

Technical Requirements Table, v3.0  
 Technical Requirements: Luminaires

#	Category	General Application	Requirements					Informational/Reported Items		
			Minimum Light Output (lm)	Minimum Efficacy (lm/W)		Minimum Warranty (years)		CCT / CRI / L70	Primary Use	Distribution
				Tier 1	Tier 2*	Tier 1	Tier 2			
1	Outdoor	Outdoor - Low Output	250-2000	65	90	5	10	≤5700 / ≥65 / ≥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 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>Other</li> </ul>	See Primary Use Zonal Lumen Density Requirements below
2		Outdoor - Mid Output	2000-10,000	70	100					
3		Outdoor - High Output	≥10,000	75	115					
4	Indoor	Interior Directional	575-4500	45	60	5	10	≤5000 / ≥80 / ≥50,000	<ul style="list-style-type: none"> <li>Wall-wash Luminaires</li> <li>Track or Mono-Point Luminaires</li> <li>Other</li> </ul>	
5		Display Case	50-375 lm/ft	50	70				<ul style="list-style-type: none"> <li>Display case Luminaires</li> <li>Horizontal Refrigerated Case Luminaires</li> <li>Vertical Refrigerated Case Luminaires</li> <li>Other</li> </ul>	
6		Troffer	≥1500	85	115				<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>Other</li> </ul>	
7		Linear Ambient	≥375 lm/ft	85	115				<ul style="list-style-type: none"> <li>Linear Ambient Luminaires: Direct</li> <li>Linear Ambient Luminaires: Direct/Indirect</li> <li>Linear Ambient Luminaires: Indirect/Direct</li> <li>Linear Ambient Luminaires: Indirect</li> <li>Other</li> </ul>	
8		High-Bay	≥5000	80	110				≤5700 / ≥70 / ≥35,000	

Technical Requirements: Retrofit Kits\*

#	Category	General Application	Requirements					Informational/Reported Items		
			Minimum Light Output (lm)	Minimum Efficacy (lm/W)		Minimum Warranty (years)		CCT / CRI / L70	Primary Use	Distribution
				Tier 1	Tier 2	Tier 1	Tier 2			
9	Outdoor Retrofit Kit	Outdoor - Low Output	250-2000	65	90	5	10	≤5700 / ≥65 / ≥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 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 below
10		Outdoor - Mid Output	2000-10,000	70	100					
11		Outdoor - High Output	≥10,000	75	115					
12	Indoor Retrofit Kit	Troffer	≥1500	85	115	5	10	≤5000 / ≥80 / ≥50,000	<ul style="list-style-type: none"> <li>• Retrofit Kits for 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces</li> <li>• Retrofit Kits for 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces</li> <li>• Retrofit Kits for 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces</li> </ul>	
13		High-Bay	≥5000	80	110					

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

Technical Requirements: Lamps\*

#	Category	General Application	Requirements				Informational/Reported Items	
			Minimum Light Output (lm)	Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L70	Primary Use	Distribution
				Tier 1	Tier 1			
14	Linear Replacement Lamp	Four-Foot Linear Replacement Lamps	2 lamps, Tested In Fixture: 3,000 lm Bare Lamp: 1,600 lm	In Fixture: 85 lm/W Bare Lamp: 100 lm/W	5	≤5000 / ≥80 / ≥50,000	• Four-Foot Linear Replacement Lamps	See Primary Use Zonal Lumen Density Requirements below
15		Two-Foot Linear Replacement Lamps	3 lamps, Tested In Fixture: 2,000 lm Bare Lamp: 800 lm	In Fixture: 85 lm/W Bare Lamp: 100 lm/W	5	≤5000 / ≥80 / ≥50,000	• Two-Foot Linear Replacement Lamps	

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

Tier 2:

Luminaires may not qualify for Tier 2 using “Other” as the Primary Use category. Retrofit Kits applications must designate one of the primary uses listed. Linear Replacement Lamps are not eligible for Tier 2.

