

## LIGHT UP YOUR HOME IN THE YEAR 2010 AND BEYOND

*Carol Lamkins, CID, CMKBD*

The time has come to phase out the 125-year-old incandescent “bulb” in the next four to twelve years in favor of new generation energy-efficient lamps that will cost consumers more but return their investment within a few months. The old “bulbs” (lamps) will be replaced by energy-efficient products, including compact fluorescents (CFLs) and emerging products such as light-emitting diodes and energy-saving incandescent lamps.

According to recent legislation, all lamps must use 25% to 30% less energy than today's products by 2012 through 2014. Between January 2012 and January 2014, a push for this efficiency assimilation will result in the 100-watt lamp being replaced with a 40-watt energy efficient lamp. By 2020 lamps must be 70% more efficient to qualify as high efficacy. Efficacy is the ratio of light from a lamp to the electrical power consumed, expressed as lumens per watt.

The new rules are expected to save consumers \$40 billion in energy and other costs from 2012 to 2030, avoid construction of 14 coal-fired power plants and cut global-warming emissions by at least 51 million tons of carbon annually. Consider that incandescent lighting creates more pollutants and gives off more greenhouse emissions than energy-efficient lighting. If just one room in every U.S. home had Energy Star labeled lighting, the change would keep one trillion pounds of greenhouse gases out of the air.

On average, lighting accounts for about 25% of all the electricity used in a home. The Energy Star program focuses on labeling energy-efficient lighting that produces greater light for less money. The Advanced Lighting Package (ALP) within the Energy Star program ranks rooms based on frequency of use and offers the minimum percentage of fixtures per area needed to improve the quality of life. All Energy Star qualified fixtures follow National Fire Protection Association (NFPA) guidelines for fire safety. Each fixture model is tested and meets strict specifications for energy efficiency and quality. Each product carries a 2-year warranty.

Despite the new laws and regulations, overcoming consumer objections may still be an issue. Here are some points that make sense.

1. Fluorescent lighting has come into a new age in both residential and commercial making applications and retrofits easier. Typical CFLs are around the size of an A-19 incandescent lamp (the common light “bulb”) that has been a standard in fixtures for decades. Long, slender fluorescent lamps or tubes are still in use and offer a variety of lengths and diameter sizes (T2, T4, T5, T6, T8, T12 and up). Keep in mind that you would need to use around 12 incandescent bulbs to match the 10,000-hour life of one compact fluorescent lamp. Multiply 12 by the number of lamps it takes to operate the fixtures in your home and you'll understand how quickly consumable items fill landfills.

2. Recessed fluorescent fixtures use less electricity and now they must also be airtight, passing less than two cubic feet of air each minute. Airtight saves money by not allowing cool air to escape in the summer or warm air in the winter.
3. High-efficacy fixtures and bulbs give off more lumens (light output) for less wattage. You receive about the same amount of light by replacing a fixture that accepts a 60w incandescent bulb/lamp with a fixture that accepts a 13w compact fluorescent lamp.
4. Energy-efficient lighting provides brighter illumination over a general area versus incandescent and halogen lamps. The latter two are brighter when you are closer to the lamp (measured in footcandles) than when you are at a distance. You should be able to “lumen match” the incandescent fixtures by specifying fluorescent systems that use 1/3 or 1/4 as much power.
5. The advancement of fluorescent lighting colors meets or exceeds the quality of light and luminance levels of the top incandescent and halogen lamps. A very important consideration of light is the Kelvin temperature or the color of the emitted light. Popular Kelvin temperatures range around 2000k which is typical of incandescent lamps. So the cool eerie blue fluorescent color has been overshadowed by the choices of warmer temperature options of light.

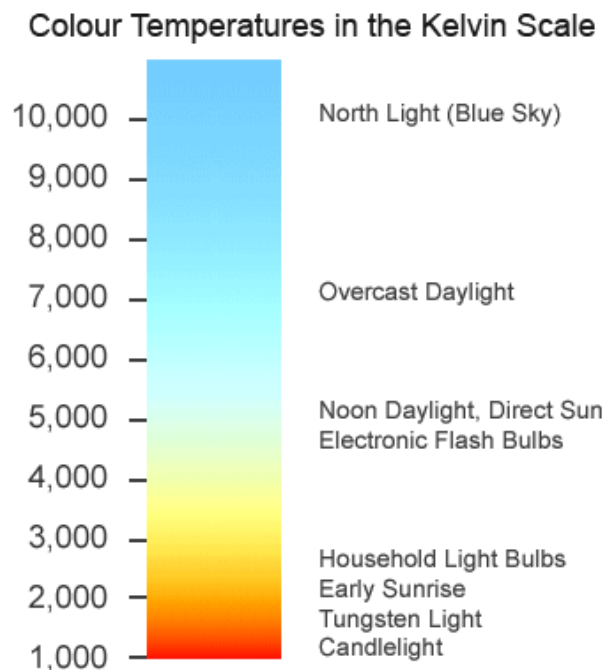


Image courtesy of [www.mediacollege.com](http://www.mediacollege.com)

