







Greening Your Home



A green home uses little or no external inputs to run. It minimises a damaging impact during its construction and during its life on the environment. It also provides a comfortable and healthy living environment and is cheap to run.

Whether buying, building, retrofitting or improving a green home, the principles which apply are the same.

-  Good passive thermal design
-  Sound material choices
-  Minimise energy input
-  Minimise water input
-  Minimise waste output
-  Minimise transport energy use

sides, facing the cold winter southerlies and also the hot summer afternoon sun.

A well-insulated sealed exterior envelope

Aim for at least R4.0 insulation on the ceiling, at least R2.5 insulation in the walls and consider R1.0 insulation under the floor.

R-value is resistance to heat flow through a given thickness of material. Ensure all windows and doors are well-sealed, exhaust fans are fitted with self-closing dampers and there are no gaps in and around walls, floor and ceilings. Draft proofing is key!

If a performance standard needs to be nominated, a minimum of 10 air changes per hour for a blower door test at 50 Pascals is a good starting point. For windows, use timber or thermally broken aluminium framed units with low E high SHGC (Solar Heat Gain Coefficient) double glazing.

Good passive thermal design

The five design principles which need to be followed to achieve a home which requires little or no energy to provide thermal comfort are:

Well-oriented

In climates with cold winters the best way to get heat into a home is through north-facing glazing. A sunny north-facing home site is gold as it enables glazing to collect winter sun. A sunny roof is also vital for mounting solar panels for electricity and/or hot water. When this is not available options for example for west facing roofs can be sought. In Sydney's climate, glazing on a sunny north facade automatically gets more solar energy as the sun drops lower in winter, yet will be shaded by suitable eaves in summer. A projection/height-above-sill ratio of 45% is recommended. If the glazing is facing more than 15 degrees off true north, this eave shading does not work as well.

Living spaces need to be located on the north side with most of their glazing area facing north. Ideally, Garage and services areas are located on the south and west

Internal mass

Internal mass can be in concrete floor slabs, reverse brick veneer, or concrete walls with external insulation. Hempcrete is a great wall material which provides both thermal mass and insulation as is cob and other natural building materials. Placing mass inside the insulated shell stabilises the internal temperature, storing the heat from both direct sunlight and from the inside air. This helps keep the room warm in winter and also cool in summer.



Cross ventilation and natural lighting

All habitable rooms need openable windows and/or doors for natural light and cross ventilation cooling. To get cross ventilation during north-east summer sea breezes and southerlies, provide at least 1 m² of opening on the north and south sides of rooms. Sometimes one of the openings will need to be in a west or east facade.

Night-time cross ventilation is important in summer to remove the heat stored in concrete slabs and walls so they cool down ready for the next day. Provide insect screens and an eave or other projection to all windows needed for cross ventilation so they can be left open during night time.

Stack ventilation and mechanical ventilation

Stack ventilation is where warmer air rises up and exits through a high opening, drawing cooler air in through low openings. This particularly helps cool a space on a still night following a hot day. An exhaust fan installed in the ceiling at the top level can provide a stronger effect.

High voids above living spaces make those living spaces difficult to heat in winter, so stack ventilation is best arranged via a stairwell which can be closed off.

Material choices

The materials used in our homes have environmental impacts due to:

- 🏠 Their extraction and manufacture (eg mining or logging)
- 🏠 The materials' behaviour in the home (eg off-gassing)
- 🏠 Their effect on the thermal performance of the building (eg thermal mass, insulation)
- 🏠 The repair or demolition of the building (eg need for painting, reusability)
- 🏠 Choose materials with a low, neutral or positive impact at all these stages. Use environmental guides and ratings produced by GECA, Ecospecified and FSC.

Some examples of using materials with lower impact of production include:

- 🏠 High recycled content materials including some concrete mixes

- 🏠 Recycled timber and bricks
- 🏠 Forest Stewardship Council (FSC) timber
- 🏠 Hempcrete
- 🏠 Cob and other sustainable building materials

In terms of environmental impact when in the home use:

- 🏠 Zero Volatile Organic Compounds (VOC) coatings and products - these are far less toxic
- 🏠 Materials which cost more but result in much lower energy use - to absorb and store winter solar energy or recycled timber or bamboo floors
- 🏠 Recycled materials
- 🏠 Materials which do not require painting
- 🏠 Materials which can be disassembled at end of life - eg where possible, specify soft mortar for brickwork.

Minimise energy input

The two ways to minimise energy input to a home are to use less energy and to harvest energy onsite.

The big energy users in a home are typically air conditioning or other heating systems, pool pumps and pool heating, and the hot water system. However, all the small energy uses can also add up to a large amount. Here are some green options:



Space heating

Firstly, if possible, create a home which requires little or no heating. Studies show the additional costs are recouped through energy savings over the life of the building.

The most efficient way to heat a space is by hydronic floor heating with the hydronic water heated by an efficient heat pump. An efficient air conditioner can also be a good option, although not as good at storing energy generated during the day in the building mass. Before purchase check out the energy ratings of air conditioners and other products.

Whatever system is chosen, create separate zones of



the house that can be closed off and ensure the system can heat or cool them independently to avoid air conditioning rooms when not in use.

Cooling

Ceiling fans are now available which have DC motors which use 1/5th the power of traditional ceiling fans. Small efficient split system air conditioners are now available. Go to:

https://reg.energyrating.gov.au/comparator/product_types/

and check out the energy rating of available models. Bigger systems typically have lower efficiencies than smaller and ducted systems are typically less efficient than split systems.

Pool

Consider converting the swimming pool into a pond or a large underground rainwater tank. Or fill it in!

