

MODERN GREEN HOMES

Renovation Special

Sanctuary

INSIDE ISSUE 41 Summer shading ideas; tiny site big plans; focus on furnishings; 8.4 Star retrofit; SIPs tips; cool basement benefits; go up in style; purr-fect design; modular mountain magic + more

RENOVATIONS & ADDITIONS

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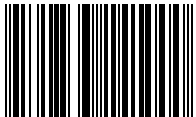
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Renovation automation

It is possible to transform an old house with its temperature extremes into a comfy 8.4 Star home – and with the latest home automation tools, you can continue making improvements that reduce energy bills too.

WORDS Rachael Bernstone PHOTOGRAPHY Shane Harris, Arch Imagery



The distinctive use of both Corten steel and Maxline custom profile cladding provides an eye-catching result.

AS A DESIGNER WHO SPECIALISES IN sustainable buildings, and who spruiks their benefits to homeowners and university students at every opportunity, Paul Hendy is well acquainted with the fundamentals that make for a comfortable and efficient home. “I have a reputation for boring people senseless about this topic, but I choose to teach because I can influence more people that way,” Paul says. “If I can convince one or two students each year to fully embrace these ideas, that creates a positive effect going forward.”

Paul regularly presents to homeowners and renovators at events hosted by the Adelaide Sustainable Building Network – which he’s been involved with since it was established in 2008 – and he always highlights the importance of good solar orientation and passive ventilation opportunities. But when it came to buying his own home, Paul ignored his own advice.

His family, including wife Irina and

their 4-year-old daughter, had moved into a traditional single-storey cottage in Adelaide’s inner east as tenants in 2013; when the house was listed for sale in 2015, they bought it, thus avoiding the trouble of moving.

“When I do presentations, I outline all the reasons why you should buy a house, but here, where the street faces north, even in the middle of winter the verandah shelters that elevation completely: there is no solar gain whatsoever,” he says. “Inside, there was a traditional plan of two open rooms and two closed rooms, and a kitchen and bathroom in the lean-to at the back. Also, the house was in poor repair: it ticked all the boxes about why you wouldn’t buy a home, but my wife loved it, so we bought it.”

Admittedly, it was in a great neighbourhood – the couple had lived around the corner for several years before their daughter was born – where real estate is tightly held. Also, because the family



KEY FEATURES

- 8.4 Star energy rating achieved for the whole house, despite sub-optimal solar orientation
- KNX automation system installed to ensure the passive and active heating and cooling systems work in unison
- No more temperature extremes! New basement room and ‘earth tubes’ keep an even internal temperature
- Reduced energy bills achieved through better thermal performance, energy efficiency and gas disconnection.



Clerestory windows to the north flood the living area with natural light, despite it being located to the south. The ducts are part of the air transfer system which moves air (summer and winter) at high volume, slow speed. In addition, a KNX automation system monitors and controls summer ventilation.



By choosing a standalone addition, Paul was able to leave the original roofline intact, saving time and cost and providing a clear distinction between the new and old. The high vaulted ceiling gives a sense of space, as does the kitchen island cum dining table.

already occupied the house, Paul could visualise ways of extending it to bring in northern light and increase its overall eco-credentials.

He started designing the renovation even before the settlement was finalised, opting to replicate the house's original 8m x 8m footprint in a new open-plan space at the rear. It comprises kitchen, living and dining zones, and boasts a raw industrial aesthetic inside that ties in with his chosen external material palette of weathered Corten steel and painted steel cladding.

An unusual addition is the new basement that is accessed via a stairwell

from the living room: it leads down to the main bedroom and bathroom that, when complete, will become the master suite. Paul says it's a very peaceful space with a stable comfortable temperature year-round, and as such, it plays an important function in the home's carefully thought out heating and cooling strategy. And unlike the front rooms of the old cottage, natural light fills the basement via the stairwell.

The new main space has porcelain floor tiles over a suspended concrete slab, augmenting the thermal mass of the existing brick and stone cottage. It features high north-facing double-glazed windows,



As part of the renovation, they chose to eliminate all gas appliances, including installing an efficient induction cooker in the kitchen. They are now one of a growing number of all-solar-electric homes in Australia.



The basement level (still under construction) taps into the stable ground temperature and helps keep a constant comfortable internal temperature year-round. Since the renovation, the lowest logged temperature has been 18.8 degrees Celsius and the highest last summer was 26.9.

which flood the space with natural light and help to passively heat and cool the house, depending on the season. The room also boasts a small wood-burning heater for winter's coldest days.

