

MODERN GREEN HOMES Sanctuary

INSIDE ISSUE 11 45 pages of inspiring sustainable homes; recycled kitchens; ask our experts; solar heating & cooling; greener concrete; ventilation; low-water lawns

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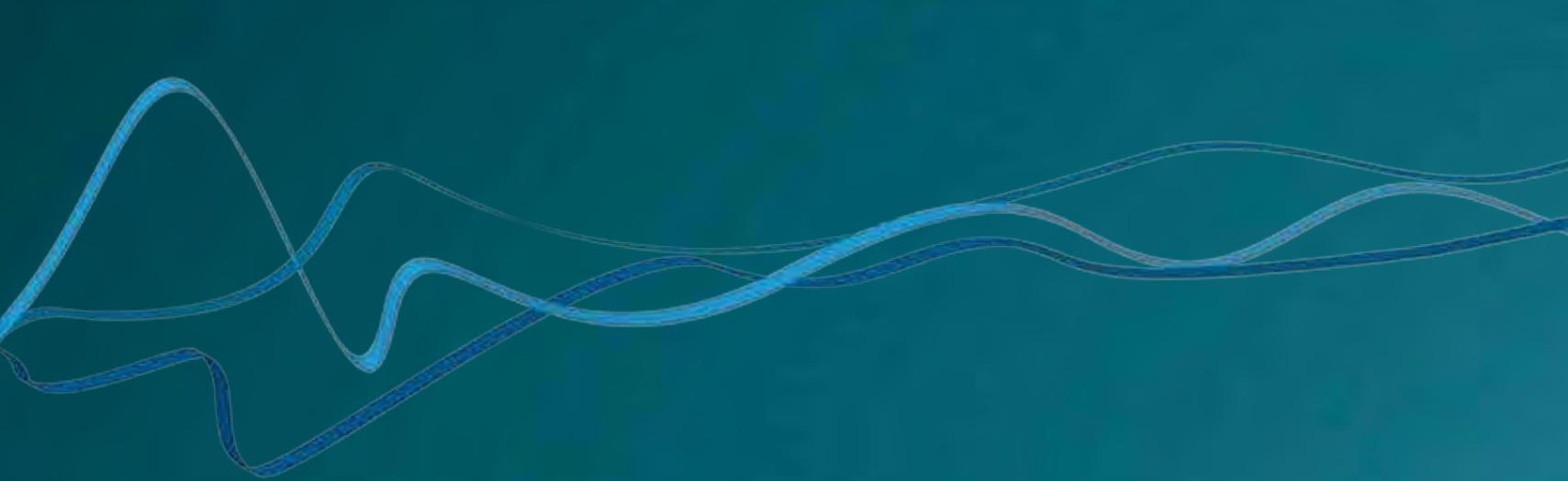
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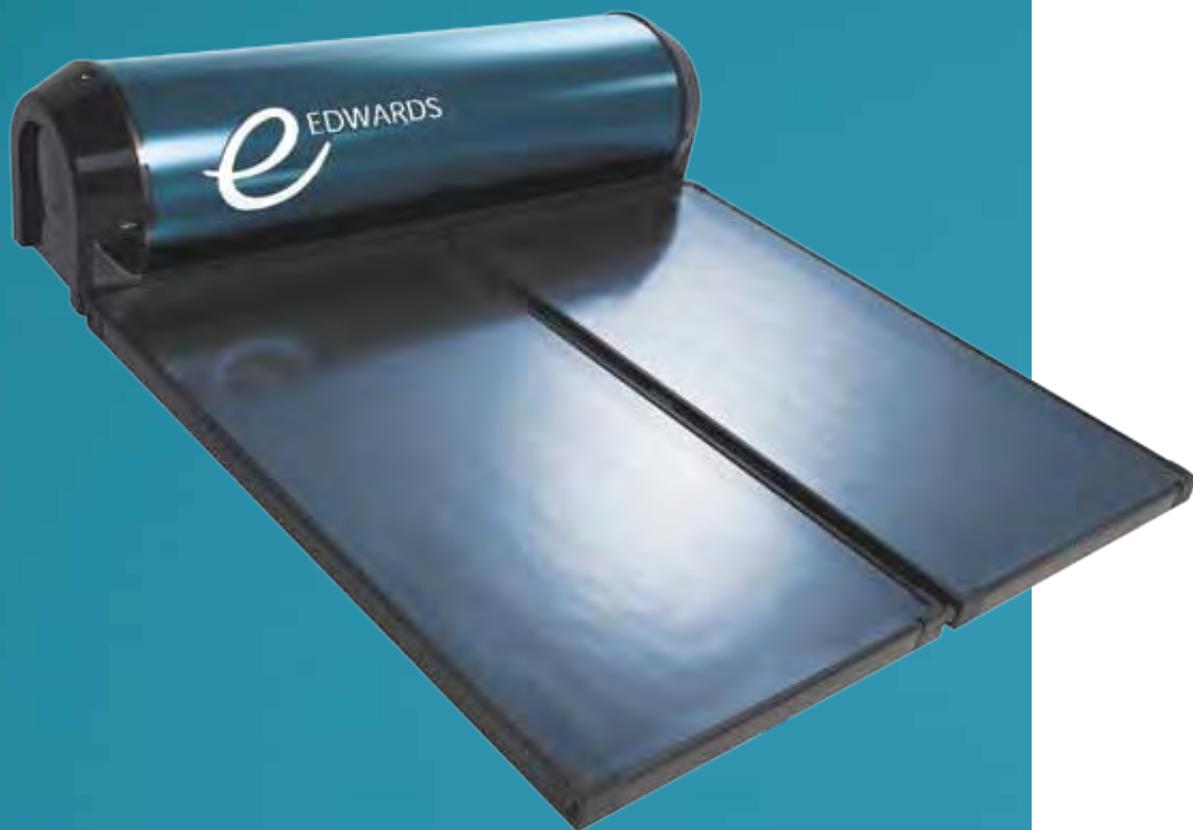


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The modest renovation of a postwar bungalow in the Melbourne’s West Preston scores a double victory for heritage conservation and for sustainability.

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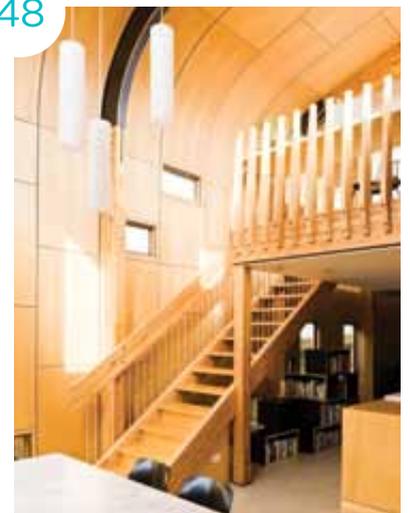
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Letter from the Editors



Verity Campbell



Michael Day

Times move fast. When Sanctuary was launched in 2005 as Australia's first magazine for environmental home design, Al Gore was still just that guy who was robbed at the 2000 US presidential election.

Four star houses were state of the art and the average householder probably thought global warming had something to do with daylight savings. Since then, awareness of global warming and the environment has grown exponentially. Now it's no longer a case of why we should build environmental houses but how.

Thanks in part to organisations like the Alternative Technology Association (ATA, publishers of *Sanctuary* magazine) and publications like *Sanctuary* and *Your Home*, the average green homebuilder and renovator is much better informed about basic environmental design.

They don't need to be sold on correct solar orientation or thermal mass. They're telling us, we understand all that about deep eaves and glazing to the north. What we're after are words and pictures about stuff we haven't thought of yet. Nitty gritty stuff: features, fittings and fixtures we can easily source and specify.

So our house profiles are much more detailed now. You only need to compare this edition to, say, *Sanctuary* 6 or 7 to see the difference. The magazine has moved beyond showcasing passive design per se and is much more focussed on specific solutions.

Sometimes those things lend themselves to pictures, sometimes not. Realising that nitty gritty does not always make for great eye candy, we've initiated a new section called Design Notes where we put all the "dry but essential" stuff. Topics we cover include eco concrete (p84), recycled kitchens (p86) and cool pantries (p80). On p92 we profile new and innovative products. Not because they're cool, necessarily, but because they can make a difference. So when you tire of all those gorgeous house pics, you can flick down to the back of the mag for something a little more educational.

If you're struggling with a particular challenge, with our new Ask the Experts column (p96) we invite you to submit your question to a sustainable architect or house designer (for design queries) or to the ATA's resident sustainability consultant (for product queries). We'll choose a representative sample to be answered each issue. Email us at sanctuary@ata.org.au with the subject line "Ask the Experts". You might also want to try the ATA member's forum at www.ata.org.au/forums, which has threads on everything from polished concrete to phase-change plasterboard.

And feel free to ping us with general comments too! We love your feedback.

Email: sanctuary@ata.org.au



Sanctuary is published by the Alternative Technology Association (ATA), a not-for-profit environmental organisation promoting renewable energy, sustainable building and water conservation since 1980.

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Winner TreeHugger.com's 2010
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An energy efficient LED fitting for every situation

Introducing the CeeLux® HB13 pendant, surface mount and recessed downlights

The CeeLux® HB13 consumes just 13 watts of power to produce light equivalent to a 35 watt halogen bulb. This environmentally friendly replacement for energy hungry halogen downlights has been supplemented with these simple and stylish pendant and surface mount versions.



The new **CeeLux HB13P** fitting is a stylish LED pendant luminaire from Hotbeam. This ceiling mounted fitting is composed of anodised aluminium housing, height adjustable suspension and a ceiling plate with bracket.

The new **CeeLux HB13S** fitting is a high-output LED surface mount downlight. The surface mount fitting incorporates the CeeLux HB13 downlight. Hotbeam's CeeLux HB13S fitting gives you a simple and long lasting downlight option where there is not enough cavity space to install a recessed downlight.



The **CeeLux HB13** fitting consumes just 13 watts of power to produce light equivalent to a 35 watt halogen bulb. The HB13 recessed downlight operates at a low temperature ensuring safety in the surrounding space. It has a water resistant face plate. The CeeLux runs from 240VAC directly so requires no transformers. The CeeLux HB13 comes in a warm white colour temperature.





ONCE IN A LIFETIME

For Riddel Architecture, a brief to build “the most sustainable home possible” on the Brisbane River’s prestigious south bank was a unique opportunity to prove green can be glamorous.

WORDS DANIELLE DUNSMORE **PHOTOGRAPHY** CHRISTOPHER FREDERICK JONES



The north-south running gallery features fin windows that have been angled to permit light inside while minimising ingress of hot afternoon sun. Painted red they form a striking feature wall. To the east, high-level louvres to the courtyard permit ventilation on hot days. (The Australian hoop pine ply lightshades are by David Trubridge.)

QUEENSLAND GETS ITS FAIR SHARE OF SUN.

Now its warmth and light have been harnessed to an extent rarely seen in an amazing new home in Brisbane's Hill End.

Designed by David Gole and Emma Scragg of Riddel Architecture (RA), this house goes to extraordinary lengths to harness and control the elements. Which is just one way in which RA realised their clients' brief "to build the most sustainable home possible".

At the time of our visit, the brand new home had had several open days over two weeks, receiving hundreds of visitors – including numerous architects and builders – keen to see some of the latest environmental design and technology brought to life.

The team spared no pains in living up to their clients' expectations, including incorporating a recycled content in the building of 80 per cent. In that and many other ways (for instance, making use of low-carbon, magnesia-based eco concrete), the project gave RA an opportunity to push the envelope in sustainable home design.

David Gole explains RA's approach to the project. "Unfortunately, the previous home had been altered and extended several times, was of no historical value and was run down." Despite this, RA and builder Rob Peagram Builders made sure very little of the old home wound up in landfill. "About 80 per cent of the old home was reused in the new one."

"We reused the old VJs (tongue-and-groove wall panelling), the ceiling and floor joists, the floor boards, decking and the weatherboards," says David. "Rob stockpiled useful materials onsite, sorting out what was reusable and what wasn't. We were very lucky – Rob and his team really believed in the project."

Recycled materials were used in the wall frames, floor and roof frames, steelwork, linings, cladding, concrete floors and tiling. The mix of old and new gives the home character, and has obvious environmental benefits.

"We even avoided bringing in a portaloos during construction – because of its associated chemicals – and instead simply built an outhouse using the old toilet suite."

Outdoor entertaining areas are strategically shaded, while indoor areas are designed to capture and direct breezes, expelling or retaining heat as required. External venetians deflect the heat from outside, while concrete (make that eco concrete) floors help regulate internal temperatures.

The home works around a grassy courtyard, allowing the sunlight and breezes into every room as required.

The front half of the home houses the garage and plant room, with two bedrooms, and a bathroom upstairs. Connected by a wide, open gallery to the home's riverfront section, you can go upstairs to the master bedroom suite, stay ground level in the kitchen and living areas, or descend to a fabulous underground suite that any teenager would give their right arm for! This fabulously cool subterranean room has a skylight upstairs to the living area – positioned "just so" to capture daylight and winter sun.

Either side of the open kitchen are two living areas: one for summer that faces the river and is open to the cooling southerly breezes; and the other for winter, with concrete floors to store the heat of the winter sun.

The separate areas are all connected by generous partition doors and breezeways. To economise on floor space, many of the rooms allow multiple uses. A bedroom can convert to an office or to a visitor suite.

"We needed to connect to the river in every way possible. All the rooms look through to the water – almost from the front door."

The social aspect of the home, both inside and out, was also a major consideration. "We wanted this house to look no different to any other in the street. Very unpretentious, friendly and inviting with no front fence and the gates set back. The garage you can look into: it's open and not a solid wall, or a barrier into the home."

The fabulous site, on the southern bank of the Brisbane River, is prime real estate, and even though sustainability was a priority the home still needed to be at home in such a premium address. "The value of the land requires a commitment to high quality design and finishes," says David Gole.

"We wanted to prove that you could build a sustainable home, with architect and quality builder, for the same price, around \$3500 per square metre, as a home of similar quality without any sustainable credentials."

Certainly with a massive 80 per cent recycled content, passive solar design, underground water tanks, solar power, no air-conditioning, and low fuss, hardwearing materials, only a handful of houses Australia-wide could tick as many environmental boxes as this one.

But when you combine design smarts with drop-dead gorgeous looks and "location location" you have a once-in-a-lifetime, see-it-to-believe-it house. No wonder people are queuing up to see it.

.....
 For more information about eco concrete see
 Design Notes – Greener Concrete, p84



The kitchen cabinetry is built completely of plantation hoop pine ply with water-based stains and clear finish. Feature door handles are of brushbox and the benchtops are reconstituted stone.



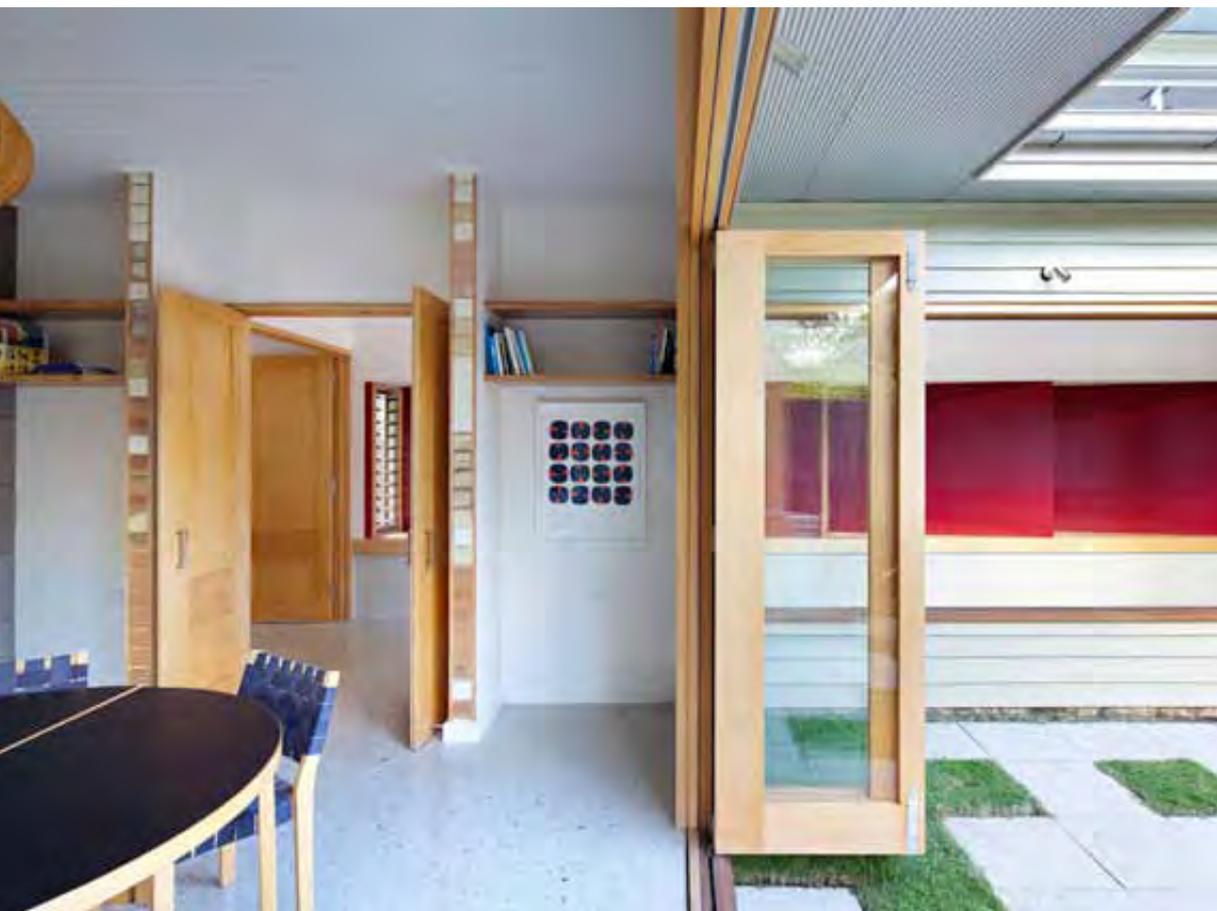
The timber-floored living/dining room blurs the lines between inside and out by combining a light filled indoor room with a partially shaded river terrace. The concrete blockwork wall provides bracing and thermal mass.



