

Creative Uses of Fluorescent Lighting

Energy-efficient fluorescent lighting need no longer play second fiddle to incandescents.



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Traditional incandescent fixtures can now be replaced with pin-based compact fluorescent light fixtures. A range of residential styles are now being offered.

by Jennifer Brons

Researchers and public policy advocates have long known that fluorescent lighting saves energy and reduces atmospheric pollution, but public acceptance of this technology has been slow to grow. Many people still hold negative impressions about fluorescent lighting that are based on long-outdated lighting technologies (see “Lighting Technologies,” p.15). With current lighting technologies and lighting designs, today’s energy-efficient

lighting systems can enhance the appearance of homes.

In 2002, to encourage more widespread use of energy-efficient lighting, the Lighting Research Center (LRC) specified several energy-efficient lighting effects in a designer showcase home in the upscale community of Saratoga Springs, New York, and opened the home to public tours. In designing the lighting systems for this home, we strove to minimize glare and use improved color rendering lamps (lightbulbs) and ballast technology. Soffits

and valances were used to integrate the lighting with the home’s architectural features. In most decorative fixtures, CFLs replaced incandescent lamps.

The Lighting Research Center surveyed the opinions of 400 visitors over the course of three weekends. These visitors replied to general questions comparing the house to ten others in the designer showcase tour. A second questionnaire was distributed to 27 paid experimental subjects who were asked to compare the lighting in the demonstration house with that in an

Lighting

otherwise similar home equipped with incandescent lighting. This comparison home was located on a nearby street, built by the same builder, in a similar traditional architectural style and size, and had been used in a previous showcase of homes. Survey respondents were not told that they were evaluating energy-efficient lighting.

Both random visitors and paid subjects rated the energy-efficient lighting not merely as high as the incandescent lighting, but in fact, even higher! Visitors rated the attributes of energy-efficient lighting as equivalent or better on all questions, including those on color appearance, brightness and dimness, shadows, humming sound, light distribution, appearance of people, flicker, visual comfort, visibility, and overall appearance of the home. Nearly 90% of the respondents said that they would like to have this type of lighting in their house.

What follows are tips for making energy-efficient lighting effective and attractive in the home. To maximize energy savings, these techniques should be applied in areas where homeowners spend most of their time, such as in the kitchen, family room, or living room.

One-for-One Substitutions

For general lighting, many homeowners use surface-mounted diffusers—ceiling-mounted diffusers, pendants, and wall sconces—that send light in all directions. Although incandescent fixtures are most common, fluorescent lamps are ideally suited for diffuse light distribution. When selecting a new fixture, consider choosing one that allows for some ventilation rather than one that is tightly enclosed, as high operating temperatures can degrade the electronic circuitry. Many styles of residential surface-mounted light fixtures are now available that meet Energy Star specifications. For the latest list of light fixtures with the Energy Star label, go to www.energystar.gov.

Energy Star light fixtures typically operate pin-based CFLs. Alternatively, homeowners can use screw-based



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A custom-built valance directs light upward and downward (*top*), and is coordinated with the materials and mounting location of other cabinetry (*bottom*).



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Lensed linear fluorescent light fixtures are mounted above cabinets to provide uplighting. Light is bounced off the ceiling and down into the space for glare-free general lighting. (Allow a minimum of 18 inches for uplighting; if ceilings are too low, consider a short pendant fixture mounted to the ceiling.) Task lighting is provided by undercabinet light fixtures, operated from a wall switch for convenience.

CFLs in their plug-in table lamps or diffusing hard-wired fixtures. CFLs now come in a wide range of wattages and sizes; a few are even designed to be operated with a standard incandescent dimmer (see “CFL Dos and Don’ts”).

Architectural Integration

To make fluorescent lighting attractive in the home, integrate uplighting with such architectural features as cabinetry and vaulted ceilings. Uplighting allows light to bounce off the ceiling

or walls before it reaches the eye (see photos, p. 14 and 15). Using the architecture to diffuse light will enhance the appearance of the home to create a pleasant, glare-free environment. However, these strategies will work only with light paint colors and matte

Lighting Technologies

Many unfavorable impressions about fluorescent lighting are based on old technologies. New technologies are available that make fluorescent lighting not only energy efficient, but attractive as well.

Electronic ballasts. Fluorescent lighting requires a ballast, a device that provides the initial starting voltage and regulates the operation of the lamp. High-frequency electronic ballasts are recommended over older magnetic ballasts for many reasons—and not just because they are more energy efficient. Electronic ballasts turn on the lamp more quickly, eliminating the old “ping-ping” start. Unlike magnetic ballasts, electronic ballasts

do not make the light appear to flicker in peripheral vision. Nor do they hum and buzz during operation. Electronic ballasts have been widely used in the commercial sector but are now available for many residential lighting products.

Color rendering index (CRI). Fluorescent lamps come in a range of color rendering capabilities. The old cool white lamps had a poor CRI rating: 60 on a scale of 1 to 100. Newer triphosphor lamps have CRIs in the 70s and 80s, and sometimes into the 90s, allowing colors to appear natural and skin tones to look healthy.

Correlated color temperature (CCT). Fluorescent lamps come in a range of correlated color temperatures. The CCT of a lamp

refers to the yellowish or bluish appearance of the light. A high CCT (4,100–5,000 degrees Kelvin) will look bluish-white, while a low CCT (2,700–3,000K) will look yellowish-white. A CCT of 3,500K is considered neutral. Choice of CCT is a matter of preference. Appearance of bluish colors (glass and steel) is enhanced under high CCTs, while wood surfaces look good under neutral or low CCTs. When coordinating fluorescent general lighting with incandescent accent lighting, consider using neutral and lower CCT lamps to unify appearance.