The indoor temperature of the entire house – existing cottage and new extension – is controlled by a KNX automation system that operates in three modes: passive, active and mixed. “In winter, it's purely active, when a network of large ducts shift warm air from the back room into the colder front part of the house,” Paul explains. “In summer, passive mode kicks in when various temperature sensors

in the front and rear sections determine that it's needed. The high-level windows automatically open to allow cool air from the earth tubes in the basement to circulate throughout the house.

"In mixed mode, which occurs when the outdoor temperature is too hot for the earth tubes to keep up with the demand for cool air, the house stays sealed. As the outdoor temperature falls in the evening the high windows automatically open and the house is purged of warmer air."

The system follows basic logic, Paul asserts, although he admits that the planning and installation was more complicated than a typical home renovation project. "It can be complex to wire up because you have to run circuits from the appliances back to the base," he says. "The system is optimised for use with home energy storage, which we'll install in a couple more years when the technology is sufficiently mature."

"At the moment, we still draw power from the grid during the evenings, but even on a dull day we make about 1.9kWh of electricity," Paul says. "As long as I scale the battery so we have sufficient capacity

to charge it between a spell of dull days, we should be okay. Batteries are still quite complex and I see them being sold very poorly at the moment – but we are hoping that a 10kWh unit will suit our needs."

The house already has a 5.3kW photovoltaic system on the east- and west-facing roofs, which provides ample energy for their daily requirements, despite the fact that Irina works at home running a family daycare business.

Paul removed the gas connection during the renovation, opting to install an electric induction cooktop and Thermodynamic brand hot water system instead. "This is an all-electric house now because we were paying \$90 per quarter before to cook on gas and heat hot water," Paul says. "Now our hot water is heated during the day and doesn't use any grid energy".

For this astute designer, the metrics of sustainable design have to stack up financially, as well as be good for the environment. "I grew up in the south-west of England, and my father installed double glazing 43 years ago," Paul says. "At the time, he was not at all interested in saving the planet, but he was interested in saving

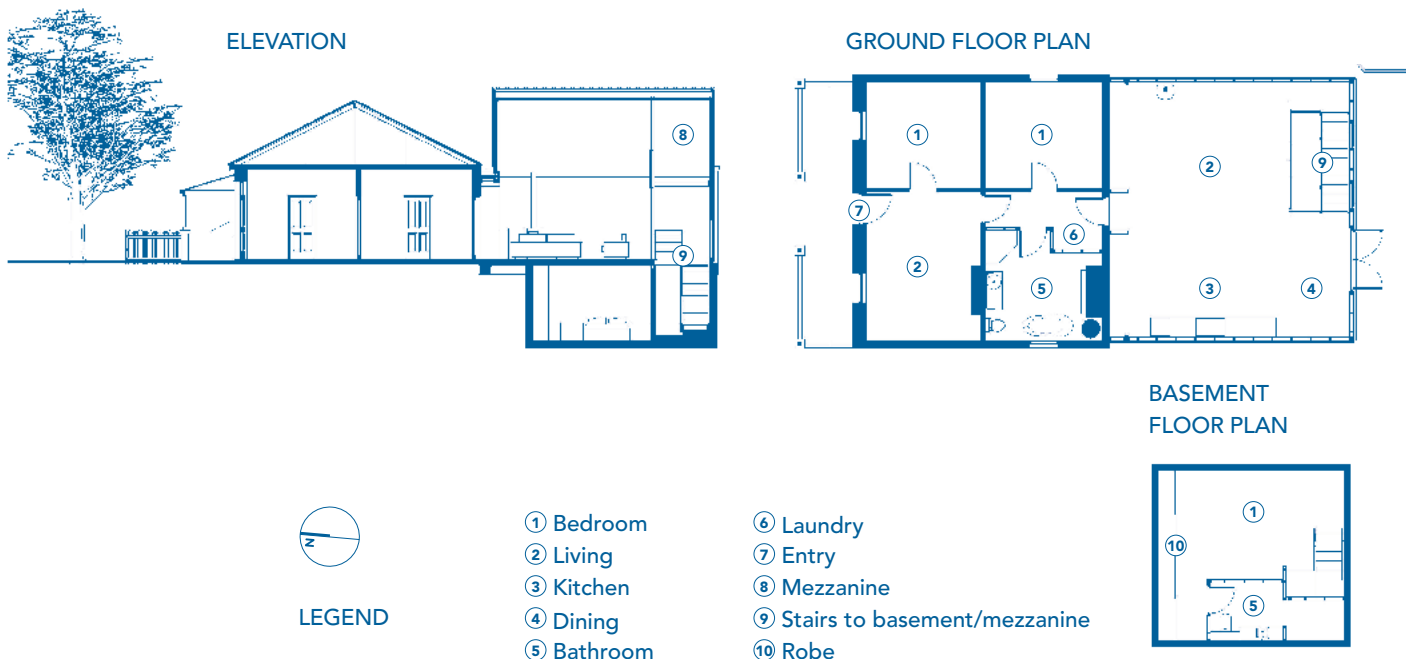
money. Electricity was expensive and our house was cold and damp, so having a more moderate indoor temperature was a desirable outcome."

