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6. Residential Lighting

This chapter covers Title 24 California Code of Regulations, Part 6 (California Energy Code, or the Energy Standards), requirements for lighting in low-rise residential buildings and the dwelling units in high-rise residential buildings. It is for lighting designers, electrical engineers, and enforcement agency staff working on residential lighting.

6.1 Overview

For residential buildings and spaces, all the lighting requirements are mandatory. The residential lighting requirements are different from the nonresidential ones because there are no maximum lighting power threshold for spaces, no required calculation of lighting power, and no prescriptive method for showing compliance. There are luminaire requirements and lighting control requirements for residential lighting installations.

The residential luminaire requirements apply to permanently installed luminaires, including luminaires with easily interchangeable lamps. They do not apply to portable luminaires such as table lamps or freestanding floor lamps. The lighting control requirements are focused on dimming and occupancy sensing control requirements for applicable spaces and occupancies.

All section (§) and table references in this chapter refer to sections and tables contained in Title 24 California Code of Regulations, Part 6, also known as California Energy Code or the Energy Standards.

6.1.1 What's New for the 2019 California Energy Code

- Clarification edits to the language of the residential lighting requirements in order to improve consistency such as the luminaire efficacy requirement of Section 150.0(k)1 and the different luminaires listed in Table 150.0-A as meeting the efficacy requirement.
- Minor modifications to the lighting controls requirements to maintain consistency with the requirements for dimmers and vacancy sensors.
- Edits to the language of the residential outdoor lighting requirements in order to improve readability, such as eliminating the redundant requirement of override to ON.
- Clarification edits to Table 150.0-A; eliminated outdated references to GU-24 socket; streamlined references to LED light sources and solid state lighting.
- Testing requirements for testing laboratories and manufacturers by harmonizing the requirements of Reference Joint Appendix JA8 with similar tests under the ENERGY STAR® program for lamps and luminaires.

- Clarification changes to the JA8 requirement including requirements about sample size, efficacy test, start time test, and color characteristics test.
- Clarification of the definition of habitable space in §100.1 to include or exclude spaces. A habitable space includes spaces designed for living, sleeping, eating, or cooking, and excludes bathrooms, toilets, hallways, storage areas, closets, and utility rooms.

6.1.2 Scope

The residential lighting requirements in the Energy Standards apply to more than just single-family homes. Space types covered include:

- Single-family buildings, indoor and outdoor lighting.
- Low-rise multifamily buildings (three stories or less), indoor and outdoor lighting.
Refer to Section 6.4.1 for low-rise multifamily requirements.
- High-rise multifamily residential units.
Refer to Section 6.4.2 for high-rise multifamily requirements.
- Outdoor lighting, additions and alterations.
Refer to Section 6.5 for outdoor residential lighting requirements.
Refer to Section 6.7 for additions and alterations of residential buildings.
- Residential spaces in nonresidential buildings.
The following subsections list the spaces required to comply.

6.1.3 Residential Functional Areas in Nonresidential Buildings

The following areas in nonresidential, high-rise residential, and hotel/motel buildings are required to comply with the low-rise residential lighting standards, as defined in §130.0(b):

- High-rise residential dwelling units
- Outdoor lighting attached to a high-rise residential building or hotel/motel and separately controlled from inside of a dwelling unit or guest room
- Fire station dwelling accommodations
- Hotel and motel guest rooms. Guest rooms are also required to comply with the lighting shut-off requirements in §130.1(c)8, which require captive card key controls, occupant sensing controls, or automatic controls. Guest rooms must also meet the controlled receptacle requirements of §130.5(d)4
- Dormitory and senior housing dwelling accommodations. The requirements also apply to additions and alterations to functional areas of existing buildings specified above.

- All other function areas in nonresidential, high-rise residential, and hotel/motel buildings, such as common areas, shall comply with the applicable nonresidential lighting standards.

6.1.4 Related Resources

The California Energy Commission and others prepare educational resources with information about residential lighting. The Energy Commission's resources are here: http://www.energy.ca.gov/efficiency/educational_resources.html.

6.2 Indoor Luminaire Requirements

A luminaire, which is a light fixture, is defined by §100.1 as a complete lighting unit consisting of a light source such as a lamp or lamps and the parts that distribute the light, position and protect the light source and connect it to the power supply.

A lamp is a light bulb or similar separable lighting component. It is defined by §100.1 as an electrical appliance that produces optical radiation for visual illumination with a base to provide an electrical connection between the lamp and a luminaire, and installed into a luminaire. The definition is expanded to clarify that a lamp is not a luminaire and is not an LED retrofit kit designed to replace additional components of a luminaire.

The 2019 Energy Standards for residential lighting require all permanently installed luminaires to be high efficacy, as specified in §150.0(k). Permanently installed lighting is defined in §100.1 and examples of permanently installed lighting include:

- Lighting attached to walls, ceilings, or columns.
- Track and flexible lighting systems.
- Lighting inside permanently installed cabinets.
- Lighting attached to the top or bottom of permanently installed cabinets.
- Lighting attached to ceiling fans.
- Lighting integral to exhaust fans.
- Lighting integral to garage door openers if it is used as general lighting, is switched independently from the garage door opener, and does not automatically turn off after a pre-determined amount of time.

The following are examples of non-permanently installed lighting:

- Portable lighting as defined by §100.1 (including, but not limited to, table and freestanding floor lamps with plug-in connections);
- Lighting installed by the manufacturer in refrigerators, stoves, microwave ovens, exhaust hoods for cooking equipment, refrigerated cases, vending machines, food preparation equipment, and scientific and industrial equipment;

- Lighting in garage door openers which consists of no more than two screw-based sockets integrated into the garage door opener by the manufacturer, where the lights automatically turn on when the garage door is activated, and automatically turn off after a pre-determined amount of time.

6.2.1 Residential Luminaires – High Efficacy by Default

Luminaires in any of the following categories are automatically classified as high efficacy and do not have to comply with the requirements of Reference Joint Appendix JA8 (aka JA8 – refer to next section for details).

- a. Pin-based linear fluorescent luminaires using electronic ballasts.
- b. Pin-based compact fluorescent luminaires using electronic ballasts
- c. Pulse-start metal halide luminaires.
- d. High pressure sodium luminaires.
- e. Luminaires with induction lamp and hardwired high frequency generator.
- f. LED luminaires installed outdoors.
- g. Inseparable solid state lighting (SSL) luminaires containing colored light sources for decorative lighting purpose.

Recessed downlight luminaires must meet the JA8 requirements.

Screw-based luminaire types must have a JA8-compliant light source or lamp installed in them at the time of inspection.

All other luminaire types must also meet the JA8 requirements.

Table 6-1 summarizes the requirements for residential high-efficacy luminaires. There are luminaires automatically classified as high efficacy, luminaires that must use JA8-certified light sources or lamps, and recessed downlight luminaires in ceilings.

