table 4:*** *Efficacy Requirements for DLC Standard Mogul Screw-Base (E39/E40) Replacements for HID Lamps [In-Luminaire]*

| Category | General Application | Minimum Light Output (lm)[2] | Minimum Efficacy (lm/W) |
|---|---|---|---|
| | | In-Luminaire | In-Luminaire |
| Mogul Screw-Base (E39/E40) Replacements for HID Lamps | Outdoor: Low Output | 250-5,000 | 105 |
| | Outdoor: Mid Output | 5,000-10,000 | 105 |
| | Outdoor: High Output | 10,000-30,000 | 105 |
| | Outdoor: Very High Output | ≥30,000 | 105 |
| | High-Bay | ≥10,000 | 120 |
| | Low-Bay | 5,000-10,000 | 115 |

## Light Output and Distribution Requirements by Primary Use Designation

***Table 5:*** *Primary Use Technical Requirements: Light Output and Distribution*

| Primary Use Letter | Primary Use Designation | Minimum Light Output (lm) | Zone/Spacing Criteria/Beam Angle | ZLD/SC/BA Nominal Requirement | ZLD/SC/BA Tolerance | ZLD/SC/BA Requirement with Tolerance |
|---|---|---|---|---|---|---|
| A | Outdoor Pole/Arm-Mounted Area and Roadway Luminaires | 1,000 | 0-90° | 100% | -1% | ≥99% |
| | | | 80-90° | ≤10% | +3% | ≤13% |
| B | Outdoor Pole/Arm-Mounted Decorative Luminaires | 1,000 | 0-90° | ≥65% | -3% | ≥62% |
| C | Outdoor Full-Cutoff Wall-Mounted Area Luminaires | 300 | 0-90° | 100% | -3% | ≥97% |
| | | | 80-90° | ≤10% | +3% | ≤13% |
| D | Outdoor Non-Cutoff and Semi-Cutoff Wall-Mounted Area Luminaires | 300 (0-90° zone)*** | 80-90°*** | ≤10%*** | +3% | ≤13% |
| E | Bollards | 500 | 90-110° | ≤15% | +3% | ≤18% |
| | | | >110° | 0% | +3% | ≤3% |
| F | Parking Garage Luminaires | 2,000 | 60-80° | ≥30% | -3% | ≥27% |
| | | | 70-80° | ≤25% | +3% | ≤28% |
| G | Fuel Pump Canopy Luminaires | 2,000 | 0-40° | ≥40% | -3% | ≥37% |
| | | | 40-70° | ≥40% | -3% | ≥37% |
| H | Landscape/Accent Flood and Spot Luminaires | 250 - 1,000 | 0-90° | ≥85% | -3% | ≥82% |
| I | Architectural Flood and Spot Luminaires | 1,000 | 0-90° | ≥85% | -3% | ≥82% |
| J | Stairwell and Passageway Luminaires | 750 | 0-90° | ≥85%‡ | -3% | ≥82% |
| K | Wall-wash Luminaires | 575 | 0-90° | ≥60%‡‡ | -3% | ≥57% |
| L | Track or Mono-Point Directional Luminaires | 250 | 0-90° | ≥85% | -3% | ≥82% |
| M | Vertical Refrigerated Case Luminaires-center | 100 lm/ft | 10-90°† | ≥95%† | -3% | ≥92% |
| N | Vertical Refrigerated Case Luminaires-end | 50 lm/ft | 10-90°‡‡ | ≥95%‡‡ | -5% | ≥90% |
| O | Horizontal Refrigerated Case Luminaires | 100 lm/ft | 0-90° | ≥95% | -3% | ≥92% |
| P | Display Case Luminaires | 50 lm/ft | 0-80° | ≥95% | -5% | ≥90% |
| Q | 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces | 2,000 | SC: 0-180° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | SC: 90-270° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | ZL: 0-60° | ≥75% | -3% | ≥72% |
| R | 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces | 1,500 | SC: 0-180° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | SC: 90-270° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | ZL: 0-60° | ≥75% | -3% | ≥72% |

| Primary Use Letter | Primary Use Designation | Minimum Light Output (lm) | Zone/Spacing Criteria/Beam Angle | ZLD/SC/BA Nominal Requirement | ZLD/SC/BA Tolerance | ZLD/SC/BA Requirement with Tolerance |
|---|---|---|---|---|---|---|
| S | 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces | 3,000 | SC:0-180° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | SC:90-270° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | ZL:0-60° | ≥75% | -3% | ≥72% |
| T | Linear Ambient Luminaires (Indirect Component) | 500 lm/ft | 90-150° | ≥35% | -3% | ≥32% |
| U | Direct Linear Ambient Luminaires | 375 lm/ft | 0-60° | ≥40% | -3% | ≥37% |
| V | High-Bay Luminaires (Commercial and Industrial) | 10,000 | 20-50° | ≥30% | -10% | ≥20% |
| W | High-Bay Aisle Luminaires | 10,000 | 20-50° | ≥50% | -10% | ≥40% |
| | | | 0-20° | ≥30% | -10% | ≥20% |
| X | Low-Bay Luminaires (Commercial and Industrial) | 5,000 - 10,000 | 20-50° | ≥30% | -10% | ≥20% |
| Y | Retrofit Kits for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires | 1,000 | 0-90° | 100% | -1% | ≥99% |
| | | | 80-90° | ≤10% | 3% | ≤13% |
| Z | Retrofit Kits for Outdoor Pole/Arm-Mounted Decorative Luminaires | 1,000 | 0-90° | ≥65% | -3% | ≥62% |
| AA | Retrofit Kits for Large Outdoor Pole/Arm-Mounted Area and Roadway Luminaires | 1,000 | 0-90° | 100% | -1% | ≥99% |
| | | | 80-90° | ≤10% | 3% | ≤13% |
| AB | Retrofit Kits for Full-Cutoff Outdoor Wall-Mounted Area Luminaires | 300 | 0-90° | 100% | -3% | ≥97% |
| | | | 80-90° | ≤10% | 3% | ≤13% |
| AC | Retrofit Kits for Parking Garage Luminaires | 2,000 | 60-80° | ≥30% | -3% | ≥27% |
| | | | 70-80° | ≤25% | +3% | ≤28% |
| AD | Retrofit Kits for Fuel Pump Canopy Luminaires | 2,000 | 0-40° | ≥40% | -3% | ≥37% |
| | | | 40-70° | ≥40% | -3% | ≥37% |
| AE | Retrofit Kits for 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces (all Primary Use Designations) | 2,000 | SC:0-180° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | SC:90-270° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | ZL:0-60° | ≥75% | -3% | ≥72% |
| AF | Retrofit Kits for 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces (all Primary Use Designations) | 1,500 | SC:0-180° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | SC:90-270° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | ZL:0-60° | ≥75% | -3% | ≥72% |
| AG | Retrofit Kits for 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces (all Primary Use Designations) | 3,000 | SC:0-180° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | SC:90-270° | 1.0-2.0 | ±0.1 | 0.9-2.1 |
| | | | ZL:0-60° | ≥75% | -3% | ≥72% |

