

## Technical Requirements Table, V4.1

Table 1: Technical Requirements: Luminaires

#	Category	General Application	Requirements								Distribution
			Minimum Light Output (lm)	DLC Standard			DLC Premium**			Primary Use***	
				Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L70	Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L90 / L70		
1	Outdoor	Outdoor – Low Output	250-5,000	90	5	≤5700 / ≥65 / ≥50,000	110	5	≤5700 / ≥65 / >36,000 / ≥50,000	<ul style="list-style-type: none"><li>• Outdoor Pole/Arm-Mounted Area and Roadway Luminaires</li><li>• Outdoor Pole/Arm-Mounted Decorative Luminaires</li><li>• Outdoor Full-Cutoff Wall-Mounted Area Luminaires</li><li>• Outdoor Non-Cutoff and Semi-Cutoff Wall-Mounted Area Luminaires</li><li>• Bollards</li><li>• Parking Garage Luminaires</li><li>• Fuel Pump Canopy Luminaires</li><li>• Landscape/Accent Flood and Spot Luminaires</li><li>• Architectural Flood and Spot Luminaires</li><li>• Stairwell and Passageway Luminaires</li><li>• Specialty:_____</li></ul>	See Primary Use Zonal Lumen Density Requirements in Table 4, below
2		Outdoor – Mid Output	5,000-10,000	95			115				
3		Outdoor – High Output	10,000-30,000	100			120				
4		Outdoor – Very High Output*	≥30,000	100			120				
5	Indoor	Interior Directional	250-4,500	65	5	≤5000 / ≥80 / ≥50,000	90	5	≤5000 / ≥80 / >36,000 / ≥50,000	<ul style="list-style-type: none"><li>• Wall Wash Luminaires</li><li>• Track or Mono-Point Luminaires</li><li>• Specialty:_____</li></ul>	
6		Case Lighting	≥50 lm/ft	80			125			<ul style="list-style-type: none"><li>• Display Case Luminaires</li><li>• Horizontal Refrigerated Case Luminaires</li><li>• Vertical Refrigerated Case Luminaires</li><li>• Specialty:_____</li></ul>	
7		Troffer	≥1,500	100			125			<ul style="list-style-type: none"><li>• 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces</li><li>• 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces</li><li>• 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces</li><li>• Specialty:_____</li></ul>	
8		Linear Ambient	≥375 lm/ft	105			130			<ul style="list-style-type: none"><li>• Direct Linear Ambient Luminaires</li><li>• Linear Ambient Luminaires w/ Indirect component</li><li>• Specialty:_____</li></ul>	
9		High Bay	≥5,000	105			130			≤5700 / ≥70 / >36,000 / ≥50,000	

\* Under the next revision to the efficacy requirements (V5.0), DLC intends to split the “very high” outdoor lumen bin from the “high” lumen bin, and set unique efficacy requirements for each bin.

\*\* Products seeking qualification in the DLC Premium classification will be required to pass an L<sub>90</sub> > 36,000 hours, as evaluated using TM-21. This requirement is in addition to the L<sub>70</sub> requirements of the DLC Standard classification.

\*\*\* Luminaires may not qualify for DLC Premium using “Specialty: \_\_\_\_\_” as the Primary Use designation.