Table 6-1 (A Short Version of Table 150.0-A): Summary of Compliant Luminaire Types

High-Efficacy Luminaires*	JA8 High-Efficacy Lighting – Lamps and Light Sources that must be JA8-certified	*Recessed Downlight Luminaires in Ceilings
<ul style="list-style-type: none"> • Pin-based linear fluorescent light sources using electronic ballasts • Pin-based compact fluorescent light sources using electronic ballasts • Pulse-start metal halide light sources • High-pressure sodium light sources • Luminaires with induction lamp and hardwired high frequency generator • LED light sources installed outdoors • Inseparable SSL luminaires containing colored light sources for decorative lighting purpose 	<ul style="list-style-type: none"> • Light sources installed in ceiling recessed downlight luminaires. The downlights shall not have screw bases. • LED luminaires with integral sources • Screw-based LED lamps (A-lamps, PAR lamps, etc.) • Pin-based LED lamps (MR-16, AR-111, etc.) • Any light source or luminaire not listed elsewhere in this table 	<ul style="list-style-type: none"> • Shall not have screw-based sockets • Shall contain JA8-certified light sources • Shall meet all performance requirements in §150.0(k)1C

6.2.2 Residential Luminaires – JA-8 Compliant

Luminaires not listed in the previous section must have an integral light source or removable lamp that meets the performance requirements of JA8. The requirements in JA8 ensure that new lighting technologies like LED provide energy-efficient light, while also maintaining performance characteristics that customers expect. In addition to setting minimum efficacy requirements, JA8 establishes performance requirements that ensure accurate color rendition, dimmability, and reduced noise and flicker during operation.

Luminaires with integral sources, such as LED luminaires, must be certified by the Energy Commission as meeting the JA8 requirements. Luminaires that have changeable lamps (such as screw-base luminaires) must be installed with lamps that have been certified by the Energy Commission.

Luminaires and lamps that the Energy Commission certified must be marked with JA8-2019 or JA8-2019-E on the product. The JA8-2019-E marking indicates that the product

has passed the more stringent ENERGY STAR's Elevated Temperature Life test as specified in Reference Joint Appendix JA8 of Section JA8.3.5. The product is appropriate for elevated temperature applications for installation such as in enclosed luminaires.

Luminaires that can be classified as high efficacy by meeting the requirements of JA8 include:

1. LED luminaires with integral light sources that are certified to the Energy Commission.
2. Screw-based luminaires with JA8-certified lamps.
3. Low-voltage pin-based luminaires with JA8-certified lamps.

Almost any luminaire can be classified as high efficacy, as long as the luminaire is installed with a JA8 compliant lamp. The exception is recessed downlight luminaires in ceilings, which must meet additional requirements.

The Energy Commission maintains a database of certified JA8-compliant luminaires, lamps, and light sources. The database can be accessed using a Quick Search Tool (<https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx>) or an Advanced Search (<https://cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx>).

6.2.3 Recessed Downlight Luminaires in Ceilings

In addition to the high-efficacy requirements, there are several additional requirements for residential downlight luminaires that are recessed in ceilings.

Figure 6-1 Recessed Downlight Luminaires in Ceiling



Source: © 2018 Lutron Electronics Co., Inc. All rights reserved.

The first set of requirements limit the light sources and lamp types used in recessed downlight luminaires. Recessed downlights:

1. Shall contain light sources that are JA8-certified.
2. Shall not contain screw-based lamps.
3. Shall not contain light sources that are labeled not for use in enclosed fixtures or not for use in recessed fixtures.

All recessed downlight luminaires must contain a light source or lamp that is JA8-certified, such as an integral LED source or LED lamp. Screw-based lamps such as LED A-lamps or LED PAR lamps are not allowed. Pin-based lamps such as LED MR-16 lamps are allowed in recessed fixtures as long as they are JA8-certified.

In addition to the light source and lamp requirements listed, recessed downlight luminaires in ceilings must also meet all the following performance requirements:

1. Be listed for zero clearance insulation contact (IC) by Underwriters Laboratories or another nationally recognized testing/rating laboratory;
2. Have a label that certifies the luminaire is airtight with air leakage less than 2.0 cubic feet per minute (CFM) at 75 Pascals when tested in accordance with ASTM E283 (exhaust fan housings are not required to be airtight);
3. Be sealed with a gasket or caulk between the luminaire housing and ceiling, and have all air leak paths between conditioned and unconditioned spaces sealed with a gasket or caulk;
4. For luminaires with hardwired ballasts or drivers, allow ballast or driver maintenance and replacement to be readily accessible to building occupants from below the ceiling without requiring holes to be cut in the ceiling.

Luminaires that meet the first two performance criteria will list this information on luminaire cut sheets or packaging. Contractors are responsible to ensure that luminaires are properly sealed, and any ballasts or drivers are accessible.

Recessed downlight luminaires that do not meet all requirements cannot be used for residential lighting.

**Figure 6-2 Recessed Luminaire with an IC Housing (left);
Recessed Luminaire with a Non-IC Housing (right)**



Source: © 2018 Lutron Electronics Co., Inc. All rights reserved.

6.2.4 Recessed Luminaires other than Ceiling-Recessed Downlight Luminaires

For recessed luminaires to be installed in new residential spaces, the installed light sources and lamps shall be JA8-compliant to meet the elevated temperature requirement. The JA8-compliant lamps and light sources shall have the JA8-2019-E marking to signify that it can be installed in an enclosed luminaire.

6.2.5 Enclosed Luminaires

Any enclosed luminaire to be installed in residential spaces shall be used with JA8 compliant lamps or light sources meeting the elevated temperature requirement. The JA8-compliant lamps and light sources shall have the JA8-2019-E marking to signify that it can be installed in an enclosed luminaire.

The certified JA8-compliant lamps and light sources can be looked at in the Energy Commission's Appliance Database by going to <https://cacertappliances.energy.ca.gov/Pages/ApplianceSearch.aspx>.

Figure 6-3 Images of JA8-2019-E Compliant Lamps



Source: Maxlite

6.2.6 Screw-Based Luminaires

For screw-based luminaires to be installed in residential spaces, the installed lamps shall be JA8-compliant lamps.

6.2.7 Night Lights, Step Lights and Path Lights

Night lights, step lights and path lights must either:

1. Be rated to consume no more than 5 watts and emit no more than 150 lumens; or
2. Comply with Table 150.0-A (a short version of the table is available on page 6-4) and be controlled by vacancy sensors.

6.2.8 Light Sources in Drawers, Cabinets, and Linen Closets

Light sources in drawers, cabinets, and linen closets must either:

1. Be rated to consume no more than 5 watts and emit no more than 150 lumens, and be equipped with controls that automatically turn the light off when the drawer, cabinet, or linen closet is closed; or
2. Comply with Table 150.0-A (a short version of the table is available on page 6-4) and be controlled by vacancy sensors.

Example 6-1: Screw-based luminaires

Question

I am using a screw-based luminaire that is rated to take a 60W lamp for lighting over a sink, and I plan to install a 10W LED lamp. Does it meet the residential lighting requirement for screw-based luminaire and Table 150.0-A?

Answer

If the LED lamp is JA8-certified and marked JA8-2019 or JA8-2019-E, then it meets the residential lighting requirement on screw-based luminaire and Table 150.0-A.

Example 6-2: Color-tunable and dim-to-warm luminaires installed in residential buildings

Question

Can color-tunable luminaires and dim-to-warm luminaires be certified to meet JA8 specifications?

Answer

The JA8 specifications require the color temperature (correlated color temperature, CCT) of the light sources to be no greater than 4000 Kelvin (K). If the color-tunable luminaire product or the dim-to-warm luminaire product produces a color temperature of no greater than 4000K, it meets the color temperature criteria of JA8.

Example 6-3: Fade-in lighting

Question

I would like to use lighting with an aesthetic fade-in feature in my design. The JA8 has a start time requirement. Are fade-in lights able to qualify as high efficacy?

Answer

Aesthetic fade-in lights are acceptable under Title 24. The test procedure for start time measures “[t]he time between the application of power to the device and the point where the light output reaches 98% of the lamp’s initial plateau.” The “initial plateau” is “[t]he points at which the average increase in the light output over time levels out (reduces in slope).”