| Primary Use Letter | Primary Use Designation | Minimum Light Output (lm) | Zone/Spacing Criteria/Beam Angle | ZLD/SC/BA Nominal Requirement | ZLD/SC/BA Tolerance | ZLD/SC/BA Requirement with Tolerance |
|---|---|---|---|---|---|---|
| AH | Retrofit Kits for Direct Linear Ambient Luminaires | 375 lm/ft | 0-60° | ≥40% | -3% | ≥37% |
| AI | Retrofit Kits for High-Bay Luminaires (Commercial and Industrial) | 10,000 | 20-50° | ≥30% | -10% | ≥20% |
| AJ | Retrofit Kits for Low-Bay Luminaires (Commercial and Industrial) | 5,000 (<10,000) | 20-50° | ≥30% | -10% | ≥20% |
| AK | Four-Foot Linear Replacement Lamps (T8, T5: all Primary Use Designations) | 1,600 | Beam Angle: | 140° | -5° | 135° |
| AL | Four-Foot Linear Replacement Lamps (T5HO: all Primary Use Designations) | 3,200 | Beam Angle: | 140° | -5° | 135° |
| AM | Two-Foot Linear Replacement Lamps (all Primary Use Designations) | 800 | Beam Angle: | 140° | -5° | 135° |
| AN | U-Bend Replacement Lamps (all Primary Use Designations) | 1,400 | Beam Angle: | 140° | -5° | 135° |
| AO | Three-Foot Linear Replacement Lamps (all Primary Use Designations) | 1,200 | Beam Angle: | 140° | -5° | 135° |
| AP | Eight-Foot Linear Replacement Lamps (all Primary Use Designations) | 3,200 | Beam Angle: | 140° | -5° | 135° |
| AQ | Screw-Base Replacements for HID Lamps in Outdoor Pole/Arm-mounted Area and Roadway Luminaires | In luminaire: 1,000 | 0-90° | 100% | -1% | ≥99% |
| | | | 80-90° | ≤10% | 3% | ≤13% |
| AR | Screw-Base Replacements for HID Lamps in Outdoor Pole/Arm-mounted Decorative Luminaires | In luminaire: 1,000 | 0-90° | ≥65% | -3% | ≥62% |
| AS | Screw-Base Replacements for HID Lamps in Outdoor Full Cut-off Wall-mounted Area Luminaires | In luminaire: 300 | 0-90° | 100% | -3% | ≥97% |
| | | | 80-90° | ≤10% | 3% | ≤13% |
| AT | Screw-Base Replacements for HID Lamps in Parking Garage Luminaires | In luminaire: 2,000 | 60-80° | ≥30% | -3% | ≥27% |
| | | | 70-80° | ≤25% | +3% | ≤28% |
| AU | Screw-Base Replacements for HID Lamps in Fuel Pump Canopy Luminaires | In luminaire: 2,000 | 0-40° | ≥40% | -3% | ≥37% |
| | | | 40-70° | ≥40% | -3% | ≥37% |
| AV | Screw-Base Replacements for HID Lamps in High Bay Luminaires (Commercial and Industrial) | In luminaire: 10,000 | 20-50° | ≥30% | -10% | ≥20% |

| Primary Use Letter | Primary Use Designation | Minimum Light Output (lm) | | Zone/Spacing Criteria/Beam Angle | ZLD/SC/BA Nominal Requirement | ZLD/SC/BA Tolerance | ZLD/SC/BA Requirement with Tolerance |
|---|---|---|---|---|---|---|---|
| AW | Screw-Base Replacements for HID Lamps in Low-Bay Luminaires (Commercial and Industrial) | In luminaire: 5,000 - 10,000 | | 20-50° | ≥30% | -10% | ≥20% |
| AX | Vertically Mounted Four Pin-Base Replacement Lamps for CFLs | In luminaire: 575 (1-lamp configuration) | Bare lamp: 675 | ZL:0-60° | ≥75% | -3% | ≥72% |
| AY | Horizontally Mounted Four Pin-Base Replacement Lamps for CFLs | In luminaire: 800 (2-lamp configuration) | Bare lamp: 675 | ZL:0-60° | ≥75% | -3% | ≥72% |
| AZ | 2G11 Base Replacement Lamps for CFLs | 1,900 | | Beam Angle: | 140° | -5° | 135° |

*** Lumen output and efficacy are evaluated considering the light output in the 0-90° zone only. See non-cutoff wall-mounted area luminaires details below.

† Bilateral, symmetric light distribution on two hemispheres

‡‡ One-sided, single hemisphere light distribution

‡ Bilateral for surface-mounted units, single hemisphere for corner-mounted units

## Backlight, Uplight, and Glare (BUG) Ratings Requirements

In addition to the distribution requirements in **Table 5**, all outdoor luminaires shall report the 6-character BUG values. BUG ratings for child products are reported by the applicants. BUG ratings for parent products will be generated by the DLC using tested photometric data, per IES TM-15-11 and Addendum A for IES TM-15-11. The following Outdoor Low, Mid, High or Very High Output Primary Use Designations are exempt from BUG reporting requirements:

- Landscape/Accent Flood and Spot Luminaires
- Architectural Flood and Spot Luminaires
- Specialty: Wall Grazing/Slicing
- Specialty: Hazardous Flood and Spot Luminaires
- Specialty: Soffit Lighting
- Specialty: Sports Flood
- Specialty: Natatorium Lighting
- Specialty: Tunnel Lighting

Applicability to future Specialty Primary Use Designations will be determined on a case-by-case basis.

## Controllability Requirements

***Table 6:*** *Controllability Requirements for DLC Standard and DLC Premium*

| Metric | DLC Standard Requirements | DLC Premium Requirements |
|---|---|---|
| **Dimming** | *Indoor luminaires and retrofit kits, excluding case lighting and Specialty primary uses intended for hazardous locations:* **Continuous dimming capability required.** | All products (indoor and outdoor) must be **capable of continuous dimming**. |
| | *Outdoor luminaires, retrofit kits, and mogul screw-base replacement lamps for outdoor applications, excluding landscape accent/flood, specialty sports flood, specialty tunnel, and Specialty primary uses intended for hazardous locations:* **Continuous or step dimming capability required.** | |
| | *Lamps, unless noted above:* **Continuous dimming capability required.** | |
| | *All other products:* **Required reporting of dimming capability**. | |
| **Integral Controls** | All products must report on the availability of integral controls* | |
| **Controls Communication** | All products listed as dimmable are required to report the available wired and/or wireless control communication protocol(s)* | |

* Please see Version 5.1 Technical Requirements policy document, Controllability section for more details

## DLC Premium

DLC Premium is a higher-performance classification for luminaires and retrofit kits. The DLC Premium classification is intended to differentiate products that can achieve higher performance that exceeds DLC Standard requirements. If a manufacturer seeks qualification of its product(s) to the DLC Premium classification, it must provide all the necessary testing to demonstrate that the product(s) meet the Premium classification's requirements in addition to meeting all base Standard requirements except for lumen maintenance. Only luminaires and retrofit kits are eligible for qualification under DLC Premium. Replacement lamps, Linear-style Retrofit Kits for Troffers, and any products with a Primary Use Designation as "Specialty" are not eligible to qualify for the DLC Premium classification.

