



## Chapter 11 LIGHT YOUR HOME WISELY

What can good lighting do for you?

- Save money on your electrical bills
- Improve safety
- Create the mood you want in every room
- Minimize headaches and eyestrain when reading, sewing, or performing other close work
- Prevent distracting glare on TV and computer screens

### LIGHT IT RIGHT

Some experts estimate that lighting represents 20% of all residential electrical energy use. Through thoughtful design and selection, you can cut that amount in half.

Your home's lighting could stand improvement if

- your electricity bill is high
- you turn on electric lights during the day
- you have to squint to read a book
- you cast a shadow on your kitchen counter or work bench
- you avoid rooms that feel “gloomy”
- glare, shadows, or lack of contrast cause people to trip

Simple lighting changes—many of them inexpensive—can make your home not only more energy-efficient, but also safer and more comfortable.

Think through how you want to use each room in your house and identify any lighting problems. Then you can develop a plan to address problems and make your lighting system meet your needs.

Designers categorize lighting in terms of three basic functions:

- *General lighting*, also known as *ambient lighting*, illuminates space so you can see people and objects clearly and move about safely.
- *Task lighting* shines directly on visually demanding activities, such as reading, knitting, or chopping vegetables.
- *Accent lighting* is used for decorative purposes, usually to highlight art objects or architectural details.



TOP: Ambient lighting is provided here by the corner torchière, the cove lighting in the ceiling, and sunlight; it is often of lower wattage than task or accent lighting. BOTTOM: Accent lighting is a decorative element that picks out art objects or interesting textures. LEFT: Task lighting is more intense, letting you use higher-wattage bulbs only on items you need to see clearly.



Moving furniture closer to a window is a double-win: you get the pleasures of sunlight, and you save on your electrical bill.



The deciduous trees outside this room admit plenty of winter sun, then provide shade when they come into leaf during hotter seasons.



Having windows on more than one wall gives a room more depth and dynamism.

For example, if you turn your spare bedroom into a home office, you might put a desk lamp at the workstation (task lighting), place a *torchiere* in the corner (ambient lighting), and focus a *halogen* light on your diploma (accent lighting).

## START WITH SUNLIGHT

*Daylighting* means using the sun as your main light source during the day. You may be able to increase the amount of free light you get from the sun by making a few basic changes. Start by looking at your furniture arrangement: Could you move a desk or reading chair closer to a window?

Daylighting offers too many benefits to pass up:

- Sunlight is free.
- Daylighting decreases your dependence on the power grid.
- When you use less electrical lighting, you lower your contribution to greenhouse gas buildup.
- Sunlight is dynamic, constantly changing in direction, intensity, color, and warmth.
- Sunlight makes you feel good. It links your internal clock to the sun's cycles. Regular, prudent exposure to sunlight may even improve your health and mood.

Because the sun follows a predictable path, you can plan your daylighting based on your family's schedule. You might turn a dark corner of your kitchen into a cozy breakfast nook that catches the morning sun, or put a window in a solid door to light up a dark foyer.

Pay attention to where the sun shines into your house, and how that shifts throughout the day and the year. Are some rooms too dark, and others too bright? Make notes on how you'd like to change the daylighting in each room.

Now explore ways to add, remove, block, or treat windows to let in more sunlight where you want it (see Chapter 7). If you live in a hot climate, you'll be glad to know that you can choose windows or apply special treatments to keep out the sun's heat while letting in its light.



Look around the outside of your house. Are your landscape plantings supporting your daylighting schemes? Trimming, adding, or removing vegetation can significantly change the daylighting in a room. Roof overhangs, shade trees, plants, and the ground surface outside your home also affect how light comes through your windows.

If you're planning an addition, you have the opportunity to design for daylighting from the start. Be sure to also take into account how the addition will change the way sunlight falls into existing rooms.

## Plan Your Daylighting

To best use daylight, think about how each room will be used:

- Is it a space for paying bills or reading? Place desks and reading chairs near windows, but facing away from them if glare is a problem.

- Will people gather there? If sunlight will shine directly into people's faces, install blinds that direct light toward the ceiling, hang curtains to diffuse the light, or simply rearrange the seating.
- Does your family watch TV, play video games, or use computers there? Position fixed screens so they don't reflect a window (or an electric light), and consider where people will sit to use portable items. Test the reflection by holding a mirror where the TV or monitor will be situated. If you see a window or a light in the mirror, there will be a reflection on the screen.