For light sources with a fade-in feature, the light output intentionally follows a programmed fade-in curve to increase light output gradually. Because the light output must level out, the initial plateau for these light sources is the point in time at which there is perceived light output and the perceived light increase begins to follow the programmed fade-in curve. The programmed fade-in curve is expected to be continuously increasing as a function of time.

This allows fade-in lighting to qualify as high efficacy.

Example 6-4: Kitchens exhaust hood lighting**Question**

I am installing an exhaust hood over my kitchen range that has lamps in it. Do these lamps have to be high efficacy?

Answer

This lighting is part of an appliance and does not have to meet the residential lighting requirements for permanently installed lighting.

Example 6-5: Kitchen alterations**Question**

I am designing a residential kitchen lighting system with six 12W LED recessed downlights and four 24W LED tape lights for under cabinet lighting. How many watts of incandescent or halogen luminaires can be installed?

Answer

None. Low efficacy luminaires are no longer allowed for residential lighting. All luminaires must meet the definitions of high-efficacy luminaires in Table 150.0-A of the Energy Standards.

Example 6-6: Night lights**Question**

Where are night lights permitted to be installed in residential buildings?

Answer

There are no location restrictions in the Energy Standards. Permanently installed night lights and night lights integral to installed luminaires can be installed anywhere in single family buildings, dwelling units of multifamily buildings, or other residential spaces.

6.2.9 Blank Electrical Boxes

For blank electrical boxes mounted more than 5 feet above the finished floor, the boxes shall be served by a dimmer, vacancy sensor, or fan speed control.

Example 6-7: Blank electrical boxes

Question

How many blank electrical boxes located more than 5 feet above the finished floor can be installed in a residential building or space?

Answer

The number of boxes can be as many as the number of bedrooms in a residential building or dwelling unit. The number of boxes can be less but not more than the number of bedrooms.

This requirement applies to those located more than 5 feet above the finished floor. It does not apply to boxes mounted below 5 feet or at 5 feet above the floor.

6.3 Indoor Lighting Control Requirements

Using lighting controls is an important part of the Energy Standards because they can produce energy savings for the owners and users of the spaces.

6.3.1 Lighting Control Requirements in Accordance with Room and Luminaire Types

Following are general control requirements that apply for the room type and for the luminaire type:

A. Readily Accessible Manual Controls

All permanently installed luminaires shall have readily accessible wall-mounted controls that permit the luminaires to be manually turned on and off.

B. Multiple Switches

This applies to three-way, four-way, and other lighting circuits controlled by more than one switch. A lighting circuit controlled by more than one switch where a

dimmer or vacancy sensor has been installed to comply with §150.0(k) shall meet all the following conditions:

1. No controls shall bypass the dimmer or vacancy sensor function.
2. The dimmer or vacancy sensor must comply with the applicable requirements of §110.9(b).

C. Energy Management Control Systems (EMCS) and MultiScene Programmable Controllers

An EMCS system with the appropriate lighting control functionality can be installed for meeting the lighting control requirements of Section 110.9 and 150.0(k)2.

A multiscene programmable controller with the appropriate dimmer functionality can be installed for meeting the dimmer requirements of Section 110.9 and the applicable requirements of Section 150.0(k)2.

The EMCS or the multiscene programmable controller do not have to be certified to the Commission. However, the person who is constructing and installing the EMCS system must complete an installation certificate.

D. Exhaust Fans

There are two options for the lighting associated with the fans:

1. All lighting shall be controlled separately from exhaust fans.
2. For an exhaust fan with an integral lighting system, it must be possible for the lighting system to be manually turned on and off while allowing the fan to continue operating for an extended period of time.

E. Ceiling Fans

Ceiling fans with integrated light sources can be controlled with a remote control.

F. Spaces Required to Have Vacancy Sensors / Occupancy Sensors

The following residential spaces are required to have at least one luminaire in the space to be controlled by an occupancy or vacancy sensor:

1. Bathrooms
2. Garages
3. Laundry Rooms
4. Utility Rooms

G. Luminaires Required to Have Dimmers or Vacancy/Occupancy Sensors

All LED luminaires are required to be controlled by a National Electrical Manufacturers Association (NEMA) SSL-7A-compliant dimmer unless they are controlled by a vacancy sensor or an occupancy sensor. The combined use of NEMA SSL-7A-compliant dimmer with LED luminaires can ensure flicker free operation when the luminaire is dimmed. This dimmer/light source compatibility information is on dimmer cut sheets or dimmer product packaging.

For the 2019 Standards, occupancy sensors can be installed for meeting the vacancy sensor requirement of the residential lighting standard as long as the occupancy sensor operates in the manual-ON and automatic-OFF mode.

Dimmers and vacancy sensors are not required for any luminaires located in hallways or in closets less than 70 square feet.

Example 6-8: Using vacancy sensors and dimmers

Question

Can I install vacancy sensors in hallways and closets even though the Energy Code does not require it?

Answer

Installing controls such as vacancy sensors in hallways and closets is allowed.

A vacancy sensor turns off lighting when a space is unoccupied. This can save energy and the energy bill compared to a manual on-off switch control where the light may be left on for some unattended periods.

Using vacancy sensors is recommended for any application where they can provide additional energy savings or additional amenity for the homeowner or occupant.

A dimmer varies the intensity of the light to suit the occasions or the time of the day. When less light is needed, the homeowner can reduce the light intensity with a dimmer and save energy.

6.3.2 Lighting Control Functionality

All installed lighting controls listed in §110.9(b) shall comply with the requirements listed below. In addition, all components of the system installed together shall meet all applicable requirements for the application for which they are installed as required in §130.0 through §130.5, §140.6 through §140.8, §141.0, and §150.0(k).

Designers and installers should review features of their specified lighting control products for meeting the requirements of Section 110.9(b) as part of the code compliance process.

A. Time-Switch Lighting Controls

Time-switch lighting control products shall provide the functionality listed in Section 110.9(b)1 of the Energy Code.

B. Dimmer

Dimmer products shall provide the functionality listed in Section 110.9(b)3 of the Energy Code.

There is also a compatibility requirement for forward phase cut dimmers used with LED light and the dimmers must comply with NEMA SSL 7A, as mentioned earlier in this manual.

C. Occupant Sensing Controls

Occupant sensing control products (including occupant sensors, partial-ON occupant sensors, partial-OFF occupant sensors, motion sensors, and vacancy sensor controls) shall provide the functionality listed in Section 110.9(b)4 of the Energy Code.

One important functionality is automatically turning the lights either off or down within 20 minutes after the area has been vacated.

Exception to the requirement: Occupant sensing control systems may consist of a combination of single or multi-level occupant, motion, or vacancy sensor controls, provided that components installed to comply with manual-on requirements shall not be capable of conversion by occupants from manual-on to automatic-on functionality.

D. Using Vacancy Sensors or Occupancy Sensors

Manual-on/automatic-off occupant sensors, also known as vacancy sensors, automatically turn lights off if an occupant forgets to turn them off when a room is unoccupied.

Additionally, the sensors are required to provide the occupant with the ability to manually turn the lights:

1. Off upon leaving the room
2. Off while still occupying a room
3. On upon entering the room

The manual-off feature provides the occupants with the flexibility to control the lighting environment and to turn off the lights when they are not needed.

The 2019 Standards allow occupancy sensors to be installed to meet the vacancy sensor requirement of the residential lighting standard as long as the occupancy sensor is configured to operate in the manual-ON and automatic-OFF mode.

