

*California*  
**Energy Commission**



# **California Residential Lighting Energy Efficiency Standards**



**Energy Hotline:** 800-772-3300 (Please Call First)

**CEC:** <http://www.energy.ca.gov>

**2005 Standards for Residential and Nonresidential Buildings:**

[http://www.energy.ca.gov/2005\\_standards/rulemaking/documents/15-day\\_language/2003-10-21\\_400-03-001-ET15F.PDF](http://www.energy.ca.gov/2005_standards/rulemaking/documents/15-day_language/2003-10-21_400-03-001-ET15F.PDF)

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# California Title 24 Residential Lighting Standards

## Comparison of 2001 to 2005 Standards

Applicable provisions will also apply to interior lighting in

- High-rise residential living quarters
- Hotel/motel guest rooms



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## High Efficacy vs Low Efficacy Lighting

<b>2001 Standards</b>	<b>2005 Standards</b>
<p>It is necessary to differentiate between low efficacy and high efficacy lighting systems in order to comply with residential lighting Standards.</p>	
	<p>AND It is necessary to calculate installed wattages Kitchens</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Definition of High Efficacy Lighting

<b>2001 Standards</b>	<b>2005 Standards</b>
<p>Not less than 40 lumens per Watt.</p>	<ul style="list-style-type: none"><li>➤ 15 Watts or less: minimum <b>40</b> lumens per Watt</li><li>➤ 15 to 40 Watts: minimum <b>50</b> lumens per Watt</li><li>➤ Over 40 Watts: minimum <b>60</b> lumens per Watt</li></ul>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Ballast Requirements


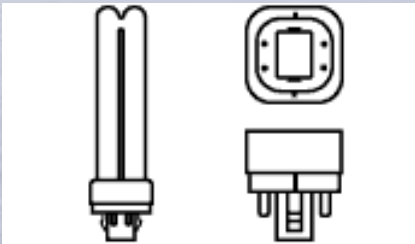
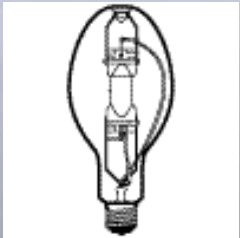
<b>2001 Standards</b>	<b>2005 Standards</b>
	<p>Ballasts for lamps rated 13 Watts or greater shall be electronic and shall have an output frequency of no less than 20 kHz.</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Definition of High Efficacy Lighting

2001 Standards	2005 Standards
<p data-bbox="125 691 877 801">Must not contain medium based incandescent sockets.</p> <div data-bbox="175 898 415 1139"></div> <p data-bbox="220 1176 354 1300">Medium Base Lamp</p> <div data-bbox="512 893 923 1135"></div> <p data-bbox="618 1176 814 1300">4-pin Quad Compact Fluorescent</p>	<p data-bbox="1018 532 1759 642">Must not contain medium based incandescent sockets</p> <p data-bbox="1087 672 1843 1200">[except for outdoor high intensity discharge lighting (HID) containing an HID lamp, and factory-installed hardwired HID ballast and HID rated socket, and meeting minimum lumens per Watt].</p> <div data-bbox="1553 936 1791 1172"></div> <p data-bbox="1606 1210 1740 1335">Medium Base HID</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine system efficacy

For all pin-based fluorescent systems, only the Watts of the lamp (not the ballast) need to be considered. Divide the initial lamp lumens by the lamp Watts.

Virtually all pin-based fluorescent systems will qualify as HIGH-efficacy for the residential lighting standards.

Initial Lumens      ÷ Watts      = Efficacy

(13-Watt Quad)      900      ÷ 13      = 69.2 lpW



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine system efficacy

All screw based lighting systems without factory installed hardwired ballasts are considered LOW-  
efficacy.

All low-voltage incandescent lighting is considered LOW-  
efficacy lighting (including tungsten halogen,  
MR-11 and MR-16).



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine system efficacy

All line voltage and low voltage tracks are considered LOW-efficacy for residential lighting standards, regardless of the lamp type attached to the track.

