Consumer Factsheet

Home lighting

PEER REVIEWED

Lighting is an important parameter in home design, enabling safety and comfort for the performance of everyday tasks, such as walking, reading, cooking, etc. The purpose of this factsheet is to inform people about the properties of the most common household lights and assist them choose the right light bulb for their needs.

Which lighting types should I use in my home?

There are three main types of light bulbs that can be used in home interiors: Light Emitting Diodes (LEDs); Fluorescents and Compact Fluorescent bulbs; and halogen bulbs. The choice of lighting source depends on many parameters, such as the use of the space and the lighting levels required, the cost of the bulb and its useful life, the energy that it consumes, the colour of the light it emits, etc.

Two main lighting techniques are used in home environments: general lighting and task lighting. General lighting is used to light a large space, e.g. a dining room or a bedroom. General lighting can be provided by natural light, artificial light or a combination of the two. Task lighting is the lighting used to increase the amount of light in a specific, smaller area, such as on a desk, on the kitchen counter, etc. Task lighting is usually provided by fixtures, as artificial light is more easily controlled than natural light. Both general and task lighting can be tailored to a resident's needs.

The following paragraphs describe the main types of bulbs used in homes and their characteristics. Useful information for general and task lighting is also provided.

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Halogen lights

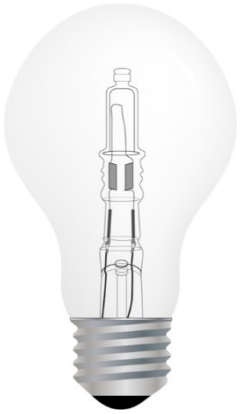

Figure 1. Halogen light bulb with Edison screw cap

Figure 2. Halogen spotlight

Halogen bulbs are a type of incandescent lamp, which is more efficient and has a greater lifespan than the phased-out incandescent filament lamps. However, they are much less efficient than fluorescents and LEDs, they don't last as long and emit greater amounts of heat when turned on. Halogen lamps maybe useful for smaller applications, e.g. to highlight a space or object but may overheat[1] and thus present a fire risk. General lighting, i.e. a whole room lighting should be provided by other lighting types. Halogen lamps are easily dimmable, cheap and provide instant, full output.

Halogen bulbs come in many different shapes such as Bi-pin, MR, PAR, reflector lamps, double ended, single ended, and A-shaped, to enable different applications. Note that different lighting fixtures might require either mains or low voltage halogen lamps. Thus, when buying a halogen bulb to replace an old one, make sure that you have the old bulb with you and you check that all the characteristics are the same.

Fluorescent and Compact Fluorescent lights

Fluorescent tubes are mostly used in working environments but can also be found in home kitchens and bathrooms. They come in many lengths and diameters and they should be chosen depending on the fixture's standards. The tube can even be bent to form a circular light, commonly found in kitchen fixtures.

Old fluorescent lights using magnetic ballasts, can occasionally cause flickering and/or humming. Even unnoticeable flickering can cause headaches, eye strain and general eye discomfort and is not recommended for people with epilepsy, vertigo and other disorders. To avoid flickering of fluorescent lights replace them on a regular basis, as old bulbs flicker more and ensure all parts of the fixture work properly.

Contemporary fluorescent lights, however, use electronic ballasts which eliminate flickering that is perceived by the human eye and minimise the discomfort. Replacing of old fixtures using magnetic ballasts with new systems that use fluorescent tubes with electronic ballasts is recommended. Fluorescent tubes are not easily dimmed, and dimming would require a special fixture installed.

[1] https://www.fire.nsw.gov.au/page.php?id=709

Figure 3. Compact Fluorescent light bulb with bayonet cap

Compact fluorescent lights (CFLs) are another type of fluorescent light, where the tube is twisted and folded, so that the length is reduced, and the CF bulb can replace incandescent bulbs in domestic fixtures. CFLs usually do not flicker and should not be used with dimmers, unless otherwise stated on the product packaging. Fluorescent tubes and CFLs are much more efficient than halogen lamps and emit more diffuse light, with less anticipated heat. Older fluorescent and CF lights had slow warm-up times however, the newer versions have much shorter warm-up times and are suitable for use in many domestic spaces.