6. Compact fluorescent lamps produce more light with about 70% less heat than incandescent or halogen bulbs. The electronic ballasts work in a way that causes the lamps to use less energy to start and operate. Electronic ballasts operate at over 20,000 cycles per second as opposed to conventional magnetic ballasts, which alternate at 60 cycles per second. By operating at this higher frequency, electronic ballasts increase lamp efficacy by 10-15% and completely eliminate hum and flicker.
7. The Color Rendering Index (CRI) describes the effect a light source has on the color appearance of an object by measuring how accurately light reflects the true color of

an object. CRI rates light sources on a scale of 0 to 100 with higher CRIs being closer to the natural color of objects. 80+ CRI is considered excellent.



Warm White  
3000k - 52 CRI

SPX 30  
3000k - 82 CRI

SPX 65  
6500k - 82 CRI

8. When you increase your light level, you increase safety with better visibility. Whether it is part of our exterior security system or simply for navigating hallways and corridors, increased levels create safer environments. Also as we age we need more light for tasks such as food preparation, sewing or reading.
9. Another important safety feature of compact fluorescent products is that they produce about 70% less heat than incandescent or halogen lamps. Being cooler to touch than both incandescent and halogen fixtures, you don't need to wait long for energy-efficient lamps to cool down before replacing. In some instances, you don't have to wait at all. That means they are safer to replace without burning the skin.
10. And lastly, consider the frequency of lamp replacement of high mounted fixtures. You can you reduce the chance of ladder accidents when you only need to change the high-efficiency lamps once every seven years or so.

Now let's move on to a simple outline of **CALIFORNIA TITLE 24 - The new residential lighting Standards** effective January 1, 2010.

**OVERVIEW:**

1. Applies only to permanently installed luminaires
2. In general, the following are high efficacy luminaires:
  - a. Fluorescent fixtures with electronic ballasts
  - b. CFL fixtures with electronic ballasts
  - c. Fixtures with High Intensity Discharge (HID) lamps
3. In general, the following are NOT high efficacy luminaires:
  - a. Any fixture with incandescent lamps
  - b. Any fixture with a screw base CFL
4. Portable lighting is exempt (plug-in table lamps, floor lamps, etc.)
5. Wattage of luminaires are only a factor in kitchens

- Does not apply to luminaires that are integral to appliances (refrigerators, range hoods, garage door openers)

### SUMMARY OF REQUIREMENTS

<b>High-Use Areas</b> According to Energy Star's Advanced Lighting Package, at least <b>50%</b> of fixtures should be energy-efficient.	<b>Medium-Use Areas</b> According to Energy Star's Advanced Lighting Package, at least <b>25%</b> of fixtures should be energy-efficient.	<b>Outdoor Areas</b> According to Energy Star's Advanced Lighting Package, at least <b>50%</b> of fixtures should be energy-efficient.
<ul style="list-style-type: none"> <li>➤ <b>Kitchen</b></li> <li>➤ <b>Dining Room</b></li> <li>➤ <b>Living Room</b></li> <li>➤ <b>Family Room</b></li> <li>➤ <b>Bathrooms</b></li> <li>➤ <b>Halls</b></li> <li>➤ <b>Stairways</b></li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Bedrooms</b></li> <li>➤ <b>Den</b></li> <li>➤ <b>Office</b></li> <li>➤ <b>Basement</b></li> <li>➤ <b>Laundry Room</b></li> <li>➤ <b>Garage</b></li> <li>➤ <b>Closets</b></li> <li>➤ <b>All other rooms</b></li> </ul>	<ul style="list-style-type: none"> <li>➤ <b>Affixed to Home</b></li> <li>➤ <b>Free-standing poles, excluding landscape and solar lighting</b></li> </ul>

