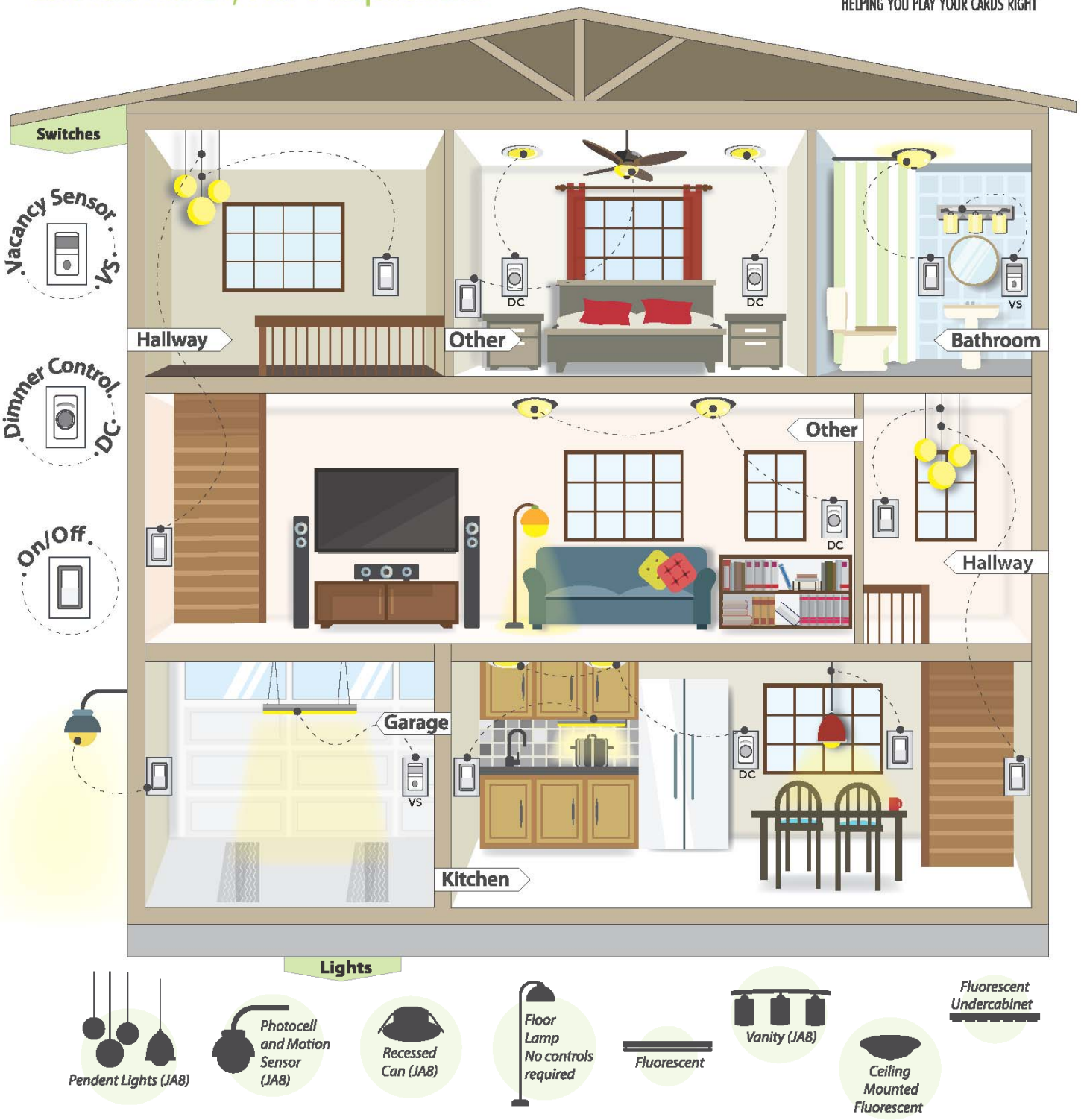
Decoding Residential Lighting™

Let's Talk Title 24, Part 6 Requirements

Energy Code Ace™
HELPING YOU PLAY YOUR CARDS RIGHT



This program is funded by California utility customers and administered by Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E®), Southern California Edison Company (SCE), and Southern California Gas Company (SoCalGas®) under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Lighting Controls Required

All installed luminaires shall be high-efficacy (see table below) that are permanently installed or integral to a luminaire exhaust fan, or ceiling fan. Portable lighting (plugged in) are not subject to these requirements.

Location	Control Requirements			Special Considerations
	Vacancy Sensor	Dimmer	On/Off Switch	
Bathroom	*At least one light in each of these rooms to be controlled with vacancy sensor, no matter the light source type.*	▪ *JA8 lamps/luminaires to be controlled with either dimmer or vacancy sensor.* ▪ *"Automatically" high efficacy can be controlled with either on/off switch, vacancy sensor, or dimmer.*	✓	▪ ***On/Off switch*** *to be readily accessible manual controls, allowing occupants easy control of lighting in the space (or outdoors).* ▪ ***Exhaust fans*** *to be switched/ controlled separately from lighting.* ▪ ***Undercabinet*** *lighting switched separately all other lighting.* ▪ ***EMCS*** *can be used if dimmer control requirements met.*
Laundry/Utility			✓	
Garage (attached or unattached)			✓	
Kitchen	▪ *JA8 lamps/luminaires to be controlled with either dimmer or vacancy sensor.* ▪ *"Automatically" high efficacy can be controlled with either on/off switch, vacancy sensor, or dimmer.*		✓	
All Other: i.e. bedrooms, living rooms, office, dining, attic spaces, closets ≥70 ft^2, detached storage buildings			✓	
Closets <70 ft^2	*Dimmer or vacancy sensor are not required even if JA8 lamps/luminaries are used.*		✓	
Hallways			✓	
Blank Electrical Boxes (more than 5 feet above floor)	*Each box to be controlled by either vacancy sensor, dimmer or fan speed control.*		✓	▪ *No greater than the number of bedrooms*
Nightlights	*Vacancy sensor not required.*			▪ *Permanent, or integral to exhaust fan or luminaire, not to use more than 5 watts per fixture.*
Outdoors ▪ Lighting attached to home or any other building on property.	▪ *Photocell and motion sensor OR* ▪ *Photocell and time switch OR* ▪ *Astronomical time clock OR* ▪ *EMCS that works like an astronomical timeclock* ▪ *Illuminated signs: Meet NR sign lighting requirements (§130.0(c)) OR use no more than 5 watts*		✓	▪ *Controls that override to ON shall not be allowed unless the override automatically reactivates within 6 hours.* ▪ *Landscape lighting exempt.* ▪ *Lighting not attached to building(s) exempt.*

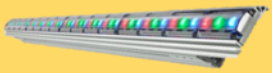
Alterations/Additions to Existing Home

Will Require Compliance to these Requirements	Does NOT Require Compliance to these Requirements
Such as (but not limited to) work TYPICALLY associated with pulling a building permit: ▪ **Adding onto a home:** New areas of the home must meet the applicable requirements. ▪ **Remodeling a home:** When work is done with a permit, then these requirements apply to the remodeled spaces as is applicable. ▪ **Spaces not being renovated:** None of these requirements apply to spaces or fixtures NOT being added/remodeled/replaced.	Such as (but not limited to) work NOT typically associated with pulling a building permit: ▪ Changing the light bulbs; ▪ Changing lighting controls; ▪ Replacing lighting fixtures; ▪ Moving light fixtures.

What's Considered High Efficiency Lighting

(images are examples only)

Luminaire/Fixture Type

	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  ▪ GU-24 other than LEDs  ▪ Inseparable SSL luminaires with colored light sources for decorative lighting purpose 	▪ LED luminaires with integral sources  ▪ Screw-based LED lamps  ▪ Pin-based LED lamps  ▪ GU-24 based LED light source  ▪ Recessed Ceiling (Can) Lights: *Recessed ceiling downlights (can lights) CANNOT be screw base and must use aninsulation contact & air tight (ICAT) rated can.* 
Outdoor	▪ Pulse-start metal halide.  ▪ High pressure sodium.  ▪ Luminaires with hardwired high frequency generator and induction lamp.  ▪ Inseparable SSL luminaires that are installed outdoors. 	

Lamps and Title 20 versus Title 24 Requirements

Title 24 - JA8 (2016)	Title 20 (2016) – All Occupancies	
All Residential Occupancies (Except Night Lights)	**General Service LED Lamps (Tier 1)**	**Small Diameter Directional Lamps**
		
Effective Date	**January 1, 2017**	**January 1, 2018**	**January 1, 2018**
Base Type	All (Except Night Lights)	E12, E17, E26, and GU-24	ANSI ANSLG C81.61-2009 or E26
Power Factor	≥ 0.9	≥ 0.7	No Requirement
Start Time	≤ 0.5 seconds	No Requirement	No Requirement
Lifetime	≥ 15,000 hours	≥ 10,000 hours	≥ 25,000 hours
Dimming	Down to 10 %	No Requirement	No Requirement
Efficacy	≥ 45 lumens/Watt	≥ 68 lumens/Watt and ((2.3 x CRI) + lm/W) ≥ 282	≥ 80 lumens/Watt Or ≥ 70 lumens/Watt and (lm/W + CRI ≥ 165)
CCT	Inseparable ≤ 4,000 K Separable ≤ 3,000 K	No Requirement	No Requirement
Chromaticity	-0.0033 ≤ Duv ≤ 0.0033	ANSI C78.377-2015 Compliant	No Requirement
CRI	≥ 90	≥ 82	No Requirement
R1-R8	No Requirement	≥ 72	No Requirement
R9	≥ 50	No Requirement	No Requirement

Additional Resources:

✦ Tools

MAEDBS – Public Search Feature
Title 20 Reference Ace
Title 24 Reference Ace
Resources Ace – Energy Code Ace

✦ Forms/Checklist

CF2R-LTG-01
CF2R-LTG-02
2016 Residential Mandatory Measures Summary

✦ Training & Videos

CLTC - Title 24 Residential Videos
Title 24 Online Self-study Courses

✦ Fact Sheets – Energy Code Ace

Residential Lighting 2016
Residential High Efficacy Lighting JA10
State Regulated Lamps, Lighting the Way to Efficiency

✦ Resources for Manufacturers

Title 20 – On Demand Training

Fact Sheet: Residential High Efficacy Lighting for Manufacturers

✦ Resources for All

Appliance Hotline (CEC) - 888.838.1467
Application Guide – Residential Lighting 2016
Blueprint 117
CEC – Online Resource Center
CLTC – Publications
CLTC - Residential Lighting Guide for 2016
What's New in 2016 Title 24 for Residential Lighting?

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 (Energy Standards), Title 24, Part 6 include luminaires, high-efficacy luminaries, vacancy 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: Include any addition of new square footage, where new luminaries are installed
- Alterations: Include modifications where luminaries are replaced
- Permanently Installed Lighting: Includes ceiling luminaries, chandeliers, vanity lamps, wall sconces, under-cabinet luminaires, and any other type of luminaire that is attached to the dwelling
- Vacancy Sensor: A manual-on/automatic-off lighting control, which includes a manual-off option

Why? The California Energy Commission estimates that in California, lighting accounts for 22% of residential electricity use. The Energy Standards for residential lighting are designed to increase the use of efficient technologies in order to decrease this consumption. In doing so, these requirements will also support achieving the mandates of Assembly Bill 1109 that requires residential indoor lighting energy consumption be reduced by 50% of 2007 levels by 2018.

Relevant Code Sections

2016 California Building Energy Efficiency Standards, Title 24, Part 6:

- Section 110.9 – Mandatory Requirements for Lighting Controls and Systems, Ballasts, and Luminaires
- Section 130.0(b) – Functional Areas where Compliance with the Residential Lighting Standards is Required
- Section 130.0(c) – Luminaire Classification and Power
- Section 150.0(k) – Mandatory Features and Devices, Residential Lighting
- Reference Joint Appendix 8 (JA8) – Qualification Requirements for High Efficacy Light Sources
- Residential Compliance Manual, Chapter 6 – Residential Lighting

Relevant Compliance Forms

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

Compliance Requirements

All residential lighting requirements are Mandatory requirements. There are no tradeoffs between lighting and other building features. For compliance with the Title 20 Appliance Efficiency Regulations and the Energy Standards, the Energy Commission maintains a database of appliances, controls, and other devices which have been certified to the Energy Commission, including qualifying high efficacy luminaires.

Mandatory Requirements

Luminaires Section 150.0(k)

- Lighting integral to exhaust fans, unless part of a kitchen exhaust system, must also meet luminaire efficacy and lighting control requirements of Section 150.0(k)
- Luminaire Efficacy: Installed luminaires shall be classified as high-efficacy for compliance with Section 150.0(k)
- Blank Electrical Boxes: The number of electrical boxes that are more than 5 feet above the finished floor and do not contain a luminaire or other device shall be no greater than the number of bedrooms
  - These electrical boxes must be served by a dimmer, vacancy sensor control, or fan speed control
- Recessed Downlight Luminaires in Ceilings: Luminaires recessed into ceilings must not contain screw base sockets and must meet the following requirements:
  - Be defined in Section 100.1 for zero clearance insulation contact
  - Have a label that certified it is airtight with air leakage less than 2.0 CFM at 75 Pascals, be sealed with a gasket or caulk between the luminaire housing and ceiling
  - Have all air leaks paths between conditioned and unconditioned spaces sealed with a gasket or caulk
  - 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 comply with JA8
- Electronic Ballasts: Ballasts for fluorescent lamps 13 watts and greater shall be electronic with an output frequency ≥ 20 kHz
- Night Lights: Permanently installed night lights and night lights integral to installed luminaires or exhaust fans shall be rated to consume no more than five watts of power per luminaire or exhaust fan as determined in accordance with Section 130.0(c). Night lights shall not be required to be controlled by vacancy sensors
- Screw-based Luminaires: Must not be recessed and must meet high-efficacy requirements of JA8
- Enclosed Luminaires: May only contain light sources that are marked "JA8-2016-E" and must meet high-efficacy requirements of JA8

PHOTO: CLTC UC DAVIS

High-Efficacy Luminaires JA8

To qualify as a JA8 high-efficacy light source for compliance with the residential lighting Energy Standards in Section 150.0(k), a residential light source must be certified to the Energy Commission according to JA8. The requirements include a minimum efficacy of 45 lumens/watt, a power factor of 0.90 or higher at full output, a maximum start time of 0.5 seconds, a color temperature (CCT) of 3000K or less, and a color rendering index (CRI) of at least 90.

Luminaire Efficacy Classification

Table 150.0-A shows lighting that is automatically classified as high efficacy, unless installed in recessed or enclosed luminaires. For these fixtures installed in recessed or enclosed luminaires must go through JA8 in order to be classified as high efficacy.

Luminaires automatically classified as high efficacy include the following:

- Pin-based linear fluorescent or compact fluorescent lights (CFL) using electronic ballasts
- Pulse-start metal halide lamps
- High pressure sodium lamps
- GU-24 sockets containing light sources other than LEDs, such as CFLs and induction lamps
- Luminaires with hardwired high frequency generator and induction lamp
- Inseparable SSL luminaires that are installed outdoors
- Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting

Vacancy Sensors Section 150.0(k)

Vacancy sensors are required in many residential spaces. A minimum of one luminaire in each of the following spaces must be controlled with a vacancy sensor: bathrooms, garages, laundry rooms and utility rooms.

All luminaires that have light sources compliant with JA8 must be controlled by a dimmer or vacancy sensor. Exceptions are provided for closets smaller than 70 ft^2 in floor area and luminaires for hallways.

Switching Controls Section 150.0(k)2

- Exhaust fans shall be switched separately, except when lighting integral to the fan is installed that meets requirements of Section 150.0(k)2
- Lighting controls must meet applicable requirements of Section 110.9, shall be installed to allow for manual switching of on and off, and shall not bypass a dimmer or vacancy sensor function that complies with Section 150.0(k)

The switching requirements (Section 110.9) specify that time-switch controls and occupancy sensors meet Title 24 requirements, and contain additional requirements for astronomical-based outdoor lighting controls.

Residential vs. Nonresidential Indoor and Outdoor Lighting

Residential indoor and outdoor lighting requirements can be found in both Sections 150.0(k) and 140.7. Residential requirements apply to parking lots, carports, and parking garages when there are fewer than eight parking spots. Nonresidential requirements apply when there are eight or more parking spots. The tables below illustrate when to apply the residential and nonresidential lighting standards for parking garages and other outdoor lighting.