A common misconception is that all fluorescent lamps emit "cool" white light (white or blueish light). Fluorescent lamps can emit from warm to cool white light, depending on their "colour temperature" properties. You should describe the appearance of the light you prefer at the retail shop where you buy the fluorescent lamps so that they can help you choose the right lamp for your needs.

Note that cool (white-blueish appearance) light tends to keep people alert while warmer (yellowish appearance) light helps the human mind and body relax. So, you might want to use different coloured light for different rooms and/or tasks.

Fluorescent and Compact Fluorescent lamps contain mercury, a heavy metal that can lead to health risks if inhaled or swallowed. Mercury contained in fluorescent lamps can only escape the bulb if this break. Thus, fluorescent tubes and CFLs should be disposed of with hazardous waste for special handling and not with unsorted household waste. If a fluorescent bulb breaks in your home, air the room before cleaning and clean the lamp with a wet cloth. Avoid skin contact with debris and do not use a vacuum cleaner[2] .

[2] https://ec.europa.eu/health/sites/health/files/scientific_committees/docs/citizens_mercury_cfl_en.pdf

LEDs

Figure 4. LED spotlight

Light Emitting Diodes (LEDs) are one of today's most energy-efficient and rapidly developing lighting technologies. Quality LED light bulbs last longer, are more durable, and offer comparable or better light quality than other types of lighting.

Residential LEDs use at least 70% less energy, and last 25 times longer, than incandescent lighting. The differences with the more common lighting technologies are:

- they are much smaller in size and versions fitting most domestic lighting fixtures have been developed and manufactured;
- LEDs emit directional light, reducing the need for reflectors and diffusers that can trap light. This feature makes LEDs more efficient for many uses such as recessed downlights and task-lighting;
- LEDs emit very little heat. In comparison, incandescent bulbs release 90% of their energy as heat and CFLs release about 80% of their energy as heat.

LEDs can replace halogen bayonet cap or Edison screw light bulbs, Par38 (a type of halogen or LED light bulb with an aluminized reflector inside, often used outdoors).

LEDs may cost more at first but they are more energy efficient and last longer. LEDs can only be dimmed with special dimmers.

A common issue with using “retrofit” LEDs is when replacing lighting systems where the light bulb used to be dimmed. This is because dimmers for halogen bulbs are designed for much higher loads than these of LEDs, therefore it is unlikely your old dimmers will dim LED bulbs in the same way and using LEDs could cause lamps flickering. If replacing halogen bulbs `with dimmable LEDs, you will need to check with an electrician that your existing dimmer is compatible with your new LED bulb.

Figure 5. LED light bulb with Edison screw cap

LEDs can emit all different hues of white, such as warm white, cool white and daylight. Consumers should only trust LEDs from reputable manufacturers, as cheap and low-quality LEDs may flicker when dimmed, have a shorter life or be less bright than expected.

Please note that changing light bulbs can be done by the homeowner but replacing any light fittings or dimmers should always be done by a licenced electrician.

You should also avoid installing recessed fixtures of any type (halogen, fluorescent or LEDs), before a licensed electrician checks the fixture and the area where this will be installed (ceiling, wardrobe, etc.). Recessed light fixtures can generate great amounts of heat and if not properly installed they could cause a fire. Moreover, penetration of fire-resistant ceilings for installing recessed lights might compromise the fire integrity of the ceiling.

Table 1. Comparison of bulb characteristics

	Traditional Incandescent bulbs	Halogen bulbs	CFLs	LEDs
Efficiency (lumens/ Watt)	10-15	14-20	35-60	60-95
Life (hours)	1000	1000-3000	10,000	25,000
Colour appearance of emitted light	Warm white	Warm white	Warm white – Neutral white – Cool white	Warm white – Neutral white – Cool white
Energy saved using bulbs equivalent to a 60W incandescent bulb	-	25% (for a 43W halogen lamp)	75% (for a 15W CFL lamp)	70-80% (for a 8-12W LED lamp)

What other parameters will improve lighting comfort in my home?

Lamps are an important part of the lighting environment of the home. However, lighting is not only affected by the light source but also by the fitting and the surrounding environment, i.e. the room where it is placed. The following paragraphs give some general advice about elements that can improve interior lighting in the home.