Example 6-9: Bathroom vacancy sensors--manual off

Question

Should the vacancy sensor in a bathroom provide the occupant the option of turning the light off manually?

Answer

The vacancy sensor must provide the occupant with the option to turn the lights off manually.

If an occupant forgets to turn the lights off when a room is unoccupied, then the vacancy sensor must turn the lights off automatically within 20 minutes. The occupant must also have the ability to turn the lights off upon leaving the room.

Occupants have the flexibility to control the lighting environment and products greater energy savings since the lights can be turned off when they are not needed.

Example 6-10: Use of automatic-on occupancy sensors

Question

What are the options to use an automatic-on occupant sensor in a bathroom, garage, laundry room, or utility room?

Answer

Automatic-on occupant sensors that can be configured to manual-on operation can be installed to meet the residential lighting control requirements for bathrooms, garages, laundry rooms, and utility rooms.

Example 6-11: Using Energy Management Control System (EMCS) for controls

Question

What EMCS are permitted in the controls for under cabinet lighting?

Answer

An EMCS can be used to control under cabinet lighting provided that the under cabinet lighting is switched separately from ceiling lighting systems as specified in §150.0(k)2K.

6.4 Interior Common Area Lighting Requirements for Multifamily Residential Buildings

There are different applicable lighting requirements for low-rise residential buildings and high-rise residential buildings. Buildings are defined as low-rise and high-rise buildings according to the following.

A low-rise residential building is a building, other than a hotel/motel, in one of the following occupancy groups:

- R-2, multifamily, with three habitable stories or less;
- R-3, single-family; or
- U-building, located on a residential site.

A high-rise residential building is a building, other than a hotel/motel, of occupancy group R-2 or R-4 with four or more habitable stories.

Interior common areas in multifamily buildings include areas such as interior hallways, lobbies, entertainment rooms, pool houses, club houses, and laundry facilities. Lighting requirements for these spaces depend on the characteristics of the buildings. Low-rise buildings are those three stories or less, and while high-rise buildings are four stories or higher.

6.4.1 Low-Rise Multifamily – Common Area Lighting Requirements

The residential lighting requirements apply to lighting within dwelling units in multifamily buildings. In addition to the residential lighting requirements, if the interior common area of a low-rise multifamily building is greater than 20 percent of the total floor area, the lighting in the common areas must comply with the nonresidential lighting standards.

Lighting requirements in common areas of low-rise multifamily buildings depend on the percentage of the total interior common area in each building. Buildings in which the interior common area equals 20 percent or less to the floor area have one set of requirements. Buildings whose total interior common area is greater than 20 percent of the total floor area have different requirements.

A. If The Common Area Equals 20 Percent or Less of The Total Building Floor Area

In low-rise multifamily buildings where the total interior common area in a single building is 20 percent or less of the total floor area, all permanently installed lighting in interior common areas must comply with Table 150.0-A and be controlled by occupancy sensors.

B. If The Common Area is Greater Than 20 Percent of The Total Building Floor Area

In low-rise multifamily buildings where the total interior common area in a single building is greater than 20 percent of the total floor area, permanently installed lighting in common areas must meet the applicable nonresidential lighting control and power requirements. Corridor and stairwell lighting must be controlled by occupant sensors.

The relevant nonresidential lighting requirements that apply are:

1. §110.9 – Mandatory Requirement for Lighting Controls
2. §130.0 – Lighting Systems and Equipment, and Electrical Power Distribution Systems – General
3. §130.1 – Mandatory Indoor Lighting Controls
4. §140.6 – Prescriptive Requirements for Indoor Lighting
5. §141.0 – Additions, Alterations, and Repairs to Existing Nonresidential, High-Rise Residential, and Hotel/Motel Buildings, to Existing Outdoor Lighting, and to Internally and Externally Illuminated Signs

These sections cover allowable equipment, controls requirements for various space types, allowable lighting power densities for various space types, and

requirements for additions and alterations to existing buildings. More information about the nonresidential lighting requirements that apply is in Chapter 5 of the Nonresidential Compliance Manual.

In addition to meeting the applicable nonresidential lighting requirements, lighting in corridors and stairwells in these buildings must meet the following occupancy control requirements:

1. Occupancy controls must reduce stairway and corridor lighting power by at least 50 percent when the spaces are unoccupied.
2. Occupancy controls must be capable of turning stairwell and corridor lighting fully on and off from all designated paths of ingress and egress.

Example 6-12: Multifamily common areas: low rise

Question

Does the lighting for an interior common-area hallway of a low-rise residential building with a total common area of 10 percent of the total building area have to comply with the residential or nonresidential lighting requirements?

Answer

The lighting of an interior common-area hallway of any low-rise residential building with total common area of 20 percent or less of the total building area must comply with only the residential lighting requirements.

Example 6-13: Egress lighting for common areas in low-rise multifamily buildings

Question

What is the egress lighting requirement for interior common areas in low-rise multifamily buildings?

Answer

The only Energy Standards requirement is that all luminaires must be high efficacy. Refer to California Code of Regulations, Title 24, Part 2, Chapter 10, for emergency egress lighting requirements.

6.4.2 High-Rise Multifamily – Common Area Lighting Requirements

Lighting within residential units in high-rise multifamily or high-rise residential buildings is required to comply with the residential lighting requirements. Common areas in all high-rise multifamily buildings must meet all applicable nonresidential lighting requirements. In addition, any outdoor lighting attached to a high-rise residential

building controlled from within a residential unit must meet the residential lighting requirements.

Common areas in all high-rise multifamily buildings (four stories or greater) must meet all applicable nonresidential lighting requirements in the following sections:

1. §110.9 – Mandatory Requirement for Lighting Controls.
2. §130.0 – Lighting Systems and Equipment, and Electrical Power Distribution Systems – General.
3. §130.1 – Mandatory Indoor Lighting Controls.
4. §130.4 – Lighting Control Acceptance and Installation Certificate Requirements.
5. §140.6 – Prescriptive Requirements for Indoor Lighting.
6. §141.0 – Additions, Alterations, and Repairs to Existing Nonresidential, High-Rise Residential, and Hotel/Motel Buildings, to Existing Outdoor Lighting, and to Internally and Externally Illuminated Signs.

These sections cover allowable equipment, controls requirements for various space types, allowable lighting power densities for various space types, and requirements for additions and alterations to existing buildings. More information about the nonresidential lighting requirements that apply can be found in Chapter 5 of the Nonresidential Compliance Manual.

Dwelling units within high-rise multifamily buildings must comply with the residential lighting requirements.

Example 6-14: Multifamily common areas: high rise

Question

Does the lighting for an interior common-area hallway of a high rise residential building have to comply with the residential or nonresidential lighting requirements?

Answer

The lighting of an interior common-area hallway of a high-rise residential building must comply with the nonresidential lighting standards. All the lighting in common areas must comply with the nonresidential standards. Lighting inside the dwelling units must comply with the residential lighting requirements.

Hallways and stairwells are required to have partial off occupancy sensors that switch off at least half the lighting load when the hallway or stairwell is unoccupied.

6.5 Residential Outdoor Lighting Requirements

Outdoor residential lighting is sometimes subject to the residential lighting requirements, and sometimes subject to the nonresidential lighting requirements.

6.5.1 Outdoor Luminaires

All lighting attached to the residence or to other buildings on the same lot must be high efficacy. Table 150.0-A lists all qualifying high-efficacy light sources. Outdoor LED luminaires and LED light sources installed outdoors are automatically classified as high efficacy and are not required to comply with JA8.

