

# H COMFORTS E

2012

Smarter Building  
in South East New South Wales

Alpine  
South West Slopes  
Tablelands  
Coast

**FREE**





This resource was developed by Sustaining our Towns  
[www.sustainingourtowns.org.au](http://www.sustainingourtowns.org.au)  
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 NSW: Bombala, Eurobodalla, Snowy River, Boroowa,  
 Palerang, Queanbeyan City, Yass Valley, Young, Harden,  
 Goulburn-Mulwaree, Upper Lachlan, Cooma-Monaro as  
 well as the Bega Valley.



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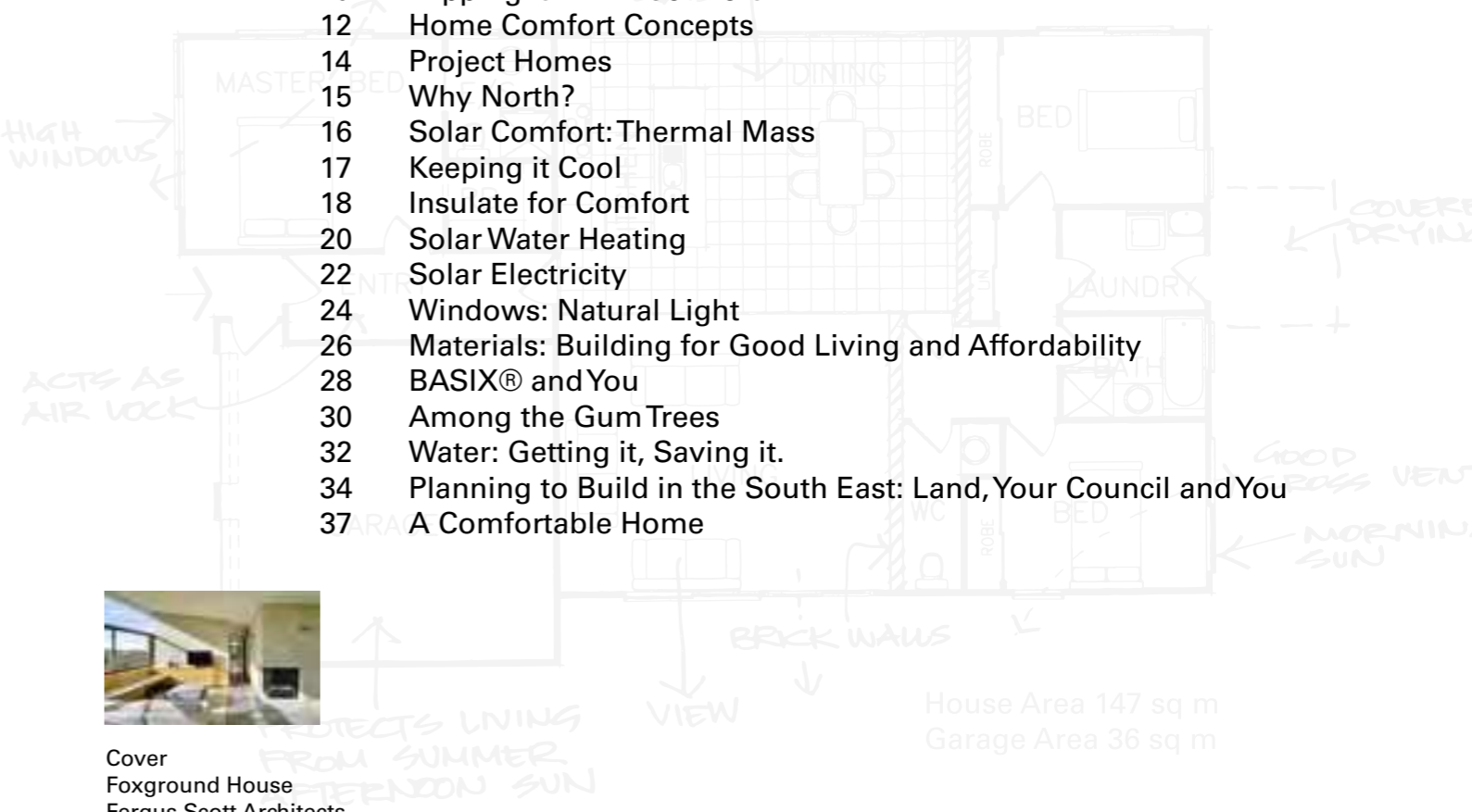


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Cover  
 Foxground House  
 Fergus Scott Architects  
 Photo - Michael Nicholson



House Area 147 sq m  
 Garage Area 36 sq m



# Making the South East Home

Welcome to the South East region of New South Wales, an area characterised by outstanding natural beauty and regional charm. From the tablelands to the sea, this magazine will guide you through the basics of building in the South East.

For many of us, our house is the biggest investment we'll ever make. That's why it's important to get it right. Designing for affordable comfort and style is crucial to enjoying your home in the years to come.

Home Comforts showcases and explains some of the easiest and most affordable methods of ensuring a luxurious lifestyle in the South East.

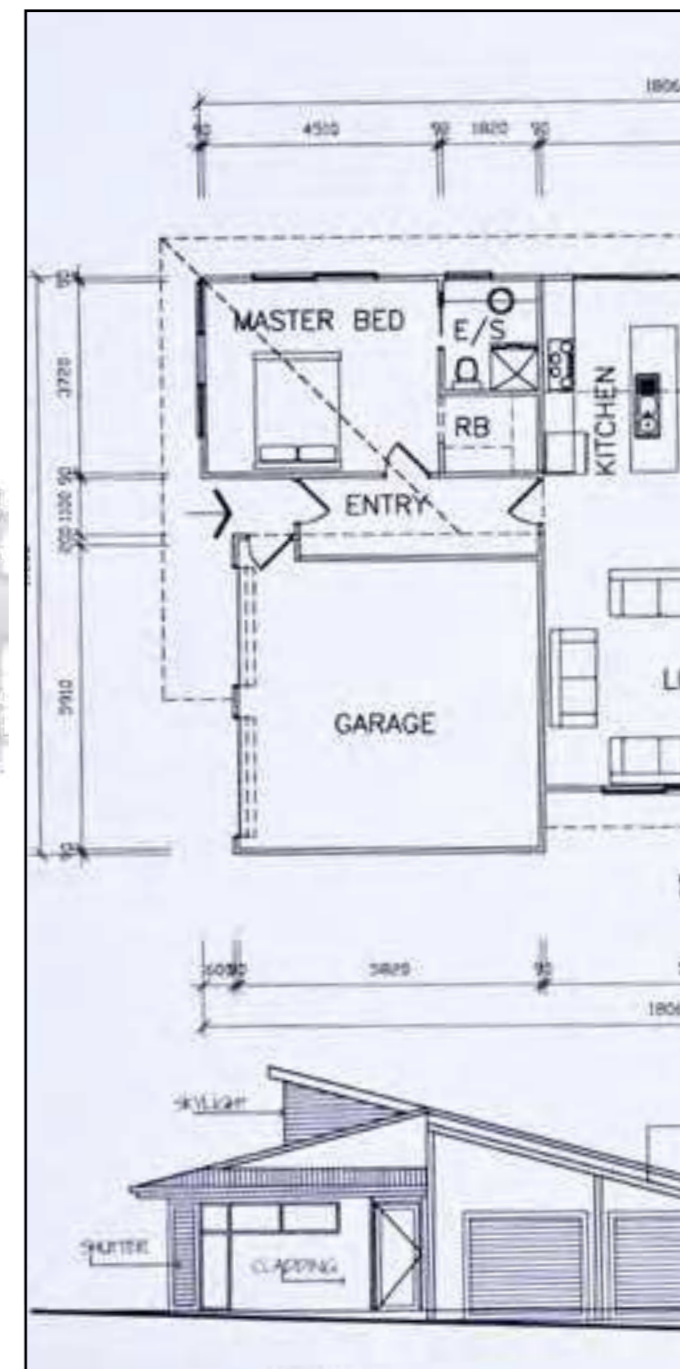


Pacific Street Tathra  
JCB Design Partnership  
Photo - Brett Boardman

Comfort, affordability and style are key to enjoying your home. And with rising energy costs it makes sense to pay attention to its design. All new Australian houses must now meet a basic level of energy efficiency and are rated on factors such as insulation, window area, hot water and energy systems, as well as the location of the home. Being familiar with smarter options means you can fine-tune your home to better suit your needs and guarantee a more affordable cost of living.

PASSIVE SOLAR DESIGN CAN DRASTICALLY REDUCE OR EVEN ELIMINATE YOUR NEED FOR MECHANICAL HEATING & COOLING

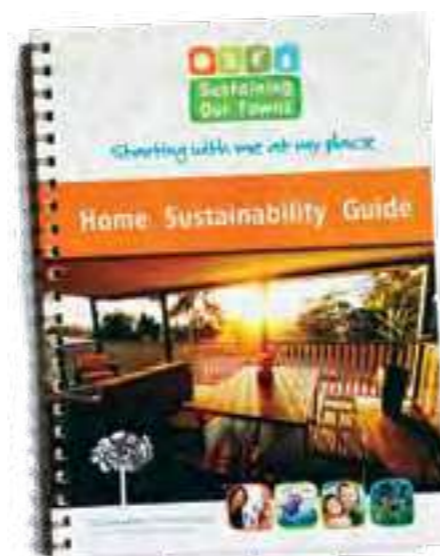
Home Comforts focuses on passive solar design as a way of ensuring a comfortable, low energy home that works in this region. The key components of passive design are explained, including solar orientation, thermal mass, insulation, natural heating and cooling, solar water heating and electricity systems as well as glazing. And because we're in the South East, Home Comforts provides a primer to local development. From BASIX® to bushfire regulations, water saving to zoning, Home Comforts will introduce you to building your life in style in the beautiful South East.





*Home Comforts* is intended to be read in conjunction with the *Your Home Technical Manual 2011* published by the Department of Climate Change and Energy Efficiency (Commonwealth Government). *Your Home Technical Manual 2011* provides comprehensive information on all the technical aspects of building energy and resource efficient homes. You can access *Your Home Technical Manual 2011* online at [www.yourhome.gov.au](http://www.yourhome.gov.au)

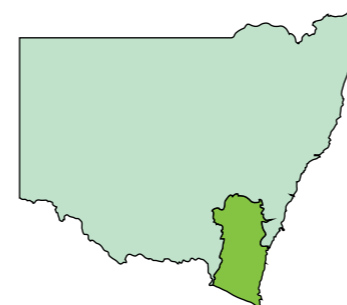
*Home Comforts* is published by Sustaining Our Towns. Sustaining Our Towns has also produced the *Home Sustainability Guide*, which contains useful information about energy and resource use, lifestyle and sustainability in the South East region. The *Home Sustainability Guide* is available online at [www.sustainingourtowns.org.au](http://www.sustainingourtowns.org.au)



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# The South East Region



The South East of New South Wales offers diverse and varied landscapes and climates, as well as country and town living. From Yass and Young in the north to Bombala and Bega in the south, this magazine explains the ins and outs of building for life in the South East. Your local region will impact on your building choices.