***Table 7:*** *DLC Premium Requirements Summary*

| Metric | V5.1 DLC Premium Requirements |
|---|---|
| **Efficacy** | +15 lumens per watt over V5.1 Standard efficacy requirements. |
| **Controllability** | All products (indoor, outdoor, lamps) must be capable of continuous dimming. Step dimming is not acceptable for Premium qualification. |
| **Chromaticity (CCT & $D_{uv}$)** | All Indoor products, except High-Bay: Products shall exhibit chromaticity consistent with at least one of the basic, flexible, or extended, nominal, 4-step quadrangle CCTs from 2200 K – 6500 K. |
| **Discomfort Glare** | UGR < 22 required for:<br>• Troffer Luminaires and Integrated Retrofit Kits<br>• Linear Ambient Luminaires and Retrofit Kits<br>UGR < 25 required for:<br>• Low-Bay Luminaires and Retrofit Kits<br>UGR < 28 required for:<br>• High-Bay Luminaires and Retrofit Kits |
| **Driver ISTMT** | TMPps ≤ driver operating temp specification for which the driver is designed to last ≥50,000 hours |
| **Lumen Maintenance** | Products seeking qualification in the DLC Premium classification will be required to pass $L_{90}$ > 36,000 hours, as evaluated using TM-21. Note new LM-80 / TM-21 guidance. |

## Unified Glare Rating (UGR)

The Unified Glare Rating (UGR) defined in CIE 117-1995 is a metric for evaluating glare performance of certain products in the indoor category. It has been widely used in Europe and other regions and has been updated recently in CIE 232-2019 for luminaires with non-uniform source luminance, such as LEDs. In this version of the Technical Requirements, UGR requirements are only specified for products seeking DLC Premium classification and for providing efficacy allowances for Premium or Standard classification products designed specifically for applications demanding low glare.

For eligible products that need to meet the UGR requirements:

- A full LM-79/distribution report for the products that have the highest total lumen output for each optical variation within the family without consideration of the effect of color properties and the .ies file based on the LM-79 test data.
- Indication on the application form which UGR bin the product's Corrected UGR value falls in. The options for the UGR bins on the application form are 10.0-12.9, 13.0-15.9, 16.0-18.9, 19.0-21.9, 22.0-24.9, and 25.0-27.9. If the product has a UGR less than 10.0, it will fall in the 10.0-12.9 bin.

For more information, please see the V5.1 Technical Requirements Policy document.

### Driver ISTMT and Specification Sheet

As part of the DLC Premium application process, manufacturers must provide the following:

1. Test report from a lab that meets the DLC's Laboratory Requirements for ISTMTs. The report must include the measured temperature from the $TMP_{ps}$.
2. A picture of the $TMP_{ps}$ location with an arrow indicating the thermocouple attachment point.
3. Documentation from the driver manufacturer that indicates the maximum case temperature for which the driver is designed to last ≥50,000 hours, as well as the TMP location it designates for thermal testing.
    a. Custom and integrated drivers must provide documentation equivalent to that required for drivers from third-party vendors. Manufacturers must supply documentation indicating the maximum acceptable temperature for the driver for 50,000-hour life, as well as the TMP to be used during thermal testing and evaluation.

The luminaire passes the driver ISTMT requirements if the measured temperature at the $TMP_{ps}$ is less than or equal to the allowable operating temperature for which the driver is designed to last ≥50,000 hours specified by the power supply manufacturer. Drivers shall be tested *in-situ* under steady-state operating conditions, with case temperature measured at the designated TMP.

One or more additional thermocouples are attached to the power supply/driver at the $TMP_{ps}$. For off-the-shelf remote power supplies, manufacturers typically provide a measurement location (case temperature designated by a "dot" adjacent to a ($t_c$) symbol) for warranty/lifetime purposes. In situations where the $TMP_{ps}$ is not designated by the manufacturer, or where power supplies are integrated with the LED package(s), array, or module(s), luminaire manufacturers should identify the $TMP_{ps}$ to be used for warranty/lifetime purposes. Note that this includes situations where the driver/power supply is not purchased from an outside vendor, and where the driver/power supply is integrated into the luminaire or lamp. Please see this image for an example of the documentation to identify these types of power supplies.

The thermocouple tolerance shall conform to ASTM E230 Table 1 "Special Limits" (≤1.1°C or 0.4%, whichever is greater).

UL 1598 testing may be used for the ISTMT report if the lab that conducted the test meets the DLC's laboratory requirements for ISTMT.

Per the Premium Requirements, custom and integrated drivers must provide equivalent driver spec sheet documentation as drivers from third-party vendors. This also applies to private labeled drivers where the private labeler does not market the private labeled driver and therefore does not have a public-facing driver spec sheet for the driver. Equivalent driver spec sheet documentation must include information on the rated driver performance, including but not limited to: input and output characteristics, the maximum case temperature for which the driver is designed to last ≥50,000 hours, TMP location, as well as the specific driver model number. Reviewers may ask for additional driver information.

## Lumen Maintenance

The DLC expects that manufacturers provide the most up-to-date LM-80 report available for the LED package/module/array used within the product. It is the submitting manufacturer's responsibility to ensure they have received the most up-to-date LM-80 report from the LED manufacturer for each application. Additional data that improves the projection accuracy cannot be ignored simply because it shows worse performance.

The Lumen Maintenance requirements for DLC Standard and DLC Premium are shown in **Table 8**:

***Table 8**: Lumen Maintenance requirements for DLC Standard and DLC Premium*

| DLC Standard | DLC Premium |
|---|---|
| $L_{70} \geq 50{,}000$ hours | $L_{90} \geq 36{,}000$ hours |

The DLC has two options for demonstrating lumen maintenance compliance.

- **Lumen Maintenance Option 1:** Using component-level performance through the TM-21 protocols, which leverage the LM-80 performance and in-situ temperature of the LED device.
- **Lumen Maintenance Option 2:** Using luminaire-level performance through TM-28 protocols, which leverage the LM-84 test performance. More information is available in the Application Instructions. Due to the length of this type of testing, it is recommended that the submitter reach out to applications@deisgnlights.org to ensure the testing will align with DLC Testing and Reporting Requirements before beginning any testing using the LM-84 method.

## LM-80 Applicability

The DLC refers to current ENERGY STAR Requirements for Use of LM-80 Data when determining applicability of LM-80 data for submitted products.

