

MODERN GREEN HOMES Sanctuary

ISSUE 40

SUSTAINABLE HOUSE DAY 2017

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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

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The container doors were left in place and act as moveable external shading for the bedroom windows when the family is using the house; when they're away, the doors are closed to help secure it and protect against possible bushfire.

Shipshape retreat



Working with a modest budget, architect Matt Elkan transforms four salvaged shipping containers into a stylish, low-maintenance getaway on the NSW south coast.



WORDS Anna Cumming
PHOTOGRAPHY Simon Whitbread

ECONOMY, SIMPLICITY AND ENERGY

efficiency were the driving principles behind Simon and Elise Byrne's family getaway, near the coast, two hours from their busy Canberra lives. "We had a very small budget, but we wanted to produce something noteworthy," says Simon. "I don't buy the idea that good architecture is only for the wealthy." He found a good match with sustainable architect Matt Elkan, who was happy to "talk about how cheaply we can build something cool."

Tailored for the gently sloping block with the street to the west, good north aspect and bushland views to the east, Matt's design centres around one 40-foot and three 20-foot shipping containers. One of the small ones forms a separate guest



Simon and Elise's brief was for a small house that would have a low impact on the site and no excavation. "We wanted minimal concrete; as much sustainable material as possible in the build; zero-VOC finishes; natural wool insulation," says Simon. The recycled timber windows and doors were the big luxury item in the build.

pod; the other two host modest bedrooms and are arranged to form an L-shape with the long container, which houses a bathroom, bunkroom and kitchen. A sunken lounge nestles into the corner of the L, and is surrounded by an extensive covered deck providing extra living space to the north and east.

Shipping containers, their design optimised for protecting goods on the high seas rather than housing humans, have limitations for architecture. "It's all about using them for areas where they work," explains Matt. "The space available inside is okay for bathrooms and even bedrooms, but pretty pokey for living spaces."

The layout of Simon and Elise's house allows the containers to take care of the

smaller spaces and service areas, and steps down to take advantage of the fall of the land to create generous ceiling heights for the living room and decks.

"If a shipping container is to be a good strategy for a building, it needs to really pull its weight. For this build, the containers minimised the need for structural walls and posts for three-quarters of the home, and allowed us to keep the roof structure pretty simple." He explains that using the containers also reduced the build time and associated costs.

Other strategies for keeping costs down included a minimal footprint – the house and guest pod together are only 94 square metres, plus 40 more of decking – and a focus on structural efficiency

Green



jewel

A subtropical renovation has not only connected a New Farm house with its lush garden but cleverly converted a rarely used swimming pool into a hydronic heating/cooling system.

WORDS Emma Scragg

PHOTOGRAPHY Christopher Frederick Jones

IN 1998, DESIGNER BRUCE CARRICK and architect Caroline Stalker bought an “ugly box” in a great location in Brisbane’s walkable New Farm, a quick cycle from the city. Collaboratively, they have carried out two renovations “on a shoestring” and recently, many years later, have found the time, energy and resources to finally do with the house what they really wanted to.

Caroline had always hated their home’s boxiness with its poor connection to the north-east facing backyard. Their final design emerged after a revelation that the swimming pool, which obstructed the house from the garden, was little-used and no longer needed. They reorganised spaces to bring in “more light, more garden, more openness and coolness,” explains Caroline. The new scheme, adding only 12 square metres, created a garden oasis centred on a babbling pond.

With the new work to the rear, they had to build above the existing levels to account

for overland flow; in Brisbane, rain falls in very brief but potentially catastrophic bursts during storms. This constraint resulted in a happy compromise of split level spaces around the new double-height living area, enabling the family to “live very comfortably adjacent in the same space but all using it in a different way”, says Bruce.

