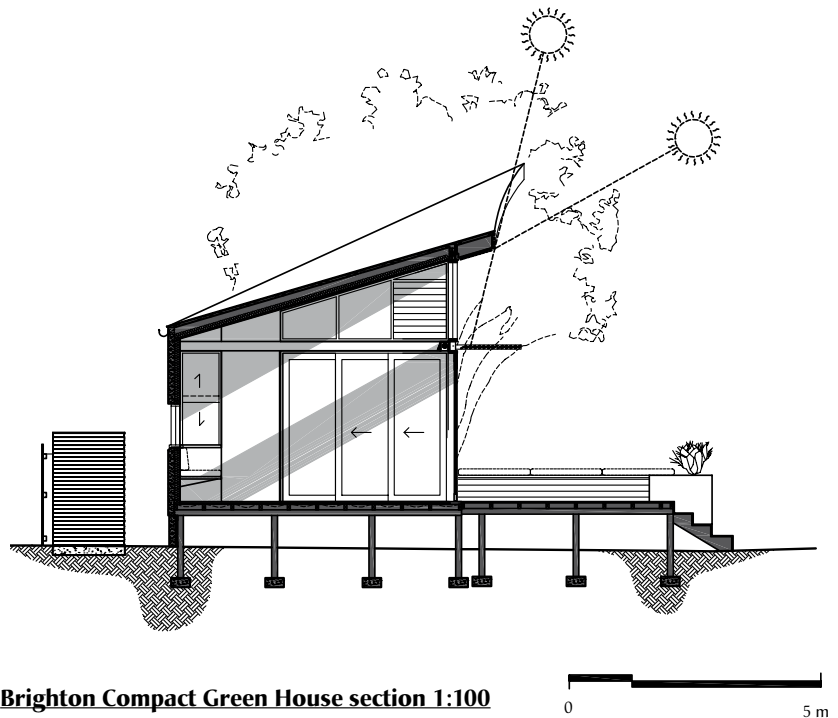


# Measuring PERFORMANCE

• RATING TOOLS •

Words by [Natasha Palich](#)

One architect's green is another's greenwash – so how do we measure eco-friendly design? This first in a series on sustainability and residential design looks at rating tools. To illustrate, Zen Architects presents a recent sustainable project, the Brighton Compact Green House.



It is estimated that residential buildings are responsible for 13% of Australia's greenhouse gas emissions and, under a business-as-usual scenario, this is expected to grow by 1.3% per year. There is an obvious need to reduce the amount of energy housing consumes – but energy consumption is just one environmental issue that must be considered in designing sustainable houses. Measuring environmental performance in residential architecture can be a challenge thanks to the array of tools available, which measure different performance indicators and are used for varying purposes – for example, regulatory compliance versus best practice. Add to this the different levels of expertise in the architectural profession, and housing described as “green” by one architect is considered “greenwash” by another.

There is a veritable plethora of tools available to measure building performance. Some relate to life cycle assessment, some to energy or water use and others to indoor environmental quality. But there isn't a Green Star tool or any other holistic assessment tool available for individual residences. Each Australian rating tool for residential projects has a different focus, whether energy consumption,

greenhouse gas emissions, appliance ratings or individual components.

House-energy-rating tools such as AccuRate, FirstRate5 and BERS Pro measure the amount of energy required to heat or cool a house, based on the performance of the envelope and certain design aspects. They do not take into account appliances in the house, the efficiency of the heating, cooling and hot water systems, or the fuel type. These tools provide ratings based on predictive performance.

In contrast, Basix sets greenhouse emissions and water use targets. The energy section of the tool considers the performance of the envelope and appliances. A Basix rating is based on predicted performance. NABERS compares the energy and water use in an existing house to a standardized average, so the rating is based on actual performance. In this way it takes into consideration the design of the dwelling, the thermal performance of the envelope, appliances used and occupant behaviour.

Some other rating tools assess components. The Window Energy Rating Scheme (WERS) assesses the performance of a complete window including the frame and glazing, the method of opening it and way it has been sealed. For appliances, Australian

Energy Star looks at office equipment, Minimum Energy Performance Standards examines energy use in appliances, and the Water Efficiency Labelling and Standards (WELS) scheme measures water use in appliances.

Most of these ratings systems are used for regulatory purposes. They focus on eliminating worst practice rather than encouraging best practice. There are projects emerging that aim for the highest possible ratings under established industry benchmarks – for example, maximum Green Star points or a ten-star rating under an energy-rating tool. When these targets have been reached, have we achieved sustainable design? And if not, what next?

Our environmental performance expectations are constantly maturing. A sustainable house is certainly more than passive design – solar hot water, solar panels, rain- and grey-water system scenario. Rating tools are useful but provide an incomplete picture; completing that picture is a personal responsibility. Using the tools as a framework, practitioners need to question the sustainability objectives of each project and how best to achieve them. The aim, then, is to continually extend and explore these benchmarks project by project as experience builds and solutions emerge.

# Brighton Compact GREEN HOUSE

• CASE STUDY •

Words by [Ben Callery](#) and  
[Erika Bartak](#) of [Zen Architects](#)  
Photographs by [Emma Cross](#)

01 Main living spaces are oriented to the north to maximize solar access and connection with the surrounding landscape.

01



**S**tars are the common language for sustainability these days, but don't be fooled; a five-star house is not the same as a five-star movie. The current five-star standard in house energy rating is intended to bring the worst performers up to a minimum benchmark and, in this case, that actually means five out of ten. Minimum requirements are likely to increase in the near future to six stars.

