

BUILDER'S GUIDE TO ENERGY EFFICIENT HOMES IN LOUISIANA: LIGHTING

by
Howard Hershberg, AIA

The Builder's Guide to Energy Efficient Homes in Louisiana (Builder's Guide) is being updated to reflect new code requirements. This is the tenth in a series of articles that will summarize the information in the guide and highlight updates.

Lighting and appliances account for 10% to 50% of residential energy use (see figure 1). Consumers can reduce lighting energy consumption without losing lighting quality. Some ways to achieve this are to paint and decorate with light colors; set general overall lighting at minimum acceptable levels; provide task lighting for activities that require more light; increase the efficiency of lamps, ballasts and fixtures; improve light quality by reducing glare and brightness contrast; and use daylighting whenever possible.

Light quality describes how well people in a lighted space can see to do visual tasks, and how comfortable they feel in that space. Good lighting quality is characterized by uniform brightness and the absence of glare. Light quality is important to energy efficiency because spaces with good light quality require less illumination, and therefore demand less electrical energy.

Figure 1. Annual Electrical Energy: Kilowatt-Hours

Appliance	Low Estimate	High Estimate
Lighting	200	2000
Refrigerator	500	2000
Clothes Dryer	300	1500
Clothes Washer*	100	1000
Television	100	600
Well pump	250	750
Hot tub / spa	1000	2500
Computer	50	400

* Includes water heating.

Energy Information Administration, Lawrence Berkeley Laboratory, and utility sources.

When using daylighting to illuminate a building, eliminating glare is essential for good lighting quality. Glare can be avoided by using light shelves, wide window sills, walls, louvers, and other devices to reflect light deeply into the building. Windows and skylights carefully located away from the sun's direct rays minimize overheating. Likewise, new selective glazings can transmit most visible light, while excluding most solar heat.

There are four basic types of lighting – incandescent, fluorescent, high intensity discharge and low pressure sodium. Incandescent lamps are the oldest, most common, and most inexpensive lamps. Incandescent lighting is produced by a white hot coil of tungsten wire that glows when heated by an electrical current. The type of

glass enclosure surrounding this tungsten filament determines its light beam's characteristics. Incandescent lamps have the shortest service life of the common lighting types. All incandescent lights are very inefficient compared to other lighting types.

Compact Fluorescents (CFL's) are the most significant recent lighting advance for homes. They combine the efficiency of fluorescent lighting with convenience and universality of incandescent fixtures. Recent advances in CFL design also provide more natural color rendition; and less flicker than older designs. CFL's can replace incandescent lights of roughly 3-4 times their wattage. CFL's are available in integral and modular designs. Integral CFL's combine ballast and lamp as a single disposable unit. Modular designs feature a separate ballast that will survive several lamp replacements before it wears out.

Lighting accounts for 20% to 25% of all American energy consumption. An average household dedicates 5% to 10% of its energy budget for lighting, while commercial establishments consume 20% to 30% of their total energy use for lighting. A typical residence or commercial facility wastes 50% or more of its lighting energy because:

1. Illumination levels are too high.
2. Lamp size and type are not optimized for their use.
3. Lights remain on too long because of carelessness or inadequate control.
4. The lighting system is dirty, antiquated, or inefficient.

Consumers can reduce light levels (without reducing lighting quality) and save lighting energy by following some or all of the following procedures:

1. Redesign visual tasks: Use a better printer with darker lettering, or install light filtering shading devices to reduce glare.
2. Reduce light levels where there are no visual tasks. Provide minimum light necessary for safety, security, and aesthetics.
4. Reduce electricity consumed by the light source, or reduce the time the light is on. Reduce a light sources' "on" time by improving lighting controls and educating users to turn off unneeded lights.
5. Lower the wattage by relamping with more efficient lighting such as CFL's.
6. Replace electric lights with natural lighting.

Maintenance is vital for lighting efficiency. Light levels fall over time because of fixture dirt, room surface dirt, and lamp aging. Together these factors can reduce lighting illumination by 50% or more while the lamps still draw full power. Clean lamps and lenses every 6 to 24 months. Replace all yellow appearing lenses. Clean or repaint walls and ceilings when dirt collects on surfaces, reducing the amount of light they reflect. Consider replacing all lamps in a lighting system at once. Common lamps, especially incandescent and fluorescent lamps, lose 20% to 30% of their light output over their service life. Group relamping saves labor, keeps illumination high, and avoids straining fluorescent ballasts with dying lamps.

This information was summarized from *Residential Energy: Cost Savings and Comfort for Existing Buildings* by John Krigger and Chris Dorsi.¹ More information on energy savings features, and the full text of the *Builder's Guide*, can be found on the DNR Technology Assessment Division website at URL: <http://www.dnr.louisiana.gov/tad> and click on the *Builder's Guide* link.

¹ John Krigger and Chris Dorsi, *Residential Energy: Cost Savings and Comfort for Existing Buildings*, Saturn Resource Management, Inc., Montana, 2004.