**There are three main regions in the South East:**



## Coastal

The **Coastal** region is characterised by a mild temperate climate, with warm summers, relatively mild winters and normally moderate rainfall.

*Eurobodalla and Bega Valley Shires.*

Towns include: Batemans Bay, Moruya, Tuross Head, Bodalla, Dalmeny, Narooma, Tilba Tilba, Bermagui, Bega, Cobargo, Tathra, Eden and Merimbula.



## Alpine

Much of the **Alpine** region is located above 700 metres, with high summer temperatures and cold winters, often with snow.

*Cooma-Monaro, Snowy River and Bombala Shires.*

Towns include: Cooma, Nimmitabel, Numeralla, Bredbo and Michelago, Berridale, Adaminaby, Bombala, Delegate and Bibbenluke, as well as the Alpine resorts of Thredbo and Perisher Valley.



## Southern Tablelands

**Southern Tablelands** and **South West Slopes**, a cool temperate climate with hot dry summers and cold winters.

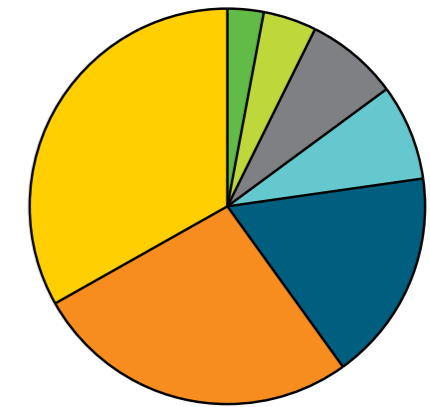
*Upper-Lachlan, Boroowa, Harden, and Young Shires. Palerang, Goulburn-Mulwaree, Yass and Queanbeyan City Councils.*

Towns include: Crookwell, Gunning, Taralga, Yass, Gundaroo, Murrumbateman, Boroowa, Harden-Murrumburrah, Wombat, Galong, Jugiong and Rugby.



# Your New Home: Design for Success

Hugh Gordon Architect  
Photo - Ben Wrigley



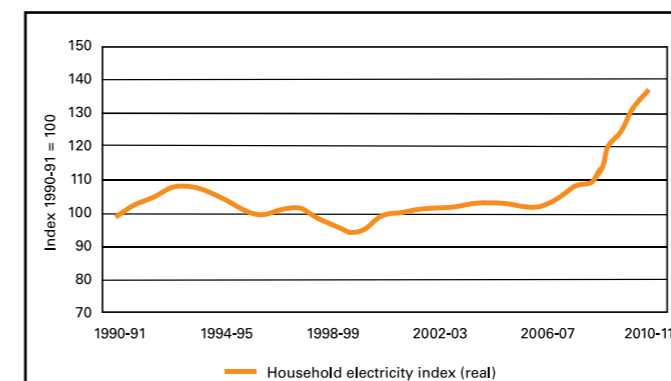
- Standby 3%
- Cooking 4%
- Lighting 7%
- Refrigeration 7%
- Other Appliances 16%
- Water Heating 25%
- Heating and Cooling 38%

Space heating and cooling, and water heating accounts for nearly 63% of household energy use in Australian homes.  
*Your Home Technical Manual 2011*

**T**here are many ways to design a new home. You can use an architect or draftsman, or buy a project home 'off the plan'. No matter which option you choose you'll need to make sure that your home suits your needs now and into the future. Good design can secure the lifestyle you want and give you the peace of mind that comes with knowing that you can continue to enjoy your home into the years ahead.

**Planning your home: keep it simple**  
One of the simplest ways to reduce the cost of a new home is to make sure your design does not exceed your family's needs. Choosing a smaller, more luxurious home is becoming increasingly popular, especially for retired or semi-retired people. A smaller, well-designed home helps guarantee lower ongoing costs, like electricity and water as well as maintenance. And the money saved can help pay for superior finishes and fittings that will last longer and increase the enjoyment of your home.

**Planning for lifestyle**  
A well-designed home will be more comfortable, healthier and more enjoyable to live in. Good design can also help to reduce your power, gas and water bills, especially as the cost of energy rises.



The price of electricity has risen sharply.

**Passive design**  
One of the best ways to ensure a comfortable, affordable home and lifestyle is to work with the climate, rather than against it. By combining good design with effective insulation, you can collect and store the sun's energy to provide your home with warmth day and night, throughout the year. Home Comforts will guide you through the basics of passive solar design as key to designing a comfortable home.



Building a home: steps along the way



Choose a site



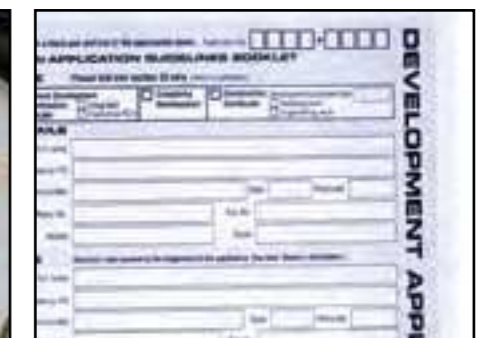
Select a design option



Come up with a plan



Have your plan energy rated through BASIX®



Local Council approves your Development Application (if you need one)

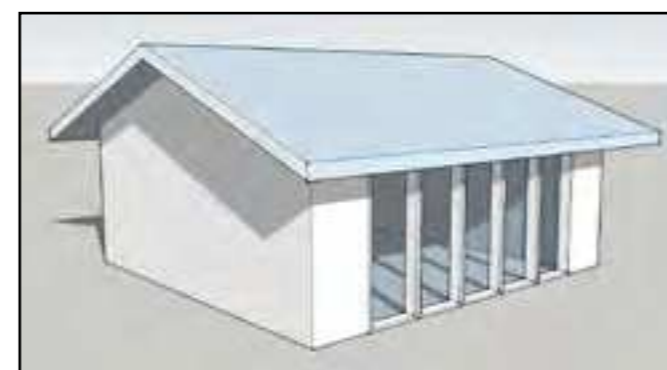


# Some Things Never Change: Comfort from the Sun

**O**rientation, or the siting of your home, is key to passive solar design. Orientation is about using the sun as a source of free home heating. Put simply, it involves letting winter sun in and keeping unwanted summer sun out. This can be done with relative ease on northern elevations by using shading devices to exclude high angle summer sun and admit low-angle winter sun.

Homes that take advantage of the sun's path and natural climate to maintain a comfortable living environment are often referred to as 'passive design' homes, because they require much less artificial or 'active' heating and cooling than many traditional homes.

**In a nutshell...passive solar design**  
In the summer, the sun is higher in the sky than it is in the winter and passive solar design maximises this advantage. Prominent north-facing shaded windows with eaves that overhang allow the winter sun to stream in and restrict the summer sun. Many passive solar design homes also locate a 'block' of dense flooring like a tiled or polished concrete slab directly inside the windows to soak up the sun's heat. This is often referred to as 'thermal mass'. Shaded north-facing windows and thermal mass are key elements in passive design. Add to this adaptations for regional climate characteristics, such as a prevailing summer sea breeze on the coast, and you're well on the way to building a home that will be comfortable with a minimum of extra heating or cooling.



Winter sun shines through north windows



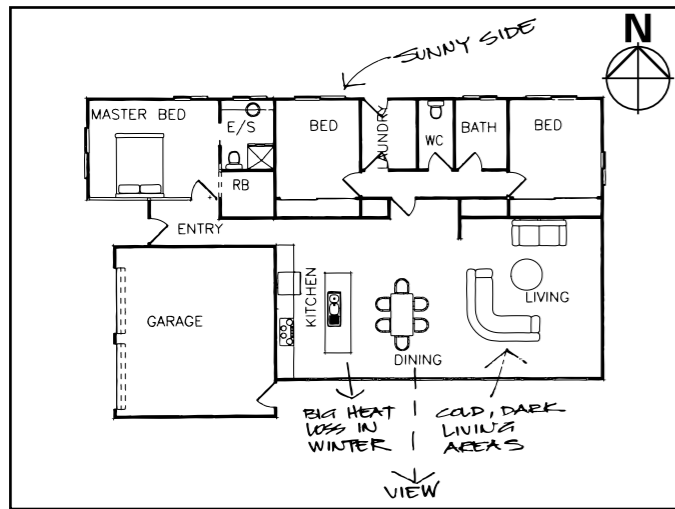
Summer sun is shaded by eaves

**Passive design isn't new**  
Colonial Australian houses commonly featured wide eaves and shaded verandahs to keep the house cool in the summer. In winter months, however, many were heated by wood or coal fires. Nowadays Australian houses can use the sun's heat in both winter and summer. With eaves, sensible window placement and the use of modern materials for thermal mass and insulation, passive design enables both sunny, welcoming spaces in winter as well as cool, breezy interiors in the summer.

EAVES ON THE NORTH SIDE  
LET IN LOW WINTER SUN,  
EXCLUDE HIGH SUMMER SUN

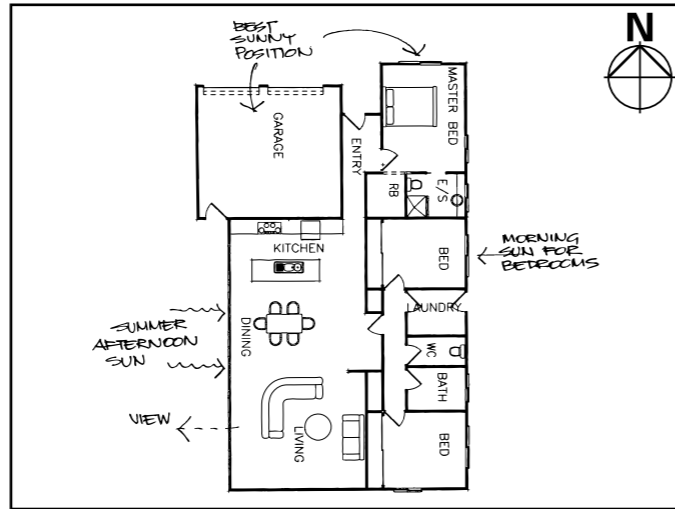
# Flipping it: Think Comfort

A conversation between a designer and client shows how a few simple changes to the floor plan of your house can make the world of difference to its comfort.



