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Appropriate sun shading is vital to successful passive solar design. Anna Cumming looks at how to ensure you can keep the sun out when it’s not wanted.

**Designing 10 Star homes**
A 10 Star home requires no heating or cooling to keep us comfortable year-round. So why are so few of these super energy efficient homes built?

**Shelter & stewardship**
A residential dwelling in Sabah, on the island of Borneo in Malaysia, is a challenging ecological design and cultural change project.

**Speed Date a Sustainability Expert**
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Super efficient, liveable and environmentally responsible homes rise again to the 2013 10 Star Challenge.

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How and when can a home sustainability assessment help you improve the performance of your home?
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Earthly home comforts

An earth-covered sustainable home pays homage to its surrounding environment.

WORDS Sasha Shtargot
PHOTOGRAPHY Ben Wrigley
ON WET AND WINTRY DAYS IN VICTORIA'S YARRA RANGES,
a house has to be decidedly warm. But it’s the quality of warmth in
Tyrone Jasper and Hailey Cavill’s house that’s arresting – deep, yet
gentle and soothing.

“The humidity doesn’t change, it doesn’t dry you out. It’s the most
human heat,” says Tyrone.

The heat rises from the tiled floor thanks to a gas-powered hydronic
slab heating system, and on this chilly day wood is also burning in the
Cheminees Philippe fireplace. An enormous steel fan on the curved
ceiling circulates air through the double height void in the living area.

The heating is just one of the striking things about this house in
Warburton, east of Melbourne. From the outside there is the home’s
distinctive curved shape, which pays homage to the contours of the
surrounding hills. There’s an impressive earth-covered roof and a large
pond at the back that continues the strong connection between home and
environment.

Tyrone, a builder and craftsman, and his partner Hailey moved into
the house, designed by Alvyn Williams of Soft Loud House Architects, in
August 2012, after 18 months of construction. On a 1.4-hectare property
overlooking the ranges, the home would provide country respite for
Hailey – a social entrepreneur with a busy working life – allowing her to
work from a home office with graceful, idyllic views. It would also provide
a challenging project for Tyrone as an owner-builder and project manager
committed to sustainable design.

Walking into the 7.3 energy star-rated house, an entryway opens
into a large central living and kitchen area. North-facing double-glazed
windows and doors bring plenty of light and open to a fully glazed
sunroom designed for passive heating. Beyond the sunroom is the
kidney-shaped pond, on the site of a disused concrete reservoir that once supplied water to Warburton – the couple employed a local contractor for the major job of breaking up the concrete. They then reused the concrete on their new driveway.

The living area is an opportunity to see Tyrone’s ingenuity and skill as a craftsman: the concrete kitchen benchtop is his creation and the stone for the fireplace was cut by hand with the help of his 80-year-old father, William. A prominent bookshelf was made from locally milled blackwood.

At one end, the rectangular living-kitchen area opens to the main bedroom and ensuite bathroom. Here the roof has been designed to be open to allow a majestic view of the rising moon from the window above the bath. At the other end of the house is Hailey’s office space, with two work rooms and a large storage area. A stairway from the living area leads to a landing with a laundry and toilet and then to a mezzanine level, where a bedroom and TV room have been designed for guests.

There’s much about the 215 square metre home that is atypical, even novel. Concrete-filled polystyrene blocks were chosen as the home’s main structure – the fully constructed polystyrene was up in a few days, with the concrete poured into the walls on-site. “It was incredibly fast to put up and it’s great insulation,” Tyrone says. As a waste product from the petroleum industry, Tyrone believes polystyrene has environmental credentials.

The green roof is perhaps the home’s most outstanding feature. Steel rafters spanning across one large curved central beam act as the spine upon which the plywood roof sits. The wood was sprayed with synthetic neoprene rubber, a resilient water-resistant material.  

Native plants grow on the earth-covered roof that provides fire resistance, thermal insulation and helps the home blend into the surrounding environment. The living spaces look north out to a pond that continues the home’s connection to the environment.
Homeowner Tyrone crafted the kitchen’s polished concrete benchtop himself. The stainless steel rangehoods were sourced from Qasair and the designer pendant light shades from Volker Haug. Salvaged blackwood was used for the bookshelf and lines the kitchen bench.

Above this, several layers of geotextiles help stabilise and provide drainage for the roof. Lastly, plastic webbing acts as a container for the soil and the plants in it. Eight tonnes of earth sit on the roof, with a green carpet of 4500 native grasses planted into it.

“I always wanted to build an underground house, but this site was not suitable for it,” Tyrone reflects. “The architect picked up on that and said it could be earth-covered rather than buried in the ground. He came up with the shape and it sold me.”

With the imposing Yarra Ranges in the background, an earth-covered roof is both aesthetically and naturally a delight, as well as an excellent form of insulation and a bushfire retardant. But the cost was considerable – the couple spent five times what they would have on a more conventional roof and were forced to borrow money to complete the house.

Despite this, there is little that Tyrone and Hailey are not happy with about their new home. Their planning and research were thorough, including the incorporation of five criteria – cost, aesthetics, function, feng shui and sustainability – which they used to evaluate each aspect of the build. Alvyn has found that the home performs thermally even better than expected, and the couple’s hard work has paid off in an exceptionally considered and sustainable home. “It’s the way they went about doing the work ... [building] sites are mostly full of machinery, but on this site so much was done by hand. It’s quite amazing,” comments Alvyn.

