Australia's leading environmental homes

sanctuary

Sustainable living with style

BUYING A **SUSTAINABLE** HOME **CHECKLIST**

KEEPING **WARM** **WITHOUT** COSTING THE **EARTH**

WIN
A WEEK AWAY AT BOORMAN ECO RETREAT VALUED AT $3000

SOLAR **HOT WATER** OPTIONS

DESIGN **FOR** **GREEN** CLEANING

12 TOP **ECO-FRIENDLY** HOMES

ISSUE 3 AUD$9.95 NZ$10.50

ISSN 1833-1416

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Features

Editorial

So much has changed in the six months since the last issue of *Sanctuary*. Climate change is front page news and interest in sustainable living is at an all time high. More Australians are looking to curb their water and energy use and to lessen their footprint on the planet. Here at the office we are receiving an increasing number of phone calls from people looking for advice on how to renovate or build their homes with less impact on the environment.

As the cool weather hits parts of Australia, looking at ways to keep your house warm without using large amounts of power becomes paramount. There are a number of measures we can all take to keep our homes at a comfortable temperature without skyrocketing bills. The first step is to stop the heat escaping from your home; place draft excluders around doors and windows, seal up vents that let warm air escape and ensure that your windows are not acting like an open door by placing curtains and pelmets over them. If you are considering renovating or building, installing or increasing the levels of effective installation is vital.

Sanctuary 3 showcases a wide variety of sustainable homes across all parts of Australia. The one thing they all have in common is that they have been built to suit their climate. By incorporating passive solar design the homes are able to stay warm and cool naturally. With clever design the homes are not only more comfortable for their occupants but also energy efficient.

For the majority of people, buying a brand new sustainable home is not an option. To help you in your search for a house we have compiled the 'Buying a Home' checklist. House hunting can be an exhausting and emotional journey. The checklist will help you compare properties and find the house, apartment or flat that is, or has the potential to be the most sustainable option. Simple things such as space to install a rainwater tank or even access to get it in are often overlooked between securing home loans and going to auctions.

With increasing demand for information and inspiration for sustainable homes we have increased the frequency of Sanctuary to two a year. We are also offering subscriptions so the magazine can be delivered to your door. Subscribers go into the running to win a week's accommodation at the Boorman Eco retreat in the Queensland Hinterland.

Now that sounds like a great winter warmer!

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Supported by the Australian Government through the *Your Home* project.

Your Home is a suite of consumer and technical guide materials and tools developed to encourage the design, construction or renovation of homes to be comfortable, healthy and more environmentally sustainable.

Your Home is a joint initiative of the Australian Government and the design and construction industries.

For further information go to www.yourhome.gov.au

ISSN 1833-1416

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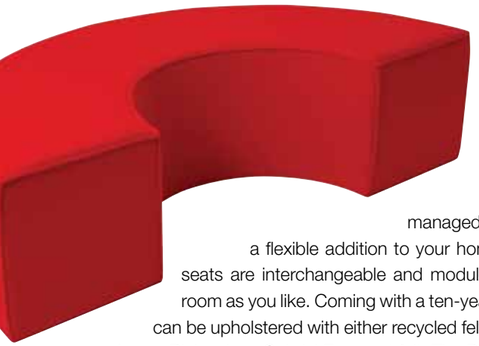
Tired of the daily uphill bicycle battle to work? Get an eco-friendly boost with the eLation Electric Bike System. Available already fitted to a bike or in kit form, the electric motor provides plenty of torque for a challenging gradient. On the flat, thrilling top end speeds will make your commute all the more quicker. The motor utilises the bicycle's gears, driving through them as the system requires. Thus the more gears, the greater the performance this eBike will give.

www.elationebikes.com.au

Hit the Spot rugs will keep the living room floor warm all winter. Hand-woven by women along the Thai-Cambodian border, these stylish rugs are made from recycled Hessian rice sacks and clothing. Paid a fair wage for their work, money earned enables families to send their children to school. Each rug comes in three colour tones and measures 75cm in diameter. A work of art in itself, a photo of the rugs maker comes with the purchase. Hall runners made by the same group of women are available upon request.

www.ecodepot.com.au



Manufactured from certified sustainable Australian-managed plantation timber, the PLOP is a flexible addition to your home furnishings. These colourful seats are interchangeable and modular, allowing you to shape your room as you like. Coming with a ten-year structural warranty, the PLOP can be upholstered with either recycled felt from post-consumer materials or James Richardson Gabriel Europost felt. The PLOP can be manufactured to fit your lounge room within six to eight weeks.

www.esogroup.com.au

Help save water and refine your bathroom with Caroma's Smart Flush toilet.

Integrating a hand basin with the toilet, this loo can save over 70 per cent of the water sent down the drain by your average single flush toilet. This minimalist structure, designed with space in mind, allows you to wash your hands in the basin before redirecting the water for flushing. This new toilet allows the household to save water without too much thought. Peace of mind.

www.caroma.com.au

Light up your home naturally with the Velux Rigid Sun Tunnel. Designed to withstand the harshest climates, these stylish sky lights stream a flood of natural light into your home. Awarded 5-stars by the Window Energy Rating Scheme, the new flat-sitting frame allows three times more light into the building than other standard versions. With a toughened glass shell on the outside, the Velux won't scratch, discolour or leak, and will provide you with the sun's warmth for many years to come.

www.velux.com.au

A lifestyle to make you "green" with envy.....

Sanctum Design and County Prestige Homes are combining their multi-award winning talents to showcase the latest in energy efficient design and modern building technology. Our new display home will reveal a truly sophisticated retreat that is naturally comfortable *and* friendly to our environment.

Our expertise, when combined with the Hunter Valley's premier residential lifestyle community, The Vintage, provides the makings of an ideal sanctuary perfect for a relaxing and fulfilling lifestyle.

For further information on building our custom or pre-designed homes in your local area, please contact our design centre on (02) 9909 8844 or via the websites listed below.

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ecobodes sustainable home loans
info@ecobodes.com.au

county PRESTIGE HOMES
www.countyprestigehomes.com.au

SANCTUM design consultants
www.sanctumdesign.com.au

As retro continues its revival, our old love affair with linoleum has sparked again. But this time it has taken the environment into consideration. Artoleum, by Forbo, is a new bio-degradable flooring material. Released in three styles, Artoleum is made from harvestable raw materials and has been awarded the Good Environmental Choice Label. With proven durability, Forbo's advanced Topshield finish protects the floor from scuffing and dirt. Another way to help minimise your footprint on the planet.

www.artoleum.com

A new addition to the Australian Made campaign, Mekko's eco-leather bags are both environmentally and animal friendly. Designed and manufactured in Ballarat, these beautifully crafted bags are made from a blend of cotton and micro-fibre sourced from Italy. Durable and practical, the bags feel fabulous and loose nothing in style.

www.mekko.com.au

Megaman's 11 Watt Dimmable Compact Fluorescent Lamp replaces the older 50 watt gu10 halogen variety and can be placed in any standard 240 volt downlight fitting. With dimming control possible on any common light switch, energy savings of 20 per cent can be made with each of the lamp's four dimming steps. Available in Warm White and Cool White, these lamps have a mega average working life of 10,000 hours.

www.environmentshop.com.au

Dimming fluoro lights has always been a problem. Most attempts result in death for the light. But Microbrite lamps can be dimmed with conventional 240 volt lamp dimmers, and have been built to withstand rapid switch operation. This means they can be used wherever a regular screw-based bulb is. This power saving globe features a long-life cold-cathode fluorescent tube and comes with a two year warranty.

www.ata.org.au

A step up

A self-sufficient weekender in the New South Wales bush

The large single-pitched roof slopes downward on the southern side to protect the house from the summer sun.

> “The house was designed so that every room enjoys the northern light and panoramic views”

The clients who commissioned this weekender in the Kangaroo Valley, two hours south-west of Sydney, wanted their retreat from the city to be “one step up from camping” in terms of its impact on the surrounding landscape. Their holiday home is environmentally sensitive but doesn’t sacrifice comfort.

The family (a married couple with three young boys) spent time camping on the 66-hectare block while considering possible sites for the house. “The location we eventually chose was the first one we arrived at,” says the owner. “It’s an elevated site but not too high. We were fortunate to find a site that has waterways either side of the house and trees that provide a windbreak and great shade. We wanted a building that was going to be sensitive to the microclimate there.”

The couple then called on Utz Sanby Architects, the firm that oversaw the renovation of their Sydney home. “Duncan (Sanby) made a couple of visits with them to help decide on the site,” architect Kristin Utz explains.

“The location they came up with was chosen to maximise the northern aspect to ensure adequate solar access, as this was always going to be a fully self-sufficient house.

“The house is several steps up from camping, but it’s still very low impact,” Kristin adds. “It’s all about the view and the greater landscape, it’s not about the house, which is almost incidental. It provides shelter but you are so much more aware of and connected to the view, the escarpment, the mist and the sunsets in this house. When you wake up in the morning and pull the blinds up, it feels like the bed is out in the field and the house practically disappears.”

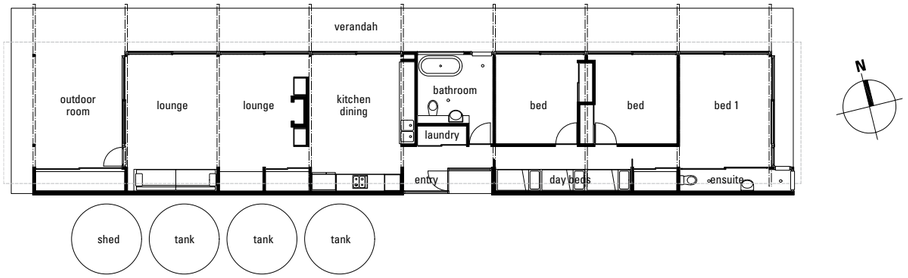
That’s exactly how the owners like it. “We told the architects **we wanted a house that would accommodate up to three families at a time, and that would capture the views,”** the owner says. “It also had to be low maintenance so that we could close the door and forget about it when we went back to real life in Sydney. And it was always going to be an energy-and-water-efficient house because it was built in a cow paddock, admittedly only a couple of kilometres from town, but there was no infrastructure there.”

While this is the first self-sustaining house designed by Utz Sanby, Kristin says she and Duncan have long been interested in environmental design. “We have always been concerned with natural ventilation and lighting, and aspect and passive environmental controls” she explains.

“We go out of our way to try to avoid air-conditioning in all of the houses we design, so we were terribly excited about working on this job.”

The house is several steps up from camping, but it’s still very low impact.

The clever use of space such as built-in daybeds, means a smaller size house and smaller environmental footprint.



The house provides shelter but you are so much more aware of and connected to the view, the escarpment, the mist and the sunsets in this house.

The building itself is a simple rectangular form that was positioned to enable every room to enjoy northern light and panoramic vistas. The solid southern wall anchors the home to the slope, while the fully glazed northern wall opens up to stunning views. **A large concrete slab provides thermal mass, keeping the house cool in summer and warm in winter**, and it extends beyond the external walls, acting as a stage from which to view the surrounding landscape.

The structure is sheltered by a large single-pitched roof that slopes downwards on the southern side. This means winter sun can penetrate the glass to warm the concrete floors, but the summer sun is excluded. Additional sun control is provided by a fixed aluminium sunshade welded to the steel roof beams. Internally, all of the rooms are fitted with motorised blinds to control heat loss during winter nights and early morning light in summer. The roof also enables the collection of rainwater, which is diverted into four storage tanks that line the southern side.

Inside, the house is of modest proportions yet it manages to accommodate several families at once. "When we have lots of friends down it works brilliantly," the owner says. "We can accommodate parents in rooms with doors, and kids on the daybeds in the corridor. Our children actually prefer to sleep in the daybeds rather than the bedrooms. They are screened off from the living area with sliding doors, and there is further accommodation in the banquette in the living room."

As well as being compact, the house was economical to build, because the architects devised a modular plan using a structural grid of eight 3.6 metre wide bays to define each room. That regularity ensured that standardised windows, louvres and doors could be used throughout the house.

The four bays at the western end incorporate a covered outdoor dining room that extends from the open-plan living area. It is separated from the kitchen by a joinery wall that accommodates a fireplace on one side and shelving on the other. At the eastern end, the four bays comprise a family bathroom and three bedrooms, the main with a narrow ensuite.

All of the rooms are accessed via a corridor on the southern side. This backbone incorporates the ensuite, kitchen cabinetry and entry porch as well as a series of 90cm deep alcoves that house built-in day beds and storage.

"The great relationship we had with the client meant that we were able to help them dismantle some of their preconceptions about the size of the house they wanted, by introducing innovative

“When you wake up in the morning and pull the blinds up, it feels like the bed is out in the field and the house practically disappears”

ways of doubling up on space, such as the built-in daybeds,” Kristin says. “The house is a bit like a ship in the way it uses space, and that enabled us to eliminate some of the floor space that many people seem to demand these days.

“Having clients who are prepared to experiment in that way, and not just push for a bigger and bigger house, is one way of becoming more sustainable,” she adds. “There is a lot of talk about environmental design on one hand, but on the other hand, houses are getting bigger all the time. Some people are prepared to go the full way, and this is a great example of that.”

The Kangaroo Valley House has led to more work of a similar nature for the firm, a direction that Kristin and Duncan are keen to pursue. “It’s been a great project for us,” Kristin says, “particularly because we’ve been able to direct potential clients to Kangaroo Valley so they can experience our work before they commission us.”

The client couldn’t be happier either. “We’ve just planted a garden and it’s a fantastic feeling to finish a day’s work there, go inside, lift the bathroom wall up, hop into the tub with a beer and the paper, and watch the dusk in the valley: it’s beautiful.”

“There is a tremendous feeling of achievement in building a house like that, which is so sympathetic to its environment,” he adds. “It looks

Water is captured from the roof to fill the four rainwater tanks on the southern side of the house.

like a shearing shed from behind, and it's wonderful to see that in a cow paddock and see kids playing around it. One of the reasons it works so well is that you spend as much time outside as you do inside, which is a good sign of the house working as we envisaged it would." ←

Bundaleer is available for holiday rentals and bookings can be made at www.kvre.com.au

Designer: Duncan Sanby (director), David Hart, Kristin Utz of Utz Sanby. www.utzsanby.com
Builder: Steele Associates Pty Ltd. www.steeleassociates.com.au
Location: Kangaroo Valley, NSW
Photography: Ben Wrigley
Features:
- 315 litre Endless Solar hot water system
- Gas-booster hydronic heating
- 1.44kW BP stand alone solar power system
- 33,000 litres of Bluescope rainwater tank storage
- Ecomax Septic System
- Astro-Foil, Autex and Solartex roof and wall insulation
- Taubmans low toxicity paints
- Silent Gliss motorised window blinds
- High level louvres for cross-ventilation
- Caroma water-efficient tapware and toilets

Sun, surf and sustainability

A Stradbroke Island retreat sets a new standard in holiday accommodation

No need for air-conditioning with louvers letting out the hot air at the top of the townhouses and drawing cool air into the stairways.

> “The popularity of these homes with the people who stay is testament to the success of this type of construction”

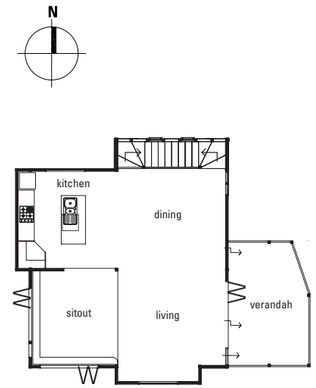
The townhouses have been designed to be as energy-neutral as possible, with energy-efficient light fittings, appliances and white goods, and solar hot water.

Picture this: Stradbroke Island, a haven of sun and surf, north of the Gold Coast and south of Brisbane; a refuge and retreat with a laid-back, beachside vibe, and increasingly, a showcase of the beach shack school of architecture. When the owners of this property, Jo and John Radovic, bought their piece of paradise, an 870 square metre site slotted between two cul-de-sacs, bound on one side by a three-storey neighbouring residence and to the rear by a nature reserve, it came with an approval for three masonry dwellings which no longer conformed to the Redland Shire Council’s development plan for the area.

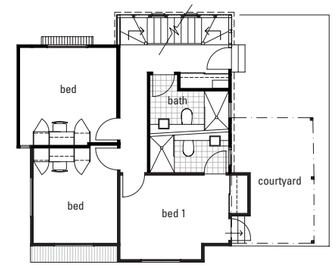
It was the Radovic’s plan to develop the site with a dual purpose, as three separate holiday houses which could double as a yoga retreat several times during the year. Consultation with their builder, Jonathan Francis, led them to Jaye Irving of Barefoot Sustainable Design, and to the decision to construct the buildings using best practice environmental and sustainable principles.

“We are totally converted to the concept of sustainable design and construction, and have integrated what we have learned into other projects. Our builder Jonathan Francis, and Jaye Irving, the designer, are passionate proponents

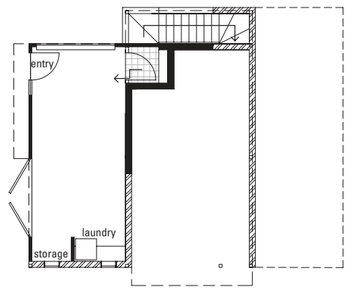
A variety of windows, including bi-folds, louvres, hoppers and bi-fold doors help cool the house and maintain a connection to the outdoors.



