

## THE TEST OF TIME

*Sanctuary revisits a Geelong house built with ESD principles firmly in mind to see how it's faring after four years.*

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Jan and Anne moved into their newly-built home in Queens Park, Geelong, with great anticipation. It had been uncompromisingly designed to Ecologically Sustainable Development (ESD) standards for year-round comfort with minimal energy use and 100 per cent water self-sufficiency. That was four years ago and a profile of the home featured in *Sanctuary 6*. Now, *Sanctuary* revisits Queens Park to see if the house is living up to its owners' expectations.

Right off the bat, Anne says the home is just as they'd hoped for. "Ninety per cent of the time the house is extremely comfortable without us having to do anything about climate control. In this sense the most effective feature is truly the passive solar design elements: the large north-facing windows with eaves, thermal mass in the floor and small windows in the south."

For the remaining 10 per cent of the time, the family has learned how to use the house to maximise its thermal efficiency, proving the maxim that passive houses need active users. The best example is the European-inspired *wintergarten*, the north-facing conservatory with single-glazed external windows and internal, double-glazed bi-fold doors that open onto the house.

"The *wintergarten* has taken me a bit of time to learn how to use – I didn't really appreciate how well it warmed up the house until last year," says Anne. "What I learned was that on cold sunny days, I just need to open the bi-fold doors and the *wintergarten* is like a thermal engine heating up the house a couple of extra degrees." The solar gain from the *wintergarten* is leveraged by thermal mass in the living area, whose polished concrete floor stores and slowly releases the sun's warmth through the day. "If the *wintergarten* is open for most of the day, we rarely need to use heating in the evening. If you have the opportunity to put some sort of conservatory in the north that opens into the house, I'd recommend it."

The family installed a heat shifter in the home to move warmed air with inline fans from the *wintergarten* through the roofspace to the south bedrooms via vents, but they've found they hardly use it. "The rooms are comfortable enough without the heat shifter. They don't get below 13 degrees Celsius in the coldest days of winter."

The house includes hydronic heating using gas heated hot water, but the last two years of gas bills demonstrate the family's dwindling reliance on it. "In our first winter in the home, in 2007, we used 500Mj of gas per day because we were relying on hydronic heating too much. We had a baby whose room faced south and we wanted to keep his room warm. Next year we halved our daily gas use to 243Mj by moving our son into a north-facing room and by learning how to use the *wintergarten* effectively. For the last two winters our bills have stabilised at around 300Mj per day."

Keeping the house cool in warm weather is aided by the effective zoning (living areas in the north, sleeping areas and food storage in the south), ventilation and operable shading. In summer "we keep the *wintergarten* shut all day. In the evening we open both sets of doors in the *wintergarten* and the back doors to make the most of the southerly breezes, which cool the place down really quickly." Ceiling fans in the living area stir muggy air around.

The owners opted for external, retractable awnings on north-facing windows when the pitch of the eaves is not low enough to keep the autumn sun out. [Ed note: for more on the benefits of retractable awnings over fixed eaves see 'Eaves' in *Sanctuary 13*.] They chose one of the newer automated motorised awnings on the market, suitable for hard-to-reach locations and for homeowners keen to ensure the house is being kept appropriately shaded even when they're not at home. Jan and Anne found that, despite the benefits, this system's anemometer (wind sensor) occasionally retracts the awning on sunny days with modest



This house in Geelong, Victoria, was originally profiled in *Sanctuary 6*.





These images show the *wintergarten* at work. From left to right: Jan and Anne keep the *wintergarten* fully closed on a hot summer's day or winter night to keep heat out (summer) or in (winter); during winter they open the internal double-glazed doors, letting the air that has been captured and heated by the slab in the *wintergarten* into the living and dining room; on a summer's night both the internal and external doors can be opened to encourage cooling cross ventilation through the house and to allow the concrete slab in the *wintergarten* to cool.

winds, and they intend to take advantage of the manufacturer's customer service to upgrade the anemometer. When the house was built, the family chose to be 100 per cent self-sufficient in water "for ethical and philosophical reasons, not economic, given how cheap water is." Jan and Anne's 19,000 litre tank has been sufficient for "two very dry years plus the first year in which we used rainwater to establish the garden. We got down to maybe 10 per cent of our tank volume at the end of last year but now it's full again."

The vegetable and ornamental garden that was in its infancy two years ago is now thriving, and it's thirsty. Its main source of water and nutrition is the house's grey and black water, which is treated onsite to Class B level in a vermiculture system and then pumped sub-surface to the growing vegetables. "It's an extremely clever but simple system," says Anne. "It's fantastic. We grow the food that we eat, nobody's ever been sick and the vegetables taste great. We went away for a couple of weeks and came back to the best tomatoes we'd ever seen. It's incredible how it self-regulates. I don't have to worry about the garden drying up, because it's looked after by our sewage." The

house remains connected to the town sewer system so that in the event of an emergency overflow, waste is discharged to the sewer, not the silverbeet.

Anne believes the cost of their 2kW photovoltaic system will be paid back sooner than expected because of money generated through the feed-in tariff (FIT). Nonetheless, they had troubles with their electricity retailer soon after the system was installed. "They'd put in the wrong meter and as a result there was no evidence from their point of view that we were feeding electricity back into the grid," says Anne. [Ed note: As part of its ongoing advocacy work on behalf of solar households, ATA's energy policy team can help members with their enquiries relating to FITs, smart meters and any other aspect of purchasing and operating a solar PV system. For up-to-date information on feed-in tariffs and retail consumption tariffs available to solar households, check out the ATA website at: <http://www.ata.org.au/projects-and-advocacy/feed-in-tariff-for-solar-systems/state-feed-in-tariffs/>] Still, the family are saving money on electricity due to the premium tariff of 66 cents per kilowatt-hour (a payment of three times



Cooling and heating of the living and dining rooms is aided by the attached *wintergarten* to the north. The double glazed doors of the *wintergarten* are visible in the centre of the image.





These images show the automated motorised awnings on the northern facade, and how they work to shade the *wintergarten* and slab in the heat of summer.



the price of consumed electricity).

So, although they used 820kWh from the grid and fed only 250kWh back into it, they came out in front thanks not only to the generous FIT but to their rollover credit at the end of the warmer months.

Anne is unequivocal that “it’s the simple stuff, not high tech” that gives their house the edge and architect Mark Sanders of Third Ecology (the firm who designed the house) wholeheartedly agrees. He says the main difference between now and when this house was built is that sustainable technologies, products and services are much easier to access. He reels off a list: double glazing is more cost-effective; “insulation is so cheap you’d be mad not to insulate as much as you could”; FSC accreditation with timbers “makes sustainable timbers easier to source, especially

as the cost and availability of recycled durable hardwoods have gone through the roof”; there are “more low- or no-VOC paints around now as a mainstream option”; LED lighting “has come a long way in terms of cost-effective options”; and “PV systems have almost halved in price.”

Anne and Mark agree that, technology aside, the fundamentals have not changed one iota.

“Passive solar design is number one,” says Mark. “Use it to reduce your energy demand before heading down the track of groovy systems and gizmos! Pay attention to design for orientation, zoning and cross ventilation, then add thermal mass, insulation, double glazing and summer shading. Get these right and you’ll reduce your energy requirements, bills and CO<sub>2</sub> emissions.”