



indoor lighting for comfort and savings

overview

Well designed 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 added 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 correlated colour 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.

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.

Figure 1 – Comparing incandescent bulbs and CFLs of similar light output over 10,000 hours of use.

	INCANDESCENT BULB	CFL
Energy Use (in watts)	60 W	15 W
Typical luminous flux (in lumens)	820	950
Bulb Life	1,000 hours	10,000 hours
Cost of bulbs over 10,000 hours of use	4 pack = \$3.00 1 bulb = \$0.75 x 10 bulbs* = \$7.50 *10 bulbs x 1,000 hour = 10,000 hours 	2 pack = \$10 1 bulb = \$5 1 bulb** = \$5 ** 1 bulb x 10,000 hours = 10,000 hours 
Cost of Electricity	60 W x 10,000 hours = 600 kWh 600 kWh x \$0.07/kWh = approx. \$42	15 W x 10,000 hours = 150 kWh 150 kWh x \$0.07/kWh = approx. \$10.50
Savings		Bulbs (\$7.5 – \$5) = \$2.5 Electricity (\$42 – \$10.50) = \$31.50 Approx. \$32

Note: *cost of bulbs and savings are estimates – use this chart as a guide only.



CFL – U-bend

Long life, energy-efficient compact 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.



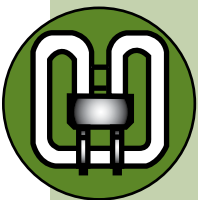
CFL – Incandescent Shape

Have a cover over the CFL that looks similar 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

Comes with newer efficient fixtures. Not sold as a replacement bulb.

Since CFLs have a rated life of 6,000 to 10,000 hours, as compared to 1,000 to 1,500 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.

The creation of electronic ballasts has been responsible for flicker-free startup and operation. However, 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.

Figure 2 – Replacement Guide

WATTAGE		LUMINOUS FLUX
INCANDESCENT	CFL	(in lumens)
40	7–9	400–500
60	13–15	800–1,000
75	18–20	1,100–1,300
100	23–26	1,600–1,800

This should be used as a guide only. Most standard incandescent bulbs will deliver approximately the luminous flux 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 luminous flux rating.

Incandescent lighting

Incandescent bulbs are still 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. 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.

Long life incandescent bulbs experience longer life because they provide less light per electrical power consumed 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.

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 the light and create softer shadows. They are designed for use in table lamps or any situations where the light source is visible.

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.



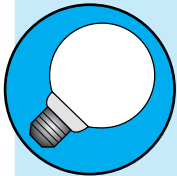
Incandescent – A-Line

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



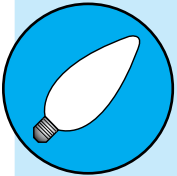
Incandescent – Reflector

Classic reflectors provide a controlled beam of light for illuminating specific areas for any effect or task. Available in a 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 Aluminised Reflectors: For a wide range of larger spotlighting and flood applications; uses range from interior spotlighting to landscape accent lighting.

ENERGY STAR® Lighting



What is ENERGY STAR?

ENERGY STAR is an international symbol of energy efficiency that identifies products that are among the most energy-efficient on the market.

Savings and convenience

All ENERGY STAR compact

fluorescent lights (CFLs) use 75 per cent less electricity than standard incandescent bulbs and last up to 10 times longer.

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 comfortable white light and excellent colour rendering. A reflector is often incorporated into the bulb for better light distribution 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 hotter than CFLs with a similar light output and must be kept clear of potentially flammable materials.

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 shortened life. Follow bulb manufacturer's instructions on the package.

ENERGY STAR qualified torchiere lamps use bulbs that are cool to the touch. Typical halogen torchiere floor lamps can burn dangerously hot – up to 1,100 °F.

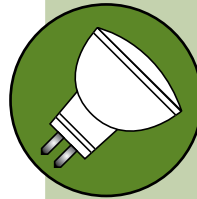
ENERGY STAR qualified light fixtures and CFLs carry a two year warranty – double the industry standard.

When you use ENERGY STAR CFLs, you save energy, money and you help protect the environment.