6.5.2 Single-Family Outdoor Lighting

All lighting attached to the residence or to other buildings on the same lot must be high efficacy, and must be controlled by a manual ON and OFF switch and one of the following automatic control types:

1. Photocontrol and either a motion sensor or an automatic time switch control;
or
2. Astronomical time clock control.

Any override to the above automatic controls to ON must return to automatic control operations within six hours.

Lighting not permanently attached to a building on a single-family site, such as decorative landscape lighting, is not regulated by the residential lighting requirements. High efficacy lighting and controls such as a time clock or photocontrol will help save energy and ensures that the lighting is not accidentally left on during daylight hours.

Table 6-2: Outdoor Lighting Standards for Single Family Buildings

Outdoor Lighting Requirements	Residential Standards; Nonres is short for Nonresidential Standards
Spaces or Areas with Outdoor Lighting	Single Family Buildings
Outdoor lighting mounted to building	Res
Private patios, entrances, balconies, and porches	Res

6.5.3 Low-Rise Residential Buildings and Other Applications – Outdoor Lighting

Low-rise residential buildings with four or more dwelling units and the following applications have the option of complying with either the residential or nonresidential lighting standards.

1. Private patios
2. Entrances
3. Balconies
4. Porches

For all other outdoor lighting applications, low-rise buildings with four or more dwelling units must comply with the nonresidential lighting requirements.

Table 6-3: Outdoor Lighting Standards for Low-Rise Residential Buildings

Outdoor Lighting Requirements	Residential Standards; Nonres is short for Nonresidential Standards	Residential Standards; Nonres is short for Nonresidential Standards
Spaces or Areas with Outdoor Lighting	Low-Rise Residential Buildings	Low-Rise Residential Buildings
Spaces or Areas with Outdoor Lighting	1-3 Dwelling Units	4 or more Dwelling Units
Private patios, entrances, balconies, and porches	Res or Nonres (builder's option)	Res or Nonres (builder's option)
Outdoor lighting not regulated by Section 3B	Res or Nonres	Nonres

Example 6-15: Outdoor lighting controls for hotel guestrooms:

Question

What are the requirements for exterior lighting of a hotel guestroom, such as balcony light?

Answer

Section 150.0(k)3B applies to “outdoor lighting for private patios, balconies, and porches.” Either residential lighting controls or nonresidential lighting controls can be selected for meeting Title 2.4.

6.5.4 High-Rise Residential Buildings – Outdoor Lighting

Any outdoor lighting attached to the building, which is controlled from within the dwelling unit, must comply with the residential requirements.

Outdoor lighting attached to the building that is not controlled from within the dwelling unit must comply with the following nonresidential requirements:

1. §110.9 – Mandatory Requirement for Lighting Controls
2. §130.0 – Lighting Systems and Equipment, and Electrical Power Distribution Systems – General
3. §130.2 –Outdoor Lighting Controls and Equipment
4. §130.4 – Lighting Control Acceptance and Installation Certificate Requirements
5. §140.7– Requirements for Outdoor Lighting
6. §141.0 – Additions, Alterations, and Repairs to Existing Nonresidential, High-Rise Residential, and Hotel/Motel Buildings, to Existing Outdoor Lighting, and to Internally and Externally Illuminated Signs

More on the nonresidential lighting requirements is Chapter 5 of the Nonresidential Compliance Manual.

6.5.5 Internally Illuminated Signs

Internally illuminated signs shall consume no more than 5W of power, or shall comply with nonresidential sign lighting requirements in §140.8.

Example 6-16: Outdoor lighting: glare control

Question

Are there cutoff requirements for residential outdoor luminaires?

Answer

There are no cutoff requirements for typical residential outdoor lighting. Residential parking lots for eight or more vehicles are required to meet the nonresidential standards, which do include cutoff requirements for luminaires with initial lumens greater than 6,200 lumens. The requirement uses the backlight, uplight and glare (BUG) ratings developed by the IES to define acceptable amounts of uplight and glare (there are no limits on “backlight.”) Even though not required for most residential outdoor lighting, luminaires that limit uplight are usually more efficient at providing light in the required area, so a lower wattage lamp and ballast can be used. The BUG requirements also reduce stray light and glare problems which can cause visual discomfort.

Example 6-17: Outdoor lighting: landscape lighting

Question

I would like to install low-voltage landscape lighting in my yard. Are these required to be on a motion sensor and photocontrol?

Answer

No. Although the lighting requirements only apply to lighting that is attached to the building, it is advisable to use photocontrols or astronomical time clock controls for landscape lighting so that the lighting is not left on during daylight hours.

Example 6-18: Outdoor lighting: patios

Question

Does outdoor lighting on the patio of a high-rise residential building have to comply with the residential or nonresidential lighting standards?

Answer

If the patio outdoor lighting is controlled from inside of the dwelling unit, it must comply with the residential outdoor lighting standards. If the patio outdoor lighting is controlled from outside of the dwelling unit, it must comply with the nonresidential outdoor lighting standards. For example, if the outdoor patio lighting is controlled by a building-wide EMCS outside of the dwelling units, it must comply with the nonresidential outdoor lighting standards.

6.6 Residential Garage, Parking Lot and Carport Lighting

Residential garages are treated as indoor spaces, while residential parking lots and carports are treated as outdoor spaces. These parking facilities are required to meet either the residential or the nonresidential requirements, depending on what type of building they are associated with.

All lighting attached to the residence or to other buildings on the same lot must be high efficacy. See Table 150.0-A for qualifying high efficacy light sources. Outdoor LED luminaires and LED light sources installed outdoors are automatically classified as high efficacy.

Regardless of the classification of the associated building, residential garages for 8 vehicles or more must comply with all applicable nonresidential indoor lighting requirements in §110.9, §130.1, §130.4, §140.6 and §141.0.

See Nonresidential Compliance Manual Chapter 5 for the nonresidential indoor lighting requirements, and Chapter 6 for the nonresidential outdoor lighting requirements.

Low-rise residential garages for less than 8 vehicles have to comply with requirements of §150.0(k)2I - the lighting to be controlled by occupant or vacancy sensors.

6.6.1 Single-Family – Garage Lighting

Garages on single-family sites with space for 7 vehicles or less must comply with the residential lighting control requirements in §150.0(k)2I, which require at least one luminaire in each garage to be controlled by an occupant or vacancy sensor.

Garages for 8 vehicles or more must comply with the applicable nonresidential indoor lighting requirements.

6.6.2 Low-Rise Residential - Parking Lot and Carport Lighting

For low-rise residential buildings, the associated parking lots and carports with less than 8 vehicles per site must comply with either the applicable nonresidential outdoor lighting requirements or the residential requirements shown on the following table.

Table 6-4: Residential Lighting Control Requirements of Section 150.0(k)3A

All lighting must be controlled by a manual ON and OFF switch	Mandatory
Photocontrol and either a motion sensor or an automatic time switch control	Choose one
Astronomical time clock control	Choose one

Residential Outdoor Lighting Control Requirements

For low-rise residential parking lots and carports with more than 8 vehicles per site, they must comply with the applicable nonresidential outdoor lighting requirements.

6.6.3 High-Rise Residential - Parking Lot and Carport Lighting

Parking lots and carports for high-rise residential buildings must comply with the applicable nonresidential outdoor lighting requirements.

Example 6-19: Parking spaces

Question

I have a low-rise multi-family complex with 20 parking spaces. The parking spaces are arranged throughout the site in groups of only four spaces each. Are these spaces required to comply with the nonresidential outdoor lighting requirements?