It must always be assumed that incandescent lamps will be used.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine wattage

Luminaires with modular components that allow conversion between screw-based and pin-based sockets without changing the luminaire housing or wiring are considered low efficacy.

It must be assumed that the maximum relamping or system wattage rated for that platform will be used.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine wattage

CFL luminaires with permanently installed ballasts that are capable of operating a range of lamp wattages, the highest operating input wattage of the rated lamp/ballast combination must be use for determining the luminaire wattage.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine system efficacy

There are no high intensity discharge (HID) lighting systems (mercury vapor, high pressure sodium, metal halide) with medium based sockets that qualify as high efficacy for interior residential lighting.

To determine efficacy for HID outdoor lighting fixtures, divide the initial rated lamp lumens by the system Watts (include lamps plus ballast Watts).

Nearly all mercury vapor systems will be LOW-  
efficacy, and most other HID systems will qualify as  
HIGH-  
efficacy.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Switching Requirements

2001 Standards	2005 Standards
<p>High efficacy lighting system must be operated on separate switch from any incandescent or other low efficacy lighting system.</p>	



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Recessed luminaires in insulated ceilings

### 2001 Standards

### 2005 Standards

Must be approved for zero-clearance insulation cover (IC)

**AND**

must be certified airtight



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# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Kitchen Lighting

### 2001 Standards

#### Definition of a Kitchen:

Kitchen/food preparation is a room or area with cooking facilities and/or an area where food is prepared.



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### 2005 Standards

#### Definition of a Kitchen:


Kitchen in a residential dwelling unit is a room or area used for cooking, food storage and preparation and washing dishes, including associated counter tops and cabinets, refrigerator, stove, ovens, and floor area. Adjacent areas are considered Kitchen if the lighting for the adjacent areas is on the same switch as the lighting for the Kitchen.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Kitchen Lighting

<b>2001 Standards</b>	<b>2005 Standards</b>
General lighting must be high efficacy.	At least 50% of installed wattage must be high efficacy. Lighting in areas adjacent to the Kitchen ( <i>i.e.</i> Nook) is considered Kitchen lighting if it is on the same switch as the Kitchen lighting.
Additional luminaires used for decorative effects need not meet this requirement.	 <p data-bbox="1367 1325 1848 1353">© Progress Lighting, used by permission</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Kitchen Light Switching

<b>2001 Standards</b>	<b>2005 Standards</b>
<p>General lighting must be controlled by a switch on a readily accessible lighting control panel at an entrance to the Kitchen.</p>	<p>High efficacy lighting must be switched separately from low efficacy lighting.</p> <p>There are no longer any constraints on where the separate switches are located.</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

For Kitchens, at least 50% of the installed wattage must be high efficacy. NO EXCEPTION.

Kitchen is the only room where wattage is a factor in residential lighting Standards compliance. It must be established that at least 50% of the installed wattage is high efficacy.

This means that for every four or five high efficacy fixtures, one low efficacy Kitchen lighting fixture may be installed.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

When calculating the energy use of low-efficacy (screw-based) lighting for residential Kitchens, it does not matter what lamp wattage or lamp type is used in a screw-based fixture.

It must always be assumed that an incandescent lamp of the maximum relamping rated wattage will be used.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

The label on the fixture showing the maximum relamping rated wattage must be permanently installed on the fixture at the factory. Field installed labels are not allowed.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

Low Efficacy System	Required High Efficacy System
<p>1 recessed can with screw based socket.</p> <p>Relamping rated wattage on factory installed label = 100 Watts.</p> <p>Low Efficacy System = 100 Watts.</p>	<p><b><u>Minimum Required:</u></b></p> <p>100 Watts</p> <p>Example:</p> <p>4 CF fixtures x 26 Watts = 104 Watts</p> <p><i>(Assuming input wattage on electronic ballast = 26 Watts.)</i></p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

