NEW LAWS, NEW LIGHTS

PHILIPS LIGHTING CO.

Legislation effective this month puts long-life, energy-efficient fluorescent and halogen lamps in the limelight

As of November 1, 1995, the Energy Policy Act of 1992 (EPACT) bans certain bulbs as being too inefficient (see Figure 1). These include those $1 fluorescent tubes you see everywhere, as well as the most common downlight reflector lamps. The ban means that you will have to pay closer attention to how you choose bulbs. As you face the new lighting market, here are some facts you need to understand about the light put out by various bulbs.

Light Quality

The two measurements of light quality you should be familiar with are color temperature and CRI, or color rendering index.

Color temperature is an expression of the visual warmth or coolness of any light source. It's expressed in degrees Kelvin (°K) and refers to the light itself rather than to the surfaces illuminated by that light. The lower the color temperature, the "warmer" the light; the higher the temperature, the "cooler" the light.

The $1 fluorescent tube I mentioned above (the F40CW listed in Figure 1) is a "cool white" tube. It puts out a bluish light that gives a harsh appearance to the space it's illuminating and makes objects look distorted. This is especially true for wood cabinets and reddish skin tones; because there's almost no red in the cool white tubes, these surfaces tend to look pale and gray under the bluish

by Nancy McCoy

light. The light from an incandescent bulb, on the other hand, is much warmer, containing more red and yellow, so wood and skin tones take on a color that most people find more pleasing (see "Choosing Light Color," page 50).

Color temperatures for residential bulbs range from a warm 2000°K to a cold 7500°K. Those warm incandescent light bulbs that you buy at the grocery store for home use have a color temperature of 2700°K; inexpensive cool white fluorescents have a color temperature of 4100°K.

Color rendering index, or CRI, is a second measure of light quality that ranks how natural or distorted an object appears when the light from a given source is thrown on it. CRI is expressed as a percentage. A minimum acceptable percentage is 70, but the closer the CRI is to 100 percent, the more natural people and objects look. Incandescent bulbs are considered the most pleasing, with CRIs close to 100. Fluorescents, on the other hand, fall across a broad range from the high 40s to the low 90s. Those inexpensive cool white fluorescent tubes, for example, have an unnatural-looking CRI of around 62.

There's no necessary relationship between color temperature and CRI — they're two different means of evaluation, particularly for fluorescent lamps. For example, a standard 100-watt incandescent bulb with a color temperature of 2700°K will cast a pleasing warm light; a typical new compact fluorescent with the same color temperature casts a slightly more greenish light. The incandescent bulb has a CRI of 100, while the compact fluorescent has a CRI of 82. It's also possible for two lamps to have the same CRI but to render certain colors differently. Generally, though, the higher the CRI, the more pleasing the light source.

Improved Fluorescents

Because EPACT became law in 1992, manufacturers have had an opportunity to develop replacements for the lamps to be banned this month. Some of the biggest changes and improvements are in fluorescent technology, because fluorescents can provide more lumens per watt (LPW) than incandescents.

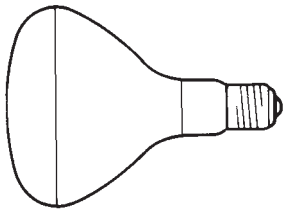
Common Lamps Discontinued as of October 31, 1995

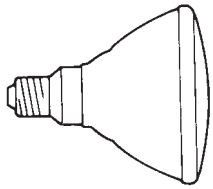
4-Foot Fluorescent Tubes

F40CW (cool white)
F40W (white)
F40WW (warm white)
F40WWX (warm white deluxe)
F40D (daylight)

Incandescent Reflector Lamps

R Lamps
R-30 50-watt
R-30 75-watt
R-30 100-watt
R-40 75-watt
R-40 100-watt
R-40 150-watt





PAR Lamps
PAR-38 75-watt
PAR-38 100-watt
PAR-38 150-watt

Figure 1. *These are some of the most common residential lamps banned by the Energy Policy Act. Replacements for fluorescent tubes will include energy-saving types as well as tubes manufactured with rare earth phosphors. Replacements for the incandescent reflector lamps will include halogen and krypton lamps, and compact fluorescents.*

Deciphering Ordering Codes

Lamp manufacturers use different abbreviations to describe their products. But in most cases, they're conveying the same kind of information: the size and shape of the bulb or tube, the wattage, and special characteristics such as color temperature or special materials used to make the bulb. Here are some examples from the major lamp manufacturers:

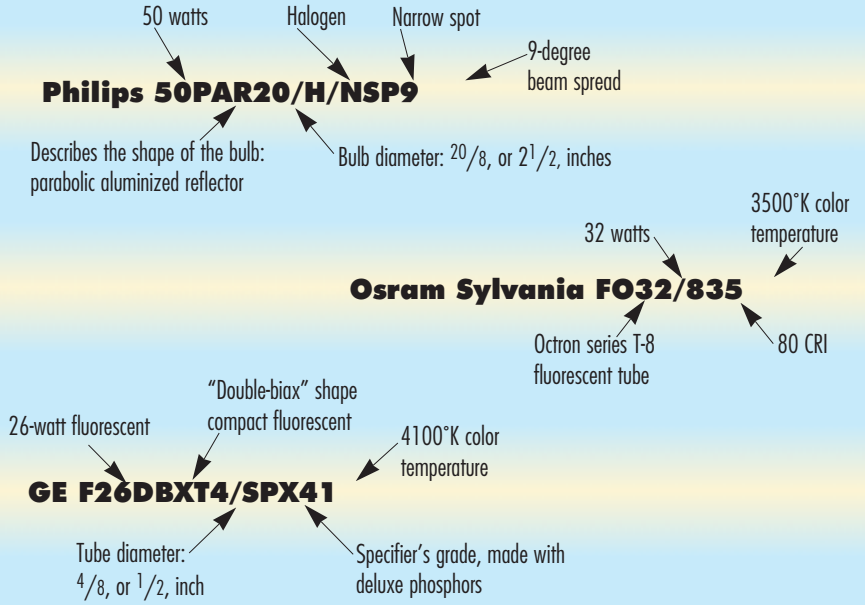


Figure 2. *Compact fluorescent downlight bulbs are too tall to fit inside cans designed for incandescents. Instead, use cans made for compact fluorescents, like this one from Juno.*

CHOOSING LIGHT COLOR

Here are some commonsense rules of thumb that can help make light color selection easier:

- All space colors (wall and floor coverings, furniture, drapes, accents, etc.) should be chosen under the lamp color specified for the installation. Experience suggests that warm sources should be used at low lighting levels, cool sources at high levels.
- Warm color schemes may appear overpoweringly warm if lighted with a warm source at relatively high levels; in this case, use a cooler light source.
- Cool color schemes may need warm light sources, particularly at low lighting levels.
- Well-shielded lighting systems, such as those using wedge louvers or low brightness lenses, will "cool off" a room. The solution is to use a slightly warmer light source to counteract the effect.
- Where color rendition is highly critical — in lighting artwork, for instance — use high-CRI continuous-spectrum sources such as GE's Chroma 50 or Chroma 75.
- Where both color and energy efficiency are important, use fluorescent lamps manufactured with "three-peak" rare earth phosphors. These lamps tend to make spaces look more colorful because the three-peak phosphors compress all colors into the blue, green, and red-orange bands of the light spectrum. This increases the contrast between colors. Three-peak lamps do not, however, increase the contrast of black-and-white objects and tasks. Claims that less light is needed for typical office and industrial tasks when three-peak phosphors are used are scientifically unfounded.
- The color of a light source does not affect the visual performance of people doing black-on-white seeing tasks. However, studies indicate that productivity may be affected by the color contrast and appearance of the visual environment and that color can contribute strongly to appearance.

Adapted with permission from GE's Lighting Application Bulletin Specifying Light and Color.

Builders in California already know this. The California Energy Code requires that the main lights in kitchens and bathrooms must have an output of at least 40 LPW — a requirement that can be met only with a fluorescent fixture. With the advent of EPACT, such regulations will probably become more common throughout the U.S.

Rare earth phosphors. Consequently, lamp manufacturers have made great efforts to improve the quality of fluorescent light. For fluorescent lamps, the CRI rating depends on the powdery phosphor coating on the inside of the bulb. Conventional phosphors typically produce light with a lower CRI. The more expensive "rare earth" phosphors, or "triphosphors," not only produce a more pleasing light, but they also do it more efficiently than conventional phosphors.

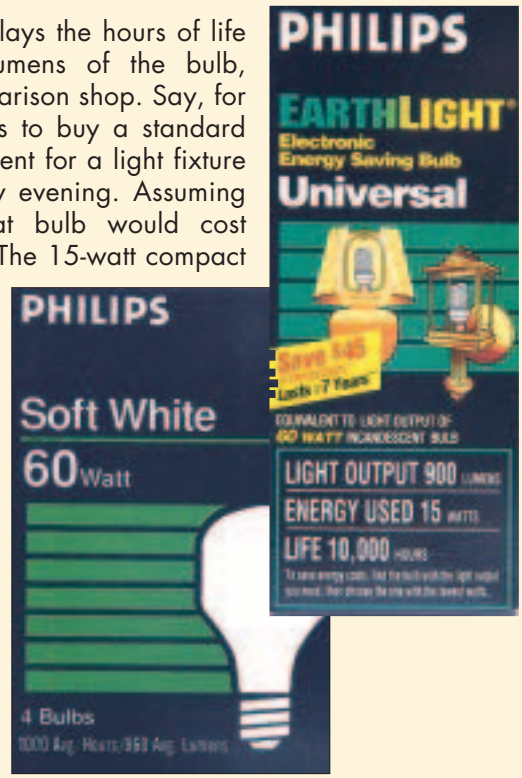
Manufacturers create blends of conventional and rare earth phosphors to produce lamps with various CRIs to suit a variety of needs. Typically, the higher the percentage of rare earth phosphors, the higher the CRI — and the more expensive the lamp.

