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Sanctuary

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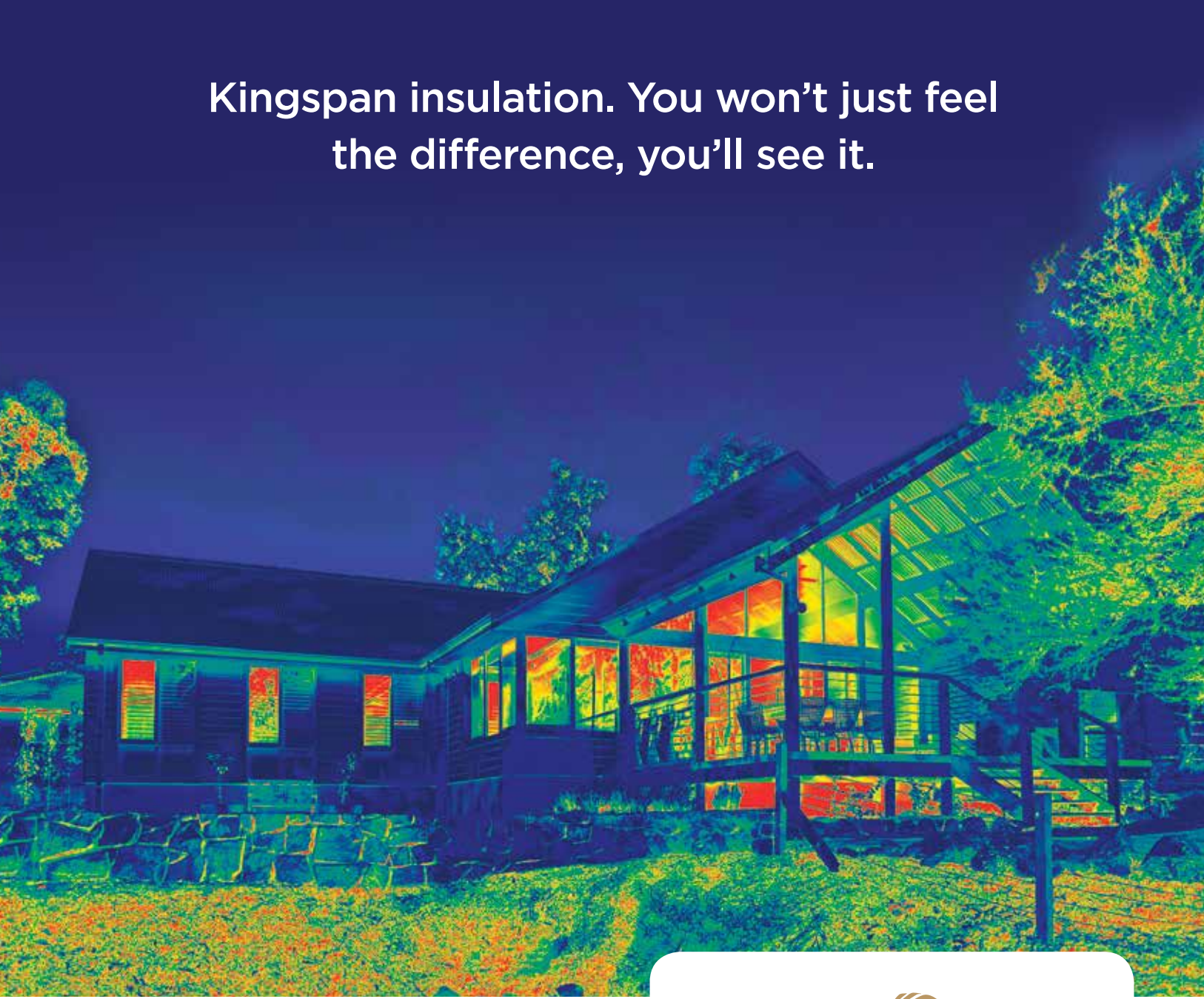

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MODERN GREEN HOMES

Sanctuary

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In this *Sanctuary* special we showcase green home, kitchen and bathroom renos, alterations and retrofits from around Australia. We also look at how to create cosy, sustainable and healthy living spaces.

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Letter from the editor

—Issue 27

Inspiration, lots of it, to revive and enjoy the spaces we share, sums up this winter issue of *Sanctuary*. It's our annual renovations, alterations and retrofits special and it's bursting with beautiful homes, kitchens, bathrooms, living and sleeping spaces, and expert advice.

You'll find profiles of homes with stylish, cosy and functional shared spaces. Three in Melbourne take different approaches to open-plan living, while in Sydney and Stradbroke Island the focus is on liveable indoor-outdoor spaces and in Perth an architect takes full advantage of unwanted materials.

These homes, plus some innovative kitchens and bathrooms, show the diverse approaches to environmentally responsible design that are possible when we, designers and householders, think outside the box.

Also in this issue, interior designer Megan Norgate shares her insights on healthy and well-designed bedrooms for a good night's sleep (p56) and we look at product choices for greener kitchens (52). If you live in a cooler climate, Alan Pears' article on heating and winter comfort (p79) and Dick Clarke's on solar hydronic heating (p82) will give you ideas about keeping warm sustainably. Or just get away from it all at a sustainably-designed winter escape (p70). Outdoors, Beth Askham looks at the range of plants that shade and bear fruit (p75).

For anyone considering renovating, Queensland architect Stephanie Skyring discusses how to choose an architect (p86). And if you live in or near Sydney, don't miss Speed Date a Sustainability Expert this June (see p60 for more).

With all the amazing ideas, people and projects featured in this issue and with many more beautiful and sustainably-designed homes being crafted and created as I write, I hope you'll forgive a moment of sentimentality. This is my last letter as managing editor of *Sanctuary*, a truly lovely magazine published by the ATA – a not-for-profit organisation I just can't praise enough. It's been a privilege sharing the homes and stories of people who have made the choice to live more sustainably, not to mention working with so many talented, passionate and truly exceptional people. Handing over *Sanctuary's* reins, it's energising knowing that more and more people are turning to sustainable design because well-designed, high-performing and healthy homes just make sense.

I hope you enjoy the stories that follow and keep turning to *Sanctuary* in print and online for sustainably-designed home inspiration and expert independent design advice.

Sarah.

sanctuary@ata.org.au | sanctuarymagazine.org.au

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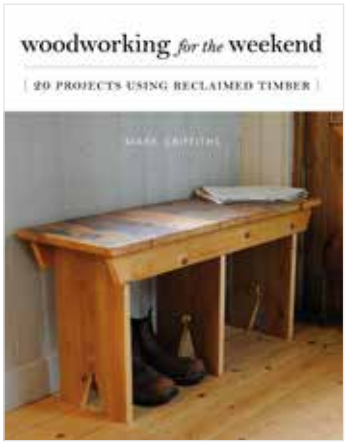
Reviews

—Books, apps, websites and other interesting stuff

If you have recommendations for books, smart phone apps, blogs, websites or anything else you think would be of interest we'd love to hear from you. Email us at sanctuary@ata.org.au

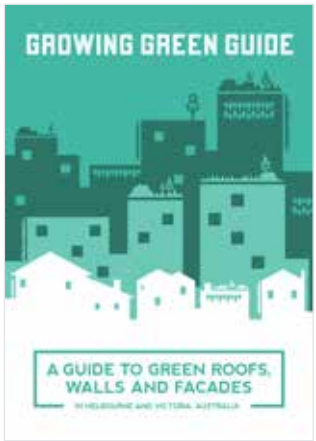
BOOKS



WOODWORKING FOR THE WEEKEND: 20 PROJECTS USING RECLAIMED TIMBER

Mark Griffiths
Ivy Press, 2013
$40.00

Making something is good for you, truly. These woodworking projects are especially good as they use reclaimed timber to make household furniture. Projects range from planter boxes to tables and pergolas. With easy instructions, lists of what you need and strategies to find discarded timber, it's a lovely how-to book that will keep you busy week in, week out.

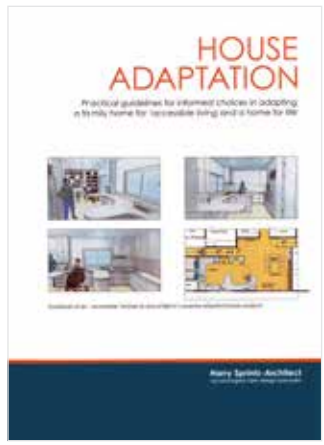


GROWING GREEN GUIDE: A GUIDE TO GREEN ROOFS, WALLS AND FACADES

City of Melbourne, 2014
PDF, free

Find out more about growing green roofs and walls in this free and detailed Growing Green Guide. It's a well-researched and comprehensive guide by the City of Melbourne that includes a technical guide and case studies.

www.growinggreenguide.org



HOUSE ADAPTATION: PRACTICAL GUIDELINES FOR INFORMED CHOICES IN ADAPTING A FAMILY HOME FOR 'ACCESSIBLE LIVING AND A HOME FOR LIFE'

Harry Sprintz, 2012
$39.50

How do we design our homes to be accessible for all, and for all stages of life? Architect Harry Sprintz's reference book discusses designing for lives in which age, accident or disability might affect mobility. With examples of homes, kitchens, bathrooms and a breakdown of costs, there is a lot of practical and insightful information in this book.

APPS

ECO ACTION TRUMPS

Free, iPhone, iPad, iPod Touch
http://ecoactiontrumps.co.uk/about/

Based on the card game Top Trumps, Eco Action Trumps sees you trumping an opponent for the eco action that scores the highest points. The cards cover activities at home, at school, at the office, alternative transport choices and options when shopping for appliances and products.

SUN SURVEYOR LITE

$6.99 Android, iOS
www.sunsurveyor.com

This app lets you visualize the sun throughout the day or through the year. It includes the ability to visualise how objects will cast shadows at different times of the day.

WEBSITES

THE NEW JONESES

www.thenewjoneses.com

With ideas on how to spend less and live more, The New Joneses website keeps you in the know about the new normal; maximising resources and minimising waste.

SUSTAINABLE TABLE

www.sustainabletable.org.au

Sustainable Table is a not-for-profit that exists to empower people to use their shopping dollar to vote for a food system that is fair, humane, healthy and good for the environment.

DID YOU KNOW?

Home extensions need detailed thermal performance design to make sure they integrate with the existing house.

Energy and water efficient systems and environmentally-preferred construction systems and materials will add value to your home.

Insulating exposed hot water pipes will reduce heat loss.

Today's refrigerators and freezers use about 40 per cent less energy than those of 15 years ago.

Source: *Your Home 5th edition* www.yourhome.gov.au Image Meghan Plowman from 'Handmade with love' p14.

In the post

Write to us! We welcome letters on any subject, whether it be something you have read in *Sanctuary*, an experience you've had as part of the green design or build process, or a great idea you would like to share.

Please limit letters to 200 words. We can't guarantee we will publish all letters received and letters published may be edited for appropriateness, clarity and length. Email letters to sanctuary@ata.org.au with your name and the state you live in.

THANKS TO THE ATA

We wanted to acknowledge the important contribution that ATA products have made to our recent home extension/renovation.

Within the constraints of Canberra's urban planning guidelines, ATA resources and member testimonials provided us with the knowledge, courage and determination to encourage our willing builder to push new boundaries in sustainable building, and to assist us in making sense of an increasingly complex maze of products promoted as green.

Resources we turned to included *Your Home, Sanctuary, ReNew, Water Not Down the Drain* and *Tankulator*.

We will now begin evaluating the contribution our home will make to the environment, and look forward to continue to learn through the ATA about all things sustainable. – *David, ACT*

CREDIT WHERE IT'S DUE

In response to the article, 'Humanitarian Architecture' in *Sanctuary 26*, I would like to give personal credit to those involved in the Emergency Architects Australia (EAA) project.

When a strong earthquake and tsunami hit the Solomon Islands in 2007, 36,000 people were displaced, 6000 homes destroyed and 165 schools flattened or severely damaged. EAA's skilled volunteers immediately joined the reconstruction effort. Patrick Coulombel and Neilson Warren carried out a rapid assessment of the damage, looked at buildings and materials to learn how they weathered the earthquake and Tsunami and recruited a team including local professionals and community members where possible. Rather than having to rebuild houses Tricia Helyar and Jon Crothers ran workshops using simple drawings produced by David Kaunitz in 17 villages throughout the Solomon Islands' western province, to demonstrate how to square up and jack back shaken dwellings and brace the structures. Ninety per cent of the houses were able to be saved in this manner. Once the local villagers were able fix their houses, they were available to work on their lost schools and village latrine projects. EAA volunteers created simple construction drawings with cutting lists so homeowners could prepare timber.

EAA volunteers Nick Ewald, Guy Luscombe, Barry Gibbon and David Rapaport designed and documented simplified drawings of prototype school buildings, including classrooms, teachers' houses and rooms, and dormitories. These buildings were developed to make use of local skills and available materials and be easy for residents to build.

Richard Briggs, Vicki Hon and Will Harvey-Jones lived onsite in the Ngari and Gilbertese communities for up to 18 months to assist the community so it could maintain the structures and build back better themselves in the event of future disasters. A total of 110 schools were rebuilt in a two-year timeframe this way.
– *Andrea Nield, Emergency Architect Australia founder*

FACEBOOK

We asked readers how their house performed in the heat wave; you replied:

The phase change, insulation, double glazing and ceiling fans are working a treat. Inside the house has not got hotter than 29 °C yet. – Peter

Given my well-insulated house is currently located on paper only, not remarkably well. – Sami

Double glazing, timber shutters (closed), greater than standard insulation in walls, including internal walls, no air-conditioning on. It's 27.5 °C at present, quite comfortable compared to outside. – Tim

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Handmade with love

Building a new house out of old materials was a singular vision for a Perth couple.

WORDS Rachael Bernstone
PHOTOGRAPHY Meghan Plowman

Carla and Ben found the front entrance door and leadlight windows at a local salvage yard. The red pavers and slabs are all recycled and sourced from private sales.

Upcycled jarrah windows along the home's north-western façade let natural light onto the concrete floor and internal recycled brick wall in the open-plan shared living space.

BUILDING DESIGNER CARLA KARSAKIS and her urban designer husband Ben always planned to build their new house using upcycled and recycled materials. They started scouring salvage yards and stockpiling timber, bricks, windows and doors long before construction began.

In 2010, the couple bought a 1940s house in Perth's inner east from its original owners. They lived in the front house for the duration of the project – clearing the backyard, sub-dividing the land, designing the new house – then sold it once their new home was complete.

From the outset, this was a shared undertaking. "My husband is very handy with the detail whereas I have a knack for imagining the overall vision and concept," Carla explains. "We came up with a general layout, then we bought all the doors and windows and retrofitted the design around the pieces we'd found. I drove the interior look of things – the balance of materials – while Ben worked on the details."

As well as scouting far and wide for 1930s jarrah windows and doors, and older style bricks, some of their materials were found closer to home. "We decided to reuse the timber from the out-buildings and garage – which the original owner had worked in for many years – in our new house. We wanted to respect the short history of the site, and to keep that spirit going," Carla says.

Their careful planning and foresight meant the build took just one year from lodging the plans with council in January 2012 to moving in the following January. Carla attributes some of the speed of construction to her use of structural insulated panels (SIPS) for the external walls. It was a product she'd never built with before and she was keen to test its thermal performance. It impressed her.

She adds that the modest size of the

Homeowners and designers Carla and Ben and Carla's father designed and built the kitchen island bench with timber from the site's old shed, pressed tin they found at a salvage yard and a new locally-sourced benchtop. The remaining kitchen cabinetry, sink and stainless steel bench were sourced secondhand from an old restaurant in Perth.

The living room sits at the north-eastern end of the house looking out to the front courtyard garden. The concrete floor has been honed to give it a smooth finish. Carla and Ben found the artwork on a holiday to Cuba and the Nogucci coffee table online through eBay.

"I can see love in every single thing: there is a story behind everything that we pulled together and created."

Architect and homeowner Carla Karsakis

The main bedroom's dressing room and ensuite is lined with newspapers from 1955 that Carla and Ben found under the front house on their now subdivided block. "We just love the colour and charm they bring this wall," says Carla. The aqua enamel sink was one of the first items Carla purchased prior to designing the home. "We then searched for months through private sales to find an antique dresser of the correct dimensions to upcycle into a vanity. We had our cabinet maker modify the legs slightly and install the sink."

house, which incorporates three bedrooms, two bathrooms and a warehouse-style open-plan living space in just 145 square metres, also hastened the construction process. Despite its small footprint, the house feels spacious inside: a courtyard on the northern side lets in plenty of natural light and the living area features 3.5 metre-high ceilings and soaring columns.

Carla also experimented with some unusual design solutions. "We pushed the envelope as much as we could, and conducted experiments because we were happy to take the risk," she says. "We did a few things that not everyone would do, such as having no hallways. The bedrooms open off the living area, but they don't lack privacy.

"Another experiment was the central island bench in the kitchen, which we built with timber from the old shed," Carla adds. "We started building it even before we had

submitted the plans, because we knew the rough dimensions of that space and that it would fit. We left it open at the front with shelving: it's raw and rustic.