Upstairs is the “parents’ zone” where existing openings have been reworked into an open, airy study and master bedroom. The bedroom is compact but exquisitely crafted in timber and ply – light filtering through the starry cut-outs makes it appear like a jewellery box set above the kitchen. Through Caroline’s work on subtropical urbanism, she was keen to ensure that every room had a green connection. “That became a big organising idea,” she said, and with this approach the potentially glary outlook over the chest-height roof in their bedroom became an opportunity. “A classic of how do you turn a handicap into





With a green roof, babbling pond and natural connection to the north-east facing backyard, the homeowners now relish downtime at home.



Sailing on land



A limestone 'labour of love' embraces advanced sustainable design and technology yet appears to have always been part of its historic Fremantle neighbourhood.

WORDS Rachael Bernstone
PHOTOGRAPHY Stephen Lobo

THIS OLD-NEW HOUSE IN FREMANTLE is the antithesis of modern project homes in the same way sailing is to air travel. Where one is cheap and fast, and has negative implications for the planet, the other is carefully planned, meticulously researched and more sustainable, although progress is inevitably slower.

The sailing boat analogy is particularly pertinent here in the heart of Fremantle – a port city that owes its wealth to the movement of ships and their cargo. The owner-builders of this house in progress – Greg and Alice – met when they were working on a tall ship, the *One&All* in Adelaide. In 2001-02, they were part of the crew that sailed the *Duyfken* replica on its 11-month voyage from Sydney to the Netherlands. In a sense, this house is a continuation of that long journey by sea.

There are parts of the project that are obviously overseen by Greg – he's a ships officer and works remotely, so when he's home for weeks at a stretch he's very hands on – while environmental engineer Alice takes responsibility for other tasks. But this project is definitely a labour of love for

OPEN HOUSE SUNDAY 17 SEPTEMBER

FREMANTLE, WA



The house is built as two separate spaces to allow for flexible or multi-generational living options and/or short-stay accommodation. Adaptive design principles have also been used, with minimal internal walls to allow space to be reconfigured, including an option to split the top level into two bedrooms or a separate studio/office.



The site features over 80 square metres of broken bricks mostly salvaged from the original house; many were used for the driveway and garage (off-street parking was a council requirement). Instead of the DIY, custom-made thermally broken steel-framed windows used in the rest of the building, timber was used at the front, in order to fit with the heritage precinct.



Low waste is a theme of this house, and salvaged materials such as bricks are used to great effect. Aggregate from the original house was mixed into concrete or seeded onto the poured slab as well as used in garden wall footings and other non-engineered applications.



Railway sleepers were used for making the backyard deck and garden fence, and even railway track was used! This was to support the 8m x 4m floor in the studio. The family enjoys an edible garden and is active in maintaining a communal shared garden in the adjacent laneway.



Windows: In the frame

Wondering which glazing is most suitable for your house and climate? Lance Turner and Dick Clarke introduce you to the delicate art of window selection, and explain the key terms and concepts to get you started.

GLAZING OF BOTH WINDOWS AND DOORS IS WHAT ALLOWS

the outside environment to interact with the interior of the house, a relationship that can be both good and bad. It's good when we open doors and windows up to allow cool summer breezes inside, but it's bad when all that glass sucks the warmth out of a room on a frosty winter evening, or lets the hot afternoon sun heat up the internal temperature to unbearable levels.

Glazing is usually the Achilles heel of a building's performance and should be one of the very first things to go under the microscope when considering a building upgrade. An otherwise well-insulated house can suffer considerable unwanted heat loss or heat gain through single-pane glass, which has almost no insulating ability – around R0.15.

The Australian Window Association (AWA) estimates that up to 40 per cent of a home's heating energy can be lost through windows and up to 87 per cent of its heat gained through them. Choosing high-performing windows and placing them appropriately can reduce energy costs significantly and improve thermal comfort. The art is in knowing how different windows will interact with the design of your home.

But where do you start to work out which glazing system or treatment is the best solution for you? It's a complex task even for a switched-on homeowner. The AWA has made things easier with the Window Energy Rating Scheme (WERS).