For Hailey, the graceful energy and feel of the home are worth the involved, and at times stressful, process of building. “It was a fantastic opportunity to start from a clean slate,” she says.

Tyrone is proud of the fact that meticulous reuse of materials meant just three trailer loads of rubbish were taken off the site. Throughout the whole build process, the right people turned up when we needed them, he says. “One of our goals was to enjoy the process. You don’t get the privilege to do this many times in your life.”
The main bedroom sits at the east end of the house, while Hailey’s office and a lounge lie at the western end below a mezzanine-level bedroom and TV room for guests.

A blackwood bookshelf sits inside the living room near the entrance. Blown glass from Healesville Glass Blowing Studio features in the front door.
Arch house
— Specifications

**Credits**

**DESIGN**
Albyn Williams, Barry O’Brien & Sean Gallagher, Soft Loud House Architects

**BUILDER**
Tyrone Jaspers

**LANDSCAPE DESIGN**
Phillip Johnson

**PROJECT TYPE**
New build

**PROJECT LOCATION**
Warburton, VIC

**SIZE**
215 sqm

**BUILDING STAR RATING**
7.3 Stars

---

**Sustainable Features**

**HOT WATER**
- Apricus evacuated tube solar hot water, boosted by Rinnai (LPG) instantaneous hot water unit.

**WATER SAVING**
- Water efficient appliances and fixtures
- Two concrete tanks provide 22,000L water storage in lieu of mains supply.

**PASSIVE DESIGN**
- Earth sheltered roof, supplemented with Earthwool R5 ceiling insulation and Formcraft ICF walls
- R2.5 batts and R2 AirCell in stud walls
- No cooling system installed.

**ACTIVE HEATING & COOLING**
- Hydronic slab heating using a Sime high efficiency boiler and Cheminee Phillipe ‘Radiante 705’ wood heater
- Evolution (DC fan) by Big Ass Fans.

**BUILDING MATERIALS**
- FormPro Polystyrene concrete forms by Formcraft Australia
- Deco rock walls; stone sourced from Castella Quarries
- Elmich Green roof system
- Concrete benchtops by Tyrone Jaspers
- Local stone abundant on the property used for natural fieldstone walls
- Salvaged timber from Bowerbird Saved Timber was used throughout the home.

**WINDOWS & GLAZING**
- Fire resistant timber window frames by B.J. Williams of Bayswater
- Double glazing by S.O.S Glass.

**LIGHTING**
- Compact fluorescent and Cree LED downlights from Solarphase Alternative Power Solutions
- Stainless steel light shades in the kitchen were sourced from Ambiance Lighting Australia.

**PAINTS, FINISHES & FLOOR COVERINGS**
- Haymes paint throughout interior
- Natural honed Travertine floor tiles
- Grimes & Sons Cement Render
- Porters Rust paints.

**OTHER ESD FEATURES**
- North orientation and window/sunroom design for winter solar gain and summer shading
- Minimal plan depth north-south for solar penetration
- Small south-facing windows to minimise heat loss and gain
- Airlock entrance to minimise energy loss
- Earth-covered roof for fire resistance and thermal insulation
- Native plants supplied by Kuranga Native Nursery
- The meticulous reuse of materials meant just three trailer loads of rubbish were taken off the site throughout the build process
- Homeowner Hailey was assisted by design consultants Mark Fenech and Michelle Piggott in the interior fit-out.

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A Castella stone wall surrounds the entry on the home’s southern side. In the garden, stone from the property was used for natural fieldstone walls. LED downlights are used throughout the interior and exterior.
Reusing old building materials was an emphasis of the restoration of this heritage listed building. Existing bricks were maintained or reused in the external walls. Floorboards from the old warehouse were used for the studio as external cladding. A studio sits next to the main house.
Ageing beauty

Most people wouldn’t contemplate converting a heritage listed derelict warehouse into a liveable home, but for one architect the conservation project made perfect sense.

WORDS Rachael Bernstone
PHOTOGRAPHY Peter Booth

WHEN ARCHITECT PETER BOOTH AND his partner, a visual artist, spotted a disused warehouse in the centre of Hobart, they saw opportunity where others saw only ruin and decay.

“The warehouse was basically a derelict shell,” recalls Peter. “The timbers had rotted away from the walls, there was no mortar between the bricks in some places so the walls had crumbled away, and the downpipes were not connected to the gutters so there was an internal waterfall. You definitely wouldn’t live there if you didn’t have to.”

The two buildings and central yard had most recently been used by a builder for storage. “As we commenced our demolition and excavation, we discovered signs that it had been used as a warehouse for over 100 years,” says Peter. The original building dates from the mid to late 1800s, and the heritage listing added to the perceived degree of difficulty in restoring or adapting the structure for modern use.

Despite these challenges, Peter saw value in transforming the building into a better-performing and more liveable home and studio. “It’s quite important for me as an architect to make the most of buildings in the city; to take a responsible attitude towards consolidating the buildings we have, without building more in the suburbs,” he explains.

Before buying the property the couple met with the heritage council. The council stipulated that the original brickwork should be maintained where possible and the new roof should be galvanised corrugated sheet, instead of the more typically used coated or pre-painted products that offer a longer lifespan. “We outlined our plan to reuse a lot of the existing building materials, and the heritage council was happy with that,” says Peter. “It was seen as a good way of going about reusing the structure.”

→
As the largest project the design duo had undertaken, they were keen to not overcommit financially. The smaller of the two buildings was converted first, enabling them to move into the studio and save on rent while work continued on the larger building across the courtyard.

