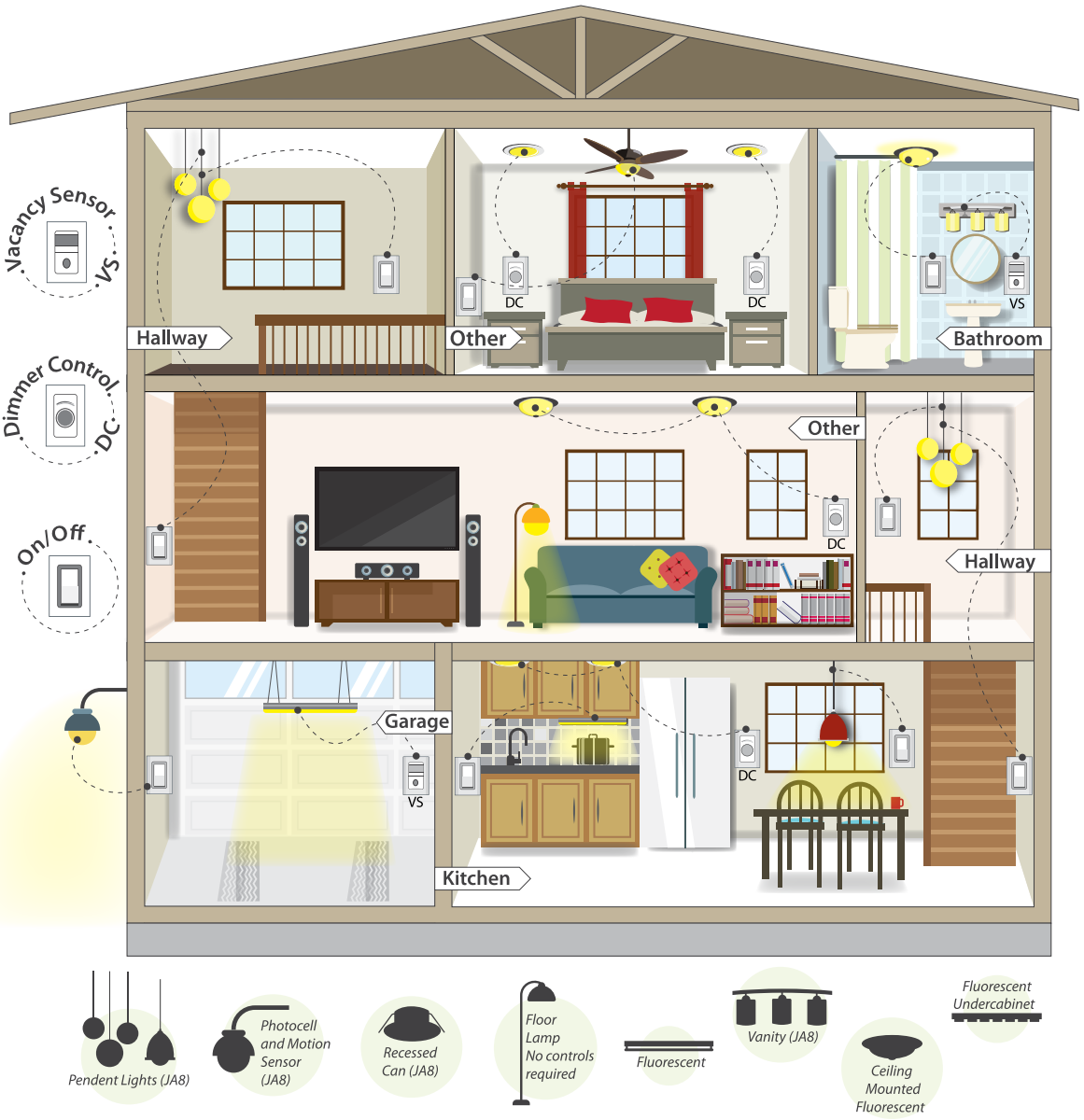
Residential

Indoor and Outdoor Lighting



What Are Residential Indoor and Outdoor Lighting Requirements?

