

Technical Requirements Table, V3.0
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	65	5	≤5700 / ≥65 / ≥50,000	100	5	≤5700 / ≥65 / >36,000 / ≥50,000	<ul style="list-style-type: none"> Outdoor Pole/Arm-mounted Area and Roadway Luminaires Outdoor Pole/Arm-mounted Decorative Luminaires Outdoor Wall-mounted Area Luminaires Bollards Parking Garage Luminaires Fuel Pump Canopy Luminaires Landscape/Accent Flood and Spot Luminaires Architectural Flood and Spot Luminaires Stairwell and Passageway Luminaires Specialty: _____ 	See Primary Use Zonal Lumen Density Requirements below
2		Outdoor - Mid Output	5,000-10,000	70			105				
3		Outdoor - High Output	≥10,000	75			110				
4	Indoor	Interior Directional	250-4,500	45	5	≤5000 / ≥80 / ≥50,000	75	5	≤5000 / ≥80 / >36,000 / ≥50,000		
5		Display Case	50-375 lm/ft	50			85				
6		Troffer	≥1,500	85			110				
7		Linear Ambient	≥375 lm/ft	85			110				
8		High-Bay	≥5,000	80			110				

* Products seeking qualification in the DLC Premium classification will be required to pass an L₉₀ > 36,000 hours, as evaluated using TM-21. This requirement is in addition to the L₇₀ requirements of the DLC Standard classification.

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

Technical Requirements: Retrofit Kits*

#	Category	General Application	Requirements							Primary Use***	Distribution
			Minimum Light Output (lm)	DLC Standard			DLC Premium**				
				Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L ₇₀	Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L ₉₀ / L ₇₀		
9	Outdoor Retrofit Kit	Outdoor - Low Output	250-5,000	65	5	≤5700 / ≥65 / ≥50,000	100	5	≤5700 / ≥65 / >36,000 / ≥50,000	<ul style="list-style-type: none"> • Retrofit Kits for Outdoor Pole/Arm-mounted Area and Roadway Luminaires • Retrofit Kits for Outdoor Pole/Arm-mounted Decorative Luminaires • Retrofit Kits for Large Outdoor Pole/Arm-mounted Area and Roadway Luminaires • Retrofit Kits for Outdoor Wall-mounted Area Luminaires • Retrofit Kits for Parking Garage Luminaires • Retrofit Kits for Fuel Pump Canopy Luminaires • Linear Retrofit Kits for 2x2 Luminaires • Integrated Retrofit Kits for 2x2 Luminaires • Linear Retrofit Kits for 1x4 Luminaires • Integrated Retrofit Kits for 1x4 Luminaires • Linear Retrofit Kits for 2x4 Luminaires • Integrated Retrofit Kits for 2x4 Luminaires • Retrofit Kits for High-bay Luminaires for Commercial and Industrial Buildings • Retrofit Kits for Low-bay Luminaires for Commercial and Industrial Buildings 	See Primary Use Zonal Lumen Density Requirements below
10		Outdoor - Mid Output	5,000-10,000	70			105				
11		Outdoor - High Output	≥10,000	75			110				
12	Indoor Retrofit Kit	Troffer	≥1,500	85	5	≤5000 / ≥80 / ≥50,000	110	5	≤5000 / ≥80 / >36,000 / ≥50,000		
13		High-Bay	≥5,000	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.

** Products seeking qualification in the DLC Premium classification will be required to pass an L₉₀ > 36,000 hours, as evaluated using TM-21. This requirement is in addition to the L₇₀ requirements of the DLC Standard classification.

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

Technical Requirements: Lamps* **

#	Category	General Application	Requirements					Distribution
			Minimum Light Output (lm)	DLC Standard			Primary Use	
				Minimum Efficacy (lm/W)	Minimum Warranty (years)	CCT / CRI / L70		
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	<ul style="list-style-type: none"> • Replacement Lamps ("Plug and Play") (UL Type A) • Internal Driver/Line Voltage Lamp-Style Retrofit Kits (UL Type B) • External Driver Lamp-Style Retrofit Kits (UL Type C) • Dual Mode Internal Driver (UL Type A or B) 	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		

* 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.

