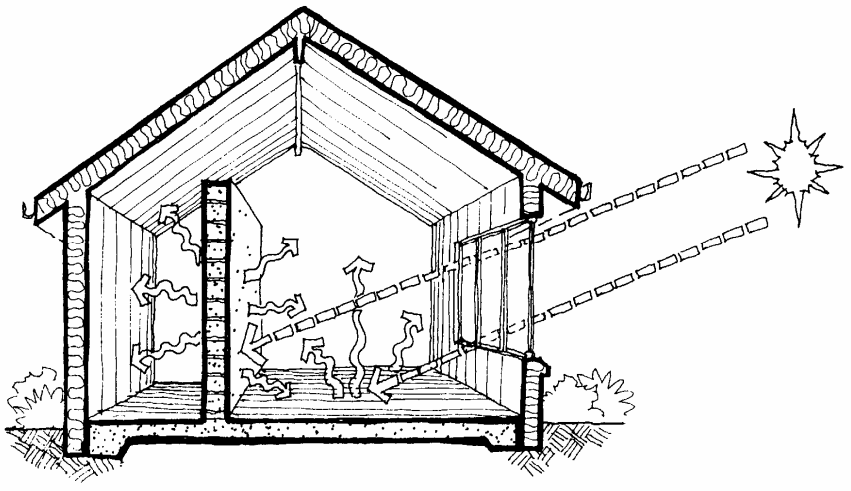
BUILDING ENERGY SMART GUIDE



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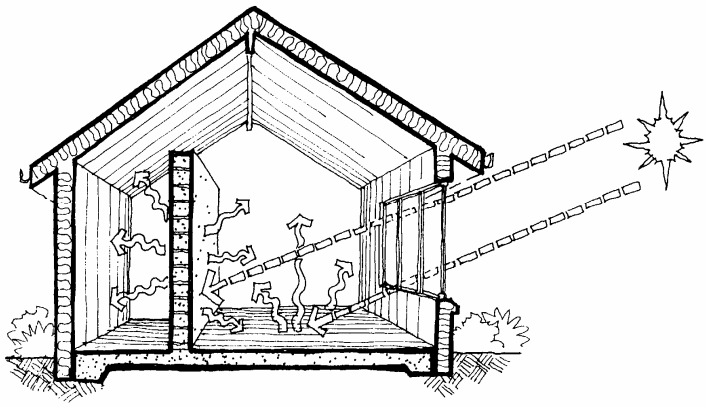
Why build 'energy smart'?

Whether you are building your own home or developing homes for others, comfort is paramount. Unfortunately, thermal comfort is often overlooked in building or designing homes. How often have we been in homes which feel like ovens in summer or the Antarctic in winter?

With good design, we can avoid having to rely on artificial heating and cooling just to remain comfortable. By making use of the sun's energy when we need it, and cooling



breezes when we don't, and with the help of good insulation, shading and orientation, homes can require almost no intervention to maintain acceptable internal temperatures.

This means, we are just as comfortable, but we are not spending so much money on energy bills, and we minimise our impact on the environment as well.

The Australian Consumers Association conducted a study which found that an average household could save up to $1000.00 a year just on energy bills, simply by living in an 'Energy Smart' home (July 1997).

This guide shows how to introduce simple concepts into the designing of homes, alterations and additions and multiple unit developments, so that living in new dwellings in Strathfield is comfortable as well as being 'Energy Smart'.

By following these principles, you can expect these results:

- ***Increased comfort***
- ***Cheaper energy bills***
- ***Greater marketability upon sale***
- ***Reduced greenhouse gas emissions***

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Definitions

Active Solar Energy Systems
Systems which combine the sun's energy with local climatic conditions to achieve thermal comfort inside buildings with the use of mechanical devices. An example is sub-floor heating which uses a pump to circulate hot water from a tank through the floor and back to solar collectors.

Ecologically Sustainable Development
Ecologically sustainable development is commonly defined as development which uses, conserves and enhances the community's resources so that ecological processes, on which life depends, are maintained and quality of life for both present and future generations, is increased.

Gross Floor Area
The floor area is that portion of the dwelling bounded by and including the external walls but excluding structures such as patios, verandahs and attached garages.