WINDOW PERFORMANCE MEASURES

WERS simplifies window comparison by rating the performance of residential windows using a star rating system, much like star ratings for appliances. The star ratings are based on the window's basic performance measures: U-value and solar heat gain coefficient (SHGC). Windows receive a rating for both heating and cooling performance. WERS has three climate types for the whole of Australia (and New Zealand fits one of these): heating, cooling and mixed. The zones indicate whether most energy will be dedicated to heating or cooling to maintain thermal comfort, and mixed means just that – about equal shares of both.

The whole-window U-value (U_w) measures how readily a window conducts heat. The lower the U-value, the greater a window's resistance to conductive heat flow and the better its insulating value. WERS gives comparative ratings for frames and glass combined in a functioning window or door. If we use old-school aluminium frames plus single glazing as a benchmark, modern aluminium frames, thermally broken frames and some uPVC frames plus double glazing (insulated glazing units or IGUs) can reduce internal to external thermal transfer (conductivity) by 50 to 75 per cent or even more. Timber frames (softwood) are about equivalent to thermally broken aluminium frames; steel frames are not proven high performers. More on frames later.

The other important factor influencing window performance

is its whole-window solar heat gain coefficient (SHGC_w). This measures the window's ability to control heat transfer from solar radiation. This coefficient is expressed as a number between 0 and 1 – the lower the number, the less solar heat the window transmits.

Real-world U-values normally fall between about 8 (worst case) down to 1 (best case). Real-world SHGCs range from about 0.75 down to 0.15. Unlike U-value, we don't tend to label high SHGC as 'bad' and low SHGC as 'good' as the judgement depends on the climate where the building is located. In almost all cases, a low window U-value is better in all climates.

SINGLE, DOUBLE AND TRIPLE GLAZING

In general, all windows will benefit from having better insulating properties – that is, from double or triple glazing or from insulating window coverings. These technologies slow down the conductive heat flows in both directions.

Double-glazed windows are far superior to single-glazed windows for insulating your home. If you're wondering whether the added cost of improved glazing is worthwhile, consider that compared to single glazing, in cold and mixed climates a double-glazed window could cut your window heat loss by 60 per cent or more, reducing heating loads.

Some people may simply choose to replace leaky old windows with double glazing, with good outcomes. But for anyone currently in the process of assessing quotes and specifying energy-efficient windows, you will already know there's a lot more to consider than multi-pane glazing to achieve optimal results.

GLASS COATINGS AND TINTS

Coated and tinted glass can be used to improve the performance of single-pane windows or to turbocharge the performance of double- or triple-glazed units to make them even better.

Tints use a pigment in the glass to reduce solar heat gain and light transmission; coatings are applied to the surface at the factory and can be reflective ('mirror' glass) through to higher-end low-emissivity (low-e) coatings.

Low-e coatings reduce the onward transfer of radiant heat, and so can reduce heat loss or gain through the glass. The coating can

be tuned to reflect most, some or very little of the radiant solar heat, depending on the needs of the climate and orientation. This approach can reduce the SHGC by more than 60 per cent compared with clear glass and is often used in warmer climates or for west-facing windows when trying to minimise heat from the sun, while still retaining daylight.