➔ Rear of house, south (river) side.



RA and builder Rob Peagram made sure very little of the old home wound up in landfill. “About 80 percent of the old home was reused in the new one.”



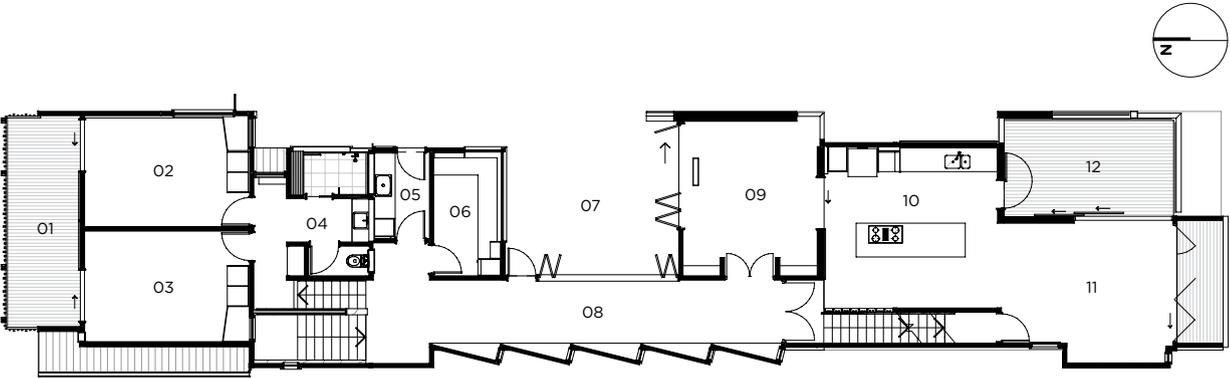
➔ The dining room looking west towards the gallery shows how the house opens onto the central courtyard. Storage and display nooks turn recycled VJ walls into features – note the original paint layers on the fin walls. (Furniture by Retro Moderne; painting, Untitled (Bean Print “I”) by Michael Phillips.) Feature floors of polished, light-coloured concrete provide the bulk of thermal mass to the main floor. Eco cement mixes with cement substitutes were used throughout the house.



➔ Louvres below casements provide low level, insect-screened ventilation to all bedrooms to provide cooling breezes when sleeping at bed height. All windows are framed in local plantation hoop pine joinery with Australian hardwood sills.

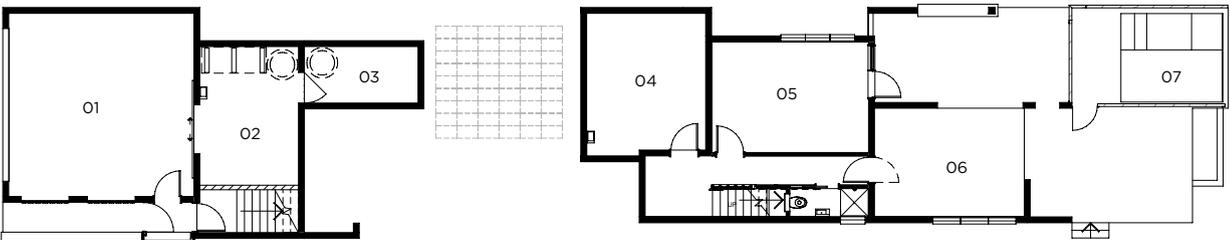
FIRST FLOOR PLAN

- 01 Balcony
- 02 Bedroom 1
- 03 Bedroom 2
- 04 Bathroom
- 05 Laundry
- 06 Study
- 07 Garden Court
- 08 Gallery
- 09 Dining
- 10 Kitchen
- 11 Living Room
- 12 River Terrace



GROUND FLOOR PLAN

- 01 Garage
- 02 Plant Room
- 03 Cellar
- 04 Store Room
- 05 Media Room
- 06 Gym
- 07 Pool



Hill End Residence

Designer

Emma Scragg, David Gole and Simon Boundy of Riddel Architecture

Website

www.rara.net.au
www.hillendeco.blogspot.com

Builder

Robert Peagram Builders

Project type

New building

Project location

Hill End, QLD

Cost

approx. \$3500 per sqm

Size

638 sqm block comprising 200 sqm vegetative buffer zone to river's edge; 261 sqm internal spaces; 52 sqm covered outdoor living; 73 sqm plant, storage and garage

Decor

Furniture by Retro Moderne; fabrics by Mokum Fabrics; paintings (unless otherwise noted) by Michael Phillips; large-format prints by Michael Schlitz

Active heating & cooling

Hunter Pacific International Typhoon ceiling fans with timber blades

Windows & glazing

- Window and door frames are local plantation hoop pine joinery with Australian hardwood sills
- Large expanses of glass to the living, dining and master bedroom use solar control, Viridian low-e 6mm Toughened Clear Sunergy Glass supplied by National Glass
- Light-coloured finishes to maximise reflection of daylight

Insulation

- R3.0 recycled polyester bulk insulation to roof cavities, with sisalation of reflective bubble-wrap-style material. The roof cavity is ventilated to further improve summer cooling.
- R2.0 recycled polyester bulk insulation with sisalation of reflective bubble-wrap. A ventilated wall cavity has been created on the south-western wall.
- Air-cell Insulbreak 65 Sisalation

Building materials

- 80% of previous building recycled into new building
- Braceboard masonite bracing (compressed sawdust waste product from sawmills) by Australian Hardboards
- Low-carbon, magnesia-based eco concrete from Tec Eco, Tasmania (see Design Notes – Greener Concrete p84), and mixed by Hanson. Flyash cement substitute to hidden/rendered concrete; silica fume (like flyash, a cement substitute and industrial waste product) to the feature floor. Silica fume gives the same green star rating as flyash but doesn't darken the concrete.
- All new timber – flooring, stairs and decking – is Chain of Custody Certified. Doors and windows are local plantation hoop pine. All wall frames, sub-floor frames and roof structure (80-85% of total timber) is recycled. Reinforcing steel to concrete is 95%-plus recycled content. Other steelwork has been minimised wherever possible and is hot-dip galvanised for greater longevity

Paints, finishes & floor coverings

- Rockcote Ecostyle paints to painted surfaces other than concrete
- Bauwerk Kalk (externally) and Uber (internally) breathable, non-toxic lime paints used to the rendered blockwork internally and externally

SUSTAINABLE FEATURES

Hot water

Edwards Titan 315L electric boosted solar hot water with a well-insulated storage tank

Renewable energy

- 3kW of Kyocera (www.kyocerasolar.com.au) polycrystalline photovoltaic panels, grid connected. Cost (incl. installation): \$28,000
- Sunny Boy 2500W SMA inverter

Water saving

- 2 x 22,500L concrete rainwater tanks below the driveway connected to hot water system, washing machine, dishwasher and toilet backup. Includes switching mechanism to townwater supply for rare cases where this may be necessary.
- Greywater from basins, showers, bath and washing machine treated on site in a greywater treatment plant, AquaReuse model ADGF01, installed by Greywater Solutions. Total cost for rainwater tanks (including Atlantis Flo-Tank, see opposite page) and greywater system: \$60,000
- Gutters and downpipes are oversized to prevent overflow during downpours

Passive heating & cooling

- Large overhangs, window hoods, outdoor living spaces, blinds, lightweight building materials and generous ceiling heights
- Cooling by natural convection (see Design Notes – House Ventilation, p88)
- Sun control via combination of vegetated trellises (using recycled timber from site), solid awnings, operable blinds and external venetians

SUSTAINABLE PRODUCTS

SWIMMING POOL

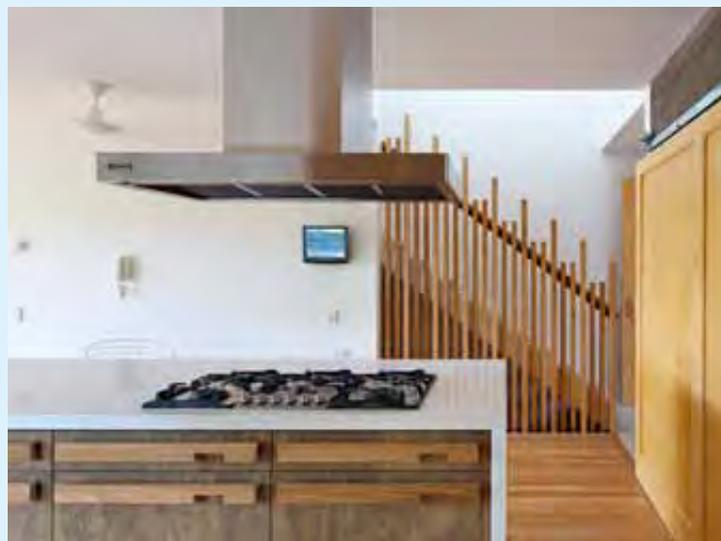
Small plunge pool features a Paramount “eco pool” circulation system and is filled and topped up with rainwater. The pool has oversize pipework for more efficient flow rates and an oversize sand filter for shorter filtering time and longer cycles between filter cleaning. It has a low-salt self-cleaning salt chlorination unit which negates having to produce and transport chlorine offsite and which allows the use of the backwash water to be flooded onto some garden areas.

Cost \$35,000

www.stuartbevanpools.com.au



ECOVISION HOME MONITORING SYSTEM



This monitoring system has a display panel (mounted on wall) and will measure energy generation and use, gas use, water storage levels and use, accumulated CO₂ emissions, and temperature and humidity. Cost (incl. installation): \$34,000

www.ecovisionsystems.com.au

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The Enviro Save system uses a thermal valve to divert cool water back into the cold water lines and store it in a pressure or rainwater tank until hot water arrives at the tap. In an average home, the makers claim, that means a saving of around 10% of all household water use. The Enviro Save fits to new homes from around \$200, and retrofits to existing homes from around \$500. The system requires no power. www.enviro.net.au



UNDERGROUND WATER STORAGE

This home has an Atlantis Flo-Tank underground storage cube system made of 100% recycled polypropylene. The permeable top allows water to enter from roof down-pipes via the lawn, sand and a filtration geofabric. This system provides 25,000L of water storage. www.atlantiscorp.com.au



LED DOWNLIGHTS

Hotbeam CeeLux Do8 directional LED downlights in warm white have been used throughout the home. The Do8 has an output equivalent to a 20W halogen while consuming only 6.5W of power

www.hotbeam.com.au





Enviro Save Water System

Judges' and People's Choice Winner ABC New Inventors program

"The invention of the century" — Viewer feedback.

"The most worthwhile invention of the year" — James O'Loghlin

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MODEST MAKEOVER

The modest renovation of a postwar bungalow in Melbourne's West Preston scores a double victory for heritage conservation and for sustainability.

WORDS VERITY CAMPBELL **PHOTOGRAPHY** RHIANNON SLATTER



Brenton's roof garden-topped garage is a multi-functional space offering the family an outdoor workspace, storage space and additional gardening opportunities. All up to build it cost him around \$1000 with plenty of free labour from friends and family. Installation of the roof garden cost the same again, with a working bee of all available hands lifting the soil system up ladders in one long day.

WEST PRESTON IS A MELBOURNE SUBURB BRIMMING

with postwar brick bungalows and a mix of long-time residents and young families lured to the area by its roomy houses and large backyards.

It's a familiar story in Melbourne's inner north, and one which has led to not a few unsympathetic renovations and boxy additions. But what makes this story unusual is that instead of modernising the home and extending its footprint, architect-owner Brenton and his family chose to retain and uncover the home's original features and layout, creating a comfortable home on a modest budget. Not only does it preserve the architectural heritage of a suburb, but from an environmental point of view it has resulted in significant savings by reusing and revitalising the home's existing materials. It's a modest project, but it speaks volumes for sustainable development.

Brenton began with the kitchen. He decided to keep the room's original configuration, which had served the house well for decades, and the fireplace.

"We chose not to knock down the original kitchen fireplace. Lots of the houses around here have the fireplace knocked out for more space, but we think it adds to the charm of the room."

The kitchen cabinetry was also kept, but a new bench top was necessary. Brenton sourced stone offcuts, but in hindsight would have preferred a laminate – "the stone benchtops that we have are quite irritating because they are very 'clacky'. I feel like I am always about to break my glass when I put it down." They built new joinery around the stove, and found taps at the Coburg Trash and Treasure market. The cabinetry handles came from a friend's old kitchen which was being demolished. All up the family spent around \$6000 on the kitchen, including new appliances – about two thirds of the minimum cost estimate in Archicentre's 2009/10 *Cost Guide* (Archicentre prices kitchen renovations at between \$10,400 and \$31,100). Brenton is quick to point out that such a low budget relied on being able to retain the existing cabinetry and to undertake pretty much all the work himself (apart from service connections and new joinery). "I would never want to clean the inside of an old chimney from 60 years of fatty cooking again," he says. "And the two years that we lived with half finished tiling were not really an advertisement for 'architecturally designed lifestyle choice'".





According to Brenton, "The utensil rail is a standard towel rail with hooks we bought from an Asian grocer on Victoria street. The shelves came from a friend who had them sitting on his balcony for two years and never got around to making what he was going to from them. The shelves are lit with one fluorescent bulb, and we 'gapped' the shelves off the wall to give the light more effect."





After the kitchen, Brenton set to work on the bathroom. He had the original cast iron bath re-enamelled *in situ*. After digging down through three layers of vinyl Brenton discovered an original concrete floor, and was delighted to find it had original coved edges. “You can’t find a builder willing to make an integral concrete skirting or cove these days.” He replaced the vanity unit and decided to “float” or suspend it over the floor – to make the room appear bigger than it is and to enable his prized coved concrete floor to be enjoyed in its entirety. The floor was finished with an Italian wax sealer (the *fondo woplus* system), which was trialled on the kitchen hearth before using on the bathroom and in the reconfigured sunroom and laundry. He chose a traditional curtain rail over the bath rather than a fixed glass screen: it’s much easier to clean and replace a curtain than it is to keep a glass shower screen free of mould and mildew, he reasoned.

To create a connection to the backyard Brenton and his family transformed the existing antechamber space adjacent to the laundry into a sunny study by adding new windows and a desk. The hardwood windows had glass installed on the outside face to create a usable window sill for books and potplants. Louvres were installed for crossflow ventilation, and these were glazed with various coloured and textured glasses to give some privacy and shadow play across the walls and floor. Brenton ground the floor by hand and sealed it with the same wax used in the bathroom and kitchen. He says “a wax finish gives a surprisingly warm finish to concrete and doesn’t make it look like a layer of plastic has been poured over it”.

“I would never want to clean the inside of an old chimney from 60 years of fatty cooking again”



Between 10 and 20% of heat loss in winter can occur through floors, so ideally, timber floors should be installed with underfloor insulation. With many existing homes underfloor access isn’t possible though, so a thick rug as shown here is an adequate substitute.

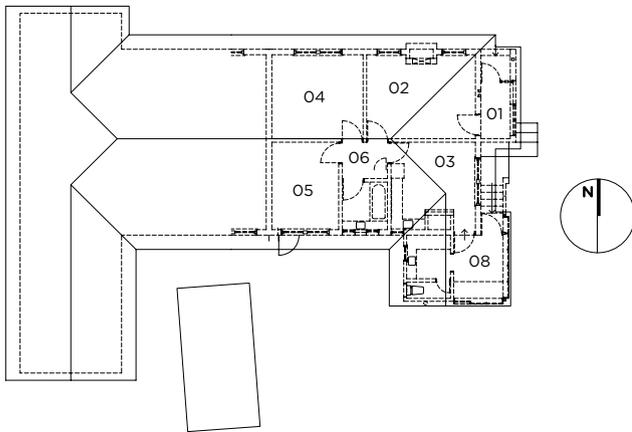
Brenton believes in functional architecture: buildings that compress as much functionality as possible into their form. When looking out into his garden from his newly minted kitchen and study, with views over West Preston, he saw a space yet to be fully utilised. He began making plans for a shed with chook house, workshop, laneway access, bike storage and roof garden. A space that fulfils many needs, but also mediates the views beyond.

For the structure Brenton sourced reclaimed timber beams from a demolished warehouse. The size of the beams governed the size of the building. The fascias were from cypress pine, while a friend's old futon base formed the vertical slats of the "windows". Brenton installed a large reclaimed gate to open onto the alley, so that he can easily come and go by bicycle (and store the bike in the shed), and an up and over door to the garden so the shed can be fully opened up to it.

Mindful of the views from the house he then set about installing a modest rooftop garden. He chose a roof garden not for its insulation value – there's no need to insulate a shed (though the chooks might disagree) – but for aesthetic reasons. The basic system he created supports a selection of native grasses and vegetables (leeks, tomatoes, pumpkins) and is watered by hand. A task Brenton is training his son to take over.