## Designing Windows for Light

Windows are the key to sunlit rooms. Here are some helpful rules of thumb for designing and using windows to admit light:

- An unobstructed glass area equal to 5% of a room's floor area should provide adequate ambient light.
- Windows on more than one wall make a room feel lighter and more dynamic.
- The higher the window, the farther sunlight can reach into the room.
- *Clerestory* windows (a series of windows high in a tall wall) can light spaces directly, or indirectly by reflecting sunlight off walls and ceiling.
- Unobstructed north windows provide relatively glare-free lighting.
- *Borrowed light* makes use of glazed interior openings to transmit light from a sunny room to a darker room or hallway. To maintain privacy, use textured glass or glass block.

## Selecting Skylights

Sunlight from above makes a space feel open and lively while reducing the need for electric lighting. Skylights needn't be large; a skylight can illuminate a room twenty times its size.

*Tubular skylights* have a highly reflective inner surface that bounces sunlight into the living space. A tubular skylight can be a good choice for a small, dark space, such as an interior hallway or a windowless bathroom.

If you choose a conventional skylight, you can distribute sunlight more broadly into the room by angling the walls of the light well through the attic. For either type of skylight, make sure the light well or tube penetration is insulated where it passes through the attic, and that it is well sealed against air and moisture from the attic and outside. (See Chapter 7 for more on skylights, and Chapters 8, 9, and 10 for air-sealing, insulation, and attic options.)



## Balancing Daylight and Solar Heat

Too much sunlight may make your house too warm. Here are some ways to avoid this problem:



A daylit kitchen can be delightful, as long as glare isn't a problem. Use adjustable blinds or sheer curtains if there are times of day when sunlight shines straight into your eyes.



A "skylight well" should be carefully sealed and insulated. Splaying the walls of the well allows broader sunlight distribution.



A tubular skylight admits abundant sunlight without the need to cut roof framing members.



Light outdoor surfaces and furniture will bounce more daylight into a space.

- Install rollup shades inside or outside the window; exterior retractable shading blocks solar heat more effectively than interior.
- At south-facing windows, add an awning or overhang to block direct sunlight.
- Apply reflective film to window panes.
- If your winter heating costs are low and your summer cooling costs are high, choose window glass with a low solar heat gain coefficient (SHGC—see Chapter 7).
- Plant *deciduous* bushes and trees outside east- and west-facing windows—or train a vine up a vertical trellis—to filter hot summer sunlight and admit winter sunlight.



If you want both solar heat and light, see Chapter 13.

### Daylighting on a Budget

If the daylighting in your home isn't ideal—and your budget doesn't include new windows—try some of these low-cost tricks:

- Light-colored walls and floors bounce light around a room and make the space feel bigger and brighter.
- Semisheer curtains or glare-reducing window treatments diffuse intense sunlight.
- Blinds or plantation shutters let you control how much light gets in. For large, wide windows where horizontal blinds would be heavy and difficult to manipulate, try vertical blinds.
- Light surfaces outside your windows (such as a light-colored patio or path) will reflect sunlight into a room, while vegetation or dark surfaces will absorb light.

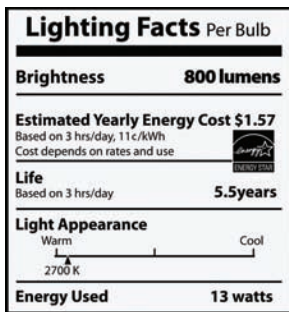
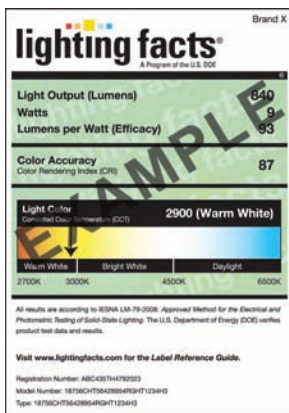
## SUPPLEMENT DAYLIGHT WITH ELECTRIC LIGHT

Most of us learned to select our lighting by choosing an *incandescent light bulb* that we considered “bright enough.” That brightness is roughly indicated by *wattage (W)*—a measurement of how much energy the bulb uses. Comparing wattage has been a pretty good way to choose a good incandescent light bulb for the desired illumination level (usually a 40W, 60W, or 75W bulb).