Halogen – PAR

Halogen PAR lamps provide clear, comfortable white light.



Halogen – MR16

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



Halogen – A-Line

Halogen bulbs offer an alternative to the incandescent A-line.

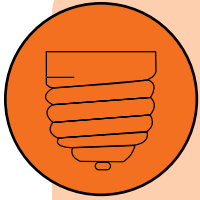


Halogen – Mini Candle

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

Lamp Base Shapes

Most of the lamp sockets for incandescent, halogen and CFLs come in two common forms.

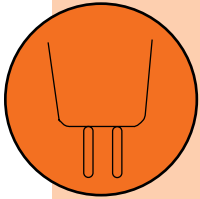


1st Common Form Edison or Medium Screw

For use with most incandescent bulbs from 11W to 250W, halogen lamps type PAR/ A-line, some MR16-line voltage (120V), and most screw-based CFLs with integral ballast form.

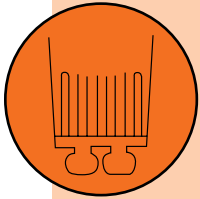
2nd Common Form Bi-Pin

Some specialty sockets like the Bi-Pin are used for selected lamps. Lamps are different for each of these socket types and can not be interchanged.



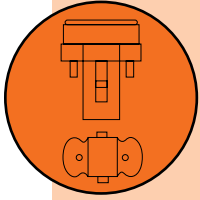
GU5.3 / GX5.3

For use with halogen MR16-low voltage lamps (12V).



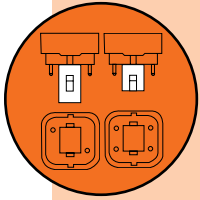
GU-10

For use with halogen MR16-line voltage (120V).



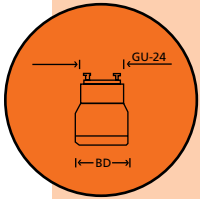
G23

For use with 2-pin double/ twin CFLs (5W to 13W).



G24

For use with 4-pin double/ triple CFLs (18W to 70W)



GU-24

For use with new type CFL lamps with integral ballast (soon to be commercially available).

Fluorescent tubes

Like CFLs, fluorescent tubes provide about four times more light (lumens) per electrical watt consumed than incandescent bulbs. This means that one 40-watt fluorescent tube produces a similar amount of light as three 60-watt incandescent bulbs, and lasts about 10 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 limits the 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 Correlated Colour Temperature below). "Cool" lamps are generally used in utility settings (laundry and shop areas), 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 retail lighting displays will demonstrate the difference between "warm" and "cool" lamps and can provide guidance on their appropriate use.

Lighting terms

Bulb, lamp, fixture and 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.

CRI – Colour Rendering Index, describes how well colours are represented under that light source. 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 'very good' colour rendering.

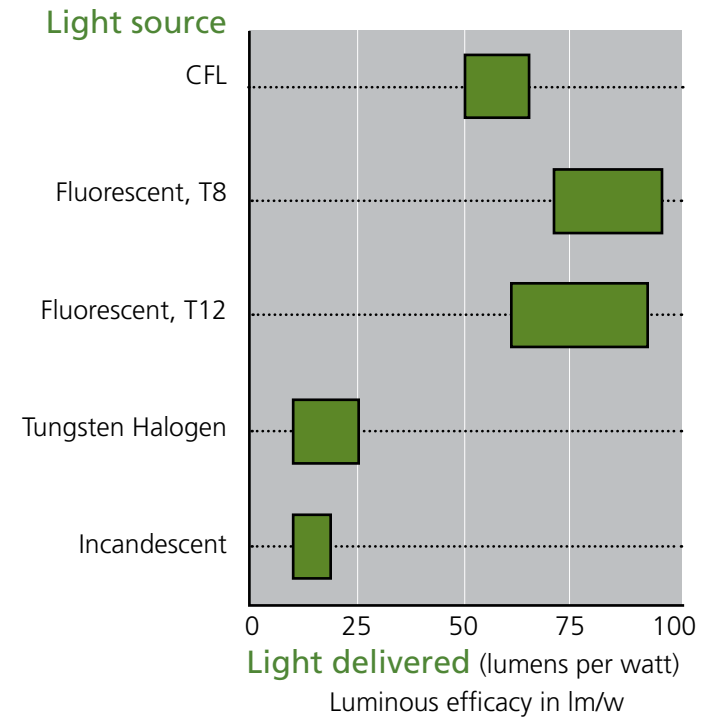
Correlated Colour Temperature – This measures the slight differences in the colour makeup of light. "Warm" light sources have a low colour temperature (2,500 to 3,000K). "Cool" light sources have a higher colour temperature (>3,300K) and feature more blue. Standard incandescent bulbs are 2,700K while halogen lamps are 3,000K. Many CFLs fall within that 2,700 to 3,000K range.