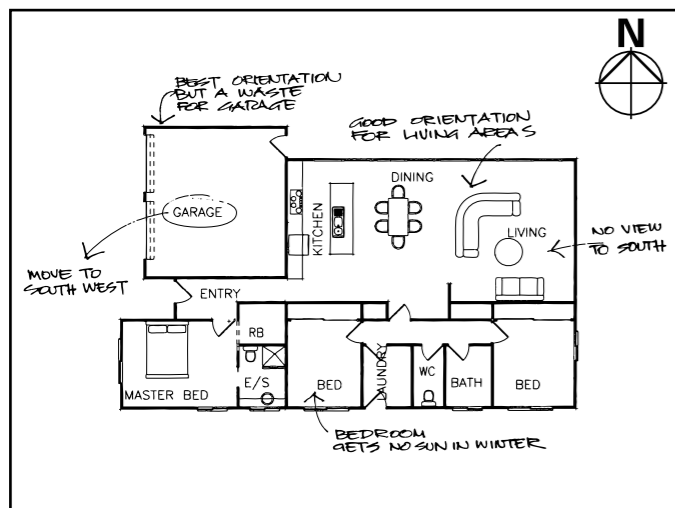
Client - We like this layout, not too big, kitchen, living and dining in one big area. The best view on our block is to the South, so we can get that from our living areas.

Designer - OK, but your living areas will be cold and dark in winter, with lots of heat loss through those big south facing windows.



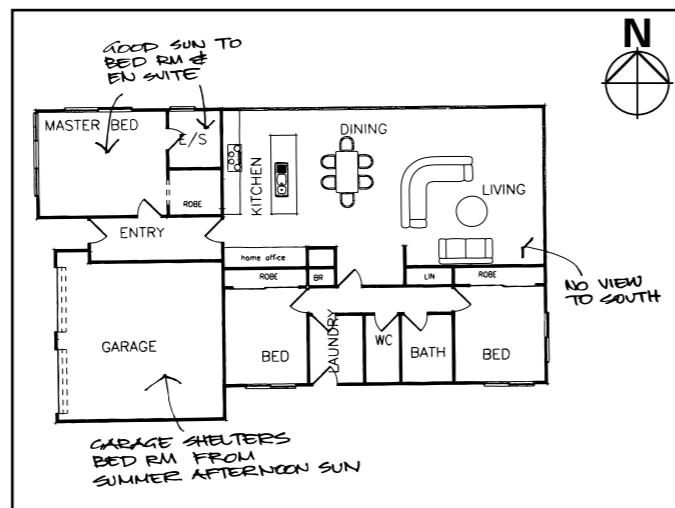
Client - How about this? If we rotate it the bedrooms get morning sun, and the living areas get winter sun in the afternoon, plus we still get the view.

Designer - The garage is getting the best sunny position, and the sun will cook you in the living room in summer. It's always better to have the long side of the house facing north.



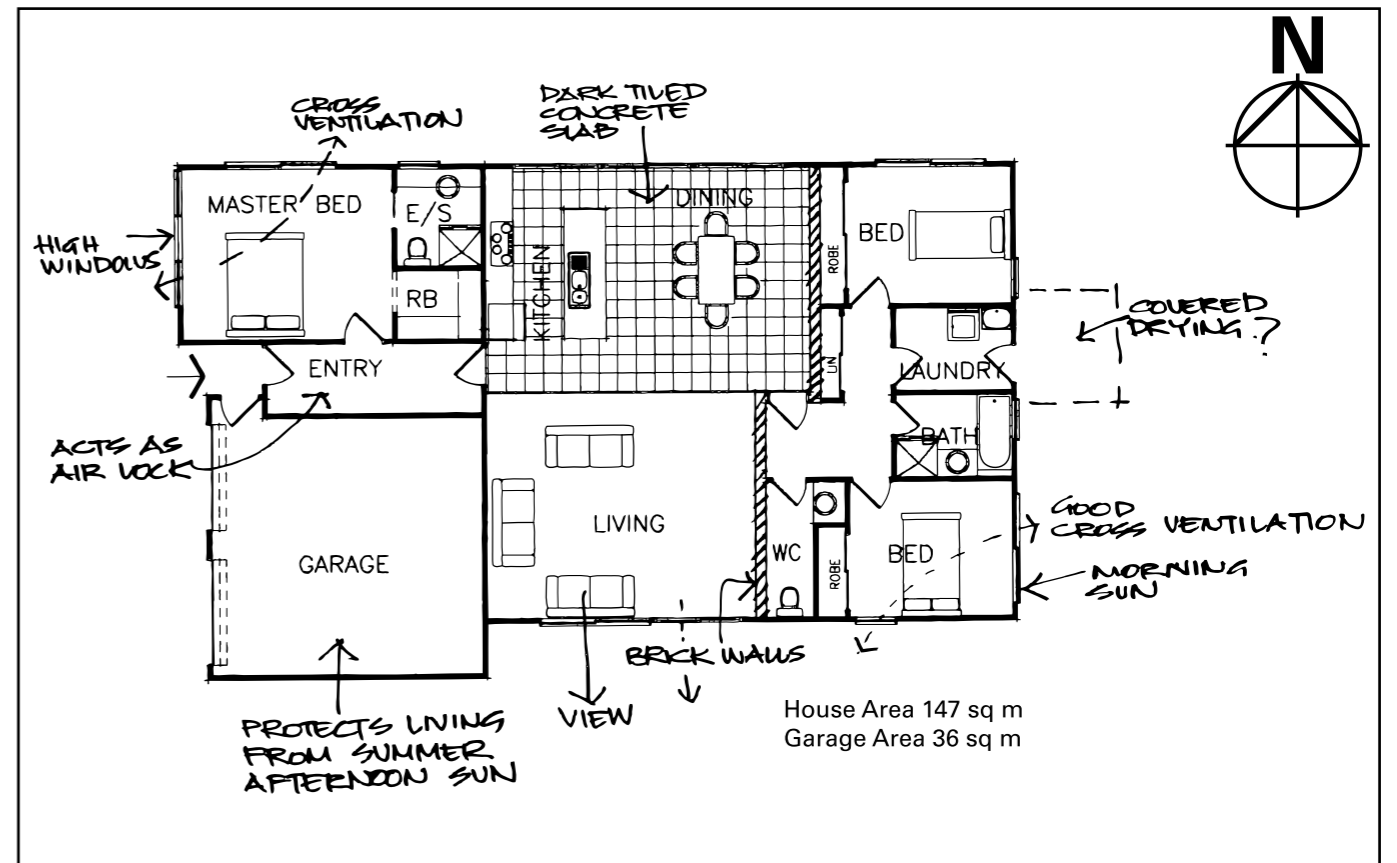
Client - If we flip it we get the living areas to the north, but we lose the view.

Designer - Better again, but the garage is on the northern side. Let's try a minor redesign, with the garage on the south west corner so it protects the house on summer afternoons.



Client - That's more like it but we still don't get the view.

Designer - Let's try with the same elements moved around, with the bedrooms on the east and a central living area.

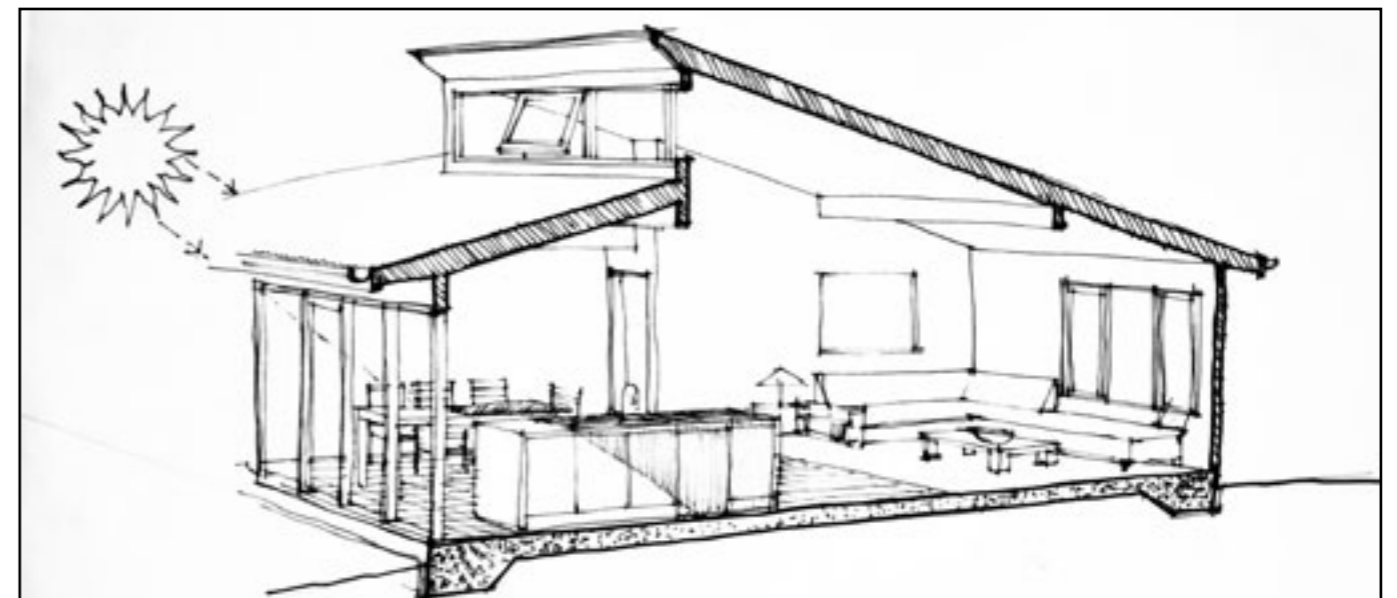


Client - Great! That is even better, we get morning sun into the kids rooms, the view from the living room as well as a sunny kitchen and dining room.

Designer - Yes, and having a living area in the centre with some solid brick walls and a tiled floor on the north will give you a comfortable house. With the lounge on the south your soft furnishings aren't in the sun. Consider a pergola or verandah on the east with a covered drying area for the laundry, and maybe a deck off the main living area. If we set up the roof with generous eaves, about 700mm, we will keep out the summer sun while allowing the winter sun shine in to heat the tiled concrete slab.

Client - Could we have a timber floor in the dining room?

Designer - Floor coverings like timber or carpet will reduce the warming effect of sun hitting the slab, so we'll keep them in the living room to the south. Some high openable windows will let out hot air as it rises in summer.



# Home Comfort Concepts

## Solar Hot Water System

Flat plate collectors on north facing roof pitch with a gas boosted hot water storage tank at ground level.