Table 2: Technical Requirements: Retrofit Kits\*\*

#	Category	General Application	Requirements								Distribution
			Minimum Light Output (lm)	DLC Standard			DLC Premium***			Primary Use****	
				Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L70	Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L90 / L70		
10	Outdoor Retrofit Kit	Outdoor – Low Output	250-5,000	90	5	≤5700 / ≥65 / ≥50,000	110	5	≤5700 / ≥65 / >36,000 / ≥50,000	<ul style="list-style-type: none"><li>• Retrofit Kits for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires</li><li>• Retrofit Kits for Outdoor Pole/Arm-Mounted Decorative Luminaires</li><li>• Retrofit Kits for Large Outdoor Pole/Arm-Mounted Area and Roadway Luminaires</li><li>• Retrofit Kits for Outdoor Full-Cutoff Wall-Mounted Area Luminaires</li><li>• Retrofit Kits for Parking Garage Luminaires</li><li>• Retrofit Kits for Fuel Pump Canopy Luminaires</li></ul>	See Primary Use Zonal Lumen Density Requirements in Table 4, below
11		Outdoor – Mid Output	5,000-10,000	95			115				
12		Outdoor – High Output	≥10,000	100			120				
13		Outdoor – Very High Output*	≥30,000	100			120				
14	Indoor Retrofit Kit	Troffer	≥1,500	100	5	≤5000 / ≥80 / ≥50,000	125	5	≤5000 / ≥80 / >36,000 / ≥50,000	<ul style="list-style-type: none"><li>• Linear Retrofit Kits for 2x2 Luminaires</li><li>• Integrated Retrofit Kits for 2x2 Luminaires</li><li>• Linear Retrofit Kits for 1x4 Luminaires</li><li>• Integrated Retrofit Kits for 1x4 Luminaires</li><li>• Linear Retrofit Kits for 2x4 Luminaires</li><li>• Integrated Retrofit Kits for 2x4 Luminaires</li></ul>	
15		Linear Ambient	≥375 lm/ft	105			130			<ul style="list-style-type: none"><li>• Retrofit Kits for Direct Linear Ambient Luminaires</li></ul>	
16		High-Bay	≥5,000	105			130		≤5700 / ≥70 / >36,000 / ≥50,000	<ul style="list-style-type: none"><li>• Retrofit Kits for High Bay Luminaires for Commercial and Industrial Buildings</li><li>• Retrofit Kits for Low Bay Luminaires for Commercial and Industrial Buildings</li></ul>	

\* Under the next revision to the efficacy requirements (V5.0), DLC intends to split the “very high” outdoor lumen bin from the “high” lumen bin, and set unique efficacy requirements for each bin.

\*\* Retrofit Kits and Replacement Lamps must be tested inside luminaires, per the policies for those products. See Retrofit Kit Policy, Linear Replacement Lamp Policy, and Screw-base Replacement Lamp Policy for details.

\*\*\* Products seeking qualification in the DLC Premium classification will be required to pass an L<sub>90</sub> > 36,000 hours, as evaluated using TM-21. This requirement is in addition to the L<sub>70</sub> requirements of the DLC Standard classification.

\*\*\*\* Retrofit Kits applications must designate one of the Primary Use designations listed.

