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ISSUE 33 • SUMMER 2015
AUD$11.95 • NZ$12.95
SANCTUARYMAGAZINE.ORG.AU
ISSN 1833-1416

Home lighting design

WORDS

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Lighting is the forgotten hero of home design – when done well it makes us feel good, and our homes safe and easy to navigate, but it can also be energy hungry. Interior designer Megan Norgate suggests ways to make clever lighting choices that look great and have less impact.

LIGHTING ACCOUNTS FOR AN AVERAGE OF 6 PER CENT OF residential energy use and between 8 and 15 per cent of the overall household electricity budget. There are clearly efficiency and budgetary gains to be made when designing and specifying lighting solutions. Despite this, home lighting choices are often an after-thought, missing the opportunity to maximise efficiency and to access the potential health, functionality and aesthetic benefits of good lighting design.

Each area of a home has different lighting requirements and each light fitting need only provide enough directional light for its purpose. The earlier that lighting is addressed in the design and build process, the more likely sustainable and appropriate choices will be made before time, patience and budget run out.

DAYLIGHT AND PEOPLE

The most important source of light to consider is daylight, not only because it is a free resource, but also because it positively affects our health and happiness. Ideally a home has enough windows that supplementary lighting is rarely needed during daylight hours, as this causes the least disturbance to human circadian rhythms. Circadian rhythms are the biological, behavioural and cognitive changes that occur in the body over a 24-hour period in response to environmental signals such as light and darkness. Natural light can assist in reducing fatigue and improve sleeping patterns, alertness and mood.

Appropriately sized and oriented windows will allow light gain according to the direction and timing of sunlight. For example, east-facing windows can be lovely in bedrooms and kitchens to help you start the day, and larger windows are needed in daytime use areas such as kitchens and living areas than in bedrooms and utility spaces. Though of course, window sizing and orientation for daylight should be considered within passive solar design requirements to balance against undesired heat gain or loss.

In a dimly-lit environment, the placement of new windows, skylights or solar tubes can have multiple benefits. When there is overshadowing from a neighbouring property, boundary wall or vegetation, a clerestory or highlight window can dramatically improve an interior space. Alternatively, quality skylights with seals, double glazing and a capacity for summer shading can be used. Solar tubes effectively access natural light with a small glazed surface area, preventing the heat gain and losses associated with skylights.

Other, often less expensive tactics include painting the shaft or light well a light colour to bounce light into the interior, or using light paint and reflective surfaces on south-side exterior fences or walls to bounce light back through south-facing windows. For apartments or other spaces with no roof or wall access to daylight, LED skylights that mimic the outdoor light levels could be a good option.

PLANNING YOUR LIGHTING

A considered lighting plan begins with working out what tasks are likely to be done in a particular space, and the amount of lighting required to comfortably complete them. This means considering the ways householders use each room; if people sometimes work at the dining table, then an option for bright light is a good idea. Even better, place a window or skylight above daytime work areas to boost productivity.

Lighting throughout a house can be provided by a combination of ceiling lights, wall lights, downlights and pendants. Some areas of the home, such as utility areas and passageways, have fixed layouts but bedrooms, living rooms and dining rooms have movable elements, so a degree of flexibility can be incorporated, including the use of standard and table lamps. In open plan designs, flexible lighting can help to define zones and allow for differing moods and activities.

Architect Caroline Pidcock worked hard to bring light into the once dark kitchen of her beautifully renovated Victorian terrace in inner Sydney. The suspendend LED Koda light over the kitchen bench offers a small amount of uplighting as well as downlighing to add to the the general ambience of the room. LED strip lighting above the kitchen bench with a mirror splashback helps to bounce the light around the room. See *Sanctuary* 32 for a full profile on this house. Image by David Iacono.

TASK LIGHTING

Task lighting is needed in utility areas such as kitchens, laundries, bathrooms and offices. Here it can be directed where it is needed most, such as above the sink, stovetop and food preparation areas, ensuring a person's head will not cast a shadow. LED strip lights and recessed downlights under cabinets are ideal for these purposes, and should be specified before cabinets are built and installed so that recessed tracks, cutouts and transformers can be integrated into the design.

OUTDOOR LIGHTING

Outdoor lighting is important for safety and amenity, but don't overdo it, and make sure directional lighting doesn't face a neighbour's window or entranceway. Floodlights can use up to 500 watts per light and can easily be left on accidently during the day, so using LEDs could save around 80 per cent of energy use. Wall-mounted lights, solar lighting and porch lights are a welcoming safety feature around access areas. Outdoor living and dining spaces can also benefit from ambient lighting, such as a pendant or solar powered fairy lights strung over pergolas or fences. Various landscape, deck and pathway lighting can be used for safety and effect; pick a couple of key areas to highlight rather than the whole space.

HOW MUCH LIGHT?