## Light Coloured Roof

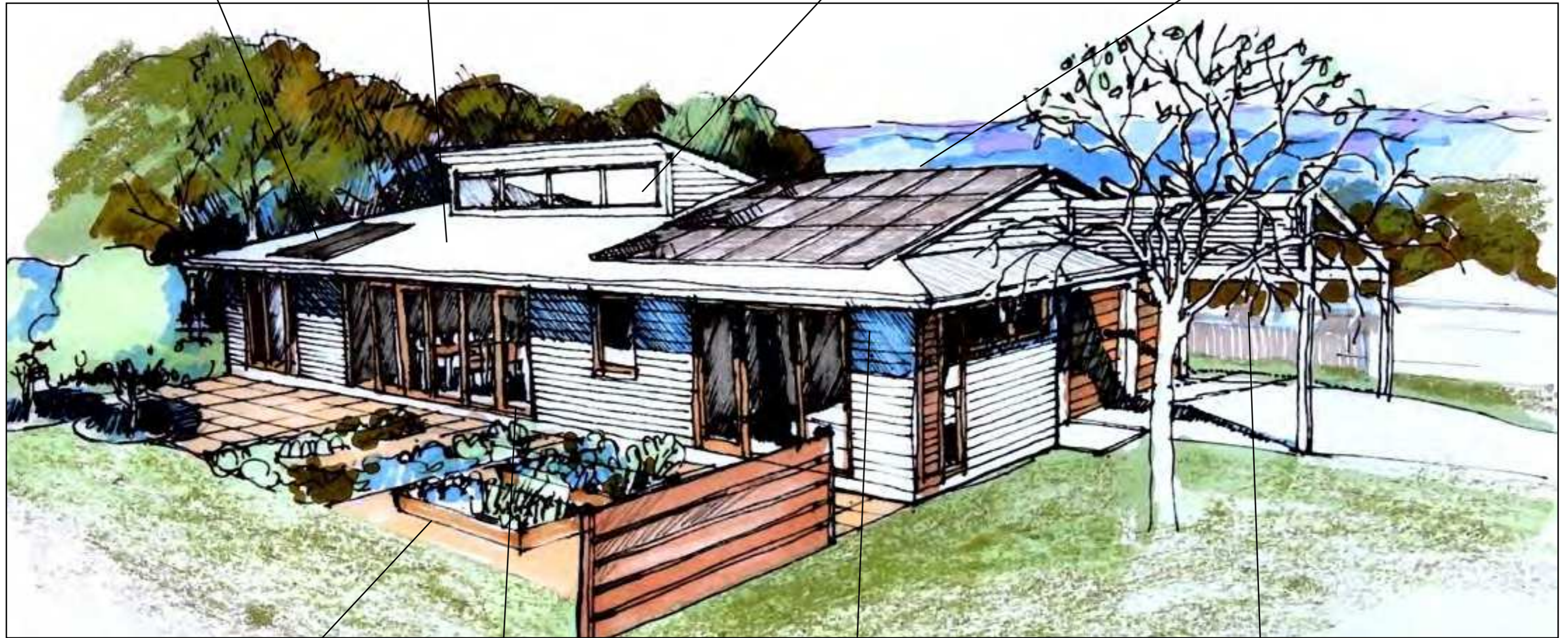
A lighter coloured roof will reflect more heat than a dark roof and will keep the roofspace and house cooler on hot days.

## High Windows

High windows not only brighten up a space, they can be opened to allow hot air to escape as it rises.

## Grid Feeding Solar Electricity System

A 3kW solar electricity installation should be enough to cover the power needs for an energy efficient Australian home.



## Vegetable Garden

A vegetable garden and orchard will thrive in this sunny sheltered courtyard, and is easily watered with rainwater collected from the roof.

## North Facing Windows

North facing glass allows the winter sun to shine in and warm the house, and is easily shaded in summer. Choosing high performance glass such as double glazing will help to keep the house warm in the cooler months.

## Eaves

Eaves are where the roof of the house overhangs the wall. Eaves not only protect the walls and windows from water, the size of your eaves should be designed to provide shade in summer and allow sun in winter, keeping the house comfortable and saving money on heating and cooling bills.

## Shading

A deciduous tree and pergola with a deciduous vine provide shading from hot afternoon sun on the western side of the building. In winter the plants will have dropped their leaves, allowing the sun to shine in and warm the house.





## Project Homes

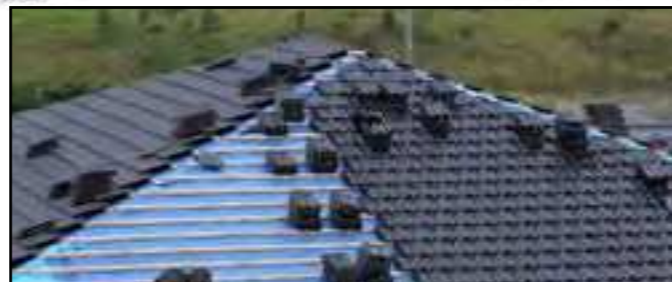
As you can see, the orientation of your home makes a huge difference to the sunlight that 'hits' the building. If you are considering buying a project home you should look carefully at the orientation of your proposed house. A poorly oriented home will require additional heating and cooling equipment, such as air conditioners, and although these may be included in the cost of the house, you'll still have to pay for their energy use into the future.

There are a number of project home companies that now specialise in energy efficient building options. And many project home companies will flip or invert your chosen house plan to achieve better solar orientation, at no extra cost to you.



Brick veneer is not a structural component of a home, rather it is a decorative cladding over a timber or steel frame. In terms of your home's climate control, brick veneer performs poorly compared to other cladding options, such as lightweight timber or fibre cement.

LIGHT COLOURED ROOFS  
KEEP HOUSE COOLER



The colour of a roof has an impact on the temperature of the roof space and the temperature inside the house even with roof and ceiling insulation. The colour range is defined by solar absorptance (SA) which is a measure of the amount of heat transferred through the roof.

### What to look for....

If you're considering buying a project home, simply ask what options are available that minimise energy consumption.

Some of the key features to specify are:

- Light coloured roof
- Eaves for shading
- Good northerly orientation
- Solar hot water system



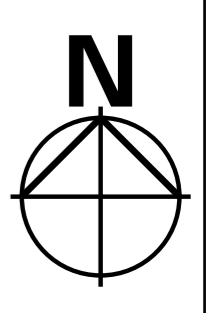
## Why North?

Orientation is crucial to the success of a passive solar home. With good orientation the need for auxiliary heating and cooling is reduced, resulting in lower energy bills. You can achieve good passive solar performance at minimal cost if your site has the right characteristics.

Where possible, choose a site that can accommodate north-facing daytime living areas and outdoor spaces. Ideally the long axis of your home should face true or 'solar' north, although orientations between 15°W-20°E of north should pose no problem. If ideal orientation is not possible, as is often the case in higher density urban areas, an energy efficient home can still be achieved with careful attention to design.

SOLAR NORTH IS  
12° WEST OF MAGNETIC NORTH  
IN S.E. NSW

**What is 'Solar North'?**  
True or 'Solar' North is the direction along the earth's surface towards the geographic North Pole. The direction deviates from magnetic north throughout Australia.





# Solar Comfort: Thermal Mass

By incorporating heavy, solid materials into the construction of your home, you can dramatically improve your comfort in a range of climates. Often called 'thermal mass', these materials slow down the change in temperature between outside and inside. So, for example, in winter, a concrete slab situated in front of north facing windows will retain and radiate the sun's heat into the rest of the house. In the summer the high sun is excluded by eaves and shading and the slab remains cool, regulating the temperature of the house. Commonly used high thermal mass building materials include concrete, brick and stone.

North facing windows catch the low sun in the winter, heating up a slab of dense material, or 'thermal mass'. This slab then re-radiates the heat back into the house during the rest of the day and through the night. In the summer external shading cuts out the sun's rays while high windows allow warm air to rise and escape.

Thermal mass is not a substitute for insulation. Thermal mass stores and re-radiates heat whereas insulation slows or reduces heat flowing into or out of the building. A high thermal mass material is not generally a good thermal insulator so it's important to insulate your home in conjunction with using high thermal mass materials.

You can read more about thermal mass and its use in climate control in *Your Home Technical Manual 2011: Thermal Mass*

CONCRETE SLABS HELP MAINTAIN STABLE INDOOR TEMPERATURES

In brick veneer houses with tiled roofs the thermal mass materials are on the outside and the insulative materials are on the inside. The value of thermal mass is minimal in this form of construction. An alternative is **Reverse Brick Veneer**, where brickwork is on the inside of an insulated lightweight wall.



Hendry Taylor House  
Peter Stutchbury Architecture  
Photo - Michael Nicholson



# Keeping it Cool

Passive solar homes manage the sun's heat to keep your home a comfortable temperature, summer and winter. The ideal passive solar home uses orientation and shading to prevent the sun from entering your home in the summer months. Thermal mass, insulation and well-sealed windows help keep your home cool during the heat of the day. Additional shading, such as deciduous trees or a trellis with a grape vine can provide a cool buffer around your home.

Passive cooling can be as simple as opening a window placed to take advantage of sea breezes or cool evening air. Convective cooling lets hot air rise and escape through high windows while drawing in cool air from south facing, shaded windows. Windows on opposite sides of a room allow for cross ventilation.

If you need additional cooling, ceiling fans are a good option as they circulate air to assist natural evaporative cooling. In hot, dry regions such as the Alpine and Tablelands, evaporative coolers are particularly effective. An evaporative cooler is a device that cools air through the evaporation of water, which requires much less energy than refrigerative air conditioning. In extremely dry climates, it also has the added benefit of conditioning the air with more moisture.

DECIDUOUS TREES & VINES ON WEST & NORTH WILL PROVIDE SUMMER SHADE.

Air conditioners account for 40 per cent of the electricity used by NSW households during the summer. Air conditioning can cost the average home around \$265 a year to run, compared with just \$20 per year to operate six ceiling fans.





# Insulate for Comfort

**Roof and ceiling insulation can save up to 45 percent of heating and cooling energy, while wall insulation will save up to an additional 20 percent.**

Properly installed insulation can maximise your home's comfort while minimising the costs of heating and cooling. Used in conjunction with other design ideas, such as good solar orientation and the use of thermal mass, insulation can dramatically improve the comfort of your home.

The South East region is classified as a 'heating region'. That means we spend significantly more energy on heating than cooling. Having effective insulation in your home means that more heat stays in your house for longer, cutting down on heating bills.

There are two types of insulation, bulk and reflective.