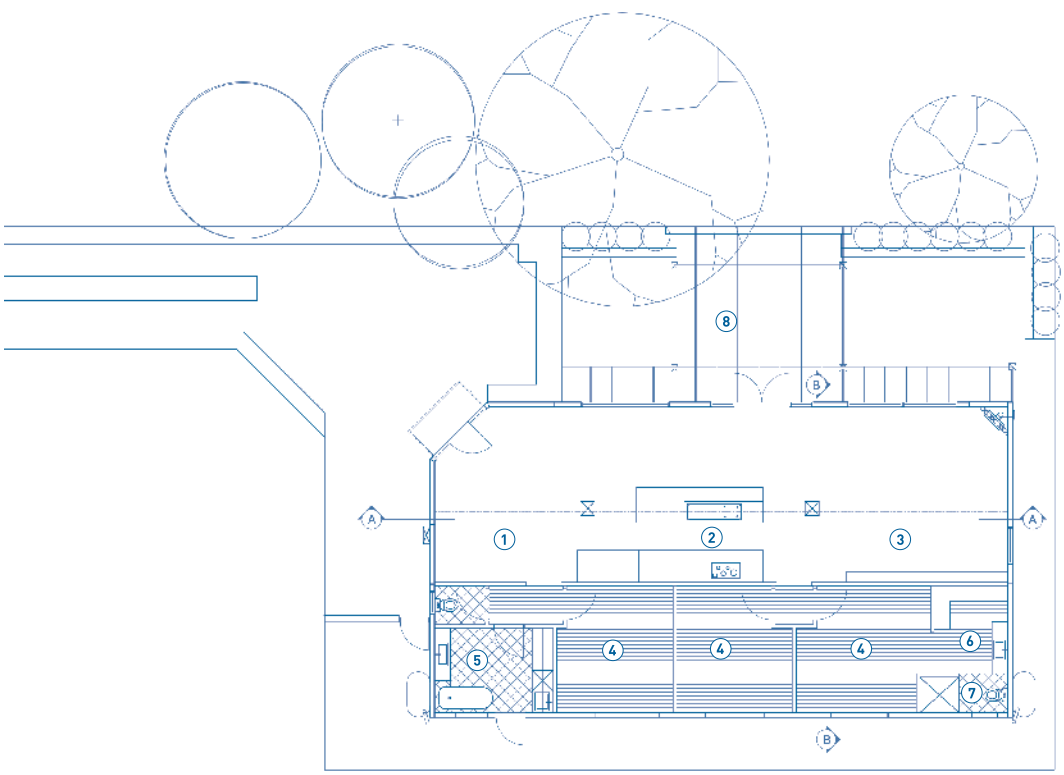
"Also, we just honed the concrete floors and left the cracks as they were, which you might not do for a client's house."

Sometimes budgets blow out during construction, but not in this case. "Our motto to ourselves was to keep true to the brief, so when options came up to do something more elaborate, or to buy expensive appliances or light fittings, we would always look for a secondhand or recycled item that could fulfil that role in the house, Carla says. "I've seen people get carried away once they start building, but we were strict with ourselves and we had a goal: to keep true to our original idea."

The couple developed their shared vision over many years while travelling and exploring, and were sure they could realise it. "People were concerned that it would look too rustic, but we had confidence in ourselves and that we could pull it off, and that we would like it anyway," Carla says. "But it turns out a lot of other people like it too, which is great."

Now that she has lived in the house through all four seasons, Carla continues to enjoy the warmth of the raw materials that she and Ben sourced. "I don't ever tire of it. It's a great house to entertain and live in. We love the light that comes through, everything is carefully considered and there is good spatial flow," she says. "I can see love in every single thing: there is a story behind everything that we pulled together and created. It's been very satisfying, and while I'm itching to do another one, it's so hard to consider ever moving!"

FLOOR PLAN



Bedford house

—Specifications

Credits

DESIGN
Carla and Ben Karsakis, Etica Studio

BUILDER
CGM Living

PROJECT TYPE
New Build

PROJECT LOCATION
Bedford, WA

COST
$280,000

SIZE
145 sqm

BUILDING STAR RATING
9 Stars

Sustainable Features

HOT WATER
– 340L Heat Trap Solar hybrid photovoltaic maxi collector.

WATER SAVING
– AWWS GreyFlow 00 greywater diversion system
– Waterwise garden and minimal lawn.

ACTIVE HEATING & COOLING
– Industrial wall mounted fans.

BUILDING MATERIALS
– Walls are a combination of SIPs and recycled red bricks
– Sealed honed concrete in living areas
– The kitchen island bench was designed and made by Ben, Carla and her father using timber from the site's old shed, salvaged rusted pressed tin and locally-sourced jarrah
– Remaining kitchen cabinetry was sourced secondhand, along with the sink and stainless steel bench, from an old restaurant in Perth
– Timber from the site's out-buildings and garage was used to construct the pergola
– Upcycled jarrah floorboards line the bedroom floors, with leftover floorboards used for shelving in the living room and kitchen.

WINDOWS & GLAZING
– Recycled 1930s jarrah used for timber-framed external windows
"We intended to replace the glass," explains Carla, "but the performance is quite high and so we've left the original glazing."

LIGHTING
– Compact fluorescent and LED lights within upcycled vintage ship lights and pendant lights.

PAINTS, FINISHES & FLOOR COVERINGS
– Recycled jarrah floorboards in bedrooms
– Original 1950s newspaper sheets used as wallpaper in the ensuite
– Antique encaustic tiles in wet areas from Spain via eBay. "These were our splurge item," says Carla.
– Unused paint from Paint Recyclers used for base coats, low VOC Solver paints thereafter.

OTHER ESD FEATURES
– House size minimised and shape extremely efficient to avoid construction material wastage and reduce embodied energy.

"I have a love of fashion illustrations and the painting was inspired by a vintage *Vogue* cover," says Carla of the mural she painted on this wall at the back of the courtyard. "It provides a focus and a sense of scale to the otherwise narrow courtyard space."

Australian Government

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5th Edition

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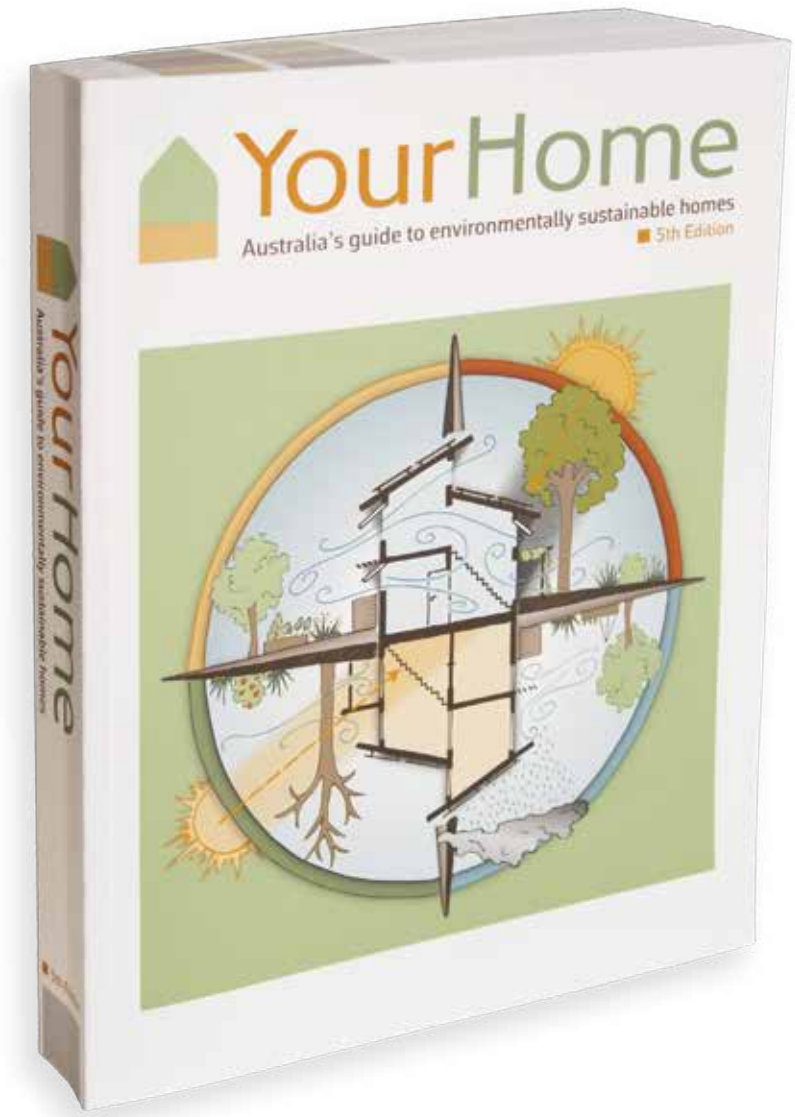

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Texture & light

A renovation and extension to a 1920s Melbourne home blends open-plan living with discrete spaces to maintain its character and improve its liveability.

WORDS Jacinta Cleary
PHOTOGRAPHY Erica Lauthier

The extension matches the small 1920s scale of the old house, but natural light and views enliven the new living areas. "A room can feel more complex or rich or textured when different light comes in throughout the day, and the year," says architect Kirsty.

The garden, deck and pergola spaces have been designed as a series of external living spaces that are visually and physically connected with the home's interior living spaces. Recycled spotted gum is prominent throughout the home, used for the decking, flooring, kitchen pantry and benchtops.

An extension to this Thornbury house was sympathetic to its original 1920s scale and aesthetic. The result is a compact home that blends open-plan living with discrete spaces and doesn't encroach on its productive front and rear gardens.

A much-loved feature of the existing house, the retrofitted pantry is a homely side entrance room to this Thornbury home. From the pantry, householders and guests look south through louvre windows into the art and living rooms and the garden beyond.

WHEN YOU WALK IN THE BACK DOOR of this house in Melbourne's north you're faced with enough fresh produce and condiments to encourage you to head straight into the kitchen and cook.

The home's rear entry has been moved to the pantry, just one of the quirks and charms of this updated 1920s home. "It's nice to enter and see the food, and walk past the fridge with the kids' drawings, right into the heart of the building. It's quite a sensual entry to the house in a way," says architect Giles Lawson.

Faced with a south-facing rear and a smallish block, the owners enlisted architecture firm The Rexroth Mannasmann Collective to extend their poorly orientated home in a truly sustainable way. They wanted to preserve as much of the original home as possible, including their much-loved kitchen and pantry. The extension needed to be compact and not encroach on the garden, and be open plan but with some discrete spaces. It also needed to be subtle, says Giles. "They didn't want a big bank of windows looking out to the garden."

The kitchen had long been cut off from the garden by a classic lean-to at the back of the house. Giles and his colleague Kirsty Fletcher identified a risk that the old, enclosed kitchen might once again be disconnected from the new open-plan living spaces and the outdoors. "We just had to think a little harder," says Kirsty.

Keeping the kitchen was a sage economic decision, costing just $6000 to update, excluding appliances, with a kit fit-out and the classic original cabinets reused. Retaining the kitchen also inspired the architects to create a long internal vista from the kitchen to the pergola through the updated pantry, the new kids' art room and the living room. The view is made more dynamic by louvres between the rooms that

Clerestory windows bring light into the south-facing addition. Warm air is vented up and out through high-level louvres while internal louvres encourage southerly breezes through the entire house. The small east-facing window in the dining room lets natural light in but, in keeping with passive solar design principles, minimises heat gain and loss.

draw a cooling southerly breeze deep inside the home, and have a rainbow-like effect on light.

"A room can feel more complex or rich or textured when different light comes in throughout the day, and the year," says Kirsty. The extension matches the small 1920s scale of the old house through similar sized rooms, but natural light and views like the one from the kitchen enliven the new living area.

Giles explains the other design tricks he and Kirsty used to brighten such a potentially dark space: "It was really about getting the light into the living areas," he says. The design steals light from the north for the south, with clerestory windows in the south-facing living room and art room high enough to catch the northern sun. "We've tried to get good eastern light into the kitchen in the morning," he adds, "and we've orientated the dining, living and art room spaces to the west where [the home owners] spend a lot of time at the end of the day."

Giles says he and Kirsty were judicious about window size and placement. "A south-facing orientation and west face can be quite problematic in terms of heat loss and gain, so they're really quite careful openings." Slot windows, such as the day bed window on the west side, have been used to limit big expansive glass and to capture small, striking views.

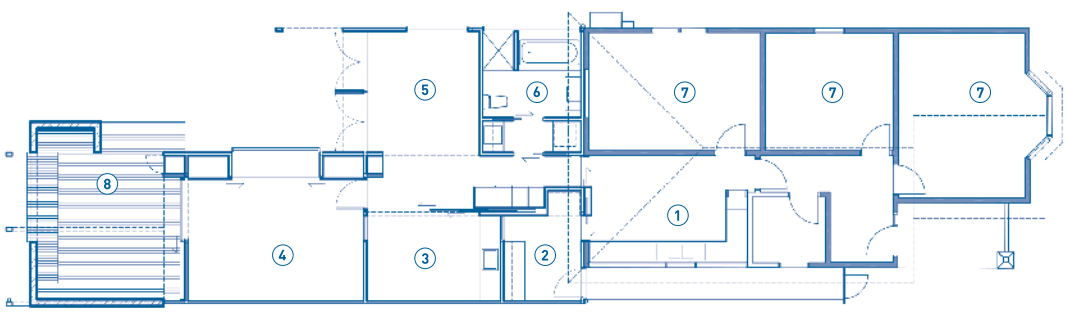
The extension is split into zones so that heating and cooling (ceiling fans) can be switched on only where needed. A sliding door along the day bed seals the living room from the western sun when it's hot outside, creating an insulating air pocket on that face. In winter it's the best seat in the house for natural warmth. A hydronic

heating system that uses water preheated by a solar hot water system provides additional warmth.

The owners were pragmatic about materials to save money and resources, using weatherboard to reflect the construction of the existing house and quite modest sheet products inside, such as plywood, that were quick and cost effective to install, says Kirsty. She adds that the decorative bits are used sparingly, such as the pressed tin sliding door to the art room with its chalkboard back that creates a versatile open or private living area and future study.

While the home's footprint is small, the sense of available space has been maximised. The rear pergola and deck off the dining room are outdoor rooms that double the living areas for a good part of the year. "The owners planted out to the fence on the east and west. That brings all those tiny leftover areas into play and draws them into the house," explains Giles. Yet more vistas to be enjoyed via perfectly positioned slot windows. S

Architects Giles and Kirsty were tasked to create flexible living spaces that were both discrete and connected. They incorporated open-plan living with intimate space by incorporating sliding doors, such as the white pressed tin door pictured left, and creating internal vistas such as the internal louvre window into the living room and the doors out to the garden.



LEGEND

1. Kitchen
2. Pantry/Entry
3. Art room/Study
4. Living
5. Dining
6. Bedroom
7. Bathroom
8. Deck

Thornbury renovation

—Specifications

Credits

DESIGN
Giles Lawson, Kirsty Fletcher & Brenton Weisert, Rexroth Mannasmann Collective

BUILDER
Chris O'Kane, Artezen Construction

PROJECT TYPE
Renovation

PROJECT LOCATION
Thornbury, VIC

COST
$270,000 (excl. prof. fees)

SIZE
Existing house 97 sqm, addition 72 sqm, outdoor entertaining 22 sqm, land 392 sqm

Sustainable Features

HOT WATER
- Solar hot water system from Going Solar
- Hot water system preheats water used in the hydronic system.

WATER SAVING
- 10,000L stormwater is harvested in stainless steel tanks
- A Davey pump and RainBank controller feed rainwater to the garden, toilet and washing machine
- AWWS Grey Flow 00 greywater system diverts water to the garden.

PASSIVE DESIGN
- High-level, shaded north-facing windows bring light into south-facing living spaces
- East and west-facing glazing is minimised
- Internal louvres for good natural ventilation draw cool southerly breezes deep into the house
- West-facing window (and daybed) in the living room brings winter sun inside; timber doors shut this space off for summer protection
- Thermal mass in new concrete slab.

BUILDING MATERIALS
- Recycled spotted gum flooring and decking
- Recycled spotted gum kitchen and pantry benches
- Pergola is laminated plantation cypress timber beams
- New external cladding is Carter Holt Harvey FSC-certified SHADOWclad
- Internal joinery is made from Carter Holt Harvey FSC-certified PLYgroove plywood and AFS-certified spotted gum
- Burnished concrete floor in the centre of the house
- R3.5 insulation plus R2.0 blanket in the roof , including Tontine polyester sound and thermal batts, plus Kingspan Air-Cell and Foilboard insulation used under boxed gutters
- Reuse of original kitchen cabinetry and secondhand cabinet for bathroom vanity
- EO board used for joinery.

WINDOWS & GLAZING
- Operable high-level windows vent warm air outside in summer
- Robert Mason Breezeway louvre windows
- Double glazing and/or low-e windows throughout.

ACTIVE HEATING & COOLING
- GreenHeat hydronic system
- Beacon Futura ceiling fans in all rooms.

LIGHTING
- Secondhand light fittings and LED fittings
- Day lighting maximised
- Compact fluorescent and LED down lights from Beacon Lighting
- Secondhand fittings.

PAINTS, FINISHES & FLOOR COVERINGS
- G.E.A.L low VOC water-based wax finish
- Whittle Wax to timber benchtops
- Low VOC paint throughout
- External blinds shade windows and doors where necessary
- Treatex hard wax finish (penetrating, low VOC sealer) applied to timber flooring.

OTHER ESD FEATURES
- Plan adopted for its minimal site footprint.
- Garden area preserved and a new permaculture garden planted.

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Beach shack revival

Nestled below the protective ridge of Point Lookout on North Stradbroke Island sits Timbin Timbin, a beach shack and its recent lightweight extension.

WORDS Emma Scragg

Lightweight building materials, including a pine frame, plywood and fibre cement cladding, were selected to reduce transport costs to the island and to complement the fishing shack aesthetic of the original house. "The house's small footprint [120 square metres] has significantly reduced the energy and material cost of the building work and will have a significant effect on the extent of maintenance required in the long term," says architect Jeremy.

OWNED BY THE SAME FAMILY SINCE 1948, Timbin Timbin's original compact fibro shack was due for repairs and needed more space to accommodate its owners' now large extended family.

Timbin Timbin (meaning great north wind) sits on a steep sand slope, facing east-northeast out to a stunning view of the sea and passing humpback whales. The new wing has been oriented to maximise winter sun and provide protection from strong winds and afternoon sun. Pandanus and cotton trees partly shade the house from its exposure to intense morning sun.

