

sanctuary

Sustainable living with style

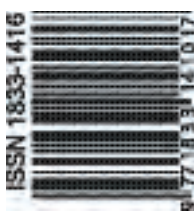
15 **STUNNING**
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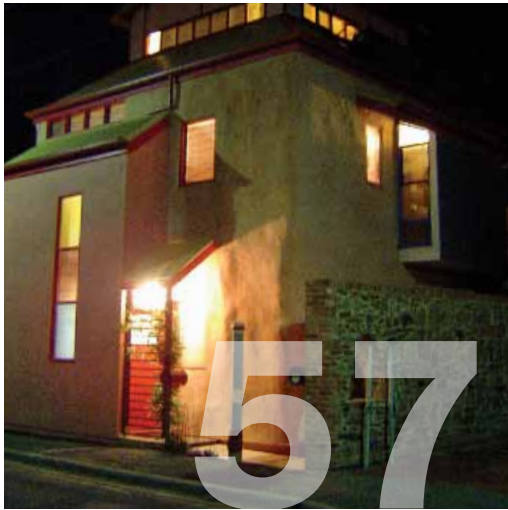
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Editorial

For most of us, our homes are more than a roof over our heads – it is the place we share with family and friends, a place of joy and comfort. Our growing concern for our environment has led us to take simple measures like putting out the recycling and saying no to plastic bags. But one area that is often overlooked is the way our homes are built and how they operate.

No longer simply the domain of people living in rural areas or ‘alternative’ lifestylers, sustainable homes are starting to make a big impact. Maybe it’s because you no longer have to compromise on comfort or style; a sustainable home will actually increase your level of comfort and ease the strain on your hip pocket.

In *Sanctuary*, we have brought together fifteen of Australia’s leading practitioners of sustainable house design. With their cutting-edge ideas, these homes are an inspiration to anyone wanting a building that lessens the impact on our environment. From the windswept Tasmanian countryside to the bustle of inner-city Sydney and the tropics of Cairns, these houses showcase the very latest and most stylish innovations.

Even if you are not considering building your own home, or commencing a major renovation, there are still a number of simple ways you can make your home more sustainable. *Sanctuary* contains a range of hints and tips to make it easy for everyone to have a comfortable, beautiful home. Simple solutions such as adding shading sails or installing energy efficient light globes can improve your home significantly.

As Dick Clarke, designer of the home showcased in *Reinventing the feel* points out, we can all make a difference for the better even when we make the smallest change to our homes. Why not use non-toxic paints when you need to give the home a new lick of paint?

I hope you enjoy the first issue of *Sanctuary* and are inspired by the beautiful homes, and I hope we have made it easier for you to create your own sustainable haven.

If you would like more hints and tips go to the ATA website www.ata.org.au or the *Your Home* website www.yourhome.gov.au for a store of information on sustainable building.

Donna Luckman
Editor

Publisher	ATA
Editor	Donna Luckman
Sub-Editor	Marni Cordell
Proofreader	Lisa Mariah – www.claritypoint.com.au
Contributors	Florian Yan Hilary Harper Christopher Moore Stephen Berry Olivia Neville-Smith Frith Kennedy Lance Turner
Advertising	Kylee Smith Olivia Neville-Smith
Brand Consultant	Glyn Cryer – Tiko
Designer	Damian Monaghan – www.giraffe.com.au
Printing	Custom Press
Print Production	Caidex Print Management
Photography	Robin Sharrock – Cover photo David Johns Stephen Berry Mirvac Group Caroma Sustainable Pty Ltd Tim Wheeler – Wheeler Studios Chris Rowett Barwon Water Rob Little – Rob Little Digital Photography Denys Finney – visual media Neco – the eco hardware store Ozone Tropical Designs John Maitland Philips Lighting (a division of Philips Electronics Australia Limited) Walter Glover – Universal Magazines Richard Stringer

Advertising enquiries
Olivia Neville-Smith
Telephone 03 9415 2106
Olivia@ata.org.au

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Gordon & Gotch

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ABN 57533056318
PO Box 2919
Fitzroy VIC 3065
Telephone 03 9419 2440
Facsimile 03 9419 2441
sanctuary@ata.org.au
www.ata.org.au

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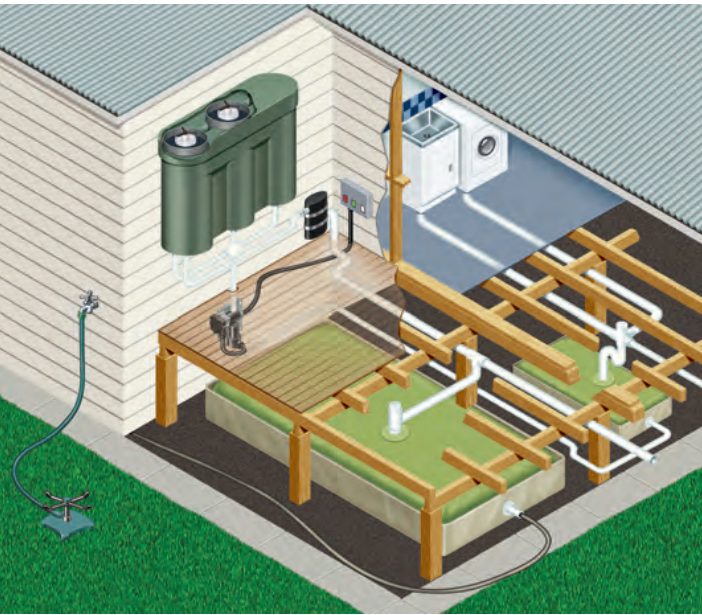
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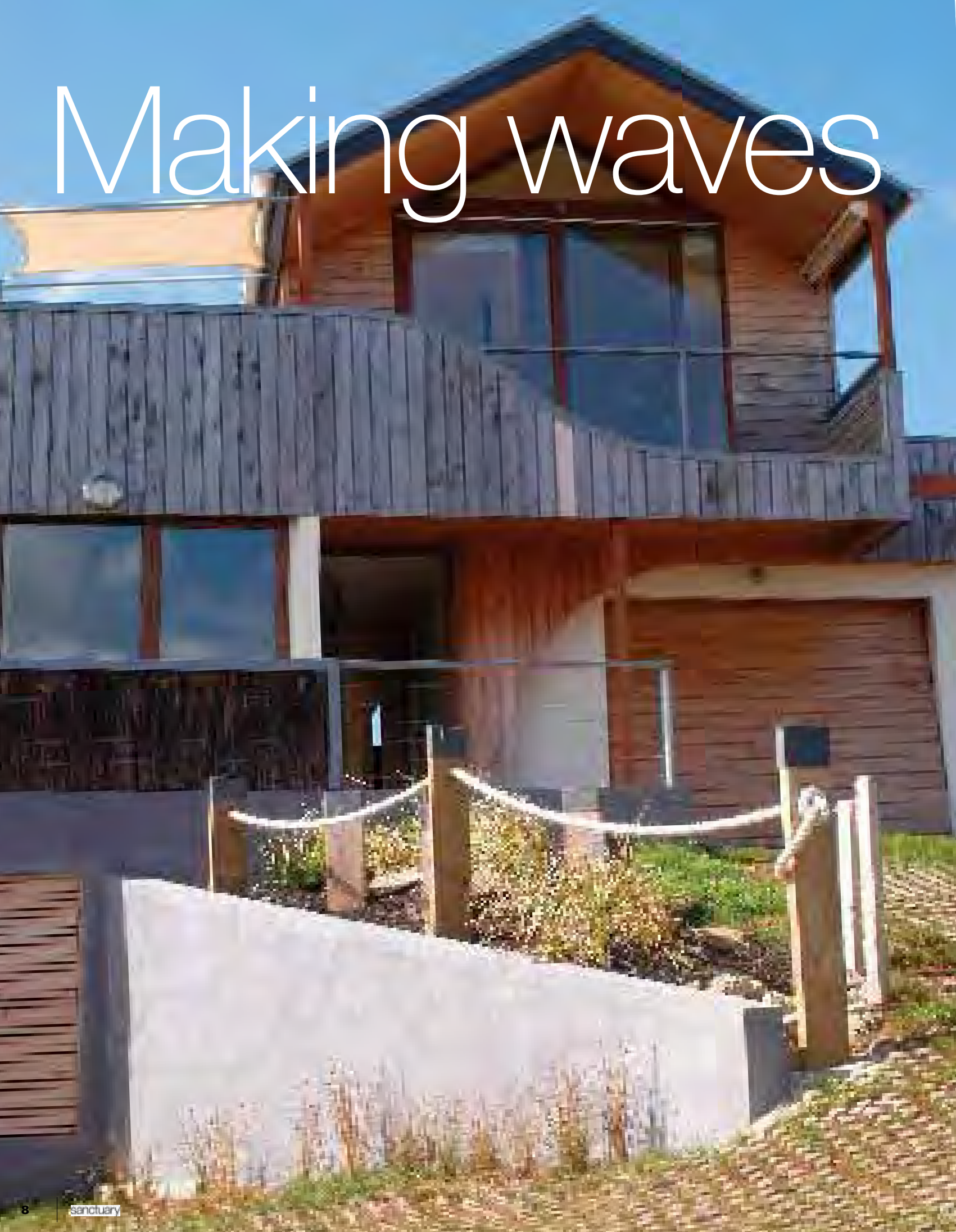
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Making waves

Even the garage has been designed to blend in with the landscape. Every angle has been considered in this entrancing beachside home.

The clean, white walls and harmonious timber finishes provide a complimentary foredrop to the mesmerising views.



“We wanted the house to have a ‘sense of place’. We wanted it to reflect the movement of waves and the shape of sand dunes,” says Bradford of his parent’s house on the beachfront at Port Fairy in Victoria. “It was very important that the design was sympathetic to the landscape.”

David, Judith and Bradford Phillips’ home is in the kind of location that makes most of us sigh and go dreamy-eyed. On the edge of the small town of Port Fairy, about 25 minutes west of Warnambool on the Great Ocean Road, the house has breathtaking views of the ocean, the historic Griffith Island

lighthouse, the Moyne River tributary, the reef lying out yonder and beautiful Eastern Beach with its characteristic Norfolk pines.

It would have been possible to build any kind of house in this magnificent spot and still enjoy the views. But Bradford, who was the driving force behind the sustainability features of the house, believes that **“our dwellings reflect our social conscience”**. For him, it was far more fulfilling to build a site-responsive, minimum-impact house that blends with its surroundings.

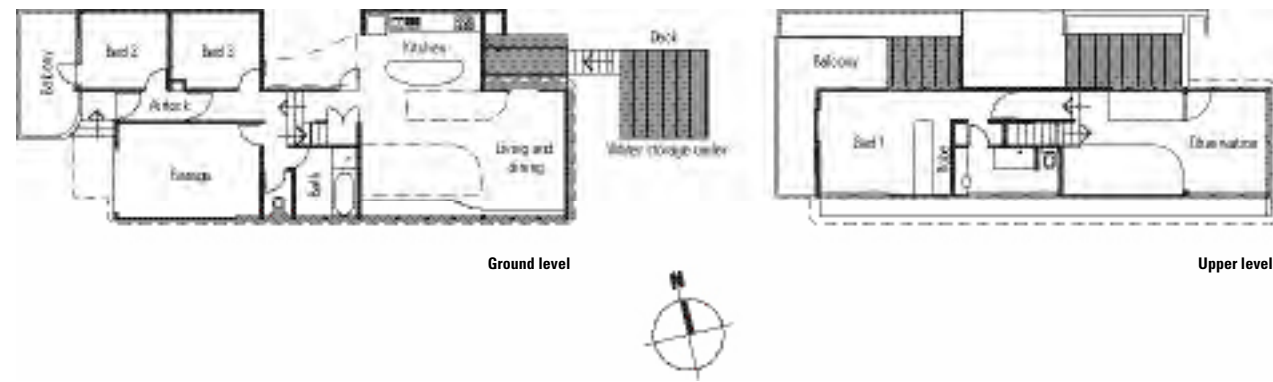
Bradford’s interest in energy efficiency and

sustainable design comes from a belief that we have become disengaged from the natural environment. He was also aware of the long-term financial advantages of energy efficiency on both a personal and community level.

The family owned the property for 50 years before they decided to subdivide the site. It created two beach frontage blocks, and a third one that faces the street. Part of the land was required for a shared driveway and was designated common property. A further 139 square metres, adjoining a road reserve, was donated to the local council. This



The beautiful sugar gum floors were sourced from plantations, and recycled hardwood Victorian ash and jarrah were used for the furnishings.



The soft grey of the Cypress macrocarpa cladding helps give the house its natural look.

“We wanted the house to have a ‘sense of place’. We wanted it to reflect the movement of waves and the shape of sand dunes”



formed public open space, which is a subdivision requirement. David and Judith kept a beachfront block of 473 square metres for themselves.

It was planned from the start that the houses on the two beachfront blocks would share a party wall and sympathetic designs, so certain covenants were placed on the adjoining block before it was sold. Building designers Andreas and Judy Sederof from Sunpower Design were engaged to turn the Phillips’ visions and desires into reality.

Constructing the double-storey house required little site excavation as both the building and

driveway followed the sand dune profile. Cypress macrocarpa cladding was used on top of rendered Hebel AAC block walls for a natural look. **“Cypress macrocarpa comes from windbreak plantations on many Victorian farms.** It weathers to a soft grey and needs no ongoing maintenance for at least 15 years,” says Andreas.

One of the most striking features of the house is, of course, the windows, and not just because of the breathtaking view outside. The imaginative window shapes were part of the design brief given to Andreas and Judy. “I don’t think that the view

is diminished by limiting the window size,” says Bradford. “In fact, we feel that the views are much more focused by being framed, and through the careful placement of smaller windows that are also more thermally efficient.”

Another distinctive design feature is the creative, wave-like, stepped roofline. “The roofline is the most visible element of a dwelling,” says Bradford. “And we wanted it to be original.”

Inside, the clean, white walls and harmonious timber finishes provide a complementary foredrop to the mesmerising views. Low toxicity finishes

were used wherever possible, including Berger Breathe Easy paints and Porters limewash for the walls, tung oil for the floors and Becker Acroma low-VOC sealers for the timber finishes.

Great attention was placed on timber use throughout the house, so that no old growth or rainforest materials were used. The beautiful timber floors are sugar gum from plantation sources near Camperdown and are very hard-wearing. The building frame is plantation pine and the architraves and skirtings are finger-jointed pine. All cabinet finishes are from New Age Veneers or

are recycled hardwoods such as Victorian ash and jarrah. The exception is the Canadian cedar that makes up the window frames, as Andreas could not source an economical alternative that had a durability of over 60 years.

Andreas has broken up the upper floor area with mezzanine spaces that not only maximise natural light and access to views, but also create vertical thermal chimneys, which allow air to circulate freely between the living areas upstairs and down.

Internal temperatures are also regulated by high thermal mass from the ground floor concrete

slab, together with good polywool-batt insulation and double-glazing on all windows. The interior temperature ranges between 18 and 26 degrees Celsius.

In summer, large external shade sails and drop down blinds are fitted to the northern and western windows for solar protection. **Sashless sliding windows or casement windows enable large volumes of uninhibited airflow, and cross-ventilation through the building** is further enhanced by the aligned front and back doors.

The garage and driveway display the same



sensitive design and philosophy as the house. The shared driveway has been laid with Hume BG slabs (concrete grass pavers) interspersed with lawn. Seventy per cent lawn to 30 per cent block reduces run-off and heat reflection. The garage has been covered over with fill from the site excavation, then planted with native grasses and creeping pigface. "Garages are often a blight on the landscape, especially on the coastal landscape," says Bradford. "The earth-covered garage was an attempt to minimise its visual impact."