- **Bulk insulation** contains many pockets of air, like a feather doona.
- **Reflective insulation** reflects radiant heat.

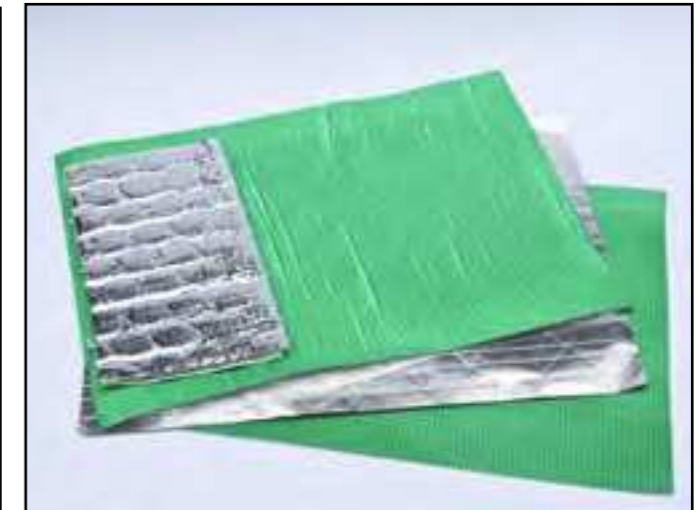
Some insulation products combine bulk and reflective properties.

Most houses use a combination of bulk and reflective insulation. Where you live will affect what type of insulation that will work best for your home. For instance, houses in inland areas where minimum temperatures are lower will benefit from more bulky insulation. Insulation can assist with weatherproofing and eliminate moisture problems such as condensation. Some types of insulation also have soundproofing qualities.

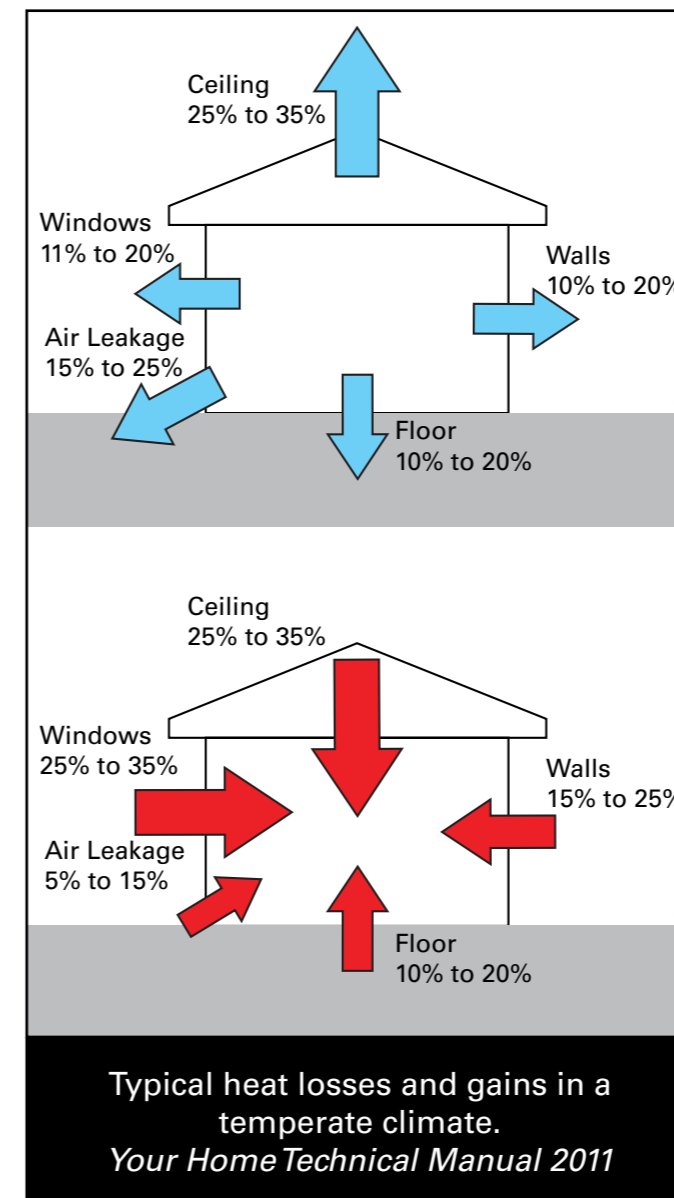
Many people are familiar with the idea of insulating a house's roof and walls with bulky insulation, however, insulating the floor is important as well, especially in the inland areas of the South East. It's important to insulate the edge of slabs that sit on the ground as well as underneath suspended floors. The Alpine region of New South Wales is the coldest region of Australia and in this area you should ideally insulate the underside of slabs on the ground as well.



**Bulk insulation** acts as a barrier to heat flow, keeping heat in or out of your home. It can be made from materials like glass wool, polyester, rock wool, wool or polystyrene. Bulk insulation is available as batts, rolls, loose fill or boards.



**Reflective insulation** helps keep your home cool in summer by reflecting radiant heat. It is usually shiny aluminium foil laminated onto paper or plastic and is available as rolls, sheets and batts.



Insulation products are rated with R-values. The R-value of a material describes its thermal resistance — how much the material inhibits the transfer of heat. The higher the R-value, the more effective the level of insulation.

You can read more about ideal insulation solutions for your climate in *Your Home Technical Manual 2011* 'Insulation'.

Water heating accounts for 25% of the energy use of an average Australian home.

# Solar Water Heating

Water heating is one of the largest users of energy in your home so using the free energy from the sun to heat your water makes good sense. A solar water heater can provide 90 percent of all your water heating needs, depending on the type of system and your climate. In the South East, solar water heating systems are a popular choice for water heating.

Although solar water heating systems can cost more than gas or electric systems to install, you'll soon recover the cost of installation through decreased energy bills, especially with projected rises in electricity and gas prices.

Solar hot water systems use solar collectors or panels to absorb energy from the sun. Solar collectors trap and use heat from the sun to raise the temperature of water. The two most common types of solar collectors are flat-plate and evacuated tube collectors.

## Flat-plate solar collectors

These are the most common type of collector. They are comprised of:

- An airtight box with a transparent cover.
- A dark coloured, metallic absorbing plate containing water pipes.
- Insulation to reduce heat loss from the back and sides of the absorber plate.

Flat plate collectors use simple, tried and true technology to capture the sun's rays. One slight disadvantage of flat-plate collectors is that they only operate at maximum efficiency when the sun's rays strike perpendicular to the flat plate. They also suffer some heat loss in cold weather.

## Evacuated tube solar collectors

This kind of collector consists of:

- A series of transparent outer glass tubes that allow light rays to pass through with minimal reflection.
- Each tube contains an inner pipe coated with a layer that absorbs the sun's rays, generating heat.
- A vacuum (hence 'evacuated') exists between the outer tube and the inner pipe, which acts as insulation, reducing heat loss.

Evacuated tube systems are more expensive than flat-plate systems, but are also more efficient, particularly in the cooler months and on cloudy days.

The location of the hot water storage tank also varies between systems.

In **passive** systems, water is heated in collectors and rises to the tank above. Cooler water then circulates downwards through the panels. The benefit of this system is that there is no pump, which increases the reliability of the system, however you'll need to make sure that the section of your roof structure is strong enough to support the water tank.

In **active** systems, water is pumped between the collectors and the tank, which is typically located at ground level. Because active systems do not require a roof-mounted tank they have less visual impact, particularly when the solar collectors are mounted flush with the roof. However, active systems have an electric pump, are usually more expensive to purchase and require more maintenance than passive systems.

Some solar water heaters have frost protection included to prevent damage in frost prone areas. Although the Alpine, Tablelands and South West Slopes regions have regular frosts almost all of South East New South Wales can experience frost, and it makes sense to plan for this when choosing a solar hot water system. The most effective frost protection option is to use an indirect system.

**Indirect** systems use a heat exchanger and are recommended for areas that are susceptible to frost. Water that has been treated with some form of anti-freeze (such as glycol) is run through the collectors. The heat that is absorbed from the sun into the anti-freeze is transferred by the heat exchanger into the water in the storage tank. The anti-freeze treated water is kept totally separate from the water used for domestic purposes.

A **booster** is fitted to a solar system's water storage tank to heat the water when sunlight is insufficient, powered by electricity, gas or solid fuel. An increasingly popular boosting approach is to use an inline gas booster that works like an instantaneous water heater.

Plan for your hot water system before you build. It should be as close as possible to where you want to use the hot water (generally, the bathroom or kitchen). This will save water, and cut down on energy losses and your bill.

INSULATE HOT WATER PIPES & LOCATE CYLINDER NEAR FREQUENT WATER USE POINTS (KITCHEN, BATHROOM)

Under the Small-scale Renewable Energy Scheme eligible solar water heaters are entitled to a number of Small-scale Technology Certificates (STCs). This is based on the estimated amount of electricity in megawatt hours (MWh) the system displaces over the course of its lifetime. The number of STCs a particular SWH model is entitled to create will depend on its installation date and geographic location identified through its postcode.

Your STCs can be assigned to a registered solar water heater Agent (such as a retailer or installer) in exchange for a financial benefit, such as a discount off your invoice.

You can read more about Small Scale Technology Certificates at the Office of Renewable Energy Regulator [www.orer.gov.au](http://www.orer.gov.au)

# Solar Electricity



**S**olar power systems are now an affordable option for Australian households looking to reduce their power bills and generate their own clean electricity. The combination of Australia's dry climate and latitude give it a high potential for solar energy production, and recent years have seen an increasing amount of households taking advantage of that potential.

Photo-voltaic (PV) solar systems produce electricity from solar radiation. There are two main types of photo-voltaic system.

**Grid feeding** systems feed electricity into the grid and the house then uses the electricity from the grid. It's just like being a small power station: you're connected to the grid like most homes, however, you export electricity as well as importing it. This is the most common form of solar photo-voltaic system.

**Stand alone** systems are not connected to the grid. They have a battery bank to store energy and sometimes a generator to provide additional electricity. In some cases the cost of installing a stand alone photo-voltaic system can be less than connecting your new home to mains electricity, especially in rural areas.

The size of your system will affect the amount of electricity you generate. Low solar conditions, such as mid winter or cloudy weather, will be helped significantly with more solar panels.

Naturally, the more efficient your home, the less energy you need to use. Exporting more electricity than you import will ensure your bills are easy to manage.

Planning for your solar panels before you build your home can make a big difference. Solar panels are most effective when placed on a section of north facing roof, at a pitch of 25-35 degrees. 'Building in' your solar panels will mean they will sit smartly and seamlessly on your roof, rather than requiring an additional frame to elevate them above your roofline.