ABSA: The Association of Building Sustainability Assessors

The Association of Building Sustainability Assessors (ABSA) represents building and design professionals who specialise in assessing the environmental impact of buildings. ABSA Accredited Assessors use sophisticated computer programs to analyse your building plans and can offer practical advice on cost-effective ways to improve its performance.

NatHERS or equivalent
The Nationwide House Energy Rating Software (NatHERS) has been developed by the CSIRO to encourage improved design that will reduce energy consumption and improve thermal comfort in houses. NatHERS is a computer program that provides a quick, comprehensive and effective assessment of a house design - generating a star rating between 0 to 5 stars (least to most energy efficient), similar to that used in many household appliances.

http://www.nathers.gov.au/

Living area
Living areas are any room in a house designed for communal use such as: kitchen/dining room, living room, rumpus room, den.

Alterations and additions
Development on an existing dwelling.

Non-Renewable Energy
Around 95% of NSW electricity is generated from coal. Coal is a non-renewable resource, by burning coal for electricity, people are significantly contributing to the greenhouse effect. By building an energy efficient house the pollution from coal is reduced by up to 50%.

North Point
In any discussion relating to orientation of a dwelling or part thereof, a reference to 'north' is a reference to true solar north and not magnetic, or compass north. True solar north varies from magnetic north depending upon the location. In Sydney, for example, magnetic north is approximately 12 degrees east of true solar north.

Passive Solar Energy Systems
Systems which combine the sun's energy with local climate characteristics, to achieve thermal comfort inside buildings without the use of mechanical devices. In a passive system, the building itself is a solar collector, as well as a heat storage and transfer medium.

R-value
An R-value is a numerical value given to insulation. The higher the R-value the more insulating the product.

Renewable Energy
Renewable energy is energy generated from a renewable resource such as the sun, wind, water or biomass.

Solar Access
Solar access is a measure of how much sunshine (solar access) is available to assist with the heating of a building.

Thermal mass
Thermal mass is the term used to describe the capacity of building materials to store thermal (heat) energy.

Harnessing the sun – using it to best advantage all year round

Aim

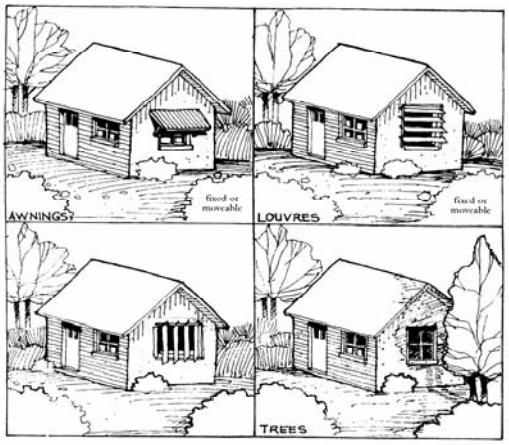
- Warm your home in winter
- Keep your home cool in summer

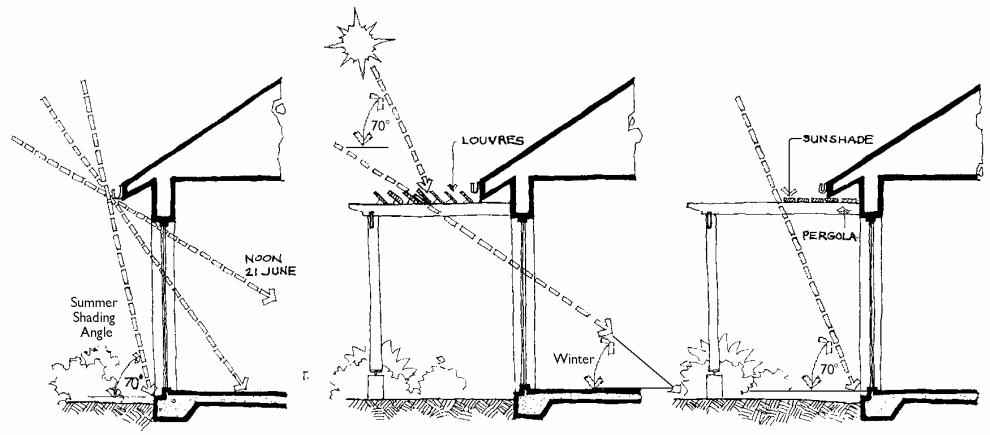
The difference in the sun

Summer sun sits higher in the sky than winter sun and is much hotter. Shading devices can be designed to block summer sun but allow winter sun to penetrate.