Upper level



Middle level



Ground level

and the popularity of these homes with the people who stay is testament to the success of this type of construction” says Jo.

Consequently, the plan for masonry construction was abandoned and instead **Jaye has used a “mixed media” of materials which delivers buildings which sit lightly on the site, positioned to catch prevailing breezes, block the summer sun and allow maximum privacy and views for each dwelling**. Battened fibre cement sheeting, corrugated iron and translucent panels provide an interesting and pleasing exterior, and throughout the site, Bangalow palms with understory plantings, water features and water permeable pathways allow the soil to breathe and absorb rainfall. The leafy, green canopy cools the site, and in turn the homes, and by placing all car parking off-site, the garden area has been significantly increased.

Given the fact that the homes are three-storeys, it was imperative for Jaye to devise a strategy to deal with the rising heat and the western sun, as it had been agreed that the homes would not have airconditioning. Adjacent to the staircases are translucent panels interspersed with louvres, so that while filtered natural light illuminates the area, hot air rises to the top of the buildings

Battened fibre cement sheeting, corrugated iron and translucent panels are combined to make buildings that block the summer sun and allow maximum privacy and views.

where louvres allow it to escape, drawing cool air into the stairways. An added advantage of the translucent sheeting is that it offers UV protection and significantly less heat transference than glass.

Sliding aluminium screens shade western windows from the sun. Operated from the exterior, they slide across the openings when needed, reducing the internal temperature significantly. They also help with privacy. On other windows, battened timber screens perform the same service. These strategies have been so successful that it has not been necessary to use blinds or curtains in the homes' living areas. Generous 800mm eaves shade the walls and help reduce heat transfer.

Elsewhere in the homes, Jaye has specified a variety of window styles, including bi-folds which concertina to each end of the opening, louvres, hoppers, and most surprisingly, bi-fold doors inside the buildings!

"The views over the bushland and out towards the ocean are superb" he says, "this way, the room is opened up, floor to ceiling, and a glass barrier ensures safety criteria are met. It creates a connection to the outdoors, to the native bushland and to the ocean beyond. The use of louvres is a sound way to increase ventilation, and in many places I've used them floor to ceiling, to keep the airflow through the homes constant. The owners have found that the homes stay cool in summer, and that they only need a small heater in winter."

Fibre free insulation, recycled timber floors, non-toxic paints and natural fibre furniture have helped create a healthy retreat.

This is an important factor, as the Radovic's brief was to make the homes as energy-efficient as possible. "The upfront costs of solar photovoltaic panels were very expensive," says Jo, "but a sound investment, we felt." Excess power has been sold back to the mains power grid, with some problems along the way.

"In hindsight, I would opt to supplement the power generated by the photovoltaic panels with a battery backup (rather than sell to the grid). So far, we have generated plenty of power for the properties, so the battery backup would be just that." Jaye has designed the home to be as **energy-neutral as possible, incorporating energy-efficient light fittings, appliances and white goods, and utilising solar hot water systems on the roofs of the buildings.**

Jaye and the Radovics agreed that water conservation was essential. The on-site water tanks' capacity is 45,000 litres and according to the owners, they are usually two-thirds full. The water is used to irrigate the gardens, ensuring their constant lush state, and for showering in the garden after a swim. Water is saved through the installation of low-flow taps and shower heads and dual flush toilets.

> "The solar power system generates enough power to service all the buildings on the property"

Another criteria was the use of products low in volatile organic compounds (VOCs), which Jaye says have reduced toxic emissions. The slow release of VOCs is said to be detrimental to general health and well being, and is positively dangerous in the event of a fire. Using fibre free insulation, recycled timber floors, non-toxic paints, natural fibre furniture, and stone and stainless steel for benchtops has, in the words of Jo and John, given them buildings which are "instantly relaxing ... it just feels great."

Elandra is available for holiday rentals.
For more details go to www.elandra.net.au

Designer: Barefoot Sustainable Design – Jaye Irving. www.barefootdesign.com.au
Builder: Jonathan Francis
Location: North Stradbroke Island, QLD
Photography: GWP Studios
Features:
- 990w grid-interactive BP solar power system
- 305 litre Edwards solar hot water system
- Miele gas range and frontloading washing machine
- Westinghouse 5-star refrigerator
- 2 x 23,000 litre tanks for all three houses
- Cotto toilets
- Roof and wall insulation
- Non-toxic finishes
- Solomit Brush Fencing
- Native species garden

House hunting

Searching for a new home? Here is what to look for to find a sustainable option

Andreas Sederof gives the lowdown on what to look for when buying a home

Looking at how thick the property pages are in the newspaper, the Australian housing market does not look like slowing down. The majority of the houses up for sale are not new housing stock but existing homes. So what should you look for when inspecting houses to find an environmentally-friendly home?

Location, location, location

The old real estate adage is a most important aspect of finding your sustainable home. Before inspecting the house, check that its location suits your current and future lifestyle. Is the house close to schools, work, shops and even where you like to go out and relax? Does the house have good access to public transport, walking and cycling paths? There is no point in having an energy efficient house if you rely heavily on your car. Each Australian home produces around 14 tonnes of greenhouse gases each year and a third of this comes from cars. Reducing the amount of time you use a car to get to places will not only be better for the environment but also for your health and hip pocket!

Another important consideration when looking at location is to find out if the area has any local council controls or restrictions such as heritage overlays. Local council restrictions may affect your ability to make changes to the home, including the installation of rainwater tanks and solar hot water. In rural areas check the cost and availability of electricity, gas, water supply, wastewater treatment and garbage disposal. In some locations it will be cheaper to be self-sufficient in power and water rather than pay the expense of connection to the mains utilities.

Renovators delight

Now that you have the location, its time to check out the house. According to Andreas Sederof from Sunpower Design, the first thing you should look at when inspecting a house is to check whether it is has good exposure to the north sun.

"Ideally you want a house that has a long east-west axis and that has a good northerly aspect that will not be overshadowed by trees or flats," says Andreas.

"This is especially important in winter. Roof windows may overcome this problem however it's important to get expert advice as roof glazing can be tricky."

In all but tropical climates you want to have good solar access to passively heat and cool your home. The size, orientation and slope of the block will affect how well you can capture the sun to warm the house, provide natural light, heat water with a solar hot water system or to even power your home with solar panels.

"The second thing to check when you walk into a home is to see if the house hasn't moved, that all the doors and windows sit squarely. A house that has shifted will be a leaky building that would require a lot of structural work to fix, draught sealing alone will not be enough. Timber floor dwellings can be most at risk as gaps can appear around the wall frames,' says Andreas.

Another important consideration is whether the house is well insulated or has the potential to be. "If you are looking at an A-pitched house that has exposed roof beams it will have an insulation R-rating of 1 to 2 when ideally you need a rating of R-8. It would take a lot of effort and money to insulate."

"Check if the house has any insulation and if not make sure it has the space and you can access the ceiling and walls to install insulation." says Andreas.

By looking at the home and how it sits on the block as well as its structural condition you will be able to assess the potential of the house to be energy efficient.

Waterproof

Also check the house for water saving potential. If the house does not come with rainwater tanks, check to see its potential here. Is there space for the installation of a tank close to downpipes for easy collection?

A lot of new houses have the plumbing located within the concrete slab of the building. This can be a problem when you need to access the plumbing to install a greywater system or other water saving devices.

The bottom line

With all major purchases it comes down to the bottom line. Make sure that you choose a house that fits within your budget and that you set aside money to improve its energy and water efficiency or get professional help. By choosing a house that is or has the potential to be a sustainable home you will save money on running costs and have a more comfortable home.

Buying a house checklist

Will the home suit my lifestyle now or is adaptable into the future?

How big does it need to be?

Is there money in the budget for better design and efficiency and/or money to get professional advice?

Is the house located near places you visit regularly, such as work or school, shops, friends and family?

What options do I have for getting local food in or near my home and could I reduce the distance my food travels?

Is the home big enough for what I need, but not too big to increase my energy use for heating, cooling and cleaning?

Are the main living areas facing north with windows to maximise warm winter sun?

Are the eaves large enough to provide shading from the summer sun, or can they be increased in size to do so?

Are windows and doors located appropriately to get good natural cross ventilation, or can they be adjusted to do so?

Are windows located on the east or west and do they need to be shaded, or can they be relocated or removed?

Will neighbouring buildings cause overshadowing problems?

Are seals to prevent draughts incorporated?

Is there a good location for drying clothes, or can one be provided?

Is there insulation in the roof, walls and doors and/or can this be added?

Is there a rainwater storage tank and/or solar hot water system, or could these be installed?

Are existing heating and cooling systems, taps, appliances, lighting and hot water systems adequate and/or energy efficient?

Are the building materials and appliances durable and low maintenance, or could these be replaced with some that are?

Are any toxic materials used inside, or could these be replaced by non-toxic materials?

Can the plumbing be accessed for installation of water saving features such as greywater systems and rainwater tanks?

For more information:

Your Home
www.yourhome.gov.au

The flexible home

A clever renovation has created extra space for a growing family without building a second storey or reducing the garden

Sustainable design requires more than simply ticking boxes. Sure, eco-friendly elements such as good insulation, water tanks, recycled materials, and composting combine to build the picture, but the fundamentals of good design should never be ignored. The clever use of space, the inspired capturing of natural light, and the judicious zoning of rooms are the basics that will make all the difference. **This five-star-rated house by Zen Architects covers all the bases (right down to its water-efficient showerheads) but really earns its stripes when it comes to the essential tenets of design.**

Jeremy Watson and Kim Shaw wanted more room for their growing family (two boys and one on the way at the time of building) and an improvement in general amenity. Where there was only one crowded living area they wanted two separate rooms, plus a study, plus a guest room. They assumed they would have to build a second storey to fit all this on the fairly modest block in Melbourne's northern suburbs.

The brief they gave to project architect Shae Parker called for alterations and additions to a family home that suffered from poor energy-efficiency. The existing building comprised a Victorian house with a dated extension that leaked warmth through badly-sealed, single-glazed windows.

"We wanted to make the house nicer to live in and reduce our energy use. There was lots of waste in the old house which had no insulation", says Jeremy.

Zen Architects, however, came up with a different scenario. The design team showed that with some clever spatial arrangements it could avoid the cost of building a second storey and still deliver everything on the clients' wish list. To help achieve this, the existing footprint has been altered and slightly enlarged to create space for extra living

The 5.5 metre skillion roof is tilted up to the west to capture the late afternoon light via high clerestory windows, which open to let out rising hot air via louvres.

> “This project shows that a dynamic five-star energy-rated house is achievable within the constraints of a family budget, a heritage overlay, and a limited site”

and sleeping and to promote a better connection between indoors and out.

The project succeeds thanks to a handful of architectural masterstrokes. One of these is the long slice of space that almost runs the width of the site and separates the old Victorian front rooms, retained as bedrooms, from the new living and kitchen extension. This slender volume provides an effective airlock when sliding doors are pulled across, so the front or rear sections of the house can be heated (or not) in a contained and efficient manner. The space also functions as a study, with an inbuilt desk and storage at one end, and a linen store with another bank of storage at the other. Sections of the decking-clad floor lift up to reveal cellar storage, and overhead skylights channel valuable natural light into what was once a rather dull area. At either end, doors open to small courtyards to promote good cross ventilation.

The canny use of inbuilt furniture and slide-away door panels is carried through to the new living and kitchen area. The need for extra living space, plus occasional guest accommodation, was solved by creating a space that would serve as both. Adjacent to the kitchen, this secondary living space becomes a bedroom in moments. Two door panels slide across to separate it from the kitchen, and a double bed folds down from the ply-clad joinery in which it is usually concealed. Bingo! “The clients didn’t need a permanent guest room, just a space that could be adapted,” reasons the architect. “It made sense to be able to turn part of the living area into an occasional guest room.”

“The flexibility is really great, we can open up the sliding doors to create a bigger living area when we have people over, make it a more intimate space when its just the family or close it off when a bunch of kids are around,” says Jeremy.

A third keynote feature is the dramatic skillion roof to the new extension, more than 5.5 metres high at its zenith. Tilted up to the west, it captures beautiful late afternoon light via high clerestory windows, which open to let out rising hot air via operable louvres. This creates a stack effect, as the windows are high enough to promote an effective, cooling updraught. While the old home had too much glazing that let heat escape in winter, the new extension has wisely placed double-glazed windows. The main living area is connected to the garden, and sliding glass doors open it to the outdoor deck (essentially another living space). The primary living room is anchored via a north-facing

A double bed folds down from the ply-clad joinery turning the living space into a guest bedroom.

> “Insulating the floors, walls and ceilings in both the new and old parts of the building, and replacing the old single-glazed windows with new double-glazed ones, have helped make the house more energy efficient”

> “In summer the house is 10 degrees cooler inside than outside. You can really open up the house at night to let in the cool air and close up again in the morning, There is no need for air-conditioning”

wall that frames the view and decreases excessive heat loss and gain.

The concrete slab underfoot acts as a heat sink soaking up the warming afternoon sun, and emitting heat back into the space at night. The ceiling is sufficiently angled that it can also bounce light down and back into the secondary living/guest room during the day. When the western sun becomes too intense, external operable shutters fixed to the clerestory windows can be closed, and a huge outdoor shade sail can be installed. Eaves and fixed louvres protect the north-facing windows from the worst of the summer sun, while the warming winter rays are allowed in when the sun is lower in the sky. "In summer the house is 10 degrees cooler inside than outside. You can really open up the house at night to let in the cool air and close up again in the morning, There is no need for air-conditioning," says Jeremy.

Space and light strategies aside, the architects paid due attention to other sustainability staples. **Plantation timbers, low-emission paints, all-natural Marmoleum floors and plywood cabinets help reduce off-gassing and contribute to the building's low-impact credentials.** Simple metal-effect painted fibro panels are used for external cladding.

Rainwater is harvested via an in-ground tank (under the rear deck) and all areas of the roof, both old and new, have been designed to channel as much rain as possible. Grey water recycling and on-site composting feeds the garden, which has been populated with drought-tolerant and indigenous plants. The old roof has been used to house solar evacuated tubes which provide hot water for the house and the hydronic heating panels (helped along, when needed, by a gas booster).

"This project shows that a dynamic five-star energy-rated house is achievable within the

Extra space has been added to the kid's bedrooms in the old part of the house with built-in mezzanine beds.

constraints of a family budget, a heritage overlay, and a limited site," says Shae. "By doing things like insulating the floors, walls, and ceilings in both the new and old parts of the building, and replacing the old single-glazed windows with new double-glazed ones, we achieved the five-star rating for the whole house, not just the new section." And where the homeowners had believed they'd need 242m² to meet their needs, the architect was able to achieve everything in 187m², saving money and maximising garden space.

Designer: Zen Architects (Shae Parker and Ric Zen). www.zenarchitects.com
Builder: Rex Building www.rexbuild.com.au
Location: Northcote, VIC
Photography: Emma Cross
Features:
- Solar hot water with gas boost supplies hot water and hydronic heating
- 10,000 litre Septech rainwater tank
- Eco Care grey water system
- Re-use of flooring, windows, fittings and appliances from original home
- Natural cross-ventilation and lighting
- Plantation and radially-sawn cladding, decking, flooring and fencing
- Dulux Breathe Easy paint
- Marmoleum flooring
- Polyester wool batts and Aircell wall and ceiling insulation and Foamular slab insulation
- Paco Jaanson water-efficient toilet
- Kusasi water-efficient taps and showerheads
- Drought tolerant native landscaping

A naturally warm home

Keep warm during the winter months without costing the earth

Most people's energy bills go up in winter due to heating use, but you needn't pay so much each year. By making a few changes to your home you can considerably reduce your heating bills and stay comfortable in the process.

Design for warmth

The cheapest way to heat your home is to use the warmth of the sun. If you are building or renovating, include passive design principles in your plans to let the winter sun in and keep the summer sun out. Position the daytime living areas so that they face north, with windows strategically placed to let in the winter sun and shaded by eaves, sails or external blinds during summer.

In cooler climates, thermal mass can help regulate the temperature inside the house, especially when there is a big difference between day and night outdoor temperatures. Use building materials that have high thermal mass such as concrete, bricks and tiles to absorb heat during the day and radiate the warmth back into the home during the night.

Changes around the home

Even if you are not building there are some measures that you can take to stop heat escaping from your home. Good insulation is a must. Insulation is like a barrier, preventing heat passing in and out of the house and can be placed in the ceiling, walls and floor. When looking for insulation check its R-value; the higher the value the greater the level of insulation.

In a well insulated home most heat loss occurs through windows. One option is to replace your windows or retrofit them to be double-glazed. If double-glazing is not an option, heavy curtains will insulate windows at night when the heater is turned on. Pelmets placed above the curtain can help stop warm air being sucked into the space between the curtain and window.