The larger building faces northeast, so Peter opened up the main wall with double glazing to bring in light and warmth, and split the building into two zones – the northeastern end houses the living spaces and mezzanine main bedroom above, while the garage lies at the southwestern end, with two guest bedrooms and a bathroom above. “This gave us a primary space to occupy, so we could close off the other bedrooms and not heat them, unless we had guests to stay,” he says.

The building needed much restoration work to make it habitable, including modern insertions such as super-insulation, nine skylights and double glazing to make it comfortable in Hobart’s cold winters. However, Peter was respectful towards the original structure. “During demolition, we salvaged everything, so we were able to use the floorboards from inside for external timber cladding, and our internal doors and frames were made with timber from the original building too,” he says. The windows were also made using recycled timber.

While Peter was keen to incorporate ecological design elements, he was constrained by the tight footprint and the heritage structure, which precluded some typical add-ons, such as rainwater tanks and solar power. “In the CBD, we can readily tap into existing infrastructure, so we opted for mains water with the most efficient water fittings we could afford for taps, toilets and showers,” he says. “And because all of Tasmania’s power is green – hydroelectric – and we wanted skylights, and there is no gas line in the street, we opted for two small and efficient electric hot water systems – one in the studio and one in the main building. These are close to the outlets so we don’t waste heat or water in transport.”
“It's quite important for me as an architect to make the most of buildings in the city; to take a responsible attitude towards consolidating the buildings we have, without building more in the suburbs.”

Peter Booth
Designer Peter Booth found recycled hardwood floorboards for the first floor from a demolished scout hall in northern Tasmania. A concrete slab soaks up the sun’s heat and high insulation levels in the walls and ceiling limit heat loss.

Taking the view that the building might be rented, Peter installed ducted reverse cycle air-conditioning. However he says the northeast orientation, double glazing and thermal mass in the brick walls and concrete floor combine to provide warmth throughout the day and into the evening, without the need for further mechanical heating.

As the owner-builder on the project, Peter admits it was a long, slow and sometimes testing process. “We bought it in 2008, settled in February 2009, and it took us nine months to get the studio habitable and install services – sewer, stormwater, power – for the main building,” he recalls. “Then we had tools down for about six months to take a break prior to the next stage, before building for another 18 months, while working in our other jobs as well.

“I was confident from the outset that we could do it, but my partner probably wasn’t aware of what we’d bitten off,” he laughs. “But what she initially lacked in skills she made up for in enthusiasm, and in the end it was a very rewarding process.”

---

**LEGEND**

1. Kitchen/Dining
2. Living
3. Garage
4. Bedroom
5. Bathroom
6. Studio
7. Courtyard
Harrington house
— Specifications

Sustainable Features

HOT WATER
- Dux 250 ProFlow electric hot water systems fully insulated and installed internally in the studio and main house.

Architect and homeowner Peter Booth explains that due to heritage constraints, solar hot water and solar power were not an option. Because of Tasmania’s hydro power and no gas line into the property, electric hot water systems were the best choice.

WATER SAVING
- All tapsets are WELS 5 star (6L/m); showerhead is WELS 3 star (9L/m).

PASSIVE DESIGN
- Double-glazed north-facing wall to maximise solar gain
- Velux skylights to all rooms increase solar gain and allow for purging of hot air as required
- Main bedroom mezzanine over the living/kitchen area minimises the area requiring active heating.

INSULATION
- Roof insulation achieves R7.5 total with:
  - Bradford R1.5 Acousticon Faced Glasswool Blanket
  - Bradford R2.5 Soundscreen batts 90mm
  - Bradford R3.1 Soundscreen batts 110mm
- External walls achieve R6 total insulation value with two R5 Bradford Soundscreen batts
- Internal walls achieve R3 total insulation value with R2.5 Bradford Soundscreen batts.

ACTIVE HEATING & COOLING
- Reverse cycle air conditioner installed. Peter explains that the current tenants use this for just 20 minutes in the morning during winter.
  - Heatmaster open wood fire.

BUILDING MATERIALS
- Existing bricks reused
- Reclaimed bricks from demolition stage used for walls
- Reclaimed structural hardwoods from demolition phase used for roof structure, new exposed floor structure, internal doors and door frames
- Recycled hardwood floorboards sourced from the demolition of a scout hall in northern Tasmania
- New glue laminated structural hardwood beams fabricated from offcuts and shorts
  - Polished concrete floor.

WINDOWS & GLAZING
- Velux high performance double-glazed skylights
- Timber framed external window frames fabricated from recycled timber by Woodn’t It Be Nice
- Viridian Thermotech Comfort Plus double glazing
- Breezway Altair louvre windows with 6mm toughened glass with a low-e coating.

PAINTS, FINISHES & FLOOR COVERINGS
- Dulux low VOC Wash & Wear paint
- TasPaints waster-based polyurethane applied to all timber surfaces.

Credits

DESIGN
Booth & Watts

BUILDER
Owner-builder

PROJECT TYPE
Renovation

PROJECT LOCATION
Hobart, TAS

COST
$320,000

SIZE
House 160 sqm, land 189 sqm

© Natural light floods through large north-facing, double-glazed windows and nine skylights into a mezzanine bedroom and open plan living and kitchen area below. New glue laminated structural hardwood beams were fabricated from timber offcuts and shorts.
The simple life

The pared back design of this modular home promotes sustainability, simplicity and liveability.