David and Judith hadn't previously lived in a house with high environmental credentials, but they are now enthusiastic supporters. David notes that the house is much more comfortable, and therefore relaxing, because of its high thermal performance.

Asked for his advice to anyone planning to build a sustainable home, Bradford recommends a thorough investigation of the most recent technologies, a preparedness to provide your builder

Low toxicity finishes were used wherever possible, including Berger Breathe Easy paints and Porters limewash for the walls, tung oil for the floors and Becker Acroma low-VOC sealers for the timber finishes.



The house is designed to allow cross ventilation; together with the insulation and double-glazing this keeps the temperature inside below 26 degrees.

with information on these new technologies, and, where applicable, getting help from your building designer or architect for any subdivision processes, to ensure the most sustainable outcome.

Looking out the windows at the deep blue of the ocean and the peaceful coastline, one cannot help but be glad that individuals like David, Judith and Bradford are taking a personal stand to promote sustainable living. It's so refreshing to find home owners who are committed to the environment, that one almost forgets to be envious of their magnificent home. ➡

Designer: Sunpower Design Pty Ltd

Builder: Ross McLeod

Location: Port Fairy, Victoria

Features: AAC blockwork and cypress macrocarpa cladding

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Keoghs Creek, Tasmania. Photo: Philip Sloane

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Touching lightly

Sleek, suave and sustainable: the Design Studio says it all.

Queensland designer Brett McKenzie strives to integrate architectural form with a philosophy of 'touching the earth more lightly'. This approach is markedly evident in his 'Design Studio' display home, above the seventeenth hole of the golf course at Brookwater, a residential community integrated into a Greg Norman-designed course in outer Brisbane.

The site had great views and a peaceful bush setting, but the dramatic 14-metre gradient, and the

site aspect, presented Brett with a few difficulties.

"The key challenge of the site is that the longest element is to the western side," he says. "We ended up using a masonry blade wall to take the brunt of the western-side elements, protecting the house and providing a very solid connection to the earth."

The house was designed as two pavilions, one set below the other on the hillside, and joined by a short staircase and corridor. Excavation of the site was minimal, done only to create access to the

block from the street, and for the foundations. The fill from excavation was then used to level out the area between the two pavilions.

The bedrooms occupy the double-storey upper pavilion, while the main entertaining areas are in the lower pavilion. The stairwell to the master bedroom acts as a thermal flue, with a mechanical ceiling vent that can be opened in summer to release hot air, and closed in winter to allow heated air to circulate back through the house.

"We've turned that negative space into a hard-working positive space that takes cool ventilation through the home," says Brett.

Concrete polished floors and the masonry blade wall provide thermal mass. However, the rest of the house is made with lightweight materials to suit the sub-tropical climate of southern Queensland.

There was a strong emphasis on using recycled materials, materials with low embodied energy, and timber from renewable sources. "There's a certain

“We built this home to show people they don't have to forgo comfort to achieve sustainability”

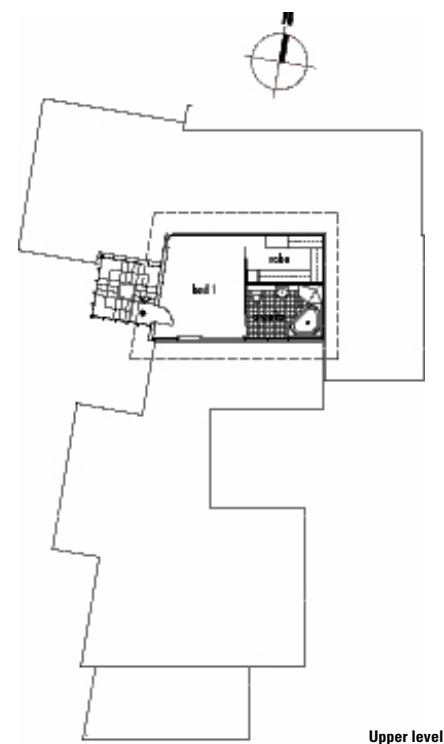
Recycled timbers and polished concrete give the floors extra style.



stigma about reused and secondhand materials; that they have no value. Actually, a lot of recycled materials have a much higher value because of the character that comes with age," Brett says. "For example, we've used recycled timber planks for the external decks to give them a chunky boardwalk effect."

Hot and humid summers mean that good solar protection and passive cooling are essential in Queensland. The interior was shaded by adjusting





Upper level



Ground level



Master bedroom stairwell acts as a thermal flue, with a mechanical ceiling vent that can be opened in summer.



the height of the walls, keeping the pitch of the roof low, and widening the eaves to 900mm. The wide eaves also give an architecturally pleasing depth to the house. Low-emissive glass reduces heat transference through the windows.

"Sustainable building design also involves taking into consideration the natural air flows of the site, and constructing the house in a way that takes advantage of these through passive ventilation,"

Brett says. Louvers on the windows direct breezes into the house, and a stunning plunge pool and other water features outside the windows provide evaporative cooling.

Household water is to be recycled through grey- and black-water systems which Brett estimates will reduce water consumption by around 60 per cent. Rainwater is collected on the roof and stored in tanks under the floor of the lower pavilion.





Water features near windows cool the air as it flows through the house.



AAA-rated showerheads and water efficient taps have been fitted throughout the house, and ten photovoltaic panels provide renewable energy.

Brett's achievements in the Design Studio have been recognised with numerous industry awards, and he hopes the house will continue to showcase the principles and benefits of green design. "We built this home to show people they don't have to forgo comfort to achieve sustainability," he says. ←

Designer: Sustainable Pty Ltd

Builder: BV McKenzie Building P/L

Location: Outer Brisbane, QLD

Key Features: 25,000 litre rainwater tank

6000 litres grey-water system

1.5kW grid-connected photovoltaic power system

Low-emissive coated windows

Recycled timber and polished concrete floor



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Window Shopping

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Windows are a beautiful feature of our homes, providing us with light, fresh air and wonderful views. They allow us to maintain an important connection with the outside environment, but windows can also compromise our internal environment. Poorly planned or wrongly sized windows can either let in unwanted heat, or hamper the flow of fresh air into your home.

However, thanks to some clever new technologies, windows no longer have to be a compromise between getting enough light and keeping the house at a comfortable temperature. Some types of glass can help make your windows more energy efficient.

Tinted or toned glass is coloured glass that acts like sunglasses to reduce the amount of heat and light entering your home.

Reflective glass has a coating that reflects heat and light away from the window. **Double-glazed** windows are window units with two panes of glass and a sealed air gap in between. These are far superior to single-glazed windows for insulating your home.

Low-emissive (low-e) glazing is a glass coating that blocks radiant heat transfer (heat waves given off by hot objects). It acts like a ‘heat mirror’, reflecting heat back into a room in winter, while letting sunlight in from outside.

Spectrally selective glazing allows some wavelengths of energy to pass through but reflects others; for example, it will transmit light but not heat. It is often used for warmer climates or west-facing windows when trying to minimise heat from the sun.

If you’re wondering whether the added cost

of improved glazing is worthwhile, then consider this: compared to single-glazing, a double-glazed window could cut your heat loss in half.

To help you make the right choice, the Window Energy Rating Scheme (WERS) rates the energy performance of windows and gives them a star rating according to their heating and cooling performance. Look for the WERS label when selecting a window and choose the window with the highest star rating for your climate and budget.

Frames

Another important factor that affects your window performance is the type of window frame you use. Basically, if your framing material is a good heat conductor, it will let the heat in during summer and let the heat escape during winter.

Just by touching different window frames you can feel the difference; is it a lot hotter or colder than the room? Aluminium frames are not very good conductors and dark coloured frames in full sun can become hot to touch. Examples of frames with good insulating qualities include timber frames (though these require regular maintenance), aluminium frames with thermal breaks, ‘combination’ frames that have aluminum on the outside and timber on the inside, and PVC frames.

For more information:

Window energy rating website
www.wers.net

Your Home website
www.yourhome.gov.au



Window tips

- Large north-facing windows are ideal as they catch the winter sun but can be easily protected from the summer sun.
- Protect your windows from excessive sun with external shading.
- Use improved glazing such as double-glazing or spectrally selective glass.
- Check the energy performance rating of windows.
- Choose frames that have good insulation properties.

Comfort zone

With its cut and polished urban allure, this zone-arranged home is designed for simply living.

There is a common misconception among prospective home owners and renovators that environmentally sustainable design, and cutting-edge, residential architecture don't make very compatible partners.

But with this west Sydney house, architect Tone Wheeler has proven that a sustainable house doesn't need to be clunky and utilitarian. Employing clean, minimal lines and robust materials to complement sound environmental principles, Tone has created a house that is both sharp and relaxed.

While its neighbours almost exclusively are solid brick, Tone finished the house in fibro sheeting, making it "a little bit more industrial, a little bit more contemporary."

"Most of this existing subdivision is brick and tile. They are houses that are following a tradition from the 1890s," explains Tone. This house is different. Internally, small touches like expressed steelwork add to this gritty, urban feel.

The home owners wanted a low-maintenance house that would cater for the needs of their large family and many visiting family and friends.

The house is made up of two separate pavilions with the living, dining and kitchen in the northern pavilion and the bedrooms and rumpus room in the pavilion running parallel to the edge of the site, facing north-east. **It is reminiscent of the great Aussie holiday home with its separated living and sleeping dormitory.** "By splitting into those different zones you can actually run the house [more sustainably]," says Tone. The notion of 'lifestyle' is at the very crux of his design philosophy: "The key for me in designing a sustainable home is to think about it as a lifestyle; not to think about the house, but about how people can live in that house."

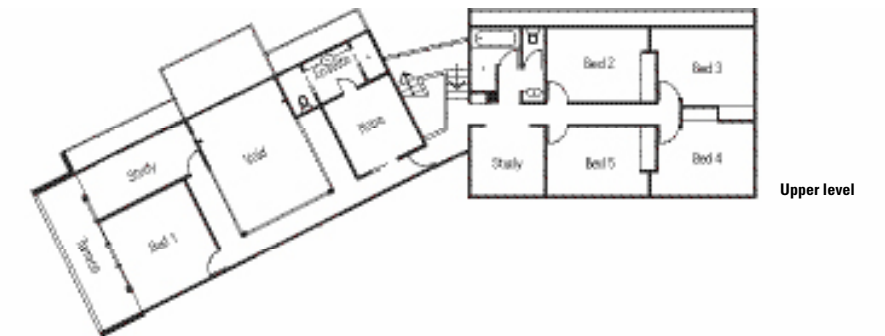
The hub of the home is the dining room, oriented directly north with double-height doors and glazing,



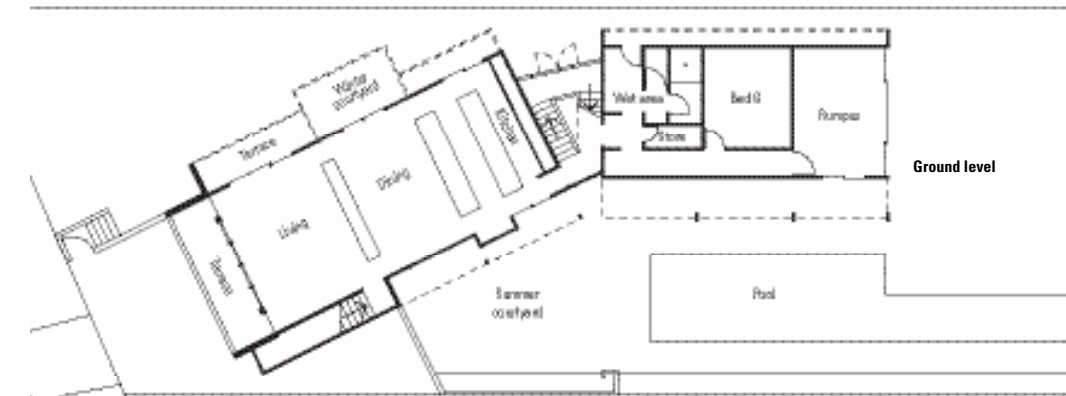
The hub of the house, the dining room, faces north to make the most of natural light and warmth.



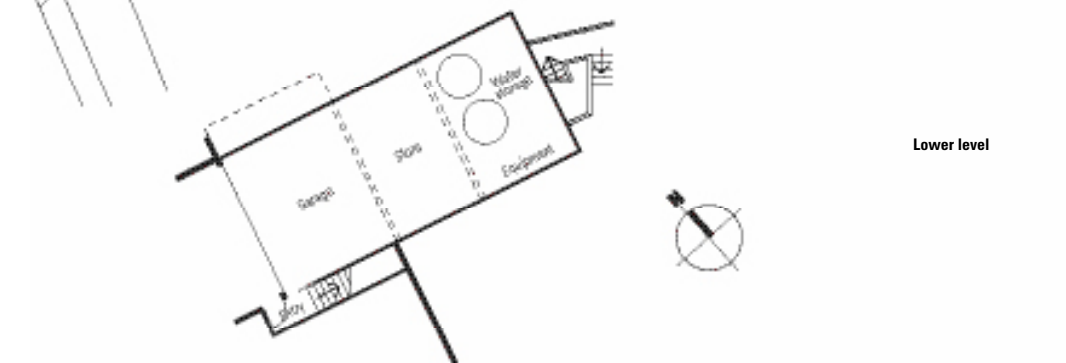
“The key for me in designing a sustainable home is to think about it as a lifestyle; not to think about the house, but about how people can live in that house”



Upper level



Ground level



Lower level



The separation of the living areas from the bedrooms gives the home a 'beach house' feel.

Contemporary design coexists with sustainable principles.

allowing maximum solar penetration in winter. A short eave is in place to provide protection from the high summer sun. On the west side of the building, the windows are Opti-float glass tinted to reduce solar gain. Doors are located all around this space to allow extensive cross-ventilation in the warmer months. In fact, Tone points out that **almost all the glazing in the house is on doors, rather than windows, which can be opened outwards.** The house is insulated throughout and double insulated in the ceiling.

The floor of the house is polished concrete on a concrete slab which lends the living spaces a funky, contemporary feel, as well as providing thermal

mass as it stores and holds warmth in the cooler times and slowly releases that warmth throughout the day. Solid internal walls and the fact that the home has been nuzzled into a small hillside also help keep the house warm in winter. The hill acts in the same way that a heavy or dense internal wall would, storing heat during the day and releasing it slowly. The floor has also been wax-sealed to ensure no gases are released from the concrete or sealant.

Tone has extended the polished concrete floors outside to the courtyard areas so that on warm summer nights, with the large glass doors opened, the family can dine or entertain in the courtyard.

The architect has softened the impact of the concrete in the garden by edging the terraces with Australian native plants that require little watering. Rainwater collected from the roof is used to keep the grass green. Tall trees have been planted along the southern boundary of the property to provide privacy from the neighbours and give the house a sense of seclusion.

The home owners are delighted with the finished product and love the fact that it's just so easy to live in. They had a list of environmental concerns that had to be addressed in the design of the building, but they also wanted a house tough enough to handle the kids and big enough to cope



The upstairs windows create a stack effect that draws out the hot air on summer nights.



Period piece

From historical to spacious and functional, a single storey 1880s home moves onwards and upwards.