Residential indoor and outdoor lighting technologies regulated by California's Building Energy Efficiency Standards (Title 24, Part 6 or Energy Code) include luminaires, high-efficacy luminaries, vacancy/occupancy sensors and switching controls. The requirements in this fact sheet apply to residential, single-family buildings and multifamily buildings that are three stories or less. Residential lighting requirements also apply to residential spaces in nonresidential buildings, including dwellings in high-rise residential buildings, guestrooms of hotels/motels, and dwelling spaces of fire stations, dormitories and senior housing.

Know Your Project – Key Terms

- **Additions:** Includes any addition of new conditioned square footage and volume, where new luminaires are installed
- **Alterations:** Includes modifications where luminaires are replaced via a building permit through Authority having Jurisdiction (AHJ)
- **Permanently Installed Lighting:** Includes hard wired ceiling luminaires, chandeliers, vanity lamps, wall sconces, under-cabinet luminaires, luminaires in drawers/cabinets, night lights, step and path lights, and any other luminaire that is attached to the building, or buildings, on the property
- **Vacancy Sensor:** A manual-on/automatic-off lighting control, which includes a manual-off option
- **Occupancy Sensor:** Is allowed when it is programmed to function like a vacancy sensor (manual-on) for final inspection
- **Low-Rise Multifamily:** Residential building with ≥3 dwelling units and ≤3 habitable stories above grade
- **High-Rise Multifamily:** Residential building with ≥3 dwelling units and >4 habitable stories above grade

Why? The California Energy Commission estimates that in California, lighting accounts for 22% of residential electricity use. The Energy Code for residential lighting is designed to increase the use of efficient technologies in order to decrease this consumption.

Relevant Code Sections

2019 California Building Energy Efficiency Standards, Title 24, Part 6:

- Section 110.0 – Systems and Equipment - General
- Section 110.1 – Mandatory Requirements for Appliances
- Section 110.9 – Mandatory Requirements for Lighting Controls
- Section 130.0(b) – Nonresidential, High-rise Residential, and Hotel/Motel Occupancies - Functional Areas where Compliance with the Residential Lighting Standards is Required
- Section 130.0(c) – Luminaire Classification and Power
- Section 130.0(d) – Lighting Controls
- Section 130.0(e) – Energy Management Control System (EMCS) (when applicable)
- Section 150.0(k) – Mandatory Features and Devices, Residential Lighting
- Joint Reference Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
- Joint Reference Appendix JA10 – Test Method for Measuring Flicker of Lighting Systems
- Residential Compliance Manual, Chapter 6 – Residential Lighting

Relevant Compliance Forms

Certificate of Installation:

When HERS measures are required, the CF2R must be created on a HERS provider website to be registered. This is required for all forms associated with a project that has any HERS measures.

When HERS measures are NOT required, these forms can be used:

- CF2R-LTG-01-E – Certificate of Installation, Lighting - Single Family Dwellings
- CF2R-LTG-02-E – Certificate of Installation, Lighting - Multifamily Dwellings

For more on HERS requirements, see the Energy Code Ace 2019 HERS Fact Sheet.

Compliance Requirements

All residential lighting requirements are Mandatory requirements. There are no tradeoffs between lighting and other building features. You may search the MAEDbS for certified products.



PHOTO: CLTC UC DAVIS

Mandatory Requirements

Luminaires: Section 150.0(k)

- All permanently installed lighting, including lighting integral to exhaust fans, unless part of a kitchen exhaust system, must meet these requirements
- Installed luminaires must be classified as high efficacy for compliance per Table 150.0-A
- Recessed Downlight Luminaires in Ceilings: Luminaires recessed into ceilings must not contain screw base sockets and must meet the following requirements:
  - Use a rated zero clearance insulation contact and airtight can (ICAT) using a gasket or caulk between luminaire housing and ceiling and for all air leak pathways between conditioned and unconditioned spaces
  - Allow ballast or driver maintenance and replacement to be readily accessible from below the ceiling for luminaires with hardwired ballasts or drivers
  - Contain light sources that are JA8 certified
- Night lights, step lights and path lights, and light sources in drawers, cabinets and linen closets:
  - If consuming no more than 5 watts of power and emitting no more than 150 lumens, neither JA8 luminaires nor vacancy/occupancy sensors are required
  - If consuming over 5 watts or emitting more than 150 lumens, JA8 luminaire and vacancy/occupancy sensors are required
- Screw base luminaries must not be recessed and must meet high-efficacy requirements of JA8
- If separable light sources are installed in an enclosed or recessed application, they must be marked "JA8-2016-E," indicating they are certified as meeting the elevated temperature requirements of JA8

Ballasts

- Ballasts for fluorescent lamps ≥13 watts must be electronic with an output frequency ≥20 kHz

For more information on the JA8 qualification requirements, see the Energy Code Ace fact sheets on High Efficacy Lighting for Manufacturers, and Title 20 and Title 24, Part 6 JA8: Key Differences and Overlap.