WORDS Jacinta Cleary
PHOTOGRAPHY Brendan Finn
This modular 7.8 Star home sits on an east–west axis with large north-facing double-glazed windows that let sunlight flood into the home for passive solar design.

“The house was so lovely to live in last summer; it just stays quite comfy in the heat. We’ll add some drop blinds on the east for more shade though.”

Designer and homeowner Robyn
Hassall had an ambitious plan: create a small, energy efficient home for people who don’t want to go through an extensive design process. The couple had created numerous one-off homes as the team behind Castlemaine’s Lifehouse Design, but saw a gap for a streamlined and adaptable modular home.

Over four years they developed a concept and refined its design to produce a space-efficient home based on versatile 3 by 5.4 metre modules. It’s not delivered in sections like a prefabricated home, but is built entirely on-site.

Once their concept was honed it was time to build a prototype. It was also a chance for the couple to create their own peaceful home, to downsize and step back from their busy lives. They found a block at Campbells Creek near Castlemaine in central Victoria, a semi-suburban area with the quiet of the forest a five-minute walk away. The 710-square-metre lot is on an east–west axis providing a generous northern side for passive solar design. “We wanted to prove you could build something environmentally sustainable on a small site,” says Robyn.

The concept’s simplicity is evident in the linear layout of the new Campbells Creek home. The house is only as big as it needs to be, providing the shell for an uncluttered life. Their personalised rectangular plan comprises six design modules in a row, creating a compact 90 square metre home. Side by side are the bedroom, study, bathroom and an open plan living, dining and kitchen area. No more, no less.

With such a pared back design, there are no excess materials or unnecessary details to increase costs. The exterior is modern and light with timber walls and an unobtrusive flat roof. Paints and varnishes have barely been used. The house is constructed from materials that look beautiful in their natural state, such as the trowel-finished concrete slab and the silvertop ash walls simply finished with natural oil. The rear south wall is designed around entire compressed fibre cement sheet panels to reduce waste and labour costs. The full-sized sheets can be unscrewed and reused if the house is ever dismantled.

DESIGNERS ROBYN GIBSON AND PAUL
The southern wall is made of CSR Cemintel Barestone compressed fibre cement sheet with a natural finish. Silvertop ash cladding is finished with a natural oil.
Inside, the home’s long, narrow form allows air to flow easily from one end to the other. “We’ve designed it as one long pavilion to really maximise the northern aspect and get good ventilation,” says Robyn. Casement windows throughout the home help catch the breeze on warm nights. “The house was so lovely to live in last summer; it just stays quite comfy in the heat. We’ll add some drop blinds on the east for more shade though.”

The home runs the block’s southern length and as a result the concrete slab is flooded with the sun’s natural warmth on clear winter days. Sun also hits a blockwork feature wall in the living area, which stores additional heat from a strategically placed wood-fired stove in front. These passive design features of mass and northern orientation help to naturally warm the home, and a small floor plan ensures it happens quickly. Winter days in Castlemaine can be clear and crisp, with Robyn arriving home one sunny afternoon to a balmy 22 degrees Celsius inside thanks to a good dose of sunshine hitting the slab. “We just don’t need much heating. We find when we do light the fire it just heats the whole house.”

The home retains heat in the cool months due to high levels of insulation in the roof, walls and double-glazed windows throughout. Its house energy rating was boosted to 7.8 Stars with the choice of a waffle slab; the concrete was poured over a layer of pods that help insulate the slab from the ground’s temperature changes. The 2.2 kilowatt solar photovoltaic system covers the home’s low electricity needs.

A 600mm-deep spine running along the southern side of the house (to the right in the image) fulfils different purposes in each room, including a window seat in the living room, wardrobes, cupboards and a desk in other parts of the house.

Structural plywood was used to line the ceilings throughout the home. It was also used for shelving in the hallway, the living area and for the bathroom unit and robe doors.
The home's passive design, including thermal mass and double-glazed windows along its northern side, helps to naturally warm it in winter. The small floor plan ensures it happens quickly. A wood-fired slow-combustion heater adds additional warmth.

One of the challenges of designing a small dwelling is creating storage space while maintaining a clean layout. A clever design feature is a 600mm-deep ‘spine’ that runs along the south of the house, fulfilling different purposes in each room such as a wardrobe, cupboards, desk and window seat. “Architect Glenn Murcutt and others have been designing houses in this way for many years, but the way it applies to our very small house is very effective and a lovely design feature.”

“There’s a simplicity with living here, it’s just quite beautiful,” says Robyn of her new home. “I love its warmth and lightness on winter mornings, the flow of spaces, and the textural interest created by the mix of finishes and materials.” It seems this building designer has created her ultimate place, an elegant, uncomplicated abode, and one that’s intended for others to replicate and enjoy.
**Campbells Creek house**  
—Specifications