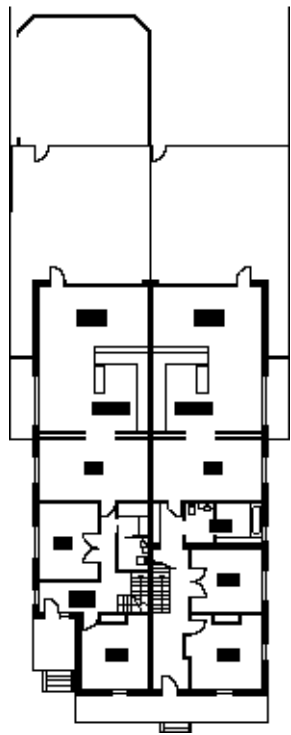
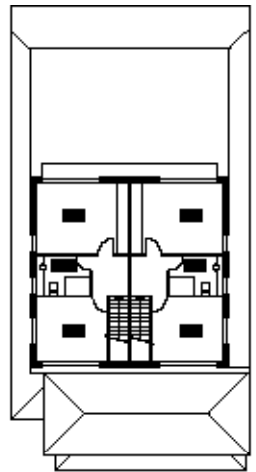


with guests. They insisted on solar hot water and collecting rainwater for reuse, but it was only after talking with the architect that they became aware of some of the simpler issues like orientation, passive solar gain and thermal mass. The house is easy to keep clean with just water and a mop, and light and warm enough to be comfortable all year round.

This house represents a way forward for all those who want both a groovy city pad, and a green-friendly residence. ➡

- Designer:** Tone Wheeler
Builder: Inten Constructions
Location: Sydney, NSW
Key Features: Fixed eaves for shading
Laminated and tinted windows
30,000 litres rainwater tank
Solar hot water
Stack cooling system

The polished concrete is so warm and beautiful, plans for a timber-covered floor were dropped.



So you're interested in environmentally sustainable design, you've done your homework and you think you know what's achievable. You've visited the displays and you've read up on the subject on the internet.

But you want to live in an established suburb, with strict development restrictions, in cool/temperate Melbourne. You've got teenage children. You've bought a 120-year-old house with two substantial renovations added to it. It sits on a long narrow block facing the wrong way. Sounds like too much of a challenge, doesn't it?

Well this 1880s home in outer-Melbourne Kew proves that it's not.

Designed by David Oppenheim from Sustainable Built Environments, the project accommodates **two double-storey townhouses that have been fully renovated, extended and retrofitted.**

"The development has been an amalgamation of an existing single storey, two-room 1880s building that was retained at the front of the property, with the new, two-storey section at the rear of the property to the north," David explains. "The scheme was developed on a site that has a historical overlay, and a local community concerned about how new developments would impact the feel of their neighbourhood."

David was very aware of the difficulties, but optimistic and prepared for the challenge. "Town planning issues were considerable. The local community are intensely anti-development, particularly regarding two-storey and multi-dwelling projects," he says. But the neighbours' concerns were allayed with careful planning that ensured overlooking was minimal and the heritage integrity maintained. Communication was the key to keeping all interested parties happy.

The owner, Perri, is delighted with the results: "It's all one beautiful, big space," she enthuses. "I love spaces with light. I like being able to see the

garden from the inside."

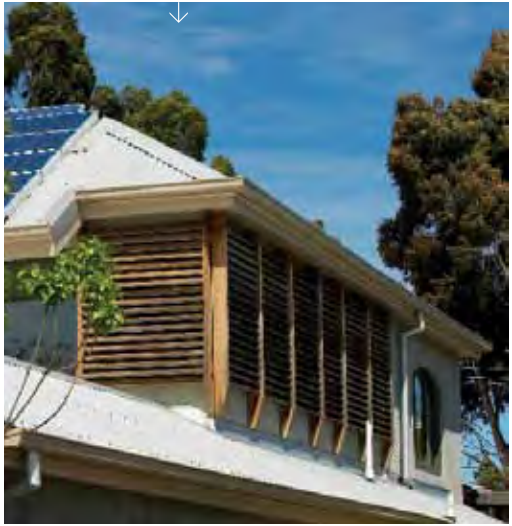
The original house has been subdivided through the middle on the north-south axis so both townhouses have access to the northern sunshine, a separate street address and a separate entrance on the main road, with rear lane access for parking. Each house contains four bedrooms, two living spaces and a dining area. Living spaces and the main bedrooms were placed on the north (ground and first floor respectively) with other bedrooms and ancillary spaces behind. One of the townhouses utilises the original entrance while the other has a new entrance on the left of the facade.

“I love spaces with light. I like being able to see the garden from the inside”

The townhouses have their own solar hot water and solar power systems.



Recycled wood blinds protect the windows from the westerly sun.



The ground floor is a concrete slab and the first floor is a suspended concrete slab, warming during the day and releasing its heat during the evening in the cooler months. Perri wanted a timber-covered floor but has warmed to the natural concrete. "The concrete floor was originally meant to have timber over it, but we decided once the concrete was done we might live with that for a while, and it is just so beautifully warm. It doesn't get cold!" There was more to worry about than simply keeping the house warm in winter. "With teenage children, quiet was a premium for me. **Double-glazing has cut out noise in terms of trams and traffic outside**, and the

(suspended) concrete slab cuts out a lot of noise from upstairs."

David has also tried to use recycled, recyclable and renewable resources wherever possible. "In this house, we've used a lot of recycled timber. All of the external decking is recycled jarrah. The window frames, and this is quite unusual, are made from recycled hardwood."

The roof was constructed using corrugated steel. This was lined internally with plasterboard and double-thickness polyester insulation batts. The overall insulation value of this was estimated at R6.5. Insulation is rated for its thermal properties



The top of the 10,000 litre underground concrete tank is an attractive feature of the entrance walkway.

With help from a landscape designer, Perri has built a no-water garden that incorporates drought tolerant plants.



and R6.5 is very high indeed. The slate roof on the existing house was restored, and the new first floor roof was lined with recycled slate for visual continuity.

Each townhouse has its own rainwater system. Rainwater is collected off the roof and fed to downpipes that have individual first-flush diverters. The downpipes feed into an underground 10,000 litre concrete tank. There are two taps on the kitchen sink, one supplied from the tank, and one from mains water. An automatic town water top-up system has been installed so that the tanks will not run dry, requiring the pumps to be re-primed.

Whether you are starting from scratch or retrofitting an older house, the basic principles and concepts of energy efficiency and environmentally sustainable design remain the same. It is sometimes said that the best thing an architect can get from his client is a tight brief. The good ones know how to respond creatively to these restrictions. In this instance, David Oppenheim has created a house that operates almost subliminally, so effectively have these principles been applied. 🏡

- Designer:** Sustainable Built Environments
- Builder:** Summit Builders
- Location:** Melbourne, Victoria
- Key Features:**
 - Solar hot water
 - 0.96 kW grid-connected photovoltaic power system
 - 10,000 litre rainwater tank
 - Double-glazed windows
 - Recycled timbers

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Living on the driest continent on earth, most Australians are aware of the need to save water. Rather than waiting to renovate or buy a new home there are some simple measures you can take now to reduce your water use and bills.

Probably the simplest thing you can do is to fix any leaking taps. A tap leaking at the rate of one drip per second will waste more than 12,000 litres of water a year. There are also numerous tap fixtures that reduce water wastage. Flow regulators control the amount of water coming out of the tap. You can buy taps that have in-built flow regulators or you can install a regulator into your existing taps. A lot of water is wasted trying to get the temperature right, before getting in the shower. To stop this waste, **install mixer taps, which allow you to pre-select your temperature.**

Another easy way to save water is to install an efficient AAA showerhead. They cost the same as conventional showerheads but save hundreds in water bills and can come with additional features such as massage, self-cleaning and flow cut-off control.

There is nothing more irritating, or wasteful, than a leaking toilet. A visible leak can waste over 95,000 litres a year. Most modern toilets are dual flush, but if you have a single flush toilet place a water displacement device in your tank or have a plumber adjust the flush volume of your cistern.

When buying a new washing machine or dishwasher, choose a water efficient model. Front loading washing machines use less water and less detergent. From July 2006 it will be mandatory for all washing machines, dishwashers, toilets, showerheads and most taps to carry a water-rating label. Toilets will be subject to minimum water efficiency requirements. The label gives the appliance a star rating and a water consumption figure.

A simple check for leaks and a couple of cheap fixtures can save thousands of litres of water, and save you money. Many state governments also offer cash rebates on water-efficient purchases so check with your local environment agency to save more money.

For more information:

Water rating website
www.waterrating.gov.au

Water saving website
www.savewater.com.au

Your Home website
www.yourhome.gov.au

Water saving tips

- Fix leaking taps and toilets.
- Install water efficient shower, toilet and tap fixtures.
- Choose water efficient washing machines and dishwashers.
- Try to wash only full loads of laundry or use the economy cycle.
- Wash cars and bikes on the lawn so that the grass is watered at the same time.

With a AAAA rating the Caroma Smartflush toilet only uses 4.5 litres per full flush.



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Hamlyn Heights, Geelong. Melway Ref: 441 D6

Phone: (03) 5278 6781

Open: Saturday, Sunday and Monday, 12-5pm



For more information on Sharland Oasis, contact Barwon Water on 1300 656 007 or visit www.barwonwater.vic.gov.au/sharlandoasis



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An inspirational oasis

A cutting-edge display home sets
a stylish example for the water and
energy conscious.



So simple but effective, internal blinds help keep the house cool.

As the largest regional urban water authority in Victoria, Barwon Water knows a thing or two about the effects of water shortages on both city and small town communities. After all, the 250,000 water users on its books include residents of ever-expanding Geelong and dune-dwellers enjoying the surfing life in the small towns that hug the rugged Great Ocean Road.

But rather than merely preaching water conservation and sustainability, Barwon Water decided to lead by example, and design a display home that incorporates all the water and energy saving ideas it could muster under the one roof.

The authority enlisted the services of Mark Sanders, an architect with local firm Third Ecology, and briefed him to create an ecologically sustainable display home that would inspire and educate home makers, giving them a raft of practical ideas to take away and employ in their own homes.

Located in Geelong, 'Sharland Oasis', as the house is known, is part of a water-sensitive urban subdivision developed by Barwon Water as part of its commitment to the Water Resources Development Plan (WRDP), an initiative that aims to reduce water consumption by 15 per cent over the next two decades.

In designing the double-storey house, Third Ecology has combined passive solar design principles with a sleek, contemporary aesthetic. Externally, it boasts a sophisticated yet honest palette of materials and textures that includes dark brickwork, timber details and lightweight cement sheet cladding. **Inside, the mood is restful and welcoming with elegant timber joinery, neutral colours, polished concrete flooring and generous floor-to-ceiling views of the landscaped garden.**

The Sharland's first lesson is to show how rooms can be arranged to maximise northern light while still offering protection from the late afternoon sun,

which can be particularly harsh in summer. The architect has designed the garage, laundry, powder room, bathroom and kitchen as a linear west-facing zone that essentially protects the sleeping and living zones from the brunt of the afternoon sun.

The dining, living and outdoor deck areas have been skewed to face north and east, to benefit from the morning sun, while the bedrooms are oriented to the more subdued south-eastern light. Generous glazing in the main living areas ensures these rooms are flooded with the warm, low sun during winter, and external blinds and deep eaves are in place to protect the same areas

from the hot, high sun in summer.

Windows have been strategically placed to promote cooling cross ventilation, too, particularly in the open-plan living, kitchen and dining area. It is expected that the **inside temperature will rarely sneak above 26 degrees Celsius during summer, nor will it get much cooler than a comfortable 18 degrees in winter.**

Third Ecology opted for a concrete slab floor at ground level to create a passive thermal mass that would help stabilise internal temperatures all year around. By day, the slab will absorb the warming rays of the low winter sun and radiate this stored

heat back through the house when the sun goes down. The slab is made of 20 per cent recycled concrete aggregate, and even its steel reinforcing boasts 100 per cent recycled content. The cement contains recycled 'flyash' and 'slag', which are by-products of the cement production process.

All materials in the house were carefully chosen. The interior paint is non-toxic and water-based, and contains no dangerous organic compounds or solvents, and the kitchen and ensuite benchtops are made from reconstituted stone, cut and polished using recycled water. All the timber in the house is either plantation,

Plants range in their water efficiency depending on their location in the garden.



“Water-efficient plants including drought-tolerant varieties in the front garden and low-maintenance native shrubs and trees in the backyard, can be watered with rainwater or recycled household water”



The bathrooms and laundry are fitted with AAA-rated taps and showers and the toilets are AAAA-rated dual flush units.



One of the many types of rainwater tanks that Sharland Oasis makes use of.

The kitchen benchtops are made from reconstituted stone, cut and polished using recycled water.




sustainably sourced or recycled timber.

The key to energy efficiency, however, is ensuring that all the elements of a house work together as a team. There's no point having an effective thermal mass if the warm air is allowed to disappear through the roof or out through the windows. Because more than 30 per cent of heat loss and gain occurs through the roof, it makes sense to pump up the insulation as much as possible (think of it as a very warm hat on your head) so Third Ecology has used more than twice the standard amount of roof insulation.

The roof has also been designed to house solar panels for a photovoltaic power system and a solar hot water system, the latter fitted with instantaneous gas boosting. Even the pipes are insulated to reduce heat loss between the hot water system and the taps. So while the power of the sun is being channelled to provide comfort inside, it is also being harnessed to provide essential household services and ensure big savings on bills.

Windows are necessary for sunshine and natural

light, but they can also affect internal temperature. High performance double-glazed windows and timber frames (sourced from a certified sustainable forest) have been used to reduce heat loss in winter and heat gain in summer. The walls feature plantation timber frames with brick veneer at ground level, and lightweight cement sheet cladding on the upper level. Batts and foil-coated polystyrene foam boards have been used within the walls to provide almost double the insulation level of the standard home.

It will come as no surprise that Sharland Oasis also ticks the boxes when it comes to water saving. Barwon Water was well aware of the statistics: in the Geelong area, the average household water usage is 210,000 litres per year, of which only one per cent is used for drinking. This meant that most of the water used in the house did not have to be the high-quality drinking water provided by Barwon Water; it could come, instead, from rainwater collection and grey-water (recycled household water for use in the garden). 

“In designing the double-storey house,
Third Ecology has combined passive solar design
principles with a sleek, contemporary aesthetic”



The house has two 4500 litre underground concrete water tanks to supply the toilet, washing machine, dishwasher and outside taps. In times of severe drought, mains backup will automatically kick in so the household doesn't go without. The kitchen, bathrooms, laundry and garden are fitted with AAA-rated taps and showers and the toilets are AAAA-rated dual flush units. The primary source of water is on-site water tanks.

The Sharland Oasis's lush garden has been filled with water-efficient plants including drought-tolerant varieties in the front garden and low-maintenance native shrubs and trees in the backyard, which can be watered with rainwater or recycled household water.

The building process itself was a sustainable affair. Nearly 70 per cent of all building waste was recycled rather than sent to landfill sites. And the local waterways were also protected by using haybales to prevent fine silt and mud from washing into the stormwater system.