The old house and new kitchen, living and sleeping wing are linked by a deep roofed terrace which was originally intended to be an enclosed living room. However budgetary constraints meant the planned glazed doors were removed, leaving it as a sheltered outdoor room. It's now a favourite space where the family comes together.

Timbin Timbin's owners initially approached architect Jeremy Salmon with a desire for more space without overwhelming the 60 square metres of the original shack they loved. They were also wary of the high costs of delivering materials to the island by vehicle ferry and maintaining their holiday home in a harsh marine environment.

Keeping the overall footprint compact to fit the existing levelled terrace not only meant no removal of vegetation and very little movement of sand, but is also in keeping with Jeremy's approach to beach shacks. Having stayed at his own family's tiny Point Lookout beach house all his life, he's observed that we're all very lazy. "If there's somewhere good to sit close to the kitchen, you tend to not always go outside more. If you make something small, you force people to go outside." By providing appealing spaces beyond the walls of the house, the family is encouraged to enjoy the natural environment, the beauty of "Straddie".

Jeremy has firsthand experience of the rapid weathering the island's houses are exposed to and the significant upkeep they require. A small house not only aligns with his environmental design ethic but reduces

A lockable gate is effectively the front door for the two halves of the home. The addition (pictured far left) is positioned so householders can enjoy the views, but also to maximise northern orientation for the new rooms and protect the outdoor living area.

these unavoidable ongoing maintenance costs. In coastal locations, salt spray corrodes just about everything. It also coats glass so louvre windows were an obvious solution to make regular cleaning of the upper level windows easier. Termites were the other major challenge. Steel stumps and slab-on-ground limited to the rebuilt bathroom in the original cottage are the primary physical barriers to keep these hungry critters at bay.

The subtle yet identifiable differentiation between old and new parts of the home is a highlight for its owners. It's a move away from Jeremy's usual approach to clearly differentiate these elements, but continuing the minimal material palette and building the extension with simple sheet cladding on a lightweight frame made sense. "It's incredibly expensive to bring heavy materials across the bay [from Brisbane]," he explains. "The logic to me is still to use lightweight materials." Plywood flooring saved material costs and construction time, providing both a construction platform and the finished floor. Tiling is limited internally to the splashbacks and bathroom floors but features externally as an enduring material for the exposed terrace.

Timbin Timbin is a great example of a renovation that is site sensitive, economically and socially sustainable and one that stays true to the simplicity of the traditional beach shack aesthetic.

"It's been in the family for a long time so the owner hasn't spent a million dollars buying a block of land, making her feel obliged to spend a lot of money on the house," Jeremy reflects. This led to an efficient floor area and outward focus on the site, a refreshingly down-to-earth approach, which will work to the family's benefit long into the future. S

The kitchen and living area in the new wing extend out to the sheltered terrace. All building and fitout materials were chosen carefully with simplicity and long-term maintenance in mind.

Stradbroke Island house

—Specifications

Credits

DESIGN
Jeremy Salmon

BUILDER
Whitekey Constructions

PROJECT TYPE
Alteration & Addition

PROJECT LOCATION
North Stradbroke Island, QLD

COST
$350,000

SIZE
Land 582 sqm, existing house 60 sqm, additions 60 sqm + deck

Sustainable Features

HOT WATER
– Electric boosted solar hot water system.

"This was selected because the booster would receive little regular use and an electric boosted unit could be mounted internally. Gas boosted units on the exterior of the house in such an exposed seaside location, which are left unused for periods of time, are problematic," explains Jeremy. "Anything mechanical and electrical over there is problematic."

WATER SAVING
– 5000L polytank for rainwater harvesting.
– Onsite wastewater treatment with Biolytix Biopod system as there is no council sewer connection to the site. "This system significantly reduced the extent of soakage trenches required and also reduced groundwater contamination," explains Jeremy.

PASSIVE DESIGN
– Bulk and reflective foil insulation in all new walls and roof
– The small footprint of the building and placement of windows enhance cross ventilation.

"The roofed deck that nestles between the old and new parts of the house provides a major living space facing the view while dealing with high wind and early morning sun issues," adds Jeremy.

ACTIVE HEATING & COOLING
– Martec ceiling fans have plywood blades to reduce rust problems.

BUILDING MATERIALS
– Building materials were selected to reduce transport costs to the island and to complement the fishing shack aesthetic of the original house.
– Treated pine framing (essential for termite resistance as the island termites like hardwood) with painted fibre cement cladding and cover strips
– The house sits on steel posts and bearers close to the ground on an existing flat area to minimise any new excavation or retaining walls
– Floors are plywood with a 'C' face. "This is a rugged surface that does not rely on maintenance of a perfect finish to look good." says Jeremy.

WINDOWS & GLAZING
– Mostly powder-coated aluminium windows and doors used where new windows were required
– Operable [openable] windows are mostly Breezeway Altair louvred glass

"This allows good control of blustery coastal conditions combined with the ability to clean the consistent salt spray from the inside on the upper levels," says Jeremy. "They are also easy to insect-screen."

LIGHTING
– Generally surface mounted fluorescent oyster fittings.

PAINTS, FINISHES & FLOOR COVERINGS
– Water-based clear finish to plywood floors
– Ceramic tile in bathrooms.

OTHER ESD FEATURES
– Every item was chosen carefully with simplicity and long-term maintenance in mind
– Screw piles meant no excavations were required, which in sand is very difficult and destructive. Architect Jeremy notes that they also seem to be the most reliable footing type in this location.
– Vegetation was preserved during construction as the new wing was built on the existing cleared level pad beside the cottage.

Renos & Retrofits

In this Sanctuary special we showcase green home, kitchen and bathroom renovations, alterations and retrofits from around Australia. We also look at how to create cosy, sustainable and healthy living spaces.

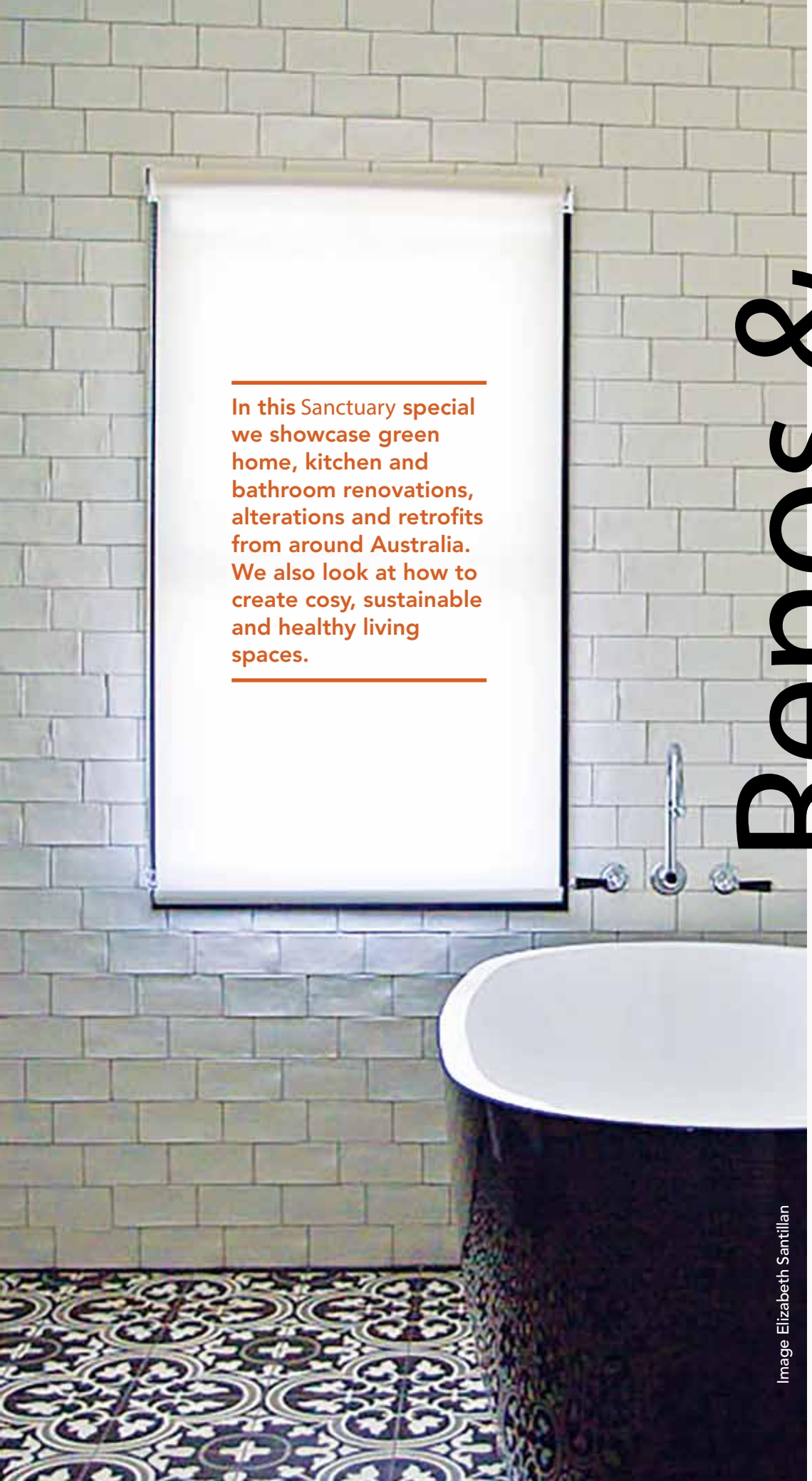


Image Elizabeth Santillan

A delightful addition

A new addition makes a small Northcote cottage light, warm, functional and cosy.

WORDS Sarah Robertson **PHOTOGRAPHY** Neil Prieto

IF EVER THERE WAS A HOMELY HOME TO MAKE YOU FEEL comfortable, cosy and happy, it might just be this one in the Melbourne suburb of Northcote. The renovated house, home to designer Emily Wright of accessories label Nancybird and her partner and ecologist Robert, marries an impeccable and eclectic interior aesthetic with a keen sense of environmental stewardship.

Emily and Robert commissioned architect Olivia van Dijk to redesign the weatherboard house, giving the façade a fresh coat of paint but focusing on bringing much more warmth and light into the south-facing living and kitchen areas.

Together they decided on a single-storey extension incorporating living, kitchen and dining areas, as well as a new bathroom and laundry. It was Olivia's job to design it to be highly functional, light-filled and based on passive solar design principles. Emily and Rob wanted an addition that didn't mimic the original cottage but complemented it in materials, scale and presence.

"The extension needed to open up to the south to build a strong connection between the new living space and the garden, so one of the challenges was to bring northern light into the home in an interesting way," explains Olivia. Her design opens the living room to the north through a courtyard and angled roofline with clerestory windows. "I'm really happy with how the project has worked out ... it feels spacious and open but still has a lovely sense of intimacy, warmth and craftsmanship," she says.

Emily commissioned furniture designer Damien Wright of Wright Studios to craft the kitchen Olivia had designed. He used local and recycled timbers, including yellow stringybark for the cabinetry and recycled mountain ash. The benchtop was made from hardy stainless steel.

Rob and Emily went over their budget, with the design and build costing about $340,000, including design fees and unexpected costs. "Our budget was initially much lower than this, but to do justice to the design we decided to go for better materials, such as a more bespoke kitchen using handmade hardwood veneers instead of ply. We also needed to do things like restump the existing house which added quite a bit of associated costs."

Emily and Rob are thrilled with their revitalised cottage. "The light, the sense of scale and proportion are great," says Emily. "I also love the way in which the back room blends with the outdoors."

The south-facing rear of the semi-detached Northcote home looks out onto a water-efficient rain garden designed and landscaped by homeowner Rob with indigenous semi-aquatic plants and recycled pavers.

"We love the functionality of the kitchen; the space works easily with us both in there," homeowner Emily says of the kitchen designed by architect Olivia van Dijk and fitted out with recycled timbers by furniture designer Damien Wright.

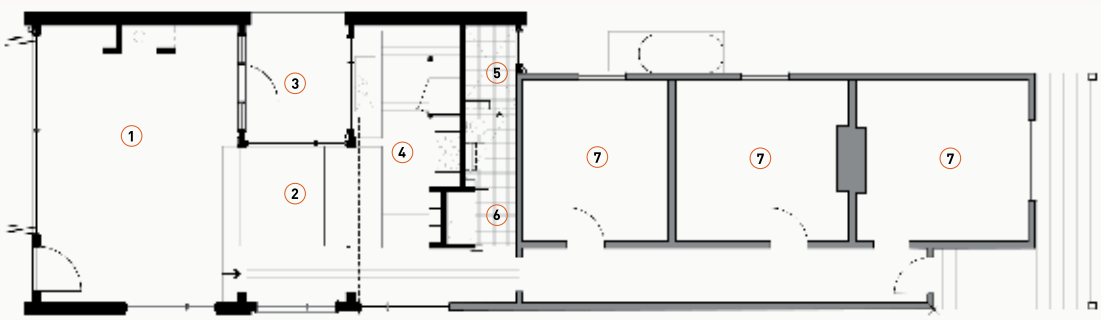
The windows overlooking the garden to the south are raised to enable better use of the living space. Double glazing and a better insulated building fabric mean less noise seeps in from outside.

N

LEGEND

1 Living
2 Dining
3 Courtyard
4 Kitchen
5 Bathroom
6 Laundry
7 Bedroom

FLOOR PLAN



Northcote cottage

—Specifications

Credits

DESIGN
Olivia van Dijk

BUILDER
Martin Brothers Building

KITCHEN CABINETRY
Damien Wright,
Wright Studios

PROJECT TYPE
Addition

PROJECT LOCATION
Northcote, VIC

COST
$300,000-$350,000

SIZE
Existing house 80 sqm,
addition 52 sqm,
land 293 sqm

Sustainable Features

PASSIVE DESIGN
- Passive solar design principles incorporated into a new single-storey addition
- Double-glazed windows throughout the entire house, except for the existing street-facing window.

BUILDING MATERIALS
- EcoFoam insulation pumped into the walls of the existing weatherboard cottage and roof
- Fletcher Sisilation installed under the existing house's new roofline and the addition's roofline. Pink batts installed under the attic floor and above bedroom ceilings.
- Openable windows installed in the living area at high and low points for airflow
- Secondhand bricks used for all new brickwork, including the fireplace which was built with bricks from the original fireplace
- Blackbutt and mountain ash used for the window frames, living room ceiling and kitchen floor
- Furniture maker Damien Wright used local recycled timbers – yellow stringybark rafters from an old Footscray factory and mountain ash floorboards from a house demolition in Kew – to fabricate kitchen and dining joinery.

ACTIVE HEATING/COOLING
- Hydronic heating installed throughout the house – underfloor in the living area and wall panels in bedrooms.

PAINTS, FINISHES & FLOOR COVERINGS
- Livos oils applied to external windows
- Porter's Paints sealers applied to internal windows and concrete floors.

OUTDOORS
- Water tank feeds water to the laundry, toilet and garden tap
- A rain garden installed to reduce stormwater runoff has been planted with indigenous semi-aquatic plants.

Ipswich infill

The owner of this small urban infill block in Ipswich, Queensland, was eager to minimise excavation and preserve the existing vegetation when building her new home.

WORDS Anna Cumming **PHOTOGRAPHY** Greg Harm

"[OUR CLIENT] ASKED FOR A SELF-SUFFICIENT, SUSTAINABLE home," says architect Mick Hellen of aardvarc, who designed and delivered a 110-square-metre two-bedroom house with a north facing open-plan kitchen and living area wrapped in glazing. Large folding doors continue the living space outside onto a generous deck shaded by a mature mango tree.

The use of recycled materials where possible was also a key part of the brief. Mostly lightweight timber frame construction, the house has a feature spine wall built of bricks reclaimed from a Sydney demolition. As well as providing design interest, the bricks act as a thermal store to help regulate internal heating and cooling.

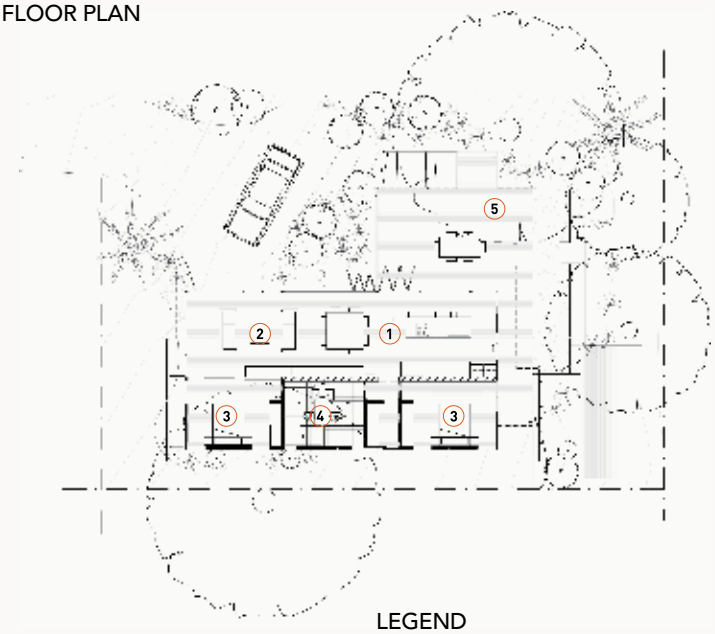
Elsewhere, the use of timber is extensive. "It adds character and warmth, and can tell a story," explains Mick. Recycled hardwood rafters, floor joists and bearers were used for the kitchen and

bathroom cabinetry and for the decking, and care was taken to use locally grown and sustainably sourced timber for other building elements. The roof framing is of recycled Queensland spotted gum, and Greenpeace-certified New Guinea Rosewood ecotimber was chosen for the window and door joinery for its durability and stability.