Luminaire Efficacy Classification (JA8)

All installed luminaires must meet the requirements in Table 150.0-A. Table 1, below, outlines these requirements.

	Automatically High Efficacy	Using JA8 Certified Lamps (JA8-2016-E must be used for enclosed lamps/ luminaires)
Indoor	• Pin-based linear fluorescent • Pin-based compact fluorescent • Inseparable SSL luminaires with colored light sources for decorative lighting purpose	• LED luminaires with white integral sources that are not decorative • Screw base LED lamps • Pin-based LED lamps • Recessed/recessed ceiling downlights or enclosed lights that are not screw base, and that use an ICAT-rated can • Any light source not otherwise listed
Outdoor	• Pulse-start metal halide light sources • High pressure sodium light sources • Luminaires with hardwired high frequency generator and induction lamp • LED light sources that are installed outdoors	

Table 1: High Efficacy Light Source Classification (derived from Table 150.0-A)

Controls: Sections 110.0 and 110.1

In addition to the requirements of Section 150.0(k), the controls must meet the minimum requirements for control functionality of all applicable controls per Sections 110.0, 110.1, and 110.9.

Required Lighting Controls

All installed luminaires must be high efficacy that are permanently installed or integral to a luminaire exhaust fan or ceiling fan. Portable lighting (plugged in) is not subject to these requirements.

Location	Control Requirements			Special Considerations
	Vacancy Sensor	Dimmer	On/Off Switch	
Bathroom Laundry/Utility Garage (attached or unattached)	At least one luminaire in each of these rooms must be controlled with vacancy/occupancy sensor, no matter the luminaire source type	• JA8 light sources must be controlled with either dimmer, vacancy sensor or occupancy sensor • "Automatically" high efficacy luminaires can be controlled with either on/off switch, vacancy/occupancy sensor or dimmer	• On/Off switch must be readily accessible wall-mounted manual controls, allowing occupants easy control of lighting in the space • Ceilings fans with integral lighting can be controlled with remote control	• Exhaust fans must be controlled separately from lighting • Undercabinet lighting must be switched separately from ceiling mounted luminaires • EMCS can be used if required code control requirements are met, and complies with §130.4 EMCS requirements • Dimmers and vacancy/occupancy sensor functions, required by code, must not be bypassed • If multiscene programmable controllers are used, they must meet dimmer requirements of §110.9 and §150.0(k)
Kitchen All Other: bedrooms, living rooms, office, dining, attic spaces, closets ≥70 ft², detached storage buildings	• JA8 light sources to be controlled with dimmer, vacancy sensor or occupancy sensor • "Automatically" high efficacy can be controlled with either on/off switch, dimmer, vacancy sensor or occupancy sensor			
Closets <70 ft² Hallways	Dimmer, vacancy sensor or occupancy sensor is not required even if JA8 light sources are used			
Blank Electrical Boxes (more than 5 feet above floor)	Each box to be controlled by either vacancy sensor, occupancy sensor, dimmer or fan speed control			No greater than the number of bedrooms
Light Features: night lights, step lights, path lights, and light sources in drawers, cabinets and linen closets	Vacancy sensor(s) or occupancy sensor(s) (and the JA8 requirements) are not required if the luminaire is ≤5 watts and emit ≤150 lumens			Light sources in drawers, cabinets and linen closets must be equipped with controls that turn off when applicable drawer, cabinet or linen closet is closed
Single Family Outdoors: Lighting attached to home or any other building on property	• Sensor types allowed include: – Photocell and motion sensor OR – Photocell and time switch OR – Astronomical time clock OR – EMCS that works like an any of the above • Illuminated signs must meet nonresidential sign lighting power requirements §140.8, or use no more than 5 watts		On/Off switch that allows all other outdoor control functions to work automatically	• Controls that override to ON are not allowed unless the override automatically reactivates within 6 hours • Landscape lighting exempt • Lighting not attached to building(s) is exempt