<table>
<thead>
<tr>
<th>Credits</th>
<th>Sustainable Features</th>
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| **DESIGN** | **HOT WATER**  
Robyn Gibson & Paul Hassall, Lifehouse Design  
**WATER SAVING**  
Vic Restorations Building Services, Castlemaine  
**PROJECT TYPE** | **BUILDING MATERIALS**  
New build  
**PROJECT LOCATION** | **WINDOWS & GLAZING**  
Campbells Creek, VIC  
**SIZE** | **LIGHTING**  
90 sqm + 30 sqm shed/studio  
**BUILDING STAR RATING** | **PAINTS, FINISHES & FLOOR COVERINGS** | **OTHER ESD FEATURES** |
| | **WATER SAVING** | Valley Windows hardwood frames  
| | **WATER SAVING** | Double-glazed glazing units throughout.  
| | **WATER SAVING** | LED lighting from About Space, Fitzroy  
| | **WATER SAVING** | - 3 watt LED exterior wall lights  
| | **WATER SAVING** | - 5 watt LED strip lights to kitchen overhead shelves.  
| | **WATER SAVING** | **PAINTS, FINISHES & FLOOR COVERINGS**  
| | **WATER SAVING** | - Livos Kunos Natural Oil sealer applied to slab and plywood ceilings; Alis Decking Oil applied to silvertop ash cladding and hardwood windows and doors  
| | **WATER SAVING** | - Haymes low VOC paint throughout the interior  
| | **WATER SAVING** | - Granite Rustic Sisal carpet on 9mm recycled cotton carpet underlay by Floorspace, Camberwell.  
| | **WATER SAVING** | **ACTIVE HEATING & COOLING**  
| | **WATER SAVING** | Metro Wee Rad wood-fired slow combustion heater in living area  
| | **WATER SAVING** | Electric panel heaters added as supplementary heating in study/living areas.  
| | **WATER SAVING** | Stud walls insulated with R2.7  
| | **WATER SAVING** | Knauf Earthwool batts & Air-Cell Permishield insulated blanket  
| | **WATER SAVING** | Roof insulated with R6.0 Knauf Earthwool batts & Air-Cell Glareshield insulated blanket.  
| | **WATER SAVING** | **INSULATION**  
| | **WATER SAVING** | - Waffle concrete slab on ground, high trowel-finished and sealed with a natural oil  
| | **WATER SAVING** | - Lightweight timber stud walls  
| | **WATER SAVING** | - Timber truss roof structure  
| | **WATER SAVING** | - Zincalume traydeck roof sheeting  
| | **WATER SAVING** | - Radial Timbers’ silvertop ash shiplap timber cladding  
| | **WATER SAVING** | - South wall (and shed/studio building) of CSR Cemintel Barestone compressed fibre cement sheet with a natural finish  
| | **WATER SAVING** | - Laminex laminate used for kitchen and hallway cupboards over E0 emissions rated board  
| | **WATER SAVING** | - Structural hoop pine plywood used for bathroom unit, robe doors, hallway shelving, and all living area joinery  
| | **WATER SAVING** | - Painted plasterboard walls internally generally  
| | **WATER SAVING** | - Structural plywood ceilings throughout (including eaves and verandah).  
| | **WATER SAVING** | **ACTIVE HEATING & COOLING**  

The modular home was constructed on-site to promote social sustainability by involving local builders and tradespeople.
Sustainable
HOUSE DAY
8TH SEPT 2013
DOORS WILL OPEN TO CURIOUS CROWDS
for Sustainable House Day (SHD) on 8 September 2013.

Homeowners around Australia are aided by community groups and volunteers as they set this Sunday aside to guide visitors through their homes in the name of sustainable design and living.

Solar passive house design, energy efficient appliances, solar power and solar hot water, sustainable products and innovative and recycled materials are just some of the features you can expect to see in homes on the day. It’s a chance to see what resourceful homeowners, whether they are owner-builders, renovators or designers, have done to make their homes energy efficient, environmentally responsible and built for life.

It’s the homeowners who really make SHD a success. They share their triumphs, challenges and their learning experiences from their journey to create a liveable and sustainable home. Many have found past SHDs so helpful for their own projects they are happy to share their own experiences.

“We opened for Sustainable House Day in 2012 to allow other people to benefit from our learnings as we have learnt from others. We also wanted to show people that building a sustainable house is not a daunting task,” says Melbourne homeowner Peter Whelan.

Running since 2001, the day always attracts thousands of visitors. In 2012, over 200 homeowners opened their doors to over 40,000 visitors around Australia. This year, a similar number are expected to open again. The 2013 event will also feature some special events. In Western Australia, Josh Byrne will officially launch his Josh’s House Project. In South Australia, the Zero Carbon House will be open for the first time to the public and in the ACT a people will be able to visit a carbon zero dairy farm.

This SHD special features houses from around the country that will open this year or have opened in the past. Inside, you’ll also find tips on the basics of sustainable design.

Sustainable House Day 2013 is proudly presented by the EnviroShop. It is also supported by Yingli Solar, Apricus and Greend.
Tips for a sustainable home

Sustainable design is really just common sense.

Insulate
BUILDING OR RENOVATING A HOME

Building a home can be one of the most challenging – and rewarding – experiences in a person’s life. The results will be with you for years, and perhaps a lifetime, so getting it right from the beginning is crucial.

Here’s our list of things to consider when designing, renovating or making small improvements to your sustainable home.

CREATE A COMFORTABLE HOME WITH PASSIVE DESIGN

A passively designed home makes the most of natural heating and cooling methods to keep its occupants comfortable year-round. Orientation, spatial zoning, thermal mass, ventilation, insulation, shading and glazing are the seven core components of passive design, explains sustainable designer Dick Clarke of Envirotecture.

Orienting your home correctly is particularly important in temperate and cool climate zones. When a building is able to let the sun in during cold seasons and shut it out when it’s hot, the other six principles of passive design can be balanced to create homes that require minimal active heating or cooling. Good orientation from a passive design perspective generally means locating living areas on the north side of the house, with glazing having clear access to sunlight even in mid-winter.