Table 3: Technical Requirements: Lamps\*\*, \*\*\*

#	Category	General Application	Minimum Light Output (lm)	DLC Standard			Primary Use	Distribution
				Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L70		
17	Linear Replacement Lamp	Four-Foot Linear Replacement Lamps	In luminaire: 2 lamps: 3,000 3 lamps: 4,500 4 lamps: 6,000  Bare lamp: 1,600	In luminaire: 100  Bare lamp: 110	5	≤5000 / ≥80 / ≥50,000	<ul style="list-style-type: none"> <li>• Replacement Lamps ("Plug and Play") (UL Type A)</li> <li>• Internal Driver/Line Voltage Lamp-Style Retrofit Kits (UL Type B)</li> <li>• 2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• 3-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• 4-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• Dual Mode Internal Driver (UL Type A or B)</li> </ul>	See Primary Use Zonal Lumen Density Requirements in Table 4, below
18		Two-Foot Linear Replacement Lamps	In luminaire: 2 lamps: 1,350 3 lamps: 2,000 4 lamps: 2,700  Bare lamp: 800	In luminaire: 100  Bare lamp: 110	5	≤5000 / ≥80 / ≥50,000	<ul style="list-style-type: none"> <li>• Replacement Lamps ("Plug and Play") (UL Type A)</li> <li>• Internal Driver/Line Voltage Lamp-Style Retrofit Kits (UL Type B)</li> <li>• 2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• 3-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• 4-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• Dual Mode Internal Driver (UL Type A or B)</li> </ul>	
19		U-Bend Replacement Lamps	In luminaire: 2 lamps: 2,500 3 lamps: 3,750  Bare lamp: 1,400	In luminaire: 100  Bare lamp: 110	5	≤5000 / ≥80 / ≥50,000	<ul style="list-style-type: none"> <li>• Replacement Lamps ("Plug and Play") (UL Type A)</li> <li>• Internal Driver/Line Voltage Lamp-Style Retrofit Kits (UL Type B)</li> <li>• 2-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• 3-lamp External Driver Lamp-Style Retrofit Kits (UL Type C)</li> <li>• Dual Mode Internal Driver (UL Type A or B)</li> </ul>	
20	Mogul Screw-Base (E39) Replacements for HID Lamps	Outdoor – Low Output	In luminaire: 250-5,000	In luminaire: 90	5	≤5700 / ≥65 / ≥50,000	<ul style="list-style-type: none"> <li>• Replacement Lamps for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires (UL Type B)</li> <li>• Replacement Lamps for Outdoor Pole/Arm-Mounted Decorative Luminaires (UL Type B)</li> <li>• Replacement Lamps for Outdoor Full-Cutoff Wall-Mounted Area Luminaires (UL Type B)</li> <li>• Replacement Lamps for Parking Garage Luminaires (UL Type B)</li> <li>• Replacement Lamps for Fuel Pump Canopy Luminaires (UL Type B)</li> </ul>	
21		Outdoor – Mid Output	In luminaire: 5,000-10,000	In luminaire: 90				
22		Outdoor – High Output	In luminaire: 10,000-30,000	In luminaire: 95				
23		Outdoor – Very High Output*	In luminaire: ≥30,000	In luminaire: 95				
24		High-Bay	In luminaire: ≥5,000	In luminaire: 100	5	≤5700 / ≥70 / ≥50,000	<ul style="list-style-type: none"> <li>• Replacement Lamps for High Bay Luminaires (UL Type B)</li> <li>• Replacement Lamps for Low Bay Luminaires (UL Type B)</li> <li>• Replacement Lamps for High Bay Luminaires (UL Type C)</li> <li>• Replacement Lamps for Low Bay Luminaires (UL Type C)</li> </ul>	

#	Category	General Application	Requirements					Distribution
			Minimum Light Output (lm)	DLC Standard			Primary Use	
				Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L70		
25	Four Pin-Base Replacement Lamps for CFLs	Vertically-Mounted Lamps	In luminaire: 575 (1-lamp configuration)  Bare lamp: 675	In luminaire: 65  Bare lamp: 75	5	≤5000 / ≥80 / ≥50,000	• Replacement Lamps ("Plug and Play") (UL Type A)	See Primary Use Zonal Lumen Density Requirements in Table 4, below
26		Horizontally-Mounted Lamps	In luminaire: 800 (2-lamp configuration)  Bare lamp: 675	In luminaire: 65  Bare lamp: 75	5	≤5000 / ≥80 / ≥50,000	• Replacement Lamps ("Plug and Play") (UL Type A)	

\* Under the next revision to the efficacy requirements (V5.0), DLC intends to split the "very high" outdoor lumen bin from the "high" lumen bin, and set unique efficacy requirements for each bin.

\*\* Retrofit Kits and Replacement Lamps must be tested inside luminaires, per the policies for those products. See Retrofit Kit Policy, Linear Replacement Lamps, and Screw-base Replacement Lamp Policy for details.

\*\*\* Replacement Lamps are not eligible for the DLC Premium classification at this time.

Table 4: Primary Use Technical Requirements: Light Output and Zonal Lumen Distribution

Primary Use Letter	Primary Use Designation	Minimum Light Output (lm)	Zone/Spacing Criteria	ZLD/SC Nominal Requirement	ZLD/SC Tolerance	ZLD/SC 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%

Table 4: Primary Use Technical Requirements: Light Output and Zonal Lumen Distribution, continued

Primary Use Letter	Primary Use Designation	Minimum Light Output (lm)	Zone/Spacing Criteria	ZLD/SC Nominal Requirement	ZLD/SC Tolerance	ZLD/SC 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 w/ 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 for Commercial and Industrial Buildings	10,000	20-50°	≥30%	-10%	≥20%
W	Low Bay Luminaires for Commercial and Industrial Buildings	5,000 (<10,000)	20-50°	≥30%	-10%	≥20%
X	High Bay Aisle Luminaires	10,000	20-50°	≥50%	-10%	≥40%
			0-20°	≥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%
AH	Retrofit Kits for Direct Linear Ambient Luminaires	375 lm/ft	0-60°	≥40%	-3%	≥37%