The exterior walls are clad with grooved ECOply panelling and translucent polycarbonate sheet for cost efficiency, light admittance and to maintain views of the sky. Louvred windows in the living area and high under the raked roof of the rear half of the house allow for effective natural ventilation in the subtropical climate, and winter heating with solar panels, rainwater tanks and a greywater system make the home self-sufficient for power and water.

Despite some initial concerns over the design relating to the character zoning of the area, Mick says the local council have come to see the house as an excellent example of infill development in a character residential area. Most importantly, the homeowner loves it. "The project turned out even better than I expected," she says. Ⓢ

FLOOR PLAN



LEGEND

1. Kitchen/Dining
2. Living
3. Bedroom
4. Bathroom
5. Deck

Ipswich house

—Specifications

Credits

DESIGN
Aardvarc

BUILDER
David James of Thirdson Construction under CS & TM Abberton Carpentry Service

PROJECT TYPE
New build

PROJECT LOCATION
Ipswich, QLD

SIZE
House 110 sqm

Sustainable Features

HOT WATER
– Solar hot water with electric boost.

RENEWABLE ENERGY
– 1.5kW solar PV system.

WATER SAVING
– Greywater treatment system ready for future connection
– 20,000L polyethylene rainwater tanks.

PASSIVE DESIGN
– Recycled masonry heat-sink wall
– Exterior shading screens on east and west elevations.

ACTIVE HEATING & COOLING
– Ceiling fans; Exterior fire pit.

WINDOWS & GLAZING
– New Guinea Rosewood ecotimber-certified timber-framed bifold doors & glazing
– Operable Breezway louvres.

LIGHTING
– Compact fluorescent & LED lights from Inlite.

PAINTS, FINISHES & FLOOR COVERINGS
– Low VOC paints; Livos Alis decking oil used to finish the floorboards and joinery.

BUILDING MATERIALS
– Mixed species recycled hardwood timber used for decking and cabinetry
– Nearly 3000 recycled dry-pressed bricks used for central load-bearing wall
– Colorbond zincalume corrugated exterior cladding; Lysaght polycarbonate cladding on east and west elevations; Rough-sawn plywood exterior cladding
– Knauf Earthwool insulation in walls and ceiling.

Three-garden terrace

Layout changes, double glazing and a creative approach to outside spaces transform a small Sydney home.

WORDS Anna Cumming

WITH ITS SERVICE AREAS BLOCKING A CONNECTION TO the rear yard and an enclosed, south-facing living space, this tiny terrace house in the inner Sydney suburb of Newtown was suffering from heat loss and a lack of natural light. "In addition, the house lies under a flight path so aircraft noise was a problem," says Matt Day of Day Bukh Architects, who took on the challenge of transforming it into a sustainable home with the highest star rating possible given its south and west orientation.

There wasn't much room to move on the 112-square-metre block, but some key layout changes, the extensive use of double glazing and a creative approach to the outside spaces have led to a successful renovation that achieves 7.5 Stars. The rear half of the house was demolished and rebuilt as an open-plan kitchen and living area with full width stacker sliding doors connecting it to the rear garden, one of three now making the home more liveable.

"The main concept of the renovation was this idea of three gardens: a morning-to-midday garden, an afternoon garden and a 'breathing' garden," explains Matt. The north and east-facing Japanese-style garden at the front of the house captures the morning sun and is enclosed with a louvred timber fence for added privacy from the street. The back garden is sunny in the afternoon, and a covered deck and low-e coated double glazing protects the new living area from too much summer heat. The third garden is a tiny space in the middle of the house onto which the living room and bedroom look, providing another direct link to the outside. "It's not a garden you can sit in, it's a breathing and light garden that's also great for cross-ventilation," says Matt.

Matt's team installed a heat recovery ventilation system to keep the home's inside air clean and fresh, and paid careful attention to sealing and insulating the house to address the twin problems of heat loss and aircraft noise. "This, plus the connection to the gardens, has markedly improved the living quality of the house," says Matt. Ⓢ

Newtown renovation

—Specifications

Credits

DESIGN
Matt Day, Day Bukh Architects

BUILDER
Serenity Constructions

PROJECT TYPE
Renovation

PROJECT LOCATION
Newtown, NSW

SIZE
House 71 sqm,
land 112 sqm

BUILDING STAR RATING
7.5 Stars

Sustainable Features

HOT WATER
– Existing instantaneous gas unit retained.

RENEWABLE ENERGY
– Solar not possible due to the location of existing trees so GreenPower is used.

PASSIVE DESIGN
– Highest possible star rating achieved despite the terrace's south and west orientation
– Concrete slab acts as thermal mass and glazing allows cross-ventilation.

ACTIVE HEATING & COOLING
– Air Change Australia ERV-IC heat recovery ventilator.

BUILDING MATERIALS
– Bricks from the existing dwelling reused
– FSC lightweight timber for walls and structure, including Hyne structural pine 90 x 45 timber Studs and pine LVLs
– Scyon Matrix fibre cement sheeting cladding
– Boral Envirocrete recycled concrete mix
– Kingspan Kooltherm rigid core insulation in floors and walls
– Walls and ceiling insulated with Foilboard Ultra
– LED lighting throughout.

WINDOWS & GLAZING
– FSC western red cedar-framed double-glazed windows and doors with Viridian EnergyTech glass
– Full-width double-glazed WRC stacker sliding doors in the living space were custom-made by Gladesville Joinery.

PAINTS, FINISHES & FLOOR COVERINGS
– Taubmans Endure Series with Thermalite to improve the wall's thermal resistance

OUTDOORS
– A front, north-facing morning to midday garden
– An afternoon garden
– A 'breathing' garden increases light coming into the house four-fold.

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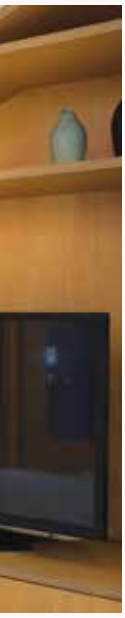
Detailed finish

A renovation extended this home only one metre beyond the building's original footprint.

DELIVER A FUNCTIONAL KITCHEN, BATHROOM AND OPEN-PLAN living area within a modest budget – this was the brief to Nest Architects for this urban Melbourne renovation. In response, architects Emilio Fuscaldo and Imogen Pullar came up with a new take on open-plan living, adding a central pod that houses the bathroom, a separate powder room and a wall of kitchen joinery. The project used inexpensive materials and focused on a superior and sleek finish, including a hardy and fastidiously-crafted concrete benchtop. Ⓢ

The FSC-certified plywood cabinetry is finished in prefinished and low-cost melamine with a plywood edge. It is adhered to an E0 substrate. FSC-certified structural timber and window frames meet the insulated concrete slab, which has been polished to reveal the black stone aggregate and finished with a Livos primer and natural Kunos oil.

DESIGN Nest Architects **LOCATION** Fitzroy North, VIC **COST** $350,000



The pod carves up the space into interconnected zones.

Inside the pod, light streams into the home's single bathroom through the triple-glazed skylight above. LED light fittings are used throughout the renovation. Images: Nic Granleese

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The green line

An interior redesign of an inner-city apartment improves its functionality and energy efficiency.

INHERITING THE CHOICES OF A PREVIOUS DESIGNER, Luke Middleton of EME Design focused on revitalising this two-bedroom apartment's interior and improving its thermal performance. Even with design elements that make energy efficiency difficult, such as a mezzanine and open staircase, the redesign has rewarded its occupants with lower bills and an increased sense of space.

Using a thermal imaging camera, EME found the spots where heat was escaping and entering. They covered and insulated a skylight and changed old downlights in the living space and kitchen to sealed LEDs. They installed draft extruders and repaired the apartment's doors so they seal completely. "We did what we could without turning the world upside down," says Luke.

Changes in the kitchen also improved the apartment's liveability. The fridge was moved from where it stood blocking access and light. Clever cabinetry created more storage space and concealed the new fridge.

Transformed on a modest budget of $35,000 to create spacious living areas, the apartment's small family (a couple and their toddler) love their redesigned home. Ⓢ

DESIGN EME Design **LOCATION** Melbourne, VIC **COST** $35,000

The retrofit improved the apartment's energy efficiency, while locally-sourced materials were used to refurbish the interior. Reflective film blinds hang on the northern windows to keep summer heat out.

A charcoal mirror splashback reflects the balcony garden and the gum tree outside, giving an increased sense of space.

The living spaces in this Pittwater cottage make the most of views and ventilating breezes. Recycled blackbutt beams are a feature and the dining table has been made out of salvaged pieces from the old deck's balustrade. Images Barton Taylor

Cottage views

A small renovation to a cottage in Clareville, NSW, involved minimal disruption to the 13 mature spotted gums on the site.

WITHOUT EXTENDING THE COTTAGE'S ORIGINAL footprint, the renovation by Matt Elkan Architect opened the cottage at the front and back so it engages with views out over Pittwater to the west and spotted gums to the east. Matt redesigned the roof at the centre of the cottage to bring more light into the home and improve natural ventilation. A covered deck of recycled blackbutt on the western side screens the kitchen from western sun.

"The house was conceived as a stop on the 'journey' from the spotted gum front yard down to the aptly named Paradise Beach," Matt explains. The void through the middle of the cottage marks out this path, with the remodelled and raised roof opening the cottage to light through high-level operable windows. S

DESIGN Matt Elkan Architect **LOCATION** Clareville, NSW

Image: Elizabeth Santillan

The rustic look

THE OWNERS OF THIS HERITAGE-listed 19th century cottage in Brisbane fell in love with it the moment they saw it and enjoyed its 'quaintness' for 10 years before they renovated, altering the kitchen and bathroom significantly to be more family-friendly.

The cheerful kitchen blends rustic charm with modern highlights. The cabinetry doors were made from recycled v-joint (VJ) boards with their original paint left intact for a decidedly rustic look. Designer Druce Davey says the boards were literally lying unused under the builder's house before becoming kitchen doors that can evolve by way of a lick of paint when the clients feel like a change in years to come. Tiled faces line open wall cabinets that have been made from recycled timber floorboards. The carcasses of the kitchen were made from long lasting form ply.

A repurposed claw foot bath, basin and timber box shelves were added to an existing bedroom to turn it into a new bathroom that leaves the original architectural features and finishes intact (see p35).

DESIGN
– Greener Kitchens + Bathrooms

LOCATION
– Brisbane, QLD

A retro refit

ASBESTOS REMOVAL LED ARCHITECT Emma Scragg to rework her kitchen, bathroom and toilet with upcycled and recycled materials. Non-toxic materials and finishes were essential as Emma was assisting with the renovations while pregnant.

The kitchen refurbishment dramatically increased bench space and storage. New cabinetry is made from local marine-grade hoop pine ply offcuts with low-VOC and VOC-free finishes and secondhand knobs.

A slot opening was added to the wall between the living room and kitchen to retain valuable wall space but connect the two spaces and share natural light and breezes.

In the bathroom and toilet, Emma liked the retro look of the 1970s floor tiles and purple bath so kept them to save money and retain the history of the house. Adding a raked ceiling, removing an awkward linen cupboard and repositioning the basin tripled storage and created a greater sense of space.

Emma added bulk insulation to the walls of the kitchen and bathroom. Recycled silky oak windows replaced aluminium sliders to improve airflow. Skirtings, architraves, window jambs and cornice trims are made from salvaged hoop pine VJs.

DESIGN
– Owner-builder architect Emma Scragg assisted by Gilbert Holmes, Gilbert Louttit and Oliver Bergel

LOCATION
– Brisbane, QLD

A recycled sink and mixer tap, salvaged ply shelves built into the wall, a secondhand oven and a seconds gas cooktop make up the kitchen. Emma added bulk insulation to the kitchen walls. Image: Emma Scragg

Accessible

A LAPSED BUILDING PERMIT AND AN urgent need for a certificate of occupancy saw modifications to this home take place in two stages. Designing the home to be wheelchair accessible, PHOOEY Architects began with a half-finished kitchen. They relocated existing walls and doors and found appliances to fit into predetermined spaces. Stud walls salvaged from the renovated basement were used to create screens that now frame the kitchen bench. Plantation hoop pine plywood was used for kitchen cabinetry in stage one, removed and upcycled into new kitchen cabinets in stage two.

DESIGN
– PHOOEY Architects

LOCATION
– Toorak, VIC

Image: Rob Anderson

Indoor – outdoor

Image: Elizabeth Santillan

THIS QUEENSLAND KITCHEN transitions to an indoor/outdoor barbecue area as it wraps around an existing tree, which was retained on the site despite a significant renovation to a 19th century workers cottage. Large drawers in place of wall cabinets minimised the materials used for joinery and ensure the concrete benchtop doesn't live in the shadows. Joinery doors made from locally-sourced and manufactured hoop pine plywood are adhered to a formply carcass. Designer Druce Davey says the concrete benchtop was chosen as a hardy indoor/outdoor finish and minimised waste compared to using sheet-based stones.

DESIGN
– Greener Kitchens + Bathrooms

LOCATION
– Brisbane, QLD

Upcycled

A WORKBENCH RECLAIMED FROM the demolished shed and turned into a vanity, antique encaustic Spanish floor tiles, a revitalised clawfoot bath and a vintage mirror make up the main bathroom in Etica Studio's Bedford home.

DESIGN
– Carla and Ben Karsakis, Etica Studio

LOCATION
– Bedford, WA

See p14 for more on this Perth home.

Image: Meghan Plowman

In season

RMIT UNIVERSITY GRADUATE RADEK Rozkiewicz has designed a kitchen to engage users to eat more veggies, less meat and seasonally with produce from local farmers. The kitchen is portable but Radek's main drive was to design a kitchen in line with an ethical food philosophy. The majority of the kitchen was made out of reclaimed hardwood, alongside bamboo ply.

No electricity is used to store food. Instead, terracotta storage units absorb water to keep fruit and veggies cool as the water evaporates.

Radek explains that the food storage unit changes with the seasons, with the terracotta tiles that the produce rests on designed with one side glazed and one side unglazed. "[The] porous side absorbs moisture and keeps cool, the glazed side doesn't so the produce that is on it absorbs the moisture instead. The idea is that you flip them throughout the year based on changing produce that prefers different conditions," he explains.

DESIGN
– Radek Rozkiewicz

Kitchen & bathroom products

Substantial energy and water efficiency gains can be made (and lost) in your kitchen and bathroom. Here, we consider some of the big-ticket energy and water-using appliances for the kitchen and bathroom.

APPLIANCES AND EQUIPMENT IN OUR KITCHENS AND bathrooms use around 33 per cent of all the energy used in our homes. Water heating follows closely as another large energy user, accounting for a further 21 per cent. Meanwhile, water savings are most achievable in the bathroom and laundry.

An environmentally and socially responsible kitchen and bathroom are not just about energy and water-efficient appliances, though. Keeping an eye on how you use the water and energy-using products in your home is vital, as is choosing appliances that are appropriately sized. It's also important to consider the social justice credentials of any product.

ENERGY RATINGS

Australia's Energy Rating Labelling Scheme ensures that many appliances have a rating telling you how much energy they use in kilowatt-hours per year. Take a look at www.energyrating.gov.au to compare the energy use of different models.

An appliance's energy rating is the estimated amount of energy that appliance will use in an average home based on typical use in one year. The more stars an appliance has (on a scale from one to six) the more energy efficient the product is compared to similar appliances.

01

REFRIGERATORS

An energy efficient fridge will have considerably lower annual running costs than its more energy hungry counterpart. For example, a 1.5 star-rated 350L fridge uses around 550kWh/year while a 3 star-rated 350L fridge uses only 350kWh/year.

To keep your fridge running as efficiently as its rating indicates it can, make sure it's in a cool spot away from cooktops and sunlight, with a 75mm ventilation space around the fridge's back and sides. For older fridges, door seals should hold a piece of paper tightly when shut – they need to be replaced if they don't. Set the thermostat to between 3 °C and 5 °C, remembering every degree lower will require 5 per cent more energy.

If you are throwing out an old fridge, make sure you dispose of it properly to keep CFCs out of the atmosphere. A great way to do this is to look for fridge recycling schemes in your area.

02
COOKTOPS

Induction cooktops have the fastest heat-up response of all cooktops and, being electric, can be powered by renewable energy. Induction cooktops use a magnetic field to induce an electric current in your pot, so it is the pot that heats and cooks the food. They use less energy than a standard electric cooktop but still might produce more emissions than gas, depending on your electricity source.

It is important to note that induction cooktops must be used with ferromagnetic pans, such as cast iron or magnetic stainless steel. For other types of pots, a disk of magnetic metal called an induction disk can be used between the cooktop and the pot.

Energy efficiency expert Alan Pears has compared a portable induction cooktop with gas and found its heat-up response to be similar if not better than using gas. Alan believes the boost feature of many induction cooktops is not needed, particularly as it can require an increase in wiring capacity back to switchboard.

Smeg induction cooktop with wok recess.

The SMEG DWA315 dishwasher has a 6-star WELS rating and a 4-star energy rating.

03
DISHWASHERS

There is a good range of energy and water-efficient dishwashers on the market that use around 11–14 litres of water per load and around 200–245kWh of energy a year when used every day. Look for dishwashers with high star ratings in both these schemes and check reviews to ensure the dishwasher will last.

To be water savvy, only run the dishwasher when it's full and scrape rather than rinse plates clean before you place them in the dishwasher. Buying a size that fits your needs will also save water and energy.

WATER EFFICIENCY

WELS is Australia's water efficiency labelling scheme. It requires products to be registered and labelled with stars representing their water efficiency. Out of a maximum possible 6 stars, tapware can be a maximum of 6 stars, toilets reach a maximum of 5 stars and the most efficient showerheads available are 3 stars. www.waterrating.gov.au

There are dollar savings associated with water-efficient technology. An investigation by *Sanctuary's* publisher, the ATA, found that in Victoria, where water prices can be high, water-efficient shower roses, taps and toilets will pay back their cost in less than 10 years. To read the report, go to www.ata.org.au/news/saving-water-means-saving-money

The Siddons Bolt-on heat pump.