## $L_{70}$ Evaluation

The DLC relies on the results from the ENERGY STAR TM-21 Calculator for evaluating compliance with the lumen maintenance requirements, except in the case where LM-80 data sets with uneven intervals are used. In this case, the DLC relies on results from the ENERGY STAR TM-21 Calculator for Uneven LM-80 Intervals for evaluating compliance with the lumen maintenance requirements. For products that have sufficient LM-80 data to project to 50,000 hours per the TM-21 limits of projection rules, the calculator must show a $L_{70}$ of 50,000 or more. In the current version of the ENERGY STAR calculator (dated 6-18-2018), this is shown in cell I42 when "70" is entered into cell I35. There are no provisions for shorter projection periods for this $L_{70}$ requirement; to qualify for Standard there must be sufficient LM-80 data to project to at least 50,000 hours per TM-21 rules.

## $L_{90}$ Evaluation for Premium Products

Products applying for DLC Premium must meet lumen maintenance requirement of $L_{90} \geq 36{,}000$ hours. The DLC relies on the results from the ENERGY STAR TM-21 Calculator for evaluating compliance with the lumen maintenance requirements, except in the case where LM-80 data sets with uneven intervals are used. In this case, DLC relies on results from the ENERGY STAR TM-21 Calculator for Uneven LM-80 Intervals for evaluating compliance with the lumen maintenance requirements. The results in the ENERGY STAR TM-21 calculator must show a lumen maintenance value of no less than 36,000 in cell I42, when cell I35 is set to 90, to meet the Premium lumen maintenance requirement. There are no provisions for shorter projection periods for this $L_{90}$ requirement; to qualify for Premium there must be sufficient LM-80 data to project to at least 36,000 hours per TM-21 rules.

### LM-84 and TM-28

Option 2 is to conduct luminaire-level testing according to the LM-84-14 test standard and apply the TM-28-14 projection methodology. For Option 2, the DLC uses a pass/fail threshold for lumen maintenance compliance. The projection from TM-28 must project to at least 6,000 hours and the lumen maintenance projection at the projection end point must be consistent with an $L_{70}$ of 50,000 hours. If choosing Option 2 for lumen maintenance determination, please contact the DLC at info@designlights.org.

### Tolerances

When applying the lumen maintenance in accordance with these protocols, the DLC applies a tolerance of 5% to drive currents tested under LM-80, and a 1.1°C to the temperature measured in ISTMT results.

### Additional Guidance on LM-80 Data Limitations

In general, full LM-80 results are necessary for DLC qualification. However, manufacturers may submit products using an LED package/module/array where limited LM-80 data is available if the following conditions are met:

1. The LED package/module/array is a successor package/module/array to a previous generation package/module/array according to ENERGY STAR® Requirements for the Use of LM-80 Data.
2. The manufacturer provides the complete (≥6,000 hours) LM-80 of the previous generation LED package/module/array.
3. The manufacturer provides at least 3,000 hours of LM-80 data of the successor LED package/module/array.
4. The successor package/module/array data demonstrates better performance at 3,000 hours than the previous generation LED package/module/array data at 3,000 hours.
5. The manufacturer provides the remaining 3,000 hour successor LED package/module/array data when available.

### Additional Guidance on LM-80 Tc Locations

Consistent with guidance from ENERGY STAR®, while there may be several acceptable locations to measure the temperature of the LED package/module/array (collectively referred to as the $TMP_{LED}$), the TMP in the ISTMT must match the TMP used during the LM-80. If the ISTMT TMP does not match the LM-80 TMP in the original submission material, DLC staff will look for the applicant to provide one of the following options:

1. Provide an LM-80 of the board or module, where the TMP is monitored/measured at the same TMP used in the ISTMT.
2. Provide an ISTMT measuring the TMP of the hottest LED in the product at the same TMP used in the LM-80.

If neither of the above is possible, and the LED TMP is not accessible, DLC staff will work with the manufacturer to obtain information that explicitly describes the relationship between the board TMP and LED TMP. However, this information will be reviewed on a case by case basis, and may not be sufficient to appropriately verify compliance with the lumen maintenance requirements for all applications.

## Spectral Quality Requirements

The DLC has spectral quality requirements for both DLC Standard and DLC Premium. Though the chromaticity requirements vary with DLC Premium classification, all other requirements are the same for DLC Standard and DLC Premium. Please see the V5.1 Technical Requirements policy document for additional details on required testing.

***Table 9:*** *DLC Standard and DLC Premium Spectral Quality Requirements*

| Metric | DLC Standard Requirements | DLC Premium Requirements |
|---|---|---|
| **Chromaticity (CCT & $D_{uv}$)** | All products must exhibit chromaticity consistent with at least one of the basic, flexible, or extended, nominal, 7-step quadrangle CCTs from 2200K – 6500K | All Indoor products, except high-bay, shall exhibit chromaticity consistent with at least one of the basic, flexible, or extended, nominal, 4-step quadrangle CCTs from 2200K – 6500K |
| **Color Rendition** | *All Indoor products, except high-bay:*<br>**Option 1 - ANSI/IES TM-30-18:**<br>• IES $R_f \geq 70$<br>• IES $R_g \geq 89$<br>• $-12\% \leq$ IES $R_{cs,h1} \leq +23\%$<br>**Option 2 - CIE 13.3-1995:**<br>• $R_a$ (CRI) $\geq 80$<br>• $R_9 \geq 0$ | |
| | *All Outdoor and high-bay products:*<br>**Option 1 - ANSI/IES TM-30-18:**<br>• IES $R_f \geq 70$<br>• IES $R_g \geq 89$<br>• $-18\% \leq$ IES $R_{cs,h1} \leq +23\%$<br>**Option 2 - CIE 13.3-1995:**<br>• $R_a$ (CRI) $\geq 70$<br>• $R_9 \geq -40$ (high-bay only)<br>• Outdoor must report $R_9$ | |
| **Color Maintenance** | *All Indoor products, except high-bay:*<br>Chromaticity shift from 1,000-hour measurement to 6,000-hour measurement must be within a linear distance of 0.004 ($\Delta u'v' \leq 0.004$) on the CIE 1976 ($u'$, $v'$) chromaticity diagram. | |
| | *All Outdoor and high-bay products:*<br>Chromaticity shift from 1,000-hour measurement to 6,000-hour measurement must be within a linear distance of 0.007 ($\Delta u'v' \leq 0.007$) on the CIE 1976 ($u'$, $v'$) chromaticity diagram. | |

### TM-30

IES TM-30-18 is a document approved by the Illuminating Engineering Society (IES) that describes a method for evaluating light source color rendition. The method encompasses several individual measures and graphics that complement one another and provide a comprehensive characterization of how the light will affect the color appearance of objects. The three highest-level components of the system are the Fidelity Index ($R_f$), Gamut Index ($R_g$), and the Color Vector Graphic. With V5.1 Technical Requirements, the DLC will allow accept TM-30 metrics to meet the color rendition requirements. At this time, these metrics are required to be reported, but are not required to meet the color rendition requirements if the CIE 13.3.-1995 requirements option is met. Using the official Excel version of the TM-30 calculation tool offered with the IES standard is required to list these metrics on the QPL. For more information on IES TM-30, please go to http://energy.gov/eere/ssl/tm-30-frequently-asked-questions, or refer to the IES TM-30-18 standard, available here.