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

Primary Use Technical Requirements: Light Output and Zonal Lumen Distribution

Table 4: Primary Use Requirements

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 Wall-mounted Area Luminaires	300	0-90°	100%	-3%	≥97%
			80-90°	≤10%	+3%	≤13%
d	Bollards	500	90-110°	≤15%	+3%	≤18%
			>110°	0%	+3%	≤3%
e	Parking Garage Luminaires	2,000	60-80°	≥30%	-3%	≥27%
			70-80°	≤25%	+3%	≤28%
f	Fuel Pump Canopy Luminaires	2,000	0-40°	≥40%	-3%	≥37%
			40-70°	≥40%	-3%	≥37%
g	Landscape/Accent Flood and Spot Luminaires	250 (<1,000)	0-90°	≥85%	-3%	≥82%
h	Architectural Flood and Spot Luminaires	1,000	0-90°	≥85%	-3%	≥82%
i	Stairwell and Passageway Luminaires	750	0-90°	≥85%****	-3%	≥82%
j	Wall-wash Luminaires	575	0-90°	≥60%***	-3%	≥57%
k	Track or Mono-point Directional Luminaires	250	0-90°	≥85%	-3%	≥82%
l	Vertical Refrigerated Case Luminaires-center**	100 lm/ft	10-90°	≥95%	-3%	≥92%
m	Vertical Refrigerated Case Luminaires-end***	50 lm/ft	10-90°	≥95%	-5%	≥90%
n	Horizontal Refrigerated Case Luminaires	100 lm/ft	0-90°	≥95%	-3%	≥92%
o	Display Case Luminaires	50 lm/ft	0-80°	≥95%	-5%	≥90%
p	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%
q	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%
r	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%

Primary Use Letter	Primary Use Designation		Zone/Spacing Criteria	Nominal Requirement	Tolerance	Requirement with Tolerance
s	Linear Ambient Luminaires w/ Indirect Component	500 lm/ft	90-150°	≥35%	-3%	≥32%
t	Direct Linear Ambient Luminaires	375 lm/ft	0-60°	≥40%	-3%	≥37%
u	High-bay Luminaires for Commercial and Industrial Buildings	10,000	20-50°	≥30%	-10%	≥20%
v	Low-bay Luminaires for Commercial and Industrial Buildings	5,000 (<10,000)	20-50°	≥30%	-10%	≥20%
w	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 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 High-bay Luminaires for Commercial and Industrial Buildings	10,000	20-50°	≥30%	-10%	≥20%
ai	Retrofit Kits for Low-bay Luminaires for Commercial and Industrial Buildings	5,000 (<10,000)	20-50°	≥30%	-10%	≥20%

aj	Four-foot Linear Replacement Lamps (all Primary Use designations)	1,600 lm (bare lamp) 3,000 lm (2 lamps in fixture)	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%
ak	Two-foot Linear Replacement Lamps (all Primary Use designations)	800 lm (bare lamp) 2,000 lm (3 lamps in fixture)	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 V3.0. Qualified products must meet the requirements in their worst case loading conditions.

Tolerances:

Table 5 presents 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 Primary Use designation, please refer to Table 4.

Table 5: 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%

†ANSI C78.377-2011 also referred to for D_{uv} and (x,y) chromaticity coordinates tolerances for indoor categories.

Lumen Maintenance:

DLC has two options for demonstrating lumen maintenance compliance. Option 1 which involves 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, resulting from solving an exponential decay function for 50,000 hours, are presented in Table 6. 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 6: Option 1 TM-21 Projected Lumen Maintenance Requirements

Projection End Point	Required lumen maintenance for 50,000 hour products
33,000 hours	≥79.03%
36,000 hours	≥77.35%
38,500 hours	≥75.98%
42,000 hours	≥74.11%
44,000 hours	≥73.06%
48,000 hours	≥71.01%
49,500 hours	≥70.25%
50,000 hours	≥70.00%

Option 2 is to conduct 6,000-hours of luminaire-level testing. 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 requirements for products requiring 50,000 hours are presented in Table 7.

Table 7: Option 2 Lumen Maintenance Requirements

Lumen Maintenance to L ₇₀	Required lumen maintenance at 6,000 hours
50,000 hours	95.8%

Table 8 percentages result from solving an exponential decay function for 50,000 hours to determine the minimum lumen maintenance necessary to achieve those thresholds. Products can demonstrate compliance with testing longer than 6,000 hours, as shown in Table 8.

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

Hours of Testing	LM $L_{70}=50,000$ hr
6,000	95.8%
7,000	95.1%
8,000	94.5%
9,000	93.8%
10,000	93.1%
11,000	92.5%
12,000	91.8%
13,000	91.1%
14,000	90.5%
15,000	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.

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 give 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 necessary L_{70} of the category the product is seeking qualification.

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 $\geq 50,000$ hours, as well as the TMP location it designates for thermal testing.
 - a. Custom and integrated drivers must provide equivalent documentation as 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), fixture 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.

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 fixtures 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 an 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 if 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 if 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.

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 degree and 90-270 degree 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 v2.1 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 fixture (such as bypassing the existing ballast). Linear replacement lamps are eligible for the DLC Standard classification only.