To assess the quantity of light needed in an area you need to consider both quantity of light emitted (lumens) and the beam angle (60-180 degrees). Lux is the measurement of light intensity, based on lumens, distance from the light source and the beam angle of the light. This measurement is used to ascertain how many of each type of light is needed in a particular area of your home. Typically for general use, 200 to 300 lux is sufficient, with 350 to 800 in task areas and 150 lux for soft light.

Free software such as Relux can be used to calculate how many light fittings are needed in each space, or lighting designers and some suppliers will be able to provide an accurate plan.

LIGHT TEMPERATURE AND COLOUR

Colour temperature is a way of defining the colour characteristics of light, ranging from cool, bluish tones to warmer, yellow and red ones. Task areas are often best served with a 'white' light at the cool end of the spectrum for a given globe wattage, as cooler LED lights tend to have slightly higher lumen outputs per watt of electricity used. Studies have shown that blue light can have a stimulating effect on people due to its similarity to early morning light. Spaces for relaxation may benefit from warmer light sources for the opposite reason. Avoid placing very warm and cool lights next to each other as they can clash. Some fittings and bulbs have both warm and cool LEDs and smart control systems, allowing the flexibility to select the colour temperature desired using a remote control or mobile phone app.

LIGHTING AUTOMATION

Home automation uses technology to control homes with the push of a button, voice command or our presence in a room. At a basic level it is a sensor light that switches on with human activity. More sophisticated systems allow lighting and appliances to be controlled via smartphones or tablets. These products allow users to schedule appliance and lighting use and get alerts when something has been left on. Home automation is best approached by starting small and understanding the technology fully before investing.

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No artifical light is needed during daylight hours in this new house in Eltham, Victoria, designed by Lume Architecture. No part of the house is more than four metres from a window, and in many rooms windows face different directions to allow for natural light throughout the day.

A LUME-INATING DESIGN

Photography by Lisbeth Grossman

Lighting was a carefully considered aspect of this new house design by Lume Architecture in Eltham, in outer, leafy Melbourne. Architect Lynnsay Prunotto used a furniture plan, guided by the homeowners Sami and Sarita, to understand their lighting needs and to avoid over-lighting.

Availability of natural light was prioritised so that artificial lighting is not needed in any room in the daytime, with no part of the house further than four metres away from a window. But Lynnsay also worked to balance glazing for natural light with energy efficiency aims. "I am very careful with window design as glass is such a poor insulator," she says. "So there is just one large double-glazed window/door in the main living space to allow a positive connection with the outdoors." In other rooms, the windows were kept smaller, but wherever possible had two in each room, facing different directions to allow for direct sunlight to enter for longer periods, as the sun moves across the sky. Attached shading to the outside prevents excessive solar gain in the summer.

Task lighting solutions included an LED spotlight, ceiling-mounted to cast directional light for reading music at the piano, and LED strip lighting over a sewing desk. Dimming switches were installed to turn task lighting to mood lighting, or to night lighting, when desirable, rather than having separate light fittings for each function, and to reduce energy use.

Recessed downlights were used with discretion, and those that were used had sealed fittings, and allowed insulation around them to reduce heat transfer between internal spaces and the ceiling cavity.

Light fittings were selected for their functionality, but also to emphasise particular interior features. The stair light, for example, lights the steps below and the curve in the ceiling overhead. Fittings were also selected for fun, such as the bright yellow ceiling mount for Sami and Sarita's young daughter, or for their sculptural quality, in the case of the pendant fittings over the dining table. Some fittings also include mobile app-controlled LED globes that can change colour.

LIGHT FITTINGS

PENDANT LIGHTS AND LAMPS

Decorative pendant lamps look best in open spaces with high ceilings or hung low over areas that are not walked under such as dining tables or the corners of rooms. Scale is important with a pendant lampshade or chandelier as the width and height of the fitting should appear balanced within the room and its furnishings. Pendant lights with solid sides will cast light downwards in a relatively narrow beam, and are better suited over a table rather than as a central light. Exposed bulbs, translucent and clear shades will cast light in multiple directions, while coloured and perforated shades will create hues and patterns in the light they throw. Coloured, milk, etched, frosted and hand-painted glass shades will create softening, diffusing and toning effects. Vintage light fittings may need to be restored and re-wired by a qualified electrician or lighting restorer, so consider the cost of this when purchasing them; multi-globed fittings such as chandeliers are likely to be quite expensive, but still comparable overall with the cost of high quality new decorative fittings. However, they can be energy-intensive if not lamped appropriately, so look for low-wattage bulbs for your fittings.

WALL LIGHTS

Wall lights are excellent for mood lighting as opposed to task lighting because they conceal the light fittings and can direct light up and/or down, creating a consistent wash of diffused light. Generally, wall lights are used in groups or with a combination of other lighting to provide adequate lux levels in a space. Wall lighting is useful for when ceiling fans are placed in a central light position. Feature wall lights and lamps can be used to highlight objects and draw people to an area. Consider the placement of all wall-mounted elements when deciding on the height and location of lights.