## Multiple CCTs

If your product family includes variations in performance other than CCT (including wattage, light output, light distribution, etc.), you must submit in accordance with the family grouping policy.

If applying for multiple CCT variations, note that the testing must be conducted on the worst-case variation (likely the lowest CCT); colorimetry data for the highest CCT variation (LM-79 section 12 measurements) from an accredited lab must also be included.

Colorimetry data is required to verify that all additional CCT variations included in a Single Product Application meet the CCT requirement. If the manufacturer cannot provide the reviewer this information, the reviewer can qualify only the model number for which test data has been provided until test data is available for the additional CCT variations.

Products that use more than one CCT of a given LED are eligible. As with the general multiple-LED-types policy, LM-80 and ISTMT testing must be provided that covers both LEDs. If the LEDs are covered by the same LM-80, only the hottest LED overall will need to be tested. Please note, that DLC normally expects that, if other parameters are equal, lower CCT will be hotter than higher CCTs.

LEDs with more than one CCT that are dynamically controlled for purposes of color-tuning must meet the requirements of the Color Tuning Policy.

## Allowances

**Table 10** presents allowances to minimum efficacy requirements that apply to products with specific features, in specific categories. Additional information will be incorporated in this section as allowances are defined. To participate in the discussion around the development of these allowances, please contact info@designlights.org.

***Table 10:*** *Allowances to Efficacy Requirements*

| Feature | General Application | Performance Metric | Allowance |
|---|---|---|---|
| **CCT** | All | ≤ 2700K | -5% |
| **Color Rendition** | Indoor, excluding high-bay | **Option 1 - ANSI/IES TM-30-18:**<br>• IES $R_f$ ≥ 75<br>• IES $R_g$ ≥ 92<br>• -7% ≤ IES $R_{cs,h1}$ ≤ +19%<br>**Option 2 - CIE 13.3-1995:**<br>• $R_a$ (CRI) ≥ 90 and $R_9$ ≥ 50 | -5% |
| | | **ANSI/IES TM-30-18:**<br>• IES $R_f$ ≥ 78<br>• IES $R_g$ ≥ 95<br>• -1% ≤ IES $R_{cs,h1}$ ≤ +15% | -10% |
| | Outdoor and high-bay | **Option 1 - ANSI/IES TM-30-18:**<br>• IES $R_f$ ≥ 70<br>• IES $R_g$ ≥ 89<br>• -12% ≤ IES $R_{cs,h1}$ ≤ +23%<br>**Option 2 - CIE 13.3-1995:**<br>• $R_a$ (CRI) ≥ 80 and $R_9$ ≥ 0 | -5% |
| **Discomfort Glare** | Troffer (Luminaires and Integrated Retrofit Kits only) | Corrected UGR < 16.0<br>at the glare evaluation reference condition of<br>• Room dimension: X = 4H, Y = 8H<br>• Spacing to height ratio (S/H): 1<br>• Reflectances: 70/50/20%<br>*(Note: Linear-Style Retrofit Kits for 2x2, 1x4, and 2x4 Luminaires are not eligible for efficacy allowances at this time.)* | -10% |
| | Linear Ambient (Luminaires and Retrofit Kits) | Corrected UGR < 16.0<br>at the glare evaluation reference condition of<br>• Room dimension: X = 4H, Y = 8H<br>• Spacing to height ratio (S/H): 1<br>• Reflectances: 70/50/20% | -10% |

| Feature | General Application | Performance Metric | Allowance |
|---|---|---|---|
| | Low-Bay (Luminaires and Retrofit Kits) | Corrected UGR < 19.0<br>at the glare evaluation reference condition of<br>• Room dimension: X = 4H, Y = 8H<br>• Spacing to height ratio (S/H): 1<br>• Reflectances: 70/50/20% | -10% |
| | High-Bay (Luminaires and Retrofit Kits) | Corrected UGR < 22.0<br>at the glare evaluation reference condition of<br>• Room dimension: X = 4H, Y = 8H<br>• Spacing to height ratio (S/H): 1<br>• Reflectances: 70/50/20% | -10% |

Allowances are cumulative up to a maximum allowance of 15%. For example, a 2700K product that exhibits superior color rendition may utilize a maximum allowance of 10%, whereas a 2700K, low glare product that exhibits superior color rendition may utilize a maximum allowance of 15%, to be applied to the efficacy requirement for the Category and General Application under which the product is qualified. Additionally, a product may take advantage of an efficacy allowance in conjunction with the luminaire efficacy tolerance.

## Tolerances

**Table 11** presents tolerances that apply to all metrics listed in the Technical Requirements Tables. These tolerances are referenced in the ENERGY STAR® Manufacturer's Guide. For zonal lumen tolerances specific to each Primary Use Designation, please refer to **Table 5**.

***Table 11:*** *Tolerances*

| Performance Metric | Tolerance |
|---|---|
| Light Output | ±10% |
| Luminaire Efficacy | -3% |
| Allowable CCT | Defined by ANSI C78.377-2017† |
| Minimum Color Rendering | CIE Ra (CRI): -1 Point<br>CIE R9: -1 Point<br>IES Rf: -1 Point<br>IES Rg: -1 Point<br><br>IES $R_{cs,h1}$: +/- 1% |

| Performance Metric | Tolerance |
|---|---|
| Color Maintenance | Δu'v': + 0.0004 points<br>Data must be consistent with the LM-80 testing and reporting guidelines |
| UGR | None |
| Power Factor | -3% |
| Total Harmonic Distortion | +5% |
| Beam Angle (Linear Replacement and 2G11 Base Lamps only) | -5° |

† ANSI C78.377-2017 also referred to for Duv, Δ*u*'*v*', and (x,y) chromaticity coordinates tolerances for indoor categories.

For any performance metrics that are measured as a percentage, corresponding tolerances refer to percentage points. For example, a power factor requirement of ≥ 0.90 (i.e. ≥ 90%) with a -3% tolerance implies a functional requirement of ≥ 0.87 (i.e. ≥ 87%). For performance metrics that are not measured as a percentage, the tolerance is a percentage of the required value. For example, for a minimum efficacy requirement of 60 lm/W with a -3% tolerance, the functional requirement is 58.2 lm/W (i.e. 60 – 3% = 58.2).

Tolerances are intended to account for all testing variation, rounding, and significant digits. The requirement values and tolerances will be interpreted by DLC review staff as exact requirements. While test labs will be expected to follow the requirements of their accreditation and relevant test standards, DLC staff will not employ additional "rounding" to interpret values below the absolute thresholds as passing. For example, if a luminaire is required to have an efficacy of 110 lm/W, then with the efficacy tolerance of -3%, any value for efficacy less than 106.70000… will be interpreted as a failing value. It is an applicant's responsibility to check all data presented in an application before submission to ensure compliance with the DLC requirements.