DESIGN FOR YOUR CLIMATE

Different climates need different houses. Australia has more than 80 climate zones but these are often simplified to eight, ranging from tropical to alpine. Make sure you employ a designer who is familiar with your zone and who designs climate-appropriate buildings – for instance lightweight and ventilated in hot, dry climates; well-insulated and with good solar access in cool climates.

In tropical and hot, dry climates, orientate the house to exclude the sun year-round and to maximise cross-ventilation. In all other climates, your aim should be to minimise summer sun and maximise winter sun, which basically means a northern orientation. Couple your passive solar design with thermal mass (materials such as concrete that absorb heat energy, or a ‘proxy’ such as a phase change material) to retain the warmth of winter sunlight and/or the cool of summer shade.

DESIGN FOR LIFE

Make sure your home is designed for the long haul, and that its materials are durable and able to be easily reused or recycled. Crucially, when designing your house, think ahead. Will your family grow, will it shrink or will it stay stable? How will your own health impact your needs in 10 or 20 years time? With these things in mind, you can design a house that not only meets your current needs, but can adapt to your changing needs without you later incurring the cost of an extension or renovation.

This approach doesn’t only apply when you’re designing a new home; it is relevant when you choose appliances for your kitchen, furnishings and more.
SIZE MATTERS
Australians have some of the biggest houses in the world. Yet the smaller a home, the easier it is to achieve higher energy efficiency standards, and the lower the upfront and ongoing costs, says Trivess Moore, research fellow at RMIT’s College of Design and Social Context.

SMART HEATING AND COOLING
Active heating and/or cooling may be necessary in many Australian homes but don’t rush to buy a heater or air conditioner when you may not need one. First, consider how you can improve your home to make it more comfortable. Australian homes are traditionally ‘leaky’ and draughts can be responsible for up to 25 per cent of your heating costs – a similar amount if you air condition. Seal any leaks, use curtains and blinds, make the most of the sun’s heat and shading to moderate your home’s climate, and insulate. If you need air-conditioning, make sure you also have ceiling fans, which significantly increase its efficacy.

INSULATE
One of the most effective ways to save money on energy bills and make your home more comfortable is to insulate. Insulation acts as a barrier, preventing heat passing in and out of a house. By reducing this heat flow you can more easily maintain a comfortable temperature inside, regardless of the temperature outside. In winter, once your home has been heated to a comfortable level, it will stay that way with less energy input than an uninsulated home. In summer, an insulated home will take longer to heat up, requiring less energy for active cooling. Insulation is not just limited to the roof – you can insulate your walls and floor for maximum energy efficiency.

BE ENERGY SMART
Lighting makes up about 11 per cent of the energy consumed in a typical home, about the same as refrigeration. Households can reduce energy use for lighting by 50 per cent or more by making smart lighting choices and using more efficient technology. Spending a little time and effort to get the lighting right in your house can save you money on energy bills and make rooms more comfortable and enjoyable.

It is important when considering the energy consumption of lighting to look at wattage, not voltage. Wattage measures electrical power, while voltage measures the electrical pressure or force a device runs at. Some bulbs, especially halogen downlights, are sold as ‘low voltage’, with many people thinking this equates to low energy consumption. This is not the case. The important factor is the power rating – 50 watts, for instance, is exactly that regardless of the voltage at which it is supplied and used.

USE SUSTAINABLE MATERIALS
Your choice of building materials can have ramifications far beyond your home. Inappropriate use of materials in building means one thing: waste. All materials have an embodied energy, which is the energy used over their lifecycle, from processing of raw materials, to manufacturing through to product delivery. If you build your house with poorly chosen materials, their embodied energy could diminish or cancel out the benefits of years of sustainable living.

Generally, the more processed a material is, the higher its embodied energy. So choose sustainably sourced timbers, recycled and locally sourced materials, and low volatile organic compounds (VOC) paints and finishes. When building, keep material use to a minimum. If you’re renovating, reuse what you can from the pre-existing building.

Recycled bricks and timber were used in the redesign of this Melbourne home by Breathe Architects. Image: Andrew Wuttke
WINDOWS
Windows and glazed doors can let in (and out) substantial amounts of heat. So even if you’ve installed insulation, go for double glazing. As a general guide, the total window area of your home or a room should be less than 25 per cent of the total floor area. Most windows should be located on a home’s north side where good solar access is easiest to manage.

BE WATER WISE
Use three or four WELS star-rated shower heads, toilets and water fixtures. Catch your rainwater in tanks for use in the bathroom and garden and look into getting a wastewater treatment system. Use drought-tolerant landscaping.

SELECT EFFICIENT APPLIANCES
An inefficient appliance can mean a lot of wasted energy as well as more heat in your home – which can be a problem in summer or in hotter climates.

When looking for an appliance, try to select the most efficient one that meets your needs and budget. Don’t forget to check product reviews – a high-efficiency appliance that has a high early-failure rate will cost you and the planet more in the long run.

STAY ENGAGED
Stay tuned in to your home – its needs and yours – to make the most of passive solar design. Open and close blinds, doors and windows to let sunlight and breezes in or keep them out. Remaining engaged can help lessen your environmental impact and ensure your home is performing as well as it can, all the time. “As a sailor adjusts the sails on a yacht, sail your home through the year’s changing climate, working with the forces of nature to power its natural comfort,” says Dick Clarke.