<table>
<tr><th rowspan="2">Space Type</th><th rowspan="2"># of Car Spots</th><th rowspan="2">Single-Family</th><th colspan="2">Low-Rise Multifamily</th><th rowspan="2">High-Rise Multifamily and Hotels</th></tr>
<tr><th>Common area ≤20% of interior space</th><th>Common area >20% of interior space</th></tr>
<tr><td rowspan="2">Parking Garages</td><td><8</td><td colspan="2">Residential Indoor</td><td>Nonresidential Indoor</td></tr>
<tr><td>≥8</td><td colspan="4">Nonresidential Indoor</td></tr>
<tr><td rowspan="2">Parking Lots & Carports</td><td><8</td><td>Residential Outdoor</td><td colspan="2">Residential or Nonresidential Outdoor</td><td>Nonresidential Outdoor</td></tr>
<tr><td>≥8</td><td colspan="4">Nonresidential Outdoor</td></tr>
</table>

Table 1: Residential vs. Nonresidential Parking Area Lighting Requirements

<table>
<tr><th rowspan="2">Space Type</th><th rowspan="2">Single-Family</th><th colspan="2">Low-Rise Multifamily</th><th rowspan="2">High-Rise Multifamily and Hotels</th></tr>
<tr><th>1-3 dwelling units</th><th>≥4 dwelling units</th></tr>
<tr><td>Private Patios, Entrances, Balconies, Porches</td><td>Residential Outdoor</td><td colspan="2">Residential Outdoor or Nonresidential Outdoor</td><td rowspan="2">Residential, if the lighting is separately controlled from inside the dwelling. Otherwise, nonresidential</td></tr>
<tr><td>Other Outdoor Lighting Attached to the Building</td><td colspan="2">Residential Outdoor</td><td>Nonresidential Outdoor</td></tr>
<tr><td>Outdoor Lighting Not Attached to a Building</td><td colspan="2">Not Regulated</td><td colspan="2">Nonresidential Outdoor</td></tr>
</table>

Table 2: Residential vs. Nonresidential Outdoor Lighting Requirements

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 Section 3 of the Business and Professions Code (note that one or more form 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

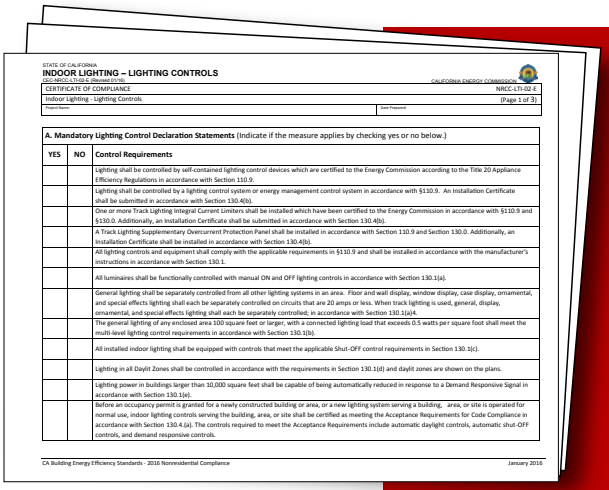
Multifamily Buildings

- CF2R-LTG-02-E – Lighting - Multi-Family Dwellings
  - Completed and signed by the responsible person(s) for the lighting construction projects under Section 3 of the Business and Professions Code (note that one or more form 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

Inspection

For either single- or multifamily lighting compliance, the inspector should verify that all luminaires are high-efficacy and that the required controls have been installed. 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 – LIGHTING CONTROLS
(SCI-NRCC-LTI-02-E (Revised 01/16))
CALIFORNIA ENERGY COMMISSION

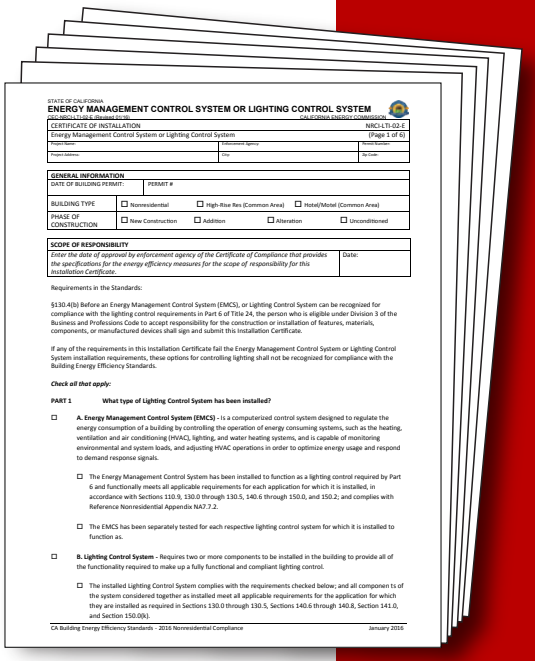
CERTIFICATE OF COMPLIANCE	NRCC-LTI-02-E
Indoor Lighting - Lighting Controls	(Page 1 of 3)

Project Name | Date Prepared

A. Mandatory Lighting Control Declaration Statements (Indicate if the measure applies by checking yes or no below.)

YES	NO	Control Requirements
		Lighting shall be controlled by self-contained lighting control devices which are certified to the Energy Commission according to the Title 20 Appliance Efficiency Regulations in accordance with Section 110.9.
		Lighting shall be controlled by a lighting control system or energy management control system in accordance with §110.9. An Installation Certificate shall be submitted in accordance with Section 130.4(b).
		One or more Track Lighting Integral Current Limiters shall be installed which have been certified to the Energy Commission in accordance with §110.9 and §130.0. Additionally, an Installation Certificate shall be submitted in accordance with Section 130.4(b).
		A Track Lighting Supplementary Overcurrent Protection Panel shall be installed in accordance with Section 110.9 and Section 130.0. Additionally, an Installation Certificate shall be installed in accordance with Section 130.4(b).
		All lighting controls and equipment shall comply with the applicable requirements in §110.9 and shall be installed in accordance with the manufacturer's instructions in accordance with Section 130.1.
		All luminaires shall be functionally controlled with manual ON and OFF lighting controls in accordance with Section 130.1(a).
		General lighting shall be separately controlled from all other lighting systems in an area. Floor and wall display, window display, case display, ornamental, and special effects lighting shall each be separately controlled on circuits that are 20 amps or less. When track lighting is used, general, display, ornamental, and special effects lighting shall each be separately controlled; in accordance with Section 130.1(a)4.
		The general lighting of any enclosed area 100 square feet or larger, with a connected lighting load that exceeds 0.5 watts per square foot shall meet the multi-level lighting control requirements in accordance with Section 130.1(b).
		All installed indoor lighting shall be equipped with controls that meet the applicable Shut-OFF control requirements in Section 130.1(c).
		Lighting in all Daylit Zones shall be controlled in accordance with the requirements in Section 130.1(d) and daylit zones are shown on the plans.
		Lighting power in buildings larger than 10,000 square feet shall be capable of being automatically reduced in response to a Demand Responsive Signal in accordance with Section 130.1(e).
		Before an occupancy permit is granted for a newly constructed building or area, or a new lighting system serving a building, area, or site is operated for normal use, indoor lighting controls serving the building, area, or site shall be certified as meeting the Acceptance Requirements for Code Compliance in accordance with Section 130.4.(a). The controls required to meet the Acceptance Requirements include automatic daylight controls, automatic shut-OFF controls, and demand responsive controls.

CA Building Energy Efficiency Standards - 2016 Nonresidential Compliance | January 2016



STATE OF CALIFORNIA
ENERGY MANAGEMENT CONTROL SYSTEM OR LIGHTING CONTROL SYSTEM
(SCI-NRCV-LTI-02-E (Revised 01/16))
CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION	NRCI-LTI-02-E
Energy Management Control System or Lighting Control System	(Page 1 of 6)

Project Name | Enforcement Agency | Permit Number
Project Address | City | Zip Code

GENERAL INFORMATION

DATE OF BUILDING PERMIT:	PERMIT #			
BUILDING TYPE	☐ Nonresidential	☐ High-Rise Res (Common Area)	☐ Hotel/Motel (Common Area)	
PHASE OF CONSTRUCTION	☐ New Construction	☐ Addition	☐ Alteration	☐ Unconditioned

SCOPE OF RESPONSIBILITY

Enter the date of approval by enforcement agency of the Certificate of Compliance that provides the specifications for the energy efficiency measures for the scope of responsibility for this installation Certificate. | Date:

Requirements in the Standards:

§130.4(b) Before an Energy Management Control System (EMCS), or Lighting Control System can be recognized for compliance with the lighting control requirements in Part 6 of Title 24, the person who is eligible under Division 3 of the Business and Professions Code to accept responsibility for the construction or installation of features, materials, components, or manufactured devices shall sign and submit this Installation Certificate.

If any of the requirements in this Installation Certificate fail the Energy Management Control System or Lighting Control System installation requirements, these options for controlling lighting shall not be recognized for compliance with the Building Energy Efficiency Standards.

Check all that apply:

PART 1 What type of Lighting Control System has been installed?

☐ **A. Energy Management Control System (EMCS) -** Is a computerized control system designed to regulate the energy consumption of a building by controlling the operation of energy consuming systems, such as the heating, ventilation and air conditioning (HVAC), lighting, and water heating systems, and is capable of monitoring environmental and system loads, and adjusting HVAC operations in order to optimize energy usage and respond to demand response signals.

☐ The Energy Management Control System has been installed to function as a lighting control required by Part 6 and functionally meets all applicable requirements for each application for which it is installed, in accordance with Sections 110.9, 130.0 through 130.5, 140.6 through 150.0, and 150.2; and complies with Reference Nonresidential Appendix NA7.7.2.

☐ The EMCS has been separately tested for each respective lighting control system for which it is installed to function as.

☐ **B. Lighting Control System -** Requires two or more components to be installed in the building to provide all of the functionality required to make up a fully functional and compliant lighting control.

☐ The installed Lighting Control System complies with the requirements checked below; and all components ts of the system considered together as installed meet all applicable requirements for the application for which they are installed as required in Sections 130.0 through 130.5, Sections 140.6 through 140.8, Section 141.0, and Section 150.0(k).

CA Building Energy Efficiency Standards - 2016 Nonresidential Compliance | January 2016

Certificates of Installation - Submission Guidelines

- A Certificate of Installation 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.
- When HERS verification measures are applicable, the person(s) responsible for the compliance documents are required to submit the compliance form(s) electronically to an approved HERS provider data registry for registration and retention.

For More Information

Primary Documents

- Section 110.9 – Mandatory Requirements for Lighting Controls and Systems, Ballasts, and Luminaires
  EnergyCodeAce.com/site/custom/public/referenceace-2016/Documents/na710section1109mandatoryrequirementsforlightingcontroldevicesan.htm
- Section 130.0(b) – Functional Areas where Compliance with the Residential Lighting Standards is Required
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Section 130.0(c) – Luminaire Classification and Power
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Section 150.0(k) – Mandatory Features and Devices, Residential Lighting
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/section1500mandatoryfeaturesanddevices.htm
- Reference Joint Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
  energycodeace.com/site/custom/public/reference-ace-2016/index.html#!Documents/appendixja8qualificationrequirementsforhighefficacylightsources.htm
- Residential Compliance Manual, Chapter 6 – Residential Lighting
  energy.ca.gov/2015publications/CEC-400-2015-032/chapters/chapter_6-Residential_Lighting.pdf
- 2015 Title 20 Appliance Efficiency Regulations
  energy.ca.gov/2015publications/CEC-400-2015-021/CEC-400-2015-021.pdf

California Energy Commission Information & Services

Title 24, Part 6

- Energy Standards Hotline: 1-800-772-3300 (Free) or Title24@energy.ca.gov
- Online Resource Center:
  energy.ca.gov/title24/orc/
  – The Energy Commission's main web portal for Energy Standards, 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:
  energy.ca.gov/appliances
- 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 2016 Title 24, Part 6 Code?
  cltc.ucdavis.edu/publication/2016-title-24-code-changes-residential
  – Lighting Appliance Efficiency Regulations: What's New in the Title 20 Code?:
  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 Lighting FAQ

  Please register with the site and select an industry role for your profile in order to receive messages about all our free offerings!

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Residential

High Efficacy Lighting for Manufacturers

New Testing and Certification Requirements

On January 1, 2017, new lighting requirements in California's Building Energy Efficiency Standards (Title 24, Part 6 or Energy Standards) for new construction will be in effect. The Energy Standards require high efficacy lighting throughout newly constructed homes, and the definition of "high efficacy" luminaire has been expanded to include luminaires containing light sources that meet the new performance requirements outlined in Title 24 Reference Joint Appendix 8 (JA8), Qualification Requirements for High Efficacy Light Sources. In addition to more quality and efficacy requirements, JA8 now also references Joint Appendix 10 (JA10), Test Method for Measuring Flicker of Lighting Systems and Reporting Requirements, for additional flicker testing and data reporting requirements for JA8 light sources.

To qualify as a JA8 light source for compliance with Section 150.0(k) of the 2016 Energy Standards, the light source must be certified to the California Energy Commission in accordance with JA8 and JA10. This fact sheet is designed to help manufacturers understand how to certify their lighting equipment.

Why?

These residential lighting requirements are designed to significantly reduce energy use in new homes. The California Energy Commission estimates 110,000 single-family homes and 30,000 multifamily dwelling units will be built in California in 2017. The new requirements are projected to reduce lighting energy use in these homes by roughly 50%. Projected energy savings for the first year of implementation (2017) equal the amount of electricity consumed annually by 13,000 typical California homes (85 GWh).

Relevant Code Sections

2016 California Building Energy Efficiency Standards, Title 24, Part 6:

- Section 100.1 – Definitions and Rules of Construction
- Section 110.9(e) – JA8 High Efficacy Light Sources
- Section 110.9(f) – Ballasts for Residential Recessed Luminaries
- Section 130.0 – Lighting Systems and Equipment and Electrical Power Distribution Systems
- Section 150.0(k) – Residential Lighting
- Joint Appendix JA1 – Glossary
- Joint Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
- Joint Appendix JA10 – Test Method for Measuring Flicker of Lighting Systems and Reporting Requirements

Requirement Highlights

- All luminaires installed in new single-family homes, townhouses, and dwelling units of new multifamily buildings must be high efficacy luminaires. The residential lighting requirements in Section 150.0(k) also apply to dwelling units of nonresidential buildings including those in high-rise residential, fire station, and dormitory and senior-housing buildings, as well as hotel and motel guest rooms.
- The definition of "high efficacy" has expanded to allow luminaires that contain screw-base sockets or sockets designed for other traditionally incandescent or halogen base types as long as these luminaires have JA8-certified lamps installed in them at the time of inspection.
  - There is no requirement for JA8 light sources to be shipped with fixtures (i.e., "bulb-in-a-box" approach.) JA8 sources / lamps can be purchased separately and installed by the builder throughout the home, as long as they are installed in the luminaires before inspection by the building department.
- Under JA8, high efficacy light sources include ballasts or drivers if needed for operation of the light source, and light sources must be certified together with a driver or ballast. If the light source is inseparable from the luminaire the entire luminaire must meet the requirements in JA8.
- JA8 requirements cover performance criteria including, but not limited to, efficacy, dimmability, longevity, color temperature, color rendering, flicker (light modulation), start time, audible noise and power factor.
- JA8 light sources must contain a marking on the product itself, identifying it as a JA8 source. The marking must read either "JA8-2016" or, for products intended to be used in enclosed or recessed luminaires, "JA8-2016-E".
  - Products installed in recessed or enclosed luminaires must contain the "JA8-2016-E" (rated at elevated temperatures) marking.
- Recessed downlights must contain JA8-certified sources, but they are not allowed to use screw-bases. Screw-based lamps (even if they meet JA8) may not be installed in downlights.
- The 2016 Energy Standards require GU-24 based LEDs to comply with JA8, in order to be classified as high efficacy. However, all other "legacy" high efficacy sources (those already deemed as high efficacy in the 2013 standards, such as GU-24 based CFLs and other pin-based fluorescent lamps) are still considered high efficacy by the 2016 Energy Standards.

Qualifying as High Efficacy

TABLE 150.0-A CLASSIFICATION OF HIGH EFFICACY LIGHT SOURCES

High Efficacy Light Sources Luminaires installed with only the lighting technologies in this table shall be classified as high efficacy	
Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are not required to comply with Reference Joint Appendix JA8	Light sources in this column shall be certified to the Commission as High Efficacy Light Sources in accordance with Reference Joint Appendix JA8 and be marked as meeting JA8.
1. Pin-based linear or compact fluorescent light sources using electronic ballasts. 2. Pulse-start metal halide. 3. High pressure sodium. 4. GU-24 sockets containing light sources other than LEDs. [a,b] 5. Luminaires with hardwired high frequency generator and induction lamp. 6. Inseparable SSL luminaires that are installed outdoors. 7. Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting.	8. All light sources in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw bases regardless of lamp type as described in Section 150.0(k)1C. 9. GU-24 sockets containing LED light sources. 10. Any light source not otherwise listed in this table and certified to the Commission as complying with Joint Appendix 8.
Notes: a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps. b. California Title 20 Section 1605(k)3 does not allow incandescent sources to have a GU-24 base.	

How to Comply

Compliance with JA8 and JA10 entails designing and marking products according to the regulations, testing regulated products using the required test methods, and certifying the product to the Energy Commission's Appliance Efficiency Database. Certifiers may access the JA8 2016 submittal template once they acknowledge that their certification is for Title 24. Instructions for submitting Title 24 appliance data for high-efficacy light sources and the submittal template can be found on the Energy Commission's website

Energy Code Ace offers free, on-demand video trainings detailing how to certify products to the Energy Commission, step by step. These trainings are focused on the compliance and certification essentials industry professionals need to know and understand. Also see the Energy Code Ace Title 20 Certification Overview, Process and FAQs fact sheet for a summary of the certification process.

Frequently Asked Questions

Q: *How do I show compatibility with a dimmer type? Do manufacturers need to test products with every potential dimmer they could be used with?*

A: No, light sources are only required to be tested with one physical dimmer, per dimmer type that is claimed as compatible. Dimmer types include:

- Forward phase-cut control
- Reverse phase-cut controls
- 0-10 volt control
- Digital controls
- Powerline carrier controls
- Wireless controls

If a product is certified to the Energy Commission as being compatible only with reverse phase cut dimmers, it only needs to be tested with one reverse phase cut dimmer, of the manufacturer's choosing. If a product is certified as being compatible with two dimmer types, for example reverse phase cut and forward phase cut, it must be tested with a minimum of one reverse phase cut and one forward phase cut dimmer.

Products certified as compliant with forward phase cut dimmers must be tested with a NEMA SSL7A dimmer (Type 1 or Type 2) of the manufacturer's choosing.

Q: *How do manufacturers process the raw flicker data collected via the JA10 test procedure, in order to obtain percent flicker values only occurring at frequencies less than 200 Hz?*

A: The JA10 test procedure describes a method of filtering the raw high frequency photometric data for use in calculating the percent flicker values for various cut off frequencies required for reporting in JA10 ("Conduct a Fourier analysis to transform data for each dimming level into the frequency domain") – this includes cut off frequencies of 40 Hz, 90 Hz, 200 Hz, 400 Hz and 1,000 Hz. The manufacturer or test lab can use their own software to filter the data but they must perform the data processing and calculations in accordance with the detailed requirements outlined in section JA10.6 of JA10.

Related Lighting Standards

JA8 focuses on performance and lighting quality to increase consumer retention of high efficacy lighting. JA8 is a technology-neutral specification; any technology capable of meeting the requirements can be certified to the Energy Commission. The JA8 requirements are similar to two other California LED lamp quality and performance specifications:

- Voluntary California Quality Light-Emitting Diode (LED) Specification
  - This voluntary specification is used for rebate eligibility and applies to a smaller set of product types than JA8, but the requirements are almost identical to the requirements in JA8.
- Title 20 Appliance Efficiency Regulations for LEDs (effective January 2018 (tier 1) and July 2019 (tier 2))
  - The Title 20 standards for LED lamps do not cover as many quality metrics as JA8, and some of the quality requirements are not as stringent as JA8. Products can be designed to meet both set of requirements.