↑ Judicious reclaiming in this house sees mustard jars reborn as spice jars.



SITE PLAN

- O1 Entry
- O2 Living
- O3 Kitchen
- O4 Main Bedroom
- O5 Second Bedroom
- O6 Bathroom
- O7 Shed with roof garden
- O8 Study



West Preston Residence

Designer

The Rexroth Mannassmann

Collective

Website

www.rexroth.net.au

Builder

Owner-builder

Project type

Renovation

Project location

West Preston, VIC

Cost

\$30,000

Applying a price guide to roof gardens is a tricky business since size, access and other factors come into play, but Fytogreen estimates \$220 per square metre for an average size (100 sq m) irrigated roof garden.

For more information about roof gardens see Green Roofs Australia (greenroofs.wordpress.com) and Urban Ecology (www.urbanecology.org.au).

SUSTAINABLE FEATURES

- 2500L BlueScope Water tank (www.bluescopewater.com.au) made from Aquaplate steel. This tank has a Colorbond colour you can choose on one side and a water proof coating designed specifically for tank manufacture on the other.
- Generic greywater diverter taps to shower and washing machine with subsurface agri pipe in trenches.
- R3.5 polyester batts in the ceiling and living room
- Breezeway Louvres to sunroom to improve cross ventilation throughout the house
- *Fondo woplus* wax floor sealer. The wax Brenton used is low in VOCs for safer installation and has proven to be hardwearing in areas like the toilet that one would usually think to use a poly sealer.

ROOF GARDENS

Rooftop gardens provide excellent insulation, protecting buildings from hot summer sun and keeping the warmth within during winter. They increase green space in an urban environment, reducing the “heat island effect”, increase a city’s capacity to uptake carbon, and decrease stormwater runoff. Long established in American cities such as Portland and Chicago, they’re becoming increasingly popular in Australia too.

There are two basic types of roof garden: extensive and intensive. Intensive gardens have considerable substrate profile with elaborate irrigation and drainage systems, so they can support trees and shrubs. Extensive systems require little maintenance and have minimal soil depth, so they add minimal load to the roof. They can generally only support ground covers and grasses.

Brenton installed an extensive Fytogreen (www.fytogreen.com.au) roof garden system on this 9 sqm shed. He applied a plastic waterproofing membrane to the roof, then installed Fytogreen’s construction systems: a LDPE sheet to protect the waterproof layer; a drainage cell and geotextile membrane; a Hydrocell foam layer (made of an aminoplast resin); a growing medium; and finally the foliage. All up the profile is 300mm, requires little maintenance and is non-trafficable. Brenton estimates this garden cost him around \$1000; costs were kept down because it’s not irrigated, he applied it himself and it’s a system designed to be non-trafficable (Brenton’s footsteps while hand watering are fine).

REENAMELLED EXISTING BATH

For an existing bath that needs another lease on life, consider resurfacing. Resurfacing can be done *in situ* over three to four hours. You can choose any colour you like and grout lines are sealed, eliminating mould and mildew. The new surface should last between 10 and 15 years (ensure you get a warranty), and you can get basins and wall tiles done at the same time.

Choose a professional resurfer with good waste management and ventilation procedures. The coatings used during the process contain toxic isocyanates – you need to ensure the applicator wears appropriate breathing protection, that professional air evacuation systems are used (the built-in exhaust fan in the bathroom should not be used) and that the work area is appropriately sealed off from the rest of the house.

Brenton’s bath was resurfaced by Nu-Pride and cost him around \$800. Look under “Bath & Basin Resurfacing” in the *Yellow Pages* for other options. www.nupridebathrooms.com.au





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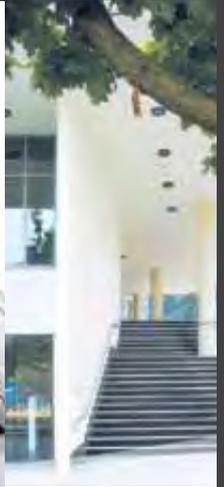
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SPREADING ITS WINGS

On a beautiful but challenging site in the Sunshine Coast hinterland, architect Dan Sparks gives a boxy concrete block home a sustainable makeover.

WORDS FIONA NEGRIN **PHOTOGRAPHY** CHRISTOPHER FREDERICK JONES



WHEN CAPTAIN JAMES COOK CAME TO

the hinterland of Queensland's Sunshine Coast in 1770 he was awed by the dramatic volcanic crags that dominate the landscape. The Glasshouse Mountains are one of the region's main drawcards, and the owners of this sustainable house in rural Maleny wake to views of them every day.

"The house is high on the ridge, 500m above sea level, so the views are fantastic. You can see the Glasshouse Mountains, and on a clear day you can see 140km away to Brisbane," says architect Dan Sparks, who is the son of the owners.

Being high on a ridge is great for panoramic views but its downside is exposure to ferocious weather. "This place gets hammered by wind and rain," says Dan. One of the briefs for the house, a renovation of an existing house, was to make outdoor areas liveable by protecting them from the elements.

The original house was a 1960s Besser concrete block box with a conventional pitched (hip) roof. The roof, some internal walls, concrete block walls, and concrete slab were retained, and the kitchen and bathroom were kept in the same position. "The aim was to rework the house rather than demolish and start from scratch; to recycle and re-use to save materials and money," explains Dan.

Most of the renovation is "within the bones of the original house", but a new building, a pavilion, was added on the south side of the house, facing east. Dan designed the pavilion to be self contained, with a living area, master bedroom, ensuite and library. But it's also a weather-stop for the outdoor terrace of the main house. "It shelters the deck from south-easterly winds and summer rain. Previously you couldn't be outside unless it was a perfect day, because of wind and rain. Now you can still be outside, or keep the external doors and shutters open, in spite of the weather."

The notable feature of the new pavilion is its twin skillion, or "butterfly", roof. The roof spreads in two directions like a butterfly's open wings, and is an ingenious design solution to a number of quandaries, as Dan explains.

"The play of the roof form is all about getting northern light and winter sun into the building. The house runs north-south, so few rooms benefit from northern light. The eaves are angled to get winter sun onto the concrete slab and heat it up, so it can act as a heat sink to warm the house through the day. Because of their depth, the eaves are big enough to block the sun in summer, helping to keep the house cool. The 30 degree pitch of the southern roof plane also allows for the future incorporation of a photovoltaic array."

Although Dan's parents live alone, they "love to entertain and have family over," so the house needed to have flexible spaces. Dan designed the building as a series of "zones" to contract to be comfortable for two people and expand to fit the extended family, as well as to help reduce cooling and heating demands.

"You can close off the bedrooms, bathroom and studio from the living area in the main house as well as the pavilion. The main living area expands by opening doors to the terrace. It's not a small house, but it can be closed off to make it more compact. At the same time, the whole family was there for Christmas and you could feel all the spaces working – it was great."

Dan's mum enjoys gardening, so water conservation was built into the design. The old concrete water tank is still operational (although you might not recognise it – it's been camouflaged as a giant chess set!). A blackwater and greywater waste system was installed, and a further clutch of rainwater tanks brings the total amount of water conservation to 122,000 litres.

Dan says his parents find the house "a pleasure to live in", and the job of designing the house was a privilege for him. "I tried to keep a rural Maleny feel, with recycled timber and smooth cement render, but the home also has clean, modern lines and pragmatic planning. That balance is a fine line to walk." That sustainability features can be merged with a modern aesthetic goes without question, but it's still a treat for his parents. "They were watching *World's Greenest Homes* on TV and they kept ringing me up to say, 'Our house has that!' They're ticking off the boxes and they love it."



Open fireplaces are the least efficient of all wood heating methods and produce the highest levels of air pollution, but slow combustion heaters such as the one used in this living room efficiently provide convective and radiant heat and are suited to large spaces.







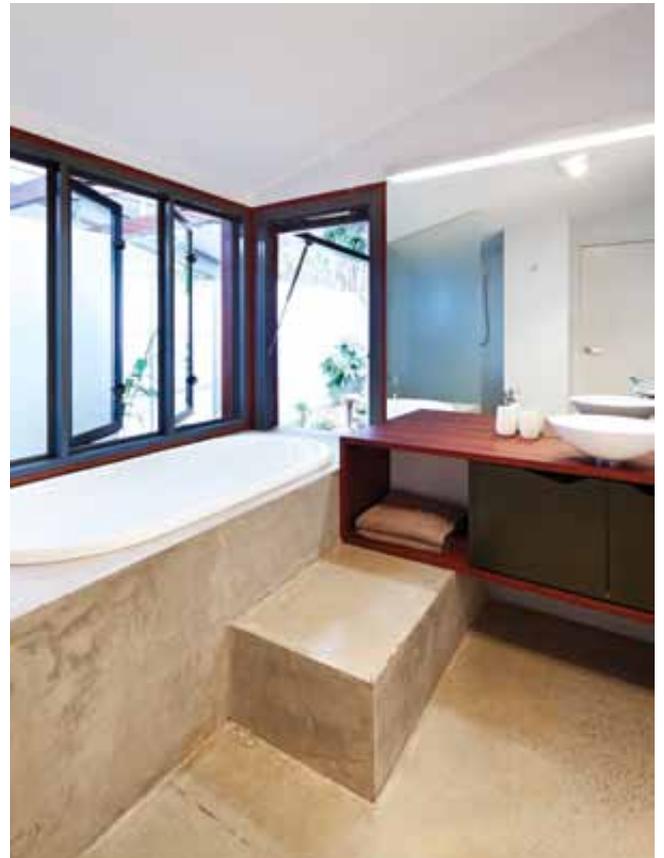
Raised planter boxes in the terrace were designed at seat height, so they can double as benches. The decking timber on the day beds (and all external hardwood) is recycled spotted gum.



Dan designed the building as a series of “zones” to contract to be comfortable for two people and expand to fit the extended family.



Insulated concrete slabs are obviously a good choice thermally. But even in a bathroom without direct access to sunlight concrete should be considered for both its robustness and its reduction of grouts and silicons which can harbour dirt and grime. Just make sure it has a microtexture finish so it isn't slippery.



- 01 Entry terrace
- 02 Living
- 03 Kitchen
- 04 Dining
- 05 Terrace/daybed
- 06 Bedrooms
- 07 Ensuite
- 08 Study
- 09 Bathroom
- 10 Bunkbeds/laundry
- 11 Studio
- 12 Winter court
- 13 Pavilion
- 14 Water tank chess board



⬇️ Bunkbeds slipped into the side of a hallway in the main house provide additional sleeping opportunities for the extended family without the need for more rooms. Under the bottom bunk is a simple yet ingenious lift-up storage cupboard faced with plywood and a subtle eyelet opening. The laundry is simply an enlarged cupboard and can be closed off with a shutter door.



⬆️ Outside the pavilion bedroom is this rainwater fed pond offering cooling breezes, or natural evaporative cooling in low humidity conditions, to the pavilion. "North-easterly summer breezes pass over the pond, which cools the air before it hits the house," says Dan. Recycled hardwood from 60 year old telephone poles was used extensively throughout the home.

Maleny Residence

Designer

Dan Sparks, Sparks Architects
www.sparksarchitects.com.au

Builder

Jaicon Constructions

Project type

Renovation and extension

Project location

Maleny, QLD

Cost

\$500,000–\$600,000,
 includes professional fees

Size

Building 214 sqm; block 2202 sqm

SUSTAINABLE FEATURES

Hot water

Ecosmart 315L solar hot water system
www.ecosmart.com.au

Renewable energy

A 4.2 kW monocrystalline photovoltaic system will be installed in the near future

Water saving

122,000L of rainwater tanks, including 5 x 11000L tanks, poly tanks, and an existing concrete tank turned into a garden-sized chess board

Passive heating & cooling

- The concrete slab to the new pavilion is utilised as a heat sink. Supplied by Honed and Polished Concrete
- R3.3 Knauf Insulation EarthWool batts to all ceilings and R2.5 Knauf Insulation EarthWool batts to all external walls and selected internal walls

Active heating & cooling

Three sided Cheminee Philippe fireplace to living room

Building materials

Recycled spotted gum hardwood

Windows & glazing

Viridian's Comfort Plus glazing within "Lifestyle" aluminium joinery
www.viridianglass.com

Paints, finishes & floor coverings

- All internal paint finishes low VOC, Resene or Porters paints
- All decking and recycled timber finished with Intergrain "Natures Own" timber oil
www.intergrain.com.au

SUSTAINABLE PRODUCTS



FANS

This home is fitted with Concept reversible ceiling fans to all living spaces and bedrooms. Fans should be the first choice for any mechanical cooling. According to the *Your Home Technical Manual*, "In a lightweight Brisbane house, fans to all living and bedroom areas will more than halve the cooling requirements. They can turn a typically 3 star house into a 5 star house." Note that some fans have curved blades rather than just a flat blade. These will be less efficient when working in the reverse direction to which the blade was designed to move.

The disadvantages with fans are that they are not very effective in extreme humidity conditions. Once the water content of the air approaches 100%, no more water can evaporate into it, so flowing air against the skin doesn't make you cooler as it's the evaporation of sweat that makes a fan feel cool – a fan doesn't actually cool anything that isn't wet.

www.yourhome.gov.au



LED READING LIGHTS

These 1W LED reading lights for the bunk beds are available from Noosa Lighting. These days LED lights have a wide variety of applications, despite most people still thinking LEDs are solely directional. There are both narrow and wide angle LED bulbs and fittings nowadays.

www.noosalighting.com.au

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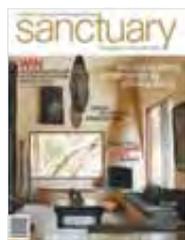
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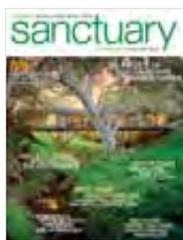
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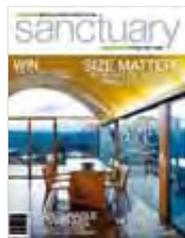
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➔ At the rear of the house, the bedrooms and living spaces enjoy an ideal north-east aspect. Beneath the garden are 14,000 litres of rainwater tank modules. On hot, dry days a water feature helps pre-cool air entering the house through evaporation. The water feature and garden beds are part of a concrete retaining wall set against the adjoining property.

A *New and old, light and dark. Brian Steendyk used his own house in inner-city Brisbane to put some of his ideas about sustainability and aesthetics to the test.*

WORDS DANIELLE DUNSMORE **PHOTOGRAPHY** CHRISTOPHER FREDERICK JONES

STUDY IN CONTRASTS



TWELVE YEARS AGO, ARCHITECT BRIAN STEENDYK

bought a cottage in Brisbane’s Spring Hill. It was freezing in winter and riddled with termites and borers, but it had potential. Brian would sit on his back (north facing) steps and think how glorious it was to have a coffee in the winter sun.

“I knew I could do something to turn it around,” he recalls. “All buildings talk to you and there are things you learn by inhabiting them.”

Fast forward to today. Brian still enjoys his coffee in the winter sun but in his living room, not on the back step. The house has been transformed, and in many ways it has become his own personal experiment in sustainable housing.

“When I started, things like water tanks and solar hot water were expensive. I was building sustainably because I wanted to have this house as a manifesto, as a statement of belief of what you can achieve.

“I recycle as much as I can but at the end of the day, once it goes beyond my bin you don’t know where it goes. So this project was one thing I could control. It was important to me to actually do it for myself and learn from the experience. I started to build as an owner builder so I implicitly knew what the line on the drawing meant.”

The front stone wall was built from Brisbane tuff stone (a local building stone) sourced from the back yard, the chimney and the outhouse. “By recycling with these foundation stones we were using history to inform the building. I think buildings should tell a history, tell where they’ve been. Some people get concerned if they put in a new floor and they have an old portion of the house that has two different timbers – but that’s the delight. Because then you can unveil its history.

“The way I devised this house was old and new, respect though contrast. The original house was an 1875 worker’s cottage. I had to breathe new life into it and at the same time I wanted to respect and prolong its life.

“Lifecycle perspective of material selection was also a priority. As well, I wanted to use very low maintenance materials.

“The flooring in the bathrooms is Corian (a solid surface by DuPont), not ceramic tiles. That has been a





The low winter sun creeps all the way to the back wall of the living room, where the concrete slab absorbs solar radiation in winter. "No ceiling" exposes the first storey timber floor frame and tells a story of the original construction.

"Lifecycle perspective of material selection was a priority. I also wanted to use very low maintenance materials."



godsend from so many perspectives. You only need to clean one flat surface and if it scuffs you can use baking soda or water and vinegar to clean it down. Tiles and grout can require caustic cleaners.

“The existing timber house was always high maintenance and you can’t do anything about that, but the rest of the house, such as the concrete, is low to no maintenance. With concrete I also don’t have to worry about termites.”

The house sits astride a hill. Raising it half a level so that it sat above the ground on the high side eliminated some termite problems. The old timber house now sits atop concrete walls, separated from them by a steel frame with a glass clerestory window that ties the timber cottage to its concrete base.

On the low side of the slope the floor level of the house is dug into the ground half a level. Brian says that this, combined with the concrete, gives the house thermal mass. “Now we don’t need a heater in winter. The awning at the back allows the winter sun in, and when the sun is higher in summer and more vertical it excludes it. In winter, the sun comes all the way to the internal back wall. In summer it stays out.”

