

# MODERN GREEN HOMES

# Sanctuary

SUSTAINABLE HOUSE DAY 2017

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WITH STYLE

PASSIVE HOUSE  
ON A BUDGET



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### FEATURES

- Windows: In the frame
- Live in 9.8 Star comfort
- Solar batteries enter the suburbs

- Tips for selecting eco materials
- Stormwater gardening
- Construction without waste

# SUSTAINABLE HOUSE DAY / 2017

OPEN HOUSES | SUNDAY 17 SEPTEMBER



170+ HOMES OPEN

Want to tour some of Australia's most progressive homes?

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**[www.sustainablehouseday.com](http://www.sustainablehouseday.com)**



## SANCTUARY IS YOUR INSIDER'S GUIDE TO SUSTAINABLE HOUSE DAY 2017

Every house we feature in this *Sanctuary* special edition is opening to the public for Sustainable House Day on 17 September 2017, so not only can you read about these impressive homes, you can visit them too. We hope you enjoy this sneaky peek at nine of 170+ homes opening nationally. And make sure you head online to find clusters of sustainable open homes in your area!



# A home for life



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Metro Melbourne's first certified Passive House is throwing open its doors for Sustainable House Day to show that high performance housing can be achieved on a tight budget.

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"This house is designed to operate perfectly well without any interventions. You can have fresh air inside all the time without anybody opening or closing doors and windows," explains Clare. "But you get more efficiency if you do ventilate passively as well." The HRV system is sufficient to vent stale air so no exhaust fans are required in bathrooms, laundry or kitchen, which avoids penetrations of the thermal envelope. But a recirculating extraction fan is still needed for cooking – the Bora induction cooktop has one built in.



The owners have preferred low-maintenance materials, such as aluminium-clad window shades (dubbed 'the eyebrows') over timber. They also chose screw piles instead of stumps to avoid use of concrete.

**WORDS** Kulja Coulston  
**PHOTOGRAPHY** David Johns

**WHEN SUSAN BOURKE SOUGHT TO** purchase a 'home for life', she never expected the journey would result in building a Passive House largely of her own design. "I was looking for a low-maintenance, single-level place for my older age. I didn't want to have to move again." But these seemingly straightforward criteria made it difficult to find anything suitable in Melbourne's south-east suburbs. "After searching and seeing a lot of dual occupancies with stairs, [my partner] Pete said: 'Have you ever thought about building?' And I thought 'really?' I had never even considered it."

While Susan was a construction rookie, partner Peter Newton had two passive solar designed houses under his belt. When an ideally oriented vacant block became available in Brighton East, close to shops

and public transport, Susan jumped at it knowing she had the right support behind her. "Then we had to start the process of looking at exactly what we were going to do!"

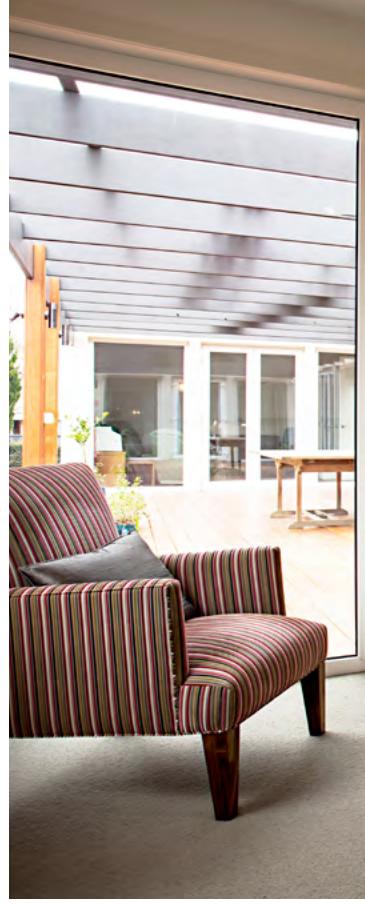
The house's floor plan – compact with three bedrooms and a north-facing open-plan living area – came together quickly. It barely changed from Susan's original design brief, which included a skillion roof to allow for a high cathedral ceiling and space for an attic. But their design thinking shifted considerably as they investigated materials that would fit within the "very rigid" budget of \$2000 per square metre.

Perhaps ironically, with Peter's background with passive solar design, it was the cost of a concrete slab that turned their attention towards lightweight construction, and ultimately Passive House – a building



Despite the supportive design team there were still setbacks, including torrential rain which set the timeframe back several months: "This area's called the sand-belt, but unfortunately we're in the only part with red clay soil," laughs Susan. The garden will be landscaped to become a productive garden, with a deciduous grapevine trained over the pergola to shade the living space in summer, but allow sun penetration in winter.