For More Information

Primary Documents

- Energy Standards Section 100.1 – Definitions and Rules of Construction
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1001definitionsandrulesofconstruction.htm
- Energy Standards Sections 110.9 – Mandatory Requirements for Lighting Control Devices and Systems, Ballasts, and Luminaries
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1109mandatoryrequirementsforlightingcontroldevicesandsyst.htm
- Energy Standards Section 130.0 – Lighting Systems and Equipment and Electrical Power Distribution Systems
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1300lightingsystemsandequipmentandelectricalpowerdistribu.htm
- Energy Standards Section 150.0(k) – Mandatory Features and Devices
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/section1500mandatoryfeaturesanddevices.htm
- Energy Standards Joint Appendix JA1 – Glossary
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/appendixja1glossary.htm
- Energy Standards Joint Appendix JA8 – Qualification Requirements for High Efficacy Light Sources
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/appendixja8qualificationrequirementsforhighefficacylightsources.htm
- Energy Standards Joint Appendix JA10 – Test Method for Measuring Flicker of Lighting Systems and Reporting Requirements
  energycodeace.com/site/custom/public/reference-ace-2016/Documents/appendixja10testmethodformeasuringflickeroflightingsystemsandrep.htm
- 2016 Title 20 Appliance Efficiency Regulations:
  govt.westlaw.com/calregs/Browse/Home/California/CaliforniaCodeofRegulations?guid=I8F8F3BC0D44E11DEA95CA4428EC25FA0&originationContext=documenttoc&transitionType=Default&contextData=(sc.Default)
- Voluntary California Quality Light-Emitting Diode (LED) Lamp Specification
  energy.ca.gov/appliances/led_lamp_spec/

California Energy Commission Information & Services

Title 24, Part 6

- Energy Standards Hotline: 1-800-772-3300 (Free) or Title24@energy.ca.gov
- Online Resource Center:
  energy.ca.gov/title24/orc/
  - The Energy Commission's main web portal for Energy Standards, including information, documents, and historical information
- JA8 Compliance for Test Laboratories Fact Sheet:
  energy.ca.gov/2016publications/CEC-400-2016-018/CEC-400-2016-018-FS.pdf
- Instructions for Submitting High-Efficacy Light Sources for Title 24 Appliance Data
  energy.ca.gov/appliances/database/forms_instructions_cert/Lighting_Products/2016%20JA8%20High%20Efficacy%20Lighting%20(JEFF).zip
- 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 2016 Title 24, Part 6 Code?
    cltc.ucdavis.edu/publication/2016-title-24-code-changes-residential
  - Residential Lighting: A guide to meeting or exceeding California's 2016 Building Energy Efficiency Standards
    cltc.ucdavis.edu/publication/residential-lighting-design-guide-2016-standards
- 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/
      - Residential Indoor & Outdoor Lighting Fact Sheet
      - Title 20 Certification Overview, Process and FAQs
      - Title 20 Lighting FAQs
    - Title 20 On-Demand Video Training:
      energycodeace.com/content/title-20-training/

    Please register with the site and select an industry role for your profile in order to receive messages about all our free offerings!

State-Regulated Lamps

Lighting the Way to Efficiency

Requirements for State-Regulated LED Lamps, Small Diameter Directional Lamps and General Service Lamps

Beginning January 1, 2018, California state-regulated LED lamps (SLED), small diameter directional lamps (SDDL), and general service lamps (GSL) manufactured on or after January 1, 2018 will be required to comply with the performance, testing and marking requirements listed in Sections 1601 through 1609 of California's Appliance Efficiency Regulations (Title 20). Compliance also includes mandatory certification of the regulated products to the California Energy Commission (Energy Commission). Certified products will appear on the Energy Commission's Modernized Appliance Efficiency Database System (MAEDBS), a publicly-available database that lists all regulated products that are legally allowed to be sold or offered for sale in California.

Why Regulate Lamps?

The lighting requirements in Title 20 are paving the path forward to an energy-efficient California that is brightly lit by quality LEDs. LED lamps are now more widely available in the market, offering comparable, cost-effective performance for significantly less energy. These LED replacement lamps use as little as one-sixth of the energy of incandescent lamps, and the efficiency of LEDs continues to improve rapidly. Average LED efficacy has also surpassed that of compact fluorescent lamps (CFLs).

Relevant Code Sections

2016 California Appliance Efficiency Regulations, Title 20

- Section 1602 – Definitions
- Section 1604(k) – Test Methods for Lamps
- Section 1605.3(k)(2)(A) & (B) – Standards for State-Regulated General Service Lamps
- Section 1605.3(k)(2)(C) – Standards for State-Regulated LED Lamps
- Section 1605.3(k)(3) – Standards for State-Regulated Small Diameter Directional Lamps
- Section 1606 – Filing by Manufacturers; Listing of Appliances in Database
- Section 1607(b), 1607(c)(2) & 1607(d)(13) – Marking of Appliances

Voluntary Quality LED Lamp Certification

In addition to the mandatory Title 20 requirements that go into effect on January 1, 2018, LED lamps may be voluntarily certified earlier with the tiered requirements for the purposes of incentive or rebate programs that rely on the MAEDBS.

As of January 1, 2017, SLEDs may be voluntarily certified to the Tier I of the Voluntary California Quality LED Lamp Specification Version 3.0.

SLEDS can also be voluntarily certified to Tier II of the Version 3.0 Specification.

Qualifying lamps may be listed in MAEDBS by selecting the "V – Voluntary" option when inputting the regulatory status.

PHOTO: CLTC UC DAVIS

State-Regulated Light-Emitting Diode Lamp (SLED)

The following are the types of SLEDs that are regulated by Title 20. A lamp must meet all these requirements to be considered a SLED:

- Lamps with an American National Standards Institute (ANSI) E12, E17, E26 or GU-24 base
- Lamps that are capable of brightness between 200 lumens (150 lumens for candelabra bases) and 2,600 lumens
- Lamps capable of producing white light with a color correlated temperature (CCT) between 2,200 and 7,000 K
- Lamps with a Duv ±0.012 (chromaticity as defined in ANSI C78.377)
- Lamps used in retrofit kits, which are products designed to retrofit existing recessed can housings that contains one of the preceding bases

In addition to the requirements above and those shown in Table 1 below, lamps must also meet the following performance and testing requirements found in Title 20 Sections 1605.3(k)(2)(C) and 1604(k), respectively:

- A color point that meets the requirements in Table 1 of Annex B of ANSI C78.377-2015 for chromaticity and color consistency
- A Color Rendering Index (CRI) (Ra) of 82 or greater
- Individual color scores of R1, R2, R3, R4, R5, R6, R7 and R8 of 72 or greater
- A power factor of 0.7 or greater
- A rated life of 10,000 hours or greater as determined by the lumen maintenance and time to failure test procedure
- A minimum light distribution requirement:
  - SLEDs that have an ANSI standard lamp shape of A: the omnidirectional light distribution requirements of the ENERGY STAR® Product Specification for Lamps Version 2.0 (December 2015)
  - SLEDs that have an ANSI standard lamp shape of B, BA, C, CA, F or G: the decorative light distribution requirements of ENERGY STAR's Product Specification for Lamps Version 2.0 (December 2015)
  - There are no light distribution requirements for other lamp shapes
- The test method for SLEDs is IES LM-79-08 with additional requirements in 80 Fed. Reg. 39665-39667 (July 9, 2015) section 430.23(ee)(Appendix BB to Subpart B of Part 430)
- For certification, compliance and enforcement purposes, the sampling provisions in 80 Fed. Reg 39664-39665 must be used
- The testing, performance and marking requirements for SLEDs can be found in Title 20 Sections 1604(k), 1605.3(k)(2)(C) and 1607, respectively. SLEDs have additional requirements in 1607d(13)

State-Regulated Small Diameter Directional Lamp (SDDL)

A state-regulated SDDL is a non-tubular directional lamp with a diameter of 2.25 inches or less that can operate at 12 volts, 24 volts or 120 volts. State-regulated SDDLs are further defined by additional characteristics such as base, lumen output and rated life. SDDLs may be incandescent, halogen or LED.

A state-regulated small diameter directional lamp is a directional lamp that meets all of the following criteria (see Title 20 Section 1602):

- Capable of operating at 12 volts, 24 volts, or 120 volts
- Has an ANSI ANSLG C81.61-2009 (R2014) compliant pin base or E26 base
- Is a non-tubular directional lamp with a diameter of less than or equal to 2.25 inches
- Has a lumen output of less than or equal to 850 lumens, or has a wattage of 75 watts or less
- Has a rated life greater than 300 hours

The requirements for SDDLs are shown in Table 1 below.

- The test method for state-regulated SDDLs that use incandescent filament technology is 10 C.F.R. Section 430.23(r) (Appendix R to Subpart B of part 430)
- The test method for LED California state-regulated small diameter directional lamps is the same as SLEDs (IES LM-79-08 with additional requirements in 80 Fed. Reg. 39665-39667 (July 9, 2015) section 430.23(ee)(Appendix BB to Subpart B of Part 430))
- For certification, compliance and enforcement purposes, the sampling provisions in 80 Fed. Reg 39664-39665 must be used for SDDLs that are LEDs
- The testing, performance and marking requirements for SDDLs can be found in Sections 1604(k), 1605.3(k)(3) and 1607, respectively


PHOTO: CLTC UC DAVIS

State-Regulated General Service Lamp (GSL)

California has had requirements in place for GSLs since 2011 (Title 20 Section 1605.3(k)(2) for Tier I requirements). On January 1, 2018 Tier II of the GSL requirements will become effective. Lamps manufactured on or after January 1, 2018 are subject to the Tier II requirements.

The definition of a California state-regulated GSL is identical to the definition of a federally-regulated GSL found in Title 20, Section 1602(k), and includes general service incandescent, compact fluorescent, and LED lamps. It does not include fluorescent tubular lamps or incandescent reflector lamps. In addition to the requirements shown in Table 1 below, GSLs must also have a CRI greater than or equal to 80 for nonmodified spectrum lamps or 75 for modified spectrum lamps.

The test method for GSLs that use incandescent filament technology is 10 C.F.R. section 430.23(r) (Appendix R to Subpart B of part 430), and the test method for medium base CFLs is 10 C.F.R. section 430.23(y) (Appendix W to Subpart B of part 430). LED GSLs are *de facto* SLEDs and should be tested in accordance with the requirements in Title 20 Section 1604(k) and certified to the Energy Commission under the state-regulated LED lamp appliance type (and not as GSLs) if they meet the requirements for SLEDs described above.

The testing, performance and marking requirements for GSLs can be found in Title 20 Sections 1604(k), 1605.3(k)(2)(A & B) and 1607, respectively.

	SLED Minimum Requirement		SDDL	GSL (Tier II)
Effective Date	Tier I January 1, 2018	Tier II July 1, 2019	January 1, 2018	January 1, 2018
Compliance Score[1] Efficacy + [$\alpha \times$ CRI])	282	297	Either: • 80 lumens per watt (lpw) or • 70 lpw and a minimum compliance score of 165	None
Minimum Efficacy	68 lpw	80 lpw		45 lpw
Minimum Rated life	10,000 hours		25,000 hours	1,000 hours
Standby Power	None	0.2 W	None	None

Table1: State-Regulated Requirements

[1] *For SLEDs, $\alpha = 2.3$; for SDDLs, $\alpha = 1$.*

How to Comply with Title 20

Compliance entails:

- Meeting the applicable design or performance standards (efficiency standards)
- Testing regulated products using the required test methods
- Marking the regulated product in accordance with Title 20 Section 1607, and
- Certifying the product to the California Energy Commission

Even if a regulated lighting product meets all performance, testing and marking requirements outlined in Title 20, it is illegal to sell or offer for sale a regulated product in California if the model is not certified to the Energy Commission and listed in the MAEDBS.

Everyone in the sales chain – including manufacturers, distributors, retailers, contractors, importers and installers – is responsible for ensuring regulated products are listed in the MAEDBS. To learn more about the MAEDBS and how to use it, view the Energy Code Ace Title 20 On-Demand Video Trainings.

Frequently Asked Questions

Q: *Is a minimum of 10,000 testing hours needed to comply with the SLED requirement for a rated life of 10,000 rated hours or greater?*

A: No. The required test duration is determined by section 4.6 "Calculate Lumen Maintenance and Time to Failure" of the required LED test procedure found in 10 C.F.R. 430.23(ee) (Appendix BB to Subpart B of Part 430).

Q: *How do I know if an LED lamp that is used only for special applications is covered under Title 20?*

A: The requirements for SLEDs and SDDLs are independent of end-use or application, and are based only on lamp characteristics. A lamp is covered if it meets the definition of a SLED or SDDL per Title 20 Section 1602(k).

Q: *Do the definitions recently adopted by the U.S. Department of Energy and published in the Federal Register on January 19, 2017 apply to Title 20?*

A: No. All relevant definitions are included in Title 20, Section 1602(k), including those for federally-regulated general service incandescent lamps and federally-regulated incandescent reflector lamps. Federal definitions are not applicable to Title 20 until they are adopted by the California Energy Commission in a rulemaking.

Q: *If an LED lamp is certified for Title 24 "high efficacy" lamp requirements, does it need to be certified again for the Title 20 requirements?*

A: Yes. The lamp must be certified separately to the Title 20 requirements. Certification to the MAEDBS for Title 24 (Building Energy Efficiency Standards) represents compliance with that program, not compliance with the requirements in Title 20, which is the Appliance Efficiency Program that regulates the sale of appliances in California. The Title 24 "high efficacy" requirements (also referred to as JA8) apply only to residential lamps and luminaires, and differ from the Title 20 requirements outlined here. A lamp that meets JA8 may not meet the efficacy (compliance score) required in Title 20. SLEDs that also meet JA8 are not lawful for sale in California after January 1, 2018 unless they are certified to the Energy Commission. While there is some testing overlap (both primarily reference IES LM-79), it is recommended that test laboratories review both requirements when testing LED lamps. The LED lamp must be listed in the MAEDBS to comply with Title 20.

Q: *Are retailers responsible for complying with Title 20? How about installation contractors?*

A: Yes and yes. Everyone in the supply chain – manufacturers, distributors, retailers, contractors and importers – is responsible for ensuring regulated products are listed in the MAEDBS before they are sold or offered for sale in California. Each party should independently determine applicable regulations for certain product types by referring to the Title 20 standards.

Q: *Are out-of-state retailers required to comply with Title 20 if they sell lighting products to someone in California via online or mail order sales?*

A: Yes. Products sold online or by mail from out-of-state retailers to an end-user in California must meet Title 20 requirements since they are being offered for sale and sold into California. The product models must be listed in the MAEDBS to be legally sold or offered for sale in California.

Q: *Are there marking requirements that manufacturers must comply with under Title 20?*

A: Title 20 specifies marking requirements for manufacturers in Section 1607(b), which states that the following must be "permanently, legibly, and conspicuously displayed on an accessible place on each unit" of the regulated appliance:

1. Manufacturer's name or brand name or trademark
2. Model number
3. Date of manufacture, including year and month or smaller increment

There is an exception for lamps where the information required by Section 1607(b) can be clearly and permanently placed on the product itself or on the product packaging (see Section 1607(c)(2)).

There are also additional marking requirements for SLEDs found in Title 20 Section 1607(d)(13).

Q: *Do lamps packaged with ceiling fan light kits need to comply with any of the Title 20 lamp requirements?*

A: No. Ceiling fan light kits and the lamps they are packaged with are subject to federal energy and design standards (see 10 C.F.R. 430.2 and 430.32(s)). For example, if an LED lamp is packaged with a ceiling fan light kit, the lamp does not need to meet the Title 20 SLED requirements. However, ceiling fan light kits must still be certified to the Energy Commission and listed in the MAEDBS to be sold or offered for sale in California.

Q: *Are 3-way incandescent lamps packaged and sold with portable luminaires exempt from Title 20?*

A: No. Though 3-way incandescent lamps are not regulated by state or federal standards (when sold by themselves), they cannot be packaged and sold together with portable luminaires in California. Portable luminaires manufactured on or after January 1, 2010 must meet the applicable testing, performance, certification and marking requirements in Title 20. A 3-way portable luminaire is required to be packaged with a 3-way CFL or a 3-way LED. The light source must meet the minimum efficacy and performance requirements specified in section 1605.3(n).

For More Information

Primary Documents

- Title 20 Appliance Efficiency Regulations
  tinyurl.com/Title20

California Energy Commission Information & Services

- 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:
  energy.ca.gov/appliances
- Modernized Appliance Efficiency Database (MAEDBS):
  https://cacertappliances.energy.ca.gov/Login.aspx

Additional Resources

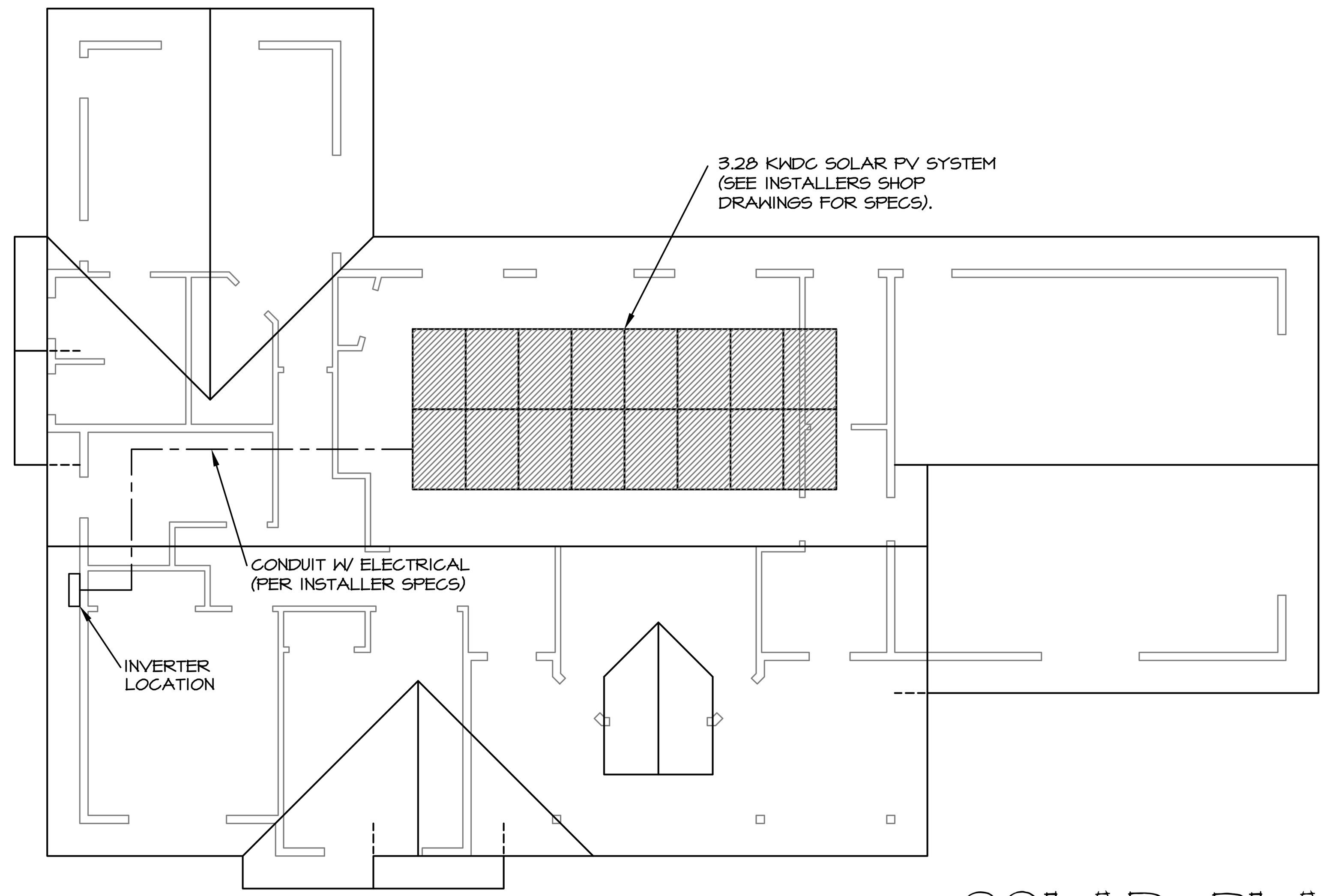
- California Lighting Technology Center (CLTC) Guide:
  - Lighting Appliance Efficiency Regulations: What's New in the Title 20 Code?
    cltc.ucdavis.edu/publication/title-20-lighting-appliance-efficiency
- Energy Code Ace:
  EnergyCodeAce.com
  - An online "one-stop-shop" providing free resources and 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 Certification Overview, Process and FAQs
      - Title 20 Lighting FAQs
      - High Efficacy Lighting for Manufacturers
      - Residential High Efficacy Lighting – JA10 Flicker – Fourier Transform
    - Title 20 On-Demand Video Training:
      energycodeace.com/content/title-20-training/

    Please register with the site and select an industry role for your profile in order to receive messages about all our free offerings! You can also email us at Title20@energycodeace.com.