The home’s aesthetics were also a major consideration for Brian, a designer as well as an architect, and a believer that a beautiful living space can improve quality of life.

“The composition of the house from an aesthetic perspective was an issue as far as using concrete. Concrete is a cold material. The contemporary ‘minimalist’ design aesthetic requires the extensive use of white with concrete. But in south-east Queensland, if you get sun on white you need sunglasses!

“White works in a European context where you are trying to maximise the sun, but in Queensland I think we should actually use dark colours to reduce the reflection, as well as add visual warmth.

“You can see in this house that all colours are dark, and the house has soul. The concrete could have been stark and cold, but because of the dark colours it actively complements the rest of the composition, along with the timber used in the internal joinery.

“With my own home I could experiment, as well as monitor what works, what doesn’t, and from that comes what I would recommend for my clients.”

As Brian says, he’s put his money where his mouth is.



- 01 Living
- 02 Kitchen
- 03 Lounge
- 04 Main Bedroom
- 05 Walk-in Robe
- 06 Ensuite
- 07 Guest Bedroom
- 08 Bathroom



→ The front stone wall is made from Brisbane tuff found on site.



↑
1875 workers cottage meets 21st Century design. Behind the dark bronze louvres on the south-west facing veranda is a staircase. The louvres induce convective air movement, expelling hot air through windows in the attic space in summer. The sheeting next to the louvres is rough-sawn plywood.



←
The old timber house now sits atop concrete walls, aiding in termite protection and hence conservation of the old cottage.

Spring Hill Residence

Designer

Brian Steendyk

Website

www.steendyk.com

Builder

Owner-builder

Project type

Renovation

Project location

Spring Hill, QLD

Size

Land 200 sqm; house
(incl. attic) 163 sqm

SUSTAINABLE FEATURES

Renewable energy

1.2kW grid-connect PV system comprising eco-Kinetics ERA – ESPSA170 solar panels and Sunny Boy inverter

Water saving

14,000L underground rainwater storage via Atlantis Matrix Tank Modules www.atlantiscorp.com.au – see p17 for more information

Passive heating & cooling

- Constant temperatures maintained through insulation, natural ventilation and burnished concrete floor slab for thermal mass
- Staircase inserted into the south-west facing veranda surrounded by galleries of dark bronze louvres induces cross ventilation and in summer expels hot air through windows in the attic space

Building materials

- Weather board retained from original structure
- CSS Panther off-form coloured concrete
- Carter Holt Harvey Ecoply cladding

Windows & glazing

G James Green Solect 6.38mm laminated thermal glass
www.gjames.com.au

Paints, finishes & floor coverings

Recycled black butt timber floor boards

Other ESD features

- Bamboo planter bed screens courtyard while still allowing dappled light and breezes to penetrate
- “Dry” western garden using succulents and low water use plantings
- Deciduous frangipanis for shading

SUSTAINABLE PRODUCTS

DAVEY RAINBANK AUTOMATIC RAINWATER HARVESTING

The RainBank System at the Spring Hill residence harvests rainwater for toilet cisterns, the washing machine, garden beds and pond. Made in Australia, the Davey RainBank automatically sources rainwater first and only uses mains water as a back up. It will also allow water supply in the event of a power failure. www.davey.com.au



SOLAR HOT WATER SYSTEM

There are two main types of solar hot water systems: evacuated tube and flat-plate systems. Flat plate systems like this one are cheaper to install, but can be less efficient year round since they only operate at maximum efficiency when the sun's rays strike perpendicular to the plate.



www.solahart.com.au

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HEIGHT

&

On a long, narrow block starved for light in inner-suburban Melbourne, two architect-homebuilders employ inspired design to rise above their home's space constraints.

WORDS FIONA NEGRIN **PHOTOGRAPHY** SONIA MANGIAPANE

LIGHT



The northern side of the block is faced by a four metre high boundary wall, blocking northern light in the winter. In response, the designers created "sunshells", built higher than the neighbour's wall, to capture northern light and draw it into the building.

IF YOU THOUGHT THAT AN EXTREMELY narrow plot of land with little direct sunlight would make an inauspicious site for a house, you would be right. Unless, that is, you're a couple of architects in the market for "a weird block of land that nobody would know what to do with". So it happened that Tim Hill and Dominique Ng bought a tight 160 square metre block wedged between a former factory and an industrial kitchen in Melbourne's Kensington.

"We couldn't see any way to get into the real estate market apart from buying a cheap block of land and using our standard skill set to build a house ourselves," says Tim. He and Dominique had already spent six years plotting their dream home when they found this site. "We'd read a lot about small houses. We were thinking about what a good house would be like. 'Sustainable' is a word that's come into common use, but we simply thought of it in terms of function and good design, which to us meant natural light, effective ventilation and comfort."

The house achieves a five star-rated building envelope without setting out to be, as Tim puts it, "super green". Instead, the house achieves its high efficiency rating from its innovative design, which was devised in response to the site's primary constraint: a long, skinny block, with the north-facing side overshadowed by the neighbour's four metre high wall. Clearly, the main problem Tim and Dom faced was how to get enough natural light. This led to their creative solution, dubbed "sunshells", for harvesting sunlight. High on the north-facing wall is a row of windows. At two storeys high, the windows are above the neighbour's wall and have brilliant solar access. Sunlight floods through the windows and washes across the wood veneer ceiling and southern walls to the ground floor.

A slight gap between the second-storey floor and the south wall not only facilitates the 'dripping down' of light from the second storey, but also lets cool air flow through the house from the low south-facing windows to the north-facing windows upstairs. "The window placement creates a natural stack effect, or cross ventilation," says Tim.

"When you open the windows and doors in summer, a gentle draft comes through the house. On the other hand, when you close them in winter, the house is quite self-contained."

Tim says the house is comfortable all year round. The concrete floor is shaded in summer, thanks to a grand old deciduous street tree that blocks the western sun. "During horrendous summer nights it's actually comfortable in here. I sleep under covers the whole time!" In winter a gas in-slab hydronic system makes quick work of warming the house. "I turn it on in the morning and within twenty minutes the floor is warm to the touch."

Because the block was so compact, Tim and Dom aimed to maximise space. "You can do pretty cool things on small blocks," says Tim. The stairs to the mezzanine level, for example, are 25cm narrower than usual to save space, but because their treads overlap, they're easy to walk on. All doors and windows can be flung open to expand spaces and "foster connections between rooms". With all internal doors open, a person lying in bed could have a conversation across the courtyard with someone cooking in the kitchen.

"It's not enough to have one space for one occasion when space is limited: you need multiple uses for space." Tim gestures to the living area, which opens onto the kitchen and courtyard. "This was designed for family gatherings, because Dom has a large family." Sadly, family gatherings now will be tinged with regret: Dom passed away unexpectedly within months of the house being completed.

Despite Dom's passing, Tim says he can't imagine leaving. "It's a really comfortable city pad. When you design a place yourself, you can do it in a way to suit your lifestyle. It's modest-sized, but I wouldn't want it any bigger. This is an incredibly comfortable solution for me – I love everything about it."

.....
 For more information about natural convection see [Design Notes, House Ventilation p88](#)

→ The living room doors open onto the home's street-side courtyard and slatted timber front fence. This street interactive design encourages passers-by to stop and chat with Tim if he's sitting in view in his living room; if he's feeling less social he can increase privacy by partial closure of the doors. The doors are also a key component in the house's cross ventilation system.

↓ The beautiful naturally-lit mezzanine room above the kitchen can be used for numerous functions; at the moment Tim has it set up as a study. The open mezzanine design fosters social cohesiveness in the home: it means that chef and "worker" can "happily carry on a conversation".



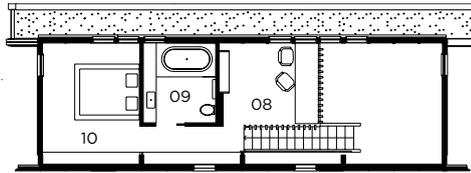


➔ The designers chose this distinctive V-column because “it provides a lot more space at ground level than a conventional post and beam arrangement, making it easier to get the car in and out of the garage on this tight site. Aesthetically, the column also creates a distinct identity, emphasizing the ‘treehouse’ idea of a retreat at the back of the block.”

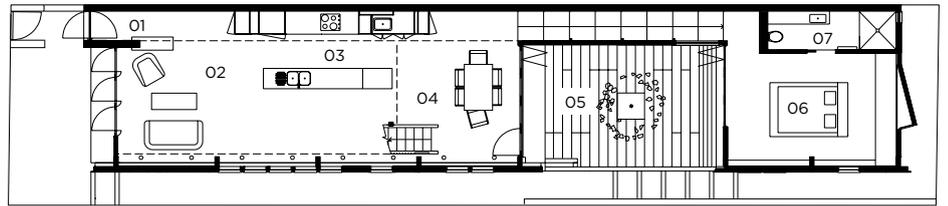




The main bedroom opens onto the courtyard and is accessed via a stairway running along the northern boundary. This room was designed to be a retreat, yet is connected to the main living areas via the courtyard when the bi-fold doors are opened. The carpets are made from natural fibre, sisal.

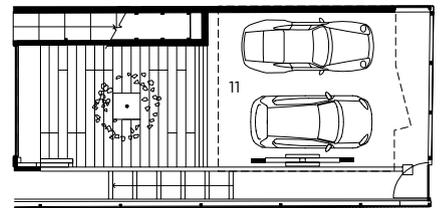


FIRST FLOOR PLAN



GROUND FLOOR PLAN

- 01 Entry
- 02 Living
- 03 Kitchen
- 04 Dining
- 05 Courtyard
- 06 Main Bedroom
- 07 Ensuite
- 08 Study
- 09 Bathroom
- 10 Guest Bedroom
- 11 Car Port



CAR PORT PLAN

↓
 The formly box bookcases are designed as multifunctional storage, and can be relocated and reconfigured as needed. Here they're placed under the staircase to utilise this traditionally challenging space. The kitchen cabinetry is plywood.



Kensington Residence

Designer

Tandem Design Studio
www.tandem-studio.net

Builder

Owner builder/
Mark Builders

Project type

New build, urban infill

Project location

Melbourne, VIC

Cost

\$500,000–\$600,000,
includes professional fees

Size

Building size 135 sqm;
block size 160 sqm

SUSTAINABLE FEATURES

Hot water

Quantum 270L heat pump hot water service (approx \$1650;
www.quantumenergy.com.au)

Passive heating & cooling

Air-cell Insulbreak 65 to roof and R4 Sisalation insulation in roof and walls. The cross section of the home encourages a “stack effect”, promoting cross ventilation from the ground floor openable windows and doors to the first floor (see Design Notes – House Ventilation, p88)

Building materials

Internal shiplap cladding supplied by Radial Timbers

Windows & glazing

Double-glazed argon filled hardwood framed by Stegbar

SUSTAINABLE PRODUCTS

IN-SLAB HYDRONIC CENTRAL HEATING

The house has a Rehau in-slab hydronic heating system to the main living areas powered by a natural gas boiler. Tim estimates it costs him around \$150 per quarter and takes about 20 minutes to warm up. Ideally the entire slab should be insulated from the ground and the walls insulated from the slab to reduce heat loss. Heating zones and thermostats are essential to reduce energy use. The *Your Home Technical Manual* rates hydronic zoned inslab heating with wood, solar or gas power as having low running costs; it rates greenhouse gas emissions from natural gas as low, and wood and solar as very low.
www.yourhome.gov.au

LOW-ENERGY LIGHTING

LED and compact fluoro lighting throughout the house was supplied by Sylvania Lighting Australasia. Sylvania Lighting offer a recycling service, SYLrecycle, for all fluorescent tubes up to 1500mm in length, as well as compact fluorescent bulbs. Call 1300 728 988 to organise a pre-paid recycling box which will be delivered and collected by Sylvania. Alternatively contact your local council – a small number of them will recycle LED and compact fluoro tubes for free.

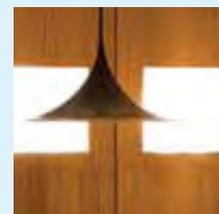
www.sla.net.au



DANPALON TRIPLE CELL POLYCARBONATE SKIN

Danpalon translucent panels were used on the facade and upper levels of the house to bring in natural light. Danpalon provides good thermal insulation and blocks UV radiation; it's made from 30% pre-consumer recycled content, is 100% recyclable and is available in a range of colours. It's imported from Israel. Cost per square metre is around \$150, including timber framing and installation.

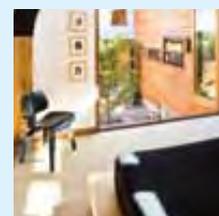
www.danpalon.com.au



SISAL CARPETS

Natural fibre sisal carpets were installed in the bedroom and upper floors. Sisal carpets are made from the fronds of *Agave sisalana*, grown primarily in East Africa, China and Brazil. Sisal carpets have no VOCs, are biodegradable, and provide excellent wear and tear. Costs range from \$44 to \$160 per square metre, depending on the tightness and style of weave, colour and source of the material. Tim's sisal carpets were installed by Floorspace.

www.floorspace.com.au



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BEST OF BOTH WORLDS

An inner-city Sydney renovation preserves a Victorian-period terrace's beauty and boomer-era grandeur while remedying its deficiencies by introducing light, air and stunning views.

WORDS JUDY FRIEDLANDER **PHOTOGRAPHY** SUE STUBBS



The rear doors and feature windows at the eastern end of the house maximise views and amenity while employing a pergola (over which will be grown a deciduous vine) and external blinds to minimise unwelcome summer sun.



IT'S A SIGN OF A GOOD RENOVATION

of an old period terrace when it brings out the very best of the original heritage features while providing present-day panache.

Thanks to architect Caroline Pidcock, this little terrace in Sydney's inner western suburb of Glebe is now showcasing its boom-period Victoriana through a 21st century lens.

Says Pidcock: "While the house is not heritage listed, it contributes to the area.

"We aimed to retain the best of what is there in the public realm, while ensuring the new work is well designed so it contributes positively to the heritage of the future."

In the front half of the house, two original fireplaces framed by crisp white walls, high ceilings, plaster cornices and ceiling roses seem to invite the visitor or lucky inhabitant to repose with a good book and a glass of wine.

Step into the renovated addition in the back half of the house and the style is contemporary with a nod to period detail. The rear of the house has been connected to the backyard via an open family room and deck extending from the kitchen. In the kitchen, a north-facing period-style stained glass window throws coloured rays across the floor. More light emanates through the rear doors and highlight windows that open onto the deck.

There are external blinds to east-facing windows and a pergola which will provide a frame for a deciduous vine over the deck to protect the eastern doors.

Owner Christine Asmar is thrilled by the renovation, which has allowed her and partner Tom Angelo to "live in the treescape".

The outlook behind the property is very inner-western Sydney, with gum trees, tin roofs, laneways, sandstone walls and windows into other lives providing a rich, living landscape.

"Previously, we could only see this lovely treescape through a narrow opening in the kitchen," says Asmar. "Now, the whole living area has been opened up so that the outlook has come to us."



→ Light cascades down the central stairwell from an overhead double-glazed skylight. Note abundant cupboard space under the stairs.



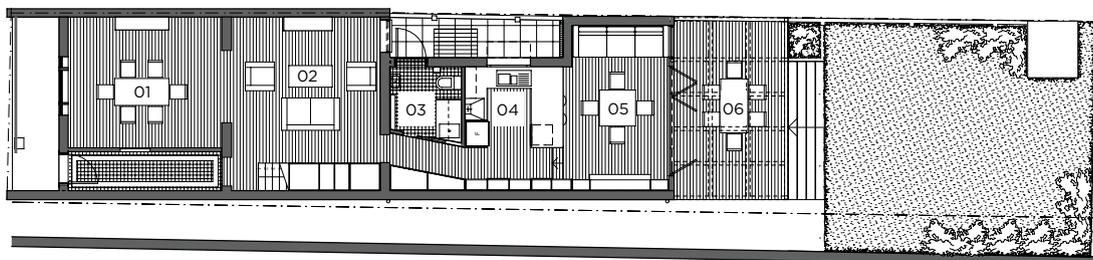
← The downstairs toilet/laundry, coming in at a mere 3.78m², defies its dimensions with a large mirror and white, light-reflecting surfaces. It has taps for a tight fit: Bastow Georgian basin mixer twinner with an Ostar 9045 wall-mounted basin. Mixers with separate hot and cold taps are more energy-efficient than single levers, which tend to be left in the middle position.



Original fireplace surrounds combine with timber furniture to retain a period aesthetic, while an east-facing operable Breezeway louvred window opening into the central lightwell controls light and ventilation, blending period form with contemporary function.

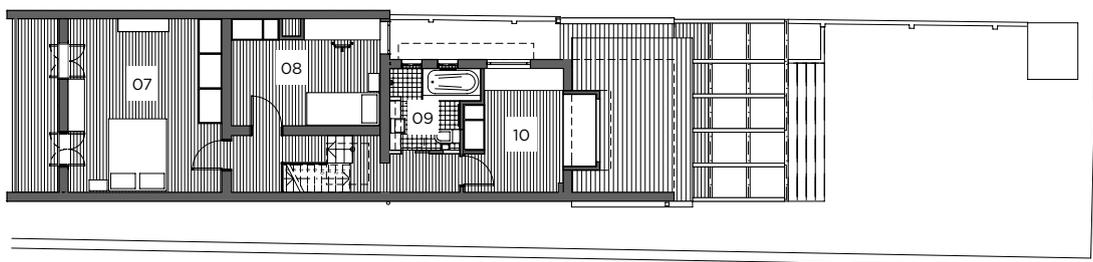


“While the house is not heritage listed, it contributes to the area. We aimed to retain the best of what is there in the public realm.”