The type of photo-voltaic system you choose, either stand alone or grid feeding, will affect the pitch of your solar panels. For instance, grid feeding systems can afford to sit on a shallower pitch that maximises summer time electricity production.

However, standalone systems need panels at a pitch that optimises both summer and winter production. In other words, in the summer time you can easily produce excess amounts of electricity but you can sacrifice the ability to produce this excess electricity for the sake of more reliable electricity supply in the winter.

Solar modules produce most power when they are pointed directly at the sun. It is important to install them so that they receive maximum sunlight. Ideally they should be in full sun from 9am to 3pm in mid winter.

With a grid feeding solar system, your bills are calculated as the difference between the amount of electricity you import and the amount you export to the grid.

Under the Small-scale Renewable Energy Scheme eligible solar panel systems are entitled to a number of Small-scale Technology Certificates (STCs). This is based on the estimated amount of electricity in megawatt hours (MWh) the system generates over the course of its lifetime. In addition, your system may be eligible for Solar Credits which multiplies the number of STCs the system can receive. You can read more about STCs and Solar Credits at [www.orer.gov.au](http://www.orer.gov.au)

There are other options for producing electricity at home - such as wind or small-scale hydro electric. Read more in *Your Home Technical Manual 2011*, Energy Systems.

# Windows: Natural Light



Foxground House  
Fergus Scott Architects  
Photo - Michael Nicholson

Your home's windows should frame your views while providing privacy. Windows let in light, air and warmth, but are also a significant source of heat loss. Striking the right balance between these factors is the key to successful window design. Your choice of joinery and glazing will have a significant impact on your home's thermal comfort, as well as its BASIX® rating.

Windows and doors are crucial to cross-ventilation, so it's important to think about their location. By placing windows on both sides of a room cross ventilation will encourage natural air-flow and cooling.



Metal fly screens not only keep insects out, they can help to protect your home from ember attack in a bushfire.

In Australia the thermal performance of windows is rated according to WERS (Window Energy Rating Scheme) in units called U-value and Solar Heat Gain Coefficient.

**U-Value** measures how readily a window assembly (including frame and fittings) conducts heat. It is a measure of the rate of non-solar heat loss or gain. The lower the U-Value, the greater a window's resistance to heat flow and the better its insulating value.

**Solar Heat Gain Coefficient (SHGC)** measures how readily heat caused by sunlight flows through a product. The lower a window's SHGC, the less solar heat it transmits.

Choosing windows for a passive solar home means achieving the right balance between U-values and SHGC.

[www.wers.net](http://www.wers.net)

## Glazing

There are several types of glass available for windows and doors.

### Clear Float Glass

Clear float glass is transparent and colourless, offering high visible light transmittance.

### Toned Float Glass

Toned float glass is tinted. Tinted glass is designed to reduce the amount of light and heat that enters your home. However, well-placed, shaded windows will provide better heat and light than poorly located tinted windows.

### Low E Float Glass

Low E glass is a low reflective and highly transparent glass. It is specifically designed to reduce heat transfer in both warmer and cooler climates and thus reduce energy costs.

### Laminated Glass

Laminated glass is safety glass that has been manufactured by adhering two or more sheets of glass with a flexible interlayer. This interlayer prevents the glass from disintegrating when broken.

### Toughened Glass

Toughened glass is specially heat treated to make it stronger. Toughened glass can still be broken, however it won't shatter into small fragments.

### Insulated Glass Units (IGUs)

Commonly known as double glazing, this type of glazing consists of two or more panes of glass separated by a spacer around the edges and then sealed. Insulating glass units are available in many glass combinations. Double glazing lets solar heat into your home and then helps keep it there.

## Joinery

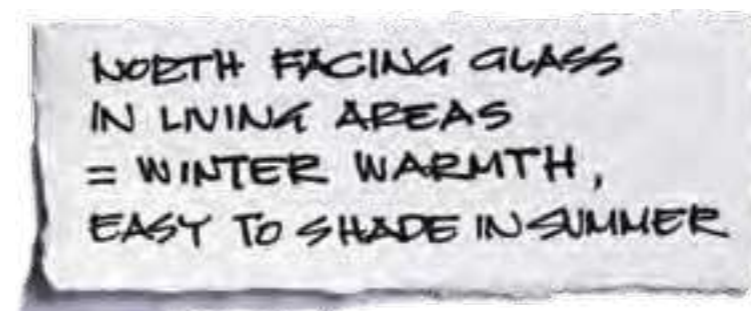
Windows and doors are commonly made from timber, aluminium and uPVC. Timber and uPVC offer the best thermal insulation. Aluminium is a poor insulator, so window manufacturers have designed ways to improve its thermal performance. Look for 'improved aluminium' window frames to minimise heat loss. Weather strips and seals also reduce heat loss through windows and doors.

In regions with extreme temperature variations, such as the Alpine and Tablelands areas, double glazed windows can provide a high comfort level throughout summer and winter and can significantly reduce or eliminate the need for artificial heating and cooling. Double-glazing isn't just for very cold places, it can help regulate the temperature of your home in the coastal region as well.

Double glazing will cost more to install than single glazed windows, however, its benefits will pay for themselves in energy savings. The increasing popularity of double glazing has lowered its cost and often the additional cost of double glazing can be less than a new set of curtains or blinds.

There are other ways of reducing heat loss through windows. Snug fitting blinds and thick curtains with pelmets act as insulation by trapping a layer of air against the window.

You can read more about this in *Your Home Technical Manual 2011: Glazing*





Hugh Gordon Architect  
Photo - Jeremy Rozdez

# Materials: Building for Good Living and Affordability

Every home contains a wide variety of building materials tailored to your design, location and needs. Selecting the right materials is about striking a balance between appearance, durability, practicality and of course cost.

Planning for a healthy, comfortable home means thinking about the types of materials you want your house to be made from. For instance, many building materials are chemically treated for a range of purposes, and may contain products from fire retardants to pesticides. Keep this in mind when talking to your designer about building materials.

Here are some things to think about when choosing building materials:

- Shop around for **locally made** products. The construction industry is an important economic generator in our region and supporting locally made building products will support your local community. The South East produces

excellent building materials such as plantation hardwoods, softwoods, remilled timbers, stone and masonry as well as a range of finished products such as joinery and cabinetry.

- **Longevity.** It's worth spending a little more on a product that will last longer, saving you the time, money and effort of replacing it in the future. For instance, galvanised steel will stand up to the weather much longer than untreated or painted steel.
- **Recycled and reclaimed** materials can provide character and appeal to your home. For instance, re-milled reclaimed timber can be a beautiful flooring option and cost around the same as a new product.
- Talk to your building designer and builder about ways to **reduce wastage.**

This house is clad in a combination of compressed fibre cement, steel and plywood. A galvanised steel awning shades north facing aluminium windows. The remilled hardwood decking is finished with a plant based wood oil. A polished concrete slab floor provides thermal mass.

When it comes to building materials, common misconceptions can influence your choices:

- Many people think that timber is unsuitable for homes in bush fire prone areas. In fact some native Australian timbers such as Spotted Gum, Red Ironbark and Blackbutt, all grown in the South East region, meet the Australian Standard for fire retardant building materials.
- Most brick homes aren't actually built of brick, rather the brick veneer is a decorative cladding covering a timber or steel frame.
- Although concrete involves a lot of energy and greenhouse gas emissions to produce, its high thermal mass can significantly cut your energy use in the long run.
- The design of your termite barrier system can reduce or eliminate the need for chemically treated timber.

From an environmental perspective, using materials that are sourced nearby will cut down on their greenhouse gas emissions. Sometimes the cost between Australian sourced products and those imported from overseas is marginal. And when it comes from Australia you are not only supporting local industry, you also have much more information about the product. For instance, some popular timbers come from poorly managed tropical rainforests. It's worth thinking about where your materials come from and investigating local options.

The Forest Stewardship Council (FSC) is a non government organisation that monitors and assesses forestry practices internationally. In Australia you can buy timber that is FSC approved and carries the FSC mark. [www.fscaustralia.org](http://www.fscaustralia.org)



## What are 'low VOC' products?

Some consumers are now choosing to buy construction materials and new furnishings that are 'low VOC'. VOC stands for Volatile Organic Compound. VOCs are chemicals containing carbon that evaporate into the air at room temperature. VOCs are present in a wide range of household products, construction materials and new furnishings. VOCs are potentially damaging to your health. When used in building products or other indoor items VOCs slowly make their way to the surface and 'offgas', into the surrounding air. Most offgassing occurs when products are new and/or freshly installed. Offgassing lessens significantly over time.

The building industry has responded to increasing consumer demand for healthier building products. There is now a range of low VOC alternatives to many products such as paints, finishes, composite materials such as MDF and adhesives used in the construction process.

Strategies to reduce VOC exposure in the home:

- Stop or reduce the use of products that contain VOCs. Many are now labelled.
- If the product is necessary, ensure adequate ventilation when using it and while it is offgassing.
- Open doors and windows whenever possible and practicable.

# BASIX® and You



**C**omfort, affordability and style are key to enjoying your home. And now, all new Australian houses must now meet a basic level of energy efficiency. New South Wales uses an energy rating system called BASIX® to rate the energy and water efficiency of new homes. BASIX® requires all new homes in New South Wales to use up to 40 percent less water and produce up to 40 percent less greenhouse gases than the average home\*.

Your house plan's heating load and cooling load are two key measurements in BASIX®. BASIX® combines these ratings with other factors, including the climate where you live and rates your home accordingly.

## What is a STAR rating?

Many people are familiar with the 'Star' energy rating method often used to describe the efficiency of buildings, appliances and materials (you might have a 'star' rating on your washing machine or fridge). Houses are often marketed as being '5 star' and project home companies

frequently use stars to describe the energy rating of their houses. You might also be familiar with the fact that houses in the ACT require a star rating before they can be sold.

These ratings were developed in line with NAtHers, an Australia-wide method of rating the efficiency of new homes.

BASIX® however, is based in New South Wales and does not use the 'star' rating system. Instead BASIX® measures the key factors such as heating and cooling loads against a 'cap', and then combines these ratings with other factors, including the surrounding climate, to give your house plan a BASIX® rating. These factors are then measured in accordance with specific targets that are aimed at reducing energy and water use, and greenhouse gas emissions\* BASIX® scores can be loosely translated into star ratings, however the accuracy of this rating will depend on how close your home is to the averages in the NAtHers system.