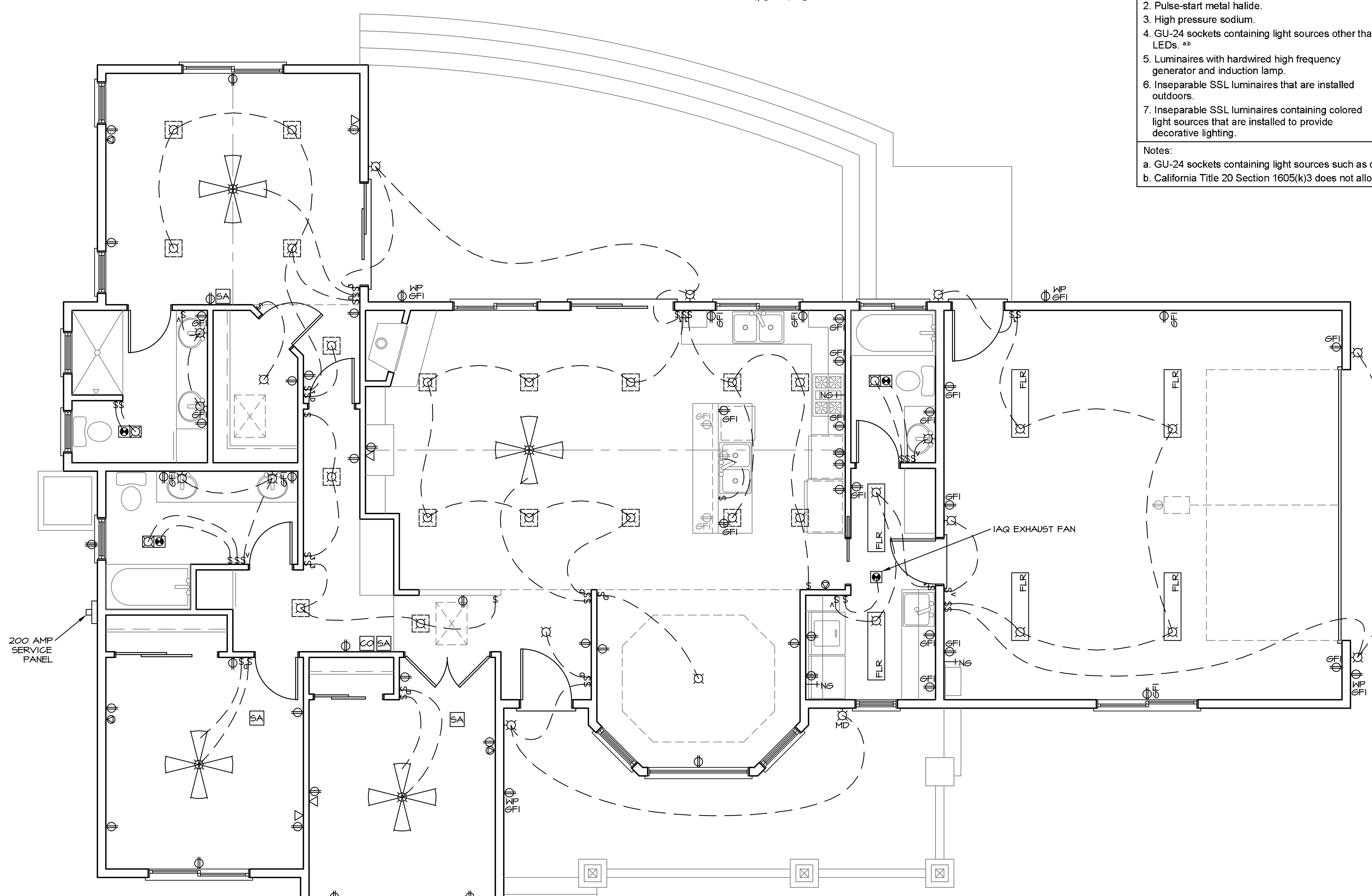
    Energy Code Ace is here to help you ensure your products meet the requirements of California's appliance and equipment efficiency energy code, Title 20 – which can help ensure that you don't encounter issues that impact your sales and bottom line, including avoiding facing civil penalties under Title 20 Section 1609 for noncompliant products.

This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.



SOLAR PLAN

1/8"=1'-0"



MAIN ELECTRICAL PLAN

1/4"=1'-0"

ELECTRICAL SCHEDULE

$	SINGLE POLE SWITCH
$3	3 WAY SWITCH
$D	DIMMER SWITCH
$V	MANUAL ON VACANCY SENSOR
⊖	110 V OUTLET
⊖	220 V OUTLET
GFI ⊖	GROUND FAULT INTERUPTER
WP ⊖	WATER PROOF OUTLET
	SURFACE MOUNT FIXTURE
	RECESSED FIXTURE (JA8-2016)
FLR	LINEAR FLOURESCENT FIXTURE
MD	MOTION DETECTOR W/ PHOTOCELL
SA	SMOKE ALARM
CO	CARBON MONOXIDE ALARM
SP	SERVICE PANEL 200 AMP
▷	TELEVISION JACK
	TELEPHONE JACK
	EXHAUST FAN
NG	NATURAL GAS

ENERGY CODE NOTES

1. ALL LIGHTING MUST BE HIGH EFFICACY PER TABLE 150.0-A BELOW
2. ALL LIGHTING THAT QUALIFIES AS HIGH EFFICACY PER JA8 MUST BE CONTROLLED BY A DIMMER OR VACANCY SENSOR
3. ALL RECESSED LIGHTS MUST BE AIR TIGHT, IC RATED AND CERTIFIED JA8-2016, OR JA8-2016-E FOR ELEVATED TEMPERATURE AND CONTROLLED BY A DIMMER OR VACANCY SENSOR
4. AT LEAST ONE LIGHT LOCATED IN A BATHROOM, LAUNDRY ROOM, UTILITY ROOM AND GARAGE MUST BE CONTROLLED BY A VACANCY SENSOR
5. BLANK ELECTRICAL BOXES >5' ABOVE THE FLOOR MUST BE CONTROLLED BY A DIMMER, VACANCY SENSOR OR FAN CONTROL SWITCH. THE QUANTITY OF BLANK ELECTRICAL BOXES IS LIMITED TO NO MORE THAN THE NUMBER OF BEDROOMS
6. EXHAUST FANS SHALL BE SWITCHED SEPARATELY FROM LIGHTING
7. ALL OUTDOOR LIGHTING PERMANENTLY ATTACHED TO THE BUILDING MUST BE HIGH EFFICACY PER TABLE 150.0-A BELOW AND CONTROLLED BY A MANUAL ON-OFF SWITCH, MOTION CONTROL AND PHOTOCONTROL
8. LUMINATED ADDRESS SIGN SHALL BE 5 WATTS OR LESS

TABLE 150.0-A

High Efficacy Light Sources Luminaires installed with only the lighting technologies in this table shall be classified as high efficacy	
Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are not required to comply with Reference Joint Appendix JA8	Light sources in this column shall be certified to the Commission as High Efficacy Light Sources in accordance with Reference Joint Appendix JA8 and be marked as meeting JA8.
1. Pin-based linear or compact fluorescent light sources using electronic ballasts. 2. Pulse-start metal halide. 3. High pressure sodium. 4. GU-24 sockets containing light sources other than LEDs. [a,b] 5. Luminaires with hardwired high frequency generator and induction lamp. 6. Inseparable SSL luminaires that are installed outdoors. 7. Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting.	8. All light sources in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw bases regardless of lamp type as described in Section 150.0(k)1C 9. GU-24 sockets containing LED light sources. 10. Any light source not otherwise listed in this table and certified to the Commission as complying with Joint Appendix 8.
Notes: a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps. b. California Title 20 Section 1605(k)3 does not allow incandescent sources to have a GU-24 base.	

ELECTRICAL NOTES

1. ELECTRICAL SERVICE SHALL BE BONDED TO COLD WATER PIPE & PROVIDE CONCRETE ENCASED ELECTRODE (UFER), #4 REBAR MIN. 20'.
2. ALL HOSE BIBS SHALL BE EQUIPPED W/ NON-REMOVABLE BACK-FLO PREVENTION DEVICES AND SHALL BE FREEZE PROOF.
3. ALL AIR CONDITIONING EQUIPMENT DESIGNED TO BE IN A FIXED POSITION SHALL BE SECURELY FASTENED.
4. NO PART OF CORD CONNECTED FIXTURES, HANGING FIXTURES, TRACK LIGHTING, PENDANTS OR CEILING FANS SHALL BE LOCATED DIRECTLY ABOVE THE TUB AND IN A ZONE MEASURED 3' HORIZONTALLY AND 8' VERTICALLY FROM THE BATH TUB RIM.
5. LIGHTING FIXTURES IN CLOTHES CLOSETS SHALL COMPLY WITH N.E.C. SECTION 410-8.
6. PROVIDE AFCI (ARC-FAULT CIRCUIT INTERRUPTER) COMBINATION TYPE PROTECTION FOR ALL BEDROOMS PER 2007 CEC SECTION 210-12(B).
7. PROVIDE AT LEAST ONE (1) 20 AMP BRANCH CIRCUIT FOR BATHROOM OUTLETS WITH NO ADDITIONAL OUTLETS CONNECTED PER 2010 CEC SECTION 210-11C(3). PROVIDE (2) OR MORE 20 AMP BRANCH CIRCUITS EVENLY PROPORTIONED IN THE KITCHEN AREA PER CEC220.4(B) & 210.52(B). PROVIDE (1) 20 AMP BRANCH CIRCUIT FOR THE LAUNDRY AREA PER CEC 210.11C(2)
8. ALL FAN LIGHTS TO HAVE SEPARATE SWITCHES & #35 METAL BOX
9. LOCAL EXHAUST BATHROOM FANS SHALL BE ENERGY STAR COMPLIANT & DUCTED DIRECTLY TO THE OUTSIDE OF THE BUILDING. PROVIDE MIN 50 CFM LOCAL EXHAUST FAN IN EACH BATHROOM W/ MAX 3 SONE RATING
10. WHOLE HOUSE VENTILATION FAN MEETING ASHRAE 62.2 MECHANICAL VENTILATION REQUIREMENTS MUST BE SWITCHED SEPARATELY AND LABELED @INDOOR AIR QUALITY FAN MUST REMAIN ON WHILE HOME IS OCCUPIED^. PROVIDE MIN 47.5 CFM FAN W/ MAX 1 SONE RATING
11. HUMIDISTAT CONTROLS SHALL BE CAPABLE OF ADJUSTMENT BETWEEN A RELATIVE HUMIDITY RANGE OF 50% AND 80%
12. LOCAL EXHAUST KITCHEN EXHAUST FAN SHALL HAVE A BACKDRAFT DAMPER & BE DUCTED DIRECTLY TO THE OUTSIDE OF THE BUILDING. PROVIDE MIN 100 CFM EXHAUST FAN W/ MAX 3 SONE RATING
13. PROVIDE SMOKE DETECTOR IN EACH SLEEPING ROOM, OUTSIDE EACH SLEEPING AREA, LIVING AREA ON EACH ADDITIONAL STORY OF THE DWELLING. SMOKE DETECTOR TO HAVE PERMANENT WIRING & 3' CLEARANCE FROM RETURN AIR. INSTALL PER MANUFACTURE'S REQ. THE ALARM SHALL BE INTERCONNECTED IN SUCH A MANNER THAT THE ACTIVATION OF ONE ALARM WILL ACTIVATE ALL OF THE ALARMS IN THE INDIVIDUAL UNIT.
14. SMOKE ALARMS SHALL BE INSTALLED, TESTED & MAINTAINED IN ACCORDANCE W/ MANUFACTURER'S INSTRUCTIONS. SMOKE ALARMS INSTALLED IN ONE & TWO FAMILY DWELLINGS SHALL BE REPLACED AFTER 10 YEARS FROM THE DATE OF MANUFACTURE 907.2.11.2.3
15. PROVIDE CARBON MONOXIDE ALARM FOR NEW CONSTRUCTION DWELLING UNITS & IN SLEEPING UNITS WITHIN WHICH FUEL BURNING APPLIANCES ARE INSTALLED & IN DWELLING UNITS WITH ATTACHED GARAGES.
16. CARBON MONOXIDE ALARMS MUST BE INSTALLED OUTSIDE OF EACH SEPARATE DWELLING UNIT SLEEPING AREA IN THE IMMEDIATE VICINITY OF THE BEDROOMS & ON EVERY LEVEL OF A DWELLING UNIT INCLUDING BASEMENTS.
17. CARBON MONOXIDE ALARMS SHALL RECEIVE THEIR PRIMARY POWER FROM BUILDING WIRING WHERE SUCH WIRING IS SERVED FROM A COMMERCIAL SOURCE & A BATTERY BACKUP.
18. THE CARBON MONOXIDE ALARM MUST BE INTERCONNECTED WHERE MORE THAN ONE ALARM IS REQUIRED TO BE INSTALLED WITHIN THE DWELLING OR SLEEPING UNIT.
19. CARBON MONOXIDE ALARMS MAY BE COMBINATION SMOKE ALARM UNITS.
20. IN DWELLING UNITS WITH NO COMMERCIAL POWER SUPPLY THE ALARM MAY BE SOLEY BATTERY OPERATED OR POWERED BY OTHER SOURCES RECOGNIZED FOR USE BY NFPA 720
21. KITCHEN PLUGS @ 18^ OR GREATER COUNTER SPACE MUST BE 4' O.C. MAX. (REACH W/2'CORD) & MUST INCLUDE (2) SMALL APPLIANCE CIRCUITS.
22. TELEVISION & TELEPHONE LOCATIONS TO BE DETERMINED BY HOME OWNER & ELECTRICAL CONTRACTOR U.O.N.
23. IN ALL ROOMS OF THE DWELLING UNIT ALL 125-VOLT, 15 & 20 AMP RECEPTACLES SHALL BE LISTED TAMPER RESISTANT RECEPTACLES.
24. TANKLESS GAS WATER HEATERS: A. PROVIDE TEMPERATURE AND PRESSURE RELIEF VALVE WITH COPPER DRAIN TO EXTERIOR. B. SUPPLY NOT TO EXCEED PRESSURE RELIEF RATING. C. SEE TITLE 24 REPORT FOR REQUIREMENTS D. PLUMBING CONTRACTOR RECOMMENDS OVERSIZE PIPES FOR THIS UNIT (CONSULT CONTRACTOR)

DESIGN-IT-RIGHT ARCHITECTS
456 BROWN STREET, SAN FRANCISCO CA
PH: (415) 356-9833 FAX 867-5309

SITE INFORMATION:
15555 JACKSON RD.
STOCKTON, CA

PROPOSED PROJECT FOR:
JOSEPH SAMPLE

DRAWNING DESCRIPTION
ELECTRICAL PLAN

REVISION DATE	BY

DRAWN BY: R BRIAN SELBY
DATE: JAN 2017
SCALE: 1/4"=1'-0"
JOB NAME: SAMPLE
ACAD DWG: SAMPLE

Decoding Residential Lighting:
Let's Talk Title 24, Part 6 Requirements

HELPING YOU PLAY YOUR CARDS RIGHT

Recording For Future Use

- Decoding Residential Compliance™
- Decoding 2016 Nonresidential Lighting™
- Decoding 2016 Resources™
- Decoding 2016 Energy Standards™

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Decoding ADUs™
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This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.

Who Are We?

Gina Rodda

Principal/Owner

gina@gabelenergy.com

GABEL ENERGY
BUILDING ENERGY ANALYSIS + ENERGY CODE COMPLIANCE

Host: Gina Rodda

Gina Rodda, our host for the Decoding Talk series, is a Certified Energy Analyst (CEA), and LEED Accredited Professional (AP).

She is involved in providing residential and non-residential energy calculations for a variety of building types throughout California; an instructor of full day trainings; and host of various webinars specific to Title 24 (Part 6) Building Energy Efficiency Standards.

Gina has been in the energy modeling field since 1991, starting the ninth California building energy code cycle of her career.

Who Are We?

Nicole (Graeber) Hathaway

Sr. Development Engineer,
Technical Communications
Director, CLTC

negraeber@ucdavis.edu

UCDAVIS
California Lighting
Technology Center

Guest Speaker:
Nicole (Graeber) Hathaway

Nicole (Graeber) Hathaway, our co-host, is a senior development engineer and the technical communications director at the CLTC. She is a Lighting Certified (LC) professional. Her work includes the testing and development of emerging lighting technologies, as well as collaborating with CLTC's industry partners on demonstration and research projects. Nicole also delivers educational seminars on today's lighting technology, policy and design.

Nicole graduated from the University of California, Davis, receiving a degree in Civil Engineering with a focus on sustainable building science and energy efficiency.

Decoding Residential Lighting

- How the mandatory requirements apply to lighting design;
- What Reference Joint Appendix JA8 means, and how to find high efficacy products that fulfill its requirements;
- How the control requirements apply to specific space types;
- What the industry has been struggling with, and the solutions and resources available to help.

