



indoor lighting for comfort and savings

overview

Well planned lighting can enhance any home and be energy-efficient at the same time. Lighting allows you to create a variety of moods and complement your décor — providing both dramatic effects and security. Find out how to select the most effective and energy-efficient lighting for your home.

Types of indoor light sources

Compact fluorescent lighting

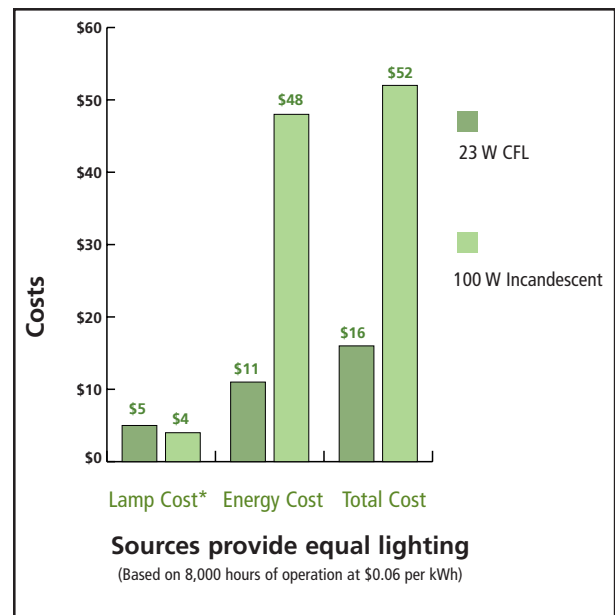
Compact fluorescent lamps (CFLs) have been designed with energy efficiency in mind. As a compact version of a regular fluorescent tube, they are intended as a direct replacement for incandescent bulbs. Screw in CFLs can be used in conventional lamp sockets.

CFLs come in a variety of shapes and sizes to fit most lighting fixtures. They've also been designed with lighting characteristics – colour rendering and temperature – very similar to those of incandescent bulbs. And although they cost more initially, CFLs will cost you less than incandescent bulbs when energy savings and longer life are taken into account.

Figure 1 shows the comparative costs of using an incandescent bulb versus a CFL.

CFLs are recommended for high use-lighting fixtures that are generally used for 3 or more hours per day. These high use areas often include hallways, family rooms, kitchens and outdoor porches.

Operating Costs for Incandescent bulbs versus Compact Fluorescent Lamps—Figure 1



Compact fluorescent lights use up to 75 per cent less energy than incandescent bulbs, while giving approximately the same amount of light as the higher wattage incandescent they replace.

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for generations





CFL — U-bend

Long life, energy-efficient fluorescent lamps designed for easy retrofit in existing incandescent sockets. May have 2, 3 or 4 tubes that are bent into a U-shape.



CFL — Spiral

Spiral shape provides better light distribution than U-bend. Great for table lamps.



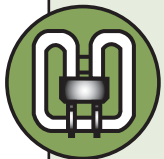
CFL — Incandescent Shape

Has a cover over the CFL that distributes the light in a similar pattern to the A-line incandescent bulb it is meant to replace.



CFL — Specialty

Special CFLs — for example dimmable or tri-light — are available for specific applications.



CFL — 2D

This unique 2D lamp is used in a wide variety of specialty fixtures. Its ultra low profile allows the fixtures to hug the wall or ceiling to provide unobtrusive lighting.



CFL — Circline

Offering a popular circular fluorescent lamp as a replacement for incandescent bulbs in typical table lamp fixtures.

Since they have a rated life of 6,000 to 10,000 hours, as compared to 1,000 hours for incandescent bulbs, maintenance requirements are dramatically reduced — particularly where fixtures are difficult to reach and burned-out lamps are time consuming to replace. (see Figure 2).

While the use of electronic ballasts has been responsible for flicker-free startup and operation, not all CFLs can be used with any control device. Most dimmers, electronic timers, and photocells require special CFLs. Incompatible use will result in premature failure of the CFL.

Ask your retailer for help in selecting the right CFL for your application.

Replacement Guide

Figure 2

Wattage		Lumen Output	Lumens per watt	
Incandescent	CFL		Incandescent	CFL
40	9	450	11	50
60	13	800	13	62
75	20	1100	15	55
100	23	1600	16	70

This should be used as a guide only. Most standard incandescent bulbs will deliver approximately the lumen output noted above; however, "rough duty" incandescent bulbs deliver considerably less. The comparison is intended for bare CFLs; those with covers or reflective styles typically deliver less light. Please refer to the CFL packaging for the manufacturers' replacement guide and lumen output rating.