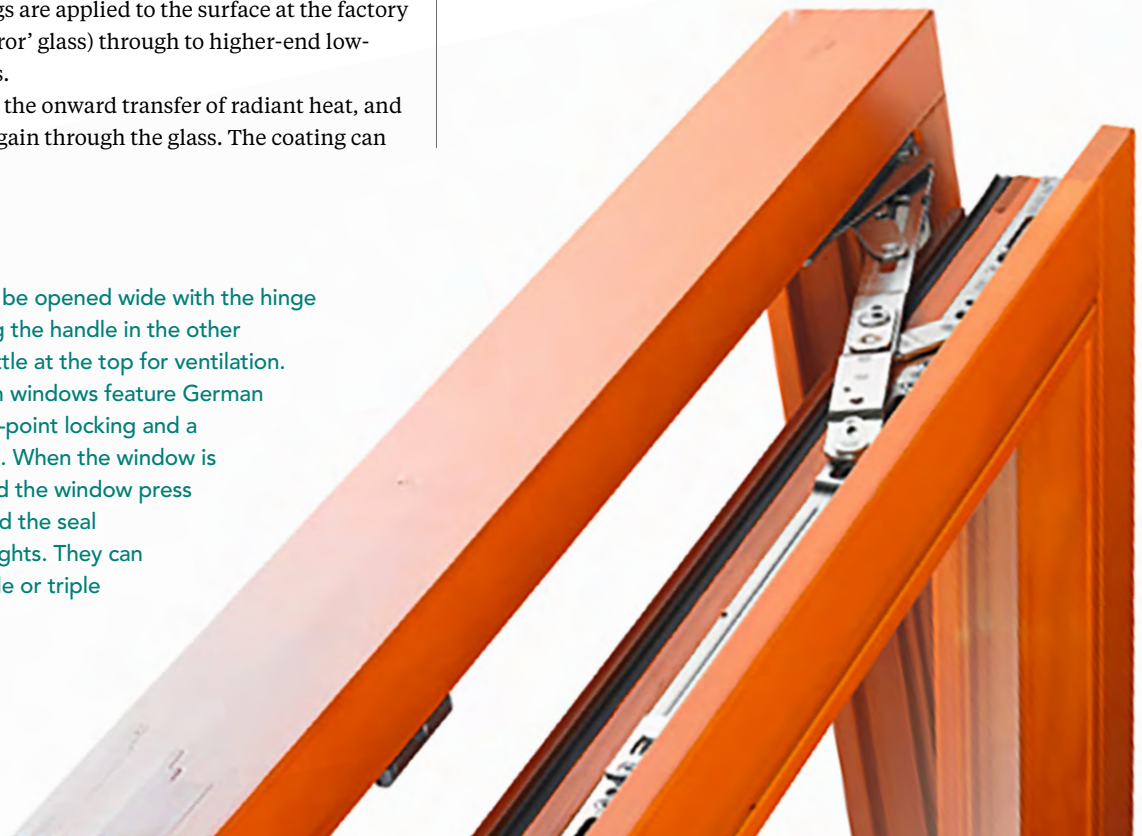
From a solar heat gain point of view, the location of a low-e coating is quite important. In hot climates or for unshaded windows facing east or west, a low-e coating should be on the inside-facing surface of the outer glass layer and should be a coating with low solar transmittance (thus, low SHGC). In climates with cold winters (most of southern Australia) where passive solar gain is needed, the coating should be on the outward-facing surface of the inner glass layer for optimal results. Getting it the wrong way around will reduce performance by about seven per cent. It may not sound like much, but to get a seven per cent boost at no extra cost simply by careful specification and correct assembly is definitely worth it!

When dealing with suppliers it is helpful to have a basic understanding of the technical aspects and what their implications are. It is possible to inadvertently select glazing for an energy-efficient building which blocks all heat flow. Sadly, we know of one instance where the passive solar design has been largely nullified by heat-blocking glass purchased on the basis of it being the 'smart' option. It was the wrong specification, because the building's shading design kept the summer sun under control, but now the winter sun's warmth is kept out too. On sunny days, the owners have to open the north-facing sliding doors to allow the sun to pump some heat directly into the slab floor – a less than ideal workaround.

→



Tilt-and-turn windows can be opened wide with the hinge to the side, or – by turning the handle in the other direction – tilted open a little at the top for ventilation. Paarhammer's tilt-and-turn windows feature German metal hardware with multi-point locking and a layer of compression seals. When the window is closed, the locks all around the window press the sash into the frame and the seal engages, eliminating draughts. They can be fitted with either double or triple glazing. Image courtesy Paarhammer.





City cornucopia

Increasing well being and connection to nature, reducing food miles to food metres, and turning waste streams into resources: it's increasingly clear that urban agriculture is a vital ingredient for sustainable cities.