### Measured temperature from the ISTMT

According to ENERGY STAR Manufacturer's Guide for Qualifying Solid-State Lighting Luminaires – Version 2.1, the measured temperature from an ISTMT has a tolerance of ≤ 1.1°C or 0.4%, whichever is greater due to thermocouple tolerance. This may change the appropriate In-Situ case temperature (Tc,°C) to enter into the ENERGY STAR TM-21 calculator. For example, a measured In-Situ case temperature of 86.1°C may be entered as 85°C to comply with an 85°C case temperature data set from the LM-80 report.

## Power Factor and Total Harmonic Distortion

In addition to the specific requirements above, all DLC-qualified luminaires must have a power factor of ≥0.9, and a total harmonic distortion of ≤20%. This applies to every category listed in the above Technical Requirements Tables. Qualified products must meet the requirements in their worst-case loading conditions.

In all cases, testing must be provided at the worst-case performance among a product's different operating modes, as the Technical Requirements for each category are minimum performance requirements. Due to design complexities of SSL luminaires and the many variables that could affect each performance

metric with a minimum requirement, it is difficult to prescribe what worst case will be for all situations. It is the manufacturer's responsibility to identify the worst-case operating mode of the product for each performance metric requirement and provide the appropriate test data. The DLC always reserves the right to ask for details of how worst-case was determined, including supporting engineering analysis and test data supporting the selection, as deemed necessary.

Our understanding of the technology has led us to expect certain operating modes and design choices to be the worst-cases. Power factor and THD are commonly seen to be worst case at 277V, while photometrics (specifically efficacy) are commonly worst case at 120V. This is not necessarily true for all luminaire designs, so a manufacturer may submit independent test data for a different operating mode if it is accompanied by a technical rationale and supporting data (independent or in-house) demonstrating that what was tested is in fact the worst-case. If testing is not conducted according to the expectations described above, DLC reviewers will ask for the testing at the expected worst-case operating modes, or a technical rationale with supporting data for an alternate worst-case operating mode for both electricals (power factor and THD) and photometrics.

Alternately, if the voltage inputs for a product include 347V and/or 480V options, manufacturers will be expected to provide a rationale for how worst-case was determined, or test data at all voltages if a rationale cannot be provided for a particular operating mode.

When submitting applications for products using universal drivers, be sure to test at the appropriate operating mode for both photometric and electrical measurements. Please note that the DLC requires the current THD ("THDi" or "ATHD") performance, not voltage THD.

The manufacturer may test only the light engine-electrical component system when conducting power factor and THD tests (for products with light engines that are separable from the housing).

## Multiple LEDs

Products employing multiple types of LEDs are eligible under the following conditions: 1) the types and quantities of the LED packages/modules/arrays are known, and 2) the LEDs are not dynamically controlled, other than for dimming purposes. That is, products where variable numbers of LEDs are dynamically chosen and therefore the precise construction of any given product is not defined are not eligible. Policy development for appropriate evaluation of this type of product is under consideration.

For products using multiple LED types, including color-tunable products, an LM-80, ISTMT, and TM-21 projection will be needed for each type of LED present in the product. As per normal thermal testing rules, ISTMTs must be conducted on the hottest LED of each type.

See the Lumen Maintenance section for more details.

## Warranty

The DLC requires a minimum warranty period of 5 years on all products listed on the QPL. The warranty must cover the complete luminaire or retrofit kit/replacement lamp when applicable. Note that the "luminaire" includes light source, housing, heat sink, power supplies and other electrical components, optics, and any other components of the luminaire. Warranty documentation must clearly explain the terms and conditions associated with the warranty.

Warranties that only cover certain components of the luminaire or retrofit kit/replacement lamp are not sufficient to meet the requirement. Consumable components that are designed and intended to be replaced as part of regular maintenance and upkeep, such as air filter elements or UV-C lamps, are not subject to the warranty requirements. Warranty statements are reviewed on a case-by-case basis and the DLC reserves to right to seek additional clarification if necessary.

Warranty terms and conditions can vary widely from manufacturer to manufacturer. The DLC explicitly defines a warranty period of 5 years and does not have specific requirements for warranty claim terms other than those listed above. The DLC does not verify or validate a manufacturer's terms, conditions or process for customer warranty claims. The DLC does not monitor field failure rates of qualified products, or policy warranty redemption or history among manufacturers. Industry stakeholders are urged to review warranty terms and conditions as part of the purchasing decision process.

## Safety Certification

### Single Product / Family Grouping / Product Updates

1. All products are required to submit a compliance certificate from an approved safety certification organization relevant in the United States or Canada. This compliance document shall bear the manufacturers name and will be proof that the products listed have been investigated by the safety organization and found to be in compliance with the standards listed on the certificate. The name of this document varies by safety organization, however, is commonly referred to as a Certificate of Compliance or Authorization to Mark.
2. During the application process, manufacturers will be required to digitally sign an agreement confirming that the safety documentation they are providing with the application covers ALL models they wish to be listed on the QPL and that the products being sold will bear the proper markings from the safety organization.

Note: If, after qualification, the safety documentation gets updated so that any model number(s) listed on the QPL are no longer covered by the original safety certificate, it is the responsibility of the manufacturer to submit the revised documentation so that the DLC records can be updated accordingly. Failure to do so may result in the product and any associated family members or private labels of the product being delisted.

### Private Label

1. All products are required to submit a compliance certificate from an approved safety certification organization relevant in the United States or Canada. This compliance document shall bear the Original Equipment Manufacturer (OEM) name and will be proof that the products listed have been investigated by the safety organization and found to be in compliance with the standards listed on the certificate. The name of this document varies by safety organization, however, is commonly referred to as a Certificate of Compliance or Authorization to Mark. If the submitted compliance certificate is different from the one on file from the OEMs submission to the DLC, the OEM must update their records prior to the private label submission being formally processed.
2. In addition to a compliance certificate from the OEM, the private labeler must also submit a compliance certificate from an approved safety certification organization which bears the private labelers name and unique file number.

3. All products are required to submit a Multiple Listing correlation sheet issued by the approved safety organization which cross references the OEM model numbers with private label model numbers.
4. During the application process, manufacturers will be required to digitally sign an agreement confirming that the safety documentation provided covers ALL models they wish to be listed on the QPL and that the products being sold will bear the proper markings from the safety organization.

Note: If the safety documentation gets updated so that any model number(s) listed on the QPL are no longer covered by the original safety certificate, it is the responsibility of the manufacturer to submit the revised documentation so that the DLC records can be updated accordingly. Failure to do so may result in the product and any associated family members being delisted.

### Verification of Model Numbers

The DLC performs a limited review of the safety documentation being submitted by the manufacturer. It is the responsibility of the applicant to verify that ALL of the model numbers that are being submitted for qualification be covered by the safety certification documents. If the model numbers being submitted are found to not have been covered by the safety certification documents that were originally submitted, the models will be removed from the QPL and further action may be taken, if necessary.