Barwon Water is justly proud of the Sharland Oasis. The stylish, comfortable home sets a fine example and is sure to inspire and educate many visitors in the future. Hopefully other local authorities and housing developers will follow Barwon Water's lead by undertaking regional and urban developments that show a sustainable way forward for all of us. ➡

For more information:

Barwon Water

www.barwonwater.vic.gov.au/sharlandoasis

Designer: Third Ecology Architects
Builder: Daran Constructions
Location: Geelong, Victoria
Key Features: Solar hot water
1.8kW grid-connected photovoltaic power system
12,500 litre rainwater tanks
3200 litre Rain Reviva grey-water system
Double-glazed windows and doors
Water efficient appliances, and fixtures
Plantation, sustainably sourced or recycled timbers

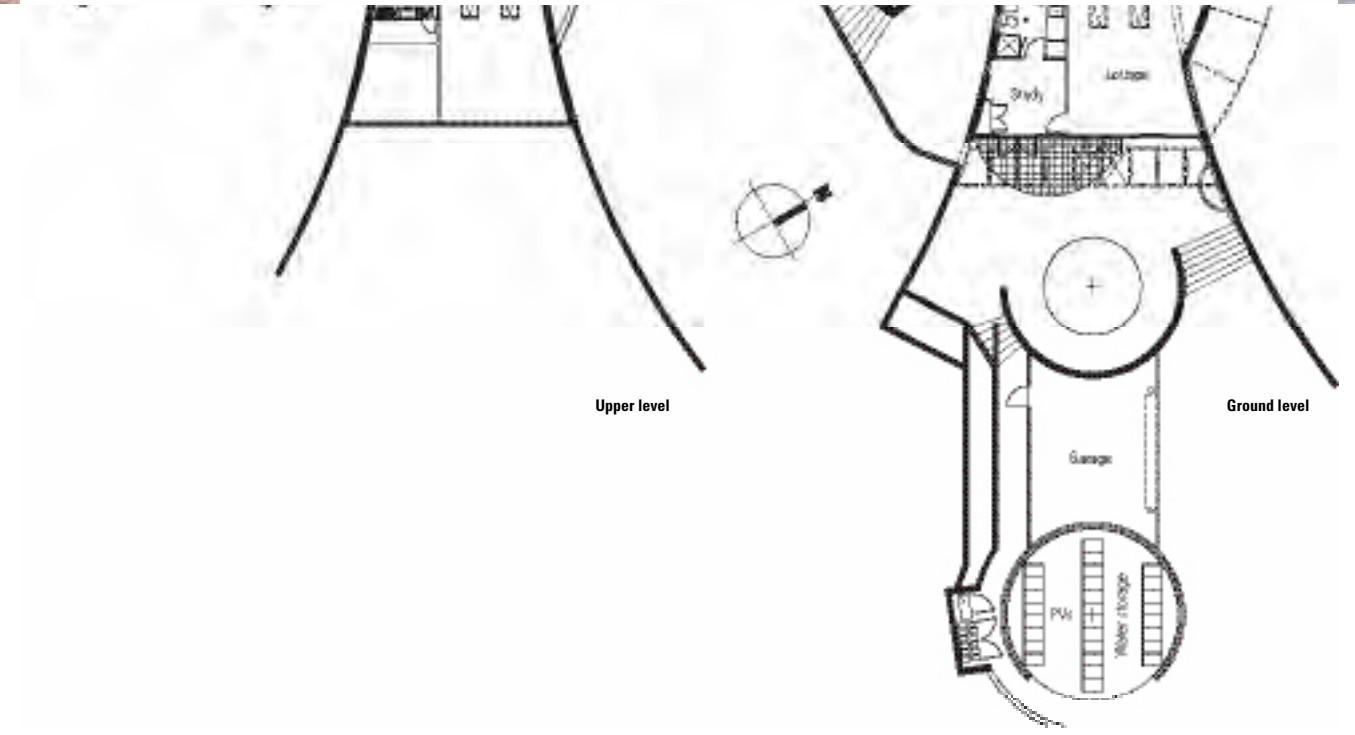
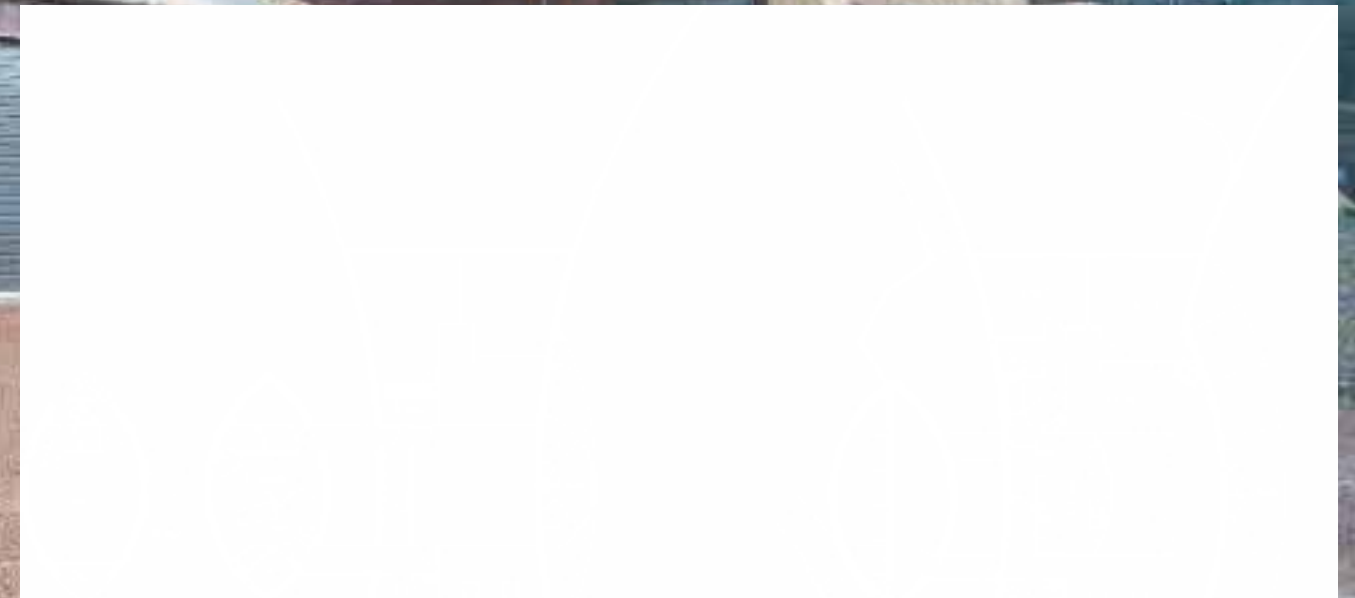


Of the earth

This house is the perfect antidote for anyone who is sick of the straight, the square and the conventional.

“You have to incorporate your sustainable design principles into the whole design concept”

A modern mud brick home, nestled in rural ACT.



Think natural forms. Think of flowing curves, and the rise and fall of hills. These are the things that come to mind when you first catch sight of this house designed by Tony Trobe from TT Architecture, located about 30 kilometres west of Canberra in rural ACT. Made from earth-coloured mudbricks and looking almost like an organic object that has grown from the earth, the house has excellent environmental credentials.

“I was quite lucky in that my clients were really committed to sustainable design principles,” says Tony. “They came with a few ideas but were very open to mine. They were willing to be quite adventurous, which encouraged me to be adventurous as well. From a design point of view it was very liberating.”

Having recently built an award-winning mudbrick building for the Tidbinbilla Nature Reserve visitors centre, Tony suggested using mudbrick to his clients. “It’s low in embodied energy and it seemed

an appropriate material considering the overall environmental themes of the house,” he says. The bricks were made locally and strengthened by adding four per cent cement to the mix.

Tony finds inspiration for design can come from a very simple thing. **“Sometimes the inspiration can come from the site, and sometimes it’s just a bit of playfulness.”** I wanted the house to look like it came out of the hill,” Tony says, and it certainly does. The curving walls and sloping lines of the house are a welcome relief from the monotony of rectangles and squares.

The main part of the house is contained between two long convex walls. Behind the main house is the parents’ retreat: a double-storey pod with a seed-shaped cross section. The upper storey is referred to as the ‘tower’ and contains a study with good views of the surrounding hills and greater Canberra. The pod is connected to the main house

via two elevated glass breezeways.

Inside, the kitchen and bathroom also feature smooth, flowing lines. **The interiors are rich with the texture of beautiful aged timbers.** Sourcing the material wasn’t easy, but the effort has been well worth it. Ironbark from the old Pyrmont Flourmill in Sydney, some of which is up to 100 years old, has been used for the lintels and structural posts. Red mahogany, a rare coastal tree that is now only available as recycled timber, was used for some of the floorboards. Recycled blackbutt was used for the rest of the flooring, as well as some of the joinery, and recycled brushbox was used for the external cladding. Where new timber had to be used, hoop pine from sustainable plantations was chosen. No reconstituted wood products, such as particleboard, were used, because of the harmful chemicals used to make them.

In Canberra’s climate, with its high diurnal



“I wanted the house to look like it came out of the hill”



fluctuations, very cold winters and hot summers, high thermal mass was an obvious design requirement. This has been provided by clay brick inner walls and a concrete floor slab, which ensure good regulation of internal temperatures in summer and winter. The house is also well insulated, with styrofoam boards under the slab, polyester batts in the ceiling and rockwool in the wall cavities, which were made wider than the standard to allow for a higher level of insulation.

Large north-facing windows at the front of the house maximise heat collection in winter, and are protected by adjustable shade sails in summer. There are only a few small windows in the south-facing walls, to avoid winter heat loss. The windows are all double-glazed, with 'combination' frames of external aluminium and internal timber. These frames don't weather as

fast as timber frames yet still provide as much insulation as full timber frames.

Summer ventilation comes from airflow through the large casement windows and doors on the north side of the house, supplemented by ceiling fans if necessary.

Because of its remote location, the house had to be self-sufficient. Water for a family of four is provided by a huge 20,000 litre stormwater tank. Twenty-eight photovoltaic panels have been mounted on top of the tank, and solar hot water panels have been fixed to the tower wall. Wherever possible, low energy appliances and fittings have been used, such as the fridge and lights.

A prototype bioseptic sewerage system was built for the house. Sewage from the house is macerated and then sent to a tank containing a reed bed, which filters it. The water from the reed



bed system is then treated by ultraviolet light and ends up good enough to be used on the garden. The system was used with great initial success. However, support services from the manufacturer have since stopped, so the bioseptic system will be replaced with another kind of septic system in the near future.

Sustainable design principles are a standard feature in Tony's houses. "It just makes sense. It's a good way of applying logic to a design," he says. But that doesn't mean that he lets these principles dictate or constrain his creativity. "I look at things holistically. **A house isn't just a machine for collecting heat or keeping cool. There has to be a human perspective to it.** In the seventies a lot of energy efficient houses were built which were great for collecting heat, but they were glary and you felt like you spent all winter squinting out of a dark box because of the low winter sun. Those kinds of houses weren't pleasant to live in. You have to incorporate your sustainable design principles into the whole design concept." ◀

Designer: TT Architecture - Tony Trobe
Builder: Ron Dowse
Location: Rural ACT
Key Features: Double skin mudbrick
Recycled timber
Double-glazed windows
20,000 litre rainwater tank
Solar hot water
Bio-septic grey-water system
2.5kW photovoltaic power system

Open space living areas provide uninterrupted views of the countryside.



Glass breezeways connect the pod, that contains study and master bedroom, with the rest of the house.

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All fired up about

Renewable energy

It's a term that's often bandied around, but what exactly is renewable energy? It is energy from sources that are naturally replenished and produce very few greenhouse gases when used, such as solar, wind and hydro power. In contrast, non-renewable energy, such as coal-generated electricity, comes from diminishing stocks of fossil fuels and produces large amounts of greenhouse gases.

You have many options for clean, renewable energy sources in your home. These range from sophisticated solar power systems, through to simply purchasing Green Power from an electricity supplier.

Solar hot water

If there's one thing Australia has an abundance of, it's sunshine. Solar power is powerful and free, so why not harness its energy for your advantage? Installing a solar water heater could be the single most effective way that you can reduce your energy bills. Water heating accounts for about 30 per cent of your total household energy use, so the potential difference that a solar hot water system can make is huge.

To provide hot water on cloudy days or when demand exceeds supply, most solar water heaters come with a gas or electric booster (a gas booster produces less greenhouse gases). Although the cost of a solar hot water heater is higher than gas or electric water heaters, you will make up for this with the savings you make on your electricity bill, and solar hot water systems generally have about twice the expected lifespan of electric or gas systems. Most state governments also offer a rebate to assist with the initial cost of the system. Contact your state government environment department to find out what's currently available.

Solar power

For the really committed, solar (photovoltaic) panels can be used to convert sunlight into electricity to power your home. Solar power systems can be connected to the electricity grid, so you can draw electricity from the grid when not enough power is being generated by the solar panels. When the sun is shining, the excess power produced by your solar power system can also be sold back to your electricity retailer.

Green Power

If setting up your own electricity-generating system doesn't appeal, you can still support renewable energy production by purchasing Green Power. Available from almost every electricity retailer in the country, Green Power is electricity generated from clean, renewable energy sources, such as wind, solar and hydro plants, as well as landfill gas, biomass and wave energy.

There are numerous Green Power options offered by retailers, but if you want to make a real difference, choose a product that has been government accredited and given the Green Power green tick. Accredited Green Power products are individually assessed to verify they comply with high environmental standards and that the electricity retailer purchases energy from new renewable sources. By buying new renewable energy you are helping to support the development of the renewable energy industry and reducing the demand for electricity from the burning of fossil fuels.



Look for the Green Power tick when purchasing green electricity.

Energy saving tips

- Install energy efficient lighting.
- Turn off sound systems, TVs and DVDs at the switch on the wall when not in use.
- Choose LCD television and computer screens as they are more efficient.
- Dry your clothes outside instead of the clothes dryer.
- Choose energy efficient appliances.

For more information:

Green Power website
www.greenpower.gov.au

Your Home website
www.yourhome.gov.au

Spin that house around

An innovative renovation to capture the sun.

Building a new house that maximises comfort and sustainability is all well and good, but what happens if you already own a house with less-than-ideal design and no option to start over again. Renovating your home is often a cost-effective and practical way to turn a poorly designed house into a winner. Innovative design solutions can often be surprisingly simple. Just take a look at the following example.

This conventional double-brick project home in suburban Marion, Adelaide, was built in the 1970s. It's a brown brick dwelling featuring bottle glass and concrete roof tiles, and looks like one of a dozen in its street. The original orientation was 45 degrees to the north-south axis, which meant that the house

received too much summer sun, but not enough winter sun, and the home owners felt cut off from the nearby reserve and creek.

Architect John Maitland from Energy Architecture came up with an innovative way to improve both the home's livability, and its environmental performance, by 'spinning' its orientation. Three triangle-shaped extensions were added, one to the loungeroom and the other to the bedrooms. Each triangle has a solid wall facing west or east, and a full double-glazed wall facing north. The livingroom timber floor was replaced with a tile-covered concrete slab to capture heat from the winter sun. These additions create necessary northerly solar access while protecting the house from the harsh summer rays.

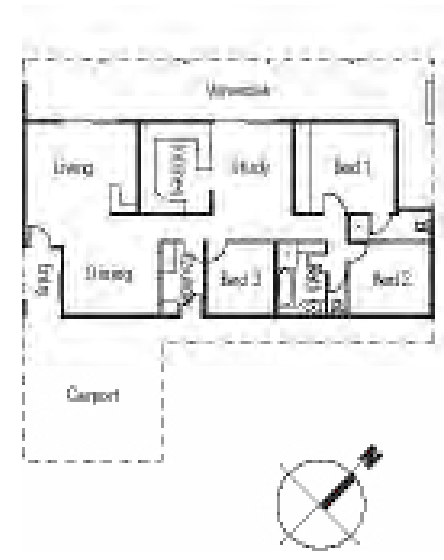
Solar panels and a solar hot water system were mounted on the new roof over the living area, which was raised and angled to provide the best aspect. The 'popped up' roof also allows more light and cooling breezes to enter the house.