Table 2: Residential Lighting Controls Requirements

Residential Lighting Requirements for Additions & Alterations

Will Typically Require Compliance	Will Typically Not Require Compliance
• When adding onto a home, the new areas of the home must meet the applicable requirements • When remodeling a home, only the work being done with a permit must meet the applicable requirements – Existing recessed ceiling luminaries with screw base sockets do not need to be replaced as long as JA8 trim kits/lamps are used	• Changing light bulbs • Changing lighting controls • Replacing lighting fixtures • Moving lighting fixtures • Spaces not being renovated in a renovation project

Table 3: Residential Lighting Requirements for Additions & Alterations

Low-Rise Multifamily Occupancies: Sections 150.0(k) and 140.7

Figure 1 illustrates when to apply the residential and nonresidential lighting standards for indoor and outdoor lighting for low-rise multifamily buildings.

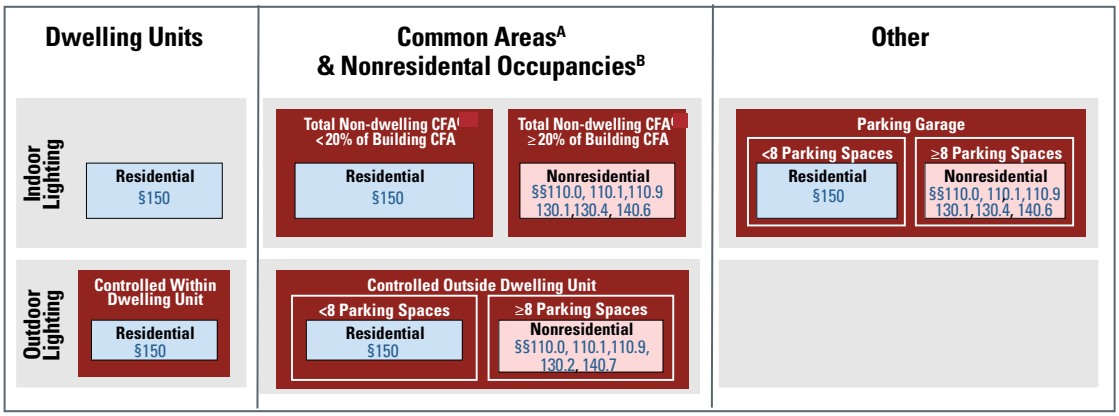


Figure 1: Low-Rise Multifamily Lighting Standards Application

A Common Areas: Areas that directly support the residential occupancy (Occupancy Group R), i.e., areas intended for use by the residents of the dwelling units (e.g., lobby, gym, laundry room and sales office for the multifamily dwelling).

B Nonresidential Occupancies: Occupanices other than dwelling units and common areas in a mixed-use multifamily building.

For more information on the High-Rise Multifamily and Hotel/Motel Occupancy requirements see the Energy Code Ace High-Rise and Low-Rise Multifamily fact sheet.



Forms – Which & When

During Construction

Single Family Buildings

- CF2R-LTG-01-E – Lighting - Single Family Dwellings
  - Completed and signed by the responsible person(s) for the lighting construction projects under Division 3 of the Business and Professions Code (note that one or more forms may be required depending upon the lighting and controls covered by an individual person)
  - Completed after the residential lighting has been installed
    - The responsible person(s) must also provide the homeowner with a lighting schedule of installed products

