



WHAT'S NEW IN THE TITLE 20 CODE?

# LIGHTING APPLIANCE EFFICIENCY REGULATIONS

Changes to California's lighting appliance requirements

The California Energy Commission adopted new standards updating the 2015 Appliance Efficiency Regulations (Title 20) for lighting appliances. Updates will roll out in two tiers with Tier 1 effective January 1, 2018 and Tier 2 effective July 1, 2019. Notably, this update adds standards for small-diameter directional lamps. The updated regulations incorporate elements of lighting product quality for both general service LED lamps and small-diameter directional lamps in addition to the traditional lighting appliance efficiency standards previously included in the regulations. The addition of these new standards will require revisions to the California Appliance Efficiency Database product certification process, as well as updates to product labeling requirements for lamp marking, marketing material, and product packaging.

## MAJOR CHANGES



### UPDATES TO LAMP REGULATIONS AND CATEGORIES

**General service LED lamps** are now regulated as a separate category from other light sources in the general service lamp category. New requirements include specific performance metrics and corresponding test methods to quantify product performance in an industry-recognized manner.

**Small diameter directional lamps** with a diameter of 2.25 inches or less that are equipped with ANSI compliant base-types or the E26 base type are now regulated. New requirements apply to both low- and line-voltage lamps.

**Portable luminaires** that are equipped with a socket requiring a general service lamp must be packaged with a compact fluorescent lamp or LED lamp that adheres to the updated lamp requirements.



### CALIFORNIA APPLIANCE EFFICIENCY DATABASE

The appliance database filing structure that manufacturers use to submit products for listing with the California Energy Commission will include new product categories and performance metrics starting January 1, 2018.



### PRODUCT LABELING

Manufacturers must test and certify their products with the updated regulations before including claims of dimmability, incandescent lamp equivalency, wattage equivalence, decorative lamp lumen output, or compliance with the Voluntary California Quality LED Lamp Specification in their lamp marking, marketing material, and package labeling.

*This guide is not intended to be used in lieu of California's Appliance Efficiency Regulations, and it is not a substitute for the code itself. Please visit [energy.ca.gov/appliances](http://energy.ca.gov/appliances) to download the official 2015 Appliance Efficiency Regulations and the rulemaking specific to General Service LED Lamps and Small-Diameter Directional Lamps.*

## TEST METHODS

The updated Title 20 regulations include a list of industry-recognized test methods to explicitly guide manufacturers along the Commission-required path to compliance. The list includes test methods to quantify both required and optional performance metrics.

**Table 1. Title 20 Performance Metrics and Test Methods**

	PERFORMANCE METRIC	INDUSTRY TEST METHOD
REQUIRED	<b>Input Power:</b> The total amount of electric power required, measured in watts, to operate the lamp, as measured at the base of the lamp.	IES LM-79*
	<b>Lumen Output:</b> The total luminous flux of the lamp at full output, measured in lumens.	
	<b>Efficacy:</b> Indicates how much light is produced by a lamp or lighting system per unit of electrical power it consumes, measured in lumens per watt (lm/W).	
	<b>Correlated Color Temperature (CCT):</b> The absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source. Light sources with a low CCT (2700–3000K) emit light with a warmer appearance. Those with a higher CCT (4000–6500K), emit light with a cooler color appearance.	
	<b>Duv:</b> The closest distance from the chromaticity coordinate of the light source to the Planckian locus on the International Commission on Illumination (CIE) (u', 2/3 v') coordinates with "+" sign for above and "-" sign for below the Planckian locus.	
	<b>Color Rendering Index (CRI):</b> The current industry standard for measuring how accurately a light source renders the colors of objects it illuminates. The average CRI value is an average of the standard color pallets known as R1 – R8. The maximum CRI value is 100.	
	<b>Power Factor (PF):</b> The input power in watts divided by the product of RMS input voltage and RMS input current of a ballast or driver.	
	<b>Lumen Maintenance:</b> The luminous flux or lumen output at a given time in the lamp's life expressed as a percentage of the rated luminous flux or rated lumen output.	IES LM-84 and TM-28*
	<b>Standby Power:</b> The power drawn while the lamp is in OFF mode.	IEC 62301/80 Fed. Reg 39667
OPTIONAL	<b>Flicker:</b> A relative measure of the cyclic variation in output of a light source (percent modulation).	Title 24, Part 6 JA-10
	<b>Rated Life:</b> The length of time at which 50 percent of a large sample of lamps reaches the end of their individual lives.	Title 24, Part 6 JA-8
	<b>Survival Rate:</b> The percent of tested units that shall be operational at the completion of the 6,000-hour life test.	
	<b>Minimum Dimming Performance:</b> The minimum light output to which a light source is capable of dimming.	
	<b>Audible Noise:</b> Noise emitted by lamps above 24 decibels when heard from one meter away from the lamp.	ENERGY STAR® Lamps V1.0 Test Methods