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"What we've modelled and predicted is that they won't need heating or cooling for around 98 per cent of the year," says Clare Parry. When combined with a solar photovoltaic system, the gas-free house will become carbon positive and essentially do away with energy bills. The house has large hallways to accommodate a wheelchair, grab rails and other fittings should they be needed for ageing in place.

quality assurance standard developed in Germany and now gaining a foothold in Australia. It mandates airtightness and prefers insulation over thermal mass. "It took a long time to change my headspace," admits Peter. "But an insulated slab was going to be over \$50,000, and a stump-based system came in at half that price. And so the house became a garden-variety stick frame with a highly insulated cladding."

Knowing very little about Passive House they engaged engineer Clare Parry of Grün Consulting who became their project 'oracle'. "I think there has to be at least one Passive House champion because the process is quite different from the way other houses are built and rated," says Clare, who is also director of the Australian Passive House Association. "The role we played was to do all of the building physics calculations and see where it sat for Passive House certification." This included advising on thermal performance, the building fabric

and HRV (heat recovery ventilation) system, as well as the hot water service and all other technical aspects.

To meet the Passive House standard, a highly insulated thermal envelope is created and made airtight by wrapping the building in a breathable 'skin', with an HRV to control airflow. In practical terms, this means avoiding penetrations of this skin and eliminating all thermal bridges to the outside. The completed house is then tested to ensure airflow is less than 0.6 air changes per hour (ACPH). This is very low compared to a typical Australian house which has 15 ACPH, "the equivalent of having a door or window open 24/7," says Peter, who is monitoring the house and is confident it will perform better than the 8.3 Star energy rating because of the Passive House specifications.

The HRV, which Peter and Susan have dubbed the "lungs" of the house, draws 25W in normal running mode and operates continuously to avoid issues such as

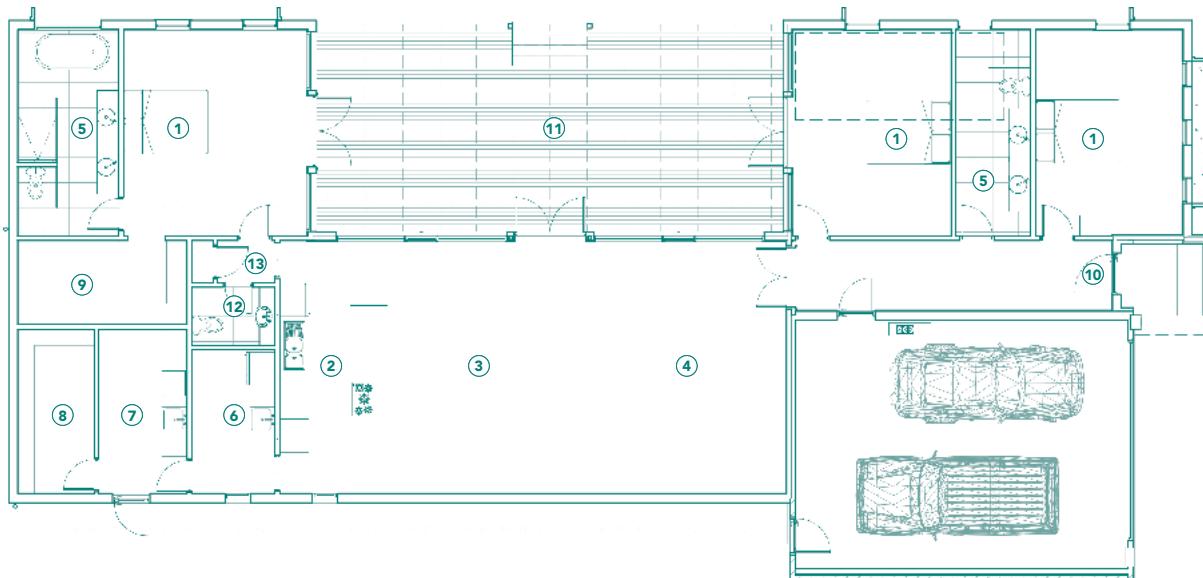
condensation and mould.

Finding a builder that could cost-effectively meet such stringent standards was the most challenging aspect of this project. The couple found just mentioning 'Passive House' seemed to inflate quotes. "It was frustrating. Especially when we did a lot of work to bring the design back to something recognisable to the current building industry, so there was no technology or up-skilling required," says Peter.

Clare says there are currently just 10 Passive House certified homes in Australia plus several dozen more in progress, which she cautions might lead some builders to apply a risk premium. She also notes that experienced Passive House practitioners sometimes use proprietary building systems that may cost more, for various reasons. In the end they were fortunate to find a perfect match with Michael Harrison who had a passionate interest in the project, but no prior Passive House experience.