GROUND FLOOR PLAN

- 01 Dining
- 02 Lounge
- 03 Toilet-Laundry
- 04 Kitchen
- 05 Family room
- 06 Deck
- 07 Main Bedroom
- 08 Guest Bedroom
- 09 Ensuite
- 10 Bedroom



FIRST FLOOR PLAN

The upstairs living quarters incorporate three bedrooms, with the third rear bedroom containing a windowed sitting nook overlooking the backyard. The adjacent bathroom, like the one downstairs, has opaque north-facing glazing for privacy and light.

Extra light was brought into the house via a large double-glazed skylight in the stairway. This can be opened on summer nights to permit stack ventilation. Openable, high level-windows above the rear doors on the downstairs deck also provide ventilation, as well as additional light and views of the treescape.

Heritage values, environmental concerns and the desire to create lighter, more open spaces were key drivers in the renovation.

“The general layout and quality of the rooms and the masonry walls and timber floors were retained to ensure the character of the house was not compromised,” says Pidcock.

“The main environmental requests were for better insulation and air flow, water saving measures, more natural light and low VOC finishes in respect to paint, floor finish and cupboards,” she says.

“The last renovation was done by a builder who threw all the rubbish under the front floors. This was pretty disastrous from an airflow and general pollution sense and it all had to be cleaned out before doing anything.” The house now boasts subfloor as well as roof space ventilation.

A 4300 litre bladder tank under the

deck provides water for toilets, washing machine and the garden. Compact fluorescent and LED lights have been used throughout the house.

Every bit of available space is used, with the family room wall and the alcove under the stairs both incorporating shelving.

The result is a house that sits comfortably in its environment, in every sense of the word. For Christine and Tom, the best part is being reunited with their immediate surrounds.

Glebe Residence

Designer

PIDCOCK Architecture
+ Sustainability

Website

www.pidcock.com.au

Builder

Bachalani Constructions

Project type

Alterations and additions

Project location

Glebe, Sydney, NSW

Cost

\$320,000

Lighting

Compact fluorescents and LEDs throughout

Paints, finishes & floor coverings

– Recycled blackbutt flooring from the Woodage to ground floor

www.thewoodage.com.au

– Synteko timber finishes

www.synteko.com.au

– Haymes Natures Palette paints internally

www.haymespaint.com.au

Other ESD features

– Reuse of existing bricks where possible

– Requirement for builder to recycle where possible

– Envirofan solar-powered dual fan subfloor ventilation

www.envirofan.net.au

– Edmonds Supavent Turbine Ventilator to roof space

www.edmonds.com.au

SUSTAINABLE FEATURES

Hot water

250L Hills Solar evacuated tube hot water system with gas booster

Water saving

– 4300L Ecosac bladder tank under deck for toilets, washing machine and landscape. www.ecosac.com.au

– Caroma's Leda 2000 Smartflush universal toilet suite

Passive heating & cooling

– North facing windows to new living area and kitchen

– High-level windows and louvre windows for ventilation

– External blinds to east-facing windows

– Pergola for planting with deciduous vine over eastern deck, protecting eastern doors

– Properly detailed insulation using Proctor breathable membranes to ensure no condensation issues; Fletcher Insulco polyester insulation for walls and ceilings; Dow TUFF-R insulation boards to double brick walls

Active heating & cooling

Ceiling fans to bedrooms

Building materials

– FSC hardwood decking from the Woodage

www.thewoodage.com.au

– Alpine Premium EO-MR (low formaldehyde, water resistant)

MDF wood panels used throughout

www.alpinemdf.com.au

Windows & glazing

– FSC certified Kamarere (*Eucalyptus deglupta*; PNG plantation hardwood) timber-framed windows and doors

– High level louvres to encourage good cross ventilation

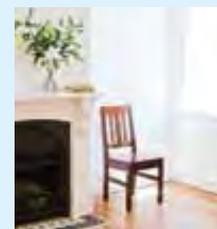
– Velux electric operable skylight with high performance glazing and electric venetian blinds

SUSTAINABLE PRODUCTS

WALL LININGS

Powerscape Health wall linings for all internal walls. These wall linings are resistant to fire, impact, water, mould and sound transmission and are certified by Good Environmental Choice Australia. They use at least 95% recycled content.

www.powerscape.com.au/health.asp



WINDOW INSULATION

Magnetite magnetic window insulation has been used in the first floor windows and doors for noise and thermal insulation. Magnetite is a retrofit double glazing system. It involves the addition of acrylic glazing to the existing glazing using an air tight magnetic seal. Its makers say that independent testing shows Magnetite can reduce noise by up to 70% and increase energy efficiency by up to 80%.

www.magnetite.com.au





Visit a Sustainable House in your neighbourhood Sunday Sept 12th

Sustainable houses throughout Australia will be opening their doors for you to look inside on Sunday 12th September.

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Check out the website for house locations and details in your local area – and admission to all houses is free.

sustainablehouseday.com

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Solar Thermal Heating and Cooling

A house that doesn't need active heating is "passive house" holy grail. But if that's too much of a stretch, a solar thermal system might get you over the line.

WORDS MICHAEL GREEN

Heating and cooling churns through nearly 40 per cent of Australian household energy use. Energy prices are set to hit ever-higher levels, so the more efficient a temperature control system is, the more attractive it looks – almost day by day.

There's a growing industry selling units that use the sun's free energy to ventilate, warm and even cool your home. They can also improve indoor air quality by reducing humidity, moisture build up and mould. Broadly, the systems fall under the banner of 'solar thermal air heating and cooling'.

So what's commercially available and how well do they work?

ROOF SPACE SYSTEMS

Roof space systems work by moving the air in our roof cavities. When the sun strikes the roof, it warms the air below – just as cars get stuffy on clear days even if it's chilly outside. For heating in wintry weather, roof space systems pump that warmer air inside the home. To help with cooling in summer, some units can extract the hot air from the roof during the day, and also, blow cooler outside air into the house overnight – useful if you're worried about security or noise from open windows.

There are two types of roof space solar

collectors. One kind, sold here by businesses such as HRV, Solectair and Smart Roof, uses the whole roof cavity as a collector. The intake is near the top of the space, where the warm air rises to. A fan sucks the air through a filter and ducts it into the home.

The second kind of technology, offered by Smart Roof in its Smart Breeze system, is suitable for metal roofs. It captures heat in the gap between the roof sheet and a layer of insulating foil or sarking underneath. The warm air rises to the apex of the roof cavity, where it's nabbed and whisked into the home (using a solar-powered fan). "The ribs act as ducts and we seal the ridge so the air can't escape," says Smart Roof CEO Robert Semmel.

He says that the system can significantly reduce bills, but won't do away with other sources of temperature control. "Our aim is to reduce heating and cooling by up to 40 per cent, not to replace it. If you've got a miserable, wet day there's no radiant heat and on really hot nights there won't be any cool air to bring in. But those are extremes.

"If the sun is out on a 15 degree day, we get temperatures up to 40 degrees [in the roof]. When cloud cover comes over, we get 30 degrees. There's a lot of wasted energy we can use," Semmel says.

According to energy efficiency expert, Adjunct Professor Alan Pears from RMIT University, the catch is that our roofs aren't very good solar heat collectors. "A roof space can be described as an unglazed, very leaky solar collector, with a substantial proportion of its area facing the wrong direction," he says. "So in that sense it's not very efficient."

But all is not lost. "On the other hand, it's a very large area, so you can collect quite a lot of useful heat, especially in mild seasons," Pears says. Light-coloured roofs with insulation directly underneath will collect much less warmth than a dark roof without insulation. Similarly, the roofing material will influence the way the systems function. Metal roofs heat up (and cool down) quickly, whereas the thermal mass in tile roofs means they take longer to warm, but stay hotter for longer in the evening.

If you've ever crawled into your roof space, the idea of pumping that air into your home might make you splutter. But Pears argues the air near the top of the roof space is likely to be no worse than other sources of ventilation in our homes. "The air coming through windows or under doors is unfiltered and often highly polluted," he says. "In any case, most roof space systems offer a filter. The filtration systems available are very



↑ SolaMate solar air collectors to metal roof



↑ SolaMate solar air collectors to tiled roof

impressive, as long as you buy a good one and maintain it properly.”

SOLAR AIR COLLECTORS

Solar air collectors, as distinct from roof space systems, consists of a clear plastic or glass-fronted panel that uses solar radiation to heat air, like the way a solar hot water unit heats water. The panel is mounted outside the house, either on the roof or a wall. A fan (usually solar-powered) blows the warmed air into the house. For cooling at night during summer, it may also blow cooler outside air into the home.

In Australia, a variety of solar air collectors are available, including products from SolaMate, Solar Breeze, Sun Lizard and Solar Venti.

Arne Hachmann’s business, Global Eco and Environmental Solutions, sells Solar Venti units. If you want to ventilate your home, he advises that a three square metre panel will suffice for an energy-efficient 250 square-metre home. If heat gain is your priority, he recommends one unit of that size per 100 square metres of floor space.

He says the Solar Venti warms air to about 35 degrees above the outside ambient temperature. “If you have a sunny 15 degree day, you would expect to get 50 degree air

ducted into your house for free, at a rate of about 200 cubic metres per hour.”

Pears has a SolaMate prototype solar air collector installed on his Melbourne house. The panel is three square metres and feeds into his hallway and living room. “In reasonably sunny winter weather, it’s enough to make a significant difference to the temperature of my fairly small and well-insulated home,” he says. “It makes a bigger difference in spring and autumn when the house cools down a lot overnight but the weather outside is pleasant.”

He warns that householders should buy big units if they want to collect a lot of heat. “Most systems are not very large, so they may not collect a lot of energy, especially on cloudy days. Also, if they’re single glazed, their efficiency may not be very good in colder weather.”

He says that solar air heaters work better in winter if they’re steeply sloped to face the low sun. “It may also be preferable to angle them slightly east of north, so they warm up the house more in the morning when air temperatures are lower and the building interior is colder.”

.....

In the right conditions a system can make an appreciable difference and help save on your heating and cooling bills.



↑ Solar Venti solar air collectors at Daylesford



↑ Smart Roof's Smartbreeze roof space unit

COST AND BENEFIT

According to the Solar Thermal Air Heating and Cooling Association, both kinds of systems start from about \$2500 installed, with an average price of \$4500 installed. It estimates that the return on investment will vary from two to ten years, depending on the house and the habits of the householders. Dr Bob Fuller, a low-temperature solar thermal researcher from Deakin University, is not yet convinced of the effectiveness of the systems. When it comes to heating, “there’s a big mismatch – the resource is low in winter when the demand is high,” he says.

Another problem is that there is no Australian Standard for this technology. “There needs to be some independent modelling and testing,” Fuller says. He maintains that as a first step householders are best served by improving energy efficiency in other ways. “I would spend the money on conservation – on better insulation, curtains, and shading in summer.”

Certainly if sun is pouring through a bank of west-facing windows, a ventilation system will only do so much. “In that situation,” says Robert Semmel from Smart Roof, “stopping heat getting in from the ceiling is not your major concern.”

For heating and cooling, the systems are most useful in a well-designed and insulated building. Where a home has thermal mass, the heavy materials will store the extra warmth and “coolth” provided by the units. In a well-sealed house, the systems not only provide fresh air securely and noiselessly, but also, less of the airflow will escape through gaps.

Both Fuller and Pears note that there is a trade-off between the amount of air coming into the home and how hot the air is. That is, the systems need time to heat the air, but if the fan runs too slowly then too little volume will enter the home to make any difference to comfort.

Pears says it’s vital that solar air collectors

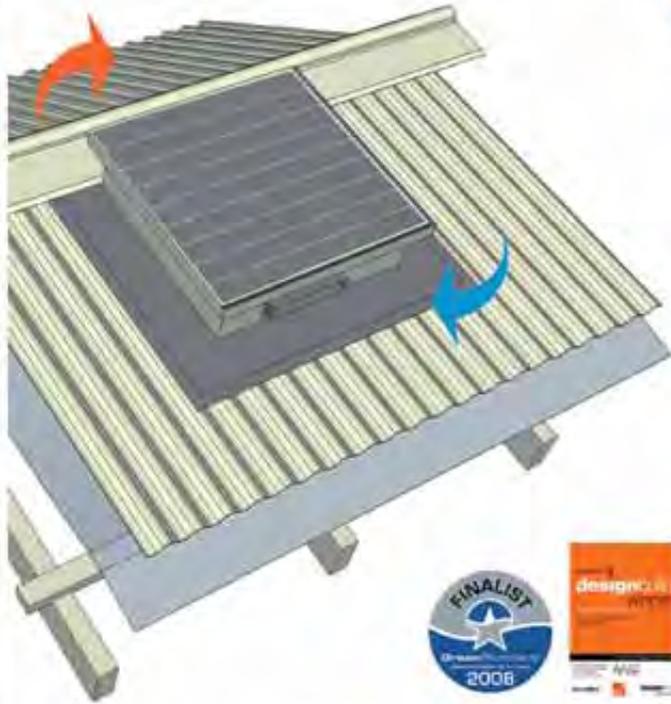
include a high-capacity, variable-speed fan that can adjust flow rates according to the heat of the air in the panel. Likewise, the ducting on both kinds of systems should be good quality, and as short and straight as possible, so as not to reduce airflow.

Some systems, complete with clever thermostats, can adjust and make the tricky decisions for you. Set to function automatically they will sense the temperatures in the collector, as well as inside and outside the home, and heat or ventilate as required.

But even the best designed systems, says Fuller, will not always be able to provide enough warmth and airflow to maintain the temperature inside the home. So it’s important not to expect miracles. These are supplementary systems, but they will not do the job all by themselves.



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The Machinery Shed

Having trawled umpteen houses on Sustainable House Day for ideas, this retired couple built their green dream home using a potent mix of design and technology. Now it's time for their house to shine.

WORDS RACHAEL BERNSTONE **PHOTOGRAPHY** SOPHIE SECK

When Keith and Gillian Helyar decided to build a new house in Canberra, they drew plenty of inspiration from houses they visited during Sustainable House Day. So it seems fitting that they should open their home to the public to share the knowledge they accumulated during the course of designing, building and occupying their environmentally friendly abode.

“We weren’t intending to build initially,” Keith Helyar says. “We looked around at Canberra houses, but we couldn’t find what we wanted. Then this block came up, and we thought we could start from scratch here.”

“It was attractive because of the Mt Majura Nature Reserve across the road, which can’t be built out, and also because it’s easy to get into the city,” explains Gillian. “Then we visited a number of homes on Sustainable House Day in Canberra and we gained a lot of knowledge. It was really stimulating.”

“Sustainable House Day is great because you can look at so many ideas in a short time, and then adapt them for your own home,” Keith adds. “We were conscious of the need for northern exposure, but the concept of building a house in Canberra with no heating or cooling was foreign to us then.”

Working with Keith’s architect daughter, Tricia Helyar, the couple have built a house with passive design measures including orientation along an east-west axis, careful placement of double-glazed Rylock windows,

extra insulation in the walls and roof, concrete floors and concrete block-lined walls for thermal mass. It also has shading and overhangs to protect the windows in summer, high-level windows in the living space that allow winter sun to enter, and cross ventilation along the north-south hallway that enables the building to breathe.

Active environmental systems boost its sustainable credentials, including a grey water recycling system; rainwater collection for reuse in toilets, washing machines, an external sink, garden taps, and as cold water in showers; a evacuated tube hot water system; and photovoltaic cells that supply power to the house and feed the grid.

“Keith and Gillian spent more than 10 per cent of their budget on active environmental systems,” says architect Tricia Helyar. “Often those elements are omitted during the construction stage because of cost concerns, and because they can be added later, so their commitment to installing them at the outset was commendable.”

The couple’s enthusiasm for the project hasn’t dimmed since they moved in: drawing on his expertise as a former agricultural scientist, Keith takes daily temperature readings both outside and inside the house, and has amassed more than a year’s worth of data to analyse its performance. “In heat wave conditions, we can maintain temperatures about 10 degrees below the under-eave





Soaking up the sun with a Hills Endless Solar evacuated tube system with 250L electric booster, and a grid connected, Solartech 2800W PV system (expandable to 4200W) creating up to 19kWh/day.





On the north side of the house 900mm eaves keep the sun out in summer, with support frames for additional shading as required. Hopper windows at the high point of the ceiling allow venting of hot air. Internally, Kresta's insulated cellular honeycomb-style blinds, some with blackout (east & west), sit within the window frame reducing air leakage.



temperature on the southern side of the house," he says.

"But we found it difficult to believe we would have no need for heating, so we installed some heating." Under-tile electrical heating was installed to both bathrooms, study, and the southern floor areas in five zones, each with thermostat and controller. Under tile heating was chosen as it provides rapid response heat to reduce tile chill in selected areas, without heating the entire slab.

"Sometimes we need extra cooling at the eastern end, where we have ceiling fans installed," Gillian adds.