In New South Wales BASIX® rates houses on factors such as insulation, window area, hot water and energy systems, as well as the location of the building. Plans for all new houses in New South Wales must meet minimum requirements in order to obtain a BASIX® certificate, which is required before you can start building. Normally your architect or draftsman will assist you in drawing up a BASIX® ready plan for your home. Being familiar with sustainable options means you can fine tune your home to better suit your needs and guarantee a more affordable cost of living. Here are some of the factors that contribute to your BASIX® rating:

**Water:** BASIX® measures factors such as rainwater tanks plumbed to the toilet, garden and/or laundry, efficient showerheads, toilets, and tap fittings.

**Energy use:** BASIX® measures energy efficient lighting, alternative energy systems such as photovoltaics, ceiling fans, evaporative coolers or high efficiency air conditioning units.

**Thermal comfort:** BASIX® measures solar orientation, insulation, outdoor window shading and building materials.

## Planning for passive solar and BASIX®

Put simply, BASIX® derives thermal comfort ratings from factors including a calculation of window area and type (double glazed etc.), room size and insulation. Although BASIX® does score good solar orientation and shading more favourably than poor orientation, many people find that passive solar homes with a large area of north-facing windows obtain the best ratings using the 'Simulation Method'.

Of the three methods that BASIX® recognises to measure thermal comfort, Rapid, DIY and Simulation, Simulation is the most sophisticated. The Simulation Method measures the thermal comfort of a dwelling by measuring many more factors than the key window size and floor area. A Thermal Comfort Certificate (sometimes called Thermal Performance Certificate) allows for a more sophisticated representa-

tion of the thermal comfort of your home. This is especially useful for passive solar houses.

## Getting a Thermal Comfort Certificate

Using one of three software tools called AccuRate, FirstRate5 or BERsPro an assessor can measure the thermal performance of your home and generate a Thermal Comfort Certificate. Alternatively you can use these tools to rate your plan as part of the BASIX® online system. The Thermal Comfort certificate must be supplied with your BASIX® certificate as part of your Development Application.



\*The percentage saving target varies depending on your climate zone and building type. For instance, almost all of the South East BASIX® aims to reduce water consumption by 40 percent, however, in Alpine region and higher areas of the Tablelands, the target is 30%. Likewise, the energy targets vary slightly depending on your region. For the South East, the coastal regions have a slightly higher energy reduction target than inland areas. You can read more about these targets in Single Dwelling Outcomes 05-08, available online at [www.basix.nsw.gov.au](http://www.basix.nsw.gov.au)





Daniel and Cecilie's Place, Tathra  
 Michael Marshman & Associates  
 Photo - Gillian MacMillan

# Among the Gum Trees

Vegetation can significantly increase the enjoyment of your home. It provides shade on those hot summer days as well as enhancing the beauty of your property. Trees provide shady groves and peaceful surroundings, as well as a habitat for birds and animals. Well-planned vegetation can also protect your home from cold winter winds and funnel cool summer breezes through your property. It's worth thinking about what kind of trees you'd like early in the building process, and where to plant them as this will help 'structure' shade and breezes around your home.

Taking into consideration the risk of bushfire will give you the confidence to use vegetation in a way that enhances the enjoyment of your home.

Bushfire is a risk in many rural and regional areas. Planning for bushfire is an essential part of the development process. In New South Wales, houses that are located within a bushfire prone area (BPA) are subject to special requirements\*. Bushfire prone areas are identified on a map that has been specially prepared by the Rural Fire Service and available through your local council.

If your property is located within a bushfire prone area you will need to get special permission to develop the site. In some cases your council will assess your bushfire preparedness plans, while in others this will be done through the Rural Fire Service (RFS). The RFS publishes a kit called NSW Rural Fire Service Guidelines for Single Dwelling Development Applications, available at [www.rfs.nsw.gov.au](http://www.rfs.nsw.gov.au)

The RFS Kit tells you how to measure the variables that lower the bushfire risk. These include:

- The slope of the land
- Distance from vegetation to (planned) dwelling
- Type of vegetation in the vicinity of the dwelling
- The Fire Danger Index (FDI) of the land

These variables combined will tell you the level of construction, such as fire retardant materials and available water supplies that will satisfy RFS requirements.

\*The bushfire regulations are currently under review, so you should always talk to your council about your building plans and bushfire risk.

Situated among mature trees on a rocky ridge and steep westerly escarpment to the Bega river, this house meets its bushfire flame zone rating by making use of fire retardant timber species. Silvertop Ash cladding and decking and recycled Blackbutt structural beams are used in conjunction with non flammable materials, core filled concrete blocks, galvanised steel, fibre cement sheet and zincalume coated steel sheet. Rainwater is captured from the roof in an extra wide box gutter and collected in two 10,000 litre steel water tanks, one for domestic supply and the other for the fire-fighting sprinkler system located along the western edge of the property that is exposed to the flame zone. A third in-ground 10,000 litre tank is provided for bush-fire fighting purposes. All opening windows are screened with stainless steel mesh.

## What is an Asset Protection Zone?

One of the key elements in bushfire protection is an Asset Protection Zone, or APZ. In simple terms, an Asset Protection Zone is an area of cleared land surrounding a building. This significantly lowers the risk of bushfire and/or ember attack. An APZ is a common requirement for homes built on bushfire prone land.

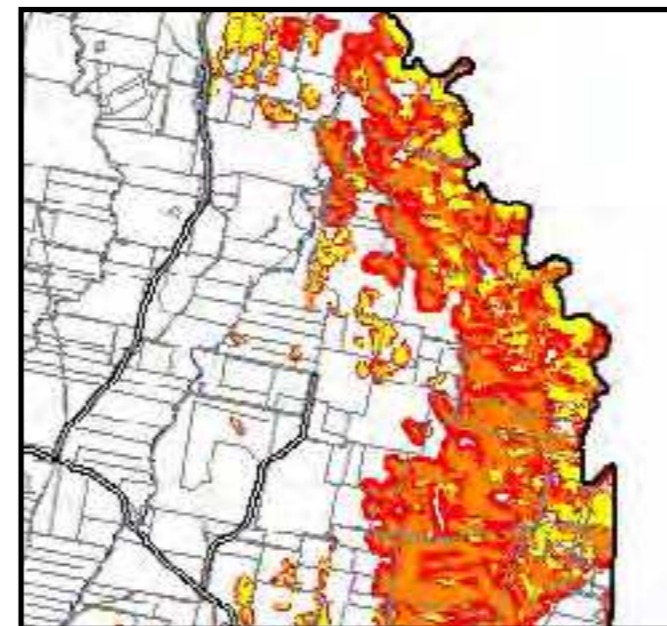
Neither the RFS nor a council has the power to impose an APZ on an adjoining landowner. It is therefore the developer's responsibility to negotiate with adjoining land owner/s as part of the development application process. Details of the proposed easement and the adjoining owners consent should be submitted with the development application.

It's important to check a property's planning controls before development. For instance, land that hosts an Endangered Ecological Community (EEC) may limit your ability to have an APZ. This could impact on your building options. If an APZ is likely to impinge on an Endangered Ecological Community your local council will help determine the action you can take to create that APZ.

If you're planning on building in a rural-residential area you will need to satisfy the RFS that they can access your property in the event of a fire. This can mean additional roading requirements. It is important to consider and budget for this.

Again, many homes in the South East are in rural settings. The RFS has requirements surrounding water access and storage for fire fighting, including dams and fire-proof water tanks.

*Home Comforts* predominantly deals with the development of standard residential dwellings in the South East. For more information on these and other developments you should check the PBP (Planning for Bushfire Protection) document available at [www.rfs.nsw.gov.au](http://www.rfs.nsw.gov.au)



## Example of a Bushfire Prone Land Map.

To find out if you live in a bushfire prone area, contact your local council and ask to view your local bushfire prone land map. This information will also be noted on the 149(2) Certificate for the property. Read more about this certificate in Planning to build in the South East, Land Your Council and You, page 34



# Water: Getting it, Saving it.

**W**ater is a precious resource in Australia. Having your own supply of water cuts your water bill, but it can also support a healthy and beautiful home garden. In New South Wales there are a number of schemes that encourage water conservation and storage, especially for home-owners. For more information on these, contact your local council. Most water collection systems consist of gutters and downpipes, leaf guard, first flush device, a water tank, overflow, and a pump.

## How big should my water tank be?

The most common home-based water conservation option is a water tank that catches the water from the roof. The size of tank you require will depend on whether you're planning on using it in addition to a reticulated water supply (town water) or for all your water needs (if you're on a rural property). If rainwater is to be your sole supply you will need a tank with a capacity of 50,000 to 100,000 litres. In general, for toilet flushing and use on a small garden, the tank should hold a minimum of 2,000 litres. For non-potable (non-drinking) domestic use and holding stormwater, a minimum of 5,000 litres is recommended. If you are just using your tank for your garden your needs will vary with climate, the size of the garden and the type of plants it contains. An average household requires a tank with approximately 2,000 to 4,000

litre capacity to water their garden year round. Also, in some areas the Rural Fire Service may require you to have a water tank for fire fighting. Again, your council can advise you about these requirements.

Water tanks come in a range of sizes, shapes and materials, including polypropylene plastic, metal and concrete. They can be installed underground, on the ground or elevated on stands.

Planning where to put your water tank should be an integral part of your home design and will affect the quality of water in your tank. Ideally you should locate your tank so that the gutters drain directly into it, rather than have a 'charged' system. A charged system is where the rainwater sits in the downpipes and the tank is filled when the pipes overflow. This water can sit in the pipes for a considerable period of time affecting its quality. There are a variety of filtration options depending on the intended use of your rainwater. Even if you aren't planning on collecting your water for drinking, filtration will protect your plumbing from damage due to contaminants.

In New South Wales there are restrictions on water collection for drinking. Your local council can assist you with information about installing a rainwater tank in your area.

All new houses are required to meet water efficiency targets through BASIX®. BASIX® recognises the Water Efficiency Labelling and Standards (WELS) scheme 6 star water rating scheme for toilets, showerheads, taps, clothes washers and dishwashers. The more stars a water fixture has, the greater the water efficiency of that fixture. BASIX® also rates and encourages the installation of a rainwater tank for flushing toilets and clothes washing machines. However, exceeding the minimum requirements of water conservation can have ongoing benefits to your lifestyle, such as a healthy, bountiful garden.

**Grey water systems** are an increasingly popular choice for water conservation and garden health. Grey water is domestic wastewater from bathing, washing dishes or laundry. It does not contain human waste (water containing human waste is called blackwater). There are two types of greywater systems, each allowing you to use greywater in different ways. A greywater diversion device enables untreated greywater to be used for outdoor purposes by distributing water to your garden through a sub surface irrigation system. A greywater treatment system enables you to use treated greywater for above surface irrigation, toilets and washing machines.