Sanctuary: modern green homes is available in digital format.

To enjoy four issues of sustainable home design, building & living advice each year, choose the PDF option when you subscribe online.

www.sanctuarymagazine.org.au
This Melbourne 8.6 Star home is on a tight block that looks north across the street. Raising the thermal mass and the living areas to the upper floor, and using cleverly placed voids to bring light to the ground floor, made the most of the tricky site.
Junction house

A Melbourne couple opened their home for Sustainable House Day in 2012 to show others that building a sustainable house is an enjoyable and gratifying experience.

WORDS Beth Askham
PHOTOGRAPHY Simon Black

PETER AND SALLY LOVE LIVING IN THEIR INNER-CITY newly built 8.6 Star energy-rated home in Melbourne’s west.

The house was designed by Peter, Sally and Melbourne-based building design firm Positive Footprints. Sustainable features include double-glazed windows that let the winter sun in to warm the upstairs suspended concrete slab. In summer the same slab keeps the house cool – even though it tipped the couple over their budget, they think it was worth it.

The house also has good insulation, water-saving taps in the bathroom, bamboo flooring and stairs, and LED lights that reduce their energy bills. The backyard is alive with raised garden beds and rainwater tanks.

“We set out to make the home sustainable for a number of reasons: to feel good when we hear the rain pour into the water tanks, get hot water from the sun, make a long term investment for our retirement to reduce bills (which we have already benefitted from), have a clean house with materials with no noxious fumes, but most importantly, to reduce our carbon footprint,” says Peter.

Peter and Sally enjoy their low energy bills and love that their home maintains a constant comfortable temperature and is warm on winter mornings. The sunlight that pours through the double glazing and the joy of having a bath in water heated by the sun are just some of the pleasures of their new house, he says.

Family visitors from the country often come to stay. Peter says the kids love the balcony and the quiet cul-de-sac where they can ride their bikes safely.

Peter and Sally opened their new home to visitors as they wanted others to benefit from their positive building experience. Peter has some frank advice for people who are considering building or renovating: be bold and don’t scrimp on important measures like double glazing. “Work out your vision and your vision may not be that hard to reach,” he says.

Polished concrete slab floors upstairs and downstairs provide thermal mass in this highly insulated home with a tight building fabric. Double-glazed windows and doors have FSC European Redwood timber frames.
Perth’s Green Swing

A small-scale urban development in Perth shows that sustainable home design and building is a perfect fit for medium density living.

PHOTOGRAPHY Sebastian Mrugalski

FIVE KILOMETRES FROM PERTH’S CBD, THE GREEN SWING development includes two townhouses and two apartments all rated as super efficient 8 to 10 Star homes. The small-scale development has small building footprints and large communal outdoor spaces.

One townhouse is reverse brick veneer and the other is strawbale combined with reverse brick veneer. The two apartments are both insulated double brick.

As high energy-star rated homes, the dwellings should require no mechanical heating and cooling to keep their occupants comfortable. Concrete slabs and brick walls are combined with high levels of insulation and double glazing to hold the sun’s heat in winter. Windows to the south allow for sea breezes and natural ventilation to cool spaces in summer.

Mark Dowley lives in the reverse brink veneer townhouse with his wife Alana and their three kids. Mark and Alana are co-founders of the development alongside Helmuth and Eugenie Stockmann. Mark’s family have lived in the house for around six months.
In winter the house performs wonderfully, says Mark. “You don’t realise the cool temperatures until you step outside.” In summer the house hasn’t performed as well as they expected as there are still finishing touches to be made, including awnings over downstairs windows and deciduous garden trees that will provide shade in summer once they are fully grown.

“The nice thing about the new development is that you have close neighbours and lots of garden space,” says Mark. “Yesterday, there were three different sets of kids running all over the block, which is really nice. The family spends a lot of time outside.”

Mark is interested in building more developments like this in the future. “I would love to see more developments in this style being built, giving a suburb a different feel,” he says.

All dwellings in The Green Swing have flat plate solar hot water and solar photovoltaic systems. The townhouses each have a 4500 litre metal rainwater tank while the apartments share a 4000 litre poly tank. The block also borders onto a community garden Green Swing residents have established next door in partnership with a local community garden association. The garden is located over a stormwater drain owned by the local council.

At a recent open day, over 200 people came to visit The Green Swing. The homes will be opening again for Sustainable House Day 2013.

LINKS
thegreenswing.net

PROJECT TYPE
New build

PROJECT LOCATION
Lathlain, WA

DESIGN
Griff Morris, Solar Dwellings

 BUILDER
Right Homes
Treehouse retreat

The chance to peek into treetop living at Currumbin Ecovillage, seven minutes inland from the Gold Coast, has been a Sustainable House Day highlight.

PHOTOGRAPH Shantanu Starick

PROJECT TYPE
New build

PROJECT LOCATION
Currumbin Ecovillage, QLD

DESIGN
Rob Norman, Symbiosphere

INTERIOR DESIGN
Sally Stent, Refound

WHEN THEY WALK PEOPLE THROUGH THE TALLOWOOD

Treehouse, building designer Rob Norman and interior designer Sally Stent show people through a house with a difference.

Homeowner Heike has happily opened her doors on Sustainable House Day to other homeowners interested in sustainable design. “I wanted to show my house so people could see that you can have a sustainable house that can be really stylish – you do not have to compromise anything,” she says.