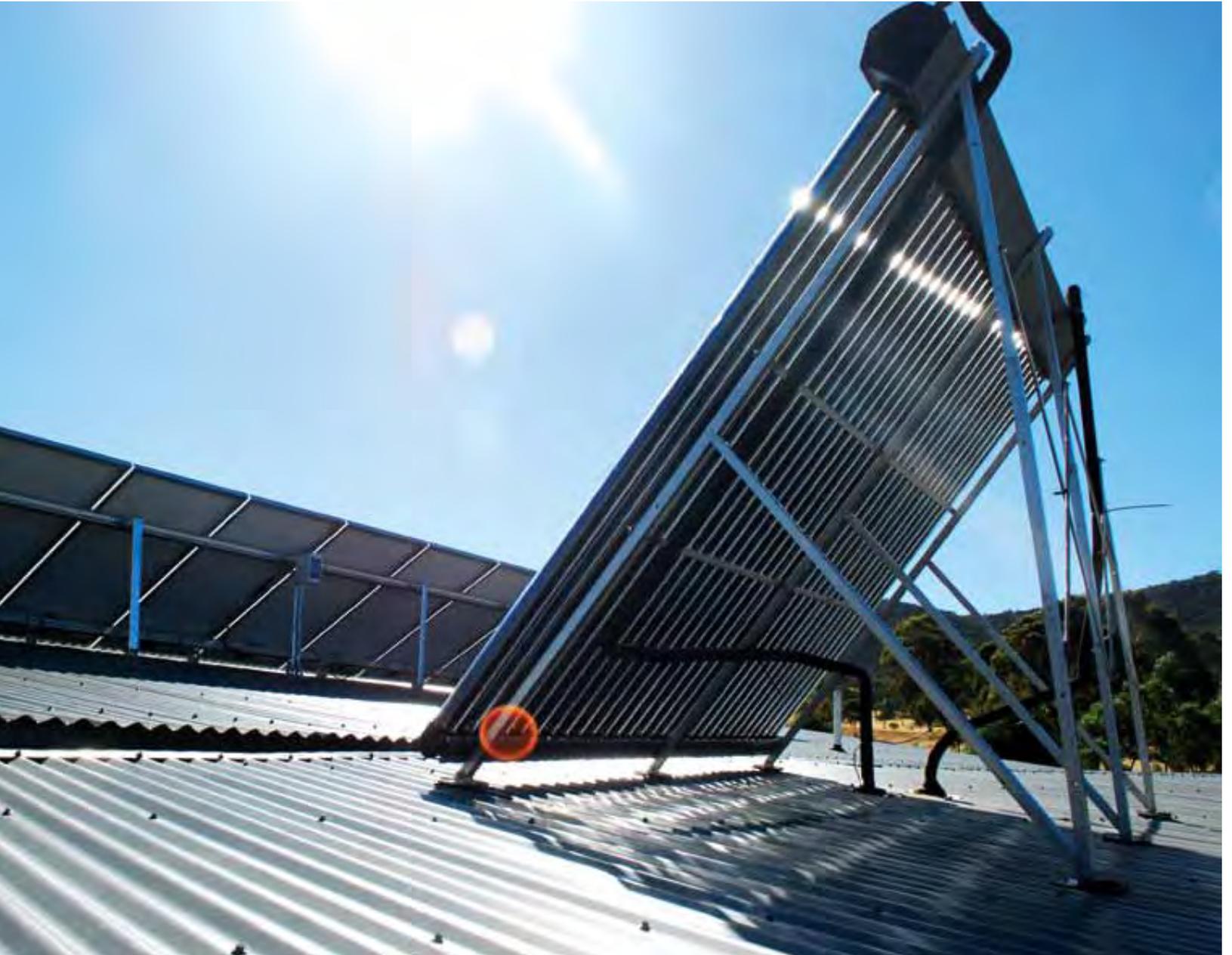
"I empathise with the person who said that a solar passive house needs active occupants," Keith laughs. "If it's important to have a draught, you need to make sure the windows are open, and you need to manage the curtains and blinds to moderate the temperature inside."

"We love the way the house functions, and we like the idea of managing it," Gillian adds. "It doesn't bother us that we have to control the windows, doors and shading. There is a certain pride that we don't have to flick a switch to turn on air-conditioning to keep cool.

"We generate more energy than we use now," she continues. "We got \$500 back on our last energy bill and \$400 in the previous quarter, so we don't have to feel guilty about using some electricity, which is why we'd prefer to use electric space heaters instead of gas appliances."

Another attribute that sets this home apart from its neighbours is the incorporation of adaptable design features, influenced by Gillian's work as a physiotherapist. "I think that houses should be designed for all ages and abilities," she says. "I've seen so many people who have had to move out of their house, or don't cope very well after an accident."

Their home is without steps – both external doors and the showers are on grade, and 1100mm wide corridors and 900mm wide doorways facilitate circulation. Power points are 600mm high instead of being at floor level, and freestanding hand basins and dual-height kitchen benches make access a breeze. In addition, the flexible floorplan can be altered should the Helyar's needs change in future. The guest wing can be reconfigured as a separate dwelling for a live-in carer, or converted into two bedrooms if new owners should require additional accommodation.



On the shady southern side of the house is a plant area comprising two 2500 litre rainwater tanks, subsurface greywater system, compost and an external wash area. Rendered Exinflex polystyrene panels by RMax (www.rmax.com.au), which gives high levels of insulation with no thermal mass, and Rockcote paint system are used for south-facing walls.





← The kitchen boasts a 3.5-star dishwasher, induction cook top and cabinetry hand-crafted by the Helyars. The concrete slab on ground has sub floor and edge slab insulation (www.wafflepod.com).

I think that houses should be designed for all ages and abilities.

“These measures don’t add much to the cost, but they do require a rethinking of the ways things are done,” Gillian says. “For example, the electrician didn’t want to install the power points at the height we wanted them, and the builder wasn’t sure you could build a hobless shower, so mistakes were made when the concrete slabs were poured.”

These atypical inclusions demanded careful management during the building phase, with the Helyars making daily site visits. Keith and Gillian also got their hands dirty by constructing joinery for the kitchen, bathroom and guest wing, installing concrete block insulation within the gyprock walls, sealing the spaces around window and door frames, and painting the entire house.

Having shown about 300 people through their home at last year’s Sustainable House Day, Keith and Gillian are looking forward to this year’s event. “There were a lot of positive comments about the front room, because it’s light and airy, with views to the mountain, which results in a sense of openness,” Gillian says. “We gained so much ourselves from participating in Sustainable House Day, and we are very keen to get the message out about the sorts of things that are important in a house.”

FOR MORE INFORMATION

- House designer: Tricia Helyar Architect www.architricia.com.au
- Builder: Craig Golding, Goldings Carpentry
- This year Sustainable House Day is on Sunday 12 September. Go to sustainablehouseday.com for more information.

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GreenPower

PVs are not the only way. Another route to a clean-energy future lies with GreenPower, a government approved suite of renewable energy products.

WORDS JENNY BROWN

One of the most inspiring environmental stories over recent years concerns the growth of GreenPower. Since it started as a voluntary electricity purchasing option in 2001, the GreenPower suite of renewable energy products has been experiencing exponential uptake.

In Australia, electricity is the biggest and fastest-growing of all sectors contributing to greenhouse gas production. The stuff that powers our homes and businesses is still overwhelmingly, over 90 per cent, derived from fossil fuels. Only around eight per cent of electricity comes from renewable sources such as wind, solar and hydro.

But despite this low base, the trend is very encouraging, as the Alternative Technology Association's (ATA) energy policy manager Damien Moyle happily points out. From a base of only 131,000 customers five years ago, the household and industrial customer base for GreenPower, which is directly supporting the expansion of renewable energy, is rapidly approaching the million mark.

"By September 2009," says Damien, "there were nearly a million residential GreenPower customers and 35,862 business customers, and this expansion is making a significant difference to the growth of renewables."

Due to the huge uptake of GreenPower, he says, "in 2008 the renewables sector delivered 23 per cent more electricity generation than was required by the Federal Government's mandatory target."

INDUSTRY UPTAKE

Andrew Richards, executive manager of government and corporate affairs with one of Australia's leading renewable energy businesses, Pacific Hydro, says GreenPower is rapidly gaining traction in the industry and commerce sphere. This suggests that industry is seeing renewables as an important pathway into the future.

In the beginning, he says "GreenPower was a scheme supported by mums and dads. Now business is investing and that's starting to have a major impact.

"Businesses are opting into ways to reduce their greenhouse impact and financial institutions are also buying into the idea."

Andrew is very confident that "by 2020, Australia could surpass its mandated renewal energy target of 20 per cent.

"It is highly feasible," he says, "that we could get to 25 per cent by 2020. And not beyond the realms of possibility that as the market cranks up, half of Australia's energy could come from renewables by 2030."

WHAT IS GREENPOWER?

The essential idea of GreenPower is simple: electricity consumers, whether private or commercial, can choose to pay a premium (a few extra cents per kilowatt hour) on top of their regular electricity consumption costs to ensure that their power is sourced wholly or partially from renewable energy sources.

This voluntary subscription, in turn, funds the development of new, large-scale



wind farms, hydroelectricity, wave, geothermal, solar and biomass electricity generation infrastructure.

The way it does it is somewhat complex but at its heart is a trading system for Renewable Energy Certificates, or RECs, which link GreenPower consumers with renewable electricity generators. When GreenPower is bought by a consumer a number of RECs are purchased out of the market by the electricity retailer. These RECs have value for the retailer and, as voluntary subscriptions are counted above and beyond the Government's mandatory 20 per cent Renewable Energy Target, this ensures more electricity generated across the grid comes from renewable sources.

With the big energy retailers required to source two to three per cent of their total energy from renewables, most have GreenPower products available to their customers. However not all products are equal. Accredited GreenPower products may contain anywhere from 10 to 100 per cent renewable energy. "If you can buy 100 per cent," says the ATA's Damien Moyle, "your electricity is essentially emissions free."

If you're keen to be part of the solution to climate change, says Damien, "then the first thing you should do is invest in GreenPower". To cut costs, follow it up by wisely marshalling your use of household power. "Consider every possible household energy efficiency investment in insulation, lighting and solar hot water."



Currently around eight per cent of electricity comes from renewable sources such as wind, solar and hydro.

The 100 per cent GreenPower option will cost five to six cents extra per kilowatt hour you use. A kilowatt hour (kWh) will run a small microwave for about an hour. A very energy efficient household might use as little as three kWh per day. The average – very inefficient – household uses more than 15 kWh per day. For the “average” household, 100 per cent GreenPower might cost an extra \$300 or so a year, but the greenhouse gas savings will be the equivalent of taking two cars off the road. For an energy-frugal house, the extra cost of GreenPower is likely to be less than \$100 a year.

CHOOSING THE RIGHT GREENPOWER PRODUCT

There are some 29 different GreenPower products on the market, each with a different mix of renewable electricity generation and varying levels of renewable content. To shine some light on the system www.greenpower.gov.au, a joint initiative of six state governments, has detailed information on renewable energy and the GreenPower standard.

For consumers, a godsend is the Green Electricity Watch website, at www.greenelectricitywatch.org.au. The site is a joint initiative of the Australian Conservation Foundation, Total Environment Centre and WWF-Australia. Its state-by-state tables give prices and star ratings to all the available GreenPower products and are the best way to quickly and easily sort the wheat from the chaff.



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P78-79 FOR A LIST OF
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Speed Dating with Sanctuary brings 10 architects and house designers to the one spot so that you can meet and discuss your plans in a relaxed "no obligations" environment.

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Cost: Free

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Go online to www.sanctuarymagazine.org.au and sign up to our newsletter. You'll receive an invite in the week of June 7.



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STATE of DESIGN

Architect & Designer Directory

The following green architects and building designers will be attending Speed Dating with Sanctuary at the State of Design festival on July 17th 2010 at the Royal Exhibition Building in Melbourne.

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Cool Pantries

Your fridge can work better and your pantry can work like a fridge with the help of a some ventilation and a little natural convection.

WORDS FIONA RUTKAY

Refrigeration is one of the biggest energy users in a home, with the typical fridge using between 600 and 900 kilowatt hours per year (which is the equivalent to running a 70 to 100W light bulb day and night, year round). Energy efficient fridges are an obvious choice if you're needing to buy a new fridge, and you can review energy efficient models on www.energyrating.gov.au. But there are other ways you can improve the efficiency of your current fridge or incorporate design features in a kitchen remodel to dramatically reduce your energy use.

INCREASING YOUR FRIDGE'S EFFICIENCY

If you're not in the market for a new fridge there are a number of ways to improve the efficiency of your existing fridge. Ensure the door seal is clean and in good condition. Avoid overloading both the fridge and freezer, ensuring at least 20 per cent free space for air circulation. You could also set the fridge thermometer to operate between 3°C and 5°C and the freezer -15°C and -18°C. You should also make sure the fridge is placed out of direct sunlight and away from heat generating appliances such as ovens and dishwashers.

Ventilation also increases the efficiency of a fridge. According to Michael Mobbs' *Sustainable House* book, placing a grate in the floor behind the fridge can increase its efficiency by up to 25 per cent. The warm air that is a byproduct of the fridge's motor rises

and helps draw cool air up from beneath the floor when exhausted through a vent on an upper wall or ceiling.

If you live in an apartment or house where installing vents is not an option, or if you have a concrete floor, you can still make your fridge more efficient by raising it up on blocks to allow air to circulate underneath. Where a fridge sits in or behind a cupboard, you could drill holes in the bottom and top of the cupboard to increase ventilation.

The more air circulating around your fridge, the more efficient it will be. The Australian Government energy efficiency website www.energyrating.gov.au recommends leaving at least 80mm behind the fridge and 25mm outside fridge walls that contain condensers. Your refrigerator's manual will also give a best practice ventilation recommendation.

COOL PANTRIES

The most environmentally friendly form of refrigeration is the combination of a small energy efficient fridge for meat and prepared food, and a ventilated pantry for food such as vegetables and eggs. "It comes down to a household understanding that when the fridge gets smaller, it's no longer the place where the weekly shop goes," says sustainability architect Emilis Prelgauskas.

A ventilated pantry is basically a vented cupboard designed to encourage cooling

airflow throughout. Vents in the floor and above the pantry shelves draw cool air from the sub-floor area. This air passes through the pantry, cooling the food, and is extracted through the top vent. All vents should be vermin-proofed with mesh.

Cool air can be accessed directly from the sub-floor area or by raising the floor of the pantry. The outward flow of air is more effective if combined with hot air rising from an adjacent fridge or hot water service, so if the fridge sits in a unit next to the pantry unit, installing vents between the fridge and pantry areas enables the heat from the fridge to help draw cool air through the pantry. But make sure air flows from pantry to fridge area, not the other way around!

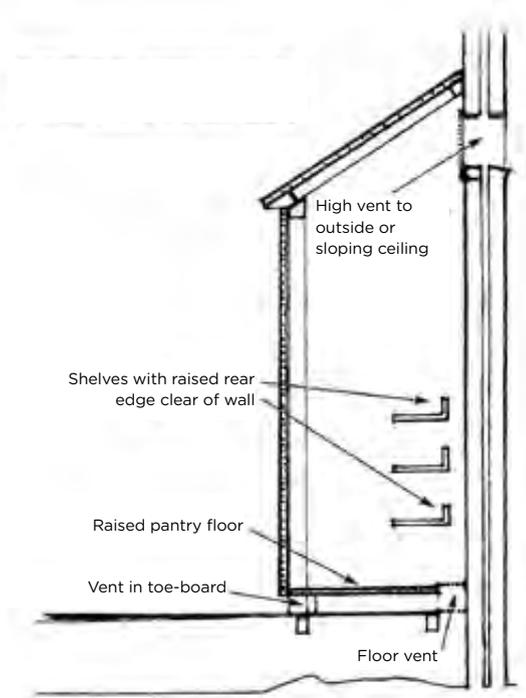
Shelving in the cool pantry should be wire or plastic mesh to help circulation and should sit away from exterior walls. Before installing ventilation, check that the underfloor area is free of smell and moisture.

Cellars are also an option for storing large quantities of food outside a fridge, though the construction of a cellar is a major building project involving excavation as well as water proofing. You should consider how easily accessible your cellar should be, which will depend on the type of food you intend to store there.

Prelgauskas says the ideal temperature for storing vegetables is 9°C, though he says temperature does not directly impact



This ventilated pantry, designed by Ande Bunbury Architects and featured in *Sanctuary 9*, has floor-level vents in the fridge and pantry area as well as vents between the fridge space and pantry. The upper vents exit through the roof via a whirlygig vent so that on still days the warmth from the fridge motor will drive the air flow through the system while on windy days the whirlygig will create the suction to draw the air through. Photo by John Bodin.



Basic ventilated pantry. Image reproduced courtesy Michael Mobbs' *Sustainable House* book and Emilis Prelgauskas.

on the success of storage for food such as whole vegetables, as long as the temperature doesn't vary too much and there is a continual exchange of air. The ventilated pantries Prelgauskas has measured have maintained a temperature of 12°C. David Holmgren's ebook, *Mellidora*, has a detailed section about his 'cool cupboards'. His design suggestions include the following: cupboard doors should be well sealed; intakes and vents should be at least 300mm in diameter; and multiple and sharp bends inhibit air flow. David's cool pantry temperatures range from 5°C in winter to 18°C in summer.

It's well worth while doing extensive research to ensure your pantry will work as you expect.

It's also a good idea to know optimum temperature and humidity levels for the fruit and vegetables you plan to store either in a cellar or cool pantry so that you can monitor the pantry's efficiency.