\* Additional requirements provided in 80 Fed. Reg. 39665-39666 (July 9, 2015), §430.23(dd) and Appendix BB to Subpart B of Part 430.

# PERFORMANCE REQUIREMENTS

## General Service LED Lamps

LED lamps are listed under a new sub-category within the general service lamp category in the 2015 Regulations. New requirements include performance metrics and corresponding test methods, which were not included in previous iterations of Title 20. These metrics and methods quantify product performance in an industry-recognized manner.

Covered products must emit less than 2,600 lumens, have a CCT between 2,200 K and 7,000 K, have a Duv between -0.012 and 0.012 in the 1976 color space, and be equipped with an E12, E17, E26 or GU-24 base. New requirements do not apply to lamps that are less than 150 lumens with an E12 or 17 bases, or lamps that are less than 200 lumens with an E26 or GU-24 base.

New requirements do not apply to lamps that emit less than 150 lumens with an E12 or 17 base, or lamps that emit less than 200 lumens with E26 or GU-24 bases.

**TIER 1: Specific to LED lamps manufactured on or after January 1, 2018, lamps shall meet the following performance criteria:**

- A color point that meets the 4-step industry requirements according to ANSI C78.377-2015
- Average CRI of 82 or greater, with individual color scores for R1, R2, R3, R4, R5, R6, R7 and R8 of 72 or greater
- Power factor of 0.7 or greater
- Rated life of 10,000 hours or more
- Light distribution:
  - Omnidirectional lamps (A-Lamps) meet ENERGY STAR® Lamps v2.0 requirements
  - Decorative lamps (B, BA, C, CA, f, or G) meet ENERGY STAR® Lamps v1.1 requirements
- Minimum efficacy of 68 lm/W
- Minimum product compliance score of at least 282 where compliance is determined by the equation:

$$\text{Compliance Score} = \text{Efficacy} + (2.3 \times \text{CRI})$$

**TIER 2: Specific to LED lamps manufactured on or after July 1, 2019, lamps shall meet the following performance criteria:**

- All TIER 1 requirements
- Maximum standby power of 0.2 watts
- Minimum efficacy of 80
- Product compliance score of at least 297 where compliance is determined by the equation:

$$\text{Compliance Score} = \text{Efficacy} + (2.3 \times \text{CRI})$$

## Small-Diameter Directional Lamps

Products covered in the small-diameter directional lamp category must have a diameter of 2.25 inches or less, be equipped with ANSI compliant base-types or the E26 base type, have a total lumen output of less than 850 lumens, and/or the lamp's power consumption must be 75 watts or less. The small-diameter directional lamp standards apply to lamps using any source technology. This includes, but is not limited to, LED technology. New requirements apply to both low- and line-voltage lamps. Additionally, lamps with a rated life less than 300 hours are not regulated under this category.