However, new developments in lighting products give us many more choices than we had ten years ago—and knowing how much energy a bulb uses doesn't tell you much about the appearance of the light it casts. Fortunately, more precise information is available on Lighting Facts labels, found on all new lighting products.

Here are some terms to look for:

- **Lumens (Lm):** light output. High-efficiency bulbs supply more lumens per watt than lower efficiency bulbs. In other words, they use less energy, so you get more light for less money.
- **Color Temperature:** the hue of seemingly “white” light, ranging from “cool” (bluish) to “warm” (reddish), expressed in degrees *Kelvin (K)*.



TOP: The LED Lighting Facts label (U.S. Department of Energy) helps you identify the best LED products for you. BOTTOM: The FTC Lighting Facts labels appear on the package of all medium screw-base bulbs.

In general, cooler light is best for visual tasks, while warmer light enhances flesh tones. For most uses, you'll probably want a color temperature of 2700K to 3000K. (Table 11.01.)

- **Color Rendering Index (CRI)**, also referred to as color accuracy: a measure of how faithfully a given light source reproduces particular colors in relation to an ideal or natural light source. As a reference point, sunlight and incandescent light bulbs have a CRI of 100. When buying *compact fluorescent lights (CFLs)* or *light-emitting diodes (LEDs)*, look for a CRI of 80 or more to get good color rendition. With a CRI below 80, some colors may shift in tone or lose saturation.

You may also come across the term *foot-candle* in relation to lighting levels. While “lumens” describes the output of a light source, “foot-candle” refers to the intensity of light falling on a given surface.

Also consider the way the bulb and fixture distribute light and where the unit is placed in the room. Overhead fixtures and bulbs that cast light in all directions are commonly used for ambient light. *Cove lighting* is a type of *indirect lighting* that involves incandescent or fluorescent lights concealed in a reflecting trough near the ceiling; the light is usually reflected off the ceiling or wall. *Directional lighting* is designed to cast a narrow beam; it's good for task and accent lighting. Using the right fixture for the job puts those lumens where you need them.

## What Kind of Electric Lighting Is Best?

There is no one right type of lighting for all applications; each type has its own strengths and weaknesses (see Table 11.02).

**Incandescent light bulbs** have been the dominant technology for most residential lighting since they were introduced in the late 1880s. They supply light that resembles sunlight early or late in the day. Ninety percent of the energy used by an incandescent bulb is lost as heat. New incandescent bulbs are markedly more efficient and longer lasting than the older ones, but as efficiency standards rise and competing technologies improve, their predominance is fading.

TABLE 11.01: COLOR TEMPERATURES OF LIGHT SOURCES

Source	Hue	Degrees Kelvin
Candle flame	Orange/red, warm	1,850–1,930
Sun at sunrise or sunset	Orange/red, warm	2,000–3,000
Incandescent light bulb	Orange/yellow, warm	2,700–3,000
White fluorescent	Wide range of options	2,700–7,500
Sun at noon	Blue, cool	5,000–5,400
Partly cloudy sky	Blue, cool	8,000–10,000

### HOW MANY LUMENS DO YOU NEED?

The answer depends on the size of the room and the color of your decor. Here are some rules of thumb (Lm/sf = lumens/square foot):

- Dining: 5–20 Lm/sf
- Living: 5–20 Lm/sf
- Kitchen: 5–50 Lm/sf
- Bathroom: 5–50 Lm/sf
- Office: 10–50 Lm/sf
- Outdoor: 0.3–1.5 Lm/sf

Apply the lower end of the range for ambient lighting and the higher end for task and accent lighting. Older occupants generally require more light, especially for close visual tasks—as much as 100 Lm/sf for sewing or reading.



Light bulb styles. From left to right: incandescent, compact fluorescent, and light-emitting diode.

## A HAPPIER KITCHEN

The *can lights* in Marc and Jill's New England home cast a pale, unpleasant light of 12-15 foot-candles at countertop level. The 23W CFLs were fairly energy-efficient, providing 1640 lumens at a CRI of 82 and a color temperature of 3000K. However, little of the CFL's light could escape the can. Marc and Jill wanted more light, better color, and even more energy-efficiency. Without changing the can light fixtures, Marc replaced the CFLs with 10.5W LEDs that provided 575 lumens at a color temperature of 2700K and a high CRI of 92.