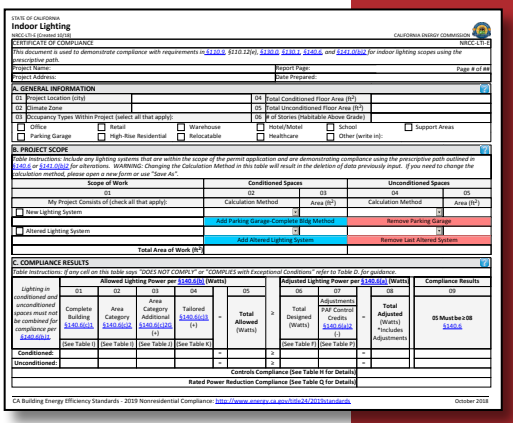
Multifamily Buildings

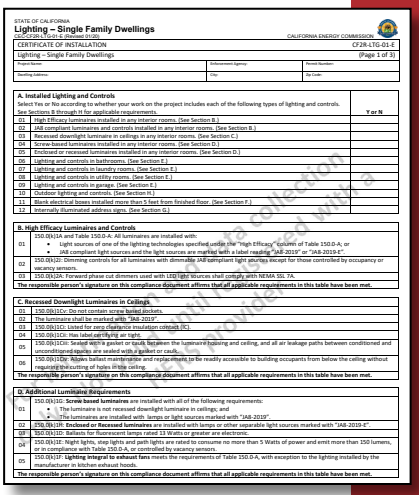
- CF2R-LTG-02-E – Lighting - Multifamily Dwellings
  - Completed and signed by the responsible person(s) for the lighting construction projects under Division 3 of the Business and Professions Code (note that one or more forms may be required depending upon the lighting and controls covered by an individual person)
  - Completed after the residential lighting has been installed
    - The responsible person(s) must also provide the homeowner with a lighting schedule of installed products
- Additional Forms - When nonresidential code sections are triggered, corresponding NRCC, NRCI and NRCA forms may be required
  - Completed and signed by the responsible person(s) for the lighting construction projects under Division 3 of the Business and Professions Code (note that one or more forms may be required depending upon the lighting and controls covered by an individual person)
  - Completed after the nonresidential lighting has been installed
    - The responsible person(s) must also provide the owner with a lighting schedule of installed products

Inspection

For either single-family or multifamily lighting compliance, the inspector should verify that all luminaires are high efficacy and that the required controls have been installed. If dimmers are installed, inspectors should verify that they work appropriately (especially when controlling LED light sources). In addition, the inspector should confirm a luminaire schedule is provided to the building owner.

Why?: To document compliance with lighting requirements applicable to the project.


STATE OF CALIFORNIA
Indoor Lighting
NRCC-LTI-E (Created 10/18)
CALIFORNIA ENERGY COMMISSION
CERTIFICATE OF COMPLIANCE
NRCC-LTI-E
This document is used to demonstrate compliance with requirements in §120.9, §110.12(e), §130.0, §130.1, §140.6, and §141.0(b)2 for indoor lighting scopes using the prescriptive path.
Project Name:
Report Page:
Page # of ##
Project Address:
Date Prepared:
A. GENERAL INFORMATION
01 Project Location (city)
02 Climate Zone
03 Occupancy Types Within Project (select all that apply):
04 Total Conditioned Floor Area (ft²)
05 Total Unconditioned Floor Area (ft²)
06 # of Stories (Habitable Above Grade)
Office, Retail, Warehouse, Hotel/Motel, School, Support Areas, Parking Garage, High-Rise Residential, Relocatable, Healthcare, Other (write in):
B. PROJECT SCOPE
Table Instructions: Include any lighting systems that are within the scope of the permit application and are demonstrating compliance using the prescriptive path outlined in §140.6 or §141.0(b)2 for alterations. WARNING: Changing the Calculation Method in this table will result in the deletion of data previously input. If you need to change the calculation method, please open a new form or use "Save As".
Scope of Work
Conditioned Spaces
Unconditioned Spaces
01 My Project Consists of (check all that apply):
02 Calculation Method
03 Area (ft²)
04 Calculation Method
05 Area (ft²)
New Lighting System
Add Parking Garage-Complete Bldg Method
Remove Parking Garage
Altered Lighting System
Add Altered Lighting System
Remove Last Altered System
Total Area of Work (ft²):
C. COMPLIANCE RESULTS
Table Instructions: If any cell on this table says "DOES NOT COMPLY" or "COMPLIES with Exceptional Conditions" refer to Table D. for guidance.
Lighting in conditioned and unconditioned spaces must not be combined for compliance per §140.6(b)1.
Allowed Lighting Power per §140.6(b) (Watts)
01 Complete Building §140.6(c)1. (Table I)
02 Area Category §140.6(c)2. (Table I)
03 Area Category Additional §140.6(c)2(B). (+) (Table I)
04 Tailored §140.6(c)3. (+) (Table K)
05 Total Allowed (Watts)
Adjusted Lighting Power per §140.6(a) (Watts)
06 Total Designed (Watts) (Table F)
07 Adjustments PAF Control Credits §140.6(a)2. (-) (Table F)
08 Total Adjusted (Watts) *Includes Adjustments
Compliance Results
09 05 Must be ≥ 08 §140.6
Conditioned:
Unconditioned:
Controls Compliance [See Table H for Details]
Rated Power Reduction Compliance [See Table Q for Details]
CA Building Energy Efficiency Standards - 2019 Nonresidential Compliance: http://www.energy.ca.gov/title24/2019standards
October 2018