## Additional Guidance for Products Seeking Qualification under the "Specialty" Primary Use Designation

This designation has been developed as an additional tool for the DLC and its Member programs to employ in seeking to identify high-quality, energy-saving LED luminaires in commercial and industrial applications for certain niche applications for which the DLC has not yet developed a specific Primary Use Designation.

To prevent the "Specialty" designation from being a loophole to get around requirements in other categories, the DLC will employ a number of principles in evaluating products submitted with this classification, including the following:

1. Products with a Specialty designation must meet the intention of the broader category and general application group under which they are designated. For example, products seeking qualification with a classification of Outdoor-Low Output-Specialty: _____ must be intended for use in outdoor applications.
2. Products with a Specialty designation must meet the minimum performance specifications of the broader category under which they are designated. This includes minimum light output, efficacy, chromaticity, color rendition, color maintenance, $L_{70}$, THD, and PF requirements.
3. Products with a Specialty designation must specify the end-use for which they are intended. For example, products that are intended to be used for stadium lighting that seek qualification under the specialty designation must indicate on the application form that their intended use is "Specialty: Stadium Lighting". DLC staff will monitor terminology and may make minor modifications to descriptor terms to ensure consistency (for example "Specialty: Stadium Lighting vs. "Specialty: Stadium Luminaire"). Changes in descriptor terms will be made in consultation with the applicant.
4. As part of its evaluation for any new Specialty designation, the DLC will make a determination on what dimming requirements will apply to that designation. Additional detail on the application and market for the end-use may be requested of the applicant to assist in making this determination.

5. The DLC retains the right to deny access to the Specialty designation for any product it does not believe meets the intention of the designation. Judgment on eligibility will be at the sole discretion of the DLC program staff.

Seeking qualification of a product using this Primary Use Designation is an acknowledgement of the rules of the program and a confirmation that the applicant agrees to abide by the decisions of the program.

Products with a Specialty designation are not eligible for DLC Premium classification.

Products seeking qualification on the QPL that would like to identify themselves as suitable for Hazardous Locations using the Specialty designations must provide documentation to demonstrate the appropriateness of their products for Hazardous Locations. Refer to the Testing and Reporting Requirements for Hazardous Location Lighting for additional details.

## Additional Guidance for Reporting Requirements

In addition to designating a Primary Use and meeting Zonal Lumen Density requirements, manufacturers submitting to the DLC need to indicate whether their products are capable of dimming and/or field-adjustability. Refer to the DLC Dimming and Field Adjustable Light Output policy and DLC Field Adjustable Distribution policy for additional details.

For products that are Color Tunable, manufacturers must indicate which of the following sub-categories applies: White-Tunable and/or Warm-Dimming. For white-tunable products, manufacturers must submit appropriate LM-79 reports according to the Testing and Reporting Requirements for Color-Tunable Products and report measured CCT (K), power consumption (W), lumen output (LM) and input control signal applied. The DLC may revise the color tunable testing requirements to align with any future industry standards published with full bodied supporting data. For Warm-Dimming products, manufacturers must submit a single LM-79 report performed at the maximum setting of the dimming input control.

Manufacturers submitting products to DLC Premium will also need to indicate whether the product can be ordered with integral controls (occupancy sensors or photo sensors). The DLC will evaluate a manufacturer's claims of integral controls capability by ensuring that these features are clearly identified on the product specification sheet. DLC reviewers may check web listings and other marketing materials and reserve the right to request additional information to demonstrate integral controls capability if product specification sheets are not sufficient.

## Additional Guidance for Specific Types of Products

### Non-Cutoff and Semi-Cutoff Wall-Mounted Area Luminaires

In this version of the Technical Requirements Tables, non-cutoff and semi-cutoff wall packs are eligible under this Primary Use Designation, distinct from full-cutoff wall packs. For non-cutoff and semi-cutoff wall packs, light output, efficacy, and zonal lumen distribution requirements are evaluated based on the lumens in the 0-90° zone only, rather than total lumens produced by the luminaire. The lumen output for these products must be ≥300 lm in the 0-90° zone; the "efficacy" calculations will include only lumens in the 0-90° zone, divided by the total wattage; and the zonal lumen requirement of ≤10% light output in the 80-90° glare zone will be calculated by dividing the lumens in that zone by the lumen total in the 0-90° zone. Please note that while whether a product passes the

requirements is based on the lumens in the 0-90° zone only, the general application (low, mid, high, or very-high output, and associated efficacy requirements) is determined based on the full light output from the product.

## Flood and Spot Luminaires

For Architectural and Landscape/Accent Flood and Spot Luminaires products, manufacturers must declare the NEMA Beam Classification of their luminaire in the 0-180° and 90-270° planes. The DLC will verify these claims against the IES files provided.

***Table 12:*** *NEMA Beam Classification*

| NEMA Beam Classification | Beam Spread Range |
|---|---|
| 1 | 10-18° |
| 2 | 18-29° |
| 3 | 29-46° |
| 4 | 46-70° |
| 5 | 70-100° |
| 6 | 100-130° |
| 7 | ≥130° |

## Wall Wash Luminaires

The zonal lumen criteria for this Primary Use is that ≥60% of the lumens must be produced in the "forward" hemisphere, toward the wall.

## Stairwell and Passageway Lighting

The DLC requires that products in the Stairwell and Passageway Lighting Primary Use Designation meet one of the following conditions:

1. Luminaires that include integral controls for occupancy sensing and bi-level dimming.
2. Luminaires that operate off remote occupancy sensors, including wireless options, where a remote sensor(s) is sold packaged together with a luminaire(s) under a single model number or ordering code.
3. Luminaires that operate off remote occupancy sensors, including wireless options, where the luminaire and sensor are sold separately, but the luminaire has features enabling communication with a remote sensor(s).

Documentation must be provided to demonstrate compliance with one of the options above, including clear documentation of at least bi-level dimming functionality (required), and communications ability (if applicable). Features must be designated clearly in the model number. Manufacturers must also declare whether the unit is intended to be surface-mounted or corner-mounted. All performance requirements in the Technical Requirements Tables refer to the full power operating mode.

### Linear Ambient Luminaires

For the purposes of family grouping, linear ambient luminaires that are available as continuous runs:

- End cap variations are not considered optical variations for family grouping and listing purposes. These product variations may be included within a given product model number or listing as bracketed options or wildcard characters.
    - Continuous runs are considered to be multiple linear ambient luminaires connected end-to-end without breaks; end caps are defined as the finish piece applied to the either end of a continuous run.
    - End caps must be less than 3" in width. End caps that do not meet these requirements will be considered performance-affecting and may not be included in bracketing for a given model number.

### Retrofit Kits

The DLC will accept QPL applications for SSL retrofit kits for the Primary Use Designations listed in the Technical Requirements Tables. Retrofit kits falling outside of one of the Primary Use Designations listed will not be accepted. The testing and reporting requirements described in the link below are intended to subject the retrofit kits to real-world thermal conditions to assure confidence in lumen maintenance. For more information, please refer to the Testing and Reporting Requirements for Retrofit Kits.