Primary Use Technical Requirements: Zonal Lumen Distribution

Table 4: Zonal Lumen Tolerances

Primary Use Letter	Primary Use Category	Zone/Spacing Criteria	Nominal Requirement	Tolerance	Requirement with Tolerance
a	Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	0-90°	100%	-1%	≥99%
		80-90°	≤10%	+3%	≤13%
b	Outdoor Pole/Arm-Mounted Decorative Luminaires	0-90°	≥65%	-3%	≥62%
c	Outdoor Wall-Mounted Area Luminaires	0-90°	100%	-3%	≥97%
		80-90°	≤10%	+3%	≤13%
d	Bollards	90-110°	≤15%	+3%	≤18%
		>110°	0%	+3%	≤3%
e	Parking Garage Luminaires	60-80°	≥30%	-3%	≥27%
		70-80°	≤25%	+3%	≤28%
f	Fuel Pump Canopy Luminaires	0-40°	≥40%	-3%	≥37%
		40-70°	≥40%	-3%	≥37%
g	Landscape/Accent Flood and Spot Luminaires	0-90°	≥85%	-3%	≥82%
h	Architectural Flood and Spot Luminaires	0-90°	≥85%	-3%	≥82%
i	Stairwell and Passageway Luminaires	0-90°	≥85%****	-3%	≥82%
j	Wall-Wash Luminaires	0-90°	≥60%***	-3%	≥57%
k	Track or Mono-Point Directional Luminaires	0-90°	≥85%	-3%	≥82%
l	Vertical Refrigerated Case Luminaires-center**	10-90°	≥95%	-3%	≥92%
m	Vertical Refrigerated Case Luminaires-end***	10-90°	≥95%	-5%	≥90%
n	Horizontal Refrigerated Case Luminaires	0-90°	≥95%	-3%	≥92%
o	Display Case Luminaires	0-80°	≥95%	-5%	≥90%
p	2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	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%
q	1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	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	2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	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 Category	Zone/Spacing Criteria	Nominal Requirement	Tolerance	Requirement with Tolerance
s	Linear Ambient Luminaires: Indirect	90-150°	≥50%	-3%	≥47%
t	Linear Ambient Luminaires: Indirect/Direct	90-150°	≥50%	-3%	≥47%
		0-60°	≥25%	-3%	≥22%
u	Linear Ambient Luminaires: Direct/Indirect	0-60°	≥40%	-3%	≥37%
		90-150°	≥35%	-3%	≥32%
v	Linear Ambient Luminaires: Direct	0-60°	≥40%	-3%	≥37%
w	High-Bay Luminaires for Commercial and Industrial Buildings	20-50°	≥30%	-10%	≥20%
x	Low-Bay Luminaires for Commercial and Industrial Buildings	20-50°	≥30%	-10%	≥20%
y	High-Bay Aisle Luminaires	20-50°	≥50%	-10%	≥40%
		0-20°	≥30%	-10%	≥20%
z	Retrofit Kits for Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	0-90°	100%	-1%	≥99%
		80-90°	≤10%	3%	≤13%
aa	Retrofit Kits for Outdoor Pole/Arm-Mounted Decorative Luminaires	0-90°	≥65%	-3%	≥62%
ab	Retrofit Kits for Large Outdoor Pole/Arm-Mounted Area and Roadway Luminaires	0-90°	100%	-1%	≥99%
		80-90°	≤10%	3%	≤13%
ac	Retrofit Kits for Outdoor Wall-Mounted Area Luminaires	0-90°	100%	-3%	≥97%
		80-90°	≤10%	3%	≤13%
ad	Retrofit Kits for Outdoor Wall-Mounted Area Luminaires	60-80°	≥30%	-3%	≥27%
		70-80°	≤25%	+3%	≤28%
ae	Retrofit Kits for Fuel Pump Canopy Luminaires	0-40°	≥40%	-3%	≥37%
		40-70°	≥40%	-3%	≥37%
af	Retrofit Kits for 2x2 Luminaires for Ambient Lighting of Interior Commercial Spaces	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 1x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	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 2x4 Luminaires for Ambient Lighting of Interior Commercial Spaces	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%
ai	Retrofit Kits for High-Bay Luminaires for Commercial and Industrial Buildings	20-50°	≥30%	-10%	≥20%

aj	Retrofit Kits for Low-Bay Luminaires for Commercial and Industrial Buildings	20-50°	≥30%	-10%	≥20%
ak	Four-Foot Linear Replacement Lamps	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	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%

- \*\* Bilateral, symmetric light distribution on two hemispheres
- \*\*\* One-sided, single hemisphere light distribution
- \*\*\*\* Bilateral for surface-mounted units, single hemisphere for corner-mounted units

**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 THDi of ≤20%. This applies to every category listed in Tables 3.0.

**Tolerances:** Below are tolerances that are applicable to all categories listed above in Table v3.0. These tolerances are referenced in the ENERGY STAR Manufacturer’s Guide. For zonal lumen tolerances specific to each category, please refer to Table 4.

**Table 5.0: Tolerances**

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

**Lumen Maintenance:** DLC has two options for demonstrating lumen maintenance compliance. Option 1 is using component-level performance through the TM-21 protocols, which leverage the LM-80 performance and In-Situ Temperature of the LED device. More information is available in the application instructions at <http://www.designlights.org/content/QPL/ProductSubmit/ApplicationInstructions>. For products where the required lifetime is longer than the projection method allows, the necessary lumen maintenance minimums at the end of the allowable projection period are as follows. These percentages result from solving an exponential decay function for 35,000 and 50,000 hours.