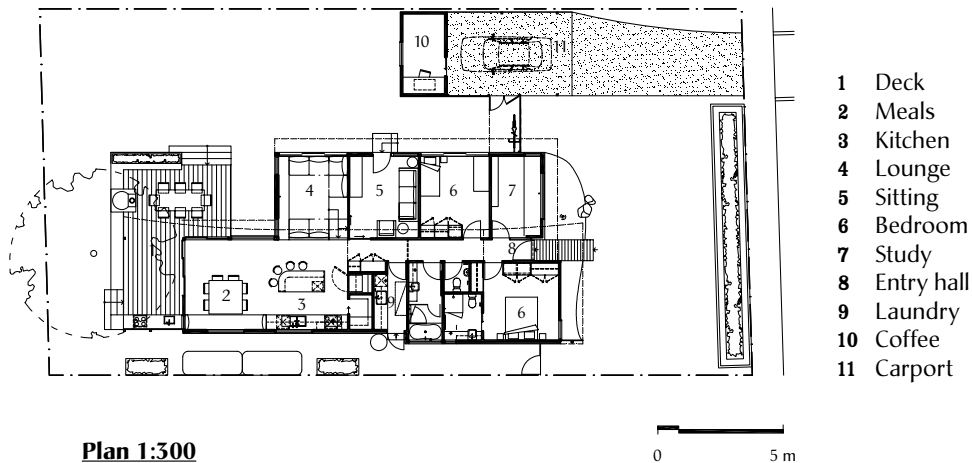
This house employs the key principles of passive solar design such as orientation and zoning. Habitable rooms are oriented to the north for maximum passive solar gain and include openable windows to the south to facilitate cross-ventilation, both of which are particularly important in Melbourne's variable climate. External shading blocks unwanted summer sun while allowing winter sun penetration.

Infrequently occupied wet areas are located on the south and grouped together to minimize pipework. Living spaces can be closed off from the hall and bedrooms to zone heating only where it is needed.

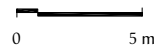
We use energy rating early in the design process, when there are more opportunities for cost-effective improvements. The initial design was tested with standard lightweight construction and modest insulation levels.

**02** The glazing design balances thermal efficiency with solar gain, daylight and visual connection to the external environment.

**03** Exposed thermal mass in the concrete floor of the sunken lounge provides internal temperature stability.



**Plan 1:300**



It performed reasonably well, validating the design decisions we had made thus far. We then tested a range of upgrades, to compare the relative benefits of different construction and higher insulation. First, we tested concrete floors, for the stabilizing effects of thermal mass on internal temperatures. We looked at various wall constructions, such as brick veneer, reverse brick veneer (for internal thermal mass), and rendered polystyrene cladding (with added insulating properties). We then explored increasing insulation levels in floors, walls and ceiling/roof, including batts and reflective cellular insulation.

Our testing also covered glazing upgrades, such as double glazing, low-e coatings and thermally efficient timber window frames. Added to this, we fine-tuned the overall amount of glass. The optimal ratio of glazing-to-floor-area can vary depending on the orientation and design features like thermal mass.

If money were no object, we would use the best available specifications to achieve an exceptional energy rating. But these results need to be tempered with real-world considerations such as budget and site. After testing the various upgrades, we performed a cost-benefit analysis by comparing thermal benefit to cost and buildability.

Including an insulated concrete floor slab would achieve an extra star, but the sloping site meant this was difficult and cost prohibitive, so we opted for a timber framed floor. We did, however, use a small concrete slab in the sunken lounge to provide some exposed thermal mass in the main living space. For the external walls, the speed, efficiency, cost and thermal benefits of rendered polystyrene cladding made it an attractive option compared to brick. Window sizes were refined and double glazing selected for all windows except louvres, which cannot be

**02**



**03**





**04** Eaves and louvred awnings are designed to prevent summer overheating and allow winter solar gain.

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#### Practice profile

The practice combines a focus on ecologically sustainable design a unique architectural aesthetic.

#### Project team

Penny Guild, Ben Callery,  
Ric Zen, Erika Bartak

#### Builder

Figurehead Constructions

#### Consultants

**Engineer:** Keith Patrick  
and Associates

**Landscaping:** Stuart  
Beekmeyer and Grant Harper

**Lighting and interiors:**  
Zen Architects

double glazed but provide excellent ventilation, particularly for high-level heat exhaust.

Rating software rewards further glazing reductions, but we balanced this with other considerations, such as a visual and physical connection to the external environment. While cross-ventilation is acknowledged in the rating software, other elements such as daylight, amenity, views and architectural delight are not. When taken to the extreme,

an Esky design (that is, a thermally efficient box) may achieve a high star rating, but does not make for very appealing housing!

These findings and decisions will not ring true in all cases – climate, block orientation, surrounding context, and the size and shape of the proposed design all affect the energy rating results. Additionally, a star rating can mean very little if the building is not used properly by occupants,

or filled with high-energy appliances.

The Brighton Compact Green House includes many sustainable elements not addressed by energy ratings, including energy-efficient appliances and lighting, rain-water harvesting, grey water recycling, and environmentally friendly materials. The final cost-effective design achieved 6.3 stars, even without concrete floors or heavyweight walls. **LD**