Why?

HELPING YOU PLAY YOUR CARDS RIGHT

Handouts

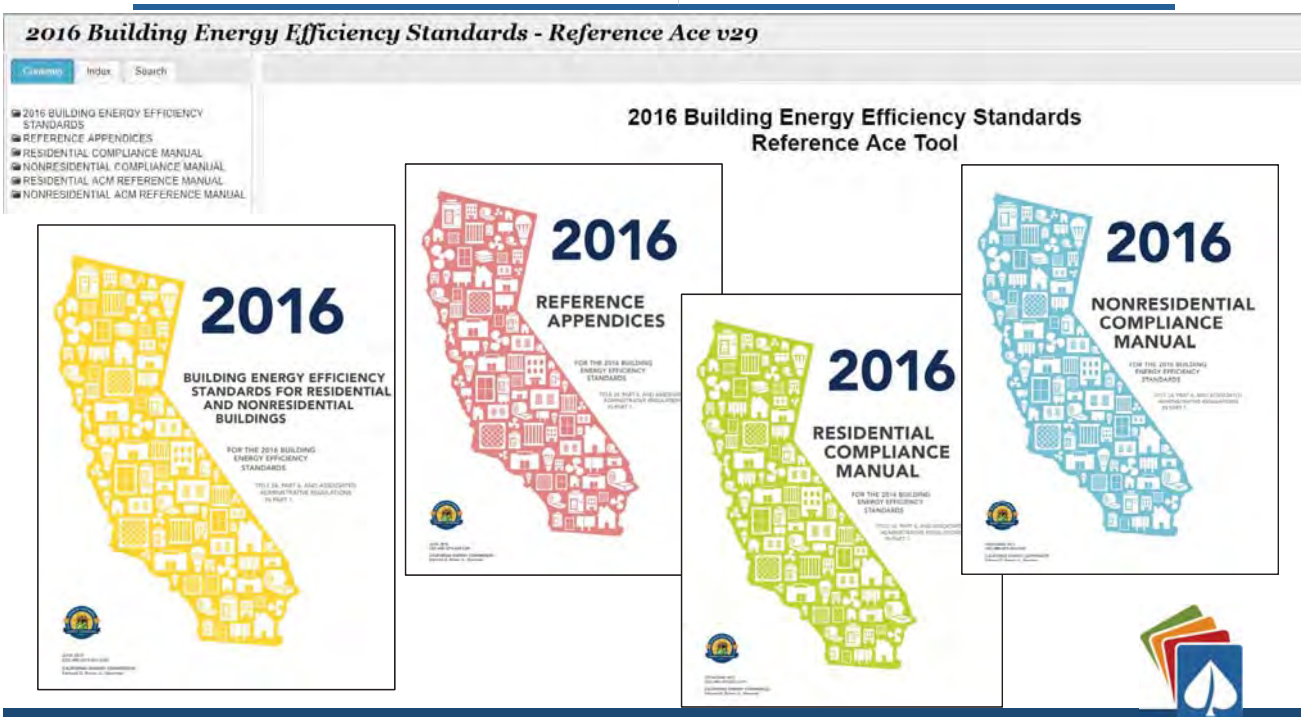

2016 ENERGY CODE
Ace Resources Fact Sheet
Residential
High Efficacy Lighting for Manufacturers

2016 ENERGY CODE
Ace Resources Fact Sheet
Residential
Indoor and Outdoor Lighting

Ace Resources Title 20 Fact Sheet
California Appliance Efficiency
State-Regulated
Lighting the Way to Efficiency
Requirements for State-Regulated LED Lamps, Small Diameter Directional Lamps and General Service Lamps
Why Regulate Lamps?
Relevant Code Sections
- Section 1602 – Definitions
- Section 1604(k) – Test Methods for Lamps
- Section 1605.3(a)(7)(A) & (B) – Standards for State-Regulated General Service Lamps
- Section 1605.3(k)(2)(C) – Standards for State-Regulated LED Lamps
- Section 1605.3(k)(3) – Standards for State-Regulated Small Diameter Directional Lamps
- Section 1606 – Filing by Manufacturers; Listing of Appliances in Database
- Section 1607(b), 1607(c)(2) & 1607(d)(13) – Marking of Appliances

Ace Tools™

Helps you navigate the Standards using key word search capabilities, hyperlinked tables and related sections



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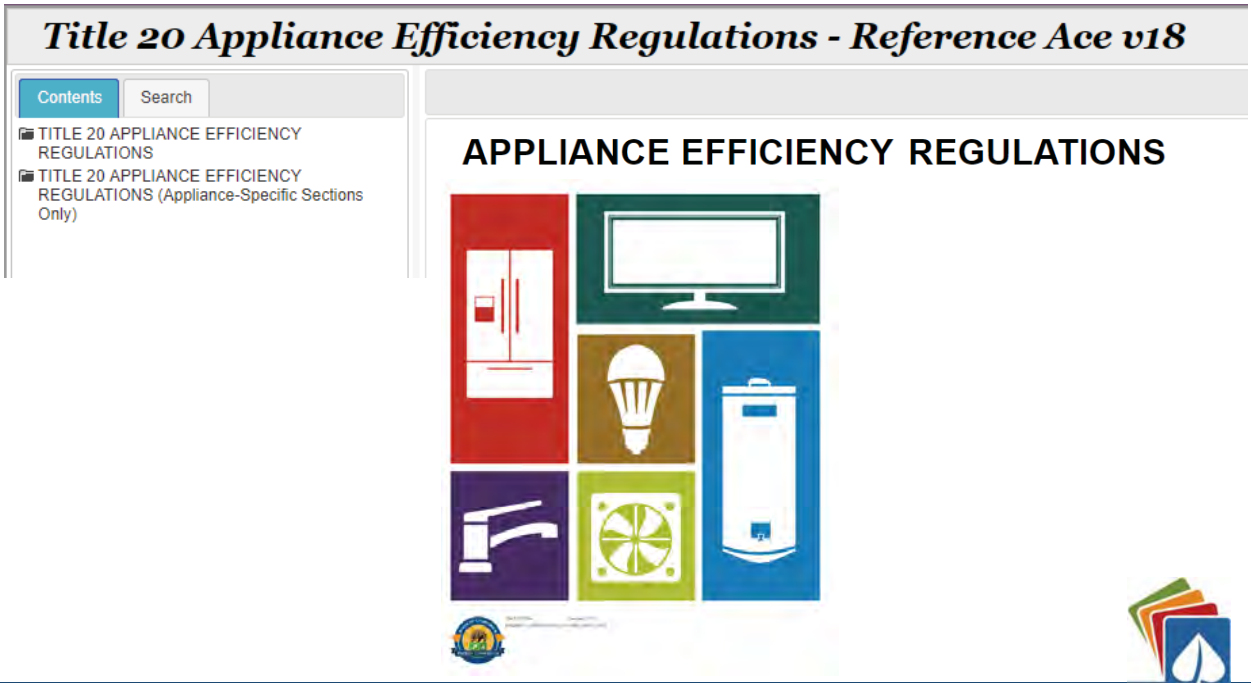
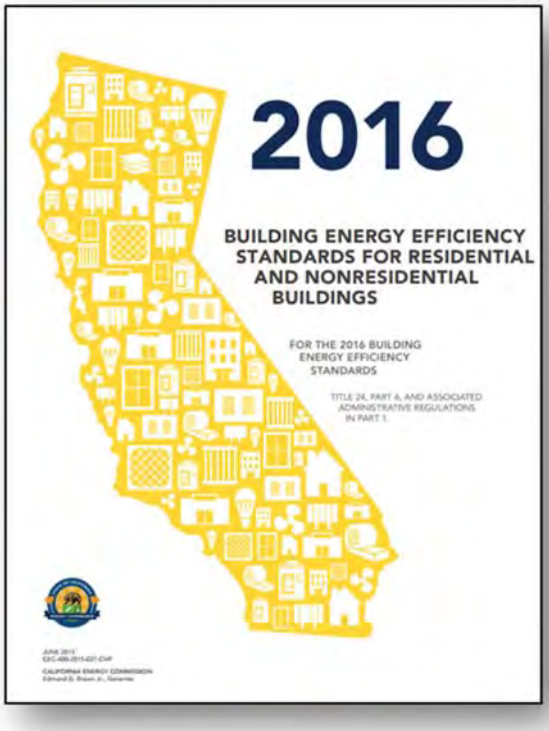


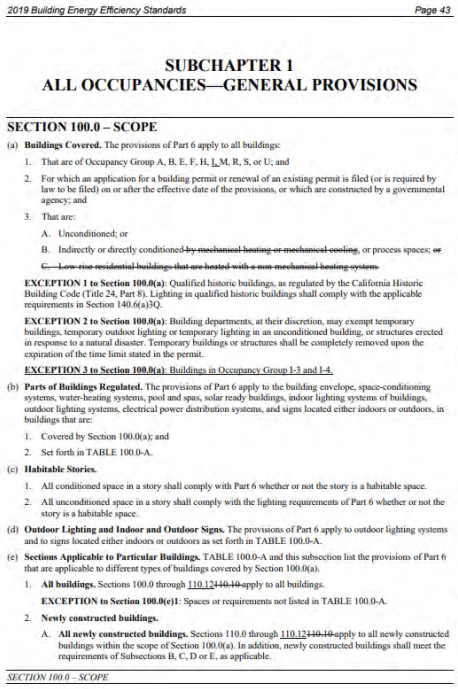
https://energycodeace.com/content/reference-ace-t20-tool

Which Code Year Applies? Permit pulled….

Jan. 2017- Dec. 2019



Jan. 2020- Dec. 2023



2019 Building Energy Efficiency Standards — Page 43

SUBCHAPTER 1
ALL OCCUPANCIES—GENERAL PROVISIONS

SECTION 100.0 – SCOPE

(a) **Buildings Covered.** The provisions of Part 6 apply to all buildings:

1. That are of Occupancy Group A, B, E, F, H, I, M, R, S, or U; and
2. For which an application for a building permit or renewal of an existing permit is filed (or is required by law to be filed) on or after the effective date of the provisions, or which are constructed by a governmental agency; and
3. That are:
   A. Unconditioned; or
   B. Indirectly or directly conditioned ~~by mechanical heating or mechanical cooling~~, or process spaces; ~~or~~
   ~~C. Low-rise residential buildings that are heated with a non-mechanical heating system.~~

EXCEPTION 1 to Section 100.0(a): Qualified historic buildings, as regulated by the California Historic Building Code (Title 24, Part 8). Lighting in qualified historic buildings shall comply with the applicable requirements in Section 140.6(a)3Q.

EXCEPTION 2 to Section 100.0(a): Building departments, at their discretion, may exempt temporary buildings, temporary outdoor lighting or temporary lighting in an unconditioned building, or structures erected in response to a natural disaster. Temporary buildings or structures shall be completely removed upon the expiration of the time limit stated in the permit.

EXCEPTION 3 to Section 100.0(a): Buildings in Occupancy Group I-3 and I-4.

(b) **Parts of Buildings Regulated.** The provisions of Part 6 apply to the building envelope, space-conditioning systems, water-heating systems, pool and spas, solar ready buildings, indoor lighting systems of buildings, outdoor lighting systems, electrical power distribution systems, and signs located either indoors or outdoors, in buildings that are:

1. Covered by Section 100.0(a); and
2. Set forth in TABLE 100.0-A.

(c) **Habitable Stories.**

1. All conditioned space in a story shall comply with Part 6 whether or not the story is a habitable space.
2. All unconditioned space in a story shall comply with the lighting requirements of Part 6 whether or not the story is a habitable space.

(d) **Outdoor Lighting and Indoor and Outdoor Signs.** The provisions of Part 6 apply to outdoor lighting systems and to signs located either indoors or outdoors as set forth in TABLE 100.0-A.

(e) **Sections Applicable to Particular Buildings.** TABLE 100.0-A and this subsection list the provisions of Part 6 that are applicable to different types of buildings covered by Section 100.0(a).

1. **All buildings.** Sections 100.0 through 110.12~~10.10~~ apply to all buildings.
   EXCEPTION to Section 100.0(e)1: Spaces or requirements not listed in TABLE 100.0-A.
2. **Newly constructed buildings.**
   A. **All newly constructed buildings.** Sections 110.0 through 110.12~~10.10~~ apply to all newly constructed buildings within the scope of Section 100.0(a). In addition, newly constructed buildings shall meet the requirements of Subsections B, C, D or E, as applicable.

SECTION 100.0 – SCOPE

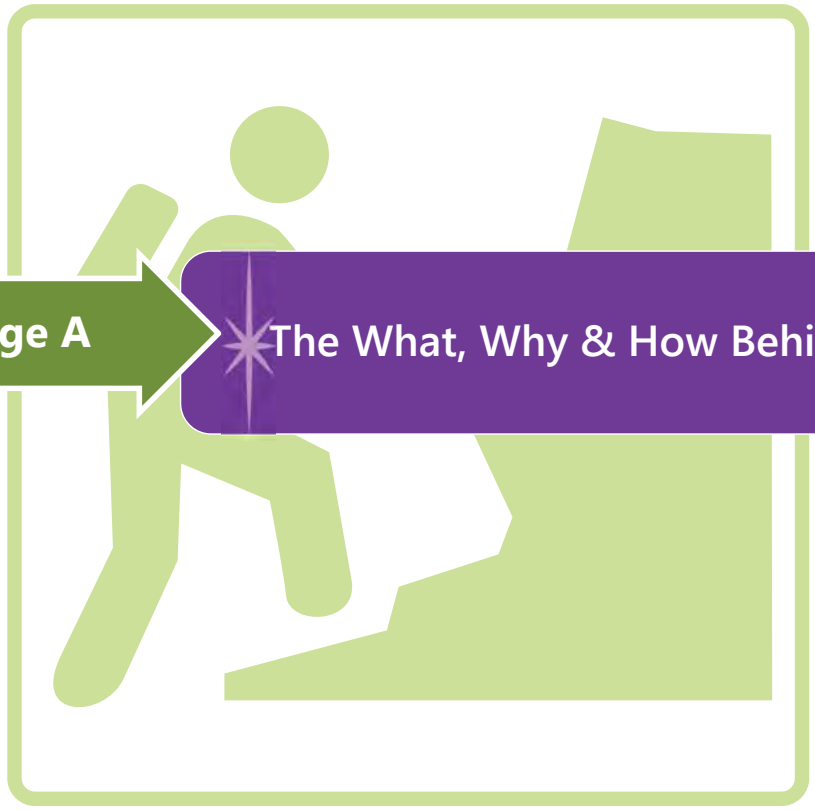
Table 100.0-A Residential Lighting Title 24 Part 6

Building Occupancies	Building Application	Mandatory: All Occupancy *Subchapter 1-2, 4 (100.0-110.11) & 130.0*	Mandatory: Residential Occupancy *Subchapter 7 (150.0)*	Prescriptive *Subchapter 8 (150.1)*	Performance *Subchapter 8 (150.1)*	Additions Alterations *Subchapter 9 (150.2)*	Joint Appendices *Residential*
Low-Rise Residential	**General**	100.0, 100.1-2, 110.0 110.1	150.0	N/A	N/A	N/A	JA8 JA10
	Indoor Lighting *(cond, uncond. & parking garages)*	110.9, 130.0	150.0(k)				
	Outdoor Lighting	110.9, 130.0	150.0(k)				

Let's Talk

HELPING YOU PLAY YOUR CARDS RIGHT 20

Challenge A



Challenge A

The What, Why & How Behind JA8

Code Sections

Building Code (Energy) Title 24 Part 6

- Mandatory high efficacy lighting requirements for lamps and luminaires installed in new residential buildings and remodel/alterations (that pull a permit)
- Lighting control requirements based on room type AND lamp/luminaire type
- Responsibility of Manufacturer to be certified to JA8 and JA10

Appliance Standards Title 20

- Mandatory requirements for various lighting technologies, including replacement lamps
- New requirements for LEDs go into effect in 2018 and 2019
- Responsibility of manufacturer to be certified to Title 20

Code Sections

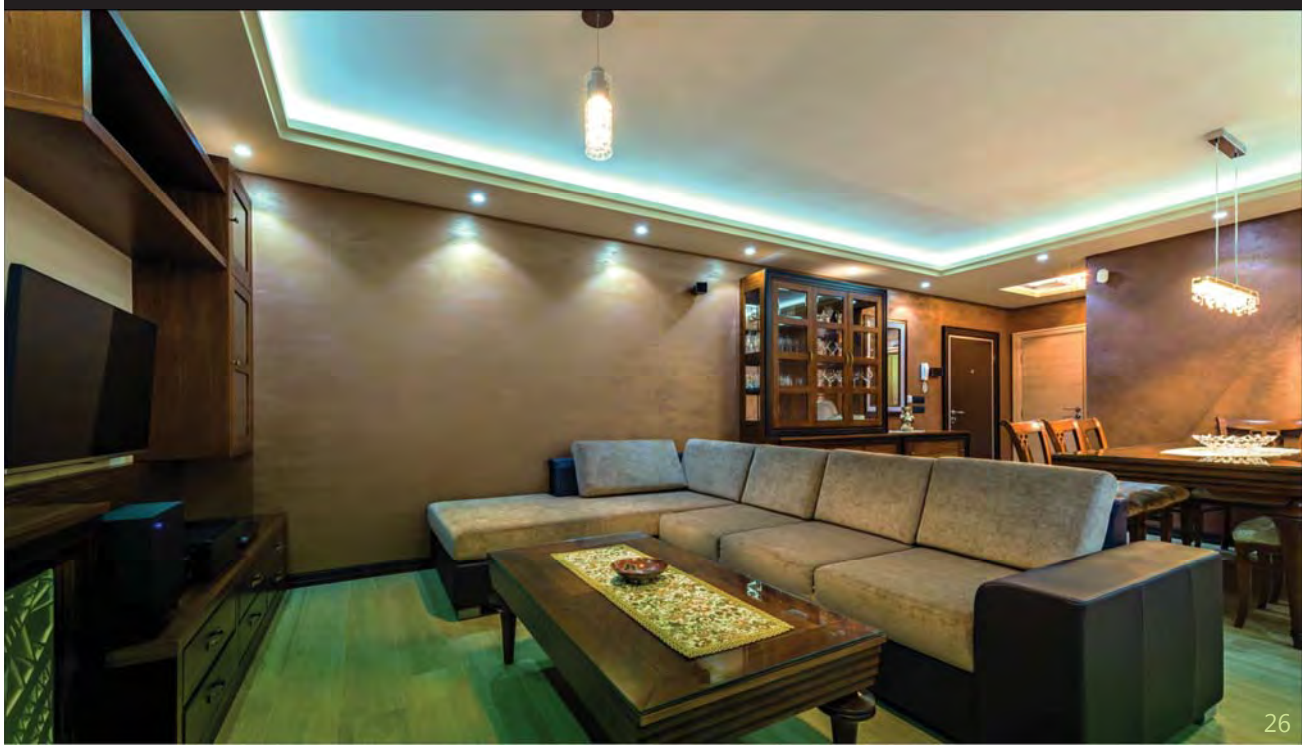
Building Code (Energy) Title 24 Part 6

- Focuses on performance and lighting quality to increase consumer retention of high efficacy lighting
- Technology-neutral specification

Appliance Standards Title 20

- Does not cover as many quality metrics as JA8, and some quality requirements are not as stringent as JA8

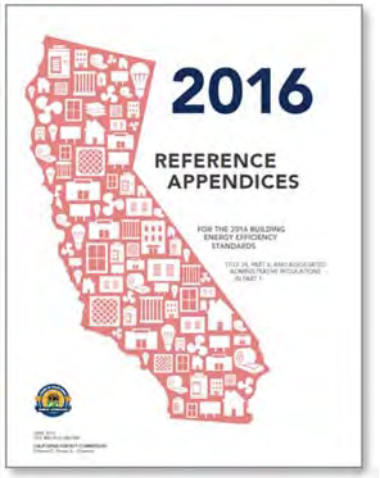
High Efficacy Lighting Requirements



How is 2016 Code Different?