Incandescent lighting

Incandescent bulbs are the most common sources of lighting in the home. Available in a variety of models, they are considered a “warm” light source and suitable for making living spaces – like family, dining and bedrooms – more comfortable by enhancing reds and yellows. Their main disadvantages are their poor use of power and short life. More than 90 per cent of the energy used by an incandescent bulb produces heat rather than light. Their typical life expectancy is 1000 to 1500 hours of operation.

Clear standard-sized bulbs are often used to add sparkle in specialty fixtures or chandeliers. They should be low-wattage and preferably controlled by a dimmer. These bulbs should not be used in situations where they are visible as they give a ‘hot spot’ at the filament location, which can create glare.

Frosted (IF) bulbs are white-coated on the inside, diffuse light evenly and create softer shadows. They are designed for use in table lamps or any situations where the light source is visible.



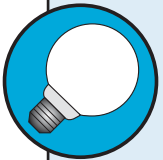
Incandescent — A-Line

The classic lightbulb provides good value and satisfies numerous lighting needs. Available in either clear for brilliant light, or frosted for reduced glare.



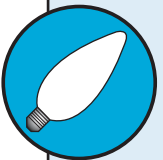
Incandescent — Reflector

Classic reflectors provide a controlled beam of light for illuminating specific areas for any effect or task. Available in wide range of diameters to fit a broad range of spot or flood fixtures.



Incandescent — Globe

Globes are ideal for decorative open fixtures. Smaller globes can often be used as a pleasing alternative to candle bulbs.



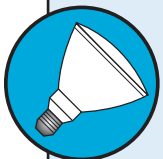
Incandescent — Candle

A perfect solution for open fixtures where the classic candle flame look is desired.



Incandescent — Flame

Unique flame-shape offers an intriguing lighting design alternative for open fixtures.



Incandescent — PAR

Parabolic Alluminised Reflectors: For a wide range of larger spotlighting and flood applications; uses range from interior spotlighting to landscape accent lighting.

Long life incandescent bulbs experience longer life because they provide less light per watt than a standard incandescent bulb making them even less energy efficient. These bulbs were meant for use in areas where light level is not critical for tasks and changing bulbs is difficult.

Reflector (R) bulbs have an interior coating of aluminum to direct the light forward. These are used in recessed fixtures to project a cone of light out of the fixture and down into the room. Ellipsoidal reflector (ER) bulbs focus the beam of light two inches ahead of the bulb to reduce the amount of light trapped

in the lighting fixture. In a recessed fixture, an ER bulb delivers more light than an R bulb.

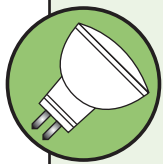
Tungsten halogen or quartz bulbs are a special type of incandescent. They are used mainly for display lighting, floor lamps and track lighting. A conventional incandescent bulb has lower bulb efficiency due to filament deposits on the bulb—this is the blackening you see on incandescents as they near the end of their life. A halogen bulb has an element added to the filling gas, which increases lamp life and efficiency. Halogen bulbs offer crisp white light and outstanding natural colours. A reflector is often incorporated into the bulb for better light dispersion and beam control. The bulbs are very compact, more energy-efficient and have a longer life than standard incandescents.

Halogen bulbs are available in both line voltage (120V) and low voltage (mainly 12V) designs. There is more ultraviolet (UV) radiation generated from tungsten-halogen bulbs than from regular incandescent bulbs due to the higher filament temperature. Safety precautions must be taken when using these bulbs. For example, fixtures for these bulbs should have a lens or glass cover that, in addition to providing the required safety protection in case of bulb breakage, filters out most of the UV radiation. These bulbs also get extremely hot and must be kept clear of potentially flammable materials.



Halogen — PAR

Halogen PAR lamps provide clear, crisp, pure white light, great for where you need that extra sparkle.



Halogen — MR16

Low voltage, compact lamps offer precise, directional lighting control.



Halogen — A-Line

Halogen bulbs offer a brilliant alternative to the incandescent a-line.



Halogen — Mini Candle

Single ended halogen bulbs utilize a mini-can base suitable for use in ultra compact fixtures.

Halogen bulbs should always be installed with the power switched off. It is also recommended that the bulb be held with a clean cloth, tissue or gloves to avoid fingerprints that can cause bulb discoloration, reduction in light output, short life, or violent failure. Follow bulb manufacturer's instructions on the package.

Fluorescent tubes

Like CFLs, fluorescent tubes provide about four times more light (lumens) per watt than incandescent bulbs. This means that one 40-watt fluorescent tube produces the same amount of light as three 60-watt incandescent bulbs, and lasts about eight times longer.