Do a walk around your home with a candle, using the flame to show if there are any drafts. Place draught excluders, such as under-door strips, and foam door and window seals around doors and windows. They are low cost, very effective and are one of the simplest ways to reduce energy use. Replace or seal off open air vents and exhaust fans that allow warm air to escape into the roof cavity or the outside air. Don't forget gaps between walls and skirting boards, and even the gaps between floorboards—these gaps may be small, but put together they can make for a great deal of cold air entering the house, especially when it is windy outside.

Heaters

For additional warmth the type of heating you use depends on the size and function of the space to be heated and how often and how many people use the space. When looking for a heater find out how much energy a heater will use, its long term running costs and how much pollution it will create.

Unless you create your own energy from a renewable source or purchase GreenPower, the energy used by your electric heater is sourced by greenhouse gas producing fossil fuels. Efficient gas heaters and reverse cycle airconditioners produce one third the amount of greenhouse emissions of standard electric heaters. They also have energy labels to help you choose the most efficient model. If looking for a space heater choose a 5-6 star natural gas heater or a 4-6 star reverse-cycle airconditioner. For central heating, zoned 4-5 star natural gas ducted heaters and zoned natural gas hydronic systems are the most economical.

Wood can be a good fuel source if the wood is sustainably harvested and sourced locally. However, the smoke from wood fires is a major source of pollution, and open fires lose 90 per cent of their heat up the chimney. If using wood make sure it is sustainably sourced and use a slow combustion heater to the manufacturer's instructions.

Solar heaters

Almost all of the energy available on the planet today comes or has come from one place—the sun. Yet, very little of it is used directly by people. There are two forms of active solar heating available in Australia; flat plate collectors and solar boosted hydronic heating.

Flat plate collectors consist of a large flat glass covered box used to heat air which is then pumped into the home using a fan. Small (approximately 1 x 2 metres) flat plate heaters can be used to heat individual rooms, while larger (approximately 3 x 4 metre) roof-mounted collectors can heat an entire home, at least when the sun is shining.

You can also use the sun's heat to provide some (or sometimes all) of the heat to a storage-type hydronic heating system. Indeed, some hydronic systems that use solar evacuated tubes are designed to be primarily heated by solar, with gas or electric boosting as a backup.

Whatever system you choose, remember that the best way to save energy, money and reduce your greenhouse emissions is with good house design. By reducing heat loss you can maintain a comfortable temperature inside, regardless of the temperature outside.

For more information:

Your Home
www.yourhome.gov.au

GreenPower
www.greenpower.gov.au

Sustainability Victoria
www.sustainability.vic.gov.au

Energy rating
www.energyrating.gov.au

Alternative Technology Association
www.ata.org.au

"40 per cent of energy consumed in the average Australian home is for heating and cooling"

Passive heating tips

- Make sure your home is properly insulated.
- Reduce heat loss through windows with curtains and pelmets.
- Fill gaps around doors, windows, vents and floorboards.
- Set the heating thermostat to 20 degrees.
- Check the heater energy rating.

The perfect balance

The home's roof-mounted solar photovoltaic system has earned Elizabeth and John over $200 in credit from selling energy back to their electricity retailer.

A future-proof home at the Aldinga EcoVillage that did not cost the earth

Early arrivals at a new and pioneering eco-village south of Adelaide, Elizabeth and John Heij were very clear about the type of home they wanted to build.

"We wanted to make sure the house was maintenance-free, easy to clean, created the minimum possible bills and had the smallest possible impact on the environment," explains Elizabeth. There was one other critical factor. Including the cost of land, it had to be designed and built for around the sale price of the modest and environmentally unsustainable suburban home in which they lived at the time.

"The message we wanted to get across is that you can do it on the budget of an ordinary suburban house transfer," she says. "To see big magazine spreads of huge, lush houses that cost up to several million dollars, with people saying they're designed for sustainable living amazes me. I wonder do they really understand what sustainable living means."

And do it they did, with the help of Adelaide's innovative Energy Architecture, led by John Maitland and project architect Ben Mountford. The result is a compact, creative, inspiring and affordable home that is a landmark property at the Aldinga Arts EcoVillage. According to the Royal Australian Institute of Architects **the house has an environmental footprint less than 25 per cent of the Australian average and won a Sustainable Architecture Merit Award** in the residential section of the 2006 Royal Institute of Architects (SA) Awards.

Elizabeth and John Heij's home is packed with environmental features including recycled timbers.

"I'm delighted to say that both John and Elizabeth were willing to take a bit of a punt (on the design)," says John Maitland, a driving force with the eco-village which is being built on previously-farmed coastal land 40 kilometres south of Adelaide. "It is quite a different piece of architecture to most of the other buildings down there...different to anything really," he says, noting particularly its "quite brutal" canted galvanised iron and deep blue sheet box form. "The house itself ... is a really lovely mix of fairly austere external skin and this warm interior which comes about through finishes and their own furnishings."

Certainly moving to Aldinga has meant no sudden conversion to sustainability principles for John, a retired nurse, and Elizabeth, a biological scientist who runs the CSIRO's online Sustainability Network. Increasingly concerned about modern lifestyles, their initial efforts went into improving their "poorly designed, badly oriented, uninsulated, three-bedroom, brick-veneer suburban box." They cut their energy consumption to below 9kwh per day (less than 70 cents on a combined day-night tariff) and 25 litres of water per person per day. But they realised to do more would require a major retrofit and represent gross overcapitalisation of the 1970s home. Then John spotted an advertisement for the Aldinga Eco-Village.

Their purpose-built home, completed in late 2004, is a showcase design packed with environmental features, many of which are required by village by-laws. But it has its own standout elements, not least the innovative conservatory along the eastern

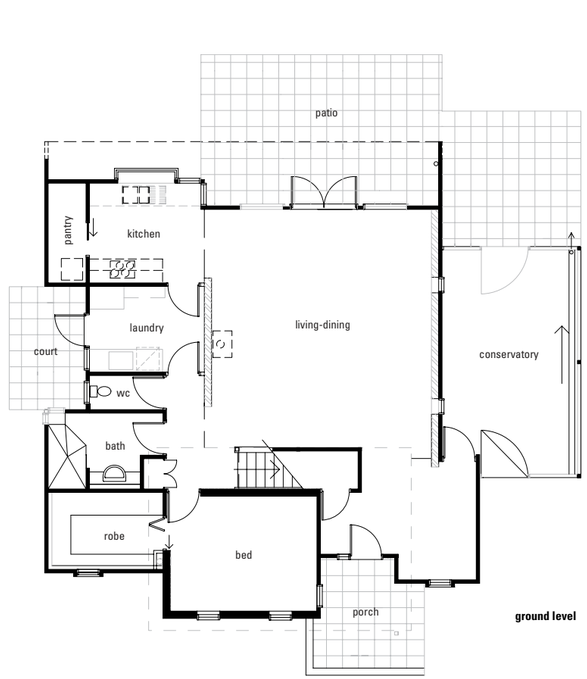
Passive-transfer hatches distributing heat from the glass house around the house

The glasshouse is the home's only source of heat.

side, its outside walls of polycarbonate sheets modelled on the glasshouses at the Plant Research Centre at Adelaide University's Waite Campus. Forming a multi-purpose space (breakfast room in winter, glasshouse for seedlings in spring and clothes drying area) the conservatory's clear walls not only create unusual ambience, but trap massive amounts of heat in winter. The heat is distributed to the rest of the home via four passive-transfer hatches, which pass cool air out and warm air in. It's the home's only source of heat and has worked exactly as they hoped.

Dubbed the Heij-Shed (the couple's Dutch surname is pronounced Hay), the house has a reverse brick veneer construction. Light-weight rendered cladding and galvanised iron provide the outside skin, and a double layer of enclosed air and bulk polyester insulation, and major internal walls of concrete-filled besser blocks, provide further thermal mass. Located on a north-facing and sloping 600 square metre lot, the bedroom is sunk one metre into the earth on the south side and topped by a mezzanine study. An in line recirculation duct distributes warm air from the mezzanine study to the bedroom, and double-glazing to the south provides a cool bedroom in summer and warm working area in winter.

> "The message we wanted to get across is that you can do it on the budget of an ordinary suburban house transfer"



All service rooms (walk-in robe, bathroom, toilet, laundry and pantry) are lined up together on the western wall of the home, helping to shut the core of the house off from summer afternoon heat. The garden bay window in the north-facing kitchen extends beyond the rest of the house, inviting winter sun onto indoor herb planters, while two casement-style windows open onto an outdoor patio to allow cooking to be easily moved outside in summer.

The home's roof-mounted solar photovoltaic system has delivered a sizeable credit on the couple's energy bill, with their entire energy cost for the first year in the home just $10. They are currently over $200 in credit from selling energy back to the grid. **Rainwater is collected from the house and garage in two in-ground concrete tanks plus several smaller above-ground overflow tanks (50,000 litres total), supplying all domestic and garden needs.** It's enough to nourish a thriving vegetable garden despite the drought, though this year saw very little surplus produce.

Not everything is or has been perfect. The building took twice as long as planned, and the couple has been disappointed by how slowly the whole eco-village is developing. In their own home, they've also struggled with a suitable grey water solution. Reluctant to commit to the "overkill" costs of the only approved biological treatment system available in South Australia, their recycling is still being done literally by the bucket. "So there are some things to work on," Elizabeth says. "But I'd say they're relatively minor."

Both sides worked to forge a balance between design, practicality and budget. "We held them down to practical things about costs, environmental footprint, maintenance and the cost of ongoing living," Elizabeth says, "and I think we actually constrained them (artistically) in some ways." John Maitland agrees the design could have been pushed "a bit further" if there had been more scope, but

The garden bay window in the north-facing kitchen extends beyond the rest of the house, inviting winter sun onto indoor herb planters.

he's not complaining. "It was a tight budget for the accommodation they wanted and the extent of the sustainability features, but we're really happy with the outcome. We don't view budget as a constraint, rather a parameter within which we design and we need no encouragement to weave sustainable principles into the design."

And it's delivered the Heijs all their key objectives. "We've got a much nicer home that's more compact, performs far better environmentally, and which came in at around the same cost we sold our old house for," Elizabeth says. "And now the savings (on energy, water, and food) are cutting in. I must say I feel quite future-proof in that sense."

Designer: Energy Architecture. www.energyarchitecture.com
Builder: Oakridge Building Services
Location: Aldinga Arts EcoVillage, SA www.aldinga-artsecovillage.com.au
Photography: Energy Architecture & Rebecca Cowling
Features:
- 280 litre Beasley solar hot water system
- Dual 1.65kW Mitsubishi battery backup and 1kW grid connected Kaneka solar photovoltaic system
- 50,000 litre rainwater tank capacity
- Plumbing for future installation of a grey water system
- Double-glazing and floor-to-ceiling curtain system
- Concrete, concrete blocks, slate, and granite to provide thermal mass inside lightweight rendered blue-board and galvanised iron shell
- Air Cell insulation
- Slate, bamboo, and recycled jarrah floors and staircase


Bridget Gardner gives us her four step plan to green cleaning

Green and clean

Keep your house clean without the chemical overkill

If you believed the advertisements on TV the only way to have a safe, clean home for your family is by constantly applying cleaning products and disinfectants to your benches, floors and walls. However, spraying, wiping and flushing all these products around the home could amount to a chemical cocktail. Research has linked exposure to chemicals from ultra-cleanliness with health problems such as asthma. Chemicals also leave a toxic trail after their use when they go down the drain into sewage, are released into the air or the packaging ends up in landfill.

How to clean green?

According to Bridget Gardner from FreshGreen-Clean there are four easy steps to green cleaning: wipe it, soak it, add it, and dry it.

"Most of the cleaning is achieved with the action of wiping the surface with a damp cloth or mop, there is often no need to add a product" says Bridget.

"Water is a very effective cleaning agent so soak stubborn grime and stains before cleaning. If there are any trouble spots left then add a non-toxic cleaning agent such as bicarbonate of soda and pure soap, or use a stronger tool such as a scrubbing brush, toothbrush, painter's razor blade or my favourite, scourers made from orange net-bags tied into a knot," adds Bridget.

After cleaning shiny surfaces with these methods, Bridget recommends a quick polish with a flannelette rag or a microfibre glass cloth to avoid the toxic solvents found in many glass or surface cleaners, and open your windows to let in the fresh air.

"A clean and dry surface will deter bacteria growth, and UV rays are a natural disinfectant, so hang your cloths and mops outside to dry," says Bridget.

Products

When choosing cleaning products, read the labels and avoid products that contain health warnings, caution or poison phrases. Alternatively, use non-toxic materials such as bicarbonate of soda, white vinegar and pure vegetable oil soap.

If you are planning to use wastewater from the laundry in the garden, avoid laundry detergents that are high in sodium and phosphorus. The build up of sodium in the soil can have a detrimental effect on your garden. As a general rule laundry liquids have lower sodium content than powders. Lanfax Labs has conducted independent research on over 90 brands of laundry liquid and powders by listing their sodium and phosphorus levels.

Water usage

It is not just the build up of chemicals that you need to be careful about, a lot of cleaning products and methods also use vast amounts of water. Bridget recommends that rather than rinsing your cleaning cloth continuously under running water, have a small bucket of water handy to rinse your cloth.

"As high-quality microfibre cloths not only reduce or eliminate the need for a cleaning product, less water is required to rinse the surface or the cleaning cloths," says Bridget.

Design for green cleaning

One of the best ways to clean green is to eliminate the need for cleaning in the first place. There are a number of clever ways to design you home so that it cuts down on the cleaning workload.

Dick Clarke from Envirotecture designs bathrooms that need very little cleaning. "The trick is to design a bathroom without silicon, and to eliminate shower screen frames and fittings. By taking away the things that harbour dirt and grime you eliminate the need for cleaning."


The Envirotecture bathroom design that reduces the need for cleaning.

Dick makes shower screens from a single piece of frameless glass embedded into the floor and wall tiles, as if it was another large tile. The waterproof membrane sits invisibly behind the tiles, and all you see is tiles, grout and glass; no silicone is required. This makes regular cleaning without harsh chemicals very easy, and there's never any mould build-up. It looks really chic too!

"Ideally you want to have a shower enclosure that has no doors and a large enough space to capture the water spray. While this may not work if you have a really small bathroom, you can still use unframed glass so there are no places around the edge of the glass to house mould and grime," says Dick.

Bridget also recommends using large sheets of glass and that the bathroom has a window that can be opened. She also suggests locating the fan above the shower, not in the middle of the room.

"And if you are going to go down the tile path make them as large as possible and ideally stain the grout," says Bridget.

Green cleaning tips

- Clean regularly to avoid the build up of dirt and the need for toxic cleaners.
- Wipe down surfaces or dishes with a microfibre cloth or a cloth and warm soapy water.
- Let in sunshine and fresh air to help kill bacteria and grime.
- Check the sodium and phosphorus content of washing detergents.
- Reduce the amount of cleaning product you use.

For more information:

Your Home
www.yourhome.gov.au

Lanfax Labs
www.lanfaxlabs.com.au

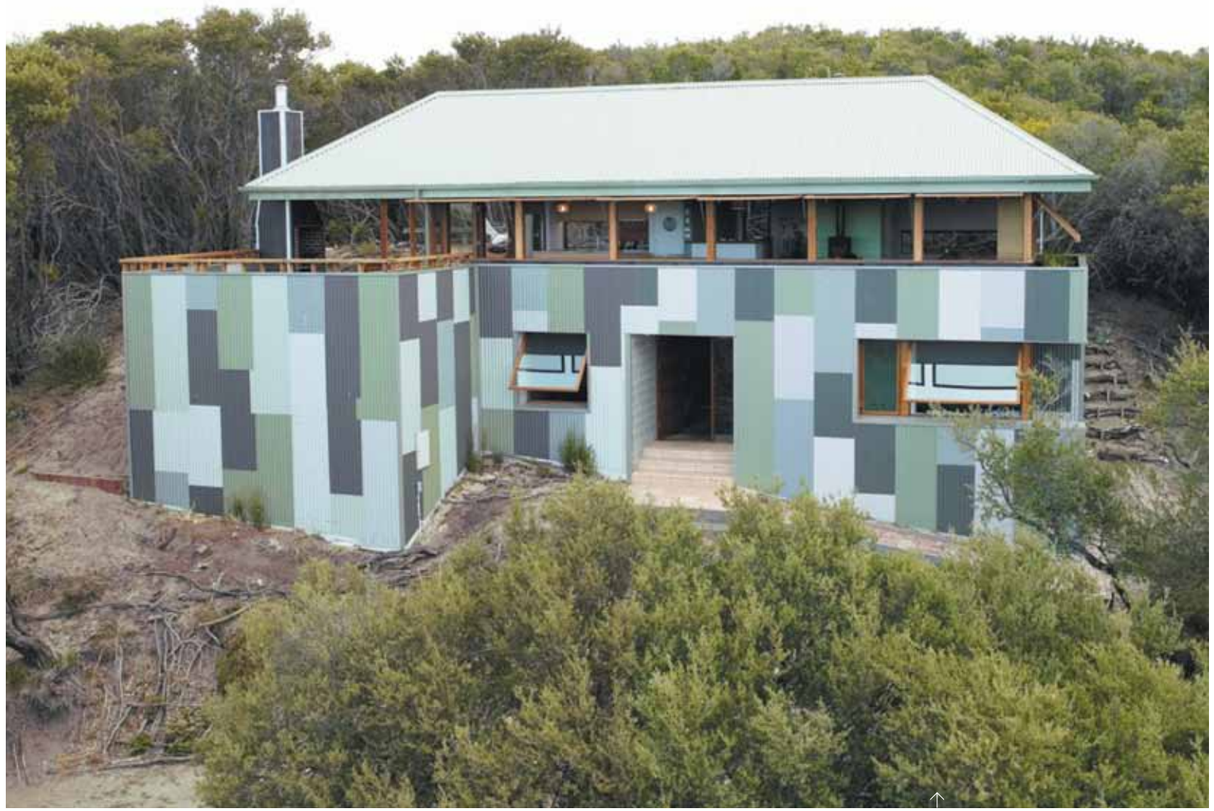
Total Environment Centre
www.tec.org.au/dev/safersolutions

FreshGreenClean
www.freshgreenclean.com.au

Of love and beauty

The poetic is combined with the practical in Venus Bay

> “We see this house as an evolution (or mutation) of the rural or coastal shack. The stories of the site and the materials used create a continuity that ties the house to a tradition of simple dwelling, rather than simply being a creative act”



Corrugated cladding offcuts create a variegated tonal effect that reflect the colours of nature and the play of light on the forest floor.