FOR MORE INFORMATION

- *Sustainable House* by Michael Mobbs has a whole chapter dedicated to the refrigerator.
- Emilis Prelgauskas has incorporated a number of ventilated pantries in homes he has designed www.emilis.sa.on.net.
- David Holmgren's comprehensive ebook, *Mellidora*, is available at www.permacultureprinciples.com. It's a case study of his experiences in building his home at Hepburn, Victoria.
- The federal government's energy rating for appliance guide is www.energyrating.gov.au. When using its energy star rating system, remember to only compare the number of stars across fridges of the same size. It's a good idea to compare fridges' energy use using the number of kilowatt hours (kWh) used per year, given on the label. Usually, the most energy-efficient designs have separate doors for the fridge and freezer, with the freezer at the bottom.



FRIDGE/FREEZER THERMOMETER

This gadget is designed for use in a fridge/freezer but it could work just as well in ventilated pantries. It uses a thermometer sensor and has an alarm. The sensor goes inside the fridge/freezer or pantry – you set the preferred temperature and minimum and maximum temperatures. If the temperature goes below or above these set temperatures the alarm will sound and you can readjust your fridge/freezer settings or move the contents of your pantry to ensure its contents don't spoil.

Available from the ATA shop for \$18 (\$15.30 for ATA members). shop.ata.org.au or (03) 9639 1500.



Lawns

Water-thirsty lawns have become the bad boys of landscaping, but they don't have to be.

WORDS JANE CANAWAY

A shady place to read, somewhere to catch the sun, a flat spot for games – lawns can provide all this and more, but their cost in terms of water use and maintenance has relegated them to the bottom of the green league.

Luckily, canny landscapers have been busy devising clever alternatives, including drought-tolerant turf and native grasses. When considering the various options, gardeners should consider what it is they most want from a lawn. Should it be a place to play or to entertain, or do you want a lawn for purely aesthetic reasons?

LAWN ALTERNATIVES

GROUNDCOVERS

If your aim is to create an area of low-growing, lush greenery to set off surrounding beds, then groundcovers may suffice. “I like to use *Myoporum parvifolium* to create an area of green contrast, with stepping stones set into it,” says garden designer Wendy Clarke who, after training with Sustainable Gardening Australia, is accredited to offer environmental advice. “You can’t walk on it but it has pretty pink flowers in spring and it looks lovely all year round.”

Other hardy plants that create a dense cover include many saltbushes (such as *Atriplex semibaccata*, *Enchylaena tomentosa* and *Einadia nutans*), which are also fire-retardant and provide habitat and food for skinks.

Many non-grasses will not tolerate traffic, but the new fine-leafed *Lomandra* cultivars are impressively hard wearing. Garden designer Liz Turner used it to great effect to replace some dead lawn around a trampoline. “The site is in full sun and the soil was pure

clay so I dug in lots of compost first, then planted it out with *Lomandra* ‘Lime Tuff’,” she said. Two years later and despite heavy use by four boys and a Labrador dog the soft, tussocky mounds are looking lush and healthy.

SYNTHETIC TURF

If you worry about embedded energy costs in petroleum-based products, skip this section, but if a perfect green sward is your thing, read on. Pros of synthetic turfs include year-round colour, shade-tolerance, a mud-free edge to pools, great drainage, rain-permeability and no mowing. Cons can include high upfront cost, heat retention, limited warranties, sterility – synthetic turfs produce no oxygen and provide no habitat – and the need for maintenance.

HARD SURFACES

For high traffic areas, timber decking or stone paving may be preferred. A major consideration, however, is the extra heat pavers retain on a hot day. Shading a paved area with a deciduous tree or carefully designed pergola can help. “I try to reduce the amount of hard surfaces I use,” says garden designer Phil Johnson. He stresses the importance of considering stormwater: “You need to think about using the run off; if you get in early in a project you can also collect the water from underneath by using permeable surfaces so it drains through.”

WHEN NOTHING ELSE WILL DO

NATIVE LAWNS

Native grasses have low water use, provide great habitat for all forms of wildlife and can

offer interesting colours (red leg grass), seed heads (wallaby, kangaroo, windmill and spear grasses) and textures (silky blue and plume grass).

However, most native grasses are grown from seed (the deep roots make turf production difficult) and develop slowly, so they need patience, hand weeding and some watering until established; chemical broadleaf herbicides are not recommended for the first few months.

Also, because many are tussock forming or have only short rhizomes they are slower to regrow if damaged by heavy foot traffic. Two showpiece lawns have been sown at the Royal Botanic Gardens, Melbourne, where they survive well but daily footy matches are not recommended.

NATIVE LAWN MAINTENANCE

At most, native lawns will only need mowing up to six times a year – usually to remove seed heads – and the blades should be kept high, around 25-40 mm. Weeping grass may benefit from an application of fertiliser if the leaves show some yellowing, but redgrass and wallaby grasses rarely need it. All native grasses will appreciate watering but they have much lower needs than exotic species. “*Microlaena stipoides* (weeping grass) is the best native lawn grass,” says Phil Johnson. “Having said that, we need to educate people about what is an acceptable-looking lawn. I don’t like a scruffy look, so I choose *Microlaena*, but I can still see the beauty in an expanse of *Danthonia* (wallaby grass) with flower heads blowing in the wind.”



NATIVE GRASS VARIETIES

Bothriochloa macra (red grass) is heat and drought tolerant. It is adapted to acid soils and low fertility soils.

Austrodanthonia (wallaby grass) is heat and drought tolerant, green all year round and hardier than weeping grass.

Microlaena stipoides (weeping grass) will survive frosts and extended hot, dry periods, but may lose leaf if not watered during these times.

SUPPLIERS

• Ko-Warra Native Grasses

(03) 5480 9778; www.nativegrasses.com.au

• Native Seeds Pty Ltd

(03) 9555 1722; www.nativeseeds.com.au

DROUGHT-TOLERANT EXOTIC TURF

If you want a lush lawn and you can't live with a native lawn then perhaps the number of exotic turfs which have been developed for Australian conditions would suit.

EXOTIC LAWN MAINTENANCE

"Anyone can have a lawn if they reduce it to a sustainable area and use whatever water is on site," says Phil Johnson. Harvest as much water as possible, including stormwater and greywater. Wendy Clarke estimates 40,000 litres can sustain up to 40 square metres of lawn, based on an average rainfall of 650–700mm.

Preparing the soil for a lawn is also important. "Normally I avoid having too much sand in soil, but for lawns you need a fair bit to avoid the soil becoming compacted," Wendy says. "To make sure the soil can still hold water and nutrients, I always use Hydrocell water retaining foam and try to add as much organic matter to the soil as I can."

Adding sand to soil will permanently improve its drainage. Gypsum dug into clay soils will improve friability and drainage by chemically binding the super-fine clay particles together to improve drainage.

Turf is best laid in spring; if warmer weather cannot be avoided, help it settle in by deep watering with Seasol or similar shock-reducing fertiliser, and regular watering.

Then there's maintenance. "One of the most important aspects of having a lawn is how you mow it," says Phil. "The easiest way to kill a lawn is to mow it so low that the roots burn and the soil dries out. Keep it long and lush and it can retain more water that way." The national website of the Savewater! Alliance, www.savewater.com.au, recommends using a slow-release fertiliser once a year and a liquid boost as needed.

EXOTIC TURF VARIETIES

Sir Walter buffalo is one of the best for Australian conditions and lifestyle, combining soft texture with resilience and low water use.

Buffalo Sapphire is a warm-season grass. It reportedly retains good winter colour in most southern states but will become dormant in colder areas such as Canberra.

Matilda is a semi dwarf buffalo that is recommended by NSW-based Bill's Turf Supplies as one of the most drought-tolerant grasses. It tolerates full sun, part shade up to 80 per cent, temperatures below zero, salty soil and clay and rocky soils.

SUPPLIERS

• Bill's Turf Supplies

www.billsturfsupplies.com.au

(02) 8999 7684

Turf, including Matilda, empire and Durban

• Buchanan Turf

1300 554 442

www.sirwalter.com.au

Sir Walter buffalo

• Ozbreed

1300 25 2000

www.ozbreed.com.au

Sapphire, native species and strappy plants

GROUNDCOVERS



Myoporum parvifolium forms a lush nature strip in this design by Phil Johnson. Photo by Claire Takacs



Lomandra 'Lime Tuff'. Photo by Jane Canaway

NATIVE GRASS VARIETIES



Austrodanthonia. Photo c/o Native Seeds Pty Ltd



Microlaena stipoides. Photo c/o Native Seeds Pty Ltd

EXOTIC TURF VARIETIES



Sir Walter buffalo. Photo c/o Buchanan Turf



Buffalo Sapphire. Photo c/o Bill's Turf Supplies

Greener Concrete

Concrete is a great way to achieve thermal mass, but until recently this has been offset by its high carbon content. A slew of new products are promising to change this.

IN THIS ISSUE WE FEATURE ONE HOUSE WITH LOW-CARBON CONCRETE. SEE ARTICLE PAGE 10.

WORDS MICHAEL GREEN

Concrete is ubiquitous. According to Dr Peter Duxson, chief operating officer of eco-concrete company Zeobond, it's the second most used commodity in the world, behind water. "Everywhere there is human activity there is concrete being used. It's versatile and cheap," he says. "It just turns out that the base ingredient that makes concrete go hard is bad for the environment."

Concrete is made up of sand, rock and water, bound together with cement. Conventional concrete uses Portland cement and although it comprises only 10 to 15 per cent of concrete, it accounts for about 70 per cent of its carbon footprint.

The high emissions come from burning limestone to create lime – from both the energy required to heat the kilns and the chemical reaction in which limestone releases carbon dioxide. Concrete accounts for about five per cent of global carbon dioxide emissions.

The material's saving grace is its usefulness as thermal mass in appropriate passive solar design. According to Riccardo Zen, from Zen Architects in Melbourne, carefully placed high-density materials are essential to cut the energy needs of homes in temperate and cool climates. "It's very hard to eliminate heating and cooling unless you have some form of thermal mass," he says.

An exposed concrete slab floor is a classic example of thermal mass. Positioned in front of windows in a north-facing room, the slab

➔ This Brisbane home, featured on p10, includes concrete floors with a silica fume cement substitute. Photo by Christopher Frederick Jones.



receives direct sun in winter. It absorbs the solar radiation and warms the house into the night. With appropriate shading, the sun won't hit the concrete over summer, so the chill of the concrete will help the home stay cool.

Given its usefulness, not to mention ubiquity, the race is on to make lower-carbon concrete. The simplest way to do so is to substitute a proportion of the Portland cement for other products. Fly ash and slag (by-products of burning coal and smelting iron ore, respectively) can comfortably replace over one-fifth of the cement content – more with chemical admixtures – without adversely affecting the quality of the product.

Independent Cement's Ecoblend, available throughout NSW and Victoria, and Boral's Envirocrete concrete blends are available with a minimum "supplementary cement material" component of 30 per cent. Boral also sells Envirocrete with one-fifth recycled crushed aggregate, which further saves on virgin resources.

Zeobond, Peter Duxson's company, makes Ecrete, a kind of concrete that replaces

Portland cement with fly ash and slag. It uses other chemicals to kick-start the binding process and ensure the curing time is fast. "The cost premium is between 10 and 15 per cent, but as we get to scale, we expect that price to come down quite significantly," he says.

Magnesia-based concretes are another kind of lower-carbon concrete. Tasmanian company TecEco sells blended cements that include reactive magnesia as well as Portland cement and waste materials. When used in permeable concrete blocks, pavers and pavements, the company's Eco-Cement even absorbs carbon dioxide over the lifespan of the material.

MORE INFORMATION

www.tececo.com

www.boral.com.au

www.independentcement.com.au

www.zeobond.com



ENVIRONMENTAL CONCRETE FLOORS

Polished concrete floors are a very sustainable option in residential construction.

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www.independentcement.com.au



By Independent Cement



A concrete fact: Zeostone Pavers reduce the carbon footprint by 50%.

- Concrete is the world's second most used commodity after water.
- It's also one of the most environmentally harmful.
- Cement is 10 – 15% of concrete but 70% of its carbon footprint.
- Around 1kg of CO₂ is emitted to produce 1kg of cement.

Zeostone is an Australian innovation that minimises the carbon footprint of pavers by upwards of 50%.

For more information visit:
www.zeostone.com.au
Call: 03 9555 6066
Email: sales@zeostone.com.au



Zeostone



Recycling Kitchens

Save money and the environment by buying second hand.

Kitchens are an expensive room to update or build from scratch. According to Archicentre's latest renovation and extension *Cost Guide* (www.archicentre.com.au), the average kitchen renovation costs between \$10,400 and \$31,100. But the financial burdens of a kitchen refurbish or new build is not the only consideration, there are the environmental ramifications. New cupboards and fixtures, bench tops, splash backs or tiles, not to mention the appliances – and all the embodied energy that goes into their production, transportation and disposal – should be factored into the purchasing decision.

Kitchens are also one of the most often renovated rooms in the house, due to wear and tear and the fickle of fashion, so it makes sense to plan for this in their design. Easily dismantled fit-outs, recyclable cupboards and appliances that have been planned for obsolescence are all obvious strategies but they have yet to receive much traction within the design industry. Perhaps if homeowners insisted on designing with obsolescence in mind, or designing to outlive fashion, the industry would be gently pushed along.

In the meantime there are recycled kitchens. As homeowners update their kitchens, a market springs up for the pre-loved kitchens, many of them in excellent condition and style, and a fraction of the price of a new kitchen. Pre-loved kitchens are worth considering if you are building a new home and can design the room around your new pre-loved kitchen, but don't discount looking into second hand kitchens for existing kitchens. Carpenters can resize cupboards, bench tops – almost everything – and you can on-sell any parts of the kitchen you can't use.

Unsurprisingly, online auction site eBay (www.ebay.com.au) is also a great resource for pre-loved kitchens. You can search for “complete kitchens” or “second hand kitchens” to see the hundreds of options, and you can sort by “Distance: nearest first” to find kitchens closest to your home. A recent search found complete kitchens starting from \$0.99, including dishwasher, oven, cook top and range hood. Other options like Gumtree (www.gumtree.com.au) and AdPost (www.adpost.com) are worth investigating too.

A handful of companies in Australia specialise in pre-loved kitchens. Second Hand Kitchens (www.secondhandkitchens.com.au) list pre-loved kitchens for sale Australia-wide. Homeowners with a kitchen to sell can list them as a classified ad, upload images, dimensions and even YouTube walk-throughs to give you a feel of the kitchen. Brisbane-based Second Chance Kitchen (www.sckw.com.au) buys pre-loved kitchens from homeowners and refurbishes them for resale. It can even install them for you, which takes the work out of finding a willing carpenter.

WHAT TO LOOK FOR

If you strike a bargain \$0.99 kitchen on eBay bear in mind you'll need to add transportation and installation costs, if you can't do these yourself. Harrie Sengers is Sydney-based cabinet maker who specialises in installing second hand kitchens (harriesengers@optusnet.com.au). He usually charges between \$1500 per installation, though costs can go up to \$2500 if there are lots of cabinets needing altering. And smaller kitchens can require extra work to make everything fit just so.

You may also want to consider the following:

- Plan your proposed kitchen before you start looking at second hand options. Bear in mind that you can buy a larger second hand kitchen and cut it down to fit your kitchen, but you can't easily uncut cupboards.
- If you don't plan to install it yourself look for a cabinet maker who is happy to work with recycled cabinetry – finding one may not be as easy as you think.
- Ideally you should inspect kitchens before you buy. Ask the cabinet maker along for the inspection – good advice can save you a lot of time and trouble.
- During the inspection take photographs and measurements so that you have a record for yourself of the kitchen's dimensions and condition prior to dismantling.
- Look for quality kitchens and appliances. Kitchens with solid timber cupboard doors usually signify that the “cupboard carcass is of a better quality too,” says Harrie, “as do quality appliances”.
- Look for a kitchen that is “made up of lots of smaller cabinets”. According to Harrie, wide cabinets make it harder to adjust the layout, so “good cabinet sizes are 300mm to 450mm for one door cabinets, and 600mm to 900mm for two door cabinets”.
- Look inside the wet cupboards to see if there is any damage. Particle boards or chipboard cabinets with signs of water damage will need to be replaced. According to Harrie, “Cabinet carcasses are not expensive so don't let water damaged cabinets stop you from getting that dream second hand kitchen. It's only when



you need to buy too many new items that you should think of leaving that kitchen and start looking for another one.”

- If you can't visit the kitchen yourself you Harrie suggests you should “ask for the dimensions of wall, oven, pantry and floor cabinets, bench tops and the overall layout to see if it fits your kitchen space,” and you should also ask for photos of some of the cabinetry details “so you can judge the state of the carcasses, hinges and fittings (they sometimes have rust on them)”.

- Ideally the kitchen should be dismantled prior to pickup. According to Harrie, “Dismantling can have hidden costs such as the disconnecting of appliances, so if you pick it up already dismantled you won't have to do it yourself. Taking out a fridge could take two people half a day, which could cost you labour (around \$600). And the weight of granite bench tops can require extra labour.”

- Even if the kitchen is already dismantled you still have to remove it, so find out whether the kitchen is in a unit or on a second storey and factor this into your costs.

Harrie's final advice is worth remembering: “There are enough second hand kitchens on the market, so if you can't find the one you want out there just be patient and wait another week”.



↑
Hana Rocak bought this kitchen for \$500 from Second Hand Kitchens. It included dishwasher, oven, gas cook top, double sink and a range of timber veneer cupboards. With the help of family and friends she transformed it into the kitchen above. Photos by Hana Rocak.