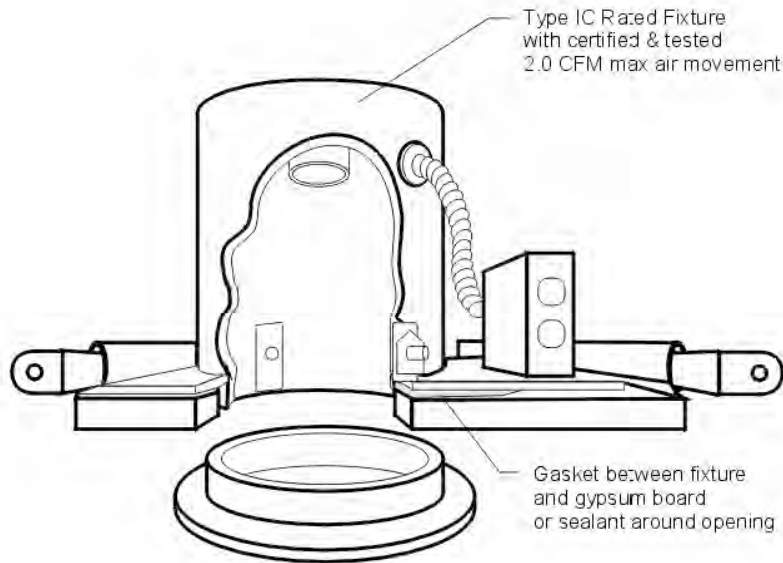
Following are some additional requirements required by Title 24.

#### HIGH EFFICACY RECESSED LUMINAIRES:

- No screw bases are allowed in compact fluorescent.
- Luminaires must be dedicated, pin-type.
- Standards do not recognize any adaptor as being able to permanently convert one type of luminaire to another type regardless of manufacturer's declarations.  
NOTE: If a luminaire has a screw-base socket, or an adaptor with a screw-base socket, it is not high efficacy, regardless of manufacturer claims.
- Electronic ballasts are required for all fluorescent lamps with power rating of 13w or more.
- LED fixtures must be California Energy Commission (C.E.C.) Certified.
- Lamps must have a minimum rated life of 30,000 hours when operated at or below a specified maximum case temperature.
- Fixtures must not exceed maximum ballast case temperature.
- Fixtures must have a ballast factor of not less than 0.90 for non-dimming ballasts.
- Fixtures must have a ballast factor of not less than 0.85 for dimming ballasts.
- Fixtures must allow ballast maintenance and replacement readily accessible from below the ceiling without cutting holes in ceiling.

## RECESSED FIXTURES IN INSULATED CEILINGS

1. Recessed ceiling fixtures must be zero clearance, insulated contact (IC) rated (heat is limited to the ballast) and certified air tight (AT) construction (not all trim kits qualify), approved and labeled "ICAT" according to ASTM E283.
2. All fixtures must be sealed with gasket or caulk between housing and ceiling.
3. The label is best verified at rough-in - the inspector may have to remove trim kit to see labels if verified at final inspection.
4. Certified trim kits on non-certified air tight (AT) fixtures will not be accepted by the inspectors.



## KITCHEN

1. Definition of a kitchen is a room or area used for food storage and preparation and washing dishes, including associated counter tops and cabinets, refrigerator, range, cooktop, oven and floor areas.
2. Any other lighting on the same switch as kitchen lighting is also considered kitchen lighting whether or not the luminaries are in the kitchen area.
3. There is no limit to kitchen lighting watts, however 50% of total installed lighting watts must be high efficacy.
4. Internal cabinet lighting allowance 20 watts per linear foot of illuminated cabinet must be interior to cabinet and illuminate the inside of cabinet measured either vertically or horizontally.
5. High efficacy fixtures switched separately from incandescent or low efficacy fixtures.
6. Switches may be mounted on the same faceplate but switched independently.
7. Additional low efficacy wattage allowance is available if kitchen has manual on vacancy sensors or dimmers.

## **BATHROOMS, GARAGES, LAUNDRY ROOMS, CLOSETS (less than 70 sq. ft.) and UTILITY ROOMS**

1. Additional low efficacy wattage allowance is only available after 50% efficacy rule is met - rules are unchanged from 2008.
2. All fixtures must either be high efficacy or controlled by a vacancy sensor (an occupancy sensor does not necessarily qualify as a vacancy sensor).
3. Sensor must be manual on and automatic off.

## **OTHER SPACES including LIVING ROOMS, DINING ROOM, BEDROOMS, ATTICS and ENCLOSED PATIO (unconditioned)**

1. High efficacy fixtures required with regular switch or incandescent fixtures with a vacancy sensor or a dimmer.

## **NIGHT LIGHTS**

1. Permanently installed night lights include those permanently installed in luminaires or exhaust fans.
2. Night lights shall contain only high efficacy lamps with no line voltage lamp holder or shall consume no more than 5 watts with no screw-base lamp holder.
3. Indicator lights that are integral to lighting controls shall consume no more than 1 watt.