**Table 6: TM-21 Projected Lumen Maintenance Requirements**

Projection End Point	Required lumen maintenance for 35,000 hour products	Required lumen maintenance for 50,000 hour products
33,000 hours	≥71.44%	≥79.03%
36,000 hours	L <sub>70</sub> ≥ 35,000	≥77.35%
38,500 hours	L <sub>70</sub> ≥ 35,000	≥75.98%
42,000 hours	L <sub>70</sub> ≥ 35,000	≥74.11%
44,000 hours	L <sub>70</sub> ≥ 35,000	≥73.06%
48,000 hours	L <sub>70</sub> ≥ 35,000	≥71.01%
49,500 hours	L <sub>70</sub> ≥ 35,000	≥70.25%
50,000 hours	L <sub>70</sub> ≥ 35,000	≥70.00%

Option 2 is to conduct 6000-hours of luminaire-level testing. For Option 2, DLC uses a pass/fail threshold for lumen maintenance compliance as established in the Energy Star Manufacturer’s Guide v2, pg. 7 ([http://www.energystar.gov/ia/partners/manuf\\_res/downloads/ENERGYSTAR\\_Manufacturers\\_Guide\\_v2.pdf](http://www.energystar.gov/ia/partners/manuf_res/downloads/ENERGYSTAR_Manufacturers_Guide_v2.pdf)). The requirements differ for applications requiring 35,000 hours of useful life and those requiring 50,000 hours, as follows:

**Table 7: Option 2 Lumen Maintenance Requirements**

Lumen Maintenance to L <sub>70</sub>	Required lumen maintenance at 6,000 hours
35,000 hours	94.1%
50,000 hours	95.8%

Table 3 percentages result from solving an exponential decay function for 35,000 and 50,000 hours, respectively, to determine the minimum lumen maintenance necessary to achieve those thresholds. Products can demonstrate compliance with testing longer than 6,000 hours, according to the table below:

**Table 8: Exponential Decay Function  $L=e^{-at}$**

Hours of Testing	LM L <sub>70</sub> =35,000 hr	LM L <sub>70</sub> =50,000 hr
6,000	94.1%	95.8%
7,000	93.1%	95.1%
8,000	92.2%	94.5%
9,000	91.2%	93.8%
10,000	90.3%	93.1%
11,000	89.4%	92.5%
12,000	88.5%	91.8%
13,000	87.6%	91.1%
14,000	86.7%	90.5%
15,000	85.8%	89.9%

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

Driver ISTMT: As part of qualifying for Tier 2 manufacturers need to provide the following:

1. Test report from a lab which meets DLC's Laboratory Requirements for ISTMTs. The report will need to include the measured temperature from the  $TMP_{ps}$ .
2. Diagram/picture of the  $TMP_{ps}$  location (if not permanently marked on the circuit board or power supply case) with an arrow indicating the thermocouple attachment point.
3. Warranty from the driver manufacturer which indicates the maximum driver case temperature for which a minimum 10 year warranty is offered.

The luminaire passes the driver (power supply) requirements if the measured temperature at the  $TMP_{ps}$  is less than or equal to the warranted temperature specified by the power supply manufacturer. Power supplies integrated with the LED package(s), array(s) or module(s), or enclosed within the fixture shall be tested in situ under steady-state operating conditions, with power supply case temperature measured at the designated  $TMP_{ps}$ .

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), fixture manufacturers should identify the  $TMP_{ps}$  to be used for warranty purposes. The thermocouple tolerance shall conform to ASTM E230 Table 1 "Special Limits" ( $\leq 1.1^\circ\text{C}$  or 0.4%, whichever is greater).

Primary Use Application Additional Category Guidance:

Flood and Spot Lighting Categories:

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

Wall-Wash Luminaires:

For clarity, the zonal lumen criteria for this category is that  $\geq 60\%$  of the lumens must be produced in the "forward" hemisphere, towards the wall.

Stairwell and Passageway Lighting:

DLC requires that products in the Stairwell and Passageway Lighting category to include integral controls for occupancy sensing and bi-level dimming. Documentation must be provided to demonstrate bi-level dimming capabilities, and occupancy sensing options 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 v3.0 refer to the full power operating mode.

DLC Retrofit Kit Policy

DLC will accept QPL applications for SSL Retrofit Kits for the primary use categories listed in the Technical Requirements Table. Retrofit kits falling outside of one of the primary uses 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 in order 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 both of the lamp itself, and its performance in reference troffers, their 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, simple replacements for fluorescent tubes and those that require modifications to the existing fixture (such as bypassing the existing ballast). Linear Replacement Lamps are eligible for Tier 1 only.