Answer

Yes, these spaces are required to comply with the nonresidential outdoor lighting standards. Parking lots and carports with 8 or more vehicles per site must meet the nonresidential outdoor lighting requirements, regardless of how the spaces are arranged.

6.7 Additions and Alterations

Additions are considered newly constructed buildings, so they must meet the applicable residential lighting requirements of §150.0(k).

For alterations, existing luminaires may stay in place but any new permanently installed luminaires shall meet the requirements of §150.0(k).

Residential building additions must meet all mandatory requirements in §150.0. Because the residential lighting requirements are mandatory, lighting in all residential building additions must meet the requirements outlined in this chapter.

For residential building alterations, any new or altered lighting systems must also meet all the requirements in this chapter. Existing luminaires and lighting systems that are not altered may stay as is. Use JA8 compliant trim kits or JA8 compliant lamps to alter existing screw-based ceiling recessed luminaires to be code-compliant.

6.8 Compliance Documentation

Submit the compliance documentation for residential lighting, which is a certificate of installation, after the lighting project is complete.

All residential lighting requirements are mandatory. There are no tradeoffs between lighting and other building features.

6.8.1 Certificate of Installation (CF2R-LTG)

Lighting control systems are required to comply with the certificate of installation (form CF2R-LTG). Although designed primarily as a nonresidential compliance document, the certificate is also required when a lighting control system is used to comply with the residential lighting requirements.

A. Person Responsible to Submit the Certificate of Installation

The person responsible for constructing and installing the residential lighting project (Title 24 California Code of Regulations, Part 1, §10-103(a)3.) must submit the certificate. The individual must be eligible under Division 3 of the Business and Professions Code. The person should ensure the installed lighting complied with the applicable lighting requirements before signing the certificate.

B. Number of Certificates of Installation Required

A residential lighting project may require more than one certificate to be submitted. If one qualified person accepts responsibility for the lighting installation of an entire lighting project, one certificate is needed. If one qualified person installs the lighting controls and another installs the luminaires, then each individual will need to submit a separate certificate.

A certificate must be submitted to the responsible code enforcement agency for any residential lighting project that is regulated by Part 6, whether that project is one luminaire or lighting the entire building.

The contractor installing hard-wired lighting systems must complete and sign the certificate. The installer verifies compliance with the mandatory requirements for lighting and whether high-efficacy lighting and the required controls (i.e., vacancy sensors, dimmer switches) were installed.

C. Registration

Registration is required for newly constructed low-rise residential buildings and for an addition or alteration project for which compliance requires Home Energy Rating System (HERS) field verification (see Title 20 California Code of Regulations §1670 et seq.). When registration is required, the certificates must be submitted electronically to an approved HERS provider data registry for registration and retention.

Registration requirements are in Chapter 2 of the *2019 Residential Compliance Manual*.

D. Certificate of Installation Requirements in the Standards

The following is the Energy Standards' language that requires the certificate to be submitted when a lighting control system is installed to comply with any residential lighting control requirements.

1. §150(k)2F – Lighting controls must comply with the applicable requirements of §110.9.

2. §110.9(a) – Lighting control devices and systems must meet the lighting control installation requirements in §130.4.
3. §130.4(b) – Lighting Control Installation Certificate Requirements
To be recognized for compliance with Part 6, an Installation Certificate shall be submitted in accordance with §10-103(a) for any lighting control system and Energy Management Control System (EMCS) in accordance with the following requirements, as applicable:
 - a. Certification that when a lighting control system is installed to comply with the lighting control requirements in Part 6, it complies with the applicable requirements of §110.9 and complies with Reference Nonresidential Appendix NA7.7.
 - b. Certification that when an EMCS is installed to function as a lighting control required by Part 6 it functionally meets all applicable requirements for each application for which it is installed, in accordance with §110.9, §130.0 through §130.5, §140.6, §140.7, and §150.0(k); and complies with Reference Nonresidential Appendix NA7.7.2.
4. §150(k)2G – An EMCS may be used to comply with control requirements in §150.0(k) if, at a minimum, it provides the functionality of the specified controls in accordance with §110.9, meets the installation certificate requirements in §130.4, the EMCS requirements in §130.0(e), and complies with all other applicable requirements in §150.0(k)2.
5. §150(k)2H – A multi-scene programmable controller may be used to comply with dimmer requirements in §150.0(k) if at a minimum it provides the functionality of a dimmer in accordance with §110.9, and complies with all other applicable requirements in §150.0(k)2.

6.9 For Homeowners

6.9.1 Lighting Schedule Submitted to Homeowner

A schedule of all interior luminaires and lamps installed must be delivered to the homeowner after final inspection (Title 24 California Code of Regulations, Part 1, §10-103(b)3). In addition to a list of installed lighting systems, the schedule should include necessary system information for regular operations and maintenance, and references to support future upgrades to the lighting system.

6.10 For Building Officials

This section provides guidance for enforcement agency personnel about what to look for on the plans, what compliance documents to expect, and high-priority issues to focus on in inspections.

6.10.1 Plans

A. Confirm All Specified Luminaires Are High Efficacy

All permanently installed luminaires shown on the plans and/or specifications must be high efficacy (§150.0(k)1A). Luminaires may comply with §150.0(k)1A as follows:

1. Luminaires automatically classified as high efficacy; or
2. Luminaires that must use JA8-certified light sources or lamps; or
3. JA8-certified luminaires.

LED luminaires installed outdoors and a number of conventional types are automatically classified as high efficacy. Refer to Section 6.2 for details about high-efficacy luminaires and JA8 compliant luminaires. Compliant luminaire types are in Table 6-1.

Plans, lighting specifications, and/or notes should specify how luminaires will comply.

B. Confirm All Required Controls Are Specified

Plans and specifications should indicate vacancy or occupancy sensing controls with at least one luminaire in each of the following spaces:

1. Bathrooms
2. Laundry rooms
3. Garages
4. Utility rooms

Luminaires installed with JA8 lamps (lamps and light sources) with dimming capability are required to be controlled by a NEMA SSL-7A dimmer, vacancy sensor, or occupancy sensor.

More additional information about indoor lighting control requirements is in Section 6.3.

C. Confirm Any Applicable Outdoor and Nonresidential Lighting Standards

Outdoor lighting shall be shown on plans or described in specifications and/or notes to be high efficacy and to meet the control requirements of §150.0(k)3.

Plans, specifications, and notes should also describe any applicable nonresidential common area or outdoor lighting requirements.

6.10.2 Compliance Documentation

Confirm that all required compliance documentation is included with the plans.

A. Certificate of Installation

The certificate (CF2R-LTG) is the primary compliance documentation for residential lighting. There will be one or more CF2R-LTG forms submitted for each project. Confirm lighting systems and lighting controls in the project are covered by a CF2R-LTG. Confirm all CF2R-LTG forms are registered.

B. Lighting Schedule

Builders must submit a lighting schedule to homeowners or occupants at the time of occupancy. This schedule should describe all installed interior luminaires and lamps. A draft schedule should be included for the plan check.

C. Documentation for Control Systems

Some lighting control systems will also require specific compliance documentation.

6.10.3 Inspections**A. Confirm Luminaires Are Properly Installed**

All installed luminaires should be high efficacy or JA8-compliant.

JA8-compliant luminaires, lamps, and light sources should have a factory or manufacturer's mark with JA8-2019 or JA8-2019-E.

Ceiling recessed downlight luminaires should have a JA8-2019 mark.

Lamps and light sources installed in enclosed luminaires and recessed luminaires should have a JA8-2019-E mark.

B. Confirm Lighting Controls Are Properly Installed

Lighting controls are properly installed per lighting applications for the spaces.