- Definition of "high efficacy" has been expanded to allow:
  - Luminaires with screw base sockets when a certified high efficacy lamp is installed
  - Sockets designed for incandescent or halogen base types (as long as a JA8 light source is installed at time of inspection)
  - Luminaires with screw base sockets may not be installed in recessed downlights
- No requirement for JA8 light source to be shipped with fixture

Scope



2016 Title 24, Part 6 – Joint Appendix JA8

- All qualifying light sources shall be certified to Energy Commission in accordance with JA8
- Light sources shall be certified together with a driver or ballast
- If light source is inseparable from luminaire, the entire luminaire shall meet the requirements of JA8

JA8 Requires What?

Joint Appendix JA8

- To be certified to JA8, products must meet qualification requirements for:
  - Luminous Efficacy
  - Power Factor
  - Start Time
  - Color Characteristics
  - Lumen Maintenance, Rated Life & Survival Rate
  - Dimming, Reduced Flicker Operation & Audible Noise (Joint Appendix JA10)

JA8 Requires What?

Metric	Performance Requirements
Efficacy	≥45 lpw (when tested at full light output)
Power Factor	≥0.9 (when tested at full light output)
Start Time	≤ 0.5 seconds
CCT	Dedicated LED luminaires, LED light engines, and GU24 LEDs must be capable of providing a CCT ≤4000K
	All other sources (e.g. lamps with base types commonly used by incandescent products) must be capable of providing a CCT ≤3000K
CRI	≥90 (Note: for color changing products, this measurement must be taken when operating at a compliant CCT value.)
Duv	Within 0.0033 of the black body locus (this is approximately 4 MacAdam steps) (Note: for color changing products, this measurement must be taken when operating at a compliant CCT value)
R9	≥50 (Note: for color changing products, this measurement must be taken when operating at a compliant CCT value)
Lumen Maintenance	Corresponds to an L70 of 15,000 (≥86.7% maintenance at 6,000 hours)
Rated Life	≥15,000 hours
Early Failure	≥90% of units operational after 6,000 hour test
Dimmability	Must be dimmable down to 10% of full light output. Forward phase cut LEDs must meet NEMA SSL7A.
Flicker	<30%, at frequencies <200 Hz, at 100% and 20% light output; tested according to the requirements in Joint Appendix JA10
Audible Noise	≤24 dBA at 1 meter, tested at 100% and 20% light output

Marking Requirements

Image source: Soraa

2016 Title 24, Part 6 – Joint Appendix JA8

- Compliant light sources must be permanently marked with:
- "JA8-2016"
- OR
- "JA8-2016-E"
  - For light sources that have passed the Elevated Temperature Life Test for enclosed or recessed fixtures
  - "E" marking lets installer and inspector know that the lamp is safe for recessed/enclosed fixture

Test Lab Requirements

Image source: http://www.iqsindia.net/iso-iec-17025-2005.htm

- Test labs must be accredited to ISO/IEC 17025 (JA8.2)
  - Do not need to be pre-approved by the Energy Commission

Title 24 Part 6: §150.0

Table 150.0-A: Classification of High Efficacy Light Sources

High Efficacy Light Sources Luminaires installed with only the lighting technologies in this table shall be classified as high efficacy	
Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are **not** required to comply with Reference Joint Appendix JA8	Light sources in this column shall be certified to the Commission as High Efficacy Light Sources in accordance with Reference Joint Appendix JA8 and be marked as meeting JA8.
1. Pin-based linear or compact fluorescent light sources using electronic ballasts. 2. Pulse-start metal halide. 3. High pressure sodium. 4. GU-24 sockets containing light sources other than LEDs. [a,b] 5. Luminaires with hardwired high frequency generator and induction lamp. 6. Inseparable SSL luminaires that are installed outdoors. 7. Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting.	8. All light sources in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw bases regardless of lamp type as described in Section 150.0(k)1C. 9. GU-24 sockets containing LED light sources. 10. Any light source not otherwise listed in this table and certified to the Commission as complying with Joint Appendix 8.
Notes: a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps. b. California Title 20 Section 1605(k)3 does not allow incandescent sources to have a GU-24 base.	

Picture Friendly Table 150.0-A

Considered "Automatically" High Efficacy

- Indoor lamps:

Pin-based linear fluorescent

Pin-based compact fluorescent

GU-24 other than LEDs

Inseparable SSL luminaires with colored light sources for decorative lighting purpose

Picture Friendly Table 150.0-A

Considered "Automatically" High Efficacy

- Outdoor lamps:

Pulse-start metal halide

High pressure sodium

Luminaires with hardwired high frequency generator and induction lamp

Inseparable SSL luminaires including all colors

Picture Friendly Table 150.0-A

"JA8" High Efficacy

- Indoor and/or outdoor lamps:

LED luminaires with integral sources

Screw-based LED lamps

Pin-based LED lamps

GU-24 based LED light source

Picture Friendly Table 150.0-A

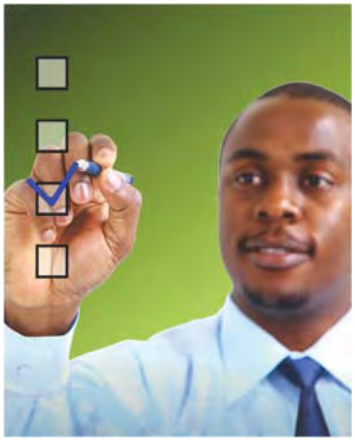
"JA8" High Efficacy

- Indoor and/or outdoor lamps:

Recessed Ceiling (Can) Lights: *Recessed ceiling downlights (can lights) CANNOT be screw base and must use a insulation contact & air tight (ICAT) rated can.*

Compliance

How to Comply: Products



Manufacturers and test labs are responsible for compliance

- Design products according to JA8 regulations
- Test products according to JA8 and JA10 testing requirements
- Certify products to the Energy Commission
  - Compliant products can be certified before January 1, 2017 effective date
- Permanently mark compliant products as “JA8-2016” or “JA8-2016-E”

How to Comply: Design/Install

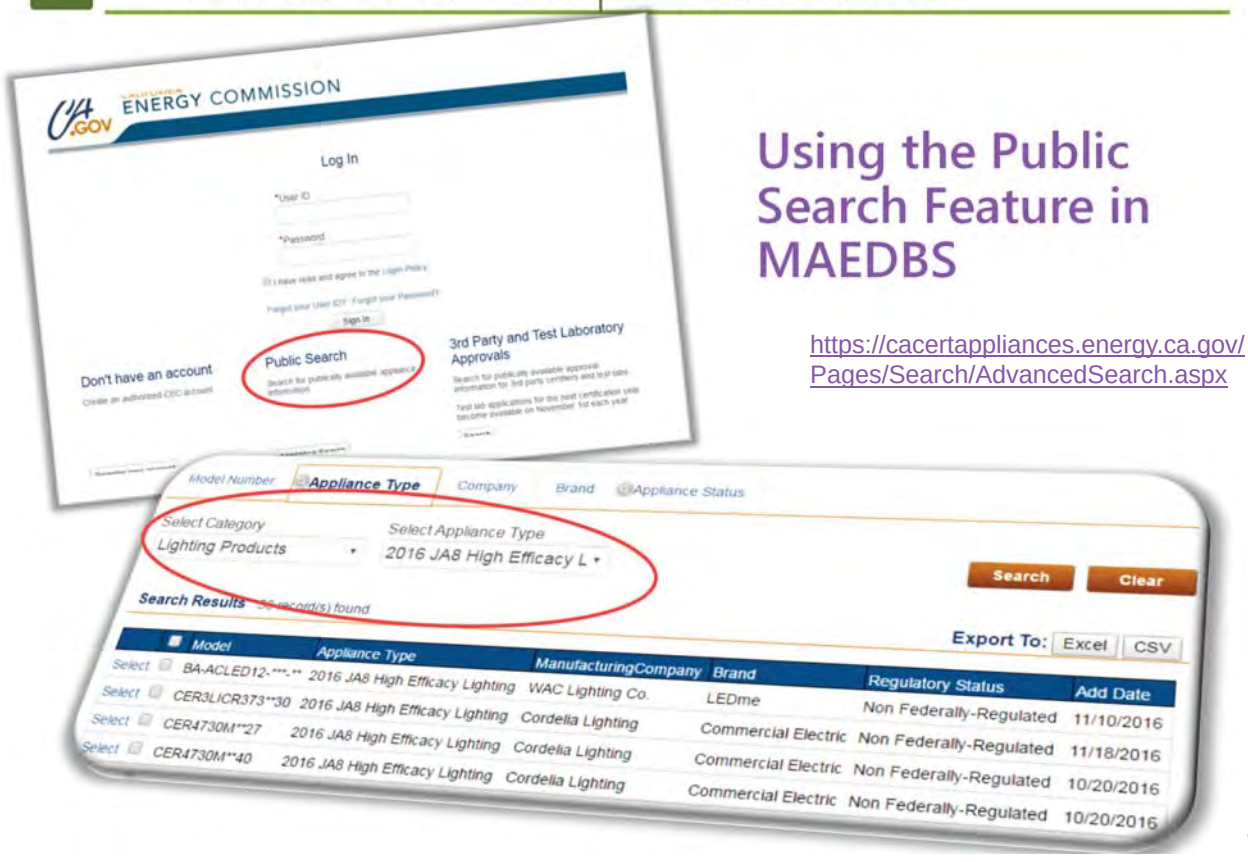
Builders and designers are also responsible for compliance

- Designers ensure that:
  - Homes and other applicable dwelling spaces are designed to meet JA8
  - This is communicated clearly in plans
- Builders ensure that:
  - JA8-compliant products are installed at time of inspection
  - New homeowners are provided with a luminaire schedule that includes list of installed lamps and luminaries

Where is the Marking??

What to look for on the shelf?

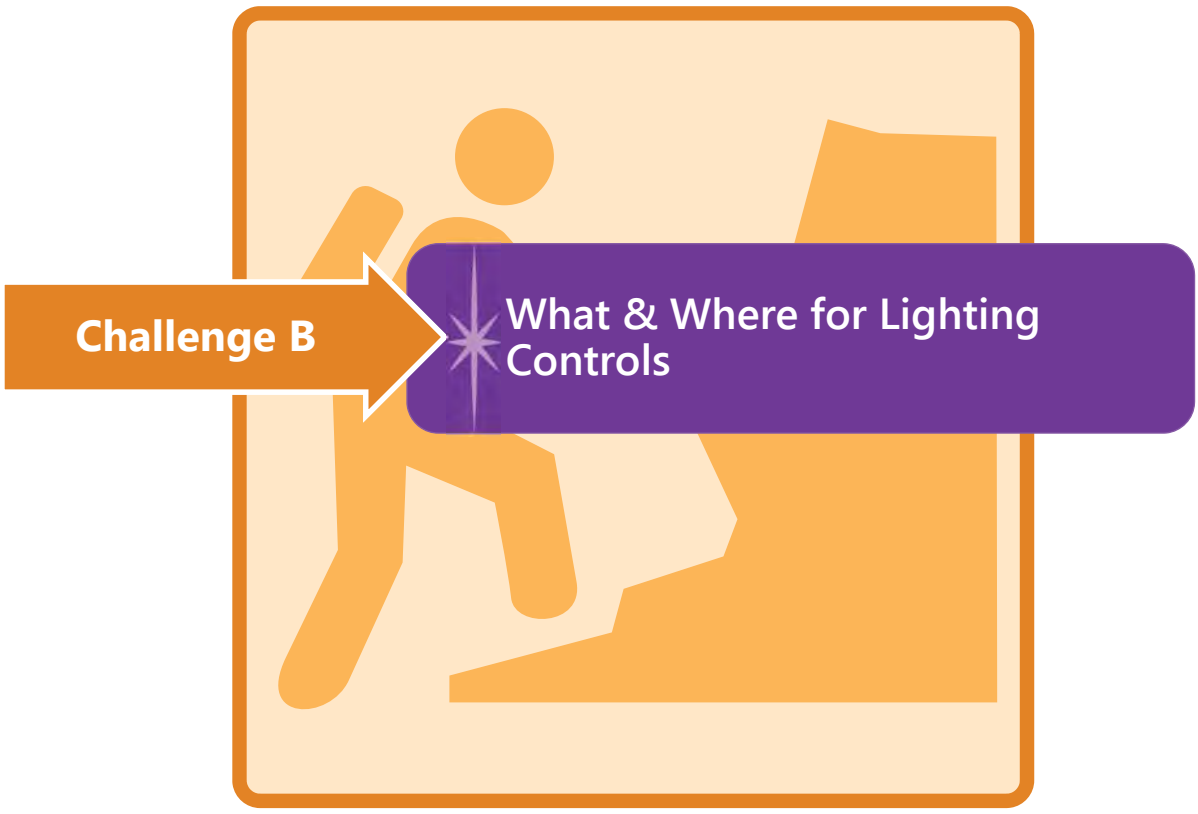
How to Find Compliant Products



Using the Public Search Feature in MAEDBS

https://cacertappliances.energy.ca.gov/Pages/Search/AdvancedSearch.aspx

Challenge B



Controls

Control Types

On/Off Switch

- On/Off switch to be readily accessible manual controls, allowing occupants easy control of lighting in the space (or outdoors).
- Exhaust fans to be switched/ controlled separately from lighting.
- Undercabinet lighting switched separately all other lighting.
- Energy Management Control System (EMCS) can be used if dimmer control requirements met.

Control Types

Indoor: Vacancy Sensor

- Manual ON:
  - Must respond to manual on NOT automatic ON (that would be a occupancy sensor)
- Automatic OFF:
  - Automatically turn OFF the lighting within 20 minutes of the space being vacant.
- Must be Title 20 certified

Control Types

Indoor: Dimmers

- Varies the luminous flux of the electric lighting system by changing the power delivered to that lighting system.
- Must be Title 20 certified
  - Reduce power consumption by a minimum of 65% percent at its lowest level;
  - Include an off position which produces a zero lumen output; and not consume more than 1 W per lighting dimmer switch leg when in the off position.
  - Reduce flicker through dimming range to be no greater than 30 percent flicker
  - For 3-way, do not override level set by dimmer and all switches should turn light off

Control Types

Image by Leviton

Indoor: Fan Speed Control

- Can be used for blank electrical boxes

Control Types

Outdoor: Photocell Sensor

- Automatically turns lights ON and OFF depending on when daylight available.
- Can be integrated into light fixture or field assembled
- Controls that override to ON shall not be allowed unless the override automatically reactivates within 6 hours
- Must be Title 20 certified

Control Types

Outdoor: Motion Sensor

- Automatically turns lights ON when a person is sensed and OFF when someone is not sensed within 20 minutes
- Can be integrated into light fixture or field assembled
- Controls that override to ON shall not be allowed unless the override automatically reactivates within 6 hours
- Must be Title 20 certified

Control Types

Outdoor: Automatic Time Switch

- Automatically turns lights ON and OFF based on time of day
- Controls that override to ON shall not be allowed unless the override automatically reactivates within 6 hours
- Must be Title 20 certified

Control Types

Outdoor: Astronomical Time Switch

- Automatically turns lights ON and OFF based on time of day AND astronomical events such as sunset and sunrise, accounting for geographic location and calendar date
- Controls that override to ON shall not be allowed unless the override automatically reactivates within 6 hours
- Must be Title 20 certified

Control Types

Photo courtesy of Lutron

Outdoor: Energy Management Control System (EMCS)

- Automatically turns lights ON and OFF based on time of day AND astronomical events such as sunset and sunrise, accounting for geographic location and calendar date
- Controls that override to ON shall not be allowed unless the override automatically reactivates within 6 hours
- Must shown to meet the requirements of nonresidential installation certificate per §130.4(b)2

Controlling Luminaire Type

JA8 versus "Automatically" High Efficacy

JA8	Automatically High Efficacy
✦ On/Off switch **AND** ✦ Dimmer AND/OR ✦ Vacancy Sensor ✧ Exception based on space type for hallways and closets <70 ft^2	✦ On/off Switch

Rooms

Indoor Room Types

Bathroom

- At least one lamp/luminaire of any type to be controlled by vacancy sensor per space
- All other lamps/luminaries dependent upon type (JA8 or "automatically" high efficacy)

Garage/Laundry

- At least one lamp/luminaire of any type to be controlled by vacancy sensor per space
- All other lamps/luminaries dependent upon type (JA8 or "automatically" high efficacy)

Hallway/ Closet <70 sf

- Vacancy sensor, nor dimmer, NOT required even if a JA8 lamp/luminaire

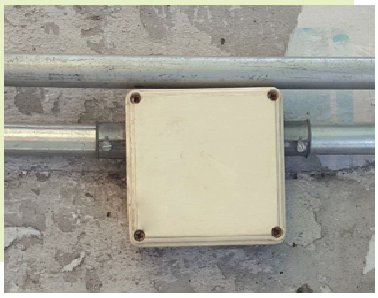
All Others

- All lamps/luminaries dependent upon type (JA8 or "automatically" high efficacy)

Indoor Considerations

Blank Electrical Boxes

- Controlled with on/off switch AND either vacancy sensor/dimmer/fan speed control
- Can only have as many bedrooms are present (can be installed anywhere in home)



Nightlights

- Vacancy Sensor not required
- Permanent, or integral to exhaust fan or luminaire, not to use more than 5 watts per fixture.