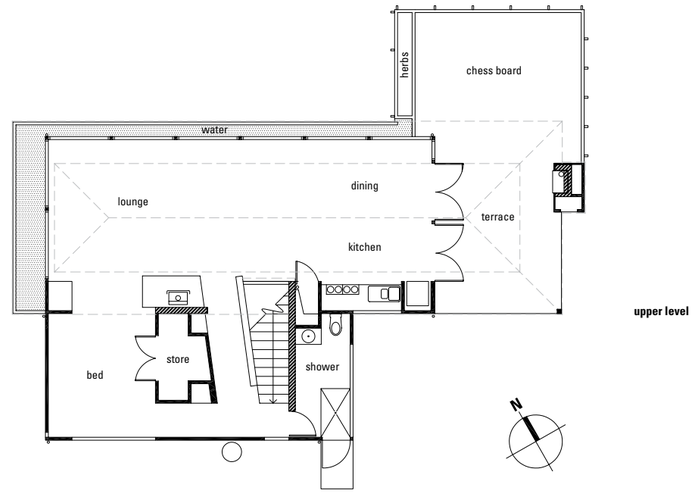
When the poetic is combined with the practical, architecture can be said to be in its element. Architect Ryan Strating, of design firm Core Collective, has designed a coastal house that weaves both qualities together in a most beguiling way. He relishes talk of spirit-of-place and wants to connect his design to stories and traditions. But he waxes just as enthusiastic about the nuts-and-bolts of building (the important but prosaic stuff) and the myriad ways you can invest a house with a high degree of sustainability and undeniable “green cred”.

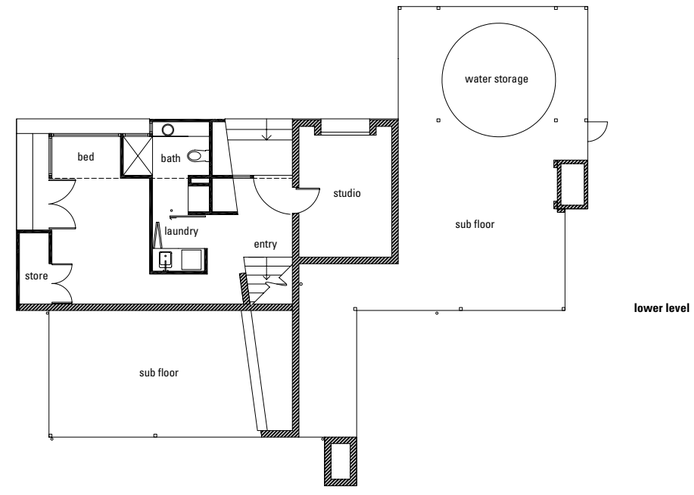
Ryan designed this house for Heather Shimmen, Ian Mooney and their daughter Grace, who knew the site well. They bought the property a few years ago after looking in the area for about 15 years.

“As soon as we walked on to the property we looked at each other and went wow. It is so hard to get land along the coast that is actual bush,” says Heather.

For six years they lived part time in the existing shack, which still stands. They knew that an eccentric musician had squatted in it before they bought the land. “The way that he, and now

“Its great, I love it, There’s nothing better at the end of a day than sitting back with a glass of red wine watching a pair of wedge-tailed eagles fly across the inlet”





Heather and Ian, occupied the site has a sense of a continuing tradition,” says Ryan. “There is a feeling of the folkloric, of stories and a sense of identity that the land has that we sought to capture in the new house.”

But how to bring these intangibles to such a tangible object as a house? Ryan thought about the other place that’s important to Ian and Heather, the old bayside suburb of St Kilda, in Melbourne. St Kilda makes the news occasionally, usually for celebratory reasons like its gay pride march and its annual festival. But prior to this project, it had been in the headlines because part of its heritage-listed Victorian-era pier and landmark kiosk had been destroyed in a fire. As long-time locals, Heather and Ian felt the loss of this beloved icon.

Ryan’s masterstroke was to source all the visible solid timber in the house directly from the demolition of the pier following the fire. “It is recycled blackbutt, a hardwood that has an extremely good durability rating and is acceptable for use in a bushfire prone area as it smoulders rather than burning with a flame,” he explains. “Some of the timber still bears the singe marks and these have been kept in some prominent positions around the house to remind us of the story in the material.”

To complete the palette of robust materials, he selected hoop pine plywood for the interior (sourced from plantations, as was the timber used in the framework) and salvaged some short lengths of corrugated cladding that had been destined for the scrap heap. These offcuts and seconds (not noticeably damaged, observes Ryan) were just what he needed to create a variegated tonal effect that reflected the colours of nature and the play of light on the forest floor. “And,” adds Ryan, “it was quite a lot cheaper than new material.” It all adds up to a celebration of the nature of the site, and the coastal vernacular, in a fresh but familiar way. “Concrete blocks and corrugated iron sheets are such an obvious choice in Victorian coastal communities that it felt like it would have been too easy to ignore them. We see this house as an evolution or mutation of the rural or coastal shack. The stories of the site and the materials used create a continuity that ties the house to a tradition of simple dwelling, rather than simply being a creative act.”

Low-toxicity finishes include the Marmoleum that covers the upper-level floor. This linoleum product is a composite of wood shavings, linseed oil and jute. The plasterboard walls are painted with low volatile organic compounds (VOC) paint to

Low-toxicity finishes include Marmoleum flooring, a product made from wood flour, linseed oil, pine resin and jute.

cut down on indoor air pollution and all the timbers and plywood are treated with Organoil, a natural tung-oil based finish.

This robust, carefully-crafted container (constructed by local builder Gill Trease) has also been designed to breathe and protect, depending on the weather, thanks to the incorporation of low tech, passive solar design principles. In the hot weather, operable windows open right out to embrace cool coastal breezes. These soothing zephyrs work their way through the house, first rippling across the surface of the upper-level water feature that houses fish and local water plants. "This has a moderate evaporative cooling effect on hot summer days, with the added benefit of reflecting rippling patterns on the ceiling," says Ryan. Practical, yet with a poetic twist.

Passive solar design works best, of course, when insulation is optimal. Here, Ryan has used double-glazing (bushfire retardant glass) and has lined the ceiling and walls with reflective insulation to keep the heat out. **The eaves have been made wider where it counts, to the east and west, to keep out the intense morning and afternoon sun in summer.**

Similarly, the house retains heat in the cooler weather. The double-glazing is augmented by well-sealed windows and doors and the lower-level concrete slab and block walls form a highly effective heat sink, soaking up the low winter sun like a lizard and radiating it out into the rooms when the sun sets and the evening cool descends. It helps that this part of the building has been backed into the dune: the stable temperature of the sand keeps temperature fluctuations in check all year long. But if this isn't quite enough, and an extra cardie simply won't do, the small upstairs wood heater has been fitted with inline fan ducting. "This moves the warm air from behind the heater into the bathroom below," Ryan explains.

"So far we have not needed the wood cut during the construction of the house. The house just stays warm around 20 degrees even on cool nights. The only time we have used the wood fire we sweltered," says Heather.

Water is collected in a 37,000 litre rainwater tank with potable bore water as a backup. Low-flush loos and taps fitted with flow-controlling valves ensure water consumption is kept to a minimum. Waste water is treated and disposed of via a low-maintenance reed-bed system, located downhill from the house. This latter system has no mechanical parts, working instead using natural processes and gravity. **"With the fall of the site we have been able to create a totally passive waste treatment system that requires very little maintenance and no power,"** says Ryan. "It uses natural systems to treat the waste to a point where it is clean enough to disperse through trenches on the site with no impact on the ground water, which must be kept clean as it is drawn up from the bore for household use. The reed bed system comprises a settling tank to remove bio-solids, a reed bed of a local species of reed to remove organics, and trenches to disperse the treated water."

Solar power was dismissed as too costly but the

> "Good passive design allows the house to stay at a constant temperature even on cold nights"

Recycled blackbutt, from the old St Kilda pier kiosk that burnt down was salvaged and used in the house.

clients found an acceptable solution by purchasing GreenPower from the electricity provider. A low-energy heatpump hot water unit has been installed at the back of the house and employs a "temperature differential" system that can extract energy from the air, even when it's cold outside.

The house was constructed in a way that a solar energy system can be introduced later on. "The roof pitch is angled so that the photovoltaic panels can be mounted flat on the roof and still have the optimum angle for catching the incident sun rays," says Ryan. "Being flat, they will look like they are meant to be there, not tacked on later. We have installed a conduit from under the roof cladding to the subfloor area, where the batteries will be installed, so that wiring the system will be very straightforward and not involve opening up the house again."

The sustainable aspects of this house go hand-in-hand with its quirky charm and sheer design bravado, and the building makes a wonderful contribution to its coastal setting.

"It's great, I love it, I just go there and sigh. There is nothing better at the end of the day sitting back with a glass of red wine watching a pair of wedge-tailed eagles fly across the inlet," says Heather.

Architect: Core Collective – Ryan Strating. www.corecollective.com.au
Builder: Trease Builders
Location: Venus Bay, VIC
Photographer: Derek Swalwell
Features:
- 270 litre Quantum heat pump
- GreenPower
- 37,000 litre ARI 'Plastank' rainwater tanks
- EWS Environmental custom waste water system
- Pilkington Frontline double-glazed windows
- Recycled blackbutt and plantation timbers
- Corrugated cladding offcuts
- Marmoleum flooring
- Coolon fluoro internal and external lighting
- Caroma water-efficient toilets
- Aqualoc valves on all taps
- Aircell and polybatts roof and wall insulation
- Berger Breathe Easy low-VOC paints and Organoil natural timber finish

Solar saviour

With the sun burning bright maybe now's the time to invest in a solar power system

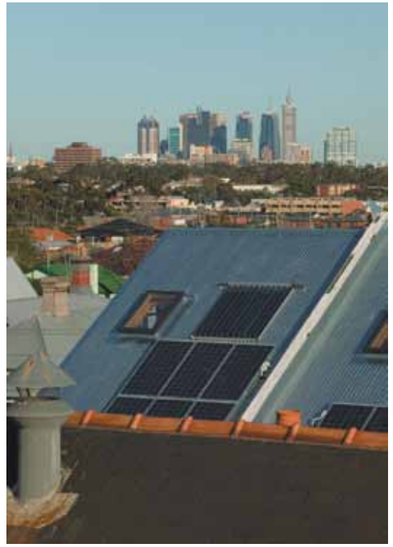
An increasing awareness of climate change has returned attention to solar power. And why not, with sufficient sunlight falling on Australia to provide the nation's total energy needs a great many times over. Steps to reduce energy usage should be taken, but with sales of solar systems on the rise, perhaps it is time to also consider a change of power supply?

How they work

Solar power systems are made from a series of photovoltaic (PV) panels that directly convert energy in the form of light from the sun into electrical energy. Solar power can be used in all parts of Australia as long as you have a suitable site with a north-facing roof, or ground space that is not shaded during the day.

Until recently, the main reason that people chose a solar system was that they lacked access to the mains power grid. In rural areas it was cheaper to install a Remote Area Power Supply (RAPS) system than for connection to the grid. With a RAPS system the solar panels charge batteries, supplying the home with power when needed.

As solar has become more popular in urban areas, grid-interactive systems are becoming the norm. With a grid interactive system the energy produced by the solar panels is fed directly into the mains grid via a device called an inverter. Any electricity produced, but not needed by the house at that time, is simply fed into the mains grid. The home can also draw power from the grid when the sun is not shining. This is the simplest system, and requires little or no maintenance, other than the occasional check to ensure it is still operating, and cleaning the solar panels of excessive dirt build up.



Size and costs

How big a system you need and how much it costs is dependent on how much energy your house consumes. Probably the most important part of system design that is often overlooked is the energy efficiency of a home. There is no point spending money on a solar system when the energy it generates is wasted. Spending a few hundred or even a couple of thousand dollars on more efficient appliances and making your home more energy efficient means you could buy a smaller solar power system.

The average home system is around 1.5 kilowatt (1500 Watts) of peak generating capacity. A 1.5 kilowatt system costs around $20,000 before the rebate, although the price depends on the options selected, such as whether the home has a suitable north-facing roof or if extra framing has to be added to the roof. Warranties on the components of solar systems range from one to 25 years, with solar panels usually guaranteed for 20 to 25 years.

To help offset the upfront costs of a solar system the Federal Government introduced the Photovoltaic Rebate Programme (PVRP) and the Remote Renewable Power Generation Programme (RRPGP), both of which are administered by the state and territory governments with some state-specific variations. Contact your state environment department to see if you qualify.

Installation

In order to qualify for the rebates, installation must be done by a renewable energy installer who is certified by the Business Council for Sustainable Energy (BCSE). Connection to the grid must be signed off by a suitably qualified person, often an electrical inspector. The company you choose to install your system should be able to organise the required inspections, as well as do the paperwork for the rebate. When shopping for your system, make sure you understand what the installer is willing to do for the installation price, and what you will have to do.

As with all things, careful consideration of both price and quality should be undertaken to ensure your home's best option. Always get at least three suppliers to quote for the same size system so you are able to compare prices. The initial financial investment may seem daunting to some, but with an ever-increasing government rebate on installation, and the knowledge that over time your electricity bills may disappear, the Australian public is increasingly investing in capturing the sun's energy.

For more information:

Your Home
www.yourhome.gov.au

Alternative Technology Association
www.ata.org.au

Business Council of Sustainable Energy
www.bcse.org.au

Ocean views

Inspired by Asia but uniquely Australian, an island retreat in far north Queensland

One, of course, is tempted to say the views are 'picture perfect'. The large windows frame an ever-changing tropical palette of turquoise and indigo blues and lime and emerald greens—a most sublime setting for one of Australia's most well-known landscape photographers.

The owner of this stunning residence which showcases the endless panorama around Bedarra Island off the northern Queensland coast is Peter Lik, famous for capturing his own panoramic views.

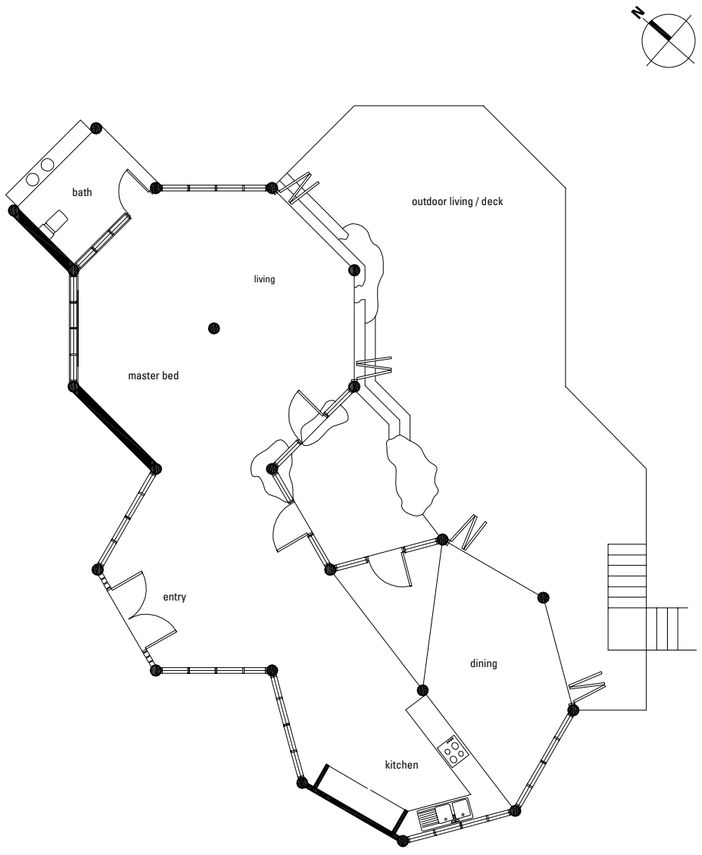
Lik's photographs of illuminating, iconic desert, rainforest and tropical scenes have won numerous international and national awards and favour vistas and landscapes.