Fluorescent tubes are connected to the power source through a device called a ballast. A ballast is a transformer-like device that delivers the starting and operating voltages and electric currents to the fluorescent lamp. A typical single electronic ballast can serve one to four fluorescent tubes.

Fluorescent tubes are named according to the colour of light they emit (refer to Colour Temperature). "Cool" lamps are generally used in utility settings (laundry & shop areas) or in rooms where the decor is in blue or green tones or where mood lighting is not important. "Warm" lamps are generally best suited for living areas more closely replicating incandescent lighting. Many lighting displays will demonstrate the difference between "warm" and "cool" lamps and can provide guidance on their appropriate use.

Lighting terms

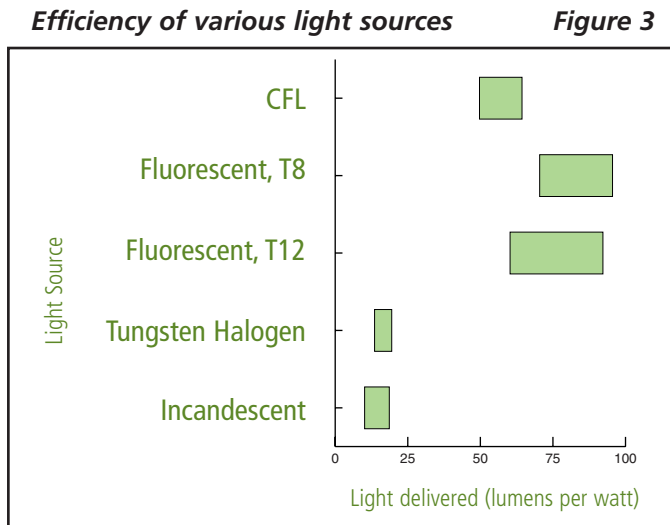
CRI — Colour Rendering Index, describes how well colours are represented under that light source compared to sunlight. Incandescent lamps have a CRI of 95+ while most CFLs are 80+. A light source with a CRI greater than 80 provides what is considered 'excellent' colour rendering.

Colour Temperature — This measures the slight differences in the colour makeup of light. "Warm" light sources have a low colour temperature (2000 to 3000K) and feature more light in the red/orange/yellow range. "Cool" light sources have a higher colour temperature (>5000K) and feature more blue. Standard incandescent bulbs are 2700K while halogen lamps are 3000K. Many CFLs fall within that 2700 to 3000K range.

Bulb, lamp, fixture & luminaire — Although 'bulb' and 'lamp' are often used interchangeably, the bulb shape was meant to refer to the shape of the incandescent light source. Lamp — which means, a device for producing a steady light — is the more correct term, particularly with all the different shapes today. A luminaire — most commonly known as a lighting fixture — consists of an electric light and its fittings.

A comparison of lumen efficiency

A lumen is a measure of the amount of light produced. The efficiency of light is defined as the ratio of the light output (lumens) to the energy input (watts). The higher the lumens per watt, the more efficient the light. Figure 3 shows the efficiency of various light sources.



Control systems

One of the simplest ways to reduce your lighting energy consumption is to add lighting controls that allow lights to be switched off when an area is unoccupied, or where lights may be inadvertently left on.

Toggle switches are the most common control for residential use. Three-way type switches, usually installed at entrances to rooms, stairways and hallway, permit the control of a light fixture from more than one location. Toggle switches can provide a pathway of light when going from one room to another and encourage energy savings by providing switches at more than one point of room entry so lights can easily be turned off when leaving rooms.

Dimmer switches can vary the level of light to create many moods while saving energy. Available in both lamp-socket and wall-mounted varieties, dimmers offer flexible control of light levels and economic operation. Using a dimmer at less than the full-bright position will prolong lamp life and conserve energy. Fluorescent lamps require special dimmers although dimmable CFLs can be used with conventional incandescent dimmers.

Low-voltage halogen (mainly 12V) lamp systems can have magnetic or electronic transformers. A magnetic transformer can be controlled with a conventional incandescent dimmer but an electronic transformer requires a special dimmer.

Ask your lighting supplier for the correct dimmer for your system.

Time controls are 24-hour electric clocks that can be set to switch devices on or off at predetermined times. Some time switches are equipped with a feature that automatically adjusts turn-on time according to season. They may for example be set to come on at dusk for a four-hour period. These are particularly well suited for controlling outdoor lighting.

A portable plug-in time switch can be used to turn a table lamp, radio or any appliance on and off automatically. These can help prevent accidents and can discourage intruders or vandals. When you are away, they can turn lights on and off at appropriate times to give your home a lived-in look or they can turn walkway lighting on for when you return at night.