Table 4: Primary Use Technical Requirements: Light Output and Zonal Lumen Distribution, continued

Primary Use Letter	Primary Use Designation	Minimum Light Output (lm)	Zone/Spacing Criteria	ZLD/SC Nominal Requirement	ZLD/SC Tolerance	ZLD/SC Requirement with Tolerance
AI	Retrofit Kits for High Bay Luminaires for Commercial and Industrial Buildings	10,000	20-50°	≥30%	-10%	≥20%
AJ	Retrofit Kits for Low Bay Luminaires for Commercial and Industrial Buildings	5,000 (<10,000)	20-50°	≥30%	-10%	≥20%
AK	Four-Foot Linear Replacement Lamps (all Primary Use designations)††	In luminaire: 2 lamps: 3,000 3 lamps: 4,500 4 lamps: 6,000  Bare Lamp: 1,600	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%
AL	Two-Foot Linear Replacement Lamps (all Primary Use designations)††	In luminaire: 2 lamps: 1,350 3 lamps: 2,000 4 lamps: 2,700  Bare lamp: 800	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%
AM	U-Bend Replacement Lamps (all Primary Use designations)††	In luminaire: 2 lamps: 2,500 3 lamps: 3,750  Bare lamp: 1,400	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%
AN	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%
AO	Screw-Base Replacements for HID Lamps in Outdoor Pole/Arm-mounted Decorative Luminaires	In luminaire: 1,000	0-90°	≥65%	-3%	≥62%
AP	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%
AQ	Screw-Base Replacements for HID Lamps in Parking Garage Luminaires	In luminaire: 2,000	60-80°	≥30%	-3%	≥27%
			70-80°	≤25%	+3%	≤28%
AR	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%
AS	Screw-Base Replacements for HID Lamps in High Bay Luminaires for Commercial and Industrial Buildings	In luminaire: 10,000	20-50°	≥30%	-10%	≥20%

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

\*\*\* 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

†† For Type C linear replacement lamps, light output requirements out of the luminaire are dependent on the number of lamps in the kit. See Linear Replacement Lamps Policy for more details.

### Power Factor and Total Harmonic Distortion:

In addition to the specific requirements above, all DLC-qualified luminaires must have a power factor of  $\geq 0.9$ , and a THDi of  $\leq 20\%$ . This applies to every category listed in the above Technical Requirements Table V4.1. Qualified products must meet the requirements in their worst-case loading conditions.

### Tolerances:

Table 5 presents tolerances that apply to all metrics listed in the above in Technical Requirements Table V4.1. 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.

### [FAQ: How are tolerances applied to the requirements?](#)

Table 5: Tolerances

Performance Metric	Tolerance
Light Output	$\pm 10\%$
Luminaire Efficacy	-3%
Allowable CCT	Defined by ANSI C78.377-2015†
CRI	-2 points
Power Factor	-3%
Total Harmonic Distortion	+5%

†ANSI C78.377-2015 also referred to for  $D_{uv}$  and (x,y) chromaticity coordinates tolerances for indoor categories.

### Allowances:

Table 6 presents allowances 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](mailto:info@designlights.org).

Table 6: Allowances

Feature or Performance Metric	Allowances
TBD	TBD

### Lumen Maintenance:

DLC has two options for demonstrating lumen maintenance compliance. Option 1 involves using component-level performance through the TM-21 protocols, which leverage the LM-80 performance and *in-situ* temperature of the LED device. Option 2 uses luminaire-level performance through TM-28 protocols, which leverage the LM-84 test performance. More information is available in the application instructions at <http://www.designlights.org/content/QPL/ProductSubmit/ApplicationInstructions>. For products where the DLC required lifetime is longer than the TM-21 projection method allows, the necessary lumen maintenance minimums at the end of the allowable projection period, which result from solving an exponential decay function for 50,000 hours, are presented in Table 7. Refer to Table 7 for TM-21 projection requirements based on reports less than ~8,500 hours of testing for a sample size of  $\geq 20$ , or LM-80 reports based on less than ~9,500 hours of testing for a sample size of  $\leq 19$ . DLC refers to *ENERGY STAR Program Guidance Regarding LED Package, LED Array, and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products* when determining applicability of LM-80 data for submitted products.

