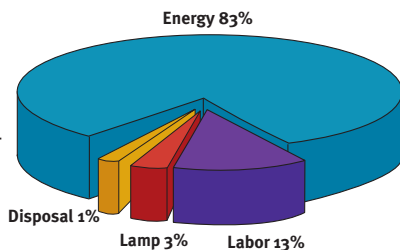


## Energy Efficient Lighting and Controls Upgrade

*An energy efficient lighting retrofit offers the fastest payback of all energy conservation measures, usually one to three years depending on hours of operation and utility rates. Unlike some other energy conservation measures there is no trade-off of quality for savings — there is actually significant improvement in the quality and quantity of light.*

### The Real Cost of Lighting

Over the life of a typical lamp the greatest expense incurred by far is the electricity it consumes, not the cost of lamp replacement or even the initial cost of the lamp.



### Reduction in Fixture Input Wattage

The input wattage of a standard magnetic ballast and two 40 watt T-12 lamps is 96 watts, whereas the input wattage of a low power electronic ballast and two T-8 lamps is 47watts, over a 50% reduction. Even more savings can be realized by delamping (removing lamps) while maintaining comparable light levels using a high output ballast, the stronger and higher color rendering lamps, a reflector or all of the above. LED exit signs use less than 10% of the energy consumed by incandescent exit signs, and CFL's use less than 25% of the energy consumed by incandescent bulbs. Light levels can be maintained and are in some cases better than before the fixture retrofit or replacement.

### Air Conditioning Savings

Lighting is a very inefficient and mostly unwanted source of heat. This heat is useful during the winter, but during the summer it causes the air conditioning system to work harder. For example, in Los Angeles the heat load factor is 1.15 which means that for every 100 watts in lighting input wattage saved, another 15 watts will be saved in the operation of air conditioning, even considering the heat loss during the winter months.

### Lower Maintenance Cost

Electronic ballasts, T-8's, CFL's, and LED's last longer than magnetic ballasts, T-12's and incandescent lamps. After delamping there are fewer lamps to replace, and considering that the labor cost of replacing lighting is typically greater than the cost of the component itself, the total savings can be very significant.

### Better Output Over Life (Lumen Maintenance)

Light output of lamps is measured in lumens. Both T8's and T12's start with about the same lumen output, but over their lives the T12 will lose 30% to 40% of its lumens while the T8 will lose only 5% to 10%. The graph on the right compares the lamp lumen maintenance over lamp life of T8's and T12's.

### Better Quality and Color (Color Rendering Index)

The colors in the boxes on the left approximate the eight standard colors accepted internationally for use in measuring the quality of a given light source by comparison to a standard light source. The universal scale for lighting quality is called the Color Rendering Index (CRI). On a scale of 1 to 100

the higher the score the better the quality. New T8's and CFL's score 85 CRI while older fluorescent T12 lamps score just 62 CRI. At 85 CRI T8's are easier on the eyes and make skin tones look more natural and paint and carpeting look newer.

**These new breakthrough products make it possible to not only reduce lighting costs but to also drastically improve lighting quality.**

**Electronic Fluorescent Ballasts and T8 Fluorescent Lamps** operate at 40,000 Hz instead of the standard 60 Hz. The higher frequency results in more efficient transfer of power to the lamp, less heat production and more light. The lamp and ballast combination lasts longer and is 30% to 40% more efficient. Lamps start faster, and the health-related factors of flicker and hum are virtually eliminated. T8 lamps (1" diam.) contain higher quality phosphors which produce better quality light than standard T12 lamps. The smaller diameter lamp also allows more light to exit the fixture.

**Compact Fluorescent Lamps (CFL's)** are miniature versions of the fluorescent fixture with a ballast and tubes made to resemble incandescent bulbs. CFL's combine the higher color rendering of the rare earth phosphors (85CRI) with the compact and flexible design of incandescent bulbs. There are screw-in or hard-wire replacements for most incandescent fixtures requiring less than 25% of the energy to operate and lasting 5 to 10 times longer.

**Light Emitting Diodes (LED's)** are tiny electronic light sources that provide an efficient low level of light for exit signs and nightlights. The typical array of LED's consumes only 2 watts, and it will last 25 years or more.

**Controls** consisting of occupancy sensors, photo sensors, dimmers and timers can reduce the hours of operation of lighting and HVAC systems by 25% to 75%.

**New linear fluorescent fixtures, HID and compact fluorescent fixtures** containing energy efficient components are often the best solution for older fixtures, fixtures that cannot be readily retrofitted or for areas with insufficient light.