04
HOT WATER HEAT PUMPS

Heat pump hot water systems are the most efficient electric water heaters available. Compared with their electric counterparts, heat pump systems use at least 50 per cent less energy, a figure that can climb to as much 75 per cent depending on your climate and the type of heat pump installed. Heat pumps extract heat from the surrounding air/ground, operating a little like a fridge but in reverse. They work best in warm, humid climates although there are some models designed for cooler climates.

A few heat pump systems we've found to be energy efficient are listed here. For much more information on heat pumps, read our article in *Sanctuary 26* and online.

Siddons Bolt-on heat pump
If you already have a hot water system that is relatively new and you don't want to replace it to make energy efficiency gains, the Siddons Bolt-on is a heat pump unit that connects to an existing tank and can save up to 75 per cent of your electricity costs compared to a regular resistive electric water heater.

Sanden heat pump
The Sanden Eco Hot Water Pump System is two separate components, a heat pump unit and a stainless steel storage tank. These can be installed up to four metres apart. The system is suitable for families of three to six people. There are also smaller models available.

05
BENCHTOPS

Out of the range of benchtops available, consider whether your choice will meet your needs, budget and align with your social and environmental views. Secondhand materials are always a good option; off-cuts are great for small areas. Here are a few tips when considering different benchtop types:

CONCRETE
– Check the sealant used and consider the embodied energy of the concrete. Ask how much recycled content is being put into the mix. Up to 60 per cent of a concrete bench mix can be recycled content, including recycled glass instead of sand and pozzolan instead of cement mix.

TIMBER
– Recycled timber: Check the sealant used, particularly if the timber needs stripping of paint. Designer Druce Davey adds: "Ensure the timber is verified recycled timber with a verifiable previous life, Australian hardwoods are best. There are timber benches out there that have been made to look recycled, but are in fact new timbers from dubious sources."
– Reclaimed timber: An alternative if recycled timber isn't available.

SECONDHAND COUNTERTOPS
– Note that countertops over 20 years old are likely to be just 450mm deep rather than the standard 600mm deep cabinets used today.

RECYCLED & ENGINEERED STONE COMPOSITES
– Composite stone consists of ground stone powder and a bonding agent. It can be manufactured in many shapes, sizes, colours and patterns. It's best to check the bonding agent is not toxic. One way to do this is to look for Greenguard certification. Stone products are durable and have the potential to be reused, however most composite products are manufactured overseas. If you choose a stone or composite stone product, make sure the labour costs are within your budget. If you're using one of the newer products on the market, ask the manufacturer to recommend stonemasons familiar with the product. Alternatively, ask your stonemason what offcuts they have available and use one of these. "Composite stone is sheet-based so there are lots of offcuts," explains Druce. "Another option is to ask which stones [your stonemason] uses a lot of and embrace one of them as they are more likely to mop up the offcuts and offer a cheaper price."

OTHER COMPOSITES PRODUCTS
– There is a small range of newer composite benchtop products manufactured (mostly overseas) that use a range of recycled materials. Products in this category include Eco by Consentino, Ecological Panel and Paperock.

SOLID SURFACES
– These acrylic resin sheets are applied seamlessly over a substrate. Care should be taken to ensure the substrate, which is normally MDF or plywood, is low emission and chain of custody certified. Druce recommends plywood as the best choice for longevity.

Read more about benchtops in *Sanctuary 17*.

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www.sanctuarymagazine.org.au/sustainable-design-directory

Sustainable architects, designers and living experts and other professional product and service providers are listed online in Sanctuary's Sustainable Design and Living Directory.

Sanctuary is Australia's premier magazine dedicated to sustainable home design.

A good night's sleep

WORDS

Megan Norgate

How do you make your bedroom the most comfortable, restful and healthy room in your house? Interior designer Megan Norgate steps through the basics of good bedroom design and fitout.

IF YOU CONSIDER THE TOTAL AMOUNT of hours we spend in various parts of the home, bedrooms are by far our most frequently inhabited spaces. Good bedroom design contributes to our psychological and physical health and wellbeing, and with careful planning need not be difficult or expensive to achieve.

THE BEST-PLACED BEDROOM

Bedrooms can be spaces for rest, work, storage and play. But for all of their potential uses, they needn't be very large.

The location of bedrooms in your house is crucial. Upstairs bedrooms can be beneficial in cool climates as the home's interior heat will collect on the upper floor. In warmer climates, placing bedrooms to the south and near thermal mass will help keep them cool.

NATURALLY LIT & DRAUGHT FREE

East facing windows are ideal in a bedroom as morning sun and a view out a window from the bed are good for the spirit. Windows that can be locked securely open at night will help to passively ventilate the room and improve indoor air quality. A ceiling fan will circulate air and reduce your need for air-conditioning.

Thermally effective window treatments are especially important in bedrooms. North or west-facing windows will benefit from exterior shading in summer to keep a bedroom cool. Adjustable exterior blinds or deciduous plantings are ideal as they adapt to provide shade as needed. High performance windows with double or triple glazing and/or low-e coatings will also help to stabilise internal temperatures. [Ed note: See our *Sanctuary 24* article on external blinds and shading online for more information on exterior blinds and shading and p75 of this issue for information on edible shading plants. Read more about high-performance windows online.]

To keep bedrooms comfortable in winter, using heavy-lined curtains that have pelmets and run to the floor will effectively trap warm air inside. If curtains are impractical or your bedroom's heaters are under the window, recess-mounted honeycomb blinds or face-fixed heavy backed roman blinds are the best option. Roman blinds use less material than curtains and so can be a good opportunity to use organic and/or locally-printed fabrics. To further reduce winter draughts and summer heat, seal up old wall vents, fireplaces and other gaps. Insect screens are useful to keep mosquitoes and other bugs at bay.

LAYOUT AND FITOUT

Preserve limited floor space by running storage cupboards above head height and tuck a bed or desk into the alcove underneath. Capitalise on high ceilings by creating a sleeping loft, utilising the space underneath to fit a wardrobe, desk or another bed. Locating the bed so you are not looking out the doorway or directly out windows onto the street will increase your sense of privacy.

Wardrobes are a cost-intensive part of a renovation, so rather than using mass-produced storage solutions, look for creative ways to reuse secondhand cabinets, or hide shelves and racks behind a lightweight ceiling-mounted curtain.

Keeping furnishings simple will reduce dust build up, which can contribute to allergies and respiratory problems. Rugs are a warm and soft alternative to carpet that can be aired and cleaned regularly. Leave new upholstery or furniture outside to off-gas for a few days to get rid of the 'factory fresh' smell. Slatted bed bases provide good ventilation around a mattress that helps to reduce the occurrence of mould and dust mites.

Mattresses are commonly constructed and treated with chemicals that contain volatile organic compounds (VOCs), such as antibacterial agents, flame-retardants, PVCs, bleaches, pesticides and dyes. These chemicals can contribute to allergies, respiratory problems and chemical sensitivities. Mattresses made of plant-based materials such as organic wool, cotton, hemp, natural latex and bamboo are an alternative option. Bamboo and latex are naturally hypoallergenic and dust mite resistant. If you are replacing a mattress

This master bedroom is free of toxins. A latex mattress and indigo dyed linen sheets are paired with a simple mid-century bedhead, lamps and ceramics. All images Megan Norgate

This child's room was dark during the day so a double-glazed north-facing high-level window was installed to make it a pleasant place to play during the day. A heavy-backed roman blind in hand-printed linen helps regulate the temperature. Vintage furniture, toys, cushions and bedspreads decorate the space.

divert it from landfill by sending it for recycling.

Ideally, use natural fibre bed linens and covers made from organic and ethically produced sources of bamboo, linen, silk or cotton. Wash and line dry new bedding before using it to get rid of any chemical residues from production, or buy secondhand blankets. Try dying old or secondhand bedding and blankets to give them a new lease of life.

Also keep in mind that many painted surfaces and composite timber products off-gas VOCs into your indoor environment so choose VOC-free paints and oils for your bedroom walls and furniture, and EO rated timbers (products that have a formaldehyde emissions limit ≤ 0.041ppm) for your cabinetry [Ed note: See articles on paint, VOCs and blinds in back issues of *Sanctuary*].

If you are concerned about exposure to electromagnetic radiation, keep digital clocks, radios, baby monitors and phone chargers away from where you are sleeping and avoid positioning a bed on the other side of a wall to a smart meter, refrigerator or other appliance. [Ed note: The World Health Organisation states that current evidence does not confirm the existence of any health consequences from exposure to low-level electromagnetic fields, but says gaps in knowledge about biological effects exist and need further research. See www.who.int/peh-emf/en/ for more information.]

Poorly designed and furnished bedrooms can affect our wellbeing and ability to get a good night's sleep. By applying a few simple design and retrofitting ideas and carefully selecting the materials we bring inside our bedrooms, we can create healthy and restful spaces that are not only a place to sleep, but a retreat in which we can relax and rejuvenate.

MATTRESS RECYCLING

An average mattress contains 12.5 kg of steel, 2 kg of wood and 1.5 kg of foam. Rather than leaving your mattress for landfill, get one of the many mattress recycling companies in major cities to collect your mattress and recycle it. Better yet are local social enterprises and recycling schemes, such as Mission Australia's Soft Landing, that recycle (and sometimes refurbish) mattresses and provide traineeships for local residents.

Megan Norgate is an interior designer, permaculture designer and sustainability consultant based in Melbourne. As principle of design firm Brave New Eco, Megan works in collaboration with various building designers, permaculturists and craftspeople. http://braveneweco.com.au

GreenPower to the people

The Community Climate Chest or 'C3' gives households and businesses access to cheaper, tax-deductible GreenPower and carbon offsets online. C3 lets you know how and where the energy is generated and how many tonnes of greenhouse emissions you will offset.

www.climatechest.org.au

GreenPower
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Administered by the not-for-profit Alternative Technology Association (ATA), C3 directs a share of the proceeds to a range of local environmental and community group project partners.

Speed Date a Sustainability Expert Sydney

Speed Date a Sustainability Expert will connect householders with Australia's leading sustainable design and living experts in Sydney this June.

LEADING SUSTAINABLE ARCHITECTS, designers and other sustainability professionals will provide free advice to the public at Speed Date a Sustainability Expert in Sydney on June 14.

Whether you are renovating, building a new home sustainably or simply seeking advice on solar power, energy-efficient products or good garden design, Speed Date a Sustainability Expert can help. Discuss your plans and ideas in 13-minute 'dates' directly with the experts.

As well as sustainable architects and building designers, participants in this year's event will have the opportunity to 'date' interior designers, gardening experts, as well as renewable energy and energy efficiency experts.

Speed Date a Sustainability Expert Sydney 2014 is being organised by *Sanctuary's* publisher the Alternative Technology Association (ATA), with support from the City of Sydney.

WHEN: Saturday, 14 June 2014
WHERE: Paddington Town Hall, Paddington

FOR MORE INFORMATION AND TO REGISTER FOR YOUR 'DATES', VISIT sdsd.ata.org.au/sydney

Online registrations for Speed Dating are essential.

SDSE Sydney 2014 is a free event brought to you by the Alternative Technology Association (ATA), The event is supported by the City of Sydney.

Image: Nick Stephenson

Designers and experts involved

ARCHITECTS & BUILDING DESIGNERS
Anderson Architecture
David Baille Architect
Day Bukh Architects
Envirotecture
G.E. Hunt
Ian Sercombe Architect
Marra + Yeh
Pidcock – Architecture and Sustainability
Sunergy Design

BUILDING & DESIGN
Australian Living
Your Abode

KITCHENS & BATHROOMS
Greener Kitchen + Bathrooms

OUTDOORS
Sydney Organic Gardens

SUSTAINABILITY CONSULTANTS
Ecological Design

Keep an eye on the Speed Date a Sustainability Expert website for the full list of experts involved on the day sdsd.ata.org.au/sydney

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Small, smart & detailed

Firm ideas and a collaborative effort by homeowners and architects made this small passively designed home bright and roomy.

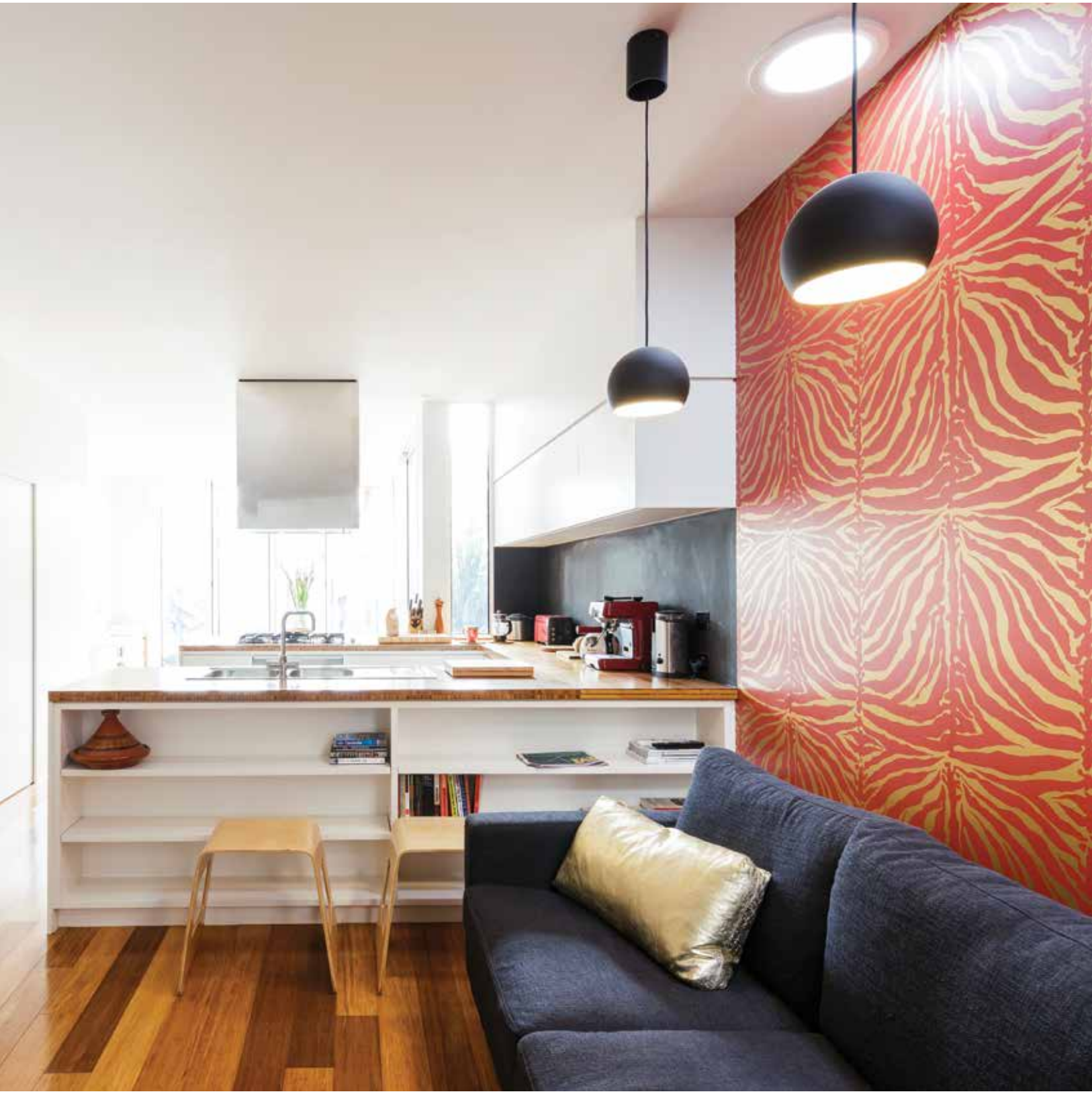
WORDS Verity Campbell
PHOTOGRAPHY Rory Gardiner

THIS SINGLE FRONTED TERRACE in Clifton Hill, inner Melbourne, is a classic Victorian. Built over a century ago when the fashion was for introspective homes, the home was dark, enclosed (for privacy) and small (for intimacy and reduced construction costs). Aside from the kitchen-bathroom extension added during the 1970s, little had changed since the home was first built. In 2005, Natalie and Andy bought the house with a view to transforming it into an archetypal 21st century green home: one that is bright, roomy, airy and smart – saving on utility bills year upon year.

To realise their vision, Natalie and Andy enlisted the support of Gardiner Architects in North Fitzroy, architects well versed in the design challenges posed by cramped inner-urban blocks.

Gardiner's solution was to replace the back of the house with a generous living, dining and kitchen space, and to include an upstairs bedroom and library. A glazed lightwell brings light into the original rooms of the home. High operable windows let light in and vent hot air via a 'thermal chimney' effect. Built-in shades stop heat admission in summer. →

The kitchen divides the downstairs living area in two, with a lounge on one side and a dining space on the other. Large double-glazed bifold doors and a Solatube bring natural light into the kitchen, dining and lounge.



"The most challenging aspect of this home was its lack of natural light," says principal architect Paul Gardiner. "We needed to reconfigure the spaces to make them work well, while ensuring we introduced light and air flow into the home."

The home also features a simple earth tube system, designed to push hot air away from the refrigerator. A pipe embedded into the concrete slab draws cool air from under the original house through to the void around the fridge. Warmed air exits through a tube above.

The home has been designed to passive design principles, what Amelda Cox, project architect at Gardiner, calls the "free stuff". "The way we approach design is to make the most of orientation, light, microclimate (for cross-ventilation). We get these principles of good design right first then guide our clients through the decision-making process for design features such as solar, glazing and cabinetry – based on budget and need."

"We know that many of our clients want sustainable design features," adds Paul. "One of the ways our practice has changed over the years is that we now work to integrate sustainable features into the home from the get-go. They're not plonked on the top as an afterthought."