"The difference in lighting quality is profound," says Marc. "The kitchen feels brighter and cleaner—well worth the upgrade. Interestingly, the light levels are *barely* higher—maybe 15 to 17 foot-candles. This shows that the lumen output of the light doesn't tell the whole story; what matters is how the *system* of the light and the fixture moves the light to where we want it."

**Halogen lights** are a longer lived, more efficient type of incandescent bulb. They emit a very bright, white light and come in many shapes and sizes; some provide an intense beam appropriate for accent lighting.

**Fluorescent lights** use electricity to produce light more efficiently than incandescent bulbs do. A *ballast* regulates the current through the light, making fluorescent lights more costly than incandescent bulbs. Four-foot fluorescent tubes have been common in commercial settings, as well as in some residential kitchens and garages. Smaller tubes are often used in kitchens as under-cabinet lighting.

**Compact fluorescent lights (CFLs)** are a type of fluorescent designed to fit in a standard incandescent bulb socket. They are 3 times more efficient than incandescent bulbs, and generally last 2 to 3 times as long. Ask people about their experiences with CFLs, and you're likely to hear anything from "I will never buy them again" to "Why would anyone still buy incandescent lightbulbs when you can buy CFLs?" The "never again" people may be remembering older or low-quality CFLs that flicker, buzz, interfere with the radio or TV, render colors poorly, or fail early.

Fortunately, newer fluorescent products (both tubes and CFLs) solve many of the problems that gave them a bad name in the past. Many provide high-quality, appealing light. Most fluorescent lights today have *electronic ballasts*, which don't cause flickering the way the old *magnetic ballasts* did. You can realize substantial savings from a small investment if you upgrade from incandescent lights to CFLs—and you probably won't need to change your light bulbs nearly as often.

When a CFL burns out, it's important to dispose of it safely. Contact your local waste management company or recycling center to learn their preferred procedures.

**Light-emitting diodes (LEDs)** are a relative newcomer on the lighting scene, and promise to become an even more energy-efficient option. They are currently much more expensive than incandescents or CFLs lighting, so use them wisely.

LEDs are very efficient at focusing light into a small area, and therefore have been successfully used to replace other types of directional lighting. Unlike fluorescents, they can be turned on and off frequently without shortening their life, which also makes them well suited to use in hallways and in fixtures controlled by motion sensors.

## Maintenance Makes the Light

A ceiling fixture that looked bright and cheery with 60W incandescent light bulbs when it was new may require 150W incandescent bulbs to look cheery once it gets dirty. This is not just a waste of energy; it can be hazardous if you use bulbs of a higher wattage than the fixture was designed for.

Cooking grease makes kitchens especially susceptible to this problem. Keeping kitchen light fixtures clean will maximize light levels.

It may not be obvious just how dirty a light fixture is, so be sure to take a close look periodically—and run your finger over the fixture if it's not too hot. Most light fixtures can be cleaned with a little soap and water, but make sure everything is dry before you turn the lights back on.

## You're in Control

Lighting controls turn lights on and off or adjust the level of light. They allow you to optimize your use of light in a space while minimizing waste. Here are some ideas for making the best use of lighting controls. Some of the following suggestions are easy retrofits; others may only be practical if you're building an addition or doing major electrical work.

### Switches

- Install individual switches on light fixtures so that people can use what they need without having to turn on lights for the entire room.
- If you're rewiring or adding on, locate switches in obvious and convenient places. Install two-way wall switches at every entrance to hallways, staircases, and large rooms.
- Use separate switches to control lights in areas that are used for different purposes, such as the counter, island, and ambient lights in a kitchen.
- For safety, make switches near stairs and other critical areas easy to see, with switch plates that glow in the dark or large toggles on pull cords.

### Dimmers

- Use *dimmers* to change the mood of a room instantly.
- Use one light for many purposes with a simple adjustment of the dimmer.
- Buy a cord dimmer or a socket adapter to dim plug-in lamps.
- Replace dimmers installed before about 1960 if they dim the light by increasing electrical resistance (released as heat), rather than by decreasing the flow of electricity. Not sure? If the dimmer itself is warm, you're wasting energy and money.
- Use dimmers with incandescent lights (including low-voltage systems) or with fluorescents or LEDs labeled as dimmer compatible. (Most CFLs aren't dimmable, and can be damaged by dimmers.)
- Don't buy bulbs for dimming that provide more light than you need. You save more energy by replacing a 100W bulb with a 60W bulb than you do by dimming the 100W bulb to the lower light output.
- Operate halogen incandescents at full power from time to time. Otherwise, they will become less efficient and may burn out sooner. (Even undimmed, older halogens that contain diodes may flicker noticeably. Dimming the light makes the flicker more pronounced.)