House Ventilation

Effective ventilation is essential to the healthiness and thermal efficiency of your home, and the best way to achieve it is through careful whole-of-house design.

ALL HOUSES IN THIS ISSUE FEATURE NATURAL CONVECTION DESIGN PRINCIPLES

Most of us spend more than 90 per cent of our lives indoors, so it's worth thinking more closely about air quality in our homes. Poor indoor air quality may cause a range of health effects from mild and generally non-specific symptoms such as headaches, tiredness or lethargy to more severe effects such as aggravation of asthma and allergic responses.

There are a number of simple things you can do around the home to improve the air quality in your home.

FOUR STEPS TO BETTER AIR QUALITY

1. Eliminate – Identify the source of air problems, eg water vapour and cooking fumes, and wherever possible eliminate through better design and product selection.

2. Ventilate – If too little fresh air enters a home, pollutants can accumulate to levels that can pose health and comfort problems.

3. Separate – Separate problem materials from occupants by using air barriers or sealers such as coatings.

4. Absorb – Indoor plants can be used to improve the quality of the indoor environment, as well as for their beauty. (Filters, UV treatment and other devices can purify air too, but they don't look as nice.)

We'll concentrate on "elimination" and "ventilation" in this article.

ELIMINATE

Eliminating pollutants from your home is largely a matter of adopting the right behaviours – eg not smoking indoors, not using open fires, and doing regular cleaning, vacuuming and dusting. Don't forget to clean

fly screens, which may have a mould build-up, pollen or other problem substances on them. Also take care to select appropriate building materials, appliances and furnishings (see "Green Interiors" in *Sanctuary 10*). These steps will make the single biggest difference to the health of your indoor environment.

The next most effective thing you can do is to ensure adequate ventilation.

VENTILATE

Ventilation can improve comfort levels and prevent the build-up of nasties in your home.

Most Australian homes rely on a combination of exhaust fans in kitchens and bathrooms and openable windows and doors (and in older homes fixed wall vents) to provide ventilation.

In colder climates such as Northern Europe's and Canada's, where the main challenge of house design is retaining heat, the prevailing standard is to seal houses tight to prevent thermal leakage. The consequent need to purge stale, polluted air and introduce fresh air has spurred the development of mechanical ventilation systems, often with heat recovery devices that transfer much of the heat from exhaust air to the incoming air to reduce energy costs.

"Heat recovery ventilation" is still a relatively new concept to Australia, where there are only a handful of companies retailing Passiv Haus type technology (most prominently air2energy and Air Change). More prevalent in Australia are the kinds of solar thermal systems we profile on p64, which in industry parlance "pressurise" the

house, pumping air in and relying on it leaking out through the cracks.

MECHANICAL VS NATURAL VENTILATION

In Canada and Northern Europe the mantra is "seal tight, ventilate right". Germany's Passiv Haus construction standard in many ways sets the standard for all buildings following this principle. However the standard is not universally accepted. In the UK, as Australian architect Caroline Pidcock found on a recent study tour, many sustainable building designers are baulking at the prescription for gapless envelope design:

"The problem ... is that the tightly sealed buildings require mechanical ventilation with heat recovery to work. The Zero Carbon Hub came to the conclusion that it is better to accept a slightly lower standard of envelope design that can be delivered through true passive means – not requiring mechanical ventilation."

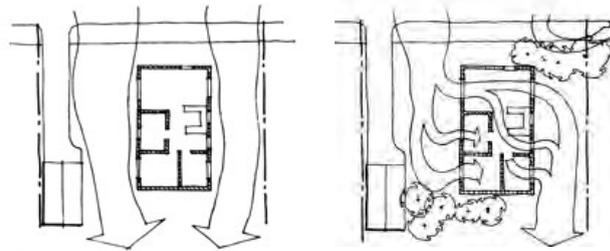
www.pidcock.com.au - Blog, London 1 February 2010; Zero Carbon Hub www.zerocarbonhub.org is a public/private partnership with a lead responsibility delivering UK homes to zero carbon standards by 2016.

The difficulties with mechanical ventilation systems, says Pidcock, are not just their upfront cost or energy consumption but that "machines require money and energy to run and maintain – which is hard to rely on, especially in low income housing."

But neither is passive ventilation without its critics. Adjunct Professor Alan Pears of RMIT University is sceptical about the "passive at all costs" approach: "It would be



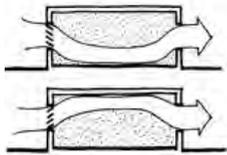
FIG A



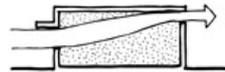
Prevailing breeze flows past house.

Dense tree planting deflects breeze through house.

FIG B



Louvres can direct airflow upward or downward.



A canopy over a window tends to direct air upward.



A gap between canopy and wall ensures a downward pressure.



Downward pressure is improved further in the case of a louvred sunshade. Use window styles with 100 per cent opening area such as louvre and casement.

interesting to compare the relative cost and reliability of a simple mechanical ventilation system using solar voltaics against the many ‘passive’ venting systems”.

Passive ventilation, Pears adds, “does save fan energy and reduce fan and duct noise, but it may undermine home security and allow outdoor noise to enter. If your house cools down too much overnight or there is a storm, you may need to get up in the middle of the night to close windows – or risk water entry or damage. If it’s not windy, open windows may provide only limited fresh air. Also, if you open the windows at the wrong times, you may add to discomfort and energy bills. Uncontrolled ventilation (through fixed vents, gaps and cracks, and permanently open windows) is a particular problem: in windy weather it allows far too much outdoor air in, adding to heating and cooling bills.”

As Pears’ example demonstrates, the term “passive design” is actually quite misleading. To work effectively, passive design requires active occupants.

Ultimately, the choice whether to ventilate mechanically or naturally comes down to your individual situation and

preference. There is no knock-out case for either approach, and many ways in which the two may be combined.

ACHIEVING NATURAL VENTILATION

The challenge with natural ventilation is to strike a balance between the need to introduce fresh air, maintain comfortable room temperatures and ensure acceptable energy conservation.

The trick is to design for effective cross flow of air through the building. The design must align windows with internal doors in a way that does not block weaker breezes, and to not locate rooms where they block breeze paths. A clever combination of landscaping and building form can also deflect and control the flow of breezes (fig a).

WINDOWS & VENTS

Windows should be designed to deflect breezes from varying angles and located on walls with best exposure to common cooling breezes (fig b). In all climate zones but the hot humid tropics, windows and vents should be closable to prevent the escape of warm air during the winter months.

The direction of prevailing winds across Australia for each month can be sourced from the Bureau of Meteorology (www.bom.gov.au/climate/averages/wind).

CONVECTIVE AIR MOVEMENT

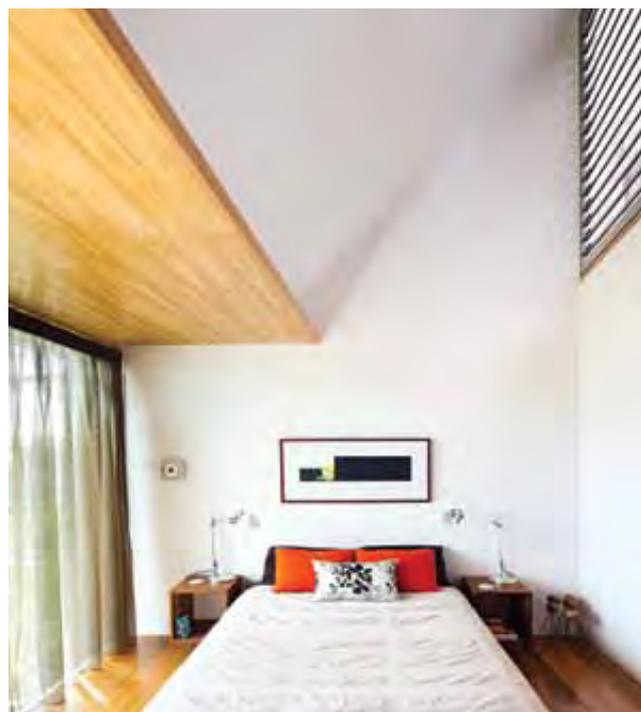
In nil breeze situations it is still possible to draw air through a building. Convective air movement relies on hot air rising and exiting at the highest point, drawing in cool air from shaded external areas over ponds or cool earth. Thermal chimneys, clerestory windows, spin away roof ventilators, and vented ridges, eaves and ceilings will allow heat to exit the building through convection. Appropriately oriented clerestory windows offer the added potential benefit of providing a lot of daylight per square metre of glass.



CONVECTION BY DESIGN

A staircase inserted into the south-west facing veranda surrounded by galleries of dark bronze louvres (fig c) induces cross ventilation and in summer expels hot air rising from the ground floor.

FIG C



↑ A high-level louvred window vents hot air from the upstairs master bedroom in the Spring Hill house (see article page 40) into the attic space. Photo by Christopher Frederick Jones.

↑ The Spring Hill house featured in this issue. The louvres are a prominent feature of the house facade. The wall where the silhouette is visible is a glazed wall that lets natural light into the stair from an adjoining room, and vice versa. Photo by Christopher Frederick Jones.

your Home

This article was produced in part with text and images from the *Your Home Technical Manual* (www.yourhome.gov.au). Your Home is a suite of consumer and technical guide materials and tools developed to encourage the design, construction or renovation of homes to be comfortable, healthy and more environmentally sustainable. *Sanctuary* is supported by the Your Home project.

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Products



01

BUILDING INTEGRATED PHOTOVOLTAIC SYSTEMS

Artemis Building Systems have developed a range of building integrated photovoltaic (BIPV) systems that can incorporate PVs into your roof or even your building's facade as a see-through photovoltaic glazing. Their "Just roof" BIPVs provide a method of replacing a section, or indeed all, of a roof with PV modules. By integrating PV panels directly into the roof fabric you can save the cost and materials involved in installing a "normal", non-active roof cladding. Retro-fits would involve extra cost over standard PV installs as the building fabric would need to be modified. Care should be taken to vent the roof-space as elevated temperatures will negatively impact the efficiency of the installation.

www.artemisbs.com

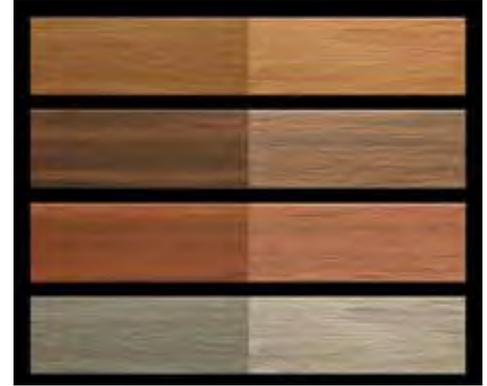


02

WATTS CLEVER POWER BOARD

Some power outlets can be inconvenient to access when you want to turn off appliances to avoid "phantom loads". Remote controlled units can help, but they can be another "always on" device. The Watts Clever simply connects devices to the powerpoint, and is turned on or off remotely from up to 2.8m away. It's ideal for the elderly or disabled and to turn off those hard-to-get-at "phantom loads". When off, this unit draws no power of its own; when on, it draws a miniscule 0.5W. Available from the ATA webshop for \$28 (15% off for ATA members)

shop.ata.org.au



03

MODWOOD COMPOSITE BOARDS

Designed and manufactured in Australia, Modwood decking and screening started life as recycled milk cartons and reclaimed pine dust (a by-product of timber milling). The robust decking boards come in a standard 23mm thick in two widths, 137mm and 88mm. They require no painting, staining or oiling, won't warp, split or rot and they're resistant to termites and insects. Expect a retail price of \$100-\$110 per square metre. The "natural grain" collection includes silver gum, sahara, black bean and jarrah.

www.modwood.com.au



04

ECOSMART FIRES

EcoSmart fireplaces are fuelled by denatured ethanol (methylated spirits), a renewable resource. The heaters are flueless and mobile, which means they're a good option if you're renting. They're also fairly efficient compared with flued heaters where heat is invariably lost up the chimney. These heaters can heat a room at around 35m² with 3.5 Kw/h, but because the fuel is relatively expensive, and its burning produces water vapour (which could be an issue in a well sealed home) they're best chosen as an occasional heater. Look online for cheaper options from other companies. The EcoSmart Blu Box Fireplace shown here retails for \$1690 to \$2390 including GST.

www.ecosmartfire.com



05

X-BOARD PLUS

If you're looking at new cabinetry, furniture or doors, you may want to consider X-Board Plus. X-Board Plus boards are VOC free, made from 100% recycled fibre waste and 100% recyclable, so they're a much better option environmentally than conventional MDF, particleboard and melamine. A 58mm board weighs 10.8kg/m² compared with 12.6kg/m² for 18mm MDF. This same 58mm board can span 1.5 times the distance of 32mm MDF, making it more versatile for many applications. X-Board Plus comes in a range of veneers, which makes it long-wearing and attractive. It costs greater than a conventional MDF up to 35 mm thick but in thicker boards this material becomes cost-effective in its own right.

www.sharpplywood.com.au



06

KHOVSGOL SOFAS

Khovsgol sofas are made using FSC (Forest Stewardship Council) timber and bamboo frames. The covers are removable, which means you can update the sofa if it's looking tired without having to get it reupholstered. The covers are 100% cashmere or organic linen; glues are solvent free and water-based; and the cushions and padding are made of natural latex foam, goose down and wool. Sofas come in a 3.5 seater (pictured: cover ivory organic linen, RRP \$5,970), a lounge chair and an ottoman.

www.obodo.com.au

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Q

The building industry appears to be reacting to sustainability rather than leading it. Familiar construction methods using well established building materials presumably offer job efficiencies that edge out less familiar sustainable options. My impression is that sustainable builds cost more and in many cases struggle under a natural tension between the home owner and their builder. I would value a discussion around these issues and how best to manage them. — *Matthew*

A

Dick — A handful of builders are at the front line, but many – while happy to build what is drawn if they get paid for it – still express doubt or some other resistance to anything new. It is a risk averse industry, plagued by Fear Of The New. Brick veneer was new once, but it grew on us like glaucoma (thanks Tim Minchin). Why then is the project industry so slow to take up reverse brick veneer?

But even familiar construction methods can provide significantly better performance if the concept is good. Things like orientation, placement of thermal mass, window sizing and shading – these happen one way or another on every job, and making them happen well costs nothing! Other sustainability gains may cost a little more up front, but all the sensible ones pay dividends in quick time.

Q

I am building a double-storey extension to my house and want to incorporate some thermal mass into the second storey. The floor for the second storey is timber frame with Hebel Soundfloor. I want to lay some tiles over the Hebel flooring to achieve some thermal mass to take advantage of the large northern window exposure in winter. However I have been unable to find any information on floor tiles and thermal mass. Have I completely missed out by not suspending a concrete floor on the second storey? — *Geoff*

A

Dick — Floor tiles are very dense but also quite thin, thus the total thermal mass (TM) available is quite low. Don't kick yourself for not using concrete, however. The Hebel floor is good for solidity and acoustics, and is also a reasonable thermal insulator. Though it has moderate TM, be aware that TM in the upper part of a building can add to summer heat gain if there is no way of preventing convected heat from accumulating upstairs.

First, make sure the floor plan is arranged such that you can either separate the levels or open them up from bottom right through the top, to allow controllable convection (stack ventilation).

Then look at using water as a de facto TM device: adding solar heat to the water in a remote collector, then directing that warm water through some part of the building, usually either via wall mounted radiators or in a thick bed under the tiles.

Q

I'm building an eco display house and have been approached by an expanded polystyrene company to use their product as cladding. It has some advantages – ie, better finished, cost-effective, lighter, good insulation – but does this outweigh the disadvantages – ie, made from fossil fuel, requires a lot of processing, not easily recycled? — *Ben*

A

John — Expanded polystyrene (EPS) has many advantages, not least its insulating properties. This alone makes it a good contender for use as cladding as the energy saved by its use far outweighs the energy used for its production. It is also cheap and easy to install.

It is made from fossil fuel, but as EPS is comprised of 98 per cent air and therefore only 2 per cent polystyrene, it is a highly efficient use of raw material.

It is also completely recyclable, from manufacturing to end-of-life. (Unfortunately this is currently done off-shore as there are only small quantities of EPS waste generated in Australia.)

Q

I would love to know how to make the most of my sash windows. I have a lovely old house with gorgeous sash windows, but they aren't very energy efficient. Part of me thinks I should be putting in double glazing – but then that also seems a bit of a waste as the old sash windows don't seem to fit together that well anymore (it's not that there are obvious gaps but air still seems to get through anyway). I'd love some advice on how to keep the character-filled windows that I love, while still doing something to improve their energy efficiency. — *Adam*

A

John — Double glazing is certainly an option but you need to draught-proof your windows first. The best way to do this is to replace the beading, which the windows use to go up and down on, with special bristle-strip embedded beading. Additionally, you need to use more bristle strip where the horizontal faces of the top and bottom windows meet and where the windows meet the frame at the top and bottom. In order to do this properly, you need to remove the windows and cut a channel in the wood using a router.

An easier alternative is to use adhesive foam or compressible rubber products available from most hardware stores. Once you have a good draught-proof seal around your windows, you can contemplate double-glazing with a sealed, retrofitable double-glazing unit. You could also consider the use of low-e glass, which achieves a high insulation performance in a single sheet of glass.

If you don't want to go the DIY route there are companies around that can do the job for you, such as Classic Windows and Doors, Sash Window Specialists and ecoMaster.



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