Natalie and Andy agree with the importance of thrashing out what you want early in the process. Andy advises would-be renovators to consider which spaces they'll spend the most time in, and think about how to heat them. "Invest in the focal point," Natalie adds. "We invested in the cabinetry. Our bamboo benchtops have amazing detailing. The joinery part of the budget was probably higher than would be typical for a similar-sized project but

Sustainable design principles and features were incorporated from the beginning of the design and build process to transform this century-old terrace into an archetypal 21st century green home – one that is bright, roomy, airy and smart.

Double-glazed skylights bring natural light into the upstairs bedroom and library. The skylights are electronically openable by remote control, have a rain sensor and an internal blockout blind. A David Trubridge Coral pendant with a compact fluorescent bulb hangs over the bed.

Throughout the build, materials were chosen for their long life cycle. A tallowwood timber feature stair complements bamboo floorboards.

A small upstairs deck is a quiet space for retreat. Recycled spotted gum decking has been finished with a Livos natural oil.

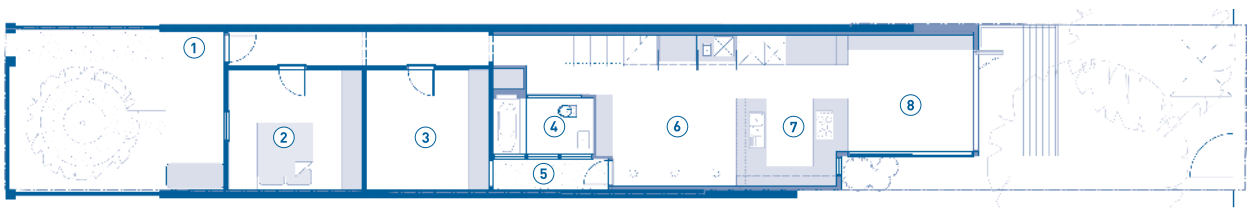
it was crucial to the project's success. It's amazing how many people comment on the cabinetry."

The couple had firm ideas of how they wanted the floor plan laid out so Gardiner's openness to Natalie and Andy's different ideas was the clincher at their first client meeting. "We had a very strong idea of what we wanted. They had to 'get' the vision in order for us to want to meet them a second time!" laughs Natalie.

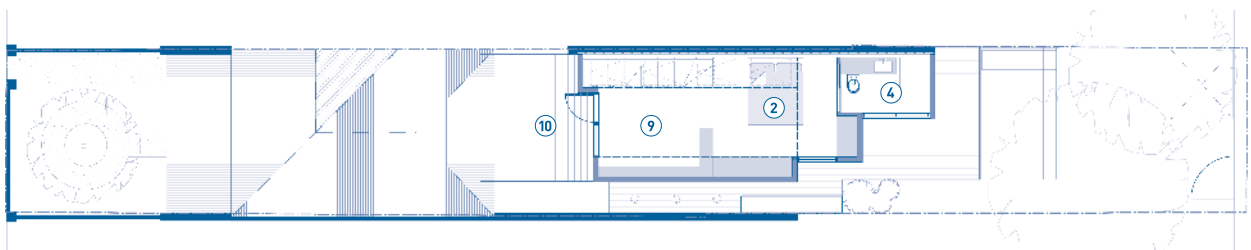
"The downstairs area was designed with the kitchen in the middle of the living and dining space, to both separate and connect the areas," says Natalie. Paul says this approach is contrary to the way the architects usually approach space planning: "We tend to orient the living spaces to make the most of the garden."

"Our clients were very passionate about this project and we loved that," adds Amelda. "They were engaged and committed from the outset. It was a collaborative process and the design has benefited through this working relationship enormously." Ⓢ

GROUND FLOOR PLAN



FIRST FLOOR PLAN



LEGEND

1. Entry/Porch
2. Bedroom
3. Study/Guest room
4. Bathroom
5. Courtyard
6. Living
7. Kitchen
8. Dining
9. Sitting/Library
10. Deck

Clifton Hill extension

—Specifications

Credits

DESIGN
Gardiner Architects

BUILDER
Adma Group

PROJECT TYPE
Extension

PROJECT LOCATION
Clifton Hill, VIC

COST
Approx. $550,000

SIZE
House 135 sqm (floor area), land 180 sqm

Sustainable Features

HOT WATER
– Apricus 30 evacuated tube solar hot water system with a 315L stainless steel tank and a Rinnai S26 booster.

RENEWABLE ENERGY
– 1.8kW solar system, including 8 Hyundai HiS-S225MF panels and an SMA inverter from G Store.

WATER SAVING
– An existing 700L tank in the front yard was retained to capture rainwater from the front of house for the front garden
– Rainwater captured from the rear of house is stored in a Tankmasta Bagel Toroid 5000L underground tank. A Vada Rain2Main controls reticulation back to the toilets, washing machine and garden.
– Water-efficient fittings and tapware throughout.

ACTIVE HEATING & COOLING
– Reverse-cycle air conditioner
– In-slab hydronic heating.

BUILDING MATERIALS
– Colorbond corrugated sheet in shale grey
– Recycled spotted gum decking from Shiver me Timbers
– Sugar gum shiplap cladding boards from SmartTimbers
– Ground floor concrete slab with perimeter and underside polystyrene insulation
– Walls insulated with 15mm Foilboard or Kingspan Aircell sarking with R2.7 Bradford Gold Batts
– Roof space filled with two layers of R3.5 batts with reflective Aircell sarking under metal roofing
– Acoustic batt insulation in the ground floor ceiling.

WINDOWS & GLAZING
– European Window Company uPVC double-glazed windows with low-e film
– Breezeway louvre units in Euro frames with low-e film
– Velux VSE double-glazed top-hung skylights are electronically operated, remote controlled, have a rain sensor and internal blockout blind.

LIGHTING
– Solatube 160DS with Vusion diffuser provides additional light to the living area
– Feature lights:
  - Toss B Sphere with a compact fluorescent bulb
  - David Trubridge Coral pendant and ‘Reed’ pendant with compact fluoro bulbs
  - Tivah Wall Lights above the bed have LED fittings.
– All other downlights have LED fittings.

PAINTS, FINISHES & FLOOR COVERINGS
– Godfrey Hirst Carramar peat carpet
– Prefinished bamboo floorboards
– Bamboo kitchen benchtop and living room unit finished with Livos Kunos countertop oil
– Factory painted joinery
– Livos Alis decking oil to decking and cladding.

OTHER ESD FEATURES
– Mini earth tube system around the fridge drags cool air from under the house to circulate it around the fridge, and takes hot air out through a tube in the floor space and outside
– Materials were chosen for their long life cycle
– East–west orientation means the front of the building shadows itself from hot western sun
– Louvres and folding doors to maximise cross-ventilation
– The thermal mass of the double skin brick walls helps the building run more efficiently.

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Winter escapes

Thinking about getting away? Here are a few of the many beautifully-designed getaways that sit lightly within their environments.

WORDS Jacinta Cleary

LOOKING FOR A HOLIDAY destination surrounded by spectacular scenery and natural habitat this winter? Eco holiday lodgings are built to have as little impact on their surroundings as possible, are designed to stay naturally warm or cool to limit energy use, and reuse as much water as possible. And the best part is that you get to sample some of the most sustainable building designs around. So this winter, head somewhere naturally warmed, either by thermal mass on a chilly afternoon or tropical sunshine through a well-positioned window.

SILKY OAKS LODGE
Mossman, QLD

A tree house above the Mossman Gorge River sounds like an ideal spot to while away the winter. Sustainability measures are essential in such a delicate rainforest environment, so Silky Oaks Lodge has its own environmental management system. The site, next to the Daintree National Park, has been reforested to rainforest habitat over the last 25 years after a long period as farming land. With a spa onsite, the property includes a greywater treatment plant, with treated water used to water the grounds and surrounding forest.
www.silkyoakslodge.com.au

WOOLSHED CABINS
Kanimbla Valley (near Blackheath), NSW

The Blue Mountains is a place to keep your eco footprint small. The design of these north-facing cabins, with a view to dramatic cliffs, was inspired by a heritage shearing shed on the property. Eco Design Architects and the owners selected the most sustainable materials and methods, including composting toilets to cut water use, citrus-based paints and oils, radially sawn timber to minimise waste and passive design principles. All that's left to do is take a walk on the 250 acres of private property.
www.woolshedcabins.com.au
Image: Lucas Trihey

DJAKANIMBA PAVILIONS
Wugularr (Beswick), NT

The Wugularr community lies in the southwest corner of Arnhem Land and is home to Djilpin Arts, an enterprising organisation that commissioned four versatile pavilions for work and leisure. The lightweight structures switch effortlessly from accommodation to training, workshop, or exhibition space through the use of fold-up, fold-down beds and sliding walls. Designed for the tropics by Insideout Architects, the pavilions sit on stilts above flood plains, and are cooled by breezes through louvres and front verandas. All income from the Djakanimba Pavilions supports Djilpin's innovative arts and cultural projects.
www.djilpinarts.org.au/visit-us/djakanimba-pavilions
Image: Peter Eve, Monsoon Studio

CAMELOT
Kangaroo Island, SA

There's nothing like watching the winter ocean while being surrounded by walls and floors of beautiful, warming thermal mass. This Kangaroo Island beach house, designed by Sunpower Design, features a polished concrete floor and internal limestone wall to absorb heat and keep visitors warm. The north-facing living area is at mezzanine level for uninterrupted ocean views, with a heat shifter to circulate warm air from here in cooler months. High levels of insulation throughout, double glazing, a solar hot water system, rainwater tanks and greywater recycling onsite make for a low impact break.
www.sealink.com.au/kangaroo-island-accommodation/450-Camelot#.UyJUE38aySM

DREAMERS
Mt Beauty, VIC

What better way to stay warm in the snowfields than in a rammed earth chalet? Designed and built by the owners, the accommodation at Dreamers features innovative passive heating and cooling. The beautiful rammed earth holds heat from a very efficient hydronic heating system. Upstairs bedrooms catch toasty hot air in winter, which is flushed out a vent in summer to keep the downstairs living areas cool. Ask about the system that pumps air from the surface of a stream to cool the buildings in summer – very clever indeed.
www.dreamersmtbeauty.com.au

LOOKING FOR MORE ECO RETREAT OPTIONS?
For more sustainable stays read *ReNew Magazine's* article online at http://renew.org.au

The Warringah Creative Space.
Image courtesy Warringah Shire Council

A space reclaimed

An old, decrepit scout hall has been transformed into a community arts space using mostly salvaged materials.

A community planting day at the Warringah Creative Space. The new garden is bursting with edible and medicinal plants.

WORDS Beth Askham
PHOTOGRAPHY Bettina Kingma

CRAFTED WITH CREATIVE THINKING and secondhand materials, artists in Sydney's northern beaches have made the Warringah Creative Space their new home.

The scout hall's transformation was a partnership between Warringah Council, Kimbriki Resource Recovery Centre and the local community. The centre includes studios and a gallery space and is being used by artists working in a range of mediums, including mosaic, clay, paint and photography.

A zero-waste policy was applied to the rebuild and everything was treated as a resource. About 80 per cent of the materials used in the new build were reclaimed, with the original timber, the old tin roof, bricks and even concrete blocks from the old toilet block all put to use in the new building. The renovation produced only one cubic metre of landfill waste.

Dr John Warburton, community deputy general manager at Warringah Council, says many councils want to reduce their carbon emissions but find it difficult to do in practice. At the beginning of the scout hall redevelopment he realised it meant doing something different and leading by example.

Accustomed to working with a detailed and prescriptive building plan, using secondhand materials was something new for the council. Applying a rigid mindset to a project that uses secondhand materials is impossible, John says. Without knowing what materials you will salvage there's no telling how you will incorporate them into a new building. "Every single week the construction team's building design would change based on what materials were available. It was a creative process that kept on evolving," he says. Convincing everyone to go on that ride was not easy but he believes the end result proves the process can work.

More than simply meeting its waste goals, the project has been an outstanding success. The gallery is booked out for months and there is a queue of artists wanting to use the studios. John says: "One of the keys to the success is that we wanted

> **"If it can't be reduced, reused, repaired, rebuilt, refurbished, refinished, resold, recycled or composted, then it should be restricted, redesigned or removed from production."**
>
> Pete Seeger

to really create a building that came from the local community and was not imposed on them. We included local residents in the rebuild – everyone we could think of was encouraged to get involved and people came and mulched, scraped, planted and painted."

Landscaper and secondhand material advocate Andrew O'Sullivan was also heavily involved in the rebuild. As a fierce advocate of reusing and respecting old materials, Andrew hopes it stands out as an example for renovators everywhere. "A lot of the old materials have a beautiful patina, are great quality and are built to last. If we don't change our mindset we will lose these beautiful materials and have them replaced with materials that are not as good."

"Reused materials don't have to look secondhand – they can look brand new," Andrew adds. He points to the new windows that blend in seamlessly with the secondhand ones.

Warringah Mayor Michael Regan says the council saved tens of thousands of dollars through reuse and reducing building site waste: "We haven't wasted a thing."

Outside, the soil from the old site was reused in the newly landscaped garden beds and more than 200 species of edible, medicinal and rainforest plants were planted by the community during a Saturday morning working bee. Plants include black sapote, mangoes, white mulberries, paw paw, guava and even a neem tree. The garden is not only a pleasurable place to be, but somewhere you can pick the ingredients for a cup of tea or a culinary dish. The garden is in good hands – neighbours come across to water it and there are workshops held in its grounds.

Some councillors were worried that people would vandalise the space – the fate of the old scout hall – but so far not one plant has been removed and there has been no vandalism. John and Andrew believe the community has a sense of ownership and is respecting and protecting the new building. Both feel they have proved the point that when the community cares about a place, it will be looked after.

Bettina Kingma is a photographer currently based on Sydney's Northern Beaches. She carries out her photography with a photojournalistic approach which aims to capture the emotions and ambience of her surroundings in her own unique style.

Image: Enoch Lau

Edible shade

Some plants will help you stay cool on hot summer days and produce fruit and veggies for your taste buds.

WORDS Beth Askham

PLANTS ARE ONE OF THE CHEAPEST low-energy shading options available. They can cut down the amount of sun coming into the house with the added bonus of improving air quality. They also provide their own type of evaporative cooling as water moves from the soil through their stems and leaves and into the air.

Here we look at some plants that provide excellent shade in summer, lose their leaves or die back in winter and also yield a delicious harvest.

Different trees and vines have different deciduous periods, so it's good to think carefully about what would work best in your area. Melbourne-based edible landscaper Rafael Schouten says if you're thinking of growing a vine, grapes and hops are great, with grapes growing horizontally and hops growing vertically.

Annual climbing plants like scarlet runner beans are also fabulous for vertical shade, growing walls of luscious green studded with red flowers. These work really well as a short-term option and are great for renters or those committed to planting each year.

If you are thinking of a tree, any deciduous tree that is not a dwarf variety could be a good option. The mulberry is a medium-sized localised tree that is fast and easy to grow and you can prune it however you like. Apricots also make good shading

KIWI FRUIT

Where to grow: Kiwis like to grow in slightly acid, sandy, well-draining loam and can even do well in large pots. The kiwi vine likes to be kept moist in summer and needs some colder temperatures to grow. You will also need both a male and female growing close together to produce fruit.

How to grow: Kiwis like a protected site where they can climb. A northern wall or pergola is a great spot for the vines.

What to look forward to: Sweet, delicious kiwi fruit should appear within two to three years after planting the vine. Pick them when they are hard and allow them to ripen off the vine.

SCARLET RUNNER BEANS

Where to grow: In full sun with strings or poles for them to wind up as they grow. They are great for shading north-facing windows and walls.

How to grow: Plant scarlet runner beans into the soil after the last frost around 50cm apart. They like rich soil and plenty of water. They take three to four months to grow to maturity so plant in September/October for full shade in the heat of summer.

What to look forward to: These glorious beans have bright red flowers, lovely green foliage and can grow up to 2–3 metres high. Image: Simon Speed

HOPS

Where to grow: Hops will only grow in the southern states of Victoria and Tasmania (below the 36th parallel south). They need plenty of sun and water, good drainage and a sunny northerly aspect.

How to grow: The hop plant is a vigorous climbing vine that will grow up strings or wires and can grow as high as 7 or 8 metres. The best time to plant the hop rhizomes is in August to harvest the hops in early March. Once the leaves have turned brown in autumn, cut the vine back close to the ground. It will lie dormant through winter and start to grow again in spring.

What to look forward to: Hops are very fast growing and grow bushy and upwards. If you plan to use hop flowers in your own home brew, four plants should provide you with enough hops for the brew with some left over to share around.

trees. According to Rafael: "An apricot is a better shade tree than other stone fruit as they grow bigger and don't need limb-pruning like peaches if you're growing them big. They spread out more than plums, which are too vertical, and have nice solid shade."

When fine-tuning your shade, Rafael says pomegranate and kiwi fruit hold onto their leaves too long into winter, while almonds and ornamental pears are fast growing but leaf out early in spring when you may not be quite ready for shade.

If you need to plant a larger tree for full-house shading, chestnuts and walnuts are great options. In places where winter shade is fine, the loquat is easy to grow, has tasty fruit and gives dense shade. Ⓢ

MULBERRY

Where to grow: Mulberries are good for the northern and western sides of the house.

How to grow: Mulberries are easy to grow and fast growing. The mulberry tree likes deep, fertile soil and water throughout summer and is tolerant of cold conditions (down to 10 °C). It can grow in most of coastal Australia but needs occasional cool temperatures to fruit well, so is not ideal in hot tropical zones.

What to look forward to: Prune them however you like to create just the right shade coverage. If you need a large space shaded, mulberries grow to a height of 8–12 metres and spread as wide as 20 metres. Fruit forms from late spring through to summer.

APRICOT

Where to grow: Apricots are a great shade tree that will grow in most of southern Australia where there is enough rain. They like full sun, so a northern aspect is a top spot.