Lik travels extensively, photographing the most exotic locations in the world, but his heart belongs to North Queensland where he has bases in Cairns and Bedarra. His galleries are located in Cairns, Port Douglas, Sydney, Noosa Heads, Hawaii and Las Vegas.

Bedarra Island was a natural choice for a getaway because of its quiet, largely unspoilt terrain. **Lik and building designer Chris Vandyke collaborated to create a "Robinson Crusoe" haven, yet all the modern conveniences are included in the house which fits seamlessly into the sensitive natural environment.**

The design consists of three pavilions interconnected at 45-degree angles on the corners. Looking up from the nearby beach, the three peaks of the roof-line follow the contours of the hills and merge into the trees. Looking down at the house, towards the Coral Sea, the decks and pavilions frame the landscape.

The pavilions have been placed on the site in a way that utilises the existing contours of the



The use of natural rockforms within the house itself is a distinctive and stunning touch, helping to create a structure that sits harmoniously in its landscape.

land and maximises the views to the ocean and neighbouring family islands. Every room has a view. The house's orientation to the shape of the land minimised the need for excavation.

Pavilions consist of living/bedroom, entry and kitchen/dining, with a huge deck flanking all the areas on the water side. The entry pavilion is the smallest and opens to an awe-inspiring view of the ocean.

The specification that natural rockforms be utilised within the house itself is a distinctive and stunning touch, helping to create a structure that sits harmoniously in its landscape.

Each of the pavilions is comprised of the same materials and scale creating a consistency of expression which makes the separate components part of a complete whole.

Recycled and sustainably managed timbers have been used extensively in the home. Wooden louvres, central "raw" poles, ceiling, flooring and decking help create a true tree-house feel. "People are craving that connection with nature," he says. "It, quite simply, makes people feel good."

The external entry vestibule is particularly stunning with a winding stair framed with recycled timber sleepers. This moves down the contours to the entry pavilion which features large Balinese entry doors.

Cross ventilation is assured with the open plan nature of the home and timber louvres can direct any breezes and guarantee privacy, that is, if someone ever walks by!

The house has been built to breathe, opening on all sides to the breeze with louvres and bifold doors. Ceiling fans help circulate and draw in cool air in extreme conditions.

> "People are craving that connection with nature ... It quite simply, makes people feel good"

Recycled and sustainably managed timbers have been used extensively in the home.

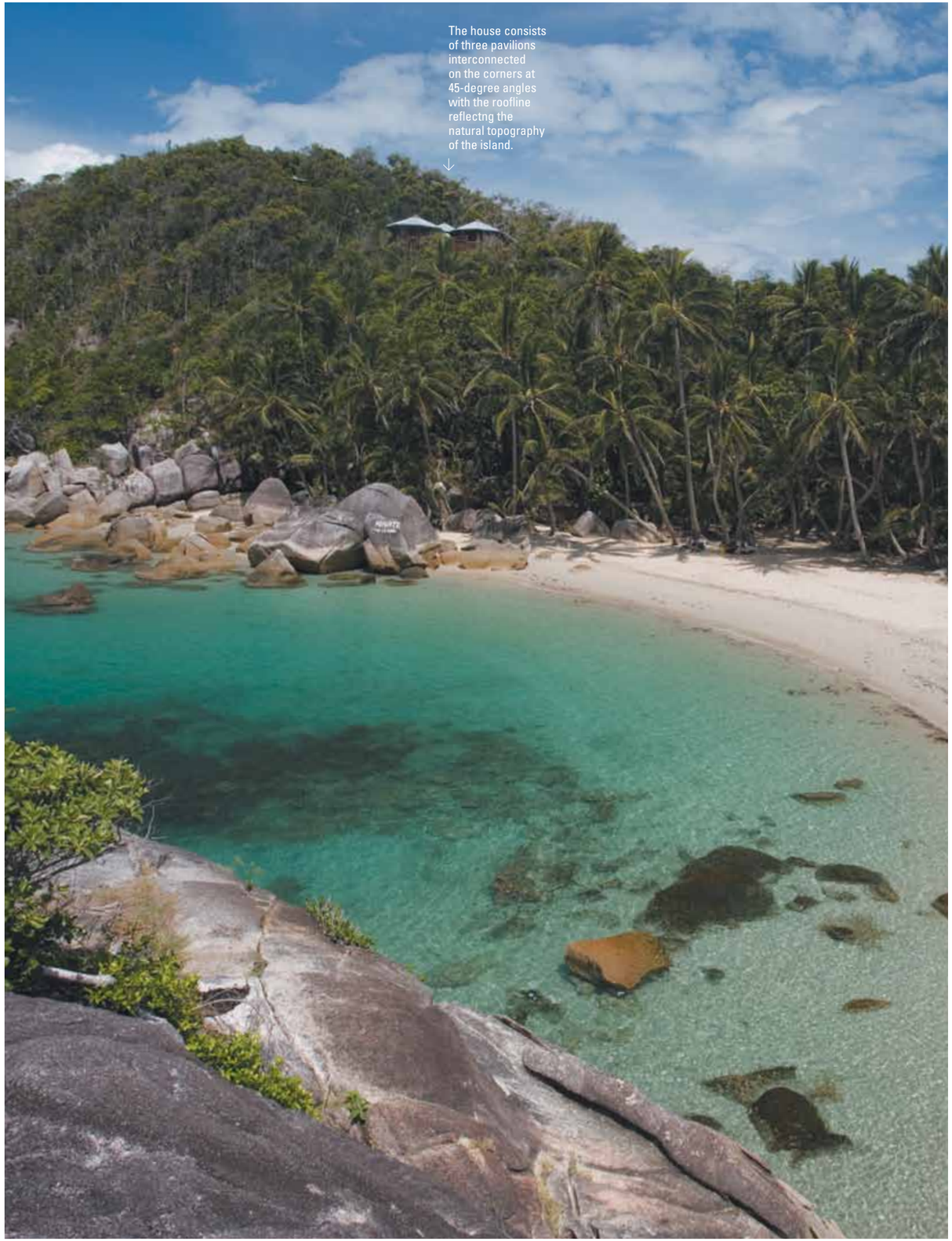
The sun rises in the north-east in winter and light is guaranteed to stream into the master bedroom and the lounge and outdoor areas. In summer, the higher altitude sun rises in the south-east and sets in the south-west, largely screened by the embankment behind. Generous overhangs block most of the summer sun from entering the building.

The interconnection of the pavilions eliminates the need for hallways which block natural ventilation and darken rooms.

Vegetation around the building filters on-site water. Two 2,500 litre rainwater tanks have been placed under the deck providing the residence's water. The five to six months of rainfall in the wet season is enough to sustain the drier period of the year, Vandyke says.

Solar panels on the north-face of the roof provide power to the building. Thermal comfort has been increased with a zincalume roof with blanket insulation.

The rustic nature of the house is enhanced with Asian and African elements. "It is an Australian home in that it has elements of other countries but also has its own 'native' influences," says Vandyke. "The verandah and the louvres are really Queenslander



The house consists of three pavilions interconnected on the corners at 45-degree angles with the roofline reflectng the natural topography of the island.

The open plan nature of the home ensures the cross-ventilation of the home and the timber louvres direct breezes around the house.

Even the bathroom takes advantage of the view.

Designer: Chris Vandyke Designs. www.chrisvandyke.com.au
Builder: Tropical Coast Builders
Location: Bedarra Island, QLD
Photographer: Peter Lik
Features:
- Bosch gas hot water system
- 2kW BP solar power system
- Low voltage LED Lighting
- 2 X 2500 litre Oz Poly water tanks
- Louvres and bifold doors for cross-ventilation
- Recycled sleepers and woolshed timber
- Natural finishes
- Water-efficient tapware, showerheads and toilet
- ILVE energy-efficient appliances
- Reflective Anticon ceiling insulation

and the materials are very Australian!"

One gets the feeling that Robinson Crusoe would be very happy here. There are certainly raw elements from nature but the 21st Century has provided a few luxuries. The stone plinth which forms the base for the bed, for example, is cushioned by a soft mattress; a rustic slab of timber lies beneath beautiful smooth stone basins in the bathroom.

Vandyke says the view from the toilet would have to be one of the best in Australia.

Not a bad place to be shipwrecked!

Future proof

Showcasing adaptable design at the doorstep to one of the world's natural wonders

> "A socially sustainable home is designed with people in mind and will meet a family's needs as they change over the years"

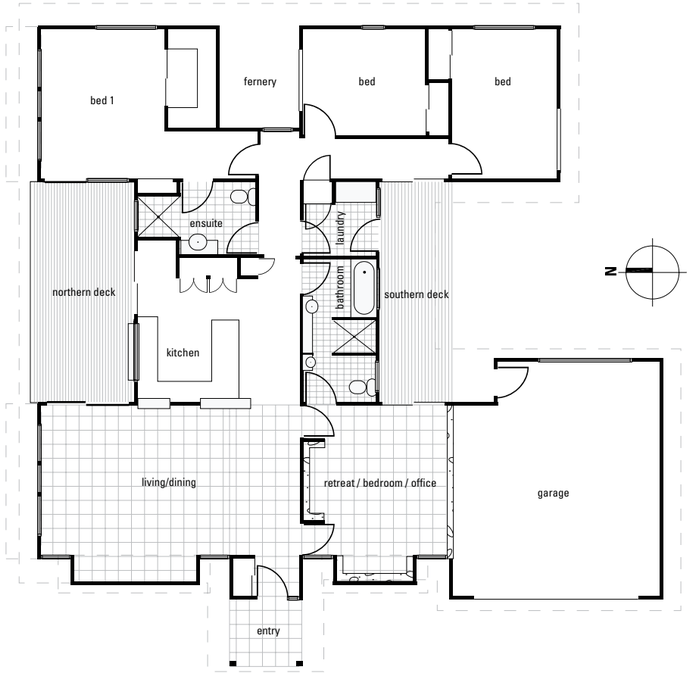
When you think about how much we invest financially and emotionally when building a family home, it makes sense to build one that will last. Whilst environmental sustainability is becoming more widely understood and accepted, it is also important to consider the social sustainability of a home. A socially sustainable home is designed with people in mind and will meet a family's needs as they change over the years.

Hervey Bay City Council is building a display home under Queensland's Sustainable Homes Program that responds to both the needs of its residents and the needs of the planet. The coastal centre of Hervey Bay, 300 kilometres north of Brisbane, is home to over 50,000 people, and renowned for its natural features and environment. Hervey Bay's attractions include calm waters, wide beaches and the annual whale migration, as well as the world heritage-listed Fraser Island and Southern Great Barrier Reef. It is especially important for the council to showcase the benefits of sustainable housing and living as Hervey Bay is one of the fastest growing areas in Australia.

In response, a median-priced three-bedroom, two-bathroom home is taking shape in the well established suburb of Torquay. Sustainable Home Hervey Bay is less than two kilometres from the Hervey Bay foreshore and close to schools, sporting grounds and shopping facilities.

The home will function well throughout a family's lifecycle accommodating new parents, toddlers, and teenagers, and will continue to serve its residents well into comfortable old age. It has been 'future proofed' with wider hallways and doorways, a ramped entry for easy access and a step-free shower. Think of parents pushing a pram, teenagers on crutches or anyone carrying a week's worth of grocery bags. As the house will suit a broad range of potential occupants it will maintain a higher market value.

The unusual triangular site with a seven-metre west-facing road frontage presented some design challenges. The development needed attractive street appeal and had to accommodate adequate



No air-conditioner or heater is needed with the ceiling fans in every room, which help to push warmer air down from ceiling level in winter.

vehicle and pedestrian access, while maximising opportunities for northern solar orientation. In response, the entrance on the western side of the house is flanked by fully insulated walls and opens onto a large north-facing living space and outdoor area. This area is designed so it can easily be modified to suit changing lifestyles. The kitchen faces the yard so children playing outdoors can be seen by anyone busy preparing a meal. The living areas can easily be reconfigured to include a home office or a quiet room shut-off from the rest of the house as the needs of the family change. This flexible home can cater for weekend guests, a live-in carer or a university student who needs a bit more space and independence.

The home has been designed to be cost-efficient over time. Good design and low maintenance materials reduce the costs of running the home, as well as repair and replacement costs. Long-term savings on electricity bills will result from energy-efficient appliances and natural heating and cooling achieved through passive design. The sustainability features of the home are expected to increase its resale value.

Indoor air quality has been enhanced by avoiding paints and finishes that release volatile organic compounds (VOCs), making the house more comfortable for everyone including allergy prone people.

Architects, The TVS Partnership, have designed the home with Hervey Bay's sub-tropical coastal climate in mind. The house has been oriented so the wide north-facing eaves exclude the summer sun and allow the low winter sun to warm the floor tiles and concrete floor slab. The internal temperature will be comfortable enough not to need any additional heating and cooling beyond the ceiling fans in every room, which help to push warmer air down from ceiling level in winter. Polyester batts insulate ceilings and external walls to reduce unwanted heat loss and gain. Large north-facing windows are positioned to capture natural light, winter sun and summer breezes, providing a wonderful sense of open space. West-facing windows have been minimised to reduce heat gain. Naturally cooling breezes can be felt in every room thanks to cross-ventilation. Lightweight suspended flooring provides good under-floor ventilation as well as access to services. A floor vent in the kitchen increases energy-efficiency by keeping the area around the fridge cool.

The south-west corner of the house has an extension to the living area that can be shut off to form a separate space. The internally exposed concrete block walls, insulated on the outside, are high in thermal mass. This enables them to absorb heat and release it slowly over time, stabilising temperatures inside the home. The adjacent garage provides shelter from the hot south-western afternoon sun, a characteristic of subtropical locations like Hervey Bay.

The centrally located kitchen, bathroom and laundry are close to the solar hot water system to reduce plumbing costs and minimise heat losses from hot water pipes. A 9,000 litre rainwater tank provides water for toilets, laundry and the garden. A grey water system collects water from the ensuite bathroom for use in a subsurface garden irrigation system.

The water-wise native garden also shades living areas, and the bedrooms at the eastern end of

The centrally located kitchen, bathroom and laundry are close to the solar hot water system to reduce plumbing costs and minimise heat losses from hot water pipes.

the house open onto a fernery, which assists with natural lighting and ventilation indoors.

Local schools and the community have been involved in the restoration of the adjoining reserve to the north of the site with water-efficient native landscaping as part of the project, and local sponsors are using the home to showcase a range of sustainable materials, products and appliances.

Sustainable Home Hervey Bay shows how the benefits of environmentally, socially and economically sustainable housing can be achieved through simple, common sense design. Visitors will see it looks like a normal home—it just performs better.

Sustainable Homes Hervey Bay is open for display as part of the Queensland Sustainable Home Program.
www-sustainable-homes.org.au
www.sustainablehomeherveybay.qld.gov.au

Designer: TVS Partnership www.tvspartnership.com.au
Builder: Ausmar Homes www.ausmarhomes.com.au
Location: Hervey Bay, QLD
Photographer: Craig Winter ARTXDESIGN
Features:
- Solahart 305 litre solar hot water system with electric booster
- 1 kW grid-interactive GridPower solar power system
- 9000 litre Action Tank rainwater tank
- Waterwise grey water system
- Clipsal Cent-o-meter
- Partial reverse concrete block construction
- Energy-efficient compact fluorescent lighting
- Highly insulated walls and ceiling
- Dulux EnvirO2 low-VOC internal paint
- Water-efficient showers, taps and toilets
- Accessible house design
- Cross-ventilation in all rooms

Place in the sun

Installing a solar hot water system is one of the best ways you can save money on energy bills and reduce your greenhouse gas emissions

Heating water accounts for 30 per cent of an Australian household's energy use, making it second only to transport as a household's largest cause of greenhouse gas emissions. However, a solar water heater can reduce your emissions by as much as four tonnes of CO_2 or more per year—the equivalent of taking one car off the road—simply by using the sun's energy to heat water at zero cost.

Depending on the climate you live in, a solar hot water system can provide between 50 to 90 per cent of your hot water needs. The initial purchase price will probably be higher than a similarly sized non-solar water heater but the savings in energy bills will generally pay for this difference in less than 10 years (in as little as four years in some cases). A solar system generally has a longer lifespan than a conventional unit, so financial returns can be considerable over the life of the system.

Federal and some state governments are encouraging the use of solar hot water systems with renewable energy certificates (RECs) and rebates. Rebates vary from state to state, but can save you a great deal on the cost of a solar water heater, making them more economically viable.

Flat panel and evacuated tube collectors

Most solar hot water systems use solar collectors (in the form of panels or tubes) to absorb energy from the sun. Water is heated by the sun as it passes through the collectors. It then flows into an insulated storage tank for later use.