A comparison of luminous efficiency

A lumen is the unit of luminous flux. The luminous efficiency is defined as the ratio of the luminous flux (lumens) to the electrical power consumed (in watts). The higher the luminous efficiency, the more energy efficient the light generation.

Figure 3 shows the luminous efficacy of various light sources.

Figure 3 – Efficiency of various light sources



"Warm" light sources have a low colour temperature (2,500 to 3,000K) and feature more light in the red/orange/yellow range.

"Cool" light sources have a higher colour temperature (>3,300K) and feature more blue. Many CFLs fall within that 2,700 to 3,000K range.

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 hallways, 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 can prolong lamp life and will conserve energy. Fluorescent lamps require special dimmers although some 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.

For example they may 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 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, or audio 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, use photocells to control the electrical lighting depending on the daylight available in the space. They could be used 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 come on at night when there is movement detected.

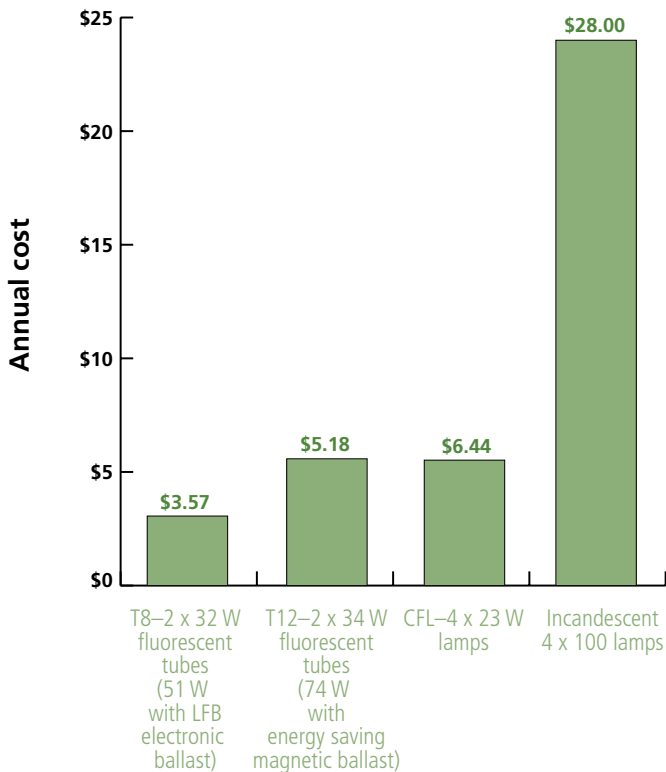
Using a dimmer at less than the full-bright position can prolong lamp life and will conserve energy. Fluorescent lamps require special dimmers, although some dimmable CFLs can be used with conventional incandescent dimmers.

Cost of operation

Fluorescent lighting is more economical and efficient than incandescent, as it gives more light per electrical Watt used. On average, a light in a home is used for 1,000 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 that needs to be added to the power of the bulbs.

Figure 4 – Typical annual cost of operation

(Based on 1,000 hours of operation at \$0.07 per kWh)



Sources providing equal luminous flux

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 system is efficient. Careful and frequent cleaning 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 information call:

Lower Mainland.....604 431-9463

Elsewhere in B.C.....1 877 431-9463

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