WORDS Anna Cumming

NEAT ROWS OF RAISED GARDEN BEDS already crammed with vegetables and leafy greens is not what you'd normally expect to find in the middle of a new housing development, but that's what greets you at The Cape, a sustainable housing project on the edge of coastal Cape Paterson, two hours drive south-east of Melbourne.

A glance at the master plan for the development shows that these beds are just the beginning of what will eventually be a 5,000-square-metre garden, with herb beds, a berry garden, orchard, composting and potting benches. The produce grown will

supply a cafe and community centre as well as feeding the garden members – interested residents and other locals. “There will be space for 100 gardeners, and we estimate that the garden will produce more than \$150,000 worth of produce each year,” says Brendan Condon, the entrepreneur and sustainability advocate behind The Cape.

But while the garden will provide its members with the opportunity to reduce their living costs through avoided food spend, it's about much more than that; it's part of a burgeoning urban agriculture movement that's aiming to bring food



Sydney not-for-profit Pocket City Farms opened its first urban farm in Camperdown in 2016. “At its most basic, creating places to connect with our food growing in the city is providing productive places for the community to gather, learn some new skills, meet some new people and get their hands dirty,” says general manager Emma Bowen. Images courtesy Pocket City Farms & Ben Symons

controlled factory style production. Australia’s Urban Agriculture Forum (UAF) defines the term as any food production – including vegetable and fruit growing, livestock raising (especially poultry), beekeeping, aquaculture and hydroponics – in suburban areas, regional centres, cities and towns; “it does not include larger-scale irrigated and broad-acre farming.” It encompasses commercial, community and individual food production on a variety of sites from private backyards and other private land to community gardens, rooftops, public spaces such as nature strips, and the grounds of schools, hospitals and other institutions.

It’s at the lower-tech end that Brendan sees the biggest opportunities. “To grow, plants need light, water, space, and nutrients. There is plenty of all of these available in cities.” He notes that traditional city design involved systems to move stormwater and waste out of them efficiently, and food bowls around the edges. “Population growth and urban expansion are putting increasing pressure on both, but if you can build low-tech, smart food-producing architecture to intercept a

city’s water and food waste streams, then you can start producing huge amounts of food.”

Through business Biofilta, Brendan is developing ‘closed loop’ wicking bed garden systems that aim to break down the three critical areas of individual resistance to getting ‘hands-on’ with food production: lack of time, space and expertise. Connected to a rainwater tank, the snap-together beds store water in their bases that’s ‘wicked’ up through the soil to the plant roots as they need it; no daily watering is needed and water efficiency is greatly improved. The subsurface watering also means that a light crust forms at the soil surface, inhibiting weed growth. “The idea is that the beds tip the balance in favour of busy urbanites, by dramatically reducing the watering and weeding required,” says Brendan. “Wicking bed technology has of course been around for a while, but we’re scaling it up. We’re designing quick-to-assemble urban farms that can turn waste streams into resources: they intercept local stormwater and food waste through compost, and produce serious quantities of food for minimal gardening effort.”

Brendan’s business partner Marc Noyce has calculated that when connected to a 10,000 litre rainwater tank collecting from a 200-square-metre Melbourne roof, the water demand of a 40-square-metre Biofilta ‘household farm’ can be met almost entirely with rainwater, and the property’s stormwater outflow will also be reduced by an estimated 70 per cent. “If everyone did it, issues like flooding in the streets would be significantly reduced, and current pipe assets would provide a greater level of service,” he says. A garden this size could produce around 640kg of vegetables each year, enough for the recommended dietary consumption of five adults, and provide the opportunity for food sharing within the neighbourhood and extended family.

At Pocket City Farms, a not-for-profit Sydney enterprise that aims to make use of the city’s unused spaces to grow organic produce, the community building and education aspect of urban farming is as important as the food production. They run a program of workshops and events to empower and encourage locals. For urban dwellers, “it is so easy to take food for granted,” explains general manager Emma