### IS FULL-SPECTRUM LIGHTING AS GOOD AS SUNLIGHT?

*Full-spectrum lights* (typically fluorescent) are designed to simulate the color appearance of sunlight at noon—an intense, slightly bluish light. Full-spectrum lights can make colors appear vibrant. However, replacing a regular light with a full-spectrum light does not replicate the essential range of daylight. Claims that full-spectrum lighting is more “natural” than other lighting are largely marketing hype.

Full-spectrum lighting is appropriate

- in an art studio, where it can help you perceive color more accurately;
- in a windowless room, where it can make the area feel more “natural” and less confining;
- during winter at high latitudes (Alaska) or in cloudy regions (the Pacific Northwest); and
- anywhere you find its effects appealing.

TABLE 11.02: COMPARING LIGHT SOURCES

Type	Description	Pros
Incandescent 	Produces light by heating a tungsten filament, which then glows.	Light appears natural to the eye. Inexpensive. Easily dimmed. Inexpensive timer and occupancy control. Intensity and direction easy to control. Most fixtures accept a range of wattages and light outputs. Lamps and fixtures widely available.
Halogen (incandescent) 	An incandescent with a gas fill tungsten filament and gases that cause a chemical reaction that returns spent tungsten onto the filament.	Slightly more efficient and longer lived than other incandescents (typically 3,000 hours). Maintains stable light output over product life.
Fluorescent (including CFLs) 	Contains mercury vapor that produces short-wave ultraviolet light, which strikes a phosphor, causing it to emit visible light.	Provide more lumens per watt (46–100) than incandescents. Longer lived than incandescents (6,000 to 20,000 hours for CFLs; 20,000 hours or more for many linear lamps). Many high-quality products are available. Available in a variety of color temperatures (3,000–10,000°K) and CRIs (51–98). Most states require spent lamps to be recycled. Available in colors (red, green, blue, yellow).
Light-emitting diode (LED) 	Consists of tiny light bulbs that fit into an electric circuit and are powered through a semiconductor.	Much longer-lived than fluorescent or incandescent (35,000–50,000 hours or more). Moderate to good output (20–60 Lm/W). Intensity and direction easy to control. Excellent colored lights available.

### THE ENERGY INDEPENDENCE AND SECURITY ACT (EISA)

The Energy Independence and Security Act (EISA) states that by 2014, all types of common household light bulbs that use between 40 and 100 watts must be 27% more efficient than comparable incandescent bulbs manufactured in 2007. These new standards will be phased in between 2012 and 2014.

CFLs and many LEDs already meet these standards, but manufacturers have also found a way to make incandescent halogen lights that meet the standard. These improved incandescent bulbs have a small halogen-filled bulb within the outer bulb, while the evacuated space between the inner and outer bulbs blocks heat losses. These lights cost more than the older bulbs, but they last longer and are more efficient.



Cons	Typical Uses
<p>Over the life of the bulb, filament material coats the glass, and the bulb gets dimmer.</p> <p>Inefficient: about 12–17 Lm/W.</p> <p>Relatively short lived: typically 750 to 1,500 hours.</p> <p>Illegal in new construction in California, unless coupled with dimmer or occupancy control.</p>	<p>Indoor lighting for almost any room.</p> <p>Flood- and spotlighting, indoors and outdoors.</p>
<p>Relatively inefficient: about 20–24 Lm/W.</p> <p>Some halogen lamps require special fixtures and sockets.</p>	<p>Indoor and outdoor lighting, especially flood- and spotlighting and low-voltage systems.</p>
<p>Older technology gives off light that looks unnatural or is unflattering.</p> <p>Costs more than incandescents.</p> <p>Linear and circular lamps don't fit fixtures designed for incandescents.</p> <p>Low-quality lamps may be short lived and inefficient.</p> <p>Lamps suitable for enclosed fixtures cost more and are difficult to find.</p> <p>Dimmable CFLs are more expensive and do not dim as well as incandescents.</p> <p>Most states require spent lamps to be recycled.</p> <p>Some lamps slow to start, or take time to come to full brightness.</p> <p>Frequent switching may shorten life.</p>	<p>Gradually replacing incandescents for most residential applications.</p> <p>Indoor and mild-climate outdoor applications.</p> <p>CFLs can be used in most places where incandescents are used.</p> <p>Often used for cove lighting.</p>
<p>Technology is new and may not be well tested.</p> <p>Manufacturers and distributors may not be well established.</p> <p>Relatively expensive.</p> <p>Variable quality.</p>	<p>Outdoors as spotlights, floodlights, and security lighting.</p> <p>Indoors as spotlights, track lighting, decorative lighting, under-cabinet lighting, and general lighting.</p>