At least one luminaire in bathrooms, laundry rooms, garages, and utility rooms are controlled with a vacancy/occupancy sensing controls.

Dimmers or vacancy/occupancy sensing controls must control JA8 light sources with dimming capability.

C. Confirm Any Applicable Outdoor and Nonresidential Lighting Standards

All lighting attached to a single-family building or other buildings on the same lot must be high efficacy, and must be controlled by a manual ON and OFF switch and one of the following automatic control types:

1. Photocontrol and either a motion sensor or an automatic time-switch control; or
2. Astronomical time-clock control.

Low-rise residential buildings with four or more dwelling units can comply with the residential or nonresidential lighting standards for certain applications

such as private patios, entrances, balconies, porches, residential parking lots, and carports with less than eight vehicles per site.

Refer to Section 6.5 for the complete outdoor lighting requirements.

Lighting that is not permanently attached to a building on a single-family site, such as landscape lighting, is not regulated by the Energy Standards.

If there is any nonresidential outdoor lighting, refer to Chapter 6 of the *2019 Nonresidential Compliance Manual* Chapter 6 for the outdoor lighting requirements.

D. Inspections for Ceiling Recessed Downlight Luminaires

Recessed downlight luminaires must be insulation contact (IC) rated and have a gasket or caulking between the housing and ceiling to prevent heated or cooled air from flowing between conditioned and unconditioned spaces.

Luminaires must include a label certifying airtight or similar designation to show air leakage less than 2.0 CFM at 75 Pascals when tested in accordance with ASTM E283. The label must be visible for the building inspector. The building official may verify the IC and ASTM E283 labels during rough inspection. If verified at final inspection, the official may remove the trim kit to see the labels.

The ASTM E283 certification is a laboratory procedure that measures the leakage of the luminaire housing or an airtight trim kit, and not the installation. Luminaire housings labeled as airtight, airtight ready, or other airtight designation do not establish that a luminaire has been installed airtight. The luminaire manufacturer shall provide instructions about the assembly required to achieve an airtight installation.

Manufacturers use different methods to meet the airtight standards. These methods include using caulk or gaskets to reduce air leakage at the luminaire housing. The lighting requirements do not favor one airtight method over another.

Because luminaire housing is not always installed perfectly parallel to the ceiling surface, both methods have their benefits as follows:

1. Caulk will fill in and seal wide and uneven gaps. After the caulk dries, it may permanently attach the luminaire housing or trim to the ceiling surface. The caulk may need to be cut away from the ceiling surface in case that a luminaire housing or trim needs to be moved away from the ceiling.
2. Many gaskets allow the luminaire housing or trim to be moved away from the ceiling after installation. If the gasket is too thin or not made out of an air stopping material, it may not sufficiently reduce the air flow between the conditioned and unconditioned spaces. Although the standards do not specify the material needed for a gasket, an open cell type of foam, particularly if the gasket is relatively thin, will not create an airtight barrier.

Install a certified airtight luminaire so that it prevents heated or cooled air from flowing between conditioned and unconditioned spaces. Seal all air leak paths through the luminaire assembly or the ceiling opening. Leak paths in the installation assembly that are not part of the ASTM E283 testing must be sealed with either a gasket or caulk.

Verify an airtight installation by:

1. Manufacturer specifications (a "cut sheet") of the certified airtight luminaire housing(s) and installation instructions are made available with the plans to show all components of the assembly needed to ensure there is an airtight installation consistent with §150.0(k)1C. This allows the building inspector to know what the manufacturer specifies to achieve airtight installation and to determine the construction phase that the luminaire should be inspected for airtight compliance.
2. The luminaire manufacturer will specify one of the methods to ensure an airtight seal of the certified airtight housing to the ceiling:
 - a. A gasket is attached to the bottom of the certified airtight housing before installing the ceiling (i.e., drywall or other ceiling materials) to create a seal. The gasket may be preinstalled at the factory, or may need to be field installed. For field installed gaskets, instructions on how the gasket is to be attached shall be provided by the manufacturer. The luminaire shall be installed so that the gasket will be sufficiently compressed by the ceiling when the ceiling is installed. A gasket that is too thin will not provide an airtight seal.
 - b. A gasket is applied between the certified airtight housing and the ceiling opening after the ceiling has been installed. The gasket creates the seal. The cut sheet and installation instructions for the airtight conditions shall detail how to attach the gasket.
 - c. Caulk is applied between the certified airtight housing and the ceiling after the ceiling has been installed. The caulk creates the airtight seal. The cut sheet or installation instructions shall specify the type of caulk that must be used and how the caulk shall be applied.
 - d. A certified airtight trim kit is attached to the housing after the ceiling has been installed. The kit in combination with the luminaire housing makes the manufactured luminaire airtight. A decorative luminaire trim that is not ASTM E283-certified does not make the manufactured luminaire airtight. Most decorative luminaire trims are not designed to make a luminaire airtight. These trims are used to provide a finished look between the ceiling and luminaire housing, and may include a reflector, baffle, and/or lens. Some trim kits are designed to make a luminaire installation airtight. These kits shall be certified airtight in accordance with ASTM E283. Certified kits consist of a one-piece lamp-holder, reflector cone, and baffle. The cut sheet and installation instructions for the airtight conditions shall show which kits should be installed with the luminaire housing and how they shall be attached. A gasket shall be installed between the kit and the ceiling.
3. The following methods for ensuring an airtight seal between the certified airtight housing or certified airtight trim and the ceiling shall be field verified at different phases during construction:

- a. A gasket attached to the bottom of the certified airtight housing shall be inspected before the ceiling is stalled when the rough-in electrical work is visible. The inspector shall review the cut sheet or installation instructions to ensure the housing and gasket have been correctly installed. All gaskets shall be permanently in place at the time of inspection. Once the ceiling material is installed, the gasket will be in continuous, compressed contact with the back of the ceiling and that the housing is securely attached to avoid vertical movement. The housing shall be installed on a plane parallel to the ceiling to ensure continuous compression of the gasket.
- b. A gasket applied between the certified airtight housing and the ceiling after the ceiling has been installed shall be inspected after the ceiling has been installed. The inspector shall review the cut sheet or installation instructions to make sure the housing and gasket have been installed correctly. The gasket shall be permanently in place at the time of inspection. It is important that the gasket is in continuous, compressed contact with the ceiling, and that the housing is attached securely to avoid vertical movement.
- c. Caulk applied between the certified airtight housing and the ceiling shall be inspected after the ceiling is installed. The inspector shall review the cut sheet or installation instructions to make sure the housing has been installed correctly and the caulk has been applied correctly. The housing should be attached securely to avoid vertical movement.

A certified airtight trim kit shall be inspected after the ceiling and the trim are installed. The inspector shall review the cut sheet or installation instructions to make sure the luminaire housing and the kit have been installed correctly. Both should be securely attached to avoid vertical movement. The ASTM E283 certification is a laboratory procedure where the trim kit is tested on a smooth mounting surface. It is common for the kits to be installed against a textured ceiling or other irregular ceiling surface. The gasket should be in continuous, compressed contact with the ceiling and the kit. Visually inspect the kit and gasket next to the ceiling to ensure a continuous seal. Kits may be installed on luminaire housings that may or may not be certified airtight. If the kit is certified airtight, it shall also have a sealed gasket between the kit and ceiling.

6.11 For Manufacturers – Certification to the Energy Commission

The following are guidelines for manufacturers to ensure their lighting products meet residential lighting requirements of the Energy Standards:

Light source products (luminaires, lamps and light sources) that are required to comply with Reference Joint Appendix JA8 shall be marked with JA8-2019 or JA8-2019-E.