Possible design solutions

- Shade the northern face of dwellings from the higher summer sun with wide eaves, adjustable louvres, deciduous trees or tall native trees
- In winter, the lower winter sun will penetrate through northern windows to heat the inside of the dwelling
- Shade the eastern and western sides of the dwelling with moveable shade structures like external louvres and shutters, and pergolas with deciduous vines
- Protect windows on winter nights with curtains to prevent heat loss
- For multiple unit developments, consider insetting balconies so windows are well shaded to the north in summer, and consider adding moveable external louvres on balconies to the east and west.



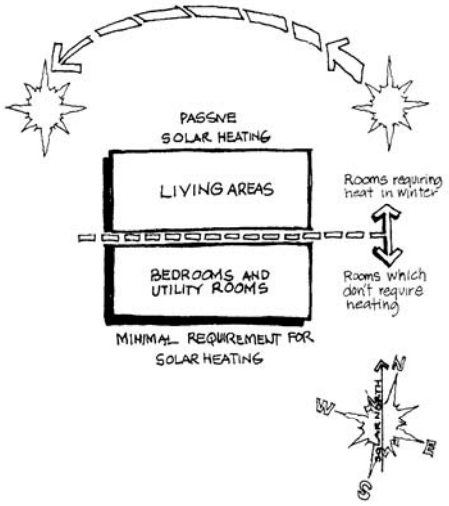


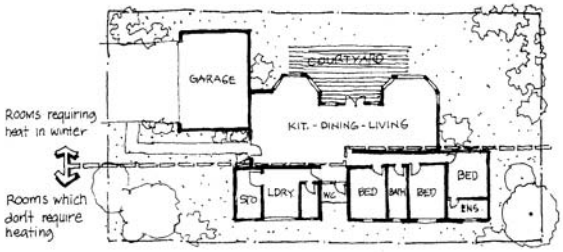
Siting the dwelling

Orientation is important because it enables you to make the most of the heating and *cooling influences throughout the year.*

Aim
Maximise:

- cooling summer breezes
- winter sun to the dwelling and private open space
- natural shading in summer

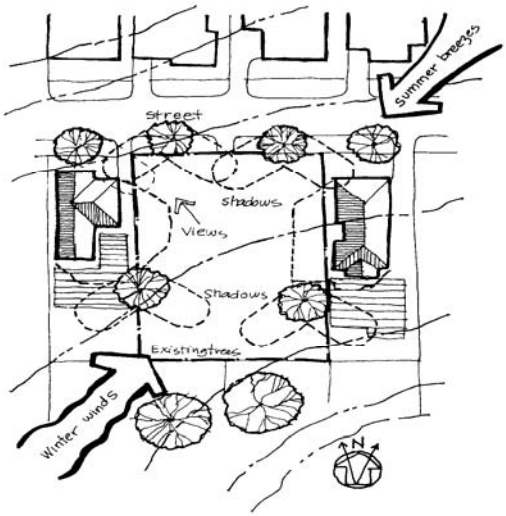




Source: Amcord, 1995

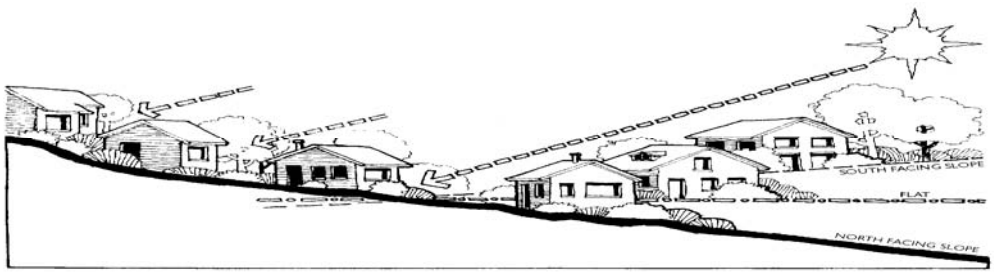
Minimise:

- winter gales
- summer sun
- shading in winter



Possible design solutions
Site dwellings so that

- The longest side of the building faces north
- Windows and doors enable breezes to flow from one side of the dwelling to the other
- The majority of window area is to the north
- Living areas such as the kitchen, rumpus room, and living room, are to the north, bedrooms to the south and utility rooms are to the west or east
- Vegetation, natural features and landscaping offer protection from winter gales, or shading from eastern and western summer sun
- Use some private open space for clothes drying and make sure it receives at least 4 hours sunlight mid-winter
- For multiple unit developments ensure there is sufficient outdoor clothes drying space for the number of units proposed.