Low Efficacy System	Required High Efficacy System
<p>2 recessed cans with screw based sockets.</p> <p>Relamping rated wattage on factory installed label = 100 Watts.</p> <p>Low Efficacy System = 200 Watts.</p>	<p><b><u>Minimum Required:</u></b></p> <p>200 Watts</p> <p>Example:</p> <p>5 CF fixtures x 26 Watts = 130 Watts</p> <p>Plus minimum 70 Watts high efficacy/electronic ballasts under cabinet lighting.</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

Standards say:

The wattage of line-voltage lighting track and plug-in busway which allows the addition or relocation of luminaires without altering the wiring of the system shall be the volt-ampere rating of the branch circuit feeding the luminaires or an integral current limiter controlling the luminaires, or the higher of the maximum relamping rated wattage of all of the luminaires included in the system, listed on a permanent factory-installed label, as specified by UL 1574, or 45 Watts per linear foot.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

### Track Lighting

Add the maximum relamping rated wattage of all installed track heads to determine if more than 45 Watts per linear foot has been used.

If using more than 45 Watts per foot of track, then you must use the larger number, otherwise use 45 Watts per foot of track.

A dimmer switch does NOT qualify as an integral current limiter controlling the luminaires.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

Standards say:

The wattage of low-voltage lighting track, cable conductor, rail conductor, and other low voltage flexible lighting systems, which allows the addition or relocation of luminaires without altering the wiring of the system, shall be the rated wattage of the transformer supplying the system, listed on a permanent factory installed label, as specified by UL 1574 or UL 1598.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE

Standards say:

The wattage of all other miscellaneous lighting equipment ***[only lighting equipment not already addressed in §130 (c) 1 through 4]*** shall be the maximum rated wattage ***[for incandescent]*** of the lighting equipment, or operating input wattage ***[for any other lighting system not addressed in §130(c) 1 through 4, including low-voltage mono point systems]*** of the system, listed on a permanent factory-installed label, or published in manufacturer's catalogs, based on independent testing lab reports as specified by UL 1574 or UL 1598.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## How to determine WATTAGE for Kitchen Lighting

For all luminaires with incandescent lamp holders the maximum rated relamping wattage shall be used, not the wattage of the lamps that are installed.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Bathroom Lighting

### 2001 Standards

#### Definition of a Bathroom:

Each room containing a shower or tub



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### 2005 Standards

#### Definition of a Bathroom:

Bathroom is a room containing a shower, tub, toilet or a sink that is used for personal hygiene.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Bathroom Lighting


2001 Standards	2005 Standards
<p>Each room containing a shower or bathtub must have at least one high efficacy luminaire.</p>	<p>All hardwired lighting must be high efficacy, or controlled by a manual-on occupant sensor (must turn off automatically when no one is present, then as normally done when lighting is needed, must be turned on manually with a switch)</p>
<p>Or, an alternative option to high efficacy bathroom lighting includes:</p> <p>High efficacy not needed in first bathroom if high efficacy lighting is installed in a utility room, laundry room, or garage,</p> <p><b>AND</b></p> <p>All outdoor lighting must be high efficacy or equipped with a motion sensor.</p> <p>If using the alternative option, each additional bathroom must have at least one high efficacy luminaire</p>	



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Bathrooms, Garages, Laundry Rooms, and Utility Rooms

<b>2001 Standards</b>	<b>2005 Standards</b>
<p>In 2001, Bathrooms are addressed separately from Garages, Laundry Rooms, and Utility Rooms.</p>	<p>Lighting in Garages, Laundry Rooms, and Utility Rooms must all meet the same requirements as apply to Bathrooms.</p> <div data-bbox="1030 892 1315 1315">A white, rectangular motion control wall switch with a sensor window at the top and a small indicator light below it.</div> <p data-bbox="1332 1263 1751 1299">Motion control wall switch</p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## For all other rooms (i.e. hallways, stairs, dining rooms, etc.)

2001 Standards	2005 Standards
No requirements	<p>All hardwired lighting must be high efficacy, or controlled by a manual-on occupant sensor, or controlled by a dimmer.</p> <p><b>Exception: Closets less than 70 square feet are exempt from this requirement.</b></p>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Outdoor lighting attached to a building

### 2001 Standards

No requirements unless used as an alternate option for high efficacy bathroom lighting.