The most common form of solar collector is the flat-plate panel. They consist of a dark coloured, metallic absorbing plate to which a network of pipes is bonded. This arrangement is then placed in an air-tight metal box with a glass cover on the top and insulation on the back and sides to reduce heat loss. As the sun shines on the collector panel the water in the pipes becomes hot due to conduction from the collector plate.

In the last few years another type of collector has started to appear on the Australian market. These are known as evacuated tube collectors. They consist of two glass tubes (one inside the other) that are bonded to each other at each end to form a sealed space between them. The surface of the inner tube is coated with a heat-absorbing coating. The space between the two tubes has most of the gas removed from it (hence they are evacuated), which provides a high level of insulation. As solar radiation passes through the outer glass tube and heats the inner tube, it is trapped by the low thermal conductivity of the space, which would otherwise allow heat loss by convection. Evacuated tube collectors are suited to colder climates as they can perform well even on cloudy days.

Collector panels need to be placed on a north-facing roof. Also, ensure the collectors are not shaded by trees or nearby buildings, particularly in winter, when the sun is low in the sky.

Storage tanks

Hot water flows into these tanks either by a passive or active system. In passive systems, the tank is placed above the solar collectors so that cold water sinks into the collectors, where it is warmed by the sun and rises into the tank. A continuous flow of water through the collectors is created without the need for pumps.

In active systems, solar collectors are installed on the roof and the storage tank is located on the ground or another convenient location. Water is pumped through the solar collectors using a small electric pump. This option is good if you want to limit the visual impact of the system on the roof or if your roof can not support the weight of the tank.

The storage tank is usually fitted with an electric, gas or solid fuel booster that heats the water when there is not enough sunlight.

The right fit

So why not start planning now for when your existing hot water system gives up the ghost! Choose one that is best suited to your climate and your lifestyle now and in the future. And remember, by reducing your hot water demand (by taking five-minute showers and washing clothes in cold water) you can reduce the size and cost of the system you need.

For more information:

Your Home
www.yourhome.gov.au

Alternative Technology Association
www.ata.org.au

> **“Reduce your energy bills and greenhouse gas emissions by up to 30 per cent by installing a solar hot water system”**

Solar hot water tips

- Choose a system size that suits your climate and number of people in your home and their needs.
- Ensure the solar collectors face north on an appropriate angle for your location and that they are not shaded by trees or neighbouring buildings.
- Use hot water in the morning so that water can be reheated during the day ready for use at night.
- Remember to turn off the booster when going on holidays.
- Check with your state government agency to see if they offer a rebate on solar hot water systems.

Top of the class

A lovingly restored old primary school is now a model for inner-city living

> “The objective was to change practices and to get a demonstration model up and running that would hopefully lead to broader change”

How does a recycled timber camel sculpture in a wildflower-filled garden relate to medium-density housing? No, it’s not pointless public art, but a symbol of our water-poor landscape, and it encapsulates the environmental principles guiding the WestWyck project.

From humble beginnings as a primary school in 1888, the inner-Melbourne property has come a long way. A local group formed a company to save it from demolition in 1993, then pioneered a new kind of residential development, built not only on co-housing principles such as communal spaces and shared decision-making, but also energy, water and materials efficiency.

As you walk onto the site, the old school building looms over the landscaped garden, filled with drought-resistant native species. This charming exterior fits the neighbourhood’s heritage character and is home to seven residents in a shared complex, complete with central courtyard and veggie garden.

Gradually the class rooms are being transformed into homes, already six modern apartments draw light and air from openable skylights and original panelled windows (ingeniously double-glazed by beveling off one side’s beading and attaching glass panels). Built-in compact fluorescent downlights illuminate high-use living areas, with low-wattage IRC halogen lamps for other rooms, and 70 watt metal halide HID uplights make the cathedral-like vaulted ceilings glow.

Mezzanine floors with glass walls salvaged from a Ford factory renovation, expand living areas without compromising vertical space. Upstairs, small balconies overlook lichen-covered roof tiles and trees. Reversible ceiling fans push heat down in winter and circulate cool air in summer, and there’s solar-heated, gas boosted hydronic heating for nippy times.

Solar panels supply power and an evacuated tube solar hot water system provides hot water and hydronic heating to the apartments.

The apartments use minimal resources: finishes are water-based and non-toxic, kitchens feature salvaged timber wainscoting (or panelling), sustainable hoop pine plyboard and recycled jarrah. Much of the flooring is the original Tasmanian oak and some sinks were reclaimed from the science labs. Double-skin aerated concrete brick construction reduces noise and aids fireproofing.

The dwellings are water-efficient, accommodating only front-loading washing machines. Showers and kitchen taps use nine litres of water per minute, vanity taps six litres per minute, and toilets are all 3/4.5 litre dual flush. Figures from a CSIRO study suggest the apartments use less than two-thirds of the average local water consumption.

Owners Lorna Pitt and Mike Hill are proud of this attention to detail. "We rebuilt the chimneys (in two of the apartments) from the old photos," Hill says, complete with matching chimney pots. And rather than increasing stormwater run-off by paving the car park, they are constructing it with a permeable surface that will allow water to seep into the soil.

Pitt and Hill have thought hard about water use. They've recycled the asphalt and concrete covering the site, substituting porous surfaces to filter runoff. Two 10,000 litre rainwater tanks will supply

Original fixtures from the school have been used in the townhouses including sinks from the science labs.

Non toxic and water based finishes are used in the apartments.

the apartments' gas-boosted evacuated tube solar hot water system, which has optional mains supply. "You could say it's grid-interactive, like the power," smiles Lorna.

All dwellings are connected to grey water and black water recycling systems. **Grey water undergoes bacterial, membrane and ultraviolet treatment, producing water for toilets, gardens and, pending changes to Victorian regulations, washing machines.**

A worm farm composts black water (toilet waste) and food scraps in two 3,500 litre vermiculture pits. Excess liquid runs through evapotranspiration beds (liquid waste evaporates and transpires through plants) and is absorbed by saline-loving native plants. The reed beds in the original design loved it so much, "they became this solid mass of reed and there was no sun and wind penetration so they stopped transpiring," Hill recalls. They substituted it with woolly tea-tree, sedge and fragrant river mint, which are thriving.

No mains water is used in the garden, which was an integral part of the design. Creating pleasant natural spaces for residents while fulfilling the medium-density plan Hill and Pitt believe is necessary in a world of shrinking resources. WestWyck has even negotiated a lower water charge with their provider, because of the reduced quantity and higher quality of any water they discharge to the sewers.

Five townhouses under construction (two already sold off the plan) give even greater potential for efficiency. **Passive solar design locates utility areas southwards, while living areas benefit from winter sun.** Slab construction with internal masonry party walls gives them high thermal mass (good for absorbing heat) and, like all WestWyck dwellings, they'll be well insulated with recycled, low-allergenic polyester insulation. Each townhouse will have its own solar hot water system, and a small solar photovoltaic array connected to two-way meters.

The original paneled windows have been ingeniously double-glazed.

Originally Hill and Pitt planned the townhouses' 5000-litre rainwater tanks facing the street, as a statement about the importance of water-efficiency. Unfortunately, others didn't see it that way. During the planning approval process, Lorna says, "that caused outrage to the point where we had to...put them underground, where logically it would have been better to put them up high."

Other challenges included finding energy-efficient pumps for the water treatment systems, and keeping up with changing lighting technology. Plumbing is an ongoing challenge, with multiple lines needed for the water treatment systems, and they've been denied some energy-efficiency subsidies because WestWyck is too small. Mike Hill admits retrofitting was "really bloody hard", with costs and timelines expanding, and a lack of skilled tradespeople.

Builder Greg Tainsh, who worked on WestWyck for eight years, saw this training in environmentally friendly construction as central to the job. "The brief to us was to maximise the use of recycled materials and minimise the use of any products containing

Each apartment has their own layout and character inherited from the old classrooms.

high levels of toxins," such as formaldehyde, he says. This is still an unusual brief for many builders, but Greg's team is now able to fulfil it for others.

Lorna says their moments of despair have been outweighed by the "massive support" from neighbours and the wider community, and their continuing motivation to create change. Besides, difficulties were always part of the plan. "The objective was to change practices and to get a demonstration model up and running that would hopefully lead to broader change." Change has gathered pace lately, with growing awareness of climate change piquing the market's interest. "When we tried to sell the first (apartment) there was market suspicion," Mike recalls. "Now we find that people are really interested."

Designer: Mills Gorman Architects & Michael McKenna Architecture & Interiors. www.millsgorman.com.au
Builder: Greg Tainsh & CDM Building Group
Project Manager: Construction Queen www.constructionqueen.com
Location: West Brunswick, VIC
Photographers: David Johns and Thomson Real Estate
Features:
- 1 kW BP grid-interactive solar system (townhouses)
- Hills Endless Solar evacuated tube solar hot water system (apartments)
- SunPlus evacuated tube solar hot water system (townhouses)
- Solar boosted hydronic heating
- Hebel panels, Cypress macrocarpa, Brims Hoop pine plywood and recycled brick cladding
- Paarhammer double-glazing, Primex double-glazing and Velux skylights
- Recycled materials from the old school and offices
- Autex polyester batts and Aircell wall, roof and ceiling insulation
- Wattyl low-VOC paints & Bona Mega non-toxic sealer
- 5000 litre Tankmasta 'Bagel' underground rainwater tank (townhouses)
- 2 x 10,000 litre custom made rainwater tanks (apartments)
- 'Aquaclarus' treated grey water system
- Custom made black water system and on-site storm water management
- Conserv & Scala water-efficient fixtures, Caroma & Fowler dual flush toilets

It's a breeze

Inspired by its surrounding landscape, this Sydney home is a natural winner

The new roof of the extension springs over the existing roof with glass louvres between the roof lines to allow air flow.

Sydneysiders are often unaware, as they drive from point A to point B in their busy lives, of the interesting topography that unfurls beneath them. Under much of the asphalt and footpaths lie crests, hills, escarpments and valleys.

And yet, sitting on the deck of Mary Lynne Pidcock's house in the south-west Sydney suburb of Earlwood, you can't help but be struck by how varied the landscape is.

Perched high between the Cooks River Valley and Wolli Creek Valley (the only bushland of any size left in the inner south-west of Sydney) you can see rocky sandstone outcrops, extensive bushland flanking the Cooks River Valley below and long patches of parklands. Beyond, you can see hills and valleys peppered with human growth—the massive shopping centres of Bondi Junction and Chatswood to the north, high density apartment blocks and Sydney's two major bridges—the coathanger and Anzac.

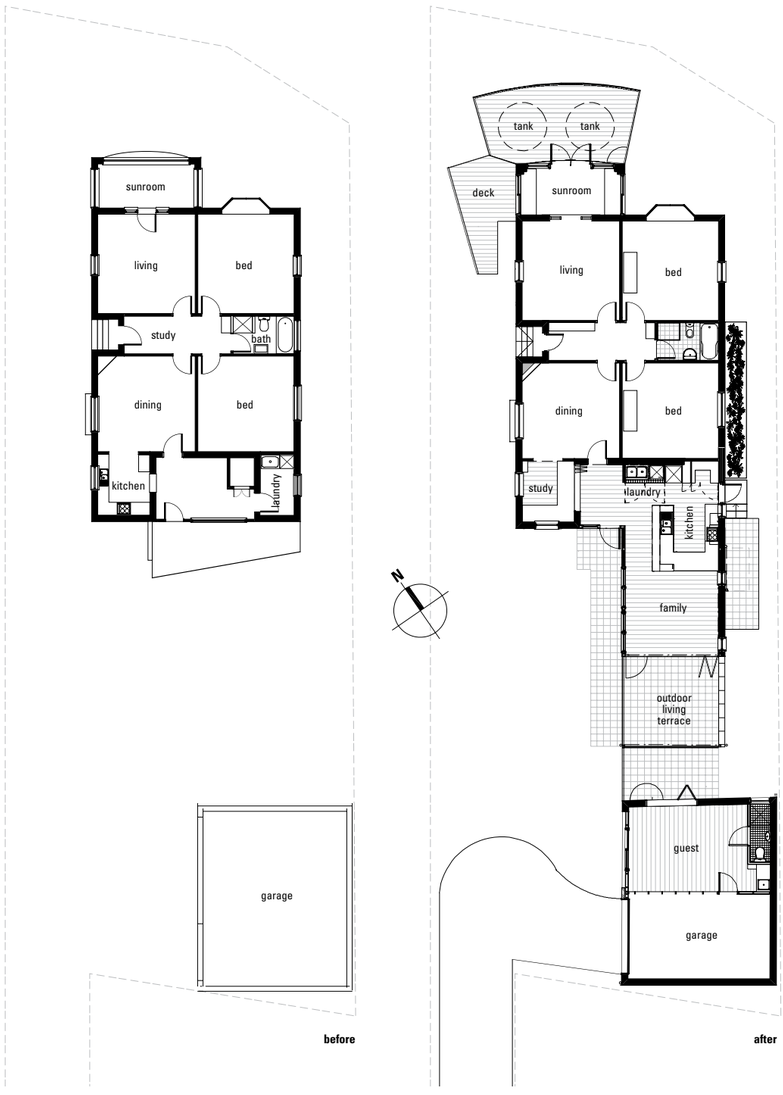
"On a clear day, as the saying goes, you can see the Blue Mountains," says Mary Lynne.

The position, often unappreciated, is one of the major reasons why she decided to purchase the house, Mary Lynne says. "When I walked in, it just felt beautiful; it had a great sense of outlook. And there was the most beautiful breeze."

The house's renovation has been sympathetic to the landscape and has not compromised on any aspect, or any iota of breeze. The extension, embellishing the original, compact, early art deco house, has retained the coziness and added an expansive dimension which can be opened or closed depending on the mood or time of day. The home feels just right for one, two or three and yet has hosted a wedding with over 100 guests.

This has been achieved primarily with the new kitchen/family room at the entrance of the home and the deck that straddles two sides of the house.

The renovation has retained the coziness of the original art deco house while opening up the house to embrace the natural light.



Water from the 10,000 litre water tanks is used for the garden, washing machine and toilets and has never been emptied.

By retaining the compactness and introducing rooms and decks open to the breeze, cooling is simply 'natural' and heating is highly achievable through the sun topped up by two small gas appliances. And with the home's native and vegetable gardens, iconic trees (Jacaranda, Illawarra flame, gum, etc) and valley below, it would seem to readily achieve high environmental status. It is a home that is as aware of its landscape as it is of its cosy, comfortable interior. It is not a home shut off from the environment, but embracing it.

Mary Lynne was motivated to join the local Wolli Creek Preservation Society one day after she "dropped down to see Marcia Hines sing at Tempe Reserve" at a tree-planting ceremony for the Cooks River Valley garden. It was there she met Sue Stevens, a university-trained urban ecologist and local bush expert, and Mary Lynne's voluntary experience planting trees in the area propelled her to make her own garden a local oasis. The garden is now full of plants native to the area such as Blueberry Ash, Coastal or White Correa, Native Mint Bush and Gymea Lily. "If it's local, there is more of a chance of it responding to the soils and different conditions," Mary Lynne says.

The kookaburras, rainbow lorikeets and magpies also approve and serenade her while she works and entertains at home.

In actual fact, the Cooks River Valley and nearby Tempe reserve has begun an extensive reclamation over the last 10 years, and is being transformed from an industrial estate to a natural environment. (The Cooks River used to be referred to as an "industrial drain".)

You could say Mary Lynne's home and garden is reflective of a whole "bush change" in attitude in this part of Sydney.

Growing up in Grafton, Mary Lynne and her siblings would run down the rolling lawns of her house to the "mighty Clarence River". "The Cooks River isn't quite the same but it is a waterway," she says.

To remind her of her provenance, Mary Lynne decided to plant round smooth river stones down the middle of the driveway.

She says the house seems to attract people "to every corner" with her nieces and nephews immediately running around from front to back and side to side as soon as they arrive.

The home is very much a family concern with well-known architect, Caroline Pidcock, overseeing the renovation. Caroline is Mary Lynne's niece.

“It is not a home shut off from the environment, but embracing it”

The new kitchen and family room extension captures the cooling breeze in summer and can be easily closed up to keep warm in winter.

Caroline, one-time president of both the New South Wales Chapter of the Royal Australian Institute of Architects and of the Australian Sustainable Built Environment Council, shared Mary Lynne's enthusiasm when she first saw the original house and location.

"It was a sturdy little house with a wonderful sense of proportion. It made sense to retain the four big rooms at the front; they were very geometric. We decided to add a section that would allow you to connect with the front area of the house which has the benefit of a level garden," Caroline says.

"The issue was working with the front area's southern orientation. We needed to ensure light and warmth would infuse the new portion."

This has been achieved through some simple but ingenious devices. The new roof springs over the existing roof with glass louvres between the roof lines. These can be shut when weather is inclement. **Sloping steel columns support a roof and pergola that provide shelter from the west.** "Every beam has a different compound angle," says Mary Lynne. "The builders couldn't rest on their laurels!"