With some clever design, this renovated building has greatly increased its sustainability credentials.

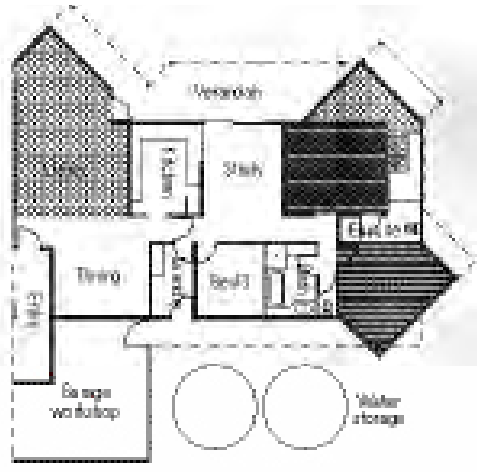
For more information:

Your Home website
www.yourhome.gov.au

Before



After



← Innovative renovation has turned this suburban home into a model of sustainability.

Orientation tips

- Face large windows and living areas north to catch the winter sun.
- Make sure windows are shaded from the summer sun.
- Locate your windows and doors to capture cooling breezes.
- In summer open windows at night to make the most of cooling breezes.
- Capture winter sunshine with dark coloured floors.



North-facing windows connect the house with the nearby reserve and creek.



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Graphics by Lavaworks

Urban revolution





On a secluded, tree-lined street in Adelaide’s CBD, a new construction is under way that heralds a new era in inner city living.

From the street, Christie Walk looks like any other inner city apartment block. But if you walk down the paved path, a small gem is revealed: the broad walkway leads past a three-storey block of six self-contained apartments, with lush plants set around the doorways to soak up the sun. Bright paint on the wooden trim lifts the earthy tones of the rounded walls. Two plump cats gaze out of a bay window, and each doorway has its own paving

work in colourful mosaic or warm terracotta. Keep walking and you discover a terrace of four three-storey townhouses, four strawbale cottages of varying sizes and a thriving garden. The five-storey block of 13 apartments, which will also feature a community kitchen, laundry and meeting room, will complete the picture. All the buildings have an inward facing aspect that gives a wonderful sense of community.



Materials from buildings demolished on the site were reused for paving and other decorative feature elements

“We have to be able to live sustainably in cities...more and more people are living in cities worldwide”

a must. In summer, the apartments rely on cross-ventilation and high thermal mass for cooling. The townhouses use the concept of the ‘thermal flue’ to draw cool air from the surrounding gardens up through the house, and expel the heated air through louvred vents or ventable skylights in the roof. The gardens are an intrinsic part of this passive cooling design, and when the rooftop garden on the smaller apartment block is fully mature, it will help insulate the building as well as provide a pleasant, shaded space to relax in.

Where appropriate, materials high in thermal mass, such as concrete floor slabs, have been used in all the dwellings. The townhouses separating walls are made of ‘earthcrete’ (a type of rammed earth material), which also helps with noise reduction within the terrace. In the apartments, internal walls are of masonry and studwork, with aerated concrete providing cost-effective insulation for the external walls. “This is preferable to concrete blocks because we get five times the amount of wall for the same amount of energy input,” says Paul.

One of the first people to move into an apartment was Effie Best, who loves the way it captures the natural light and heat. Even on Adelaide’s most wintry nights, she usually doesn’t need a heater, she says. And the cross ventilation works well in the warmer months too, with ceiling fans keeping residents at a comfortable temperature.

The concrete used in the slabs contains a high percentage of flyash (a waste product from power stations), which reduced the amount of new cement, and therefore the embodied energy and resulting greenhouse gases, required to build Christie Walk. Materials from buildings demolished on-site were

In the early nineties a group of people interested in building ‘ecological cities’ got together to build an environmentally benign urban living space. They wanted to build in a way that suited the region’s landscape and climate, used locally sourced materials and was based on collective effort, not private ownership. A non-profit organisation, Urban Ecology Australia, was established to support and facilitate ecological development and it created Wirranendi Inc as a community developer for Christie Walk. Christie Walk’s design allows for easy interaction between residents, looks good and feels comfortable. **It is also affordable, and balances the need for green space, communal living and independence in an inner city, medium-density environment.**

Because Christie Walk sits on an unusually shaped block in the heart of the city, with buildings

abutting most of its boundaries, its architect, Paul Downton, had to get creative to make the most of Adelaide’s rich store of sunlight. Paul welcomed the chance: “If you pick up a few books on solar design, you can get the feeling it’s all cut and dried,” he says. “You know: go out to your site, orient it to the north, put the eaves out a certain distance ...” This site’s unique elements and its residents’ specific needs meant these tenets had to be adapted. So the smaller apartment block is orientated east-west and some of the other dwellings have unusual orientations, to capture as much sun as possible. Some panels set over townhouse balconies have been raised slightly above the roof level, so they provide not only shade and shelter from rain, but extra ventilation.

Adelaide has a Mediterranean climate with hot summers and cool winters, so good insulation is

High density
living with an
eco edge. →



reused for paving and other decorative feature elements. Plantation pine was used for the joists, and many of the interior features were made from recycled timbers, such as the spiral staircases featuring steel, recycled jarrah and other Australian hardwoods.

Christie Walk will be enviably self-sufficient when it comes to energy use. When all of the photovoltaic panels are installed, the development will export energy to the electricity grid. The site collects stormwater from roofs and balconies which is used for irrigation and toilet flushing. A chlorine-free sewage treatment system will treat all grey- and black-water onsite, and a small community garden demonstrates that even the tiniest urban site can produce food and flowers.

The village feel is important to Effie, as is the proximity to Adelaide's wonderful produce market and local shops. She particularly likes the pedestrian-friendly layout (Christie Walk is vehicle free, although the council provides some parking). The bay windows mean living areas are light and roomy, and the kitchens are compact but easy to use, with mosaic designs over many benchtops. And the view is spectacular: the Adelaide Hills rise to the east and the shoreline stretches out to the west, giving residents a wonderful sense of the landscape and their place within it.

The dwellings are good value for money, with a planned life of 100 years, compared to about 50 years for conventional houses. The shells have been designed to sustain repeated renovation of interior spaces. Energy savings are significant: bills for a three-storey strawbale cottage are 50 to 90 per cent lower than average, depending on the season.

Joan, a resident of one of the townhouses, says, "We have to be able to live sustainably in cities."

A lot of people say 'Oh, you can go off to the bush and live on the land, where you can grow your own food and not impact on the environment,' but more and more people are living in cities worldwide." Christie Walk, with its focus on non-toxic materials, self-sufficiency and passive heating and cooling, is a living model of how good design can produce inner-city spaces that are healthier for both people and the environment. ←

For more information:

Urban Ecology Australia
www.urbanecology.org.au

Designer: Paul Downton
Builder: EcoCity Developments – stages 1 & 2
Tagara Builders – stage 3
Location: Adelaide, SA
Key Features: 40,000 litre rainwater tanks
Solar hot water
5,000 litre grey-water system
Double-glazed windows
Non-toxic construction materials and finishes
11.1kW grid-connected photovoltaic power system (in development)
Roof garden and community garden



Breathing easy

A healthy family home that is amazing to look at and functional to live in.

Stepping into the Prossers' house in Mermaid Beach, just a short walk from the dazzling beachfront of the Gold Coast, one is struck by the harmonious blend of beautiful recycled wooden timbers and airy light-filled spaces. The lush subtropical vegetation surrounding the double-storey, four-bedroom house masks the size of the small block and enhances the atmosphere of calm.

Chris and Kim Prosser set out to create a sanctuary where they could nurture their three young children in a healthy environment. "Initially we focused on indoor air quality," says Chris. "As a health professional I found that indoor air quality had a huge effect on the occupant's health, and

having children, we obviously wanted to safeguard their health. When we started to research we then found that there were many aspects of sustainability, energy efficiency and water efficiency that we wanted to incorporate into the house design."

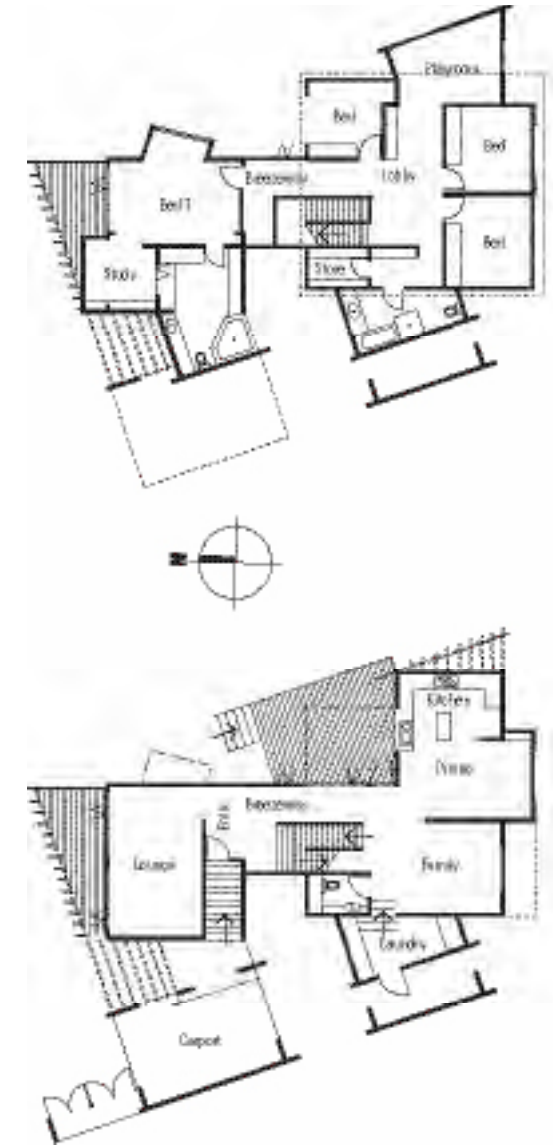
They gave architect Richard Hyde the brief of designing a modern Queenslander on a small block. It had to have excellent indoor air quality, preserve energy in construction and operation, and maximise the use of passive design.

"The first and most important step was to get the building to face the appropriate direction," says Richard. "The optimum orientation was towards the north, to get the natural breezes in the summer

and the solar gain in the winter." So the house was rotated 11 degrees off the axis of the block, which is surrounded on two sides by double-storey houses, and placed close to the front to invite cooling breezes from the open face.

The house has an open and expansive feel, thanks in part to three-metre high ceilings and wide French doors that open onto spacious decks on both storeys. It has been divided into two pavilions, linked by a space that is simultaneously an atrium, a stairwell, a louvred breezeway and a thermal chimney to maximise cooling breezes. The four bedrooms are located on the upper level and the living areas on the lower.

The boundary of inside and outside blur to create a spacious home.



Upper level

Ground level

The hallmarks of good passive cooling are evident throughout the design. The house was constructed with lightweight materials to allow rapid nighttime cooling. It is also well insulated with foil insulation, chosen not only because it was economical and efficient, but also because it is non-irritable, non-allergenic and recyclable. Shading is provided by adjustable shade sails, angled eaves and the second storey decking. And spectrally selective glass reduces heat load without compromising natural light levels.

Ventilation throughout the house is excellent. The dual pavilions are staggered along the block and are joined by a louvred breezeway, maximising cross ventilation. All rooms have timber bi-folds, French doors or louvres. Clerestory windows and a thermal chimney in the atrium also ventilate the house, meaning there is always plenty of fresh air.

The lightweight construction also meant that the house was very cost effective and easy to build, and is low in embodied energy. The roofing metal contains 70 per cent recycled content, and recycled aggregate has been used in the concrete

footings and the carport slab. Cellulose-based fibre cement sheeting, also low in embodied energy, was used for internal and external cladding. Recycled hardwood was used in the flooring, for effect.

To safeguard indoor air quality, the Prossers used non-emitting limewash paints made from natural pigments, natural oil timber finishes for internal and external timbers, and waterproofing that does not emit volatile organic compounds. A ducted vacuum system is used to clean the house, and ensures that dirt and dust are filtered and not recirculated back into the home.

Good water quality was obviously important to the Prossers as well. Most of the household water is supplied from a rainwater tank and is treated by a filter and ultraviolet disinfection system. To conserve water, they installed a water flow control system that reduces water use by up to 50 per cent, and a waste-water treatment system.

Photovoltaics and a solar hot water heater complete an impressive array of systems designed to make the most of renewable energies and natural resources. "One of the nice things [about

Limewash paints and natural timber oils give the Prossers' home a healthy finish. Louvres and French doors throughout the house help circulate fresh air.



Bedrooms located on the upper levels are kept cool with ceiling fans and the constant flow of fresh air.



The atrium joins the two pavilions of the house as well as acting as a thermal chimney to maximise cooling breezes.



living sustainably] is that we're very connected to what's happening externally," says Chris. "The rainfall cycles are very important to us because we rely on that rain in our storage tanks to supply the house. The children like that too. They look at the rainwater tanks and they can assess how much water we've got in there. We've also got a weather station on the roof so they can see which direction the wind is going."

The Prossers hired a permaculture specialist to design the garden, which features a number of indigenous plants, as well as fruit trees. Like the house, the garden is a productive as well as pleasurable space. "We think the permaculture garden really does enhance the experience of the

house because you move from one cool environment into another cool environment, which is a delightful experience," says Richard.

"It was fantastic working with some of the 'leading lights' in environmental sustainability in Australia," says Chris. "They've designed a house that is not only amazing to look at, it's also very functional to live in. It's a great feeling."

For more information:
www.healthyhomeproject.com

Designer: Richard Hyde
Upendra Rajapaksha
Builder: Chelbrook Homes
Location: Gold Coast, QLD
Key Features: Solar hot water
1.44kW grid-connected photovoltaic power system
22,500 litre rainwater tank
6000 litre grey-water system
Tinted glass windows
Adjustable sails for shading
Recycled timbers
Non-toxic finishes



The light fantastic

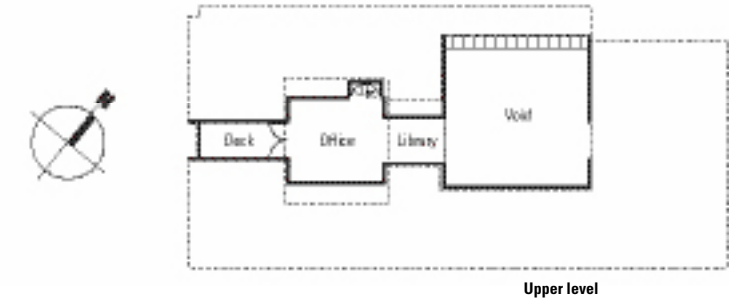
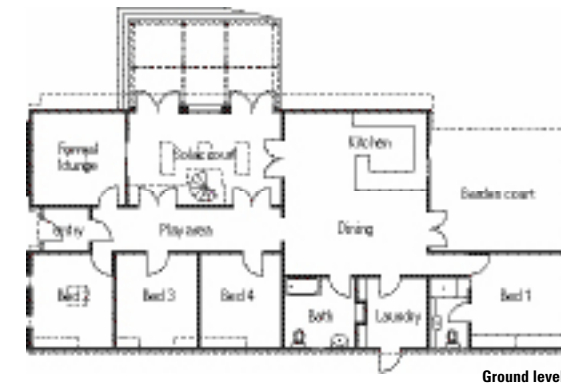
This radiant home proves you don't have to be rich to enrich your environment.