Selecting building materials and colours

Aim
- Maximise thermal mass
- Minimise heat penetration through the external skin of the building

What is thermal mass?
Thermal mass is the relative capacity of a material to store heat.

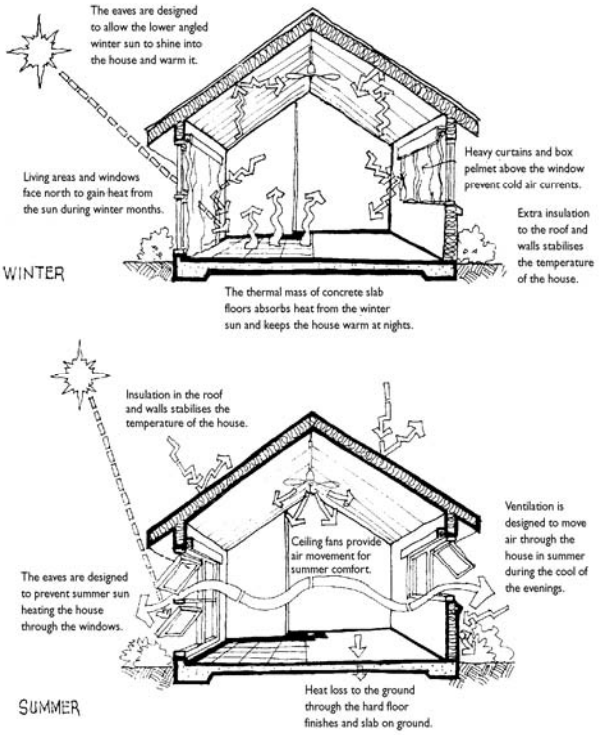
The thicker and denser a material, the greater thermal mass. Concrete has high thermal mass because it is extremely dense and it absorbs heat well. The best place for thermal mass in the interior of dwellings so that good control can be exerted over when it is used as a heat store.

In winter, we want the interior of our dwelling to become warm, but in summer, we rely on our thermal mass to store cooler temperatures associated with the ground and shaded areas, by ensuring that no direct sunlight strikes the floor or internal walls.

Possible design solutions
- Consider using slab on ground construction to ensure good thermal mass throughout the dwelling
- Use ceramic tiles in kitchen and 'sun-room' areas for added heat stores in winter and cool stores in summer
- Consider double brick construction or other heavyweight materials for internal walls
- For multiple unit developments, consider internal tiled areas in units with northern outlook and carpeted areas in units with southern outlook

The impact of colour choice
Dark colours on roofs and walls absorb heat while light colours reflect it. A dark roof can add significantly to the heat gain of the dwelling in summer.

Possible design solutions
- Plan to use mid to light coloured roofing materials
- Avoid dark paints for external walls and verandah floors
- Consider mid to dark colours for internal floor tiling to assist with storing heat in winter



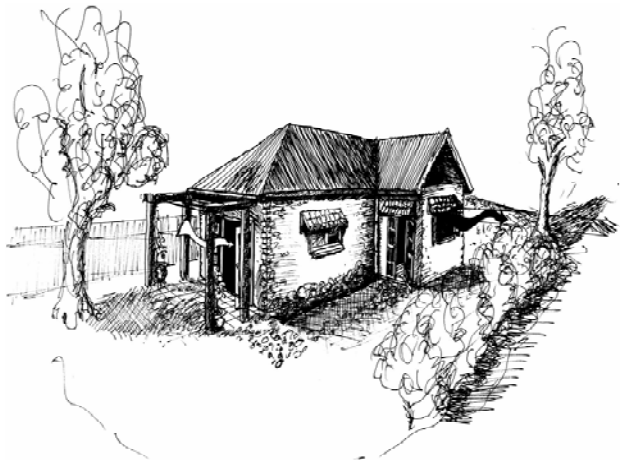
Insulation and ventilation – battling with the temperatures