## **CEILING FANS**

1. Provide more comfort and better light while using less energy with energy-efficient motors, better blade aerodynamics, energy-efficient lighting, more intelligent controls and better education of installers and purchasers.
2. Using (CFLs) could make ceiling fan lighting even more energy-efficient.
3. Compact fluorescent lamps long life reduces the hassle of changing lamps, especially in rooms with high ceilings.
4. Compact fluorescent light output can be much higher, given the UL limit of 60 watts per socket imposed on most light kit designs to prevent overheating.
5. Lower heat output from compact fluorescent lamps improves occupant comfort in most applications.
6. Ceiling fans with incandescent light kits need one switch for the fan and one dimmer/occupancy sensor for the lights – fluorescent lamps need only one switch.

## **OUTDOOR LIGHTING permanently mounted to the building**

1. Fixtures must either be high efficacy or controlled by a manual on/off switch and an auto-on and auto-off motion sensor that must comply with a 30 minute shutoff requirement.
  - a. Section 119 also allows for a temporary override switch to bypass motion sensor providing sensor is automatically reactivated within 6 hours - for parties in your backyard that last longer than 30 minutes.
2. One of the following three methods shall automatically turn the lights off during the daytime:

- a. Photocell control not having an override or bypass switch that disables the photo control; or
  - b. Astronomical time clock not having an override or bypass switch that disables the astronomical time clock; or
  - c. Energy management control system (EMCS) not having an override or bypass switch that allows the luminaire to be always on.
3. Exempt outdoor lighting:
- a. Any fixtures not attached to building
  - b. Decorative landscape lighting
  - c. Pool/Spa lighting (lighting installed directly above the water in outdoor pool, spa, hot tub, or fountain.
    - i. Pool lighting is in an area extending between 5 feet and 10 feet horizontally from inside walls of a pool.
    - ii. Spa, hot tub or fountain lighting is within 5 feet from inside walls and underwater luminaires.

## **LIGHTING CONTROLS**

### **1. Motion Sensors**

- a. At dusk a motion detector turns on the light automatically whenever sensing moving heat sources (such as a walking person or moving vehicle) in its coverage area and stays on as long as motion is detected.
- b. When motion stops, light will remain on for the predetermined time set (usually 2 or 6 minutes) and then turns off automatically.
- c. Most motion sensor fixtures are designed with screw bases for incandescent lamps.

### **2. Time-Controlled**

- a. Time controlled fixtures will turn off after a predetermined time set that could be anywhere from 2 – 30 minutes.
- b. They are most commonly designed with screw bases for incandescent bulbs.

### **3. Dimmers**

- a. Most commonly used with incandescent fixtures, dimmers are available for fluorescent fixtures.
- b. Putting a fluorescent fixture on a dimmer can be an expensive process.

The justification for Title 24 is environmental but the enforcement is based on the law. Designer awareness of these California code changes is vital for luminaire specifications to avoid costly change orders. All applicable Title-24 lighting requirements must be listed in the general notes on the drawings and other bid documents. These include Title-24 lighting requirements with each luminaire listed in the lighting schedule text. All fixtures are either high efficacy or low efficacy and must be labeled as such on lighting fixture schedule. This is especially critical for kitchen lighting calculations. All control requirements must be listed for other rooms.

These specifications are required for plan check. The new Title 24 Residential Lighting form CF-6R-LTG-1 (download at [http://www.energycode.com/?page\\_id=97](http://www.energycode.com/?page_id=97)) must be available during the field inspection versus the plan check.

**RESOURCES AND ADDITIONAL INFORMATION:**

[www.energy.ca.gov/title24/2008standards/index.html](http://www.energy.ca.gov/title24/2008standards/index.html)

[http://cltc.ucdavis.edu/images/documents/presentations/20091207\\_title24\\_presentation.pdf](http://cltc.ucdavis.edu/images/documents/presentations/20091207_title24_presentation.pdf)

[www.energy.ca.gov/title24/2008standards/index.html](http://www.energy.ca.gov/title24/2008standards/index.html)

[www.mediacollege.com/lighting/colour/colour-temperature.html](http://www.mediacollege.com/lighting/colour/colour-temperature.html)

[www.sizes.com/units/CRI.htm](http://www.sizes.com/units/CRI.htm)

[www.energycode.com](http://www.energycode.com)

[www.nema.org/lampballastmatrix/RLF\\_V4\\_2\\_FINAL.pdf](http://www.nema.org/lampballastmatrix/RLF_V4_2_FINAL.pdf)