For lighting control and light source products to be certified to the Energy Commission (as defined in §100.1), the manufacturer must comply with the requirements of certification. Certification and certification can be done on the Energy Commission's Certify My Product webpage, which is at <http://www.energy.ca.gov/appliances/>, and

under the heading “Modernized Appliance Efficiency Database System (MAEDBS)”. The procedures include filling out a certification packet and submitting a declaration of compliance, executed under penalty of perjury of the laws of California, that the regulated product meets the requirements.

Building departments, builders, contractors, and lighting designers also use the database to verify that a regulated product has been certified to the Energy Commission by the manufacturer.

Luminaires do not need to be shipped with a JA8 lamp by manufacturers.

6.11.1 Luminaires and Lamps and Other Light Sources Complying with JA8 and JA10

Joint Appendix JA8, “Qualification Requirements for High Efficacy Light Sources,” is a technical specification with requirements for high-efficacy light sources which can be luminaires or lamps.

Joint Appendix JA10, “Test Method for Measuring Flicker of Lighting Systems and Reporting Requirements,” is a supplement to the reduced flicker operation requirement of JA8. JA10 describes the test method to measure the flickering of light from the lighting system. The test involves using signal processing to remove high frequency components and quantifies flicker as a percent amplitude modulation below a given cut-off frequency.

In the 2019 Energy Standards, the testing procedures and the requirement for lumen maintenance and rated life, the start time and audible noise of JA8 have been harmonized with the ENERGY STAR® programs for lamps and for luminaires.

Product manufacturers wanting to meet requirements of the ENERGY STAR® program and JA8 of California Energy Code can use the following information to review applicable lamp and luminaire type for both standards. More information can be found at the ENERGY STAR® program.

6.11.2 Lamps and Luminaires Associated with ENERGY STAR® Programs

Lamps and luminaires associated with ENERGY STAR® program that meet JA8 of California Energy Code are in the following table as references.

Table 6-5: Lamps and Luminaires Associated with ENERGY STAR® Programs

ENERGY STAR® programs	Intended Products
ENERGY STAR® Program for Lamps	ANSI Standard Lamp Shape
	A, BT, P, PS, S and T
	B, BA, C, CA, DC, F, G, and ST
	R, BR, ER, MR, MRX and PAR

ENERGY STAR® Program for Luminaires	Directional luminaires with solid state light sources, including accent lights, cover mount and cabinet lights, downlights, outdoor lighting.
	Non-directional luminaires, including wrapped lens, wall sconces & retrofits, decorative pendants, ceiling mount & retrofits, linear strip, bath vanity, chandeliers, and outdoor ceiling or close-to-ceiling, porch or post mount.
	Inseparable SSL luminaires not listed as directional luminaires above.

Guidance on Luminaire Products in Meeting Lumen Maintenance and Rated Life Requirements

1. For Option 1 (for LED packages, LED modules or LED arrays including those incorporated into luminaires, retrofit kits and LED light engines - as allowed under the ENERGY STAR® program product specifications for Luminaires):
 - Either IES LM-80-08 and its Addendum A or IES TM-80-15 can be used for as the lumen maintenance measurement method.
2. For Option 2 (for LED luminaires, LED retrofit kits, or LED light engines):
 - IES LM-84-14 and TM-28-14 can be used as the lumen maintenance measurement method.

Guidance on Lamp Products in Meeting Lumen Maintenance and Rated Life Requirements

1. For LED lumen maintenance test method:
 - Besides the ENERGY STAR® Ambient Temperature Life test and Elevated Temperature Life test, either IES LM-80-08 and its Addendum A or IES TM-80-15 can be used.
2. For LED lumen maintenance projection method:
 - Either 10 CFR Part 430 Appendix BB to Subpart B, or IES TM-21-11 and its Addendum B can be used.
3. Linear or tubular lamp products can be tested under the ENERGY STAR® Product Specification for Lamps Version 2.1 for the Lumen Maintenance of Section 10 (ENERGY STAR® Lamps, Version 2.1). The products shall be tested in the horizontal position.

Light source products other than those mentioned above:

All other light sources (not covered in the intended scope of ENERGY STAR® Program for Lamps and for Luminaires; not linear and tubular lamps) can be tested as specified in Section 10 of the ENERGY STAR® Product Specification for Luminaire Version 2.1.

6.11.3 Marking Designation and Product Data Required for Certified JA8 Luminaires, Lamps and Light Sources

Certified JA8 products including luminaires, lamps and light sources shall have the marking showing it meets the requirement of Section JA8.5.

Table 6-6 shows different marking designations depending on the light source type.

Table 6-7 shows the product date to be submitted to the Energy Commission for meeting the requirements of Section JA8.6.

Table 6-6: Summary of Marking Designation for Certified JA8 luminaires, Lamps and Light Sources

Light Source Types	Marking Designation	Testing Notes for Meeting the Lumen Maintenance and Rated Life Requirements
1.Ceiling recessed downlight luminaires	JA8-2019	Ceiling recessed downlight luminaires that have passed rated life test of ENERGY STAR® Product Spec for Luminaire Version 2.1.
2.Lamps and Light Sources installed in enclosed or recessed luminaires	JA8-2019-E	Light sources that have passed the elevated temperature life test of ENERGY STAR® Product Spec for lamp Version 2.1; or the rated life test of ENERGY STAR® Product Spec for Luminaire Version 2.1.
3.Light Sources other than #1 and #2.	JA8-2019	Lighting sources tested per Section 10 of ENERGY STAR® Product Spec for Lamp Version 2.1 or per Section 10 of ENERGY STAR® Product Spec for Luminaire Version 2.1, and meet Section JA8.4.5.

Table 6-7: JA8 Data to Be Submitted to the California Energy Commission

METRIC	JA8 REQUIREMENTS
Light source type	LED, OLED, Fluorescent, HID, Incandescent, Other
Product type	Omnidirectional lamp, Directional lamp, Decorative lamp, LED light engine, Inseparable SSL luminaire, T20 lamp, Other
Lab accredited by NVLAP or accreditation body operating in accordance with ISO/IEC 17011?	Yes
Initial efficacy	≥ 45 lumens/W
Power factor at full rated power	≥ 0.90
Start time	≤ 0.5 sec
Correlated color temperature (CCT)	≤4000 K
Color rendering index (CRI)	≥ 90 for all products other than T20 lamps. ≥82 for T20 lamps
Color rendering R9 (red)	≥ 50 for all products other than T20 lamps
Ambient or elevated temperature test for rated life, lumen maintenance, and survival rate	Ambient or Elevated
Lumen maintenance	≥ 86.7% after final testing, or 93.1% if reporting interim data
Interim or final reporting	Interim or Final
Rated life	≥ 15,000 hours
Survival rate	≥ 90%
Minimum dimming level	≤ 10%
Dimming control compatibility	At least one type must be listed
NEMA SSL 7A compatible?	If compatible with forward phase cut dimmer control, "Yes." If not, "NA."
FLICKER:	--
See JA10 Table 10-1 for flicker data requirements and permissible answers	<30% for frequencies of 200 Hz or below, at 100% light output
See JA10 Table 10-1 for flicker data requirements and permissible answers	<30% for frequencies of 200 Hz or below, at 20% light output
AUDIBLE NOISE:	--
100% light output: Audible noise	≤ 24 DbA
20% light output: Audible noise	≤ 24 DbA
MARKING:	--
Marked in accordance with JA8.5	Yes