Aim

- Cool homes in summer
- Maintain heat in winter

Possible design solutions

- Design air entrance-ways (windows or doors) to the east and south and corresponding air-exit-ways to the west and north so that in summer, hot air can be blown away by the cooler breezes
- Orientate dwellings so the summer breezes can penetrate the dwelling
- Ensure good insulation to roof, ceiling and walls for maintaining internal heat in winter and repelling external heat in summer
- Use curtains in winter and at night to prevent heat loss through your windows
- Fit door and window seals to minimise unwanted draughts
- For multiple unit developments, consider high performance glass such as double glazing to windows on southern and south eastern faces, and self closing doors to units and main entry.



Your climate

- You may have difficulty accessing sea breezes in summer
- You can have lower winter temperatures than those on the coast
- Focus on improving the ventilation in your home for summer, but ensuring good solar access and good insulation in winter to ward off chilly winter nights

How insulation works

Insulation performs two thermal functions. It minimises heat loss, as well as preventing heat gain, by acting as a thermal barrier to heat transfer either into, or out of, your dwelling.

Insulation does not discriminate in doing this job between summer and winter, even though we need to minimise heat loss in winter but minimise heat gain in summer.

Good design can achieve this goal by combining adequate insulation with:

- Good winter sun penetration to the north;
- Good ventilation and shading in summer to all windows.

Greenhouse gas efficient hot water systems and energy smart appliances

Aim
- Reduce greenhouse gas emissions
- Reduce energy and water bills

Possible design solutions
- Save on the amount spent on energy and water bills by installing greenhouse gas efficient hot water systems and energy smart appliances and AAA rated water fittings
- minimise hot water pipe runs by locating water heater close to wet areas
- maximise lagging to hot water pipes.

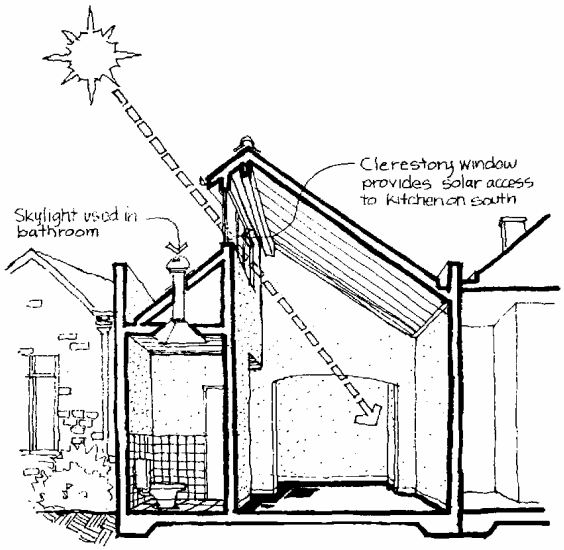
Why hot water and other appliances are important
Households consume up to 40% of their energy bills on hot water. Greenhouse efficient hot water systems produce less greenhouse gas emissions as a result of heating your water. Some examples include, natural gas, gas-boosted solar or electric-boosted solar and heat pump hot water heaters.

Energy smart appliances use minimal energy to do the same work as less energy efficient models. Look for the Label Energy Star Rating on the appliances - the more stars you see, the more money you save. Energy smart models can be found for all major appliances within the home, including refrigerators, washing machines, dishwashers, and clothes driers.

Water saving devices can save even more greenhouse gas emissions as well as cutting down on water use. These include AAA rated showerheads, mixer taps, laundry taps, and bathroom taps.

Energy Efficient Lighting
Aim
- Minimise electricity used to light your home at night
- Maximise natural lighting during the day
- Eradicate the use of artificial light during the day

How to measure energy smart lighting
Traditional incandescent lightbulbs use 8 times more energy than compact fluorescent lightbulbs. When considering lighting to minimise energy use, compare the wattage of standard incandescent globes sufficient to light a definable space (for example a living room) with the wattage of other lighting forms, for example, compact fluorescents. You might find that a single incandescent globe needs to be replaced by four halogen lights to achieve the same light levels, but a single, low wattage, compact fluorescent will also achieve the same effect. Also ensure that the lighting you choose is appropriate for the room. For example,



task lighting can be combined with low level background lighting for some rooms, whereas others require an even spread of bright lighting.