In an age when McMansions dominate the landscape of new suburban housing estates, it's a welcome relief to discover the home designed for Jan and Cath Brandjes in an estate in Sunbury, near Melbourne. This house is proof that comfortable, attractive, sustainable houses are affordable for everyone, even first-home buyers.

Designed by architect Bridget Puszka from BP Architects, the house has been designed to make

the most of the expansive views of the surrounding hills. It is distinguished from its neighbours by its unique roof profile, a reference to the nearby historic buildings of Victoria University.

It's not a large house, only 230 square metres on a block measuring 556, but the space has been efficiently planned so that there is ample room for two adults, three children, a library and an office. Features like the double-height cathedral ceiling in



High windows upstairs in the library and office induce a stack effect which helps exhaust hot air.



the kitchen and dining room, and the glass walls of the solar court, give the house a spacious and open feel.

The front of the house faces west, so the windows overlooking the street have been carefully sized to avoid overheating in the afternoon. The indoor and outdoor living areas are on the northern side of the house for optimal solar access. "Having come from the Yukon in Canada where it is often cold and dark, it was very important for us to have lots of natural light," says Jan.

Eaves shade the northern windows in summer, and the indoor sunroom has three double-glazed argon gas filled skylights that can be opened, and

are protected by reflective solar film. A solar pergola has angled overhead slats to cut out the strongest sun and maximise the space for outdoor dining. All the external windows and doors have been double-glazed. "Double-glazing is not the most affordable part of your home, but I think it's worth the money. You can sit close to the glass in winter and not feel cold, and good glazing reduces your energy costs," says Jan.

To control the cost of double-glazing, Bridget assessed the placement and function of all windows to see if they required double-glazing. "All windows require insulation or covering to stop heat transmission, and heavy drapes and pelmets is

another way to insulate windows," says Bridget.

Living in energy-efficient houses is not a new experience for Jan and Cath who have a strong commitment to sustainability principles. A builder himself, Jan acknowledges, "The three most important things to get right are passive solar design, good insulation, and sealing the building envelope".

"Putting in adequate insulation is relatively cheap, and one person can 'seal' your house in half a day at a cost of about \$300," says Jan. By sealing, Jan means blocking up all the cracks, gaps and holes in the building that admit draughts and let heat escape. This process can take a tradesperson



“Once built, passive solar design is free, putting in adequate insulation is relatively cheap, and one person can ‘seal’ your house in half a day at a cost of about \$300.”

Indoor and outdoor living areas on the northern side of the house capture the sun's light and warmth.



The solar court is a warm and light dining area during the cold Melbourne winter.

just half a day for a cost of about \$300.

Jan says that over the course of an hour, enough air will move in and out of a typical Victorian house to completely refill it six to nine times. “To be healthy, a house only needs one-third of an air exchange per hour, which means that most houses are losing far too much energy,” he says.

Because the house is so well sealed, a mechanical ventilation system was installed to ensure good indoor air quality and low humidity levels when the house is closed up in winter. The system has a heat exchanger which draws heat from stale air exiting the house, and uses it to warm up the incoming fresh air, with an estimated heat recovery rate of about 80

per cent. A filter removes airborne particles.

The mechanical ventilation system is not the only safeguard against poor air quality. During construction, building products with low volatile organic compound (VOC) levels were used wherever possible, including non-toxic paints, sealed timbers and fully sealed laminates. “It is important in a well sealed house that you use materials which have low or no VOC content to prevent the build up of chemicals in a newly constructed or renovated home,” says Bridget.

The floors are ceramic tiles for easy cleaning and dust removal. In wet areas, good ventilation and laminates have been used to minimise mould

growth. Lastly, a central-ducted vacuum system was installed to prevent recirculation of dust particles.

In summer, the external and internal doors of the living areas are opened to expand the available space and allow for good cross-ventilation. **High windows upstairs in the library and office induce a stack effect which helps exhaust hot air.** Good insulation levels and good design mean that no cooling systems are needed during summer at all, except for ceiling fans.

The house for Jan and Cath was one of 22 in their estate that received free solar hot water systems and photovoltaic panels, in a move by the estate's developers, VicUrban, and the Victorian



The photovoltaic panels generate about one quarter of the household electricity.



The unique roof profile, a homage to nearby historic buildings.



and Commonwealth Governments to promote sustainability and renewable energy. The gas-boosted solar hot water system has been installed on the north-facing roof above the kitchen in order to be close to the bathroom, the most frequent draw-off point to avoid heat loss from long lengths of piping. Beside it is the grid-connected photovoltaic array, which generates about one quarter of required household electricity.

Thanks to the passive solar design of the house, the active solar systems and the family's awareness of everyday energy conservation, **the yearly gas & electricity energy bills add up to a measly \$400**, about one-third of the amount they were using in another house in the same suburb. The house has

rainwater tanks and a grey-water recycling system, which lowered their annual water consumption to less than half that of the average Melbourne household.

The house has been used as a showcase for sustainable design. Already, many other residents-to-be have been shown its features and design aspects, and the owners have opened the house to the public for events like Solar House Day. The message that they want visitors to take away with them is simple: with smart design you can build a healthy, beautiful and affordable home. "Sustainability isn't just for the wealthy," says Jan. "Everyone can do it." 

Architect:	BP Architects – Bridget Puszka
Builder:	Owner builder
Location:	Sunbury, VIC
Key Features:	Solar court
	Double-glazed and clerestory windows
	5000 litre rain water tanks
	Solar hot water
	Gekko grey-water system
	1.6kW grid-connected photovoltaic power system
	Air filter and ventilation system

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Bright ideas

Light up your life without costing the earth.

Good lighting isn't just about the level of light; it's about creating ambience and enhancing the look and feel of a room. It's about providing bright light where you need it, at workspaces and in the kitchen, and softer lighting for entertainment areas. Household energy use in Australia is increasing, with many new homes installing inefficient lights or more light fittings than they need.

The most common form of lighting is the incandescent bulb. Despite being inexpensive to buy, these bulbs have a high running cost and need regular replacing. The trend in recent years to install numerous low voltage halogen downlights, a type of incandescent bulb, has greatly increased the power bills of many new homes. Low voltage does not in fact mean low energy consumption. Another downside is that because halogen downlights produce heat, insulation can't be placed near the fittings, resulting in even greater heat loss in winter.

If there is an ugly duckling in the lighting world, it would be the older style fluorescent light — remember those flickering, buzzing tubes? However, today's hip and sophisticated fluorescent lights are compact and attractive. They now come in a huge variety of shapes and sizes, use only a fifth of the electricity of

incandescent bulbs and can last ten times longer. Compact fluorescent lamps (CFLs) can simply be plugged into the same sockets used by incandescent lamps, so the next time an incandescent bulb in your home burns out, why not replace it with something that's kinder on the budget and the environment?

Outdoor options

Coloured party lights, path lighting, Christmas decorations, feature garden lighting — outdoor lighting can be just as varied as indoor lighting, if not more. Selecting energy efficient lights is particularly important if your outdoor lights are left on for hours at a time. Use movement-sensing devices for security spotlights and path lights, so that entrances and paths are only illuminated when necessary. And what could be more appropriate in your garden than solar powered garden lights?

Into the future

The hottest thing in the lighting world are LED lights — tiny lights made from light-emitting diodes that are much more energy efficient than the old-fashioned light bulb. You may have seen them used in traffic lights. They produce far less heat, have longer lifetimes (up to 100,000 hours) and are much more robust than the common bulb as they come as a solid chip. Their small size provides an unobtrusive source of light and enables dramatically different lighting designs. They are not yet widely available, but watch this space.

And of course, the most energy efficient form of lighting is free, natural light. Any good design will use windows and skylights to maximum effect, but also ensure your home is protected from excessive summer heat and winter cold.

For more information:

Your Home website
www.yourhome.gov.au



Appliance saving tips

- Use daylight instead of artificial light.
- Make sure that the room is not excessively lit.
- Turn off unnecessary lights.
- Use energy efficient fluorescent lights.
- Choose light fittings that allow most of the light through.
- Clean light fittings regularly to allow light to pass through.



Reinventing the feel

A weatherboard cottage gets a new lease of life

“Renovation is now a national sport. More than one in four houses have something done every year and every time that happens there’s an opportunity to make it a little more sustainable”



Dick and Bron bought their home over two decades ago in the beachside northern Sydney suburb of Elanora Heights. It was a rambling weatherboard cottage that had been built in the 1960s, with ocean views and a big leafy garden. But in spite of its proximity to the coast, the original design made no concessions for the wonderful sea breezes or northerly views. The rooms were dark and constraining, especially in the south-facing living areas, and the house was completely uninsulated. Dick and Bron were stifled in summer and freezing in winter. It wasn’t long before they

decided to renovate, to make the house not only a more comfortable and inviting place to live, but also more sustainable.

The decision to renovate rather than rebuild was made for two reasons: cost savings and environmental sustainability. “We just couldn’t afford to knock everything down and start again,” Bron explains. Dick, himself a builder and designer, adds, “The other reason to renovate rather than rebuild is the embodied energy; that is, the energy it takes to produce, move and construct a building from the chosen materials. The embodied energy in

a renovation is much lower than in new construction and our house was perfectly sound structurally. The climate here is so forgiving that we were able to use what was here and not have to throw it away.”

They began by replacing the windows at the back of the house with sliding doors, and adding a back deck. The dim kitchen was extended and opened up to much more natural light by raising the roof and adding a small west facing clerestory windows.

After a 10-year hiatus filled with travel and the commitments of raising a family, the next major step in the renovation process was the addition of



Dick and Bron's renovated weatherboard captures cooling sea breezes and northerly beach views.



a second storey, incorporating a master bedroom and a north-facing office.

The last major change occurred in 2003, when the ground floor was rearranged to move the living areas from the southern side of the house to the north. This meant that the sun became the primary source of heating in winter, and the living area had access to a north-easterly ocean view and much more natural light.

Dick employed an unusual but highly effective technique known as reverse brick veneer for the loungeroom renovation, which has boosted the

thermal performance of the room enormously. As the name suggests, **reverse brick veneer is a wall where the bricks are on the inside instead of the outside.** In normal brick veneer, the bricks are subject to the extremes of summer and winter temperatures, and are separated from the inside of the house by thin plasterboard, thus cannot effectively regulate internal temperatures. In the case of reverse brick veneer, however, the thermal mass of the bricks is protected from the external elements by a highly insulated exterior cladding, and is in the best position to regulate internal

temperatures. Reverse brick veneer is a very cost-effective way to radically improve comfort and thermal performance, especially in renovations, as the existing building frame and footings can be used most of the time.

Bron was initially quite dubious about the retrofit: "I said 'Oh, that's not going to work'. But I've had to eat my words because it does work so wonderfully. Previously there was nowhere in the house in winter where you could sit and feel snug and comfy. Now it's so lovely and warm, and in summer it's much cooler: it could be 38 degrees Celsius outside but

only 24 inside, without airconditioning. I was really impressed."

The original timber floor in the loungeroom was also replaced with a suspended concrete slab, another good source of thermal mass. Dick took the opportunity to lower the floor level at the same time, in order to create extra ceiling height.

It must have been a busy year for Dick in 2003, as that was when he also installed an innovative grey-water recycling system. Grey-water from the shower, hand-basin and laundry are treated in a gravity-fed reed bed system. Three reed bed 'tanks',

or units, have been constructed in the back garden, where they look like ornamental water features built entirely for aesthetics. The waste-water flows from one tank to the next through the gravel reed beds, and is eventually collected in a holding tank to be used for toilet flushing or garden irrigation. Water in the holding tank is recirculated by a solar powered pump. The recycling system reduces the household's water use by about 16 per cent. Considering that roughly 80 per cent of Dick and Bron's water is supplied by 16,000 litre rainwater tanks, it's not surprising that the household water

bills are very low.

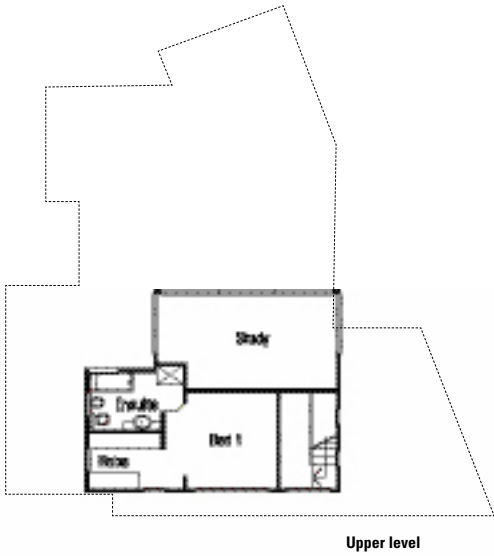
The sole source of heating in the house, apart from the sun, is the slow combustion stove in the living area. "We burn recycled fence timber, so we're not using anything that hasn't already been used," says Bron. **The stove is part of a 'heat transfer system', involving an extraction fan in the wall behind the stove flue that circulates the warm air into the bedrooms and dining room via sub-floor ducts.** The system is 'zoned' so that the warm air can be directed only to certain rooms if desired.

Thoughtful window choices have improved both

Before



After



The double-glazed windows can be securely locked open to allow the sea breezes to flow through the house. For owner-designer Dick, renovations, no matter how big or small, are a great opportunity to make the home more sustainable.



winter heat retention and summer cooling of the house. The external windows feature double-glazing with low-e coatings to reduce heat loss in winter, as well as thick curtains and pelmets. In summer, the windows are well shaded with wide eaves, trees or adjustable shading devices. The windows of the living area are wide side-hinged casements, perfect for directing the cooling sea breezes into the house. Dick and Bron have been careful to choose windows that can be locked in the 'open' position, allowing the house to be left securely in a 'breathing' state.

For Dick, renovating is even more important than

rebuilding. "Somewhere between 25 to 40 per cent of existing houses are renovated every year, ranging from a new paint job or updated kitchen to a full scale renovation of the house. Even the smallest job is a terrific opportunity to make the building better and more sustainable. For example by choosing a non-toxic paint you not only improve the air quality of the room but ensure that environmentally friendly materials were used in the manufacturing of the product."

The Clarke's spectacular home certainly embodies the energy of change. ➡

- Designer:** Dick Clarke
- Builder:** Owner builder
- Location:** Northern Sydney, NSW
- Key Features:** 16,000 litre rainwater tanks
Solar hot water
Reed bed/gravel filter grey-water system
Reverse brick veneer
Double glazed low-emissive windows
1.76kW grid-connected photovoltaic power system
LED downlights



Treehouse dreaming

This Cairns home redefines sustainable luxury living.



Large expanses of folding windows and wooden louvres open up the house to the rainforest canopy and tropical breezes.

A timber boardwalk leads me over a pond encircled with bush rocks and rippling under a gentle waterfall. Tall tropical palms stretch high above me. It might sound like I'm in a rainforest, but in fact I've just stepped inside the front door of Karen and Michael Thornton's home in Cairns. This serene courtyard, protected by a double-storey portico, is a fitting introduction to a house that has taken the idea of indoor-outdoor living to a whole new level.

Beyond the courtyard, the living area opens out to a huge covered patio and pool, with magnificent escarpment views of Cairns, the surrounding

mountains and the broad blue sweep of the Pacific Ocean. A guest bedroom with ensuite and a large room, currently set up as an office, have their own entrances.

Upstairs, there is a distinct treehouse feel. Many of the external walls are made entirely of either large expanses of folding windows or wooden louvres, so that whole walls can be opened up to the surrounding rainforest canopy and tropical breezes. The three bedrooms look out onto a sea of green and the outdoor dining area is easy accessed from the open plan kitchen.