### FLUORESCENT LIGHTS AND MERCURY

Mercury is used to produce light in a fluorescent tube or CFL. It's also toxic. But mercury is present as a contaminant in coal and other fuels used to produce electricity. Consequently, more mercury escapes into the environment from operating an incandescent bulb than from operating and landfilling an equivalent CFL.

In the last several years, the amount of mercury in a fluorescent light has been reduced to about one-tenth of what it was in the past. Today, breaking a new CFL indoors does not create a major hazard. If you remove the broken CFL and ventilate the area for an hour, your mercury exposure will be about the same as from eating a bite of tuna fish. See [epa.gov/cfl/cflcleanup.html](http://epa.gov/cfl/cflcleanup.html).

TABLE 11.03: ROOM-BY-ROOM LIGHTING

Room	Lighting Concepts
Kitchen	Position overhead and undercabinet fixtures to avoid shadows. Use fixtures made for moist environments. Consider allowing the task lighting to provide your ambient lighting. Install separate switches for range, countertops, island. Consider cove lighting to provide ambient light, possibly mounted on top of cabinets.
Bathroom	Provide adequate ambient lighting for safety while bathing. Use warm task lighting to enhance flesh tones for grooming. Install fixtures made for moist environments. Consider a small night-light for middle-of-the-night visits.
Living	Look at the room in sections and choose flexible lighting that supports several uses at once. Avoid creating glare on TV and computer screens.
Home office	Provide cool task lighting for visual work. Use accent lighting to highlight displays such as artwork, whiteboards, or framed certificates. Consider daylighting if you use the office only during the day.
Dining room	Create a relaxed mood for nighttime dining with warm ambient lighting. Encourage a more active mood with cooler lighting at breakfast or lunch.
Bedroom	Set the stage for relaxation with warm, low-level ambient lighting in the early evening, mimicking late-day sunlight. Use individual reading lights (task lighting) to allow one person to read while the room lights are off so another person can sleep.
Outdoors	Use yellow lights to avoid attracting moths. Focus lights downward to curb "light pollution" in the night sky. Aim a motion detector so it doesn't "see" small animals and windblown bushes. Use photovoltaic path lights to increase safety without increasing your electricity bill.



This kitchen has daylighting via windows; general lighting from ceiling fluorescents and cabinet-top cove lighting; task lighting on countertops; and accent lighting from ceiling-mounted spots.

### Timers

- Save money and energy by using timers to switch lights off if you tend to forget to do this yourself.
- Increase your safety while you're away by using light timers to give the appearance that someone is home. (CFLs or LEDs will cost less to operate and burn cooler than incandescent bulbs.)

### Motion Detectors

- Save energy by using *motion detectors* or occupancy sensors to turn a light on when you enter the room, and off when the room is unoccupied. (Once used primarily in security systems, these sensors are now available for home use.)
- Install motion detectors in bathrooms and bedrooms, where lights are frequently left on.

- Be sure your bulbs are compatible with the sensors (some CFLs should not be used with motion detectors).

### Photosensors

- Install *photosensors* to turn lights on when it gets dark.
- Use photosensors to adjust electric lighting levels in daylight areas.
- Install photosensors at lights you want to keep on all night and turn off automatically when the sun comes up, such as outside lights that illuminate a garden or path.
- Combine photosensors with motion detectors for security lighting.

### Central Controls

Central controls monitor lighting and operate switches, sensors, and dimmers throughout the home.