Dimming. It is now possible to buy fluorescent lighting that is dimmable, using special dimming ballasts and control equipment.

finishes; dark colors will absorb the light, and glossy finishes will create glaring reflections. Examples of architecturally integrated lighting are valances, soffits, and coves. These effects may require custom wood trim in order to conceal the lamp and promote an architecturally integrated appearance.

Recessed Downlights

Recessed downlights are currently very popular in homes (see “Recessed Lighting in the Limelight,” *HE* Jan/Feb ‘04, p. 12). There are cases in which CFL recessed downlights are an appropriate strategy to use for general lighting. Downlights provide good general lighting in rooms with dark, nonreflective colors on their walls. Some homes have low ceilings that preclude the use of uplighting. Or some homeowners may simply want to avoid having surface-mounted light fixtures in view. Although recessed downlights are not the best use of fluorescent lights, they are more energy efficient than incandescents when used for general lighting. For recessed lighting in shower areas, choose products that have the damp or wet rating required in your area. Although recessed CFLs are appropriate in some cases for general lighting, they should not be used for accent lighting.

Accent Lighting

Accent lighting fixtures, such as recessed adjustable downlights or surface-mounted track lighting, can



Custom-built cove lighting directs light upward, enhancing the appearance of vaulted ceiling and providing glare-free general lighting.

help to draw attention to displays of cherished possessions (see photo, p. 17). In order to use lighting to accent objects, there must be a ratio of 3:1 or higher between the brightness of an object and the background. (Brightness is measured using a luminance meter, in units of candelas per square meter.) To maximize visual impact and minimize energy use, accent lighting should be used sparingly, and should be operated by means of a separate switch or dimmer.

When the goal is to highlight special objects and not light the surrounding environment, incandescent accent lighting is actually the most energy-efficient solution. Reflectorized incandescent lamps more effectively focus the light on a small area, without spilling light on surrounding surfaces. Fluorescent lighting is diffuse, not directional, which makes it ideal for general lighting, but not appropriate for accent lighting. In order to achieve equivalent light levels in a small area using fluorescent lamps,

CFLs Dos and Don'ts

Do:

- Put CFLs in table lamps, wall sconces, torchieres, and other fixtures with open diffusers.
- Take advantage of CFLs designed for three-way switching when used with table lamps.
- Consider retrofitting your table lamp with a larger metal bracket, or harp, to hold

the shade on the lamp if the ballast of your CFL doesn't fit within the existing harp.

- When replacing an incandescent, either compare lumen output ratings, or select a CFL with a lamp power that is one-fourth to one-third that of the incandescent being replaced. For instance, to maintain equivalent light output, a 75W incandescent A-lamp should be replaced by an 18W–25W CFL.

Don't:

- Use CFLs for accent lighting.
- Put CFLs on an incandescent dimmer, unless the product is designed for dimming.
- Use CFLs in frequently switched locations; the more frequently CFLs get turned on and off, the shorter their life.
- Allow CFLs to protrude from the fixture, causing uncomfortable glare.



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Fireplace mantels often display cherished possessions. Accent lighting is effective if used sparingly, with incandescent reflectorized lamps, and operated from a separate switch or dimmer.

more watts are necessary, and most of the light would be wasted when absorbed by baffles.

Task Lighting

In the home, people engage in many visually intensive—and sometimes dangerous—tasks, such as chopping food in the kitchen, operating tools, stepping out of the shower, or simply reading. These are instances where task lighting can not only improve visibility but also promote safety. Fluorescent task lights are especially appropriate, because they provide diffuse light and do not burn the skin or other materials

when accidentally touched. When providing any kind of lighting, it is important to prevent a direct view of the lamp to minimize glare.

Although these fluorescent lighting techniques may cost more to install than incandescents, they are a good choice for high-use spaces such as kitchens and living rooms. Homeowners who use them can save money over time and can enhance the appearance of their homes. 

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For more information:

For more details on the lighting comparison study described in this article, see Banwell, P., et al. "A Demonstration of Energy-Efficient Lighting in Residential New Construction." *Lighting Research and Technology* 36, no. 2 (2004): 147-64.

Rea, M.S., and J.D. Bullough. "Application Efficacy." *Journal of the Illuminating Engineering Society* 30, No. 2 (2001): 73-96. The article explains how CFLs are not the most effective solution for accent lighting.

Leslie, R.P. and K.M. Conway. *The Lighting Pattern Book for Homes*. McGraw-Hill, 1996. ISBN 0-07-038079-1. This book shows how typical residential lighting can be upgraded to energy-efficient lighting. It includes descriptions of architectural integration techniques. Although the book is out of print, it can be ordered from the publisher.

The New York State Energy Research and Development Authority has posted training videos at www.GetEnergySmart.org describing in greater detail the information presented in this article.

The Energy Star Web site has extensive information about energy-efficient lighting at www.energystar.gov.

The Lighting Research Center Web site posts objective, third-party information about lighting technologies and applications, most of which is free to the public at www.lrc.rpi.edu.

Efficiency Vermont provides an attractive energy-efficient lighting guide at www.encyvermont.com/Docs/EV_LightingGuide6.18.03.pdf.

To learn more about heat management with fluorescent fixtures, see the LRC Web site at www.lrc.rpi.edu/programs/lightingTransformation/heatManagement/index.asp.

For more information about basic lighting technology, consult the on-line terminology tutorial at www.lrc.rpi.edu/education/learning.