One of the impressive aesthetic elements of the home is its integration of beautiful wooden floorboards, joinery and furniture. The floorboards are produced by Big River Timbers, a fourth-generation family business. The boards are constructed of blackbutt plywood which allows efficient use of the timber resource.

"Growing a hardwood tree to secure solid timber takes a long time," says Caroline. "By growing it for plywood, you can use it after about 30 years. You cut the logs by peeling them and then you alternately place three millimeter layers horizontally and vertically to make a very strong plywood. In this way, hardwood forests can be grown sustainably."

The wood is placed on a concrete base which has the benefit of absorbing the sun and radiating extra warmth in winter and minimising heat in summer.

The extension of the verandahs on the northern and western sides "added a new living area," says Mary Lynne. The curve of the verandah that overlooks the vista picks up on the beautiful art deco design of the stained glass in the old doors.

Water from the 10,000 litre tanks is used for the garden, washing machine and toilets. They have never been emptied, says Mary Lynne.

The garden helps to make the home "very sensory" she says. "I wake up most mornings and walk barefoot on the grass. I can smell the native mint, kaffir lime leaves and eucalypt." Plants such as Chinese Star Jasmine and the native False Sarsparilla protect the rooms from the harsh western sun.

The worm farm, purchased from The Watershed,

The house opens onto the garden full of native plants such as Blueberry Ash, Native Mint Bush and Gymea Lily.

Non-toxic paints have been used throughout the house and sustainably-harvested blackbutt plywood for the floors.

an urban sustainability education centre in nearby Newtown (managed by Mary Lynne's daughter Kalina), takes all of Mary Lynne's fruit and vegetable scraps—except for onion, garlic, ginger and citrus. The juice from the hard working worms is used to fertilise the vegetable garden to the east of the house. "All the energy that's used to irrigate and transport veggies is huge, and it's better to grow them yourself," says Mary Lynne.

The compost bin takes organic material such as fruit, vegetables, paper, grass cuttings, tea leaves, flowers, weeds and egg shells.

Energy-efficient globes have been installed throughout the house and non-toxic water-based paints were used on the walls.

The house, as they say, is a 'natural'.

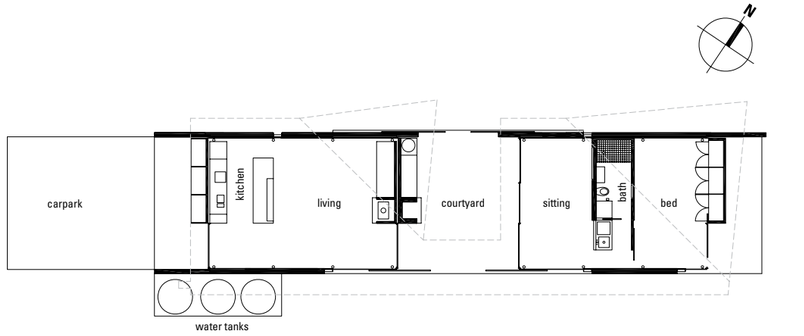
Designer: Caroline Pidcock Architects. www.cparch.com.au
Builder: Gambit Constructions
Location: Earlwood, NSW
Photographer: Dean Wilmot & Matt Hoggett
Features:
- Re-use and rejuvenation of existing house
- Good solar access to old and new rooms
- 10,000 litre rainwater tank
- Rheem 5-star instantaneous gas
- GreenPower
- Glass louvres for ventilation
- Caroma Leda water-saving toilets
- Sustainably-harvested blackbutt flooring
- Worm farm and compost bin
- Roof and wall insulation
- Low water and food producing garden

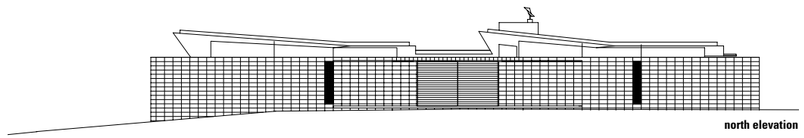
During winter days, the heavy masonry wall on the northern façade and the concrete floors absorb the heat from the sun for release at night.

Nature and nurture

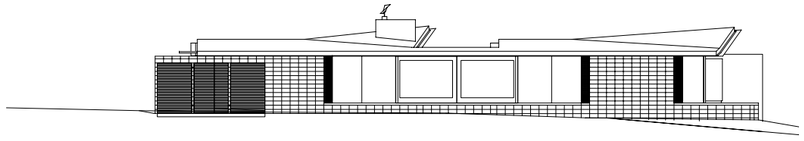
A passive-design home with an active owner on the Tasmanian coast

A long narrow plan, consisting of two pavilions positioned either side of a central courtyard, facilitates maximum sun and wind penetration.





north elevation



south elevation

Passive design, which dictates how a building sits in the landscape and interacts with the sun and wind, is one of the foundations of sustainable building. However, the term can be somewhat misleading because a house that employs such techniques engages the occupants in a non-passive way, as this home in Woodbridge, Tasmania demonstrates.

To fully enjoy this house and its location on the banks of the D'Entrecasteaux Channel, the owner chose to become a proactive and responsive user of the building. The home looks almost monastic in appearance, but its simplicity belies the considerable effort that went into its design and realisation. In fact, it embodies ideas and philosophies that two friends, who became client and architect during their collaboration on this project, had already spent many hours discussing.

"The client is a friend who I had known for a few years beforehand," says architect, Elvio Brianese from DesignInc Tasmania's Hobart office. "We often talked about what made good architecture and what opportunities were available, and he was excited about the architectural projects we were working on."

Given its rural location and DesignInc's specialisation in green buildings, the house was always going to be sustainable. **The atypical 'pared-back' approach emerged as a result of the owner's European background.** He was born in Australia to European parents, giving him a practical and utilitarian sensibility. "He believes that unless something has a function or reason to exist, you don't need it," Elvio says. "That was one of the aspects the client most enjoyed about our discussions and the design process: being involved in how and why you do certain things."

Their shared enthusiasm made this a long and intensive project, taking about three years from commencement to completion. According to Elvio, that considerable investment paid off. "As architects, success comes from knowing that the client spends the majority of his time there, even though it was originally built as a weekender," he adds. "In Hobart, his office occupies a colonial-style house, so living here is like entering a different world: it's quite a contrast."

The main difference lies in this home's ability to adapt and respond to the weather, which can change rapidly given its coastal location. Some

The aggregate used in the concrete floors was sourced from the site itself.

of these attributes are passive design features, while others engage the owner to make subtle adjustments to maintain ideal comfort inside.

A long narrow plan, consisting of two pavilions positioned either side of a central courtyard, was deliberately devised to facilitate sun and wind penetration. The two roof sections, which cover the living and sleeping quarters, tilt up at their northern edges to allow winter sun to enter, while keeping summer sun out.

Meanwhile, the heavy masonry walls on the northern façade and the concrete floors complement these qualities. During winter, the walls and floors absorb heat from the sun throughout the day, for release at night as passive heating. In summer, the cool floors help keep the interiors cool.

> “It typifies the whole mood of the place: the environment at Woodbridge is slightly wild, yet this house provides a sense of protection and luxury”

This passive system is augmented by the owner's actions. **He can open full-height glass doors and screens, and a series of slot windows that direct cross-flow breezes through vents in the ceiling, to cool the house naturally.** In winter, a cosy atmosphere is created by lighting a fire in one of two fireplaces located in the living area and the outdoor courtyard.

That central outdoor space is the heart of the home, and it is the owner's favourite place for entertaining and relaxing, especially because the fireplace can be used for *al fresco* cooking. "Part of the brief from the beginning was driven by the client's recollection that outdoor cooking and eating is one of the most pleasurable activities imaginable," Elvio says. "He loves the soul that this courtyard has created for the house. It typifies the whole mood of the place: the environment at Woodbridge is slightly wild, yet this house provides a sense of protection and luxury."

The owner agrees that the house conforms with his initial brief for a space that would be secure "from wind, cold, and excessive heat", that had a fireplace at its heart and would relate sympathetically to its landscape. He particularly enjoys the way the house is "very closely connected with nature, and the sense of tranquility".

For roughly seven months of the year, the house uses only passive heating and cooling. Otherwise, loose wood collected from the property is used in the open fires, and these can be supplemented by an electric in-slab heating system for extra warmth on very cold nights.

The house scores additional sustainability credits for its use of natural oils, timber finishes and low-emission paints that were selected to minimise

> The house can adapt and respond to the weather, which can change rapidly given its coastal location

Natural oils, timber finishes and low-emission paints were selected to minimise toxins.

toxins. Where possible, building materials, such as the Tasmanian Oak cabinetry and joinery, were sourced locally to reduce energy consumed during transport.

Taking that concept one step further, the aggregate used in the concrete floors was sourced from the site itself to minimise the home's embodied energy (which accrues during material extraction, processing and transport). Internally, the concrete was ground and polished for a smooth finish, while in the courtyard and terrace, it was left exposed to resemble pebbles on a beach.

The house is not connected to mains water, so the corrugated steel roof was designed as the primary water collector. **The roof is much larger than the internal floor area and captures more rain than projected water requirements, so that the three rainwater tanks on the southern side always contain a plentiful supply.**

Inside, the architects selected water-efficient appliances and fittings to suit the capacity of the storage tanks. Water is heated by a standard domestic hot water cylinder (taking into account that Tasmania's energy is sourced primarily from renewable hydro) positioned to minimise delivery time to the taps. Waste water from the bathroom and laundry is treated in a dual-purpose septic system before being dispersed into the environment.

The house and its courtyard provide the ideal place to observe and interact with nature's changing moods, both throughout the day and across the seasons. "The house celebrates the relationship between inside and out: it's sheltered but you still have a strong link to outside," Elvio says. "The courtyard supports that. In winter, sometimes it's blowing a gale and freezing cold outside, it's more comfortable to sit inside next to the open fire in the cave-like space. But on hot summer nights, it's fantastic to sit next to the outdoor fire, sipping red wine and looking at the moon over the water."

Designer: DesignInc Tasmania Pty Ltd. www.designinc.com.au
Builder: Cordwell Lane Building. www.cordwelllane.com.au
Location: Woodbridge, TAS
Photographer: Peter Whyte
Features:
- 5000 litre rainwater tank capacity
- Electric in-slab heating system
- Concrete slab aggregate sourced on-site
- Locally sourced Tasmanian oak timber doors and joinery
- Dulux EnvirO2 non-toxic paint
- Ram water-efficient tapware

Rain catcher

Reduce or eliminate your water bills by capturing your own water supply for the house and garden

Rainwater tank manufacturers have plenty of reason to be happy these days, as long as they can keep up with demand. Traditionally the domain of those living in regional Australia with no mains water supply, rainwater tanks are rapidly becoming a fixture in urban houses. Once there was an endless flow of water from the tap, but now water restrictions in most parts of Australia are making people think twice about how they source their water. More and more people are supplementing their mains supply with rainwater, or better still, becoming totally self-sufficient for water use.

Size does matter

To live solely off rainwater you need a pretty big tank, probably two, the rationale being that it always rains when you least need it. It's handy to have rainfall stored from wetter times to get you through the drier months. The size of the rainwater tank depends on where you're going to put it. If space is not an issue then you could place one 20,000 litre tank next to the house for all your water needs. However, some residences might be more suited to two 10,000 litre rainwater tanks, or a handful of different sized ones such as a 5,000 litre tank accompanied by a couple of 2,000 litre tanks.

If you're looking to supplement your water use with rainwater then a smaller tank might do the job. For instance, a good size for a toilet flushing tank would be 2,500 litres. A tank used solely for toilet flushing or cold water laundry use would be smaller than one used for watering the garden, which might be 4000 to 5000 litres. A tank for watering the garden is used the most during dry months, so most of the water needs to be stored from wetter times of the year.

Above or below ground

Tanks are more commonly installed above ground, although more are being placed underground. Above ground tanks are becoming more aesthetically pleasing, coming in a range of colours and materials to suit any style of house. As well as the traditional round variety there's the flat-sided oval or square slimline tanks, designed to fit narrow spaces.

Underground tanks are available as poly tanks or concrete, and are often installed when the house is being built. Concrete tanks are usually reinforced, so can go under the driveway because they can support heavy loads. Bladder tanks, consisting of a metal frame and flexible plastic, are good under houses mounted on stumps, or beneath decks.

Another thing to consider is the ability to repair your water tank. Hopefully a tank will last for many years, (some come with a 20 or 25 year warranty), but occasionally it may need to be fixed. The material used for the tank will determine how easy it is to repair, with stainless steel tanks probably the simplest to fix. Underground concrete tanks probably won't sustain much damage, but may be more difficult to repair if they do.

Health and safety

Rainwater tanks are generally not recommended for storing drinking water in urban areas, unless you install a filter and a first flush device. Between downpours, all sorts of contaminants such as bird and animal droppings, pollutants from vehicles and heaters along with the usual roof coatings and sealants gather on your rooftop.

A first flush device diverts the first flow of rainwater from the roof to the stormwater drain, preventing most of the roof debris from entering your water supply. Some tanks already come with a first flush system; if they don't then they are highly recommended, even if you don't plan to drink rainwater, as they limit the build up of sludge in the tank.

Other ways to look after your tank include checking roofs and gutters on a weekly basis, keeping the roof clear of tree branches, and draining and cleaning the tank every few years to remove sediment.

Rebates

Water tanks can be a considerable investment but fortunately there are rebates for tank installation in some states. Rebates differ from state to state, so check with local councils or water authorities for details. Also consult your local council for rules and regulations about rainwater tank installation, as each council has their own guidelines.

A truly sustainable tank

And what to do when you're finished with your tank? When the tank has reached the end of its useful life it will need to be scrapped. The best option is for it to be recycled rather than end up as landfill, giving you all the more reason to be careful when choosing your rainwater tank. A galvanised or lined mild steel tank will generally be quite corroded and you may even have to pay someone to take it away. Poly tanks have the potential to be recycled, but this is something to discuss with the tank manufacturer; if they don't have a strategy to deal with the tanks then they will most likely end up as landfill. Fibreglass tanks are generally not recyclable. Stainless steel tanks maintain some value, with all of the material able to be recycled. Scrap metal dealers may even pay for it, giving you plenty of reason to plan for the next 20 or 30 years when buying a rain water tank.

How much will be collected?

The size of your roof will also influence what size tank you get. Each square metre of roof collects one litre of water for every millimetre of rainfall received. So if you have a 60 square metre roof and there was a 10 millimetre downpour, then you stand to collect 600 litres. Considering the average roof is 160 square metres, the potential to collect water from the roof is enormous.

"In urban areas water bills can be lowered or eliminated"

For more information:

Your Home
www.yourhome.gov.au

savewater
www.savewater.com.au

Green Plumbers
www.greenplumbers.com.au

Rainwater tank tips

- Choose an appropriate size for what you intend to use the water for.
- Check with your local council about regulations or guidelines.
- Regularly clean your roofs and gutter of vegetation and debris.
- Drain and clean your tank every few years to remove sediment.
- Check with your state environment department for rainwater tank rebates.

Perched 1.5 metres above the ground, the dwelling is oriented north-west to catch refreshing sea breezes and enjoy the cooling effects of sub-floor ventilation.

Prize-winning pavilion

A model sustainable home in Broome has proved its mettle

The aptly-named Filter House has louvres on all sides and high clerestory windows to let out rising hot air and produce a thermal chimney effect.

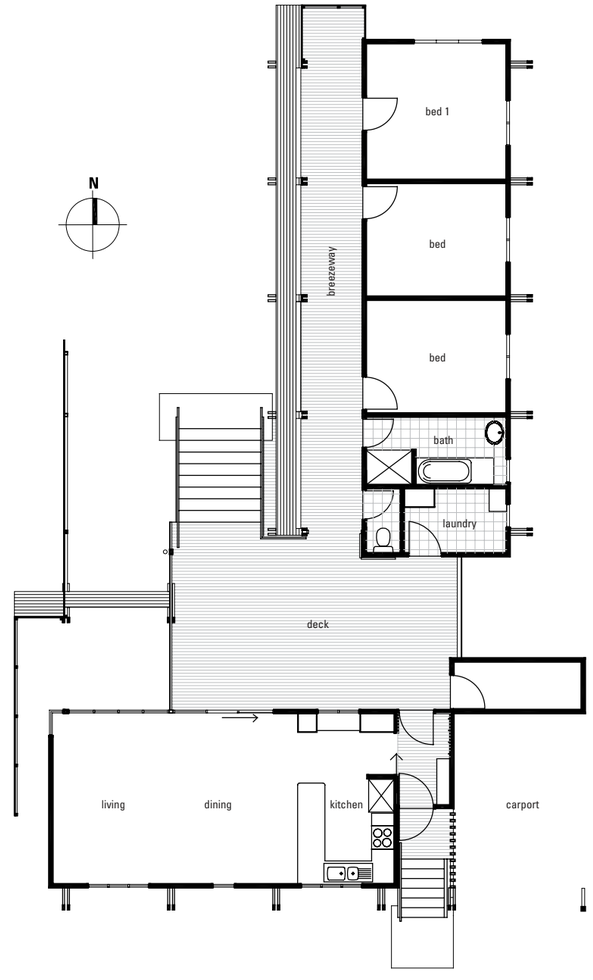
The pavilion has enjoyed a long history as an architectural staple in tropical climes. What could be better than living in an open house, protected by wide eaves, and elevated to catch available breezes? The traditional pavilion makes a lot of sense: a lightweight building that responds quickly to changes in outside temperature and maximises cross-ventilation. But in recent times, this vernacular response has been forgotten in favour of closed, air-conditioned houses that make many parts of Darwin and Brisbane look like suburban Melbourne.