Outdoor Considerations

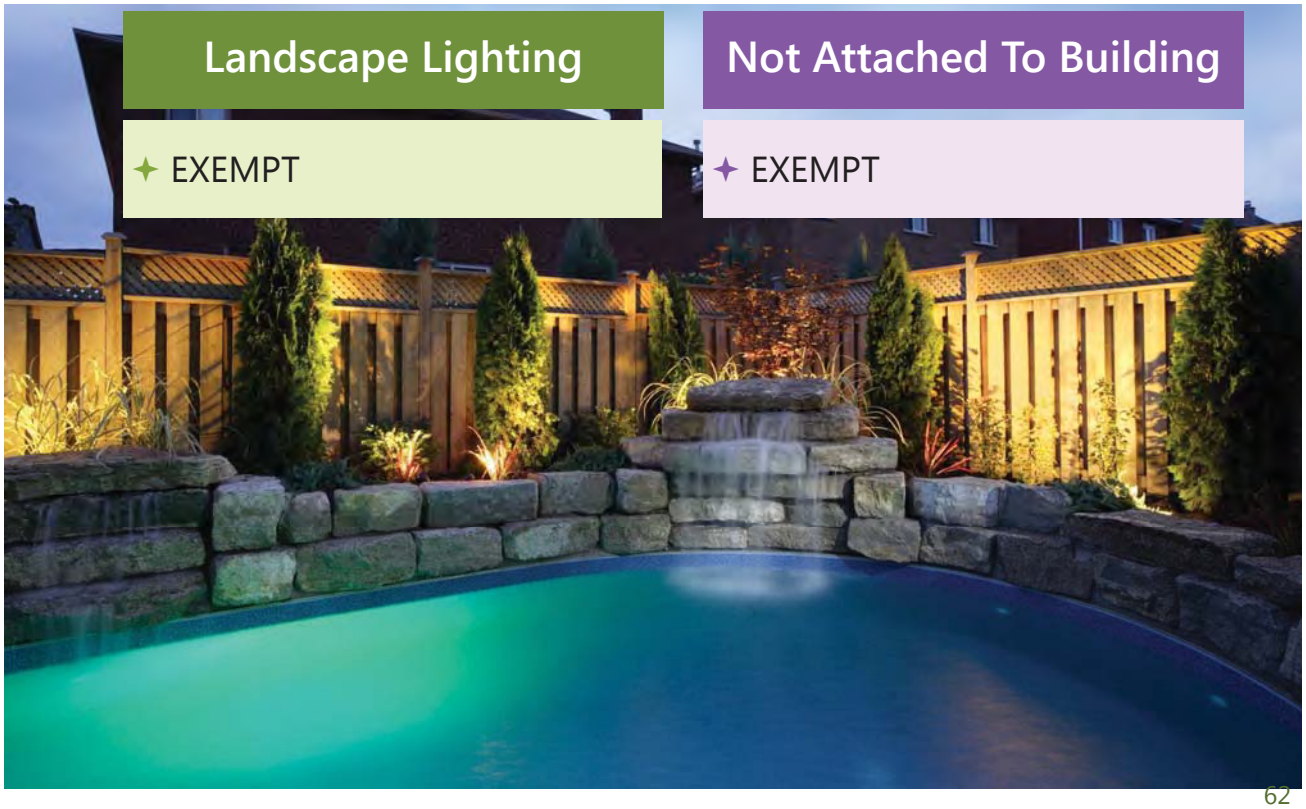
Attached to Home

- On/Off switch AND
- Photocell AND motion sensor/timeswitch OR
- Astronomical timeclock or EMCS meeting the same requirements

Attached to any other Building

- On/Off switch AND
- Photocell AND motion sensor/timeswitch OR
- Astronomical timeclock or EMCS meeting the same requirements

Outdoor Considerations



Landscape Lighting

- EXEMPT

Not Attached To Building

- EXEMPT

Outdoor Considerations

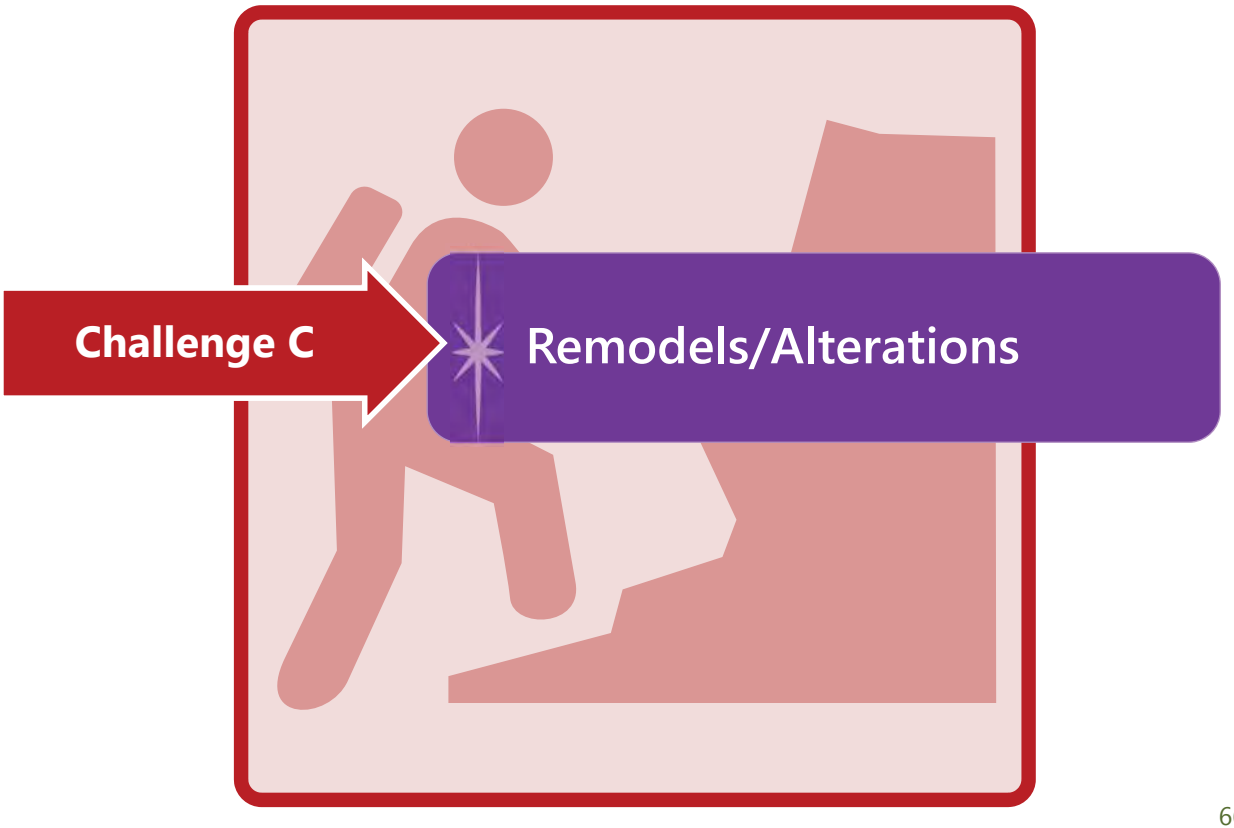
Illuminated Signs

- Can use the Nonresidential requirements of §130.0(c)

OR

- Do not exceed 5 watts per sign.

Challenge C



When Are These Requirements Triggered?

Are you pulling a building permit?

Doing work WITH Permit

- Adding onto a home:
  - New areas of the home must meet these requirements
- Remodeling a home:
  - When a permit is required by your local building department, then these requirements apply to that remodeled work
- Spaces not being renovated:
  - Not required

Doing Work WITHOUT Permit

- Changing the light bulbs:
  - Not required
- Changing lighting control:
  - Not required
- Replacing lighting fixtures:
  - Not required
- Moving light fixtures:
  - Not required

What Applies?

Remodeling a kitchen

- Pull a permit!
- Lamps/Luminaires
  - JA8 or "Automatically" high efficacy
  - Can lights cannot be screw base and use "JA8-2016-E" because they are enclosed
- Controls
  - Based on light type
  - Undercabinet lighting switched separately

What Applies?

Adding a bathroom

- Pull a permit!
- Lamps/Luminaires
  - JA8 or "Automatically" high efficacy
  - Can lights cannot be screw base and use "JA8-2016-E" because they are enclosed
- Controls
  - One fixture MUST use a vacancy sensor
  - All other controls based on what type of lamp/luminaire they are controlling

What Applies?

Effective January 1, 2018, and small diameter directi the Title 20 Appliance Effi Standards).
State regulated LED lamp base, including LED retrof can housings, must meet Appliance Standards to be California.

Replacing chandelier in dining room

- Permit typically not required, but confirm with you local building department.
- Lamp/Luminaires: No Title 24 Part 6 requirements
  - Though Title 20 lamp requirements MAY apply
- Controls: No Title 24 Part 6 requirements

Blueprint 117

General Service Lamps (Tier 1) and Small Diameter Directional Lamps

Regulation	Title 24 - JA8 (2016)	Title 20 (2016)	
Lamp Type	All Residential (Except Night Lights)	General Service LED Lamps (Tier 1)	Small Diameter Directional Lamps
Example			
Effective Date	January 1, 2017	January 1, 2018	January 1, 2018
Base Type	All (Except Night Lights)	E12, E17, E26, and GU-24	ANSI ANSLG C81.61-2009 or E26
Power Factor	≥ 0.9	≥ 0.7	No Requirement
Start Time	≤ 0.5 seconds	No Requirement	No Requirement
Lifetime	≥ 15,000 hours	≥ 10,000 hours	≥ 25,000 hours
Dimming	Down to 10 percent	No Requirement	No Requirement
Efficacy	≥ 45 lumens/Watt	≥ 68 lumens/Watt and ((2.3 x CRI) + lm/W) ≥ 282	≥ 80 lumens/Watt or ≥ 70 lumens/Watt and (lm/W + CRI ≥ 165)
CCT	Inseparable ≤ 4,000 K Separable ≤ 3,000 K	No Requirement	No Requirement
Chromaticity	-0.0033 ≤ Duv ≥ 0.0033	ANSI C78.377-2015 Compliant	No Requirement
CRI	≥ 90	≥ 82	No Requirement
R1-R8	No Requirement	≥ 72	No Requirement
R9	≥ 50	No Requirement	No Requirement

What Applies?

Replacing Portable Light Fixture Bulbs

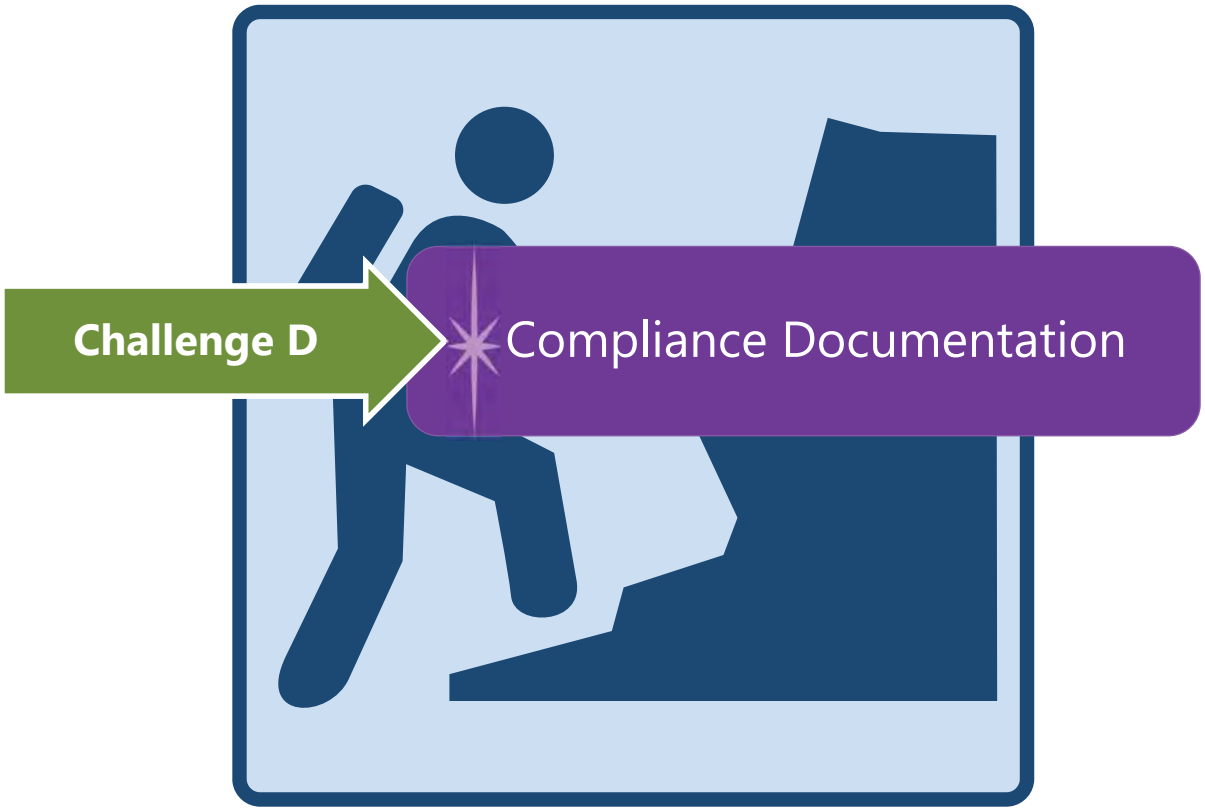
- Permit typically not required, but confirm with you local building department.
- Lamp/Luminaires: No Title 24 Part 6 requirements
  - Though Title 20 lamp requirements MAY apply
- Controls: No Title 24 Part 6 requirements

What Applies?

Changing the Light Fixtures

- Permit typically not required, but confirm with you local building department.
- Lamp/Luminaires: No Title 24 Part 6 requirements
  - Though Title 20 lamp requirements MAY apply
- Controls: No Title 24 Part 6 requirements

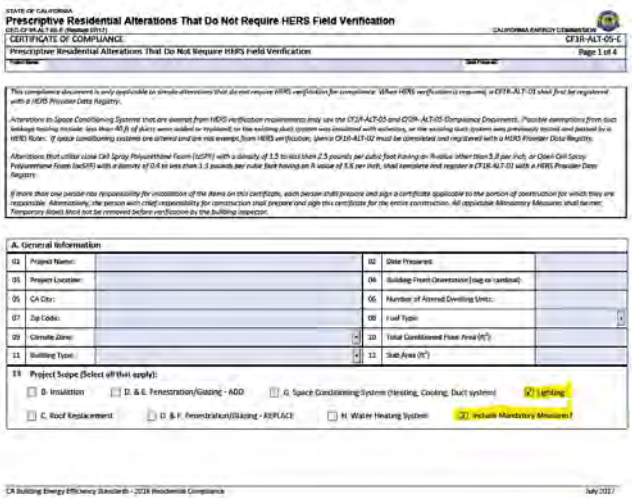
Challenge D



How Is This Documented?

CF1R

- Nothing there. These are not prescriptive or performance requirements, so it will not be documented on the CF1R-ALT/ADD/PRF forms.
  - Though the CF1R-ALT-05-E (no HERS measures) will help with mandatory requirements!


STATE OF CALIFORNIA
Prescriptive Residential Alterations That Do Not Require HERS Field Verification
CERTIFICATE OF COMPLIANCE
Prescriptive Residential Alterations That Do Not Require HERS Field Verification
CF1R-ALT-05-E
Page 1 of 4

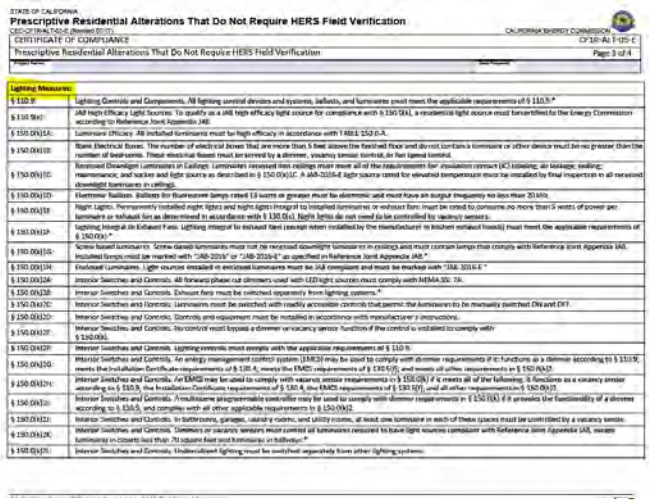
A. General Information

01	Project Name:	02	Date Prepared:
05	Project Location:	06	Building Front Orientation (cardinal):
05	CA City:	06	Number of Altered Dwelling Units:
07	Zip Code:	08	Roof Type:
09	Climate Zone:	10	Total Conditioned Floor Area (ft^2):
11	Building Type:	12	Slab Area (ft^2):

13 Project Scope (Select all that apply):

B. Insulation | D. & E. Fenestration/Glazing - ADD | G. Space Conditioning System (Heating, Cooling, Duct system) | [X] Lighting
C. Roof Replacement | D. & F. Fenestration/Glazing - REPLACE | H. Water Heating System | [X] Include Mandatory Measures?