Fit a pool cover, saving on water loss, heating, and filtration energy and chemicals.

Install 100mm thick foam insulation board under and around new concrete pools during construction.

Use a variable speed filter pump or fit a variable speed controller to an existing pump.

Adjust pump run times to the minimum required to keep the pool clean.

Hot water system

A solar hot water system needs very little back-up boosting if the collector panels or tubes are mounted facing true north in a sunny location and pitched at above 45 degrees.

Otherwise install a high efficiency heat pump (ReNew magazine publishes guides) and add a couple of extra panels to the solar power system to get effectively a solar hot water system.

Ensure all exposed hot water pipes and fittings are well insulated with at least 19mm thick pipe lagging - more for any recirculation pipes of solar hot water systems.

Fit a Valvecosy insulation on the pressure relief valve of the HWS storage tank.

Lighting

LED lights use about 1/5th the energy of incandescent lights with the same light output. There are LED replacement options for most common light bulbs. For recessed downlights, it is best to replace the entire fitting and the power supply with a complete LED fixture and driver. Choose fixtures which have no air path through them which would otherwise allow air to escape through the ceiling. Some LED downlights are IC rated which means insulation can be laid across the top of the fixture.



Appliances

When researching new appliances check the energy rating on: https://reg.energyrating.gov.au/comparator/product_types/

Look for the highest star rating of the appliances that suit your need. Also look at the annual energy usage per year. A larger capacity appliance might have a higher star rating but use more energy.

Standby energy

The total standby energy use of all the devices which are switched on 24/7 can exceed the usage of everything else in your home. Turn appliances off at the power point if convenient. If it's inconvenient to reach the switch such as behind a large flatscreen television, buy a remote switch for it.

Buy an in-home energy monitor display so you can see how much energy is being used. Use it to check the power usage of each item by switching everything off and then switching one thing on at a time. Plug items which need to stay on 24/7 into a separate outlet from everything else, so you can switch everything else off when not in use.

Refrigerator cabinet ventilation

Refrigerators work by moving heat from inside to outside, typically using the back and sides to conduct heat away to the air. Provide good ventilation to the back and sides of the refrigerator by fitting insect-screened openings in the kickboard of the cabinet underneath and in the base board either side and behind the refrigerator. There also needs to be at least a 50mm minimum space to the back and sides and a screened exit point out the top to allow the warm air to escape.

Harvest Your Own Power

If the home has an unshaded roof which is facing East, North or West, it is probably well-suited to a solar PV power system. In most cases, the best size system is the largest one which fits on the roof section with the best solar exposure. If only a few panels can face in any direction or if there is a small amount of shade which would cover some part of the panels, it is better to use a micro-inverter system where each panel generates power independently of the other panels. Ideally aim to generate as much power per year as all your house energy use including gas.





Water efficiency

Using water efficient fixtures and appliances is important to achieving water self-sufficiency. The Water Efficiency Labelling Scheme (WELS) tells you both the star rating and the water use of the item. Choose 6-7.5 l/minute 3 Star rated shower roses or better (thereby also reducing hot water energy usage), 4 star rated toilets and a 5 star rated washing machine.

Alternative water sources

In Sydney, rainwater harvesting systems are very effective at supplementing the mains water supply. On average, about 1000 litres per year runs off each square meter of roof and most of this water can be caught and stored in a rainwater tank for reuse. The rainwater collection system should incorporate some fine screening and divert the first flush of roof runoff away from the tank as this first flush usually contains the most suspended sediment from dust that has settled on the roof. A very water efficient home could source all its internal water use from a suitable rainwater harvesting system, with a switch-over device to supply mains water when the tank runs dry. For a system supplying the whole house, it is best to use a pump system incorporating a pressure accumulator tank, so that the energy use of the pump is minimised.

Greywater reuse

The waste water from showers, baths and washing machine can be diverted by a suitable system to subsurface irrigation for garden plants that need lots of water including fruit trees. You can find the NSW Guidelines for Greywater Reuse in Sewered Single Household Residential Premises at:

http://www.water.nsw.gov.au/_data/assets/pdf_file/0008/557324/recycling_grey_nsw_guidelines_for_greywater_reuse_in_sewered_single_household_residential_premises.pdf

Minimise waste output

Solid waste outputs from the home are mostly determined by the actions of the occupants but there are ways to make minimising waste easier.

- 🏠 Have a nice easy clean kitchen scraps container
- 🏠 Provide worm farms and or compost for all kitchen and garden waste
- 🏠 Set up the kitchen to accommodate refillable containers for all dry goods
- 🏠 Have a system of reusable bags for shopping and loose produce
- 🏠 Have a good recycling bin system.



Minimise transport energy

The home can have a big impact on the transport energy use of the occupant.

Depending on the needs of the occupants, the green home needs to:

- 🏠 Be close to public transport
- 🏠 Provide easily accessible, secure, sheltered bicycle storage (or cargo tricycle)
- 🏠 Install a power outlet beside the bicycle storage for charging electric bicycles
- 🏠 Provide a space to charge an electric car.

You can utilise all or many of the above examples to help Green Your Home. Be part of this movement.



Resources:

A great online reference on green homes is:

<http://www.yourhome.gov.au/>

Retrofitting Your Homes:

<https://holmgren.com.au/retrofitting-the-suburbs/>


<https://www.ecologicaldesign.com.au/>

Permaculture Northern Beaches meets monthly at Narrabeen on the last Thursday of the month with public education evenings. Details for these meetings and all of our meetings, workshops, tours, and practical activities can be found at our website:

www.permaculturenorthernbeaches.org.au

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