STATE OF CALIFORNIA
Lighting – Single Family Dwellings
CF2R-LTG-01-E (Revised 10/18)
CALIFORNIA ENERGY COMMISSION
CERTIFICATE OF INSTALLATION
CF2R-LTG-01-E
Lighting – Single Family Dwellings
(Page 1 of 3)
Project Name:
Enforcement Agency:
Permit Number:
Dwelling Address:
City:
Zip Code:
A. Installed Lighting and Controls
Select Yes or No according to whether your work on the project includes each of the following types of lighting and controls. See Sections B through H for applicable requirements.
Y or N
01 High Efficacy Luminaires installed in any interior rooms. (See Section B.)
02 JA8 compliant luminaires and controls installed in any interior rooms. (See Section B.)
03 Recessed downlight luminaire in ceilings in any interior rooms. (See Section C.)
04 Screw-based luminaires installed in any interior rooms. (See Section D.)
05 Enclosed or recessed luminaires installed in any interior rooms. (See Section D.)
06 Lighting and controls in bathrooms. (See Section E.)
07 Lighting and controls in laundry rooms. (See Section E.)
08 Lighting and controls in utility rooms. (See Section E.)
09 Lighting and controls in garage. (See Section F.)
10 Outdoor lighting and controls. (See Section H.)
11 Blank electrical boxes installed more than 5 feet from finished floor. (See Section F.)
12 Internally illuminated address signs. (See Section G.)
B. High Efficacy Luminaires and Controls
01 150.0(k)1A and Table 150.0-A: All luminaires are installed with:
Light sources of one of the lighting technologies specified under the "High Efficacy" column of Table 150.0-A; or
JA8 compliant light sources and the light sources are marked with a label reading "JA8-2019" or "JA8-2019-E".
02 150.0(k)1D: Dimming controls for all luminaires with dimmable JA8-compliant light sources except for those controlled by occupancy or vacancy sensors.
03 150.0(k)2A: Forward phase cut dimmers used with LED light sources shall comply with NEMA SSL 7A.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.
C. Recessed Downlight Luminaires in Ceilings
01 150.0(k)1Cv: Do not contain screw based sockets.
02 The luminaire shall be marked with "JA8-2019"
03 150.0(k)1Cc: Listed for zero clearance insulation contact (IC).
04 150.0(k)1Cb: Has label certifying air tight.
05 150.0(k)1Ca: Sealed with a gasket or caulk between the luminaire housing and ceiling, and all air leakage paths between conditioned and unconditioned spaces are sealed with a gasket or caulk.
06 150.0(k)1Cb: Allows ballast maintenance and replacement to be readily accessible to building occupants from below the ceiling without requiring the cutting of holes in the ceiling.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.
D. Additional Luminaire Requirements
01 150.0(k)1G: Screw based luminaires are installed with all of the following requirements:
The luminaire is not recessed downlight luminaire in ceilings; and
The luminaires are installed with lamps or light sources marked with "JA8-2019".
02 150.0(k)1H: Enclosed or Recessed luminaires are installed with lamps or other separable light sources marked with "JA8-2019-E".
03 150.0(k)1I: Ballasts for fluorescent lamps rated 13 Watts or greater are electronic.
04 150.0(k)1E: Night lights, step lights and path lights are rated to consume no more than 5 Watts of power and emit more than 150 lumens, or in compliance with Table 150.0-A, or controlled by vacancy sensors.
05 150.0(k)1F: Lighting integral to exhaust fans meets the requirements of Table 150.0-A, with exception to the lighting installed by the manufacturer in kitchen exhaust hoods.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.