The term can refer to many different technologies, from computerized systems you manage remotely to equipment that lets you adjust the lighting or appliances in one room from another part of the house.

Central controls may be integrated with security systems, telephones, and cable TV. They are common in commercial buildings, but may be overkill in your home. Assess how much time and energy you would actually save by installing central controls. Consult a professional to see if the system you want to install calls for upgrading your wiring.

### GET THE MOST BANG FOR YOUR BUCK

- Make the best use of daylighting before buying any electrical lighting.
- Participate in programs subsidized by your utility company, such as instant rebates on CFLs.
- Buy Energy Star-qualified fixtures and bulbs.
- Design your lighting well; if a task light enables you to stop using inefficient ambient lighting, you may not need to spend money retrofitting an overhead fixture.

### LIGHTING PROJECTS YOU CAN DO TODAY:

- *Move some furniture* closer to windows for better daylight.
- *Replace inefficient lights* with more efficient models.
- *Trim a shrub* that blocks daylight from a room.
- *Don't light up the whole room* if all you need is task lighting; bring in new light fixtures if needed.
- *Move light sources* or computer and TV screens to reduce glare and reflection on the screens.

### LIGHTING PROJECTS THAT WILL TAKE MORE TIME:

- *Add a new skylight or window* to improve daylighting.
- *Paint walls and ceilings* in lighter colors to bounce light around the room.
- *Add dimmers, motions sensors, or timers* to save electricity.
- *Redesign and install new lighting* in each room to better match the lighting to your needs.



## DANGER ZONE: CAN LIGHTS

*Can lights* (also known as *recessed lights* or *down-lights*) fit well with modern design. They provide local, focused lighting with minimal glare, but they're inefficient for wide-area ambient lighting.

They can also cause problems, largely because they're installed in a hole cut into the ceiling. Older can lights installed in cathedral ceilings or below an attic may allow air and moisture to pass from the room into the roof structure, increasing heating and cooling bills and encouraging mold growth. Finally, insulating around the can may create a fire hazard.

If you want can lights, buy new, insulated, airtight models that have been pressure tested for low air leakage and rated for insulation contact. Use reflector-type bulbs; most of the light from a regular bulb will get trapped inside the can, making the fixture extremely inefficient. If you use CFL or LED reflector bulbs, make sure they're designed for enclosed fixtures or they may become very hot, making them run inefficiently and shortening their life.

Consider using surface-mounted fixtures instead of can lights—perhaps *track lighting* or *wall sconces*.

## RESOURCES

### Print

*Lighting Design Basics*, Mark Karlen and James Benya, Wiley, 2004. Also available as an ebook.

*Residential Lighting: A Practical Guide to Beautiful and Sustainable Design*, Randall Whitehead, Wiley, 2008.

### Online

"Coloring Your Room With Energy-Efficient Lighting," *Alliance to Save Energy*: <http://ase.org/efficiencynews/coloring-your-room-energy-efficient-lighting>

"GE Energy Smart® CFL Savings Calculator" (*General Electric: estimates energy savings from replacing incandescent bulbs with CFLs*): [gelighting.com/na/home\\_lighting/products/pop\\_lighting\\_calc.htm](http://gelighting.com/na/home_lighting/products/pop_lighting_calc.htm)

Energy Star:

*Interactive guide to choosing lights*: [drmedia.server.com/CFLGuide/index.html](http://drmedia.server.com/CFLGuide/index.html)

*Qualified light bulbs*: [energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=LB](http://energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=LB)

*Qualified light fixtures*: [energystar.gov/index.cfm?fuseaction=find\\_a\\_product.showProductGroup&pgw\\_code=LF](http://energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=LF)

*Overview of CFLs*: [energystar.gov/index.cfm?c=cfls.pr\\_cfls\\_about#how\\_work](http://energystar.gov/index.cfm?c=cfls.pr_cfls_about#how_work)

U.S. Department of Energy:

"*Energy Savers: Lighting and Daylighting*": [energysavers.gov/your\\_home/lighting\\_daylighting/index.cfm/mytopic=11970](http://energysavers.gov/your_home/lighting_daylighting/index.cfm/mytopic=11970)

"*Energy Basics: Lighting and Daylighting*": [eere.energy.gov/basics/buildings/lighting\\_daylighting.html](http://eere.energy.gov/basics/buildings/lighting_daylighting.html)