How to grow: Apricots don't like acid soils, so place a little lime in the soil when planting. Apricots are self pollinating, so you only need the one tree to get fruit.

What to look forward to: An apricot tree can grow into a tall tree (up to 12 metres). Fruit should appear three or four years after planting and start to maturing by Christmas each year.
Image: Fir002

LOQUAT

Where to grow: The loquat is easy to grow and is generally drought tolerant. They can also grow in a wide range of soils from sandy to clay. They like to be fertilized a few times a year with a nitrogen-based fertiliser such as chicken manure. They attract fruit flies in warmer areas so some pest management might be required.

How to grow: Loquats will grow in most areas of Australia except for Hobart and on the mountains of the Great Dividing Range. The loquat is an evergreen tree that can grow up to 10 metres high so plant where you would like shading if you need it all year round.

What to look forward to: Loquats start to produce white flowers in late autumn and winter that develop into juicy small and rounded fruits in spring. The fruits are sweet with a slightly tart flavour.
Image: Infrogmation

ATA update

—Alternative Technology Association: www.ata.org.au

The ATA, publisher of *Sanctuary* magazine, is a not-for-profit organisation working to ensure its members and the wider community have access to the resources and practical information they need to green their homes and lifestyles. Stay up to date with ATA news. Subscribe to the ATA e-newsletter online at www.ata.org.au

ATA NEWS

WATER REPORT

Given recent mains-water price rises in Victoria, the ATA undertook an analysis to see which water-saving technologies are cost effective. With funding from the Consumer Utilities Advocacy Centre, ATA reviewed the economics of water-saving technology such as efficient showerheads, washing machines, rainwater tanks, greywater systems and recirculators.
www.ata.org.au/category/ata-research

ATA SIGNS MOU WITH EAST TIMOR TRAINING CENTRE

Since 2003, the ATA has been helping to install solar systems for lighting and power in remote villages in East Timor. To build on the training already conducted by the ATA and to improve technical capacity, the ATA has partnered with Timorese training institution CNEFP Tibar to establish ongoing technical support. The ATA will support the services of the CNEFP Solar Team by providing funding and staff mentoring.

DEFEND THE RENEWABLE ENERGY TARGET

The Renewable Energy Target (RET) has helped millions of Australian households install solar PV, solar hot water and hot water heat pumps and has generated millions of dollars in investment and thousands of jobs throughout Australia.

Despite this success and overwhelming support among Australians for renewable energy, the RET is under threat. Show your support for renewable energy by letting your MPs know you want them to protect the RET.
www.ata.org.au/news/defend-the-ret

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YOUR HOME 5TH EDITION

The latest edition of *Your Home*, Australia's most comprehensive consumer guide and technical manual for sustainable homes is out. With updated information, it's a great resource for homeowners, designers and builders alike.
Price: $35 (no member discount).
shop.ata.org.au/product-category/your-home-technical-manual

Winter comfort – heating options for cosy homes

What's the most environmentally-responsible way to keep warm in winter? It's a tricky question, writes energy efficiency expert Alan Pears.

WINTER COMFORT IS IMPORTANT for health and enjoyment. Yet for Australians living in cooler climates, the use of heating to provide winter comfort consumes the biggest chunk of household energy. We typically invest thousands of dollars in heating technology, and effective heating is seen as an important factor in resale value.

In many other parts of Australia, winter is short and relatively mild and many people just rug up and bear it. Indeed, I have felt colder in Queensland and Western Australia than in Melbourne because the houses and their heating equipment work so poorly!

Achieving winter comfort in a way that is affordable, effective and environmentally sound is tricky. Unfortunately, I still can't find the 'ideal' answer. To make the most informed choice about the best heating for your home, you first need to consider what you want from your heating system, including how much heating you need. Other vital options to consider are generation type, distribution and the way a system's heat is converted into comfort.

Here, I pose some guiding questions to help you determine what you want out of a heating system and discuss some system types, particularly hydronic heating. [Ed note: Read Alan's comprehensive article on heating and winter comfort in *ReNew 127* http://shop.ata.org.au/].

THE CHANGING CONTEXT

It is increasingly important to consider year-round comfort, rather than separate heating and cooling strategies. Climate change is shifting the balance: one study has indicated that, by 2070, Melbourne will be hotter and more humid than Brisbane, and heating will be a much less significant issue. [Ed note: See Alan's article on cooling in *Sanctuary 22* and in full in *ReNew 122*].

Meanwhile, improvements in building performance mean, for example, that the cost of inefficient lighting or running multiple electronic devices can be higher than heating.

WHAT DO YOU WANT FROM YOUR HEATING SYSTEM?

When thinking about heating options, it's important to frame the issue as part of a bigger picture that includes a building, energy sources, heating and heat distribution equipment, control systems and people. This system aims to provide services that include comfort – often when different people in the space want different conditions.

So, what do you want from your heating (and cooling) comfort system? Some possible preferences include one that:

- provides comfort to one or more spaces or an entire home
- is easy to make comfortable quickly after arriving home
- is quiet, with little or no air movement
- is easy to use, economical and unobtrusive
- has low capital cost and/or adds to home value
- is environmentally friendly
- has low (no?) maintenance, is reliable and easily/quickly fixed.

A variety of different solutions might deliver some or all of the desired outcomes. But it is difficult. Nevertheless, if you recognise the services you want, you can at least evaluate options against your criteria.

HOW MUCH HEATING?

The amount of heating you need to stay comfortable can depend on many things, including balancing your heating requirements against your climate – i.e. Melbourne is a heating-dominated climate (currently), but has periods of extreme heat. Microclimates and draughts also need to be addressed to maximise comfort (and minimise cost and environmental impact) in a home.

Good building design and thermal performance is also vital to human comfort. The better the thermal performance of a home, the less heating energy will be needed, along with potentially very different kinds of heating equipment. It's clear that Australia's diverse standards of housing have widely varying heating requirements: what works for a 1 Star home will be very different from what's needed for an 8 Star one.

A 200mm thick in-situ concrete thermal mass wall is suspended above 450mm of glass in this house by Breathe Architects. Winter sun peaks through north-facing windows to warm the wall and preheat the hydronic heating system's heat coils that are built into it. See *Sanctuary 23* for more on this house. Image Andrew Wuttke

But be careful: a house's Star rating is for overall annual performance and different buildings with the same annual star rating may have widely varying mixes of summer and winter performance depending on area, orientation of glazing and other factors. A competent energy rater can provide you with separate rating information on summer and winter performance. Or if you live in NSW, the BASIX scheme requires homes to meet separate summer and winter performance requirements.

However, building design is tricky. Some features that work well in one season can undermine comfort, amenity and energy use in other seasons. For example, fixed shading and wide eaves may improve summer comfort, but they can also block winter sun and light.

HEATER OPTIONS: GENERATING, DISTRIBUTING AND CONVERTING HEAT INTO COMFORT

The main options for producing heat in a home are gas (mains or LPG), electricity (resistance heating such as fan heaters and radiant panels, or reverse-cycle air-conditioning), solid fuel (e.g. wood, pellets etc.) and solar energy.

Reverse-cycle units

The efficiency of electric reverse-cycle heating has been improving. Overall, the running cost and greenhouse gas emissions (even without renewable electricity) of high star rated reverse-cycle air conditioners are now similar to, or lower than, gas. Further, if you want cooling, the extra purchase cost of reverse-cycle for both heating and cooling over a cooling only unit is very small. If gas is only used for heating, you must also consider the substantial fixed charges, as well as the cost of ongoing maintenance to ensure safe operation. Gas prices are also expected to increase significantly over the next few years as LNG plants in Queensland link local prices to global prices.

Generally, the performance of reverse-cycle units drops off, in both efficiency and capacity, in very cold weather. However, there are units with good cold-weather performance; the official ratings don't indicate this, so it's worth checking this with suppliers.

A potential issue with reverse-cycle air conditioners is standby power. Traditionally, many units have had heating elements built-in to warm the oil and refrigerant to stop them separating. Unfortunately, in many cases these operate continuously, using up to 100 watts. This can add $200 or more to annual energy bills. Since 2010, a revised appliance energy labelling scheme has included standby energy use in the star rating, so most newer units have smaller, thermostatically controlled heaters and much reduced standby power. If you have an older unit, it may save a lot of money if you switch off the power supply to it when it is not being used regularly.

Resistive electric heating

In a thermally efficient home, resistive electric heating can play a useful role for occasional local heating (e.g. a small radiant panel under a desk, or taking the chill off a bedroom), but using it for large heating tasks is three to six times as expensive as reverse-cycle air-conditioning – and it doesn't provide cooling!

Gas heating

Gas heating is widely used. Indeed, in Victoria, most new homes use ducted gas central heaters. However there is increasing concern about the worth of using gas as a transition fuel to renewables: we have delayed climate action so long that we need to jump straight to efficient use of renewables. Further, there is still significant debate about the overall greenhouse impact of gas, which can be higher than traditionally estimated, especially when it is sourced from coal seams.

HYDRONIC HEATING

Generation

Hydronic heating systems use heated water, delivered through pipes, to warm a home either by running through pipes in a slab floor (or under a timber floor with insulation under the pipes), or via wall panels or fan convectors, or a combination of these. The water is usually heated by a gas or wood-fired boiler, but electric heat pumps are increasingly being used.

Hydronic heating systems with wall mounted radiators can operate at quite high temperatures of 80 to 90 °C. This increases pipe heat losses and can also undermine the efficiency of the boiler.

To use solar energy with a hydronic system, it is best to run the system at the lowest practical temperature. The performance of solar collectors (even evacuated tube units) drops off significantly as the set water temperature increases, so boosting a conventional hydronic system may actually not make much use of solar energy. Lowering the operating temperature improves the potential for solar contribution: ideally, a smart system that adjusts the water temperature and pump speed to optimise efficiency while providing sufficient heat works best. Many people find floor heating, which uses quite low-temperature water, to be a good way to use solar heat.

Distribution

As with ducting, hydronic pipes can lose large amounts of heat, especially if insulation is inadequate – as it usually is. Typically 25mm (R0.6) insulation is used: for 100 metres of pipe, this will lose around 2 kilowatts – as much as a portable fan heater on high. Moving to 50mm insulation will cut losses by around a third. Some installers think plastic pipe doesn't need as much insulation: it does.

Running hydronic heating systems at a lower temperature can cut heat losses from the system, but it also reduces heat output: in mild or moderate weather this may not be a problem.

Losses from uninsulated sections of pipe and fittings, exposed pumps and other exposed components create disproportionately high losses – four times higher than R0.6 insulation, and much higher if exposed to wind. Pumping hot water can also use significant amounts of energy if it occurs for long periods. However, there have been major pump efficiency improvements in recent years.

Converting heat into comfort – floor heating and panels

The final stage in providing comfort is using the heat supplied by the heating system to create a comfortable environment. As discussed earlier, this happens within the context of the building's thermal performance.

Floor heating can use low-temperature heat from solar or waste heat sources, as the large area of floor only needs to be slightly warmer than the room to provide comfort. But in-slab heating typically has a very slow response, as it must heat a large mass of concrete. This makes it less suitable for climates with variable weather.

Hydronic heating panels, which work by radiation and convective heating of the air, are popular, although they can be expensive. Each room can have its own thermostatic control, so that a home can be zoned. If installed on an uninsulated external wall or under a window, local heat losses can be very high. Double glazing and wall insulation, even just a sheet of insulation between the panel and the wall, can make a big difference. S

Alan Pears has worked on sustainable energy issues since the late 1970s. He is one of Australia's best recognised and most highly awarded commentators on sustainable energy and climate issues. He teaches part time at RMIT University and is co-director of Sustainable Solutions, a small consultancy.

This article is an extract from Alan's comprehensive article on heating and winter comfort in *ReNew 127*.

Hydronic heating

Hydronic heating is so effective because of water's capacity to hold about 4000 times more warmth than the same volume of air.

WORDS
Dick Clarke

As most of us look forward to relief from heat waves and bushfires, we must also deal with winter's downside – the need for heating.

PASSIVE SOLAR HEATING SHOULD always be our first option, but for many homes, limited solar access makes this unattainable. Hydronic heating is one of the low energy products we can use to achieve powerful comfort without massive energy use and, if done properly, any net emissions.

Hydronic heating is the use of hot water to heat the occupants of a building. This can be done by using convection radiators or hot water can be piped through walls and/or floors, which then radiate warmth to the occupants within. This latter technique has become the most common and has several advantages, although it is more costly to install. Hydronic heating must not be confused with electric resistive element heating, which is a very different beast, and not at all sustainable in all but a very few instances. In Australia, 'hydronic heating' is commonly used to refer to gas-fired systems, with or without solar preheating. However heat pump systems are gaining ground, often using PV as the sole electricity source.

HUMAN COMFORT

Our perceptions of comfort are a key consideration when it comes to heating. Radiant heat is so effective it doesn't need to be 'hot' to provide warmth. If the surfaces of a building are between 20 and 22 °C the building will not feel cold, and another degree will put it into most people's comfort zone. This enables the air temperature to remain cool enough to prevent that fuggy, drowsy feeling and keep occupants comfortable and, importantly in workplaces, alert. With radiant heat there is an element of conduction at work too: if the floor is heated, cold feet are a thing of the past.

EFFICACY

Building conditioning versus air conditioning

The way hydronic heating effects human comfort – its efficacy – is the key to its growing fan base. It hinges upon water's thermal mass; that is, its ability to absorb, store and redistribute enthalpy (any heat energy, but warmth in this case). If combined with high mass materials such as concrete slab floors, brick walls, phase

A wall-mounted hydronic radiator panel.

change materials in floors or walls, or even by itself in timber-framed floors and walls, hydronic heating has the capacity to completely overpower the air temperature within a building. This is because water can hold about 4000 times more warmth than the same volume of air. Thus air-conditioning must heat and move much more air to achieve the same effect and, arguably, never can.

Power source options

Of course we must address more than just hydronic heating's ability to distribute energy. A system's energy source must also be considered if we are to arrive at an environmentally sustainable heating solution – this is where hydronics really shine.

Until recently solar hydronic heating systems have drawn energy from the sun, usually via evacuated tubes, in combination with instantaneous gas boosting. In these systems, solar collector size has been critical to ensure minimal reliance on gas boosting. Yet the relatively high cost of solar collectors has seen many undersized systems installed. This approach might reduce sticker shock for homeowners but it results in higher running costs and, of course, greenhouse emissions that are inescapable with the use of any fossil fuel.

More recently, the continued price reduction of photovoltaics (PV) coupled with ongoing improvements in the energy efficiency of electric heat pump hot water systems means it has become more cost effective to use these systems. One of the most efficient heat pumps, for instance, is the Sanden range, the largest of which has a coefficient of performance (CoP) of 4.5, meaning that for every unit of energy you put in, you get at least 4.5 units of heat out when delivering water at 60 °C. This is the big distinction between heat pumps and resistive heating elements, which by definition have a CoP of 1. This level of efficiency, coupled with a solar PV power source, is cost-effective, can be completely emissions free and has an embodied energy payback period measured in just a handful of years. [Ed note: The Sanden unit is one of a number of similar products made in Japan under the 'Eco-Cute' brand, but so far it is the only one imported to Australia. For more information on heat pump hot water systems, see our article in *Sanctuary 26* and the ATA's efficient hot water buyers guide www.ata.org.au]

SYSTEM SIZING & CONFIGURATION

There are a number of solar hydronic system configurations available to suit different installation requirements, but all involve either solar thermal and PV or a heat pump and PV.

The appropriate PV system size for solar hydronic heating depends on heating demand, which is a function of the floor area to be heated, building thermal efficiency (passive solar input, insulation, etc.), and desired temperature relative to external ambient temperature. Competent installers can work with good designers to calculate this, but as a guide, a thermally efficient house in Sydney with partial passive solar input requires about 1.5 kilowatt-peak (kWp) of PV to run the hydronics system's heat pump and circulating pumps. A home with no passive solar at all may require 3kWp. If installing PV on your house itself is not an option, you can use renewable energy by proxy through community-owned systems or GreenPower.

Also, note that while the most cost-effective option may change as technologies develop in years to come, the principles for selection will remain the same. [Ed note: Find out more about solar PV sizing and pricing from the ATA www.ata.org.au]

Additional savings may be gained by combining a hydronic heating system with a household potable hot water system. This is because hot water in a vertical storage tank stratifies, leaving the hottest water at the top of the tank. Potable hot water can then be drawn from the top of the tank at over 60 °C and mixed with cold water by a tempering valve to meet regulated maximum household hot water temperatures. Meanwhile, slightly cooler water suitable for in-slab hydronic systems is drawn from the middle of the tank and pumped through hydronic pipework. Rotex solar thermal systems are well-known for this hybrid use feature. Such a system configuration means that the heat collection side of your system must be expanded, of course, so economies of scale and summer heating requirements need to be considered.

However, we have found that it is often more economical to use a bigger PV system to power two smaller heat pumps, each with their own tank, thus separating potable and hydronic hot water completely. The size of your system will also depend on the area to be heated. To maximise efficiency, it is definitely worth splitting this into zones that can be heated separately as required. This eliminates wastage in larger buildings. Once again, it is one of the many advantages of building small.

APPLICATIONS

Hydronic heating can be used in many different building applications, and is an appropriate design strategy in any climate requiring more than occasional winter heating.

New builds

Most commonly, hydronic heating in new builds is embedded into concrete floor slabs in the form of a rectilinear spiral of plastic tubes tied to the slab's reinforcing top. But it can also be installed into lightweight wall and floor framing in contact with the surface material, be it plasterboard or floorboards. If the heat is not to be shared with the space on the other side, say in the case of a raised timber floor at ground level, then the space behind must be insulated – and probably lined to make it vermin free. External walls should be insulated on one side to direct heat inside. Internally, heat can be delivered to more than one room where the pipes are in contact with surfaces on both sides of the wall and the wall itself is not insulated.