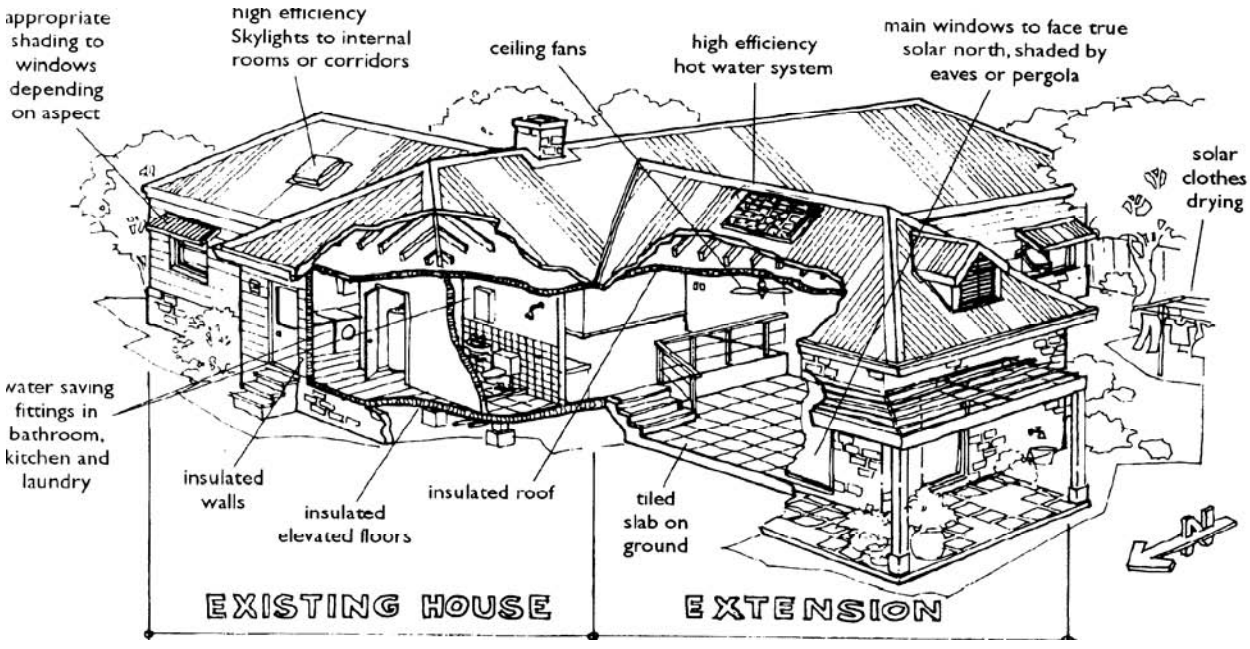
Possible design solutions
- Install light wells, Clerestory windows and skylights to provide direct or filtered light into dark rooms which require light during the day
- Ensure indirect light in summer and direct light in winter is penetrating through northern windows and doors
- Install energy smart indoor and outdoor lighting in utility rooms, the kitchen, hallways and living areas appropriate to the room's main purpose
- For multiple unit developments install self timer switches, dimmers, motion sensors and purpose specific lighting switches.