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### 2005 Standards

All outdoor lighting attached to buildings must be high efficacy, or controlled by both a motion sensor AND photocontrol.

Lighting NOT attached to a building, like landscape lighting, is exempt from this requirement.



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Residential parking lots and garages for 8 or more vehicles

<b>2001 Standards</b>	<b>2005 Standards</b>
No requirements	<p>Must meet the lighting requirements for nonresidential buildings, which may include:</p> <ul style="list-style-type: none"><li>➤ <b>Mandatory Measures:</b><ul style="list-style-type: none"><li>➤ Automatic shutoff controls</li><li>➤ Bi-level switching</li><li>➤ +175W cutoff</li><li>➤ Minimum efficacy or motion sensor</li></ul></li><li>➤ Lighting power allowances per Lighting Zone (LZ)</li></ul>



# California Title 24 Residential Lighting Standards

Comparison of 2001 to 2005 Standards

## Common Areas of low-rise residential buildings with 4 or more dwelling units

<b>2001 Standards</b>	<b>2005 Standards</b>
No requirements	All hardwired lighting must be high efficacy or controlled by an occupant sensor.

# Summary Table of 2005 Residential Lighting Standards

<b>Kitchen</b>	Electronic Ballasts for all lamps rated 13 Watts or greater	All Hardwired Lighting Must be High Efficacy	Alternate option: Up to 50% of relamping rated WATTAGE can be other than high efficacy
<b>Bathroom</b> <b>Garage</b> <b>Laundry Room</b> <b>Utility Room</b>			Alternate option: Manual-on occupant sensor
<b>All other interior rooms (i.e.: Hallway, Dining Room, Bedroom)</b>	Recessed luminaires in all insulated ceilings approved for zero-clearance insulation cover (IC) and certified airtight		Alternate options: Manual-on occupant sensor, or dimmer
<b>Outdoor lighting attached to buildings</b>	Switch all high efficacy lighting separate from low efficacy lighting		Alternate option: Motion sensor plus photo control
<b>Common Areas of low-rise residential buildings with 4 or more dwelling units</b>			Alternate option: Occupant sensor
<b>Residential parking lots and garages for 8 or more vehicles</b>	Must meet 2005 Nonresidential Building Standards		

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# **Early Adopters Lighting Compliance Credit**



## **Early Compliance Credit**

# **Limited Term Compliance Option**

- Approved May 5, 2004
- Available until October 1, 2005  
(when 2005 Building Energy Standards take effect )



## **Early Compliance Credit**

# **Limited Term Compliance Option**

- Responds to comments received from several individuals and groups.
- Initiate a credit to encourage early compliance with the 2005 residential lighting Standards.
- Designed to be energy neutral.



## Early Compliance Credit

# Limited Term Compliance Option

- The residential lighting changes represent about 2/3 of the annual electricity savings for residential buildings in the new Standards; and
- require a significant change in building industry practice.



## **Early Compliance Credit**

### **Eligibility Criteria Includes...**

- Building permit application before October 1, 2005.
- Single family buildings.
- Multi-family buildings where single dwelling units are modeled individually for showing compliance using the multiple orientation approach.



## **Early Compliance Credit**

### **Eligibility Criteria Includes...**

- Field verification by a certified HERS Rater
- Supplement to Form CF-4R signed and dated by the HERS Rater.



## Early Compliance Credit

### Eligibility Criteria Includes...

- Performance Standards Calculations:
  - Supplement to Form C-2R completed by builder or designer;
  - Form replaces the Energy Use Summary table of the actual C-2R generated by compliance software;
- Attach to signed CF-1R and C-2R forms.



## **Early Compliance Credit**

# **2001 Requirements**

- General lighting in Kitchen controlled by a switch on readily accessible control panel at an entrance.
- Rooms with shower or bathtub must have at least one high efficacy luminaire.



## **Early Compliance Credit**

# **2005 Requirements**

- All 2005 requirements as listed in prior presentation.

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**Q u e s t i o n s ?**