"The design needed to embrace the outside



world, yet provide privacy and protection from the sometimes extreme tropical conditions," says Karen, who is also the architect of the house. For her, working with the land to create a sustainable design goes hand in hand with crafting a house that feels good. "If you work with the land, it'll work with you. You can't work with a 'one size fits all' philosophy when it comes to sustainable design, I don't start designing until I've seen the client's site," she says.

In the tropical climate of Cairns, the biggest household energy consumer is generally cooling. In this house, however, good passive cooling



“People walk in here,
and they might not know
exactly what they’re
feeling, but they
know it feels good”



Water flowing
through the
house and out
into the pool
helps cool
the interior
from the
tropical heat.

design eliminates the need for airconditioning, and allows the Thorntons to live comfortably in the hot humid climate while still engaging with their natural environment. The ventilation in the house is excellent, not only because of the extensive use of louvres, but also the wide external and internal timber bi-fold doors. If necessary, ventilation can be boosted by ceiling fans. Wide eaves and the porticos shade the house, as do the many palms that have been planted around its perimeter. Tinted glazing reduces heat gain through the windows.

Although much of the home is constructed of lightweight materials for ease of cooling, Karen has

also made occasional use of materials that are high in thermal mass, including a concrete slab for the ground floor, to help regulate internal temperatures. “You can use any material as long as you use it in the right way, together with the essential application of good design,” is Karen’s advice. The house is also fitted with a solar hot water system and AAA-rated appliances and fittings.

Although Karen’s design has been influenced by years spent traveling and living among a range of cultures, she is particularly fond of Eastern approaches to sustainable living, citing the use of water features for cooling as a good example.



The openness of this design captures the all essential cooling breezes so critical in the tropics; this together with the gentle sound of flowing water creates a lifestyle that’s hard to resist



A pond in the entrance way sends cool air to the upstairs living areas, while the waterfall cascading into the pool sends cool air back into the house from the other direction. The reflection of water up onto the roof and the interior walls of the house add to the calming ambience.

“The openness of this design captures the all essential cooling breezes so critical in the tropics; this together with the gentle sound of flowing water creates a lifestyle that’s hard to resist.” The tiered design of the roof, which encourages good airflow, and the yin-yang symbol decorating the kitchen bench, also give a sense of Eastern influence.

“People walk in here, and they might not know exactly what they’re feeling, but they know it feels good,” says Karen, and for her, that feeling is an indicator of good design. Having experienced the sense of harmony and serenity that pervades the house, I’m inclined to agree. ☺

- Designer:** Karen Thornton
– Ozone Tropical Designs
- Builder:** Ozone Tropical designs
& Construction
- Location:** Cairns, QLD
- Key Features:** Smart window treatment
on all glazing
- Cross flow ventilation
- Insulation on all floors,
walls and ceilings
- No air-conditioning
- Internal and external
ponds for cooling
- AAA-rated water
appliances and fixtures



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Standing in the home appliances shop, you cast your eye over the sleek lines of refrigerators, freezers, washing machines and dishwashers. You're about to make a big investment and you don't want to spend more than you have to. Your eye takes in the prices and the energy efficiency labels, and you start to weigh up your options, with your budget firmly in mind. And this is when you have to remember that every appliance has two price tags. The first is the purchase cost of the appliance, and the second is the ongoing running cost of the appliance. It stands to reason that an energy efficient appliance that saves you hundreds of dollars each year won't take long to pay for its premium in price.

The simple and reliable way to make a smart choice on your next appliance is to look at the energy rating label. The label can be found on all refrigerators, freezers, washing machines, dish washers, clothes dryers and airconditioners, and gives a star rating between one and six stars. The greater the number of stars, the higher the efficiency. Total energy consumption in kilowatts per year is also shown. If two suitable appliances have the same star rating, choose the one with the lower energy consumption.

To help you make the choice the Energy Rating website has a wealth of information on the energy ratings of appliances. It has an interactive database that can show you the typical operating costs for different appliances so you can accurately calculate operating costs and potential savings. It also has lots of great tips on how to make your appliances run more efficiently — tips that won't cost you anything but can save you lots.

Switch off

Home entertainment and office equipment, such as televisions, computers, DVD and CD players are not currently covered by the energy rating scheme. However, if they have the Energy Star® logo, you know that they have greater 'standby' efficiency. Standby power is the electricity used when appliances aren't fully switched off, such as when the TV is turned off with the remote control. Appliances can use much more energy over a year in standby than in actual operation and can account for up to 12 per cent of a household's electricity use.

An Energy Star® appliance will automatically switch into 'sleep' mode if not being used, and/or will reduce the amount of power used when in 'standby' mode. Although the standard only applies to energy used during standby and not operation, Energy Star® appliances are often more efficient in operation too. As the Energy Star® function is not always enabled on new appliances, ask your retailer to enable it or follow the directions in the manual.

To check out the cream of the energy-efficient crop, go to the Energy Allstars website that lists the top energy performing office and household appliances.

For more information:

Energy rating websites
www.energyrating.gov.au
www.energyallstars.gov.au

Your Home website
www.yourhome.gov.au



Appliance saving tips

- Turn appliances off at the power point instead of by the remote.
- Choose energy efficient appliances, the more stars the better.
- Turn-off lights when you are not in the room.
- Turn-off your computer screen when you are away from your desk for more than 10 minutes.
- Cut out draughts by sealing cracks and gaps and blocking draughts under doors.
- Consider installing a solar hot water system with a booster – gas boosted is best.

The more stars, the more you will save on power bills.



Best in show

This cutting edge house has generated interest in sustainability for thousands through its eco-ambience.

“Smart, functional design is achievable and can be applied to any project regardless of scale or budget”



The great 20th century French architect, Le Corbusier, called the home “a machine for living”. As we become more attuned to thinking about how we can reduce our impact on the planet, from more energy efficient cars to star ratings on electrical appliances and eliminating the ubiquitous plastic bag from the weekly shopping, it is a strange oversight that the family home has not been afforded the same kind of scrutiny.

The Subiaco Sustainable Demonstration Home, in the inner-Perth suburb of Subiaco, aims to go part of the way to rectifying this situation. Designed by Griff Morris and Ken Wibberley of Solar Dwellings in association with Dr Elizabeth Karol, the house was built to teach the local community the principles of

sustainable design and construction. Home owners, renovators, community groups and even school children can wander through and learn about passive solar design, energy and water efficiency, and other concepts that can reduce the cost of the home to both the owner and the environment. The project was a collaborative effort between the City of Subiaco, state government departments, universities and business sponsors.

City of Subiaco CEO, Chester Burton, says the initiative has been well received by all. “Messages written in the guest book reveal a substantial level of enthusiasm for the project and genuine interest in smart design.”

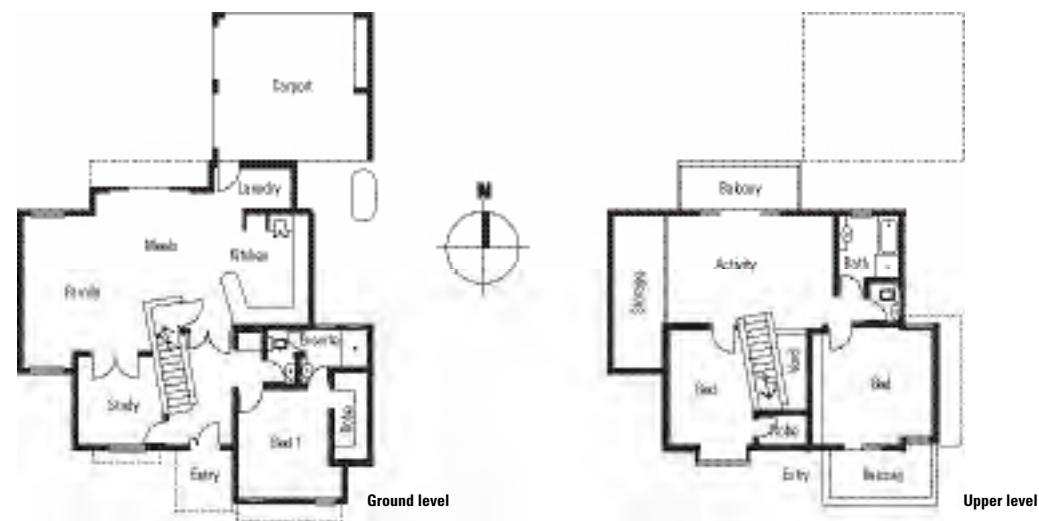
According to Chester, the City of Subiaco already

had a reputation for being a leader in sustainable living and this was a next, logical step. The Subiaco Sustainable Demonstration Home was the first sustainable display home built specifically for public education in Western Australia.

The house was built **on the site of an old cement factory in central Subiaco, with new and recycled materials, for around \$300,000.** It has proved a far wider success than initially envisioned. “Since opening, more than 16,000 people have visited the home including a number of international guests,” says Chester. The house has also won a number of national and state housing industry awards.

Building designer Griff Morris explains that the house is intended to look just like any other house.





The house generates its own power and may even make some money by selling excess power back to the electricity retailer.



"People sometimes have the idea that a passive solar, sustainable house will look somewhat 'nuts-and-berries' with bush poles and the like. The Subiaco Sustainable Demonstration Home is a modern urban house that incorporates passive solar, energy efficient and sustainable design and technologies without looking obviously different," he says.

The formal entry is located at the southern end of the two-storey dwelling, and the kitchen, laundry and living areas are located on the ground floor. The home is zoned so that all the bedrooms are located on the southern side of the house so that they are the first rooms to catch the cooling summer breezes and are protected from the hot summer sun.

Two of the three bedrooms, one upstairs and

one down, have their own bathrooms and are each large enough to serve as master bedrooms, making the house suitable for two couples or multiple occupants.

A simple concept employed that could be applied to any new home is the positioning of the kitchen, laundry and bathrooms. To minimise the run of pipes to their outlets, these rooms are all grouped together on one side of the house, under the hot water system, which is located in the roof space. This helps reduce the amount of heat lost when hot water travels through the pipes.

Walls throughout the home are either double brick or reverse brick veneer on concrete slabs. The suspended slab for the upper floor was built using

a process called 'Quickfloor', placing an 80-90mm concrete slab on a permanent steel frame. The reverse brick veneer wall consists of a single brick wall on the inside (high thermal mass), two kinds of insulation in the middle and Harditex cladding on the outside (low thermal mass) to minimise heat transfer and condensation. All the timber in the home is plantation pine, a renewable resource, and has not been treated, which means it is also low allergenic.

Western Australia has a warm/temperate climate, so heating and cooling concerns are paramount. **The southern facade of the house directs the summer "Fremantle Doctor" cooling breezes through the home.** As the air passes over the internal walls, it



The kitchen, laundry and bathrooms are grouped together under the hot water system to minimise the run of pipes to their outlets.



- Designer:** Solar Dwellings and Elizabeth Karol
- Builder:** Glenway Homes
- Location:** Subiaco, WA
- Key Features:** Solar hot water
1.5 kW grid-connected photovoltaic system
1300 litre rainwater tank
1200 litre grey-water system
Reverse brick veneer
Rammed recycled demolition waste
Plantation-sourced timber
Ducted vacuum system
Bamboo flooring

Located on the southern side of the house, the bedrooms are the first to receive the Fremantle doctor, cooling sea breezes.



draws the heat from them, before exiting via large northern windows and a highlight window on the upper level of the northern side. Most of the glazing in the house can be opened to facilitate cross-ventilation, keeping the temperature comfortable during the hot summer months.

“Probably the single most important feature of the house is its ambience,” says Griff. “It has been monitored for thermal performance and has performed spectacularly well as a purpose-built energy efficient home, so it will certainly save its occupants many dollars over the years, and may even earn them some (when excess power is sold back to the mains grid). But more than that, it has a really wonderful feel to it. In summer it is delightfully

cool without that horrible airconditioned feel, and in winter it is naturally warm,” he enthuses.

Chester Burton agrees. “Smart, functional design is achievable and can be applied to any project regardless of scale or budget. If you incorporate some basic environmental design principles, you can build a home that uses a fraction of the energy and water that the average home uses.”

When assessed by the Sustainable Energy Development Office using AccuRate, a rating program designed in conjunction with the CSIRO, the house was the best performer in a field of 50 purpose-built energy efficient homes in Australia.

Because the demonstration home has been open for an extended period of time, visitors have been

able to see how it operates in different seasons. “The two year demonstration period allows for visitors to come back at different times of the year to experience the benefits of clever design,” says Chester.

The house recycles grey-water from the bathrooms and laundry through an underground Galvin system for distribution to the gardens. A 1300 litre compact rainwater tank has been installed on the site to collect water from the roof. The water is used mainly on the garden, but the tank does have a carbon filter which makes the water drinkable. Griff says the main reason for including the rainwater tank was to show people that it didn’t have to detract from the aesthetic or

spatial feel of the home.

The house has a solar hot water system that is split into two panels because of limited roof space. The hot water is stored in a tank in the roof cavity where the ceiling insulation assists in keeping it hot. The house also generates its own solar power to support the supply from the grid, or to sell excess power back to the electricity company.

When the house is sold, the new owner will have a dwelling that not only saves them money, but also reduces the impact of the largest machine most of us will ever own. Its biggest triumph, of course, will be the lessons it imparts to the homebuilders, renovators and future home owners who have walked through its doors. Its achievement will be

the extra rainwater tanks that find their way onto new home sites, the solar hot water systems that are sold to new home owners, and the energy that is saved by people thinking more holistically about the impact they make on the earth. ◀

For more information:

www.subiacosustainable.com.au

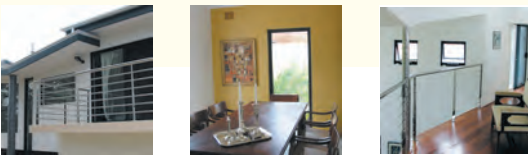
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Harbour lights

Encapsulating Sydney's sun, surf and ships to create a peaceful retreat.



A spacious house that leaves room for the garden and outdoor entertaining areas that can be enjoyed throughout the year.



Automated awnings make summer shading easy and lets in winter warmth.



As a leading practitioner in environmentally sustainable design, Sydney architect Gareth Cole gives regular seminars at Macquarie University in New South Wales. Many of the people who come to hear him speak leave with only a small notion of what they would like to do. But one couple were so inspired they asked Gareth to design their new home. The result is not just a comfortable environment to live in, but greatly reduced power bills.

The house sits on a corner site with views over a

nearby reserve and Sydney Harbour. The first step in the process was to recycle as many materials as possible from the original house, which covered 85 per cent of the site. The roof tiles were sold, the bricks were used as fill for the courtyard area and the bathroom fittings and kitchen were given to a charity that was building a home for drug rehabilitation.

The new house was carefully designed to cover just 31 per cent of the block, leaving the remainder of the site available for courtyards and landscaping.

This not only means there is less house to heat or cool, but also means **there are extra quiet areas in the yard, which can be enjoyed during the day or evening and throughout the different seasons of the year.**

To take advantage of the vistas, as well as gain true north orientation for passive solar heating, Gareth proposed a 'winged-back' footprint plan to capture the sun, which bent the house into a near V-shape. This footprint shape allowed for full-height glazing on the northern face of the building, however, the architect had to be sure the glass-to-

floor ratios were sufficient to prevent overheating inside the building. Glass doors open out to a courtyard and garden.