DOWNLIGHTS

Downlights are small, often directional lights generally recessed into the ceiling. Traditionally used with inefficient halogen bulbs, downlights have been a well-documented cause of energy wastage and high power bills, with interruption to ceiling insulation leading to unwanted heat loss/gain. Thankfully there are now LED replacements and less insulation-disruptive options available.

Surface-mounted downlights are an alternative option for general and task lighting where you want to avoid the ceiling penetrations and the associated energy loss of regular downlights. LED options are common and don't generate the levels of heat that makes halogen downlights a fire hazard. A reputable lighting supplier will be able to calculate how many will be needed.

Flat disk LED downlights are a useful option where ceilings are low, or where a surface mounted light fitting could look too busy. They typically have a wide beam spread, usually 120 degrees or wider. Unlike many downlights they are a sealed unit and insulation can be installed up to the edges of the fitting. Some fittings may be rated to be insulated over, but as all LEDs produce heat and would be more likely to overheat with insulation, they will run cooler and brighter and last longer without.

BATTEN FIX AND CEILING MOUNTED

These are an economical choice for low ceilings and anywhere a ceiling light is desired and a feature light is not required, such as laundries, bathrooms, hallways and entries.

DON'T FORGET THE SWITCHING

The homeowner should carefully study electrical plans as they know best how they are likely to use their home. Any room with two entrances should have switches at both for convenience and switches should be grouped together where possible. However, some task lighting switches might be better placed at the location they are used. Ensure the heights and locations of switches are specified in plans or you may find switch plates in the middle of your beautiful tile splash back. Dimmer switches allow lights to be softened or made brighter for mood and convenience. Typically this is useful for bedroom, living, dining areas or anywhere some control over ambience is desired. Compatible globes and light fittings must be used with dimmer switches. Image by Emma Byrnes.

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TYPES OF GLOBE

LEDS

Light emitting diodes are solid-state semiconductors that convert electrical energy into light. LEDs have many advantages over other options, including very low energy use, long life (up to 50,000 hours), instant full light, and very little deterioration over time. LED replacements should now be available for all lighting types, but some halogen globe replacements for downlight fittings can leak more air than halogens as they have cooling fins around the perimeter, which could offset any energy efficiency gains. This is one reason to opt for full fitting replacements instead of bulb retrofits. Like all technologies, quality between LED globes varies greatly, and high quality units are desirable. As the price of LEDs falls and life expectancy and savings over time are factored in, they provide a good return on initial investment.

COMPACT FLUORESCENTS

CFLs use about 70 per cent less energy than incandescent bulbs, but do have significant issues in both efficacy and environmental impact. These lights have warm up periods for full brightness so are not suitable for the instant light that may be needed in hallways, bathrooms or as sensor lights. CFLs also contain mercury so must be disposed of through recycling programs to avoid contaminating landfill, and are potentially hazardous if broken inside the home.

FLUORESCENTS

Fluorescents are typically used as office lights and the tubes come in a range of light colours, including cool, warm and daylight varieties. While high quality tubes with good quality light output are available (known as triphosphor and quadphosphor tubes), usually the much cheaper halophosphor tubes are selected; these emit a cool light with poor colour rendering, and are more prone to flickering when used in older fittings that use ferromagnetic ballasts, leading to an association with health problems. Now, energy savings are made in workspace design by using LED equivalents and by lighting specific areas only.

HALOGENS

Halogens produce a white light that makes colours appear more vivid. Halogens became very popular with the widespread use of downlights and many consumers were confused with the term low-voltage lighting, thinking it meant less energy use. In fact, a single halogen downlight consumes nearly as much electricity as a traditional 60 watt incandescent. Astronomical power bills ensued for homes containing sometimes hundreds of downlights.

LED PURCHASING TIPS

Adapted from the LED Buyers Guide in *ReNew* 133, by Lance Turner

Don't just settle on the first LED light you find that matches your requirements. Find several and compare specifications, talk to the suppliers and see if they have any recommendations. And check out online information sources such as forums and review websites—it's surprising how many people write about their light fittings!

Warranties vary widely, from three months to several years, with the higher quality units usually having longer warranties. For any half decent LED bulb or fitting you should look for at least a one-year warranty, preferably longer.

You should also keep your receipts for your LED lighting as you will need them in case of an early failure a year or two down the track. Because of their higher initial cost and long-rated lifespans, you should treat their purchase more like that of an appliance rather than a disposable item.

Generally, buying brand names such as Philips, Cree, GE, Brightgreen and Osram will ensure you buy a safe, good quality bulb or fitting, although there are many other lesser known brands that are also equally good, such as Verbatim, Mort Bay and Megaman. You should also check out review websites such as Choice (www.choice.com.au) and LED Benchmark (www.ledbenchmark.com).

MORE INFORMATION AND RESOURCES:

For more information on replacing your downlights, and detailed advice on LED purchasing and installation see the recent *ReNew* 133 LED Buyers Guide

To calculate how many lights are needed in a space www.relux.biz
To calculate lux levels www.ledrise.com/shop_content.php?coID=19

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Thank you to Graeme Ambrose from Eco Decisions for assistance with this article.