Compact fluorescents. One lamp type you will be seeing more of is the increasingly popular compact fluorescent, or CF. Not only are CFs more energy-efficient and longer-lasting than incandescents, but by using rare earth phosophors, the manufacturers have closed the CRI gap. Most compact fluorescents have a CRI of 82, with color temperatures ranging from 2700°K to 6000°K. Watch for an increasing number of new fixtures designed for compact fluorescent lamps.

Choosing a fluorescent. My favorite fluorescent lamps are those using rare earth phosphors and having color temperatures between 2700°K and 3500°K. Using these in a kitchen, for instance, lets you enter the kitchen from a living room that's lit with incandescents without noticing a difference in the light. These lamps — whether tubes or compact fluorescents — also do more justice to wood cabinets, which have lots of red in them. If you cast the bluish light from a cool white tube onto a nice piece of wood, the wood will tend to look gray and flat. A lamp with more red in it — a 3000°K tube, for example — brings out the wood's natural warmth.

Shopping for Efficiency

New lamp packaging displays the hours of life and the light output in lumens of the bulb, enabling consumers to comparison shop. Say, for instance, a shopper chooses to buy a standard 60-watt soft white incandescent for a light fixture that burns for 4 hours every evening. Assuming 10¢ per kilowatt-hour, that bulb would cost $8.76 per year to operate. The 15-watt compact fluorescent, which has greater light output, would cost only $2.19 per year — a savings of $6.57 annually on the electric bill. The incandescent bulb would burn out after a little more than eight months, while the compact fluorescent would last more than six and a half years. The annual energy savings over that time would far surpass the substantially greater up-front cost of the compact fluorescent.



Lamps made with rare earth phosphors aren't cheap, however, so you may not be able to use them everywhere. The average retail price for a good-quality 4-foot fluorescent tube with a CRI in the 70s is $3 to $6, while those with CRIs above 80 cost $7 to $12. Before installing new fluorescents, take your clients to a lighting showroom and let them compare lamps side by side.

Downlight Changes

Unfortunately, the list of banned lights includes the most common reflector lamps used for downlighting throughout the U.S. — R lamps (R stands for "reflector") and nonhalogen PAR lamps (parabolic aluminized reflector). R lamps will virtually disappear from the market (the 65-watt R-30 is one exception), while the PAR lamps that remain will use halogen or krypton gas to increase efficiency. Again, there will be some "sticker shock" as consumers adjust to the expense of the new gas-filled incandescent downlights. The increased cost should be offset by the energy savings over the life of the bulb.

Be careful when choosing replacements for R lamps. Some manufacturers' literature suggests replacing a 75-watt R-30 flood with a 75-watt PAR-30 halogen, but I don't recommend it: The 75R30 flood has a beam spread of about 72 degrees, while the average beam spread of a 75PAR30 flood may be only 30 degrees. If you want to use these, you'll have to buy more fixtures and space them closer together to prevent pools of light from forming below. When upgrading from R to halogen PAR floods, look for a "Wide Flood" or "Very Wide Flood" designation. GE's and Osram Sylvania's wide floods have beam spreads of 55 degrees. As of December 1, 1995, Philips should have a 60-degree wide flood on the market.

Also, when moving from R lamps to PAR lamps, make sure to buy "long-neck" PAR, which are designed to fit existing R-lamp fixtures.

Fluorescent downlights. What about using compact fluorescents as downlight replacements? You can get compact fluorescent lamps in a PAR or R casing, but I don't recommend retrofitting these in incandescent recessed fixtures, because the lamps protrude from the base of the fixture and create areas of glare on the ceiling. Keep in mind, too, that most screw-in-type compact fluorescents cannot be controlled with a dimmer switch.

If your client wants the energy savings of fluorescents, install recessed cans designed for compact fluorescents, which are now available (Figure 2).

New Labeling

An important goal of EPACT is to get consumers to pay attention to the efficiency — or light output per watt — of the lamps they're buying. The new required packaging will give light output in lumens, energy usage in watts, and the expected hours of life of the lamp (see "Shopping for Efficiency"). The buyer will be able to compare a 60-watt incandescent bulb, which might give 800 lumens, with a compact fluorescent that gives 900 lumens for only a quarter of the energy. The hours of life lets the buyer see that while the compact fluorescent may cost ten times more, it will last far longer. This, coupled with the energy savings from the compact fluorescent, will result in a substantial net savings.

Unfortunately, some of the new labels don't include color temperature and CRI ratings. For many lamps, you may be able to glean this information from the manufacturer's item number (see "Deciphering Ordering Codes," page 49). If not, call the manufacturer for a free catalogue that gives the technical specs for the lamps you're interested in. ■

Nancy McCoy is a lighting designer from San Francisco, Calif., and a former national education trainer for the American Lighting Association.

For More Information

GE Lighting
800/626-2004

Osram Sylvania
100 Endicott St.
Danvers, MA 01923
800/544-4828

Phillips Lighting Co.
114 Mayfield Ave.
Edison, NJ 08817
800/631-1259