Named after a lovely tallowood growing on the block, the treehouse is a spectacular home. The living spaces and verandahs look out over canopies of leafy Queensland gum trees.

Good design has ensured the house uses very little energy. It’s toasty warm in winter due to appropriate window placement and internal thermal mass and cool in summer, needing only ceiling fans to help move air around on still days. Other sustainable design features include rainwater tanks providing all house water, recycled hardwood telegraph pole floors, 60 per cent recycled slurry bathroom tiles, a 1.5 kilowatt solar power system, a solar hot water system, and a resource monitoring system tracking energy and water use.

Heike has no idea how many people have seen her home but knows that many have learnt from it. She recognises her ideas in other homes as friends ask ‘do you recognise that?’ and point out Heike-inspired features in their own homes. Contact details for tradespeople have also been passed around; a local furniture maker has had plenty of jobs as a result of people seeing his work there.

“It’s so simple to [build a sustainable home],” says Heike. “It’s not even rocket science – why don’t we all do it?”

Heike sees her home as a retreat with functional spaces and an atmosphere of wellness. There are nooks and crannies that make it cozy and indoor spaces have a real connection with nature. When you stand in the shower it’s like you are outside. “The living room and verandah open up and become one big space and the trees are right there.”

See Sanctuary 15 for a full feature on this project
www.sanctuarymagazine.org.au

A slim compact footprint respected the sensitive ecosystem and meant no mature trees were felled in the home’s construction. 3,250 litres of rainwater storage are part of a raft of water saving measures in the home.
Tropical interaction

A family home designed for interaction and comfort in the tropics sits high above the leafy suburb of Redlynch Valley, west of Cairns.

OWNERS HAYLEY AND CRAIG BUILT THEIR HOUSE IN 2008 and say that its liveability is just as fabulous a few years later.

The whole house, shaped like a horseshoe, is only one room wide, with a connecting verandah running past each room. Louvre panels enclosing the verandah can be opened to let breezes flow through the house. The verandah also provides extra space for family interaction and meant rooms could be small, saving on construction costs.

From the street, the house looks a little different to others in the neighbourhood but there are surprises in the design. “Exposure to the hot western sun is minimised,” says architect Gordon Beath, of Edge Architecture. “There is a breezeway in the centre of the house to catch the south and south-easterly cooling breezes and the living spaces face northward towards the views.”

Connecting the home to its local environment was central to its design. Gordon says that breezes through the house keep the homeowners in touch with the temperature outside. Hayley adds that they hardly ever turn on the air conditioner they initially installed, using it for maybe three to four short bursts during the wet season. Power usage is minimised due to natural lighting prevailing throughout the house.

The pivoting louvres enclosing the verandah can be shut for security or when a cyclone approaches. During storms, air and rain is allowed to move through the louvres but any projectiles are stopped. Hayley says this helped the house get through Cyclone Yasi in 2011 completely undamaged, even though a whole tree had blown into their pool and their neighbour’s homes was damaged.

Gordon says the house was designed not only for thermal comfort but also for social comfort. The design makes it possible for Hayley and Craig to keep an eye on their young children from anywhere in the house, even when the kids are in the pool outside.

Most importantly, Hayley says the house is lovely to be in; the verandah leads you around from space to space and the harsh light from the tropical sun is softened as it shines inside. “I just can’t imagine ever moving out,” Hayley says.

Every room in the house has a view as the house is only one room wide. Aluminium louvres enclosing the verandah can be opened or shut for security or in a cyclone. Image: Gordon Beath
An Adelaide home shows visitors that a cleverly designed home takes its environmental footprint seriously.

PHOTOGRAPHY Andy Rasheed

ARCHITECT MARK THOMAS, FROM SUSTAINABLE design company Goodhouse, was proud to open his home at Aldgate in the Adelaide Hills for Sustainable House Day. When he set out to build the house, Mark wanted it to be affordable and functional for his family of six. He also wanted the house to be as sustainable as possible.

To meet these goals the house is designed using passive solar design principles. In winter, sun pours through north-facing windows and warms the concrete floor and rammed earth walls. The warmth is then kept inside thanks to a highly insulated building envelope. If extra heating is required, it comes from an under-floor hydronic system that uses solar hot water boosted by a CO₂ heat pump. In summer the house is kept cool by ceiling fans, while well-placed windows create welcome cross ventilation.

Mark built his home to use fewer resources as he believes we all have a responsibility to do so. “I am not in this game because of my belief that sustainable housing is ‘nicer’ than the brick veneer alternatives. Clearly it is, but that is not my main motivation. We just have to do housing better in Australia. That’s why Oli [Scholz] and I launched Goodhouse,” he says.

“When you consider that Australia uses the most energy per capita in the world, our houses are too big and often inappropriately designed and constructed and there is no excuse. Well-designed and appropriately constructed houses cost no more than much of the current housing stock in Australia.”

Mark appreciates the home’s strong connections with the outside environment, its thermal comfort and overall environmental friendliness.

His advice for people who are renovating is to “investigate and monitor your home first, find out what the big-ticket energy consumers are and then plan the renovations around this information”. He says there is limited value in spending lots of money on double glazing if there is little insulation or changing the entire house to LED lights when there is an old electric water heater.

Asked if he would do anything differently were he to build his home again, he says there is always learning and refining to be done. “I have two rooms with a lightweight but insulated floor. If building again I would definitely build all the house on slab; the connection to thermal mass to help moderate internal temperature is crucial.”