Renovations

Hydronic heating is a suitable option to consider when renovating as it can be retrofitted into timber-framed walls and floors. Concrete slab retrofits are only worth considering if you can add a 60mm topping over the existing floor. Brick walls can be retrofitted if there is space to add 30mm of render on the inside surface beyond the pipework – and insulation in the wall cavity for external walls. Convective radiators are

Hydronic heating pipes installed in an existing timber stud wall, with the original plasterboard retained on one side. This wall is also having tamped earth installed between the studs to increase the thermal mass, but the efficacy of hydronic heating is not dependent upon this.

In-screed hydronic floor heating. Pipework is laid on a finished slab and then covered with a top layer of cement screed. Hydronic heating heat sources can include electric heat pump, gas, wood or solar, or combinations thereof.

an option in full masonry buildings, but these don't provide the full radiant heat effect across a large surface area.

At this point it's worth dispelling a myth – you can install hydronic heating below a timber floor without them cupping. A timber floor exposed to direct sunlight will easily achieve a surface temperature in excess of 55 °C, while the hot water from a hydronic system is usually in the range of 35 to 50 °C; that is, no more than sunlight. Additionally, hydronic pipe is only in direct contact with the floor at a series of isolated points. There is therefore less heat transfer than direct sunlight, which covers 100 per cent of the exposed area.

It is also worth considering hydronic heating in modular construction. It can be installed along with all the other plumbing, and as discussed above, is great for lightweight buildings. It can also be used to complement phase change materials, which are already making their presence felt (pun intended) in this realm.

Hydronic heating is not the panacea for all ills, and should never be a substitute for passive solar heating when that is available. As an adjunct to it, or as a heating system where winter sun is unavailable, it is probably the single most useful design strategy since the invention of glazed windows. Ⓢ

Choosing your architect

Architect Stephanie Skyring provides some advice about how to find the ideal architect for your new or renovated sustainable home.

IF YOU WATCH THE UK TELEVISION show *Grand Designs* you will no doubt soon appreciate the incredible value a good architect brings to the design and construction process.

A good architect will work with you to create a great design that is inspiring, meets your needs and is mindful of your budget, aiming to directly improve your quality of life and your property's value – ideally, all with minimum fuss and maximum enjoyment.

It can sometimes be difficult to find an architect who is just right for you, so it's worth spending time (and a little bit of money if you can) doing your research to make sure you find the best one to design your ideal sustainable home.

FINDING AN ARCHITECT – THE PROCESS

The right architects can be hard to find, but the following should point you in the right direction.

1. Talk to friends and work colleagues who have used architects and go and look at their finished projects.
2. Look at architect signs on construction sites in your local area and contact the owners about their experience.
3. Look through magazines featuring work done by local architects.
4. Search for architects using The Australian Institute of Architects 'Find An Architect' directory, *Sanctuary* magazine and its online directory, contact Archicentre or use other print and online magazines and directories.

Once you've found a few architects or firms that appeal, refer to the next section of this article, 'What to look for when choosing an architect', to help you sort through your shortlist.

Making contact

As a first port of call, phone the architect's office and ask if they can help with your project. A director or senior architect should be happy to chat with you over the phone to determine if your project is something they can help you with.

Architectural practices offer slightly different services depending on their expertise and areas of interest. These services are offered at varying costs by different practices, but as a general guide, smaller, suburban practices are more likely to help you with small-to-medium sized residential projects and will often be more affordable than larger city practices.
Your residential project may require one or a few design services. Architects can help you with all or some of the following:

- A full architectural service, from design to construction completion.
- Sketched design plans and elevations only. If you choose this service, you can take the project on from there with your builder or draftsperson.
- A review of designs drafted by you, a draftsperson or another architect.
- Advice on a new house you are considering purchasing to see if it can be renovated easily and within your budget.
- Advice on renovation options and potential cost issues.
- Advice on how to improve the sustainable design of your proposed new or existing home.

An architect should be able to give you some advice over the phone about the services they offer and the types of fees they charge – including whether they charge for initial consultations – so you can see if these align with your needs and budget. If

SMART SUSTAINABLE DESIGN

The sustainable design guide *Your Home* outlines nine stages of the design process. These may change depending on your project:

1. Preliminary research
2. Choosing your designer
3. Site analysis
4. Brief development, fee proposal and design contract
5. Concept designs
6. Design development
7. Final design
8. Council approval
9. Design detailing.

Author and sustainable designer Chris Reardon notes that the final design stage is often the greatest test of you and your designer's commitment to achieving an environmentally sustainable home. To ensure you don't eliminate (often low cost) sustainability elements at this stage, ensure basic passive design features and other sustainable design elements, such as appropriate glazing, are the basis for your design, rather than add-ons. He advises managing trade-offs by dividing your project into stages, implementing features you might not need straight away into a later stage.

Consider the following:

- As a rule of thumb, expect the cost of full sustainable design and working drawing documentation for a new home to be 3–6 per cent of the total budget.
- A good designer who produces a space efficient and climate-responsive home can save you at least as much as the cost of their fees by helping you reduce upfront construction costs (through efficient use of space and materials) and ongoing energy costs (through climate-appropriate design).
- Trimming just a few square metres from each room can pay for double glazing or a photovoltaic array.

Extracted from Chris Reardon's 'The Design Process' in *Your Home*, 2013.

Emma Young of PHOOEY Architects workshops some plans at the ATA's Speed Date a Sustainable Designer event in Melbourne.

Image: Nick Stephenson

what you hear all sounds good, organise to meet to talk through your project in greater detail. If not ... call another architect.

The first meeting

The first meeting may take a number of forms depending on the size of your project, your budget and your design needs.

Project briefing only – Generally if you are meeting an architect to obtain a fee proposal for a medium to large architectural project (i.e. a build cost of around $300,000 upwards), there will be no charge for the first meeting. It's best to meet at your house so the architect sees how you like to live and the things you like and don't like about your home's current design.

Hourly rates advice – If you have a small project or a limited budget some architects provide design advice at hourly rates to help you solve your design problems. This may be providing simple advice on ideas, options or costs, or a design workshop where they more actively work with you to resolve your problems on the spot.

What happens next?

After a project briefing, the architect will prepare a fee proposal for you in line with your brief. Once you have this, review and compare your experiences with each of the architects you've met and review the work they've offered to do in their fee proposals. If you really connect with an architect and like their work, but they have a higher fee, make sure to call them and discuss this. The architect may be offering you a higher level of service than the other architects. If this is more than you need they may be able to adjust their fees and services to provide a win-win solution.

WHAT TO LOOK FOR WHEN CHOOSING AN ARCHITECT

Design skills and style

All architectural practices will have their own style. Make sure you like their style, but it's also important that your style preferences are reflected in your home's design. After all, it's a house for you, not your architect.

Architectural style is generated by considering things such as client input (lifestyle needs and personal taste), functionality, climate-responsive design, site opportunities and constraints, natural light, materials, character, regulations and budget.

Some architects have a signature style and carry similar details, colours and/or forms through the majority of their projects. This may mean they can be less encouraging of client input. Other architects have projects that demonstrate a variety of style influences, which often suggests they encourage a lot of personal input from their clients. Be sure to chat to potential architects about their style and ask for examples of how they've incorporated previous client input into floor planning as well as details and features.

Functional floor planning

Logical, interesting and space-efficient floor planning that responds to your needs as well as your site features and climatic orientation is central to great design. Ask to

see some examples of floor and renovation plans – before and after. Make sure the plans show furniture (at the right scale) so it's clear that their designs function effectively.

Financial knowledge

Building is an expensive process and your architect should always be mindful of your budget. Before they start preparing detailed drawings and specifications, your architect should give you an idea of costs, including architectural fees, all other consultant fees, approval costs and estimated construction costs. Advice on the appropriate level of capitalisation for your site can also be important. We recommend that our clients speak with a local real estate agent to help them confirm their budget and brief.

Throughout the design process your architect should:

- Advise you of estimated costs or perhaps recommend involving a quantity surveyor or cost planner.
- Advise you of the relative cost of various fittings, fixtures and finishes and whether they are appropriate for your chosen budget. They may also get advice from a builder on construction costs relatively early on in the design process.
- Prepare clear and concise drawings and specifications for the builder so the builder can prepare an accurate tender. This will limit cost variations during construction.

At tender stage your architect should select quality builders who work in a cost-effective way and carefully control the tender process, assess submissions and prepare a report for your consideration.

During construction your architect may, if required, work with your builder and you to make design modifications to ensure the final building contract sum fits within your budget. At this stage, your architect should also ensure any modifications required during construction have minimal effect on the budget.

Personality & communication skills

You need to connect with your architect on a personal level and work together as a team. The design and construction process is long and there may be challenges along the way so try to find an architect you think will make this process easy and enjoyable for everyone. Most importantly, look for an architect who will listen to what you want and work to find smart ways to deliver it for you. Also, look for an architect who always says 'yes we can'. They need to have the ability to solve every challenge along the way and be committed to always find the best design solution.

Choosing the best architect to design your dream home really comes down to finding someone who thinks in a similar way to you. This will make communicating ideas much easier because you will always be on the same wavelength.

Stephanie Skyring is a director at Brisbane-based firm Skyring Architects. Her overriding goal is to create architecture and interior design that brings joy to her clients
www.skyringarchitects.com.au

MORE INFO

Sanctuary Sustainable Design Directory
www.sanctuarymagazine.org.au/sustainable-design-directory

The Australian Institute of Architects
www.findanarchitect.com.au

Archicentre
www.architecture.com.au

'The design process' in *Your Home*
www.yourhome.gov.au

ARCHITECTS & BUILDING DESIGNERS

Designers fall into one of two main categories: architect or building designer.

In Australia, architects are state-registered and regulated, and the legislation governing them varies from state to state. To gain registration under the Architects Accreditation Council of Australia, a person must hold a recognised degree in architecture or demonstrate equivalent qualifications, undertake a period of experiential training and pass a practice examination. To remain registered, architects must hold appropriate professional indemnity insurance and undertake regular continuing professional development.

Regulation and registration of building designers also varies between states. Building designers are state-registered in Tasmania, Queensland and Victoria. They are moving toward national accreditation in other states and territories. Registered or accredited building designers are required to carry professional indemnity and undertake and report continuing professional development to remain accredited. The range of services offered by building designers varies significantly.

This is an extract from Chris Reardon's 'The Design Process' in *Your Home* 2013.

MORE ON BUILDING DESIGNERS

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www.bdav.org.au
Building Designers Australia
www.bdaa.com.au

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Image: Emma Cross

01

MARMOLEUM/LINOLEUM

Invented in 1855, marmoleum is a natural floor covering made from linseed oil, rosins, wood flour, cork flour, limestone and organic pigments, all held together with a jute backing. The ingredients are pressed together to form sheets or tiles and then dried to become a durable, waterproof floor covering. Marmoleum is biodegradable and recyclable, and doesn't contain any VOCs. It's soft and comfortable underfoot and, thanks to the linseed oil, it's also antibacterial.

There is an array of patterns and colours available and it's a versatile floor covering that can also act as a benchtop covering or shelf lining.

Marmoleum is a trademarked name for this product by Forbo flooring systems. The original linoleum was made from these natural ingredients and was named by its maker from the Latin words linum (flax) and oleum (oil). The 'lino' we talk about today is a generic term that largely refers to the floor covering made from PVC (vinyl).

www.geca.org.au/products/all/782

02

INSTYLE WALLPAPER

Instyle's range of natural wall coverings, CUBISM, GILDED CORK and PIETRA, are made from cork and cellulose (with added metallic leaf and polyester in the gilded cork range). Inks used in their manufacture are water soluble and they are free from heavy metals and chemical additives such as PVC, chlorine and urea formaldehyde.

These wall coverings are suitable for both walls and ceilings and are water permeable to avoid mould and mildew. They are available in a range of colours.

www.instyle.com.au

03
SOLAR TUBE

This portable ‘Sydney Tube’ solar cooker can boil water in 20 minutes and cook or smoke food. The cooker includes a water jug and stainless steel grill to cook meat and veggies. The cooker is great for park barbecues as it folds up into a case with a carry handle. The smaller model weighs 8 kg with the larger model weighing 10 kg. Prices start at $525

www.runonsun.com.au

04
WOOD MELBOURNE TIMBER BATH SPOUTS

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www.woodmelbourne.com

05
GINGHAM OLD YARN RUG

These old yarn kilims are designed by Jardan Lab and manufactured by traditional rug makers in Turkey. The kilims are made from 100 per cent recycled wool sourced from Turkish rugs at the end of their life. This wool is then rewoven by hand using traditional techniques. The consistency and colour will differ through the yarn creating a unique variation in tone and colour that can only be achieved by age. Available in three sizes, starting from $3368.

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Melissa Wittig is a passionate indoor environment specialist with Healthy Interiors and Relish Designs (www.healthyinteriors.com.au). Dick Clarke is principal of Evirotecture, a sustainable building design firm in Sydney and Redland Bay, Queensland (envirotecture.com.au).

Q— *I am an allergy sufferer/ asthmatic, and am considering replacing my carpet, which is laid on concrete floors. I live in Perth. I hope I can achieve new floor coverings on my tight budget! – Rochelle*

A— Flooring is a significant element of an interior, and its material should be chosen according to the style of a home, how spaces are to be used and the amount of traffic and the needs of the occupants.

Depending on the style of your home, you may like to consider using the concrete floor under your carpet as your new floor surface. Concrete flooring is a solid, durable, easy to maintain surface that can be rejuvenated using a finishing coat and would eliminate the need to buy another floor covering. From a sustainability perspective, improving something you already have is better than buying something new. If your concrete floors are in reasonably good condition you are likely to find that buffing and sealing them is more economical than buying a new covering such as cork, carpet (natural fibre), engineered timber boards or linoleum.

As a hard floor surface concrete flooring allows you to visibly see accumulating dust which can be promptly removed (preferably using a HEPA filter vacuum or damp mop) to prevent dust particles from becoming airborne and aggravating your asthma.

If you do opt for concrete flooring, there are many types of surface coatings available, including solvent and water-based two pack products and naturally derived oils. Choosing a product that minimises pollutants within the interior of your home is really important. Key considerations when selecting a finishing product (or any other type of product) are durability, toxicity, emission levels (volatile organic pollutants or VOCs) and maintenance required. Opting for a product that is naturally derived and has minimal VOCs is ideal. Reducing the potential for VOCs within an interior is a really important consideration for everyone, but it is especially important for people suffering from allergies and asthma as VOCs can trigger respiratory symptoms. – *Melissa*

Q— *What are my options for insulating a cathedral ceiling above a large, upstairs weatherboard room with an apex at 4 metres? This room has an all timber lining, some in-wall insulation, a corrugated iron roof and no roof insulation. We've added external blinds and shade cloth to the windows. There are two ceiling fans, but the room still really heats up. I also wondered about using a plasterboard insulating product and venting the space with some ceiling extractor fans. – Michael*

A— Any high space will have a strong convection effect, and without any insulation, the heat gain from a big dark roof will make the upper levels extremely hot indeed. Any design or technical strategy must consider winter conditions as well – assuming you are not in the tropics.

The first and obvious thing is to insulate the roof. Having exposed rafters makes this very easy, but you will lose them behind a ceiling. Because ceiling height is not an issue here, I suggest following the principle of having a reflective/non-emissive layer facing inwards continuous below the existing rafters, protected from condensation by a good layer of bulk insulation above. This can be done in one go with a product like Kingspan Kooltherm K10. The board is made of rigid foam with an aluminium reflective laminate on one side. Fix these in continuous sheets under your rafters, with the foil facing downwards, and approximately 20mm battens or furring channel beneath to create an air gap to the ceiling.

This will give you about R5.0 in total, which is the very minimum for acceptable performance. Adding polyester batts above the Kingspan board (between the rafters) will add to this. Ideally, a total insulating value of R6.5 is good, and R2.0 Greenstuf batts will do that cost-effectively.

The next step is to look at options for controlling the convection effect in the room. Adding openable roof windows at the top of the space near to the ridge will give you the ability to free-vent the whole space. This will be very effective if you can bring in cool fresh air from down low, such as through a garden. Obviously in winter these windows remain closed. They should also not be more than 2–3 square metres in total area, and should have integrated shading.

Ceiling fans will assist if they are close enough to the inhabited floor levels, which may involve very long extension rods. These will be useful in winter too, breaking up the natural stratification of the warm air. If you have a nice sustainable heating source at the lowest level, you can make a tall space work for you by adding a warm air return system using 300 minimum diameter duct with a low energy in-line fan drawing air down from the ridge back to ground level. This should be on a timer or control system that only runs it when you're home. – *Dick*

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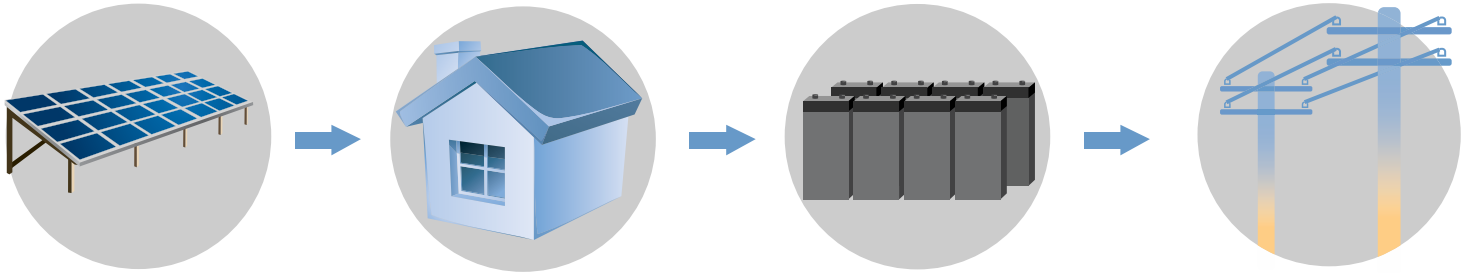

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