Beginning January 1, 2018, regulated lamps shall meet the following criteria:

- Rated life of 25,000 hours or greater
- Efficacy of at least 80 lm/W OR a minimum compliance score of at least 165 for products with a minimum efficacy of 70 where compliance is determined by the equation:

$$\text{Compliance Score} = \text{Efficacy} + \text{CRI}$$

## Portable Luminaires

Starting January 1, 2018, portable luminaires that are equipped with an E12, E17, or E26 screw-based socket must be prepackaged and sold together with one compact fluorescent lamp or LED lamp that adheres to the updated lamp requirements.

# APPLIANCE EFFICIENCY DATABASE

The appliance database filing structure that manufacturers use to submit products for listing with the California Energy Commission will include new product categories

and performance metrics starting January 1, 2018. Metrics must be tested in accordance with the methods referenced in Table 1.

## Responsibilities

Manufacturers and retailers both have responsibilities under Title 20. Manufacturers are responsible for certifying that their products comply with the standards. Retailers are responsible for ensuring that products offered for sale in California appear in the Appliance Efficiency Database.

## General Service LED Lamps

For LED lamps, multiple performance metrics are required in addition to general characteristics such as base type and lamp shape.

The following performance metrics are voluntary for state-regulated LED lamps: R9, warranty length, start time, 6,000-hour lumen maintenance, 6,000-hour survival rate, NEMA SSL 7A compatibility, and notation of the lamp's T24 JA-8 marking.

## Small-Diameter Directional Lamps

For small-diameter directional lamps, manufacturers are now required to submit values for the following performance metrics: base type, lamp type, power, lumen output, beam angle, center beam candle power (CBCP), efficacy, CRI, combined CRI and efficacy, CCT, rated lifetime (hours).

# LABELING REQUIREMENTS

Manufacturers must test and certify their products with the updated regulations before including claims of dimmability, incandescent lamp equivalency, wattage equivalence, decorative lamp lumen output, or compliance with the Voluntary California Quality LED Lamp Specification in their lamp marking, marketing material, and package labeling.

**For LED lamps manufactured on February 1, 2017 or after:** To label a product as compliant with the Voluntary California Quality LED Lamp Specification, the manufacturer shall certify that the lamp model meets each requirement of the specification.

**For LED lamps manufactured on January 1, 2018 or after:** To mark a product as dimmable, the manufacturer must demonstrate according the applicable test method that the product meets the following criteria:

- Dimmable to 10% of light output
- Capable of reduced flicker operation and specify if reduced flicker operation is 'dimmable with LED dimmer' only
- Produce noise less than 24 decibels at 100% and 20% of light output

To label products with a comparison to an incandescent lamp, manufacturers must demonstrate, using the applicable test method, that the product meets the following criteria:

- CCT of 3000K or less
- Dimmable according to previous definition
- Lumen output of 310 lumens or greater for medium-screw base lamps, or 150 lumens or greater for intermediate/candelabra bases

To claim incandescent wattage equivalency for medium screw base or GU-24 LED omnidirectional lamps, manufacturers must demonstrate that the following lumen output minimums are met:

- 40W, 310 lumens
- 60W, 750 lumens
- 75W, 1050 lumens
- 100W, 1490 lumens
- 150W, 2500 lumens

Additionally, LED lamps with candelabra bases that produce less than 150 lumens, or less than 200 lumens for other bases, shall be labeled "for decorative purposes."

**ABOUT THE CALIFORNIA LIGHTING TECHNOLOGY CENTER:** *The California Lighting Technology Center was created in 2003 by the California Energy Commission in collaboration with the U.S. Department of Energy and the National Electrical Manufacturers Association. Part of the Department of Design at the University of California, Davis, CLTC is dedicated to accelerating the development and deployment of energy-efficient lighting and daylighting technologies.*

**ABOUT ENERGY CODE ACE:** *Developed and provided by the California Statewide Codes & Standards Program, Energy Code Ace offers free energy code training, tools and resources for those who need to understand and meet the requirements of Title 24, Part 6 and Title 20. The program aims to advance the adoption and effective implementation of energy efficiency measures and building practices to lock in long-term energy savings. For more information, visit [energycodeace.com](http://energycodeace.com).*