Having trained as an industrial designer before graduating as an architect in 2008, and having lived in the United Kingdom and New Zealand before settling in Adelaide, Paul says that: "Australians are so far away from realising what's happening in terms of energy efficiency and sustainable design".

And with this project he's proved that it's possible to start with a building that faces the wrong way, is poorly insulated and poorly sealed, and consequently uncomfortable for most of the year, and still turn it into a very comfortable, liveable and energy efficient home.

Paul recently opened up his not-quite-finished house to more than 600 visitors on Sustainable House Day – the fifth such event he's been involved with – and he was extremely happy about the feedback he received from attendees.

"It was the best event we've had so far," he says. "And it all helps to spread the message wider." ⑤



Hendy Residence

—Specifications

Credits

DESIGNER

Paul Hendy, TS4 Living

BUILDER

WBS – Weber Building Services

PROJECT TYPE

Renovation and addition

PROJECT LOCATION

Beulah Park, SA

COST

\$245,000

SIZE

164 m²

BUILDING STAR RATING

8.4 Star (whole house)

Sustainable Features

HOT WATER

– Thermodynamic brand Solar System by Energie Australia, Adelaide (combined heat pump and solar thermal collector).

RENEWABLE ENERGY

– 5.3kW grid-connected photovoltaic system with 20 x Q-Cel Fourth Generation Q.Pro solar panels and Fronius Primo 5 inverter.

WATER SAVING

– All water appliances WELS approved with the highest performing fittings chosen where possible
– Underground 5000 litre rainwater storage.

PASSIVE DESIGN / HEATING & COOLING

– Northern sunlight achieved through high-level double glazing
– Combination of electrically openable high-level (4.2m above floor level) and low-level windows create ‘stack effect’ thermal cross ventilation for the whole home
– Thermal mass in the form of a 150mm suspended Bondek concrete slab and existing

solid brick and stone cottage; remainder of the concrete slab connected to the ground (uninsulated in the Adelaide Climate Zone)
– Basement constructed with 180mm thick concrete walls and floor – used as the main bedroom, ensuite and wine store. The room acts as a thermal ‘coolth’ store and assists in modulating temperatures in the home. Across the year, the internal temperature range is between 18.8 and 26.9 degrees Celsius (compared to the 15.4 and 32.8 degrees Celsius logged before the renovation)
– 2 x 150mm diameter earth cooling tubes 15m in length and buried 1.4m below ground supply fresh air at a moderated temperature to the home via the basement.

ACTIVE HEATING AND COOLING

– KNX automation system controls various elements of the passive and active heating and cooling system
– Pecan Engineering Nectre N60 slow combustion heater
– 300mm air transfer system designed to move air (summer

and winter) at high volume, low speed
– Summer ventilation and winter air transfer depend on the preset temperature differentials and data from five temperature sensors.

BUILDING MATERIALS

– Timber frame and roof, locally grown radiata pine
– DCT high performing 50mm R2.4 PIR (polyisocyanurate) insulation wraps around the walls and cathedral-style roof. Breathable membrane and R2.5 insulation in walls
– External cladding by Revolution Roofing, Corten steel custom profiles and Maxline 340 used for wall cladding with TrueOak profile used on the pitched roof.

WINDOWS & GLAZING

– uPVC double-glazed windows typically 4mm glass - 20mm gap - 4mm glass sealed units with external shading where necessary. The existing cottage has single-glazed, low-e glass as the window-to-floor area ratio is very low and double glazing is not worthwhile.

LIGHTING

– High quality colour temperature matched LEDs throughout.

PAINTS, FINISHES & FLOOR COVERINGS

– Tiles: floor 800mm x 800mm porcelain; wall 300mm x 100mm (kitchen) 800mm x 400mm (bathroom) ceramic
– Dulux low-VOC paints used throughout.



Cosy and creative: When required, the south-facing living space is warmed with an efficient wood heater.