The Filter House in Broome is not in this camp. This two-pavilion house is designed by Sustainable Built Environments (SBE) and is a response to a competition run by the WA Department of Housing and Works. The mission, for those who chose to accept it, was to come up with a sustainable house design that would suit the tropical, desert-edge climate of coastal Western Australia. It was a great exercise in leading by example and educating those involved in public housing (departmental staff and the end-users) and the general public. Rather than simply talking about design principles and publishing a paper or two, the idea was to produce actual buildings (in real locations) that could be monitored for energy-efficiency over a period of time. This approach will give the housing department plenty of ideas for future housing projects in Western Australia's north-west.

"Our design consists of two pavilions, separated to create outdoor living areas between building forms," says designer Chris Barnett, pointing out that the house was designed so it would integrate with existing built environments. "The street façade and materials express the house's raised connection to the ground and fit in with Broome's tropically casual streetscapes."

The two-pavilion strategy works a treat. The space between the two structures provides a sheltered, shaded outdoor living amenity and helps filter the often intense Broome light. Perched 1.5

> “The street façade and materials express the house’s raised connection to the ground and fit in with Broome’s tropically casual streetscapes”



metres above the ground, the dwelling is oriented north-west to catch refreshing sea breezes and enjoy the cooling effects of sub-floor ventilation. The trick to harnessing the cooling effects of cross-ventilation is to design pavilions that are just one room deep, as passageways or dividing walls can disrupt the airflow. The aptly-named Filter House does this very well, with louvres on all sides and high clerestory windows to let out rising hot air and produce a thermal chimney effect (a cooling up-draught).

The raised floor also offers protection from wet season downpours and hoards of small hungry locals. “The termites have been known to eat the paper backing off plasterboard,” Chris observes, adding that the raised floor has also created space for a series of in-ground rainwater tanks.

One of the clever things about this house is the way the sun and wind can be controlled, a must in this sometimes unpredictable and turbulent climate. A roller door to the east can be closed to protect the central deck from dusty, inclement blusters, or opened to let through gentler breezes. Landscape planting to the west also helps moderate the elements and creates a cooling microclimate. Recycled jarrah screens protect the house from the north and west sun as well as allowing a battening down of the hatches during cyclones. “The screens maintain air movement and set up a play of slatted light to covered outdoor areas and window openings,” says Chris.

Continuing the homage to vernacular building materials, swing-up corrugated iron panels can be used to control the setting afternoon sun in the bedroom pavilions while, again, offering protection from cyclones.

The Broome climate is such that passive temperature control alone was not sufficient to meet modern expectations of comfort. A small air-conditioning unit was deemed necessary (it’s half the size of what you’d normally see in Broome) and the building has been designed to minimise its use: living and sleeping spaces have been divided into two insulated cells so the aircon can service one zone at a time, when needed. Excellent insulation (R5 in the roof and R3 in the walls and floor) ensures these cells are well sealed and able to conserve active cooling in the teeth of severe heat outside. “The living cell utilises an air lock to further minimise hot air from coming in the front door,” adds Chris.

The figures look good for this house and suggest that it is a worthy prototype for future housing projects in the region. The house has been fitted with a photovoltaic solar power system that is connected to the mains grid, feeding renewable electricity back into the mains when the panels generate more power than the house is using. This is commonly at the time peak electricity demands are put on the grid by people cooling their homes and businesses in the tropical climate.

A solar hot water system captures further solar energy in providing over 65 per cent of the energy used to heat hot water. If you take into account that much of Broome’s small regional power grid is supplied by diesel generators, these renewable energy initiatives significantly reduce the greenhouse gas emissions the house produces.

Rainwater is collected and stored in the six 11,365-litre tanks housed under the building. Flow reducers, pressure balancing systems, water-efficient fittings and aerators ensure water usage is minimised. The Department of Housing and Works collected 12 months’ worth of energy-use data from the house and compared it to the same gathered from a slab-on-ground ‘reference’ house. The Filter House came up trumps, with a 60 per cent reduction in mains electricity use. Compared to the average Broome house 54 per cent less energy is used.

The Filter House might be light on fuel and open to the breezes, but it’s also as tough as nails. Its steel skeleton is as efficient a structure as it can be, and will withstand cyclones and termites.

> The Filter House uses 54 per cent less energy compared to the average Broome house

The raised floor offers protection from wet season downpours and termites, and creates space for a series of in-ground rainwater tanks.

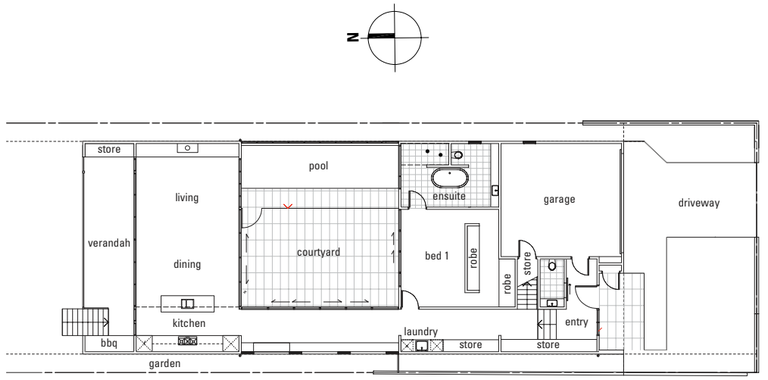
"While we encourage the bio-diversity of native species, having the building feed the local termite population does not create a sustainable outcome," says Chris wryly. Other materials are recycled or plantation sourced: the floors are plywood, the decking is made from reconstituted sawdust and recycled plastic, and the external stair treads are made from recycled plastic. Importantly, too, for this remote area, the standardised structure has the potential to be prefabricated for efficient application elsewhere in the region. This living laboratory has proved its mettle and promises a positive future for sustainable living in Broome.

Designer: Sustainable Built Environments – Design
Architects: David Oppenheim & Chris Barnett. www.sbe.com.au
Builder: HM Tracey
Location: Broome, WA
Features:
- 280 litre SolaHart solar hot water system
- 770W grid-connected AstroPower photovoltaic power system
- 6 x 11,365 litre Bushman rainwater tanks
- Wool Store foil-backed recycled wool insulation
- Water-efficient tapware
- Fully openable louvre and clerestory windows for thermal chimney passive ventilation
- Recycled Jarrah screens
- Australian hardwood plywood floors
- Reconstituted sawdust and recycled plastic decking
- Recycled plastic external stair treads

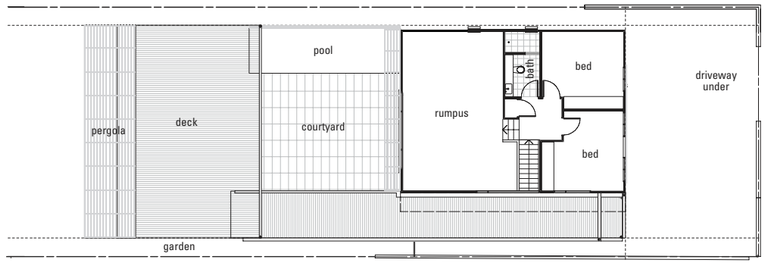
Beachside babe

A Sydney North Shore home setting a new standard in seaside living

The house is part of the new guard that invites the outside in while still offering privacy and sanctuary



lower level



upper level

For the home's owners, Tracey Spindler and Beth Nyman, 'eco-luxe' is about seeing the nearby lagoon from practically every room in the house; it's about seeing the stars lying in bed at night, and enjoying the sea breezes–while sitting in the middle of the house!

Architect Tone Wheeler's description of 'eco-luxe' for the home in Curl Curl on Sydney's northern beaches is fitting. The mood evokes an oasis or resort, all the more enhanced by welcoming in the natural setting.

One of the boons of the new trend in environmentally aware architecture and design is that more and more people are enjoying their local environment in the comfort of their own home.

Until recently, homes on the sandy streets near the beaches of Sydney would acknowledge the outside with a wooden verandah where thongs and towels would stand sentry.

Spindler and Nyman's house is part of a new guard that invites the outside in while still offering privacy and sanctuary.

Spindler says there is a definite "wow factor that walking in the front door and down the side corridor creates for people".

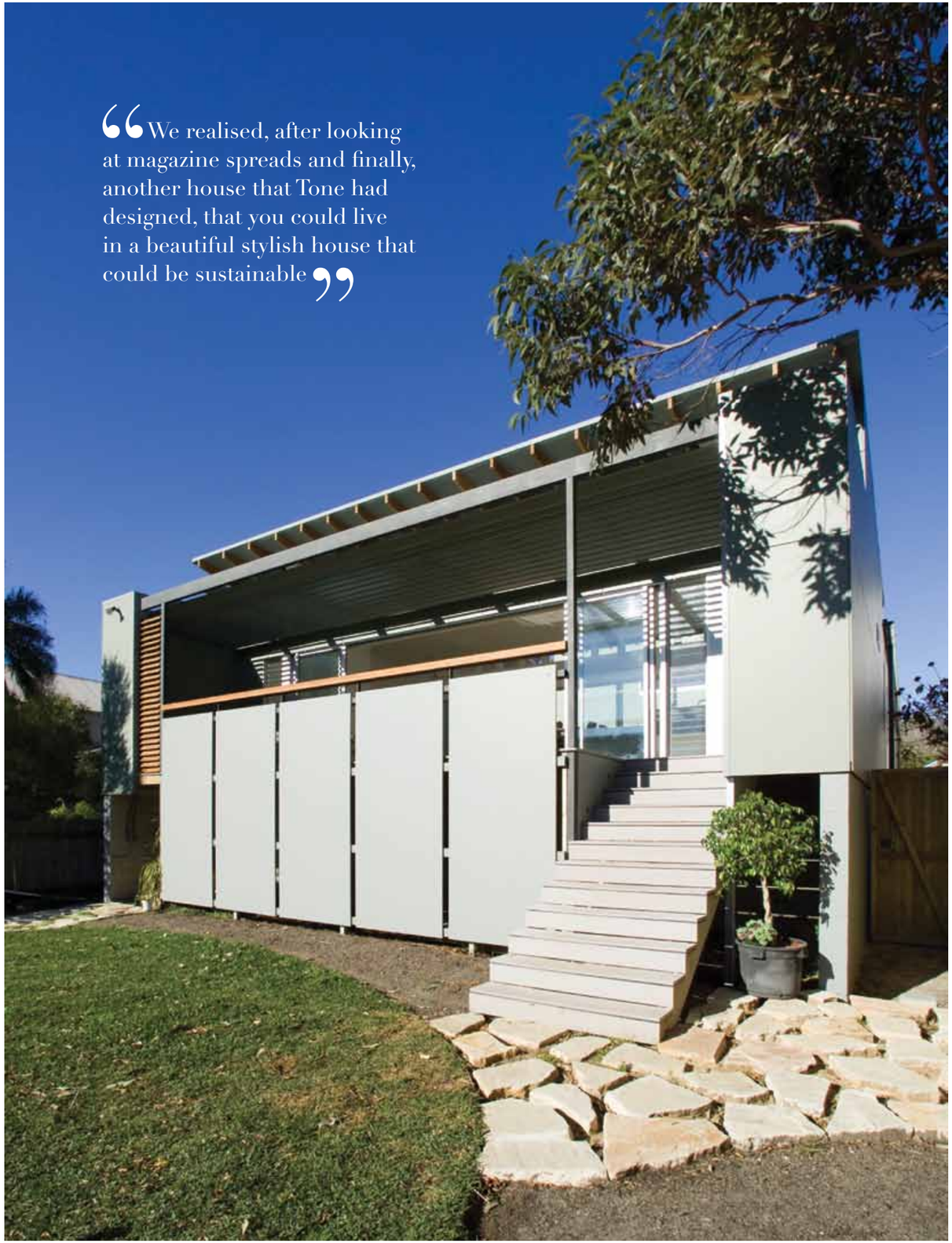
The exterior, with its cutting edge cement cladding (that uses less embodied energy and waste in the production, according to Wheeler from Environa Studio) and skewed wall and roof-line indicate a different experience internally.

Nevertheless, when you enter the front door and see the light-filled courtyard centre-right, with plunge pool and fountain sourced from a deep orange recess, and you glimpse the light bouncing off the lagoon through the glass louvres and doors to the back garden, the word "wow" does come to mind.

With the eastern and western walls offering privacy, the central courtyard is secluded and private and offers one of three separate living spaces within the house. Flanking the courtyard is an eating and lounge area and a two-level bedroom section.

The four dogs–two Jack Russells (Jarrah and Domino) and two wirey miniature dachsunds (Sammy and Sasha)–that greet you at the front door feel very much at home and have no shortage of sunny spots to wile away their time.

Tone Wheeler talks of warmth and 'coolth'–a very old word that he says should be re-introduced into the vernacular–and says many factors have gone into determining that the temperature of the house



> We realised, after looking at magazine spreads and finally, another house that Tone had designed, that you could live in a beautiful stylish house that could be sustainable

The living areas face north and the glass doors and louvres bring in plenty of sun and capture the lagoon and sea breezes.

is regulated.

Solar louvres made from coloured steel over the back verandah are set at a certain angle to direct winter sun deep into the lounge/eating area and are also contoured to ensure summer sun is directed away. **The concrete slab that the house sits on is cooler in summer because the sun does not shine directly on it.** The home's temperature is also regulated through its efficient insulation incorporating two different kinds of material, polyester and reflective foil.

The three living areas of the home all face north and the glass doors and louvres bring in plenty of sun. Wheeler explains that the glass louvres are well-placed for sea and lagoon breezes.

Spindler says that while she and Nyman wanted to be responsible environmentally, a keen aesthetic sense was a major driving force in conceptualising the house.

"We set out with a vision of a dream home that was inspired by our holidays in Bali and the Whitsundays and also, time spent in the Snowy river country of NSW," she says. "There were all sorts of aspects that we wanted to include, for example, the colours of the snow gums, an open and flowing home, a sumptuous bathroom.

The use of sustainable materials in the home has motivated the owners to use only environmentally-friendly cleaning products.

> “The most important thing is to live environmentally and to be happy”

A plunge pool is located in the light-filled central courtyard.

“We realised, after looking at magazine spreads and finally, another house that Tone had designed, that you could live in a beautiful stylish house that could be sustainable,” she says. “Style and comfort have not been compromised.”

Wheeler says that he and partner, Jan O’Connor, set out to design houses that are “beautiful and easy”. “The most important thing is to live environmentally and to be happy,” he says.

The home’s aesthetic appeal is obvious. Furnishings and finishes borrow from Australian nature; snow gum beiges, creams and olives, an array of different woods and stones.

Spindler points out that most lights are hidden behind recesses and mood lighting is achieved through dimmable fluorescents.

A gas fire has a “ceremonial and practical application”. Compressed strand-woven bamboo, an extremely hard material, is used on the stairs, landing and in the office.

A 12,500 litre water tank under the house serves the garden and outside tap outlets.

Spindler says the home has motivated them to use environmentally-friendly household cleaners. “We had previously used standard household chemicals but we are now looking for cleaning products that are responsible and sit within our environmentally-aware way of living,” she says.

Spindler and Nyman specified the garden be “drought-proof and low-maintenance” and that the selection of plants would connect the yard and the lagoon/park area. Another motivation was to “encourage the prolific and wonderful birdlife from the lagoon”.

Some of the plants include Grevillea Honey Gem, Backhousia Citriodora, Hibiscus Rose-Sinensis Hedge, Bush Dawn and Kangaroo Paw.

Both Nyman and Spindler enjoy the nearby beaches, nominating Freshwater as their favourite.

Solar louvres made from coloured steel over the back verandah are set at a certain angle to direct winter sun deep into the lounge/eating area and are also contoured to ensure summer sun is directed away.

Spindler, a fire-fighter, is a keen triathlete and Nyman is an accomplished ball-room dancer who enjoys the fitness that swimming and running on the beach affords. "We both love the beach and make the very most of living right near it," Spindler says.

Designer: Environa Studio. www.environastudio.com.au
Project team: Tone Wheeler/Jan O'Connor/Gavin Gillett
Builder: Andrew Soutar Constructions
Location: Curl Curl, NSW
Photographer: Tim Wheeler
Features:
- High thermal mass using concrete and Hebel block
- Bradford walls and roof insulation
- Rinnai instantaneous gas water heater
- 12,500 litre rainwater tank
- Matrix external cladding, Colorbond roofing and walling, stone floor finishes, Caesarstone bench tops, plywood joinery
- Energy-efficient showerheads and tapware
- Jetmaster gas fire