CA Building Energy Efficiency Standards - 2016 Residential Compliance — July 2017


STATE OF CALIFORNIA
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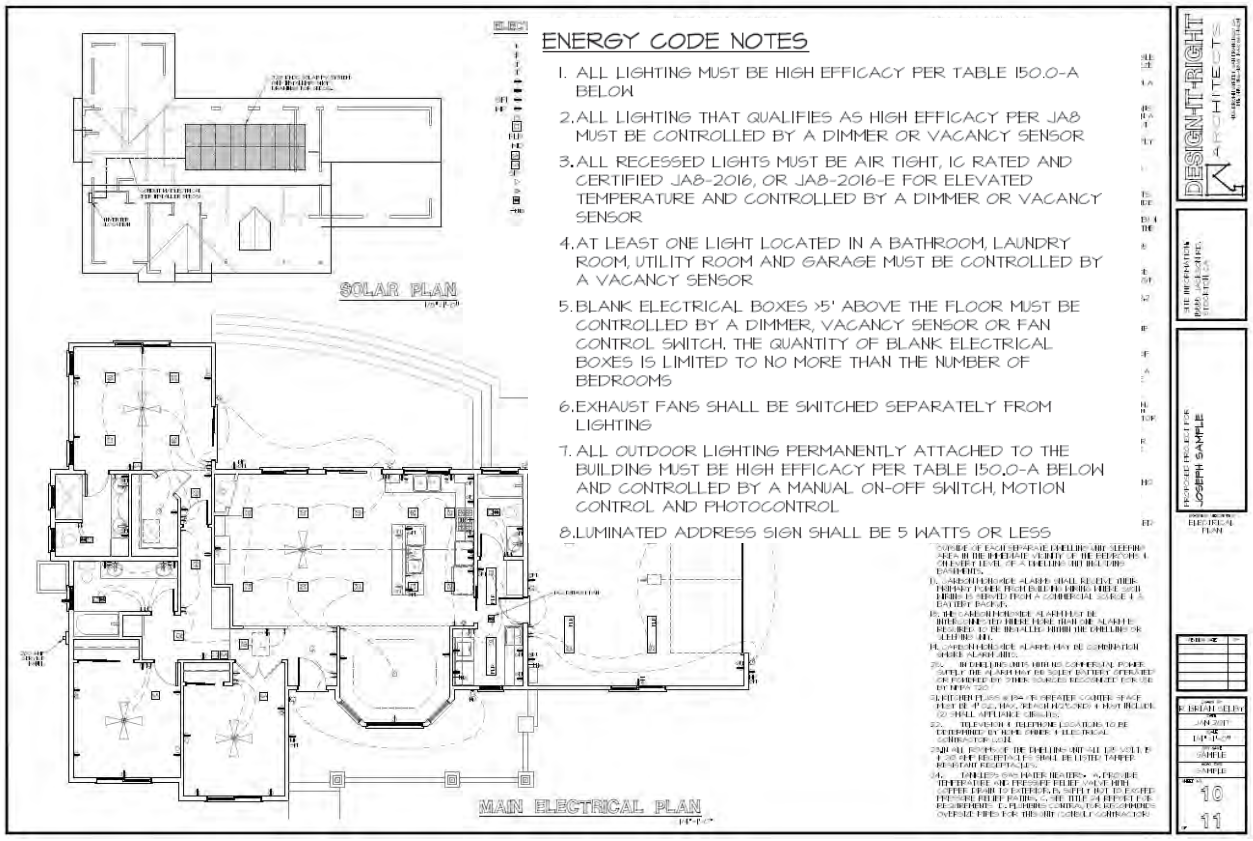
Prescriptive Residential Alterations That Do Not Require HERS Field Verification
CF1R-ALT-05-E
Page 3 of 4

Lighting Measures:

§ 110.9	Lighting Controls and Components. All lighting control devices and systems, ballasts, and luminaires shall meet the applicable requirements of § 110.9.*
§ 110.9(e)	JA8 High Efficacy Light Sources. To qualify as a JA8 high efficacy light source for compliance with § 150.0(k), a residential light source must be certified to the Energy Commission according to Reference Joint Appendix JA8.
§ 150.0(k)1A.	Luminaire Efficacy. All installed luminaires must be high efficacy in accordance with TABLE 150.0-A.
§ 150.0(k)1D.	Blank Electrical Boxes. The number of electrical boxes that are more than 5 feet above the finished floor and do not contain a luminaire or other device shall be no greater than the number of bedrooms. These electrical boxes must be served by a dimmer, vacancy sensor control, or fan speed control.
§ 150.0(k)1E.	Recessed Downlight Luminaires in Ceilings. Luminaires recessed into ceilings shall meet all of the requirements for insulation contact (IC) rated(s), air leakage, ceiling; maintenance, and sealed and light source as described in § 150.0(k)1E. A JA8-2016-E light source rated for elevated temperature must be installed by final inspection in all recessed downlight luminaires in ceilings.
§ 150.0(k)1G.	Electronic Ballasts. Ballasts for fluorescent lamps rated 13 watts or greater must be electronic and must have an output frequency no less than 20 kHz.
§ 150.0(k)1H.	Night Lights. Permanently installed night lights and night lights integral to installed luminaires or exhaust fans must be rated to consume no more than 5 watts of power per luminaire or exhaust fan as determined in accordance with § 130.0(c). Night lights do not need to be controlled by vacancy sensors.
§ 150.0(k)1I.	Lighting Integral to Exhaust Fans. Lighting integral to exhaust fans (except when installed by the manufacturer in kitchen exhaust hoods) must meet the applicable requirements of § 150.0(k).*
§ 150.0(k)1J.	Screw-based luminaires. Screw-based luminaires must not be recessed downlight luminaires in ceilings and must contain lamps that comply with Reference Joint Appendix JA8. Installed lamps must be marked with "JA8-2015" or "JA8-2016-E" as specified in Reference Joint Appendix JA8.*
§ 150.0(k)1M.	Enclosed Luminaires. Light sources installed in enclosed luminaires must be JA8 compliant and must be marked with "JA8-2016-E."
§ 150.0(k)2A.	Interior Switches and Controls. All forward phase cut dimmers used with LED light sources must comply with NEMA SSL 7A.
§ 150.0(k)2B.	Interior Switches and Controls. Exhaust fans must be switched separately from lighting systems.*
§ 150.0(k)2C.	Interior Switches and Controls. Luminaires must be switched with readily accessible controls that permit the luminaires to be manually switched ON and OFF.
§ 150.0(k)2D.	Interior Switches and Controls. Controls and equipment must be installed in accordance with manufacturer's instructions.
§ 150.0(k)2F.	Interior Switches and Controls. No control must bypass a dimmer or vacancy sensor function if the control is installed to comply with § 150.0(k).
§ 150.0(k)2F.	Interior Switches and Controls. Lighting controls must comply with the applicable requirements of § 110.9.
§ 150.0(k)2G.	Interior Switches and Controls. An energy management control system (EMCS) may be used to comply with dimmer requirements if it: functions as a dimmer according to § 110.9, meets the Installation Certificate requirements of § 130.4, meets the EMCS requirements of § 130.5(f), and meets all other requirements in § 150.0(k)2.
§ 150.0(k)2H.	Interior Switches and Controls. An EMCS may be used to comply with vacancy sensor requirements in § 150.0(k) if it meets all of the following: It functions as a vacancy sensor according to § 110.9, the Installation Certificate requirements of § 130.4, the EMCS requirements of § 130.5(f), and all other requirements in § 150.0(k)2.
§ 150.0(k)2I.	Interior Switches and Controls. A multizone programmable controller may be used to comply with dimmer requirements in § 150.0(k) if it provides the functionality of a dimmer according to § 110.9, and complies with all other applicable requirements in § 150.0(k)2.
§ 150.0(k)2J.	Interior Switches and Controls. In bathrooms, garages, laundry rooms, and utility rooms, at least one luminaire in each of these spaces must be controlled by a vacancy sensor.
§ 150.0(k)2K.	Interior Switches and Controls. Occupant or vacancy sensors must control all luminaires required to have light sources compliant with Reference Joint Appendix JA8, except luminaires in closets less than 70 square feet and luminaires in hallways.*
§ 150.0(k)3.	Interior Switches and Controls. Undercabinet lighting must be switched separately from other lighting systems.



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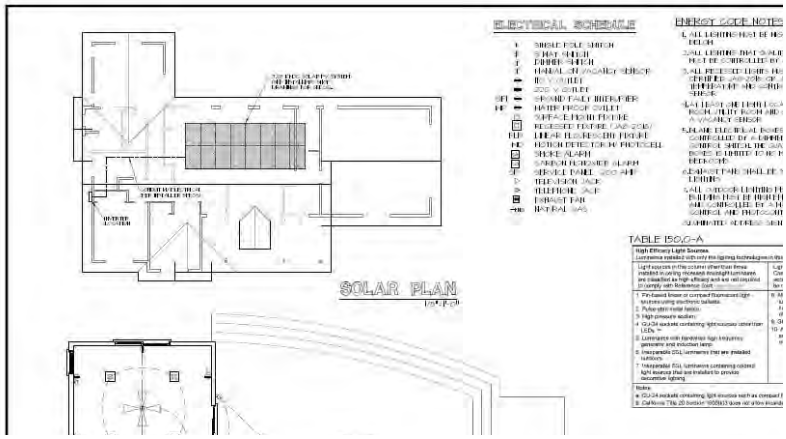
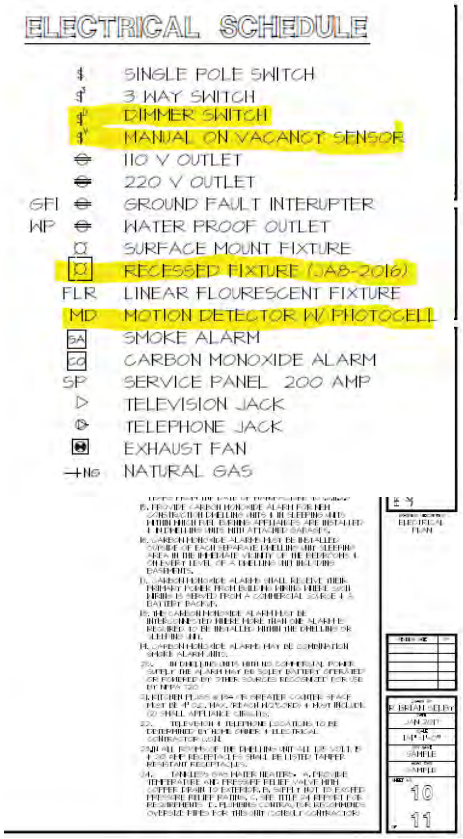


TABLE 150.0-A

High Efficacy Light Sources Luminaires installed with only the lighting technologies in this table shall be classified as high efficacy	
Light sources in this column other than those installed in ceiling recessed downlight luminaires are classified as high efficacy and are not required to comply with Reference Joint Appendix JA8	Light sources in this column shall be certified to the Commission as High Efficacy Light Sources in accordance with Reference Joint Appendix JA8 and be marked as meeting JA8.
1. Pin-based linear or compact fluorescent light sources using electronic ballasts. 2. Pulse-start metal halide. 3. High pressure sodium. 4. GU-24 sockets containing light sources other than LEDs. [a,b] 5. Luminaires with hardwired high frequency generator and induction lamp. 6. Inseparable SSL luminaires that are installed outdoors. 7. Inseparable SSL luminaires containing colored light sources that are installed to provide decorative lighting.	8. All light sources in ceiling recessed downlight luminaires. Note that ceiling recessed downlight luminaires shall not have screw bases regardless of lamp type as described in Section 150.0(k)1C 9. GU-24 sockets containing LED light sources. 10. Any light source not otherwise listed in this table and certified to the Commission as complying with Joint Appendix 8.
Notes: a. GU-24 sockets containing light sources such as compact fluorescent lamps and induction lamps. b. California Title 20 Section 1605(k)3 does not allow incandescent sources to have a GU-24 base.	



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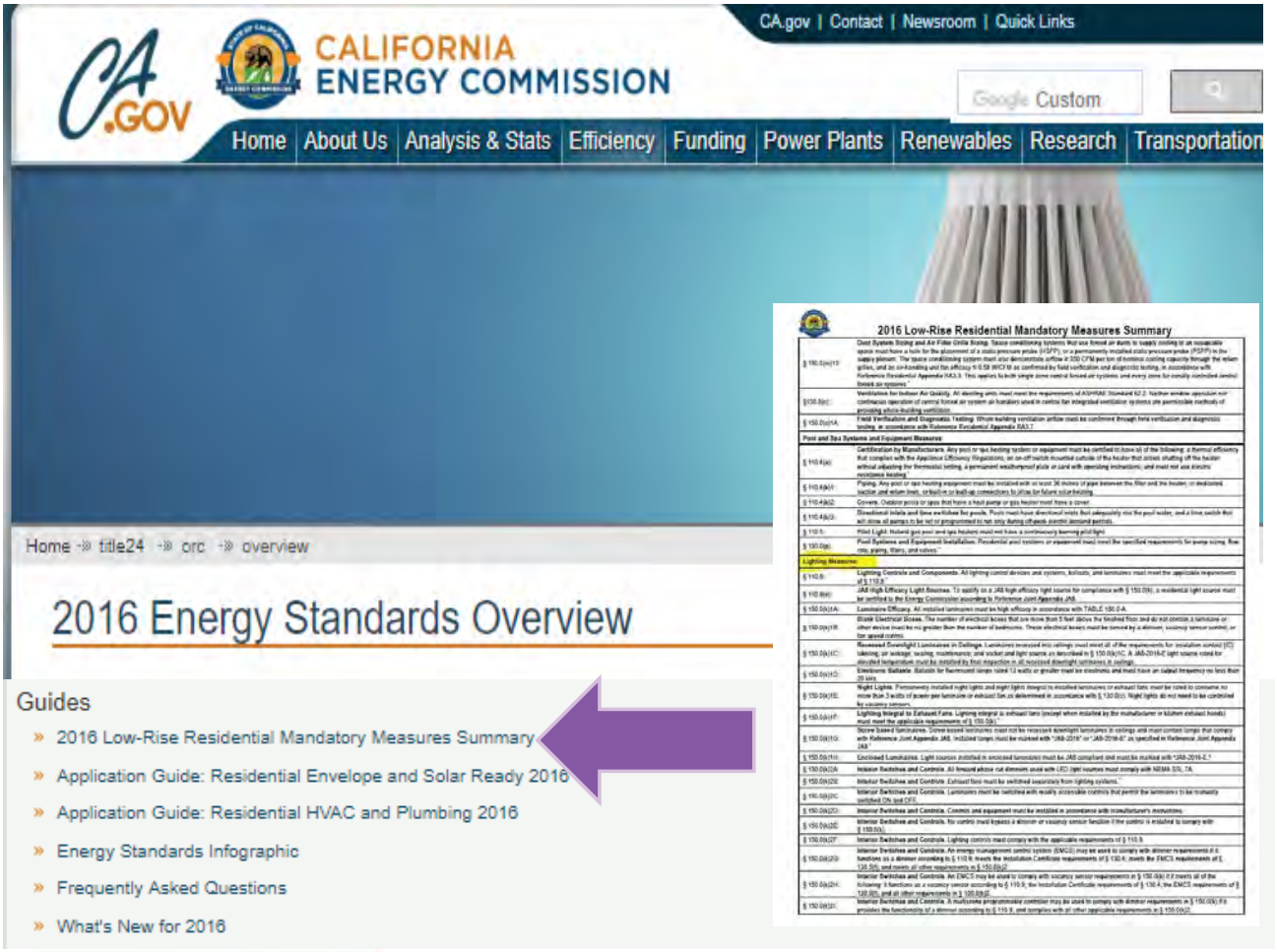


How Is This Documented?

CF2R

✦My favorite document on how, what, and when these lighting requirements apply.

Next Steps

Title 20 Support

Energy Code Ace

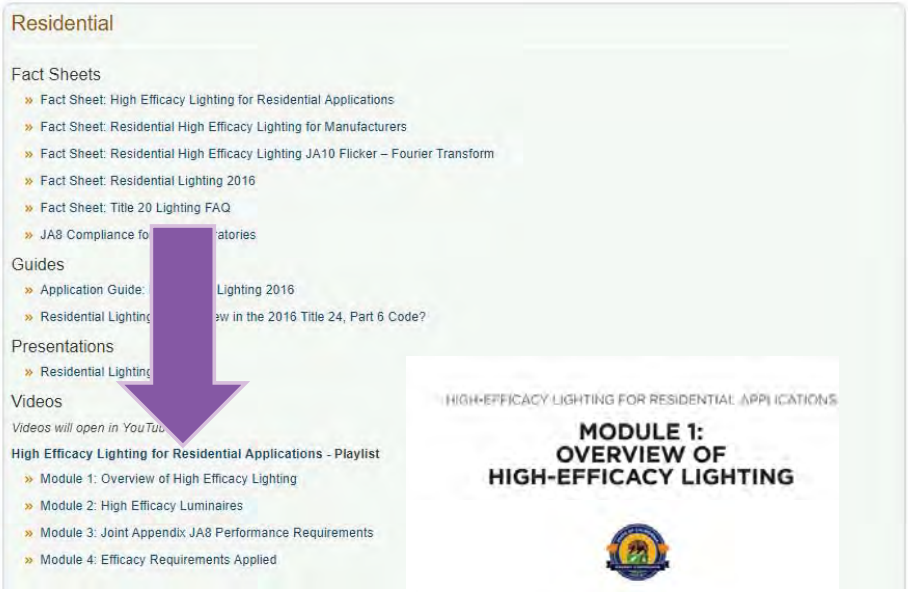
- Tools
  - Title 20 Reference Ace
- Training
  - Online self studies
- Resources
  - Numerous Fact Sheets

Where to get the Blueprints(s)

Online Resource Center
http://www.energy.ca.gov/title24/orc/

What Else is There?

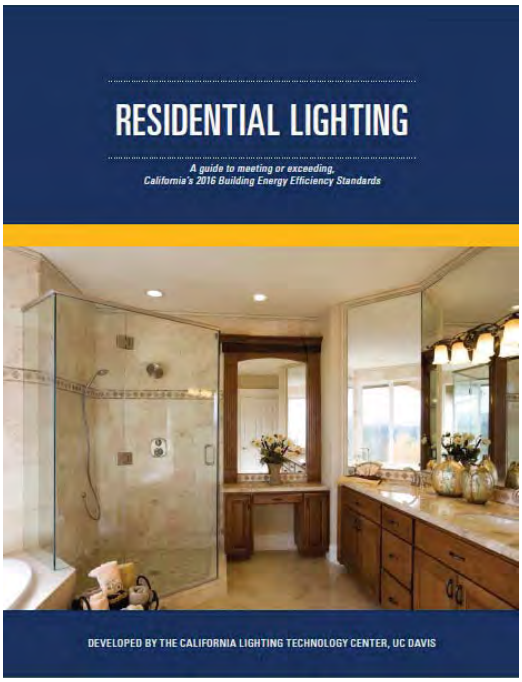
Online Resource Center
http://www.energy.ca.gov/title24/orc/



California Lighting Technology Center (CLTC)

CLTC Resources

- Application Guide
  - Provides a simplified and practical approach to lighting code compliance and design.
- Topics include:
  - Explanation of the code
  - Technical guidelines
  - Steps to compliance
  - Lighting design examples



California Lighting Technology Center (CLTC)

CLTC Resources

- Coming soon:
  - What's New in Residential Lighting for 2019?

What's Changing for 2019

- Color quality
  - JA8 will align with the Title 20 for CRI requirements of general service LED lamps.
  - All light sources provide a correlated color temperature (CCT) of 4,000 Kelvin or less.

Not Much!

- Title 24 Part 6
  - New light source categories added! Exempt if meet certain wattage, lumen and control requirements
    - Step lights
    - Path lights
    - Lights integral to drawers, cabinets and linen closets exempt if meet wattage, lumen and control requirements
  - Occupancy can be used IF programmed like a vacancy sensor ☺