### Linear Replacement Lamps

The DLC will accept QPL applications for linear tube-style products intended to replace fluorescent lamps in this category. The testing and reporting requirements described in the link below are intended to evaluate the performance of the lamp itself. For more information, please refer to the Testing and Reporting Requirements for Linear Replacement Lamps. Note that this category covers all LED tubes, including those that are direct replacements for fluorescent tubes and those that require modifications to the existing luminaire (such as bypassing the existing ballast). Linear replacement lamps are eligible for the DLC Standard classification only. Per the updated Reference Housings policy, effective with Version 5.1, Linear Replacement Lamps are verified only on their bare-lamp performance.

### Screw-Base Replacement Lamps

The DLC will accept QPL applications for screw-base replacement products intended to replace HID lamps in these categories. The testing and reporting requirements described in the link below are intended to evaluate the performance of the lamp installed in specific end-use applications. For more information, please refer to the Testing and Reporting Requirements for Screw-Base Replacements for HID Lamps. Note that this category covers only Type B and Type C replacement lamps and qualifies only products in specific end-uses. Replacement lamps are eligible for the DLC Standard classification only.

### Four Pin-Base Replacement Lamps

The DLC will accept applications for four-pin (i.e. G24q/GX24q and 2G11 base) replacement lamps. At this time, G24q/GX24q and 2G11 UL Type A lamps, and 2G11 UL type B, C, or A-B lamps are included. G24q/GX24q base UL Type B lamps (designed to operate directly using line voltage) and UL Type C products (designed to operate utilizing a non-integral driver), as well as products with other bases (including two pin products), remain under consideration for future development.

The testing and reporting requirements described below are intended to subject the lamps to conditions found in typical luminaires in order to assure confidence in performance. For more information, please refer to the Testing and Reporting Requirements for Four Pin-Base Replacement Lamps for CFLs. Note that this category covers only Type A replacement lamps (lamps that are direct replacements for CFLs and do not require bypassing the CFL ballast). Replacement lamps are eligible for the DLC Standard classification only.

Per the updated Reference Housings policy, effective with Version 5.1, 2G11-base Four Pin-Base Replacement Lamps are verified only on their bare-lamp performance.

## Testing Constraints

The DLC understands that in some scenarios, products that are required to be tested may not physically fit within the testing apparatus needed to conduct testing. This is often seen with 8-foot linear-type luminaires that do not fit in standard goniophotometers, though other restrictions may exist. In the event that a product is identified as requiring testing for a DLC application, but cannot be tested due to the constraints of the testing equipment, the DLC will need to understand and collect the following information:

1. Specific reasons why the product in question cannot be tested.
2. A proposal from the manufacturer on how to evaluate the performance of the product. Proposals must be technically sound and demonstrate a thorough understanding of the product's construction and performance-affecting variables.
3. Rationale for why the proposal is representative of the product's performance.

Proposals, once complete with the details mentioned above, will be reviewed on a case-by-case basis by DLC program management. Please provide this information ahead of submitting an application as proposals need to be approved prior to allowing the use of alternate data within an application. This will help ensure application reviews are completed as efficiently as possible. As always, the DLC reserves the right to require additional information, and manufacturers should be prepared to provide documentation that addresses concerns that arise.

The DLC has developed and approved alternative procedures for testing **linear style products with a length greater than or equal to five feet and any PUD with independent uplight and downlight**. View alternative testing procedures for these products.

Development of additional standard procedures for evaluating performance of products that are too large for testing equipment is on the DLC policy development wish list. The DLC welcomes proposals for standardizing this process. Please send all proposals to info@designlights.org.

## Policy Clarifications and Updates

As the DLC processes applications for V5.1, we have encountered the need for minor corrections, terminology clarifications, and policy interpretations. In order to be as transparent as possible, the V5.1 Policy documents will be updated as needed, and the changes will be tracked in the table below and on the DLC website. **Table 13** shows the corrections or clarifications made and where they can be found in the document.

***Table 13:*** *Corrections and clarifications published as needed*

| Date updated | Subject | Change Type | Description | Affected Page(s) |
|---|---|---|---|---|
| 10/18/2021 | Warranty Requirements | Policy Change | Adds an exception to warranty requirements for consumable components of products | 23 |
| 9/20/2021 | Document Format | Clarification | Clarifies that the formatting of this document does not correlate to the SSL V5.1 Technical Requirements | 1 |
| 9/20/2021 | Driver / Power Supply Requirement | Clarification | Adds an example documentation to help identify specific types of power supplies | 14 |
| 9/20/2021 | Color Rendering Notation | Clarification | Changes the notation of $R_a$ to include (CRI) for clarity | 17, 19, 20 |
| 6/23/2021 | Alternative testing procedures | Policy Change | Expands alternative testing procedures to include any PUD with independent uplight and downlight | 28 |
| 5/5/2021 | Color Rendition Tolerances | Clarification | More clearly lists out tolerances to color rendition | 20 |
| 3/25/2021 | Testing Constraints | Policy Change | Broadening alternative testing procedure for luminaires that do not fit inside typical photometric testing equipment from products within the linear ambient primary use designation only to any linear style product. | 28 |
| 1/22/2021 | IES Rcs,h1 tolerance | Correction | IES Rcs,h1 tolerance corrected from "-1%" to "+/- 1%" | 20 |
| 1/22/2021 | Products required to meet Beam Angle | Correction | 2G11 base replacement lamps must also meet Beam Angle requirements, along with linear replacement lamps | 21 |
| 11/13/2020 | Testing large linear ambient products | Guidance added | The DLC has developed and approved alternative procedures for testing linear ambient products with a length greater than or equal to five feet and linear ambient products with indirect components. | 28 |
| 11/13/2020 | Products with UGR < 10 | Clarification | Original version did not indicate what bin to use when a product has UGR values lower than the listed range: if a product has a UGR less than 10.0, it will fall in the 10.0-12.9 bin. | 13 |

| Date updated | Subject | Change Type | Description | Affected Page(s) |
|---|---|---|---|---|
| 11/13/2020 | Driver operating temperature | Correction | Original versions of the V5.1 Technical Requirements Tables made reference to "driver operating temperature," which should have read "driver operating temperature specification for which the driver is designed to last ≥50,000 hours" | 13, 14 |
| 8/20/2020 | Outdoor $R_9$ Requirement | Policy Change | The $R_9$ requirement for outdoor products has been changed from a required threshold to a reporting requirement only. High-bay products must still meet $R_9 \geq -40$. | 17 |
| 6/17/2020 | Exclusions from DLC Premium | Clarification | More clearly states that Linear-Style Retrofit Kits for Troffers are not eligible to qualify for the DLC Premium classification under V5.1. | 12 |
| 6/17/2020 | Lumen Maintenance - $L_{70}$ not required for DLC Premium | Correction | Original version incorrectly stated that the $L_{90}$ requirement for DLC Premium "is in addition to the $L_{70}$ requirements of the DLC standard classification." There is no $L_{70}$ requirement for DLC Premium; just $L_{90} \geq 36{,}000$ hours. | 13 |