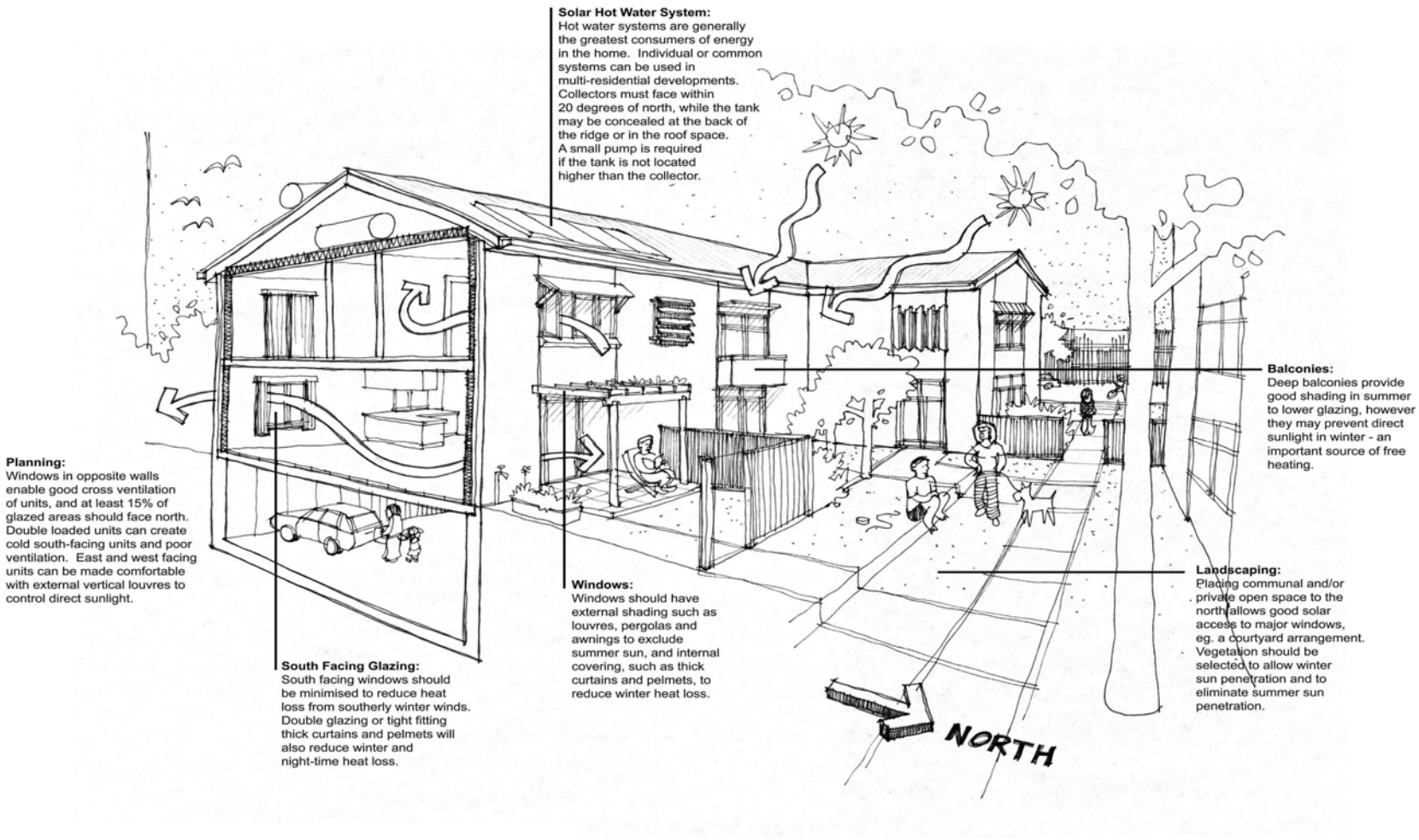
Putting it all together - designing an energy smart home

You can achieve thermal comfort, and a design that will maximise energy efficiency all year round by following a few simple guidelines:

Possible design solutions

- Insulate roof, ceiling and where appropriate, walls and floor so that the internal environment is protected from the sun in summer, and retains the heat in winter;
- Minimise the amount of window surface area on the southern sides of the dwelling as glass loses heat very rapidly – use high performance glass for added thermal protection;
- Shade windows on the northern face in summer through external shade devices such as pergolas, landscaping, or external louvres - design them so they allow the sun to strike windows in winter enabling the inside of the dwelling to heat up;
- Shade windows on the eastern and western sides in summer with shade devices such as external vertical venetian shutters, moveable louvres or blinds and landscaping;
- Design your dwelling so that living areas are on the north facing side and rooms which do not require heating and cooling, such as the bathroom and laundry, are on the western or southern face. Bedrooms are best situated on the eastern or southern side of the building;
- Allow natural light in through the use of north facing windows or skylights;
- Always choose greenhouse efficient hot water heaters;
- Always choose high Energy Star rated appliances such as clothes driers, dishwashers, washing machines and fridges, as these will save you a lot of money without compromising the amenity they provide.





An example of medium density design for good cross ventilation and solar access