Table 7: Option 1 TM-21 Projected Lumen Maintenance Requirements

Projection End Point (hours)	Required Lumen Maintenance for 50,000-Hour Products
33,000	≥79.03%
36,000	≥77.35%
38,500	≥75.98%
42,000	≥74.11%
44,000	≥73.06%
48,000	≥71.01%
49,500	≥70.25%
50,000	≥70.00%

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, DLC uses a pass/fail threshold for lumen maintenance compliance as detailed in the DLC Manufacturer's Guide, section IV.B.4.b. 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 DLC at [info@designlights.org](mailto:info@designlights.org).

When applying the lumen maintenance in accordance with these protocols, DLC applies a tolerance of 5% to drive currents tested under LM-80.

### Multiple LEDs:

Products employing multiple types of white-light 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, nor are products that are designed to be color-tunable. Policy development for appropriate evaluation of each of these situations is under consideration.

For products using multiple LED types, 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. Each LED must demonstrate the required  $L_{70}$  of 50,000 hours.

### Driver ISTMT:

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

1. Test report from a lab that meets 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 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 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 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.

The thermocouple tolerance shall conform to ASTM E230 Table 1 "Special Limits" ( $\leq 1.1^\circ\text{C}$  or 0.4%, whichever is greater).

### Safety Certification:

All products are required to submit evidence that safety certification has been obtained. DLC will not interpret proof of safety testing as proof of certification. Documentation of safety certification provided by the applicant must clearly identify the products seeking listing on the DLC QPL.

### TM-30:

IES TM-30-15 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. Starting with the V4.0 Technical Requirements, DLC will allow reporting of  $R_f$  and  $R_g$  for products on the QPL. At this time, these are optional metrics, and are not required for listing. To list these metrics for products on the QPL, using the official Excel version of the TM-30 calculation tool offered with the IES standard is required. Either basic or advanced versions of the Excel tool will be accepted. For more information on IES TM-30-15, please go to <http://energy.gov/eere/ssl/tm-30-frequently-asked-questions>. Manufacturers are also encouraged to submit this information for their listing with LED Lighting Facts.

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

This designation has been developed as an additional tool for 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 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, 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, CCT, CRI,  $L_{70}$ , 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. 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.

#### Additional Guidance for Reporting Requirements:

In addition to designating a Primary Use and meeting Zonal Lumen Density requirements, manufacturers submitting to DLC need to indicate whether their products are capable of dimming. Refer to the DLC Dimming policy for additional details: <http://designlights.org/content/QPL/ProductSubmit/DimmingInformation>.

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.

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

In Technical Requirements Table V4.1, 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  $\geq 300$  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  $\leq 10\%$  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.

#### 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. DLC will verify these claims against the IES files provided.

#### Wall Wash Luminaires:

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

#### Stairwell and Passageway Lighting:

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 Technical Requirements Table V4.1 refer to the full power operating mode.

### DLC Retrofit Kit Policy

DLC will accept QPL applications for SSL retrofit kits for the Primary Use designations listed in the Technical Requirements Table. 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 <http://www.designlights.org/content/QPL/ProductSubmit/RetrofitKits>.

### DLC Linear Replacement Lamp Policy

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 and its performance in reference troffers, the most common application. For more information, please refer to <http://www.designlights.org/content/QPL/ProductSubmit/LinearReplacementLamps>. 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.

### DLC Screw-Base Replacement Lamp Policy

DLC will accept 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 <http://www.designlights.org/content/QPL/ProductSubmit/Screw-BaseReplacementsForHIDLamps>. 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.

### DLC Four Pin-Base Replacement Lamp Policy

DLC will accept applications for four-pin (i.e. G24q/GX24q base) replacement lamps. At this time, only lamps that are intended to operate using the existing CFL ballast (UL Type A lamps) are included. UL Type B lamps (designed to operate directly using line voltage) and UL Type C products (which have the remote/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 <https://designlights.org/content/QPL/ProductSubmit/FourPin-BaseReplacementLampsCFLs>. 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.