If Sydney is enjoying one of those sunny late-winter days and the house is warming too rapidly, a moveable pergola can be extended to shade the tiled floor and internal walls. This not only provides a cooling effect inside the house, it reduces the thermal gain from the sun. Of course, it also provides extra shade in the courtyard for a cuppa and the papers in the morning.

The living and dining areas are on the ground level of the house and family, meals and kitchen areas are to the western end. The kitchen overlooks the entrance on the south side of the house and the living areas creating what Gareth calls a 'conning tower', from where the home owners can keep track of the comings and goings of visitors and family members entering or moving through the living areas.

The master bedroom and study are also located at the eastern end of the house near the living area,

each with their own terrace. A second-storey loft houses the other bedrooms, bathrooms and studio, and a garage is located in the basement.

The walls of the house are made from AAC Hebel Blocks for thermal efficiency and are rendered inside and out. The roof of the house is constructed from timber trusses with steel cladding, for both insulation and easy rain collection.

The **solar pump hot water system is located inside a laundry cupboard, which can also be used to hang and dry clothes.** "Most people stick the hot

Well blow me down

The upstairs study provides a quiet and light space to work.



Channelling the prevailing winds, this house is inspired by its surrounding environment.

This house designed by Morris-Nunn and Associates is environmentally sustainable design with a twist. Situated in a long valley 10 minutes south of Launceston, Tasmania, it rises out of the landscape as a sensuous curve. This part of Tassie can be particularly windy and the house is a representation of the prevailing nor-westerlies; it bends and twists along a lengthy axis as if it were channelling the breeze. According to Robert Morris-Nunn, the aim was to create “an appropriate poetic expression of the landscape and the forces of nature”.

Imagine the footprint of this house as a dragonfly, if you will. The formal entrance is on the southern side of the home, located at the nexus of the abdomen and the left wing of the metaphorical insect. **The fluidity of the form should not be mistaken for architectural fancy. It serves a stated purpose.** The axis is a stretched ‘S’ shape that allows the house to nuzzle into the landscape and provides protection from the wind. The solid rear wall along the southern perimeter acts as thermal mass, storing warmth when it is available and releasing it slowly back into the home. ↓

Designer: Gareth Cole
Builder: Jim Hamilton
Location: Sydney, NSW
Key Features: High use of thermal mass
Recycling of old house materials
Laminated glass windows
Heat pump hot water system
Fixed and motorised sail for shading

water unit outside and heat the camellias, but we put it in the laundry and minimised the need for a dryer in the house,” explains Gareth.

The efficiency of this house really is something to behold. There is no need for airconditioners and the home owners sometimes have quarterly power bills of as little as \$35.

But it’s not just the meagre accounts and the increased value of the house that are pleasing. “We’ve designed a house that has the peace, tranquility, light, space and natural, non-airconditioned comfort the owners required,”

Gareth says. It is also a house that shows what is possible in this realm of design. These concepts are not out of reach of the average homeowner looking to make a difference to their bankbooks, and the environment. ⬅

“the aim was to create an appropriate poetic expression of the landscape and the forces of nature”



Just inside the front door of the home is the ‘abdomen’; the room Robert calls the “inner sanctum”. It sits to the south of the main living area in a half-circled silo lit by a double-glazed, north-facing Velux skylight in the timber lined skillion roof above. The room has a slow combustion stove at its heart, which acts as a radiant heat source.

To the left of the front door is the main living area. **It features extensive floor-to-ceiling glazing, which makes the rural scenery a part of the internal scheme of the house.** The glazing also serves as the primary method of solar gain, catching the sunlight and drawing it into the room

to collect on the paved concrete slab flooring and the southern wall. It keeps the internal temperature even and comfortable throughout the year. This system is complemented by low-mass insulated timber-framed walls, clad with timber board, and extensive glazing on the northern walls. Robert points out that typically, the higher the mass a material has, the more energy is expended in its production. However, these materials are still necessary for good passive solar heating, and “the combination high and low mass materials minimises embodied energy while maximising passive solar performance.” That these theories can

be synthesised so seamlessly into such a fluid and free-flowing form is a tribute to the architect. For pictorial purposes, this room could be considered the head of the dragonfly.

The left, or western, wing of the home feeds off a corridor and accommodates three bedrooms and two bathrooms. The corridor runs the length of the concave wall, finishing at the children’s domain at the western-most point of the house (and making sure the grown-ups don’t have it all their own way). The kids have their own doorway access to the outdoor area and wonderful views as well. This outdoor area can also be accessed from the main

living room and is cleverly protected from the winds by the curve in the house and a raised mound of earth to the west.

The second wing is at the eastern end of the home, containing the kitchen, laundry, garage and a separate study. The garage acts as an informal entry for deliveries and the like, also performing as an airlock against drafts and heat loss. The study backs out of the house to the east and has its own private view. The morning sun in this part of the world is mild, so shading of the glass in the study was not considered necessary by the architect.

A solar hot water system is discreetly mounted

on the north-facing roof of the second living area and water-saving tapware and fittings are used throughout the house.

Robert explains that summer cross-ventilation is not as important in Tassie as it is in hotter climates. Ventilation here is achieved through opening louvres at the ends of the glass facade and opening glass doors. Other rooms have traditional awning sash windows with chain winders.

With Tasmania’s short daylight hours and colder weather, excessive solar gain is less of a concern, but even still, a bladed roof fans out and salutes the sun, keeping the glass shaded in summer

The windows let through the sun's warming rays and provide an uninterrupted view of the outside scenery.



but allowing winter sun to penetrate largely unimpeded. Indeed, in Tasmania, reduction in heat loss is a more critical design consideration, and to this end the architect specified R3.0 batts and reflective foil batts throughout the ceiling. On the external side of the southern wall, Robert has installed rigid polystyrene insulation that is covered in either vertical timber boarding or a skin of 90mm thick hollow blocks to form an outer weather-protective layer.

Robert Morris-Nunn's name is synonymous with design excellence, and is renowned worldwide. His body of work includes the transformation of the old IXL warehouse in Hobart into the sleek, modern Henry Jones Art Hotel. **The work of Robert and his team is proof positive that it is possible to think outside the square when it comes to making your home run as efficiently as possible.** In fact, there is hardly a square or a straight line to be found anywhere in this sleek, languid structure.

The house is striking and yet comfortable for the owners, their children and their guests. And do you think they're happy with the finished product? Their name for the house – 'Well Blow Me Down' – had more to do with their reaction to it than anything to do with the weather. 🏠



The lines and curves are not just for looks, they are important components of the house's energy efficiency.

- Designer:** Morris Nunn & Associates
Builder: Matthews Constructions
Location: Launceston, TAS
Key Features: Large north-facing glass wall
Concrete and core-filled block walls
Insulated walls, ceiling and concrete slab floor
Eaves for shading
Airlock entry
Solar hot water

Sail away

Create cool spaces with some stylish shading.

Artistic, creative, shapely, and elegant. Shading devices in the twenty first century are no longer solely about function. Yes, shading devices are still about keeping unwanted direct sunlight from overheating your home, but the wide range of styles, textures, and construction materials available means that shading devices are also about artistic expression, and extending or complementing the style of your home. There are two main types to consider: fixed shading devices and seasonal ones. Fixed devices such as eaves and pergolas have been the traditional mainstay for shading. More recently, however, sails of all shapes and sizes have added new style lines and elegance to shading. Sails can be put up and awnings pulled up and down only when needed, so you have far more control over how much sun you invite into your living space. Another option, albeit a more expensive one, is motorised awnings. If you're wondering how much heat comes through the average window on a clear day, just imagine that for every square metre of glass in your house

you have a single bar radiator heater turned on for every hour of direct sunlight. This sounds good for winter, but on a hot summer's day, why would you want a bank of heaters firing away at every window? Shading can block up to 90 per cent of this heat. The science of shading is simple. In winter the sun is lower on the horizon than it is in summer. This means we can design structures such as eaves and awnings, particularly on the north side of the house, that allow the winter sun to enter but still exclude the hot summer sun. The east and west sides of a home are a little more problematic but nevertheless solvable. In summer, sunrise and sunsets happen further to the south than those in winter. Place fixed vertical structures just south of east or west facing windows. These combined with horizontal structures can almost completely protect the windows from the sun. Of course the exact size and shape of the shading device you choose will depend on the local terrain, the style of your house and whether there is any surrounding vegetation. Plants and landscaping play a very important

part in reducing unwanted glare and heat gain. For best results, plant deciduous vines or trees to the north, and deciduous or evergreen trees to the east and west. Evergreen plants are recommended for tropical and some hot dry climates. The last word on shading is lifestyle. Remember when designing the shading strategy for your home that outdoor living is such an enjoyable and important part of Australian life. Consider incorporating shading for outdoor eating, lounging and play. Stepping out of the burning sun into the blissful cool of shade is always a moment of great relief in summer. In the twenty first century, shading is as much about adding style to your property as it is about reducing the cost of running your home.

For more information:
***Your Home* website**
www.yourhome.gov.au



Shading tips

- Install shading devices over windows and doors.
- Lighter coloured shading reflects more heat.
- Use plants to shade your home, particularly windows.
- Use umbrellas or sails to shade and protect outdoor living areas.
- Choose shading devices suitable for your climate zone and house orientation.



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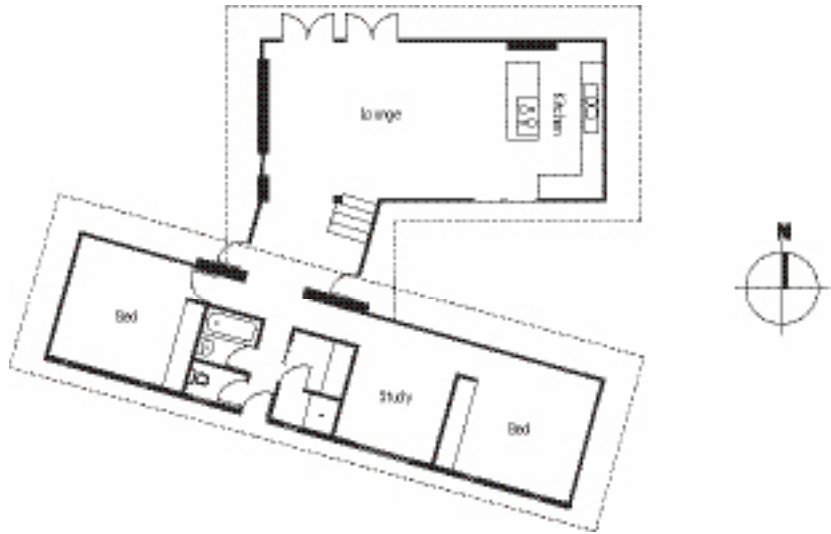
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facing north and looking down at the river”



Both wings of the house face north to catch the winter sun and the splendid views.



John Smith had been researching sustainable houses for years, ever since a day in 1977 when he picked up *The Autonomous House* by Brenda and Robert Vale. So when John and his partner Jillian Miller decided to build their own home, it went without saying that it would include as many sustainable design features as their budget would allow.

The house is in the Adelaide Hills at Norton Summit, on the edge of an escarpment with views over the Port River estuary, the Morialta Conservation Park and the Adelaide CBD. “On our very first visit, John took me over to this spot

under the tree and said ‘This is where I’d like to build a house, facing north and looking down at the river,’” Jillian remembers. Three years later, they enlisted the expertise of architect John Maitland and embarked on building their dream home.

The house is a compact, single-storey structure with two wings connected by an entry atrium. **The most important design feature of the house is highlighted by its name, ‘Kawanda Muna’, which in the local Aboriginal language means ‘north-in-front’.** Both wings face north to catch the winter sun and the splendid views. Almost all of the northern walls are glass, to compensate for

the abundant stringy bark canopy that screens out some of the winter sun. Rather than being parallel, the two wings form a wedge-shaped courtyard, which captures the cooling westerly breezes in summer.

“I was initially quite surprised at the design, having two separate sections in this cool climate, but it really works,” says John. The large expanses of glazing allow the sun to warm the concrete slab floors, which then store and slowly release the heat over many hours. Walls are made of either rammed earth or concrete block.

The house also employs a ‘trombe wall’ to trap

and emanate heat in the kitchen and living room. A trombe wall is a wall of high thermal mass, placed inside an external glass wall and separated from it by a small air space. The mass wall stores and radiates solar heat, while the glass prevents the radiated heat from escaping outside. The room behind the trombe wall remains comfortable through the day and receives slow and even heating for many hours into the night. A vent at the base of the wall allows air from the house to move into the trombe wall, and a vent at the top allows the hot air to come out of the wall and into the living area in winter. In summer, the upper internal vent is

closed and a window releases the hot air outside, drawing more cool air through the house.

John has upped the ante by adding experimental phase-change material to his rammed earth trombe wall. It involves an array of calcium chloride ‘cells’ which change from solid to liquid at 28 degrees Celsius, taking up large amounts of ‘latent heat’ in the process. The heat is then released as the calcium chloride cools and re-solidifies. The outside east and west walls were also clad on the outside with corrugated steel to protect the walls from the external elements and increase the walls thermal performance.

Supplementary winter heating is provided by a slow combustion wood stove, positioned centrally within the small house and fueled by natural-fall timber harvested carefully from the two-acre property. A water jacket around the flue boosts the solar hot water system whenever the stove is in use.

The windows were not double-glazed for budget reasons, but a transparent plastic film has been applied to simulate double-glazing. This solution is best used as a temporary measure as the film needs to be replaced over time and performs below that of a standard double-glazed unit.

“I was initially quite surprised at the design, having two separate sections in this cool climate, but it really works”



Over the years, **John had collected a large supply of recycled materials, which came into good use during construction, and considerably reduced the embodied energy required to build the house.** Ninety per cent of the timber was second-hand, including high quality jarrah used for the entry floor. Other recycled items include copper, aluminium, electrical and plumbing fittings. New materials were carefully selected on an 'environmentally preferred' basis, which included consideration of the embodied energy, durability and maintenance.

Kawanda Muna is self-sufficient for water

and waste, and produces about as much excess electricity in summer as it uses in winter. John and Jillian elected to install a stand-alone photovoltaic array instead of a roof-mounted system, because of shading from nearby trees. An innovative tracking system allows the array to rotate for maximum solar access, so that fewer panels are needed than a stationary system. Data from the array is transmitted back to a computer in the house for easy monitoring.

At only 123 square metres, John and Jillian's dream home is as large as it needs to be to happily accommodate themselves and their daughter,



The 'outside-inside' feel of the design has given the small home a relaxed spaciousness.



and not a foot larger. The 'outside-inside' feel of the design has given the small home a relaxed spaciousness. The sensitivity with which Kawanda Muna was built has given it a sense of harmony with its beautiful bush setting. 🌿

Recently, Australia lost a pioneer of the sustainable housing industry. John Smith was an innovator and passionate educator who shared his ideas through numerous environmental and community groups. His home, Kawanda Muna, was a working example of the principles he espoused and was open to all

as an educational tool. Though John died much too soon, he was successful in influencing many people's views and educating the next generation about the importance of energy and the environment. Such was his commitment to these ideas, that less than two weeks before his death and despite being in relative discomfort, he was still entertaining groups of school children at his home.

Designer: Energy Architecture – John Maitland
Builder: Malcolm Dallwitz
Location: Adelaide Hills, SA
Key Features: Solar hot water
 45,400 litre rainwater tanks
 Wet composting system
 Rammed earth construction
 Windows coated with additional plastic film
 1kW photovoltaic power system
 Trombe wall
 Recycled timber beams and flooring