Certificates of Installation - Submission Guidelines

- A Certificate of Installation (CF2R) must be submitted to the building department for any residential lighting project that is regulated by Title 24, Part 6, whether that lighting project is for only one luminaire or for the lighting of an entire building
- An NRCI installation certificate is required when nonresidential forms are used
- If an Acceptance Test is required, an NRCA form completed by the Acceptance Test Technician (ATT) is required, as well

For More Information

Primary Documents

- Energy Code Section 110.0 – Systems and Equipment - General
  energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1100systemsandequipmentgeneral.htm
- Energy Code Section 110.1 – Mandatory Requirements for Appliances
  energycodeace.com/site/custom/public/reference-ace-2019/Documents/section1101mandatoryrequirementsforappliances.htm
- Energy Code Section 110.9 – Mandatory Requirements for Lighting Controls
  energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1109mandatoryrequirementsforlightingcontrols.htm
- Energy Code Section 130.0(b) – Functional Areas where Compliance with the Residential Lighting Standards is Required
  energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Energy Code Section 130.0(c) – Luminaire Classification and Power
  energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Energy Code Section 130.0(d) - Lighting Controls
  energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Energy Code Section 130.0(e) - Energy Management Control System (EMCS)
  energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Energy Code Section 150.0(k) – Mandatory Features and Devices, Residential Lighting
  energycodeace.com/site/custom/public/reference-ace-2019/index.html#!Documents/section1500mandatoryfeaturesanddevices.htm
- Energy Code Joint Reference Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
  energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixja8qualificationrequirementsforhighefficacylightsources.htm
- Energy Code Joint Reference Appendix JA10 – Test Method for Measuring Flicker of Lighting Systems
  energycodeace.com/site/custom/public/reference-ace-2019/Documents/appendixja10testmethodformeasuringflickeroflightingsystemsandrep.htm
- Energy Code Residential Compliance Manual, Chapter 6 – Residential Lighting
  energycodeace.com/site/custom/public/reference-ace-2019/Documents/6residentiallighting.htm
- Title 20 Appliance Efficiency Regulations
  energycodeace.com/content/reference-ace-t20-tool

California Energy Commission Information & Services

Title 24, Part 6

- Energy Code Hotline: 1-800-772-3300 (Free) or
  Title24@energy.ca.gov
- Online Resource Center:
  energy.ca.gov/programs-and-topics/programs/building-energy-efficiency-standards/online-resource-center
  - The Energy Commission's main web portal for the Energy Code, including information, documents and historical information

Title 20

- Appliances Hotline: (888) 838-1467 or
  outside California (916) 651-7100
- Questions may also be emailed to Appliances@energy.ca.gov
- California Appliance Efficiency Standards Site:
  www.energy.ca.gov/rules-and-regulations/appliance-efficiency-regulations-title-20
- Modernized Appliance Efficiency Database (MAEDbS):
  https://cacertappliances.energy.ca.gov/Login.aspx

Additional Resources

- California Lighting Technology Center (CLTC) Guides:
  - Residential Lighting: What's New in the 2019 Title 24, Part 6 Code?
    cltc.ucdavis.edu/publication/residential-lighting-whats-new-2019-title-24-part-6-energy-code
  - What's New in Title 20 Code? Lighting Appliance Efficiency Regulations
    cltc.ucdavis.edu/publication/title-20-lighting-appliance-efficiency
- Energy Code Ace:
  EnergyCodeAce.com
  - An online "one-stop-shop" providing free resources and training to help appliance and building industry professionals decode and comply with Title 24, Part 6 and Title 20. The site is administered by California's investor-owned utilities.
    Of special interest: Fact Sheets
    energycodeace.com/content/resources-fact-sheets/
    - Title 20 and Title 24, Part 6 JA8: Key Differences and Overlap
    - State-Regulated Lamps - Lighting the Way to Efficiency
    - Title 20 Lighting FAQ
    - Residential High Efficacy Lighting for Manufacturers
    - High-rise and Low-rise Multifamily 2019

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