Lighting techniques

Lighting techniques include the various ways light can be distributed and/or redirected by the light fixtures. Many different techniques can be used in a home. The following paragraphs describe the two techniques that can increase visual comfort and visibility but are often overlooked.

Up lighting for general lighting purposes: The most common general lighting technique in residential buildings is with the use of downlights. Downlights are the light fixtures that emit light mainly downwards. Downlights can offer high lighting levels and they are particularly useful in rooms where visually demanding tasks are taking place, like in the kitchen or a workshop. However, they can also cause glare when the lamp is not well-concealed. Glare can cause discomfort, for example headaches, or even prevent people from carrying out certain tasks, such as seeing clearly on a screen when a lamp is reflected on it.

Not many people realise that uplighters, i.e. light fixtures that emit light upwards, can offer glare-free general lighting, appropriate for many of the activities that are performed in a house, like watching TV, dinning, chatting, etc. Uplighters can be found in different types of fixtures, such as pendant lights, floor lamps or wall-mounted lights.

Task lighting: Task lighting is the lighting that is provided by a fixture directly above the task area. In the home, these tasks could be writing, reading, cooking, shaving, searching for clothes in the closet, etc. Task lighting is not only useful for increasing the lighting levels and the visibility of the task but also to reduce the energy consumption for general lighting, as many people tend to increase general lighting load if they are not able to perform a task. LEDs are probably the best choice for task lighting, as they emit very small amounts of heat while operating, minimizing thermal discomfort. Their small size and wattage also allow for applications where space is limited, or a power outlet is not available. For example, LED strips with adhesive backing, working with batteries can easily be installed above kitchen benches, in closets, stairways and corridors to minimise the use of general lighting during the night, while reducing the chances of falls.

Colours of home surfaces and their effect on the visual environment

The amount as well as the colour of the light reaching our eyes or the surfaces in our homes depend not only on the capacity of the light source (bulb or fixture) but also on the colour of the interior surfaces. Colours and light in the home can be used to assist people with ageing eyes or impaired sight, to move safely and independently around. Colours can help you with recognising objects, sharing your thoughts with others, finding your way, and improving your mood. For more information on this important topic please see the HMinfo Consumer Factsheet: How can colours support movement of people with ageing eyes or impaired sight?

Home Lighting Checklist

Are there any burnt out bulbs in your home light fixtures?

If yes, take them to a store and ask for more efficient bulbs to replace them with. ☐

Do you think that the general lighting levels in any room of your home is lower than they should be?

If yes, check the following:

Can you install more bulbs to an existing fixture? ☐

Can you replace the existing lamps with brighter and more efficient lamps?

Can you install lamps of higher wattage?

If none of the above is possible or solving the problem, add more light fittings to the room.

Do you have difficulty performing a task, such as reading, knitting, cooking, etc, in your home? ☐

Try installing task lighting appropriate for the type of task you want to perform.

Do you experience glare from the contrast between too bright and dark areas in your home?

If yes, try the following:

If glare is caused by a window, reduce the contrast between the windows and the walls by painting the walls in brighter colours and installing darker curtains or shades. ☐

If glare is caused by light fixtures, try to conceal the light source (bulb) by using diffusers or lamp shades.

Where can I find more information?

- The HMinfo *Evidence Based Practice Review: Lighting your Way into Home Modifications, 2nd ed.* available from the HMinfo website: www.homemods.info
- The HMinfo *Consumer factsheet: How can colours support movement of people with ageing eyes or impaired sight?* available from the HMinfo website: www.homemods.info
- Lighting Council Australia, *LED Buyer's Guide,* available at https://www.lightingcouncil.com.au/fact-sheets/
- The Equipment Energy Efficiency (E3) program, Information for consumers, https://www.energyrating.gov.au/lighting
- US Department of Energy: https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/how-energy-efficient-light
- Fire and Rescue NSW. Halogen downlights. Available at https://www.fire.nsw.gov.au/page.php?id=709
- ELECSA. Recessed light fittings. Available at http://www.elecsa.co.uk/Documents/Contractor-Documents/Technical-Downloads/Recessed-light-fittings-guide.aspx
- Other home modification resources on the HMinfo website: www.homemods.info

***This information was correct at time of printing.*