Occupancy and motion sensors are electrical devices that can automatically turn lights on or off in response to the presence or absence of occupants in a space. Occupancy is sensed by ultrasonic, infrared, audio or optical means. Good applications for occupancy sensors include stairwells, long hallways, laundry rooms or other areas that are visited infrequently and where you are likely to have your hands full. Motion sensors are well suited for use outdoors to provide security (discouraging intruders), safety (to avoid obstacles) or for convenience reasons.

Photoelectric controls, commonly referred to as "photo-cells", are activated by natural light for automatic dusk to dawn lighting. As it begins to get dark, the lights will go on and as dawn approaches the lights will turn off. They are ideal for enhancing outdoor safety and security, lighting walkways, driveways, entrances and other areas where continuous night lighting is desirable. They are often used with motion sensors ensuring that lights do not come on during daylight hours.

Colour and reflection

In all lighting systems, some of the light that reaches a task area is reflected from the walls and ceilings. Lighter paint shades reflect more light while darker paint shades absorb more light. It is therefore important to choose your room colour carefully, keeping in mind how much the colour will reflect the light within the room.

Cool shades such as greens and blues, reflect more light than warm shades of beige, pink or coral. In order to get maximum efficiency from a lighting system; consider finishing the room in light colours. Where possible, avoid high gloss finishes. These surfaces produce glare and can lead to visual discomfort and eyestrain.

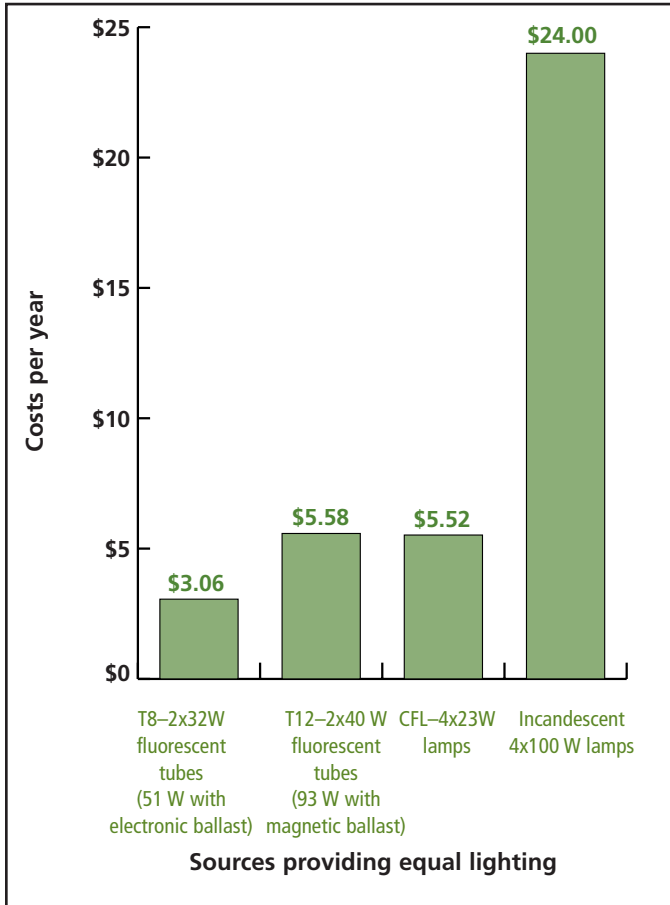
Cost of operation

Fluorescent lighting is more economical and efficient than incandescent, as it gives more light per watt used. On average, a light in a home is used for 1000 hours per year. Figure 4 shows typical annual operating costs for common sized lamps used in lighting fixtures. In fluorescent fixtures the ballast uses a small amount of power (typically 3-4 W) that needs to be added to the wattage of the bulbs.

Typical annual cost of operation

(Based on 1,000 hours of operation at \$0.06 per kWh)

Figure 4



Maintenance

When working with lights and electricity, always use extreme caution. Ensure that the electric circuit to the fixture is turned off at the breaker, and be sure that bulbs are sufficiently cool before touching.

Fixtures, bulbs and lamp parts should be cleaned at least once a year. Dust and dirt accumulation reduces the light output and therefore the light's efficiency. Careful, frequent vacuuming is often all that is required to clean lampshades. Fixture covers should be washed with soap and water, then thoroughly rinsed. Plastic parts should be allowed to drip dry because a drying cloth can create static electricity that will attract dust particles. Wet cloths should never be used to clean hot lamps as they may shatter.

Installation

This is a general guide only. Please ensure that all installations meet your requirements, manufacturer's instructions and all applicable codes, standards and regulations. BC Hydro is not responsible for installations.

For more Power Smart information call:

Lower Mainland 604 431-9463

Elsewhere in B.C. 1 877 431-9463

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