FLOOR PLAN



## LEGEND

- ① bedroom
- ② kitchen
- ③ dining
- ④ living
- ⑤ bathroom

- ⑥ pantry
- ⑦ laundry
- ⑧ store
- ⑨ walk in robe
- ⑩ entry

- ⑪ deck
- ⑫ toilet
- ⑬ pulldown stairs to attic  
(above)
- ⑭ entry



⑮

The heat recovery ventilation system (HRV), is dubbed the "lungs" of the house. It draws 25W in normal running mode and operates continuously to avoid issues such as condensation and mould.

Susan says Michael's enthusiasm was infectious: "We'd be talking to the other trades and they'd say 'Oh wow, this is the way to go'. It's been an educating process for them too." She and Peter lived locally to spend a lot of time on site and did much of the running around sourcing materials and controlling costs; as a retired teacher she enjoyed the learning aspects of the project.

The couple are keen to open their home to others to demonstrate that higher performing housing need not cost more to build, but will cost less to run: "I really have a great desire for people to realise they can afford to get a really nice house that's incredibly efficient beyond what you can imagine," says Peter.

Clare agrees: "I think that is one of the key messages of this project – it doesn't require a total overhaul of Australian building standards to deliver higher quality. We just want what we are doing now to be done better." ☈

# Caramar Passivhaus

**DESIGNER**

Ian Kidston, All Extension Design Services

**BUILDER**

Michael Harrison,  
RMH homes

**PASSIVE HOUSE CONSULTANT**

Clare Parry, Grün Consulting

**PROJECT TYPE**

New build

**PROJECT LOCATION**

Brighton East, VIC

**COST**

\$555,000

**SIZE**

House 200 m<sup>2</sup>

Garage 50 m<sup>2</sup>

Land 640 m<sup>2</sup>

**BUILDING STAR RATING**

8.3 Star; Certified to Passive House standard

**HOT WATER**

- Sanden Eco 315L heat pump.

**RENEWABLE ENERGY**

- Solar power system in planning
- Temperature, humidity and energy monitoring system (with 10 sensors) and real-time data display to allow responsive management of the house, and comparisons with similar buildings. Installed by Peter Hook, Hook Automation.

**WATER SAVING**

- 4000L rainwater tank for garden and toilet flushing.

**PASSIVE DESIGN / HEATING & COOLING**

- Designed to Passive House standard, which incorporates most of the common passive solar principles except thermal mass and cross-flow ventilation
- Fully glazed north face to act as a solar collector in winter, shade pergola with deciduous planting to prevent overheating in summer; no west glazing, limited glazing to south
- External building envelope wrapped in an airtight liner and high levels of insulation; all thermal bridges (heat conductors) that might link the exterior temperature to the interior have been removed.

**ACTIVE HEATING & COOLING**

- No active heating or cooling expected to be required for maintaining internal, year-round temperature range of 20 to 25 degrees Celsius (now owners have moved in, this is being monitored)
- Brink 400+ model HRV (heat recovery ventilation) system installed and runs 24/7 to: remove risk of condensation due to airtightness; eliminate the need to open windows, which keeps air changes per hour to <0.6; maintain quality indoor air quality by replacing stale air with filtered air.

**BUILDING MATERIALS**

- Screw pile stumps used to minimise soil site scrapping. Remaining structure is standard timber frame, timber floor and substructure with Zincalume roofing.
- Insulation: underfloor R2; bulk insulation R6 in ceiling and R4.8 in walls (R2 in stud frame plus 100mm rendered styrofoam cladding)
- Liners to create thermal building envelope: Intello high performance vapour retarding and airproofing system; Solitex Mento 3000 breathable, waterproof membrane, supplied by Laros
- Low-maintenance materials including aluminium window shades
- Floor: porcelain tiles on yellow tongue flooring
- External walls lined with standard plasterboard on 45mm battens mounted horizontally, to allow all services to be on the inside of the internal airtight lining.

**WINDOWS & GLAZING**

- Rehau frame extrusions imported from Europe but made/assembled in Australia with low-e, argon-filled, uPVC double-glazed windows and doors, from VUE windows.

**LIGHTING**

- LED lighting throughout from Light up Australia, Faulkner Victoria.

**OTHER ESD FEATURES**

- All-electric house (no gas connection), with a Bora induction flush-mounted cook top
- The landscape plan is to incorporate edible gardens with espaliered fruit trees, wicking beds for vegies and herbs
- Ageing-in-place accounted for in the design: including no stairs, easy access from the garage, hard floor surfaces, wide doorways, hallways and circulation areas.