WELS is Australia's water efficiency labelling scheme. It allows consumers to compare the water efficiency of different products, including showers, tap equipment, flow controllers (not mandatory), toilets, clothes washing machines, and dishwashers. The rating system has six stars. The more stars the better. The labels also show a water consumption or water flow figure that tells you more about the water consumption for that item, for instance, litres per wash cycle.



## Go Native

Using Australian native plants in your garden will help reduce the amount of water you use outdoors, while still allowing you to have an interesting and colourful garden, even in the driest times. A 'drought smart' garden not only saves you water, it is low maintenance, attracts wildlife and will save you both time and money.



# Planning to Build in the South East: Land, Your Council and You

**Y**ou've found your perfect site, where to from here? When you're planning a home there are a number of factors that you should consider from the outset. Not all land is the same. Matching the land you choose to your needs is an important first step in building your home.

**Remember, real estate agents are not required to give you all the information relating to properties that are for sale so you should always check with your council before buying a piece of land.**

Firstly, there's the zoning. You should always check the zoning of your prospective land before you buy. Is it residential, rural, does it have a building entitlement? You can visit Council offices to view maps that will show zonings, overlays, easements, Endangered Ecological Communities, and whether your land is in a bushfire prone area. Also, check to see if your land is on the edge of a zone, as this will have an impact on the type of development you end up building next door too. You can purchase an S149 certificate containing this information from your council for a fee.

Here are some other factors that may also apply to your land:

### **Endangered Ecological Community**

Ecological communities are unique and naturally occurring groups of plants and animals. They can be determined by factors such as the incidence of particular plant and animal species, soil type, position in the landscape, climate and water availability. Changes to the landscape as a result of human activity have put many of these unique communities at risk so that they are now listed as endangered ecological communities (commonly referred to as EECs) under the NSW Threatened Species Act (1995). If your land hosts an EEC you will need to account for this in your development plans, especially regarding land clearing. You can find out more about EECs in your area from your local council.

### **Do I need a DA (Development Application)?**

All developments, such as building a house, are subject to planning controls. You'll need to make sure that your development satisfies the requirements of the planning controls in your area. In South East New South Wales, most planning controls are administered by your local council. Your council can help you find out what the regulations are and how you can make sure your plan meets them.

Some residential developments will not require a development approval (DA) from your local council. 'Exempt development' is a minor development of minimal environmental impact that meets all the requirements of the land, such as zoning or conservation restrictions. You do not need a DA for exempt or complying development. However, for complying development you will need a 'complying development certificate'. You can get this from your council or from a private certifier. This demonstrates that your development meets the requirements.

### **And if you do need a DA....**

Once you've identified what you can do on your land you can start to draw up your building plans. Many prospective home builders attend a pre-lodgement meeting with their local council. Here, staff can help make sure your plan satisfies the requirements laid out in your area's Local Environmental Plan (LEP), Development Control Plan (DCP) and any State Environmental Planning Policies (SEPPs) (explained below). Council staff can also identify any heritage sites that will be affected and advise whether your development will require assessment under the Native Vegetation, or Threatened Species Act or any other relevant pieces of legislation.

### **Submitting a DA**

Your Council will provide you with an application form for development. You will need to fill in the form and provide:

- Your building plans
- A BASIX® certificate
- Details of any demolition that will take place on the site
- Details of bushfire plan/asset protection zone(s) if you are in a bushfire prone area
- A Statement of Environmental Effects



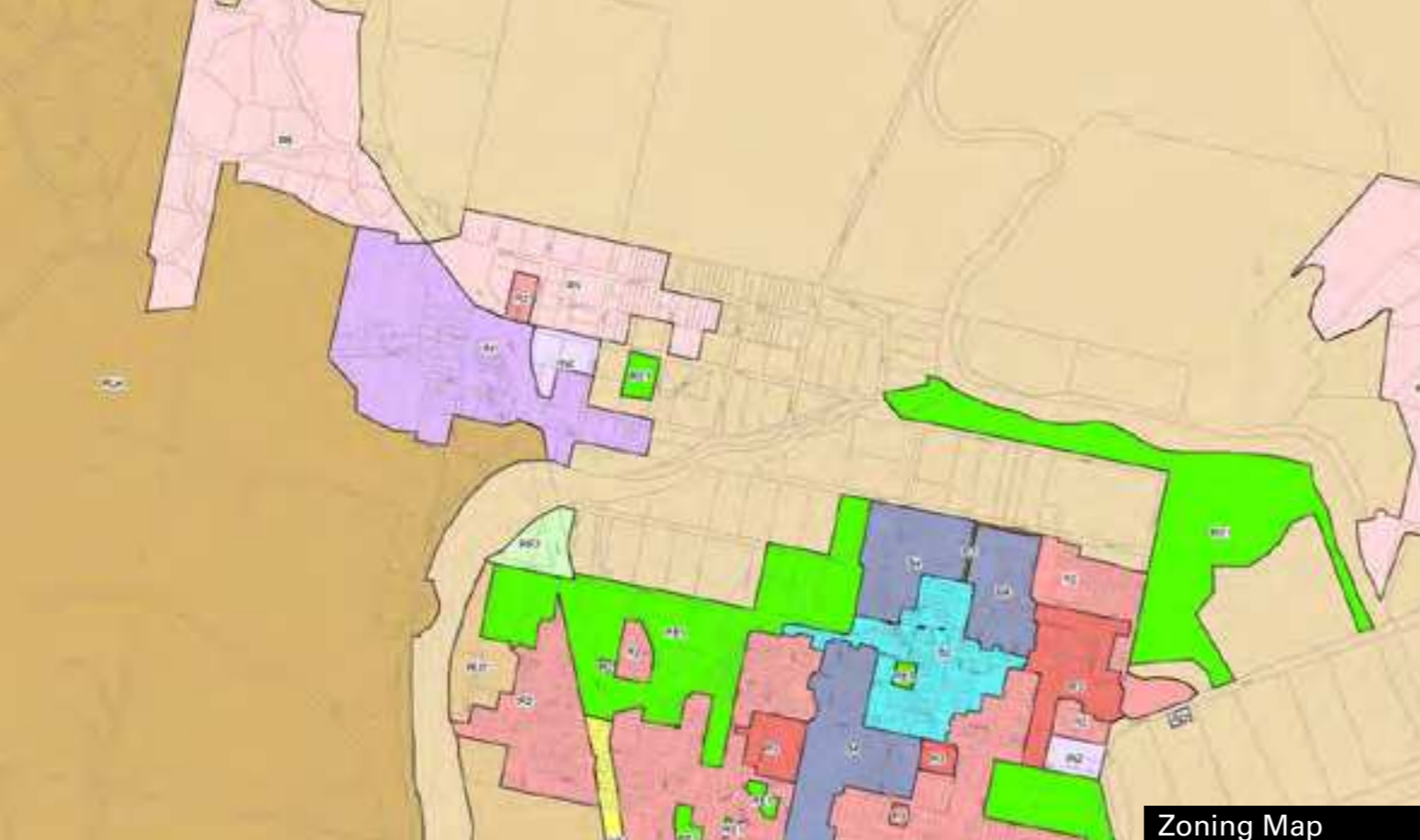
You will also need to elect a Principal Certifying Authority. This can be your council or a private certifier. The Principal Certifying Authority makes sure that the conditions of the consent are followed.

### **Construction Certificate**

You will require a Construction Certificate to sit alongside your Development Application. This document certifies that the detailed construction plans and specifications for the development are consistent with the development consent and comply with the Building Code of Australia. You can obtain a Construction Certificate from private building certifiers and many councils.

### **Monitoring**

Once your Development Application has been approved you will need to make sure that your development meets the requirements of the DA. This can be undertaken by a private building certifier or your local council.



## A Comfortable Home

### LEPs and DCPs Explained

Your DA will be assessed according to the relevant planning controls. In the South East of New South Wales the most commonly used planning controls are Local Environmental Plans (LEPs) and Development Control Plans (DCPs). These are developed and administered by your local council.

A Local Environmental Plan (LEP) sets out the permitted uses of land in a local government area. Each Council area in the South East of New South Wales has its own LEP that controls for zoning and gives legal effect to a variety of building regulations. Each Council must have a link to their LEP on their website. You can also approach your Council with any questions you have about your local LEP.

A Development Control Plan (DCP) is a series of guidelines that inform development. Many of the guidelines in a DCP are based on the Building Code of Australia (BCA). The BCA is a legally binding set of rules that govern building. Most council areas have DCPs that determine the type of development considered appropriate to the area.

In general, almost all development in the South East of New South Wales will be subject to the controls of LEPs and DCPs. Many developments will also invoke the Native Vegetation and Threatened Species Act, (see EECs above) and some will fall under SEPPs. SEPPs cover a wide range of development issues, from the protection of agricultural land to coastal erosion, that apply to the people of the state of New South Wales. There are, however, other less commonly used planning controls that may apply to you. Your local council can advise you of them.

### Land Clearing

Where you live will impact on the type of land clearing you can undertake. Many people have heard of the Native Vegetation Act 2003 that regulates land clearing in areas of New South Wales. In general, the Native Vegetation Act regulates the clearing of native vegetation on all land in New South Wales except for:

- National Parks and other conservation areas
- State forests and reserves
- Urban areas

Again, your Council can advise you of the status of your land, and whether the Native Vegetation Act applies to you.

- uses the free energy of the sun to keep warm in the winter, and even to provide hot water and electricity
- is just the right size for your needs
- reduces your bills
- works with the local climate
- keeps cool with a light coloured roof and shading such as eaves and deciduous plants
- makes use of thermal mass to maintain stable indoor temperatures
- uses cross ventilation to harness cooling breezes and fresh air
- is well insulated to keep warm in winter and cool in summer
- strikes a balance between healthy vegetation and bushfire awareness



Produced by: Fiona Whitelaw Consulting for Sustaining Our Towns  
Graphic Design: Toby Whitelaw Design  
Architectural Illustrations: Stuart Whitelaw



***Home Comforts* explains simple approaches to designing and building an energy efficient new home in South East New South Wales.**

Comfort, affordability and style are key to enjoying your home. And with rising energy costs it makes sense to pay attention to its design. *Home Comforts* showcases and explains the principles of passive solar design as one of the easiest and most affordable methods of ensuring a luxurious lifestyle in the South East.

The best home is one that suits your lifestyle. By incorporating the principles of passive design you can plan for a comfortable home for you and your family. Houses that are naturally warm in winter and cool in summer are both nicer to live in and more valuable.

Solar orientation, thermal mass, insulation, natural heating and cooling, solar water heating and electricity systems and glazing are all explained in every day language.

*Home Comforts* will guide you through the design and planning process of a smarter, more comfortable home.