MODERN GREEN HOMES

Sanctuary

ISSUE 48 | SUSTAINABLE HOUSE DAY SPECIAL

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Prefab & Passive House

WIN

A TCK Solar sponsored Tesla Powerwall 2 valued up to $15,000

Offer open to Australian and New Zealand residents. Details page 43

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Elegant infill

LOCATION Brisbane, QLD • **WORDS** Emma Scragg • **PHOTOGRAPHY** John Bourne

At a glance

- Compact, carefully designed urban infill project
- Multi-function spaces and abundant storage
- Phase change material for thermal mass in a lightweight structure
- Owner-built with the help of architecture students and volunteer labour through HelpX

Opening for
Sustainable House Day
Sunday 15 September 2019

For more information visit sustainablehouseday.com and search for 'A39 House'

Careful orientation, spaces with double functions, and plenty of storage combine to ensure this family home on a subdivided Brisbane block feels larger than it is.

After 12 years of living in an unrenovated 1920s Queenslander in inner Brisbane, Josepha Dietrich and Brett Beeson decided it was time to move out of their "leaky wooden tent" and build a home which performed better in the subtropics and suited the needs of their small family of three.

Wanting to minimise mortgage stress as well as build the least house necessary, Brett designed a compact home of 90 square metres in the rear half of their home's 640 square metre block. Using Brett's skills as an ESD consultant and mechanical engineer and with Josepha acting as the client, the new design is oriented to make the most of the northern aspect while retaining a decent area of green space. The smaller floor area also allowed for higher quality construction methods and finishes, a large solar array, a plethora of monitoring devices and a built-in air exchange unit within the budget.

Brett and Josepha used clever tricks to make their "tardis-like" home feel spacious, giving rooms and elements multiple functions and providing abundant storage. "Our study converts into a guest bedroom, our shower turns into a sunken bath, our coffee table flips up to make the lounge room an entertainment nook and our kitchen splashback is a large rectangular window that allows light into the hallway and gives a view into our son's play area," Josepha says.

Prior to construction the biggest challenges were town planning (to subdivide the relatively small block) and bringing in services (road access, power, water and sewerage) from the rear cul-de-sac. "The challenge with small-scale developments is the upfront costs can be pretty high," Brett says.

The land between the two houses was originally a swamp and is prone to overland flow, so Brett ruled out a slab-on-ground. After much thermal modelling of alternatives, he settled on an elevated, well-insulated, steel-framed timber floor and timber stud walls. The roof performance was enhanced by layering thicker-than-normal plasterboard, phase change material to provide thermal mass, 150mm bulk insulation, a plywood skin to provide a safe work platform and solid support to solar panels, and a waterproof membrane, all capped with metal roofing. While the building form is modest and modern, Josepha says "we designed our home with a nod to our old Queenslander; we used cypress horizontal weatherboards to connect with the streetscape on one half of the house and vertical tin on the other."

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6.5kW of solar panels were installed on the super-insulated roof to help power the all-electric house. A recycled timber shutter protects the glazed entry door from hot afternoon summer sun and shade sails provide summer protection to the polycarbonate deck roof.

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The main living space features large north-facing glazing, built-in lounge seating with clever storage, abundant shelving and kitchen benchtops milled from a tree felled on site.

Brett carried out much of the construction himself, using skilled tradespeople only when needed, so he could take time to test out more radical ideas and reduce build costs. He involved architecture students and volunteer labour through HelpX, where travellers work for half the week in exchange for board and lodging. This enabled some detailing to be carried out which would be prohibitive if paying a full contractor wage, "and was a bit of fun", Brett says. As the build progressed, Josepha researched the most sustainable paints, finishes and products, chose colours and upholstered Brett's built-in seating/storage in the lounge.

Timber features heavily above the steel floor frame, as Brett enjoyed working with timber and recognised its low embodied energy and ability to be reused. The floor is remilled power poles, an old Cadaghi gum felled on site became the kitchen benchtops, cypress pine framing provides natural termite resistance, and plantation plywood provided an economical and robust material for cabinetry fronts, the abundant storage and open shelving. Ply is also used for selected ceilings not only for aesthetic value but also to be easily removed for maintenance. Brett salvaged hardwood from his workplace's demolished lift shaft to clad sliding shutters for essential solid shade in summer to the east and west.

Healthy indoor air quality was assured by using VOC-free paints and clear finishes and easy-care Marmoleum to the entry and bathroom. The drop-in slatted shower deck has now been changed from timber to a composite plastic decking to reduce humidity and mould issues from the damp timber. Generous natural light and sunshine, aided by the clear polycarbonate deck roof and large glazed areas, is reflected by light wall and cabinetry colours inside and moderated by shade sails and the solid shutters in summer.

"Moving in here, it's essentially the same lightweight construction, same floor area, same location as the old house," says Brett. But the family loves the marked improvement in thermal comfort that their new home offers thanks to the careful design, and have no regrets about its neat size. S

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The built-in seating and storage makes the most of the north-east corner and was a collaborative effort between Brett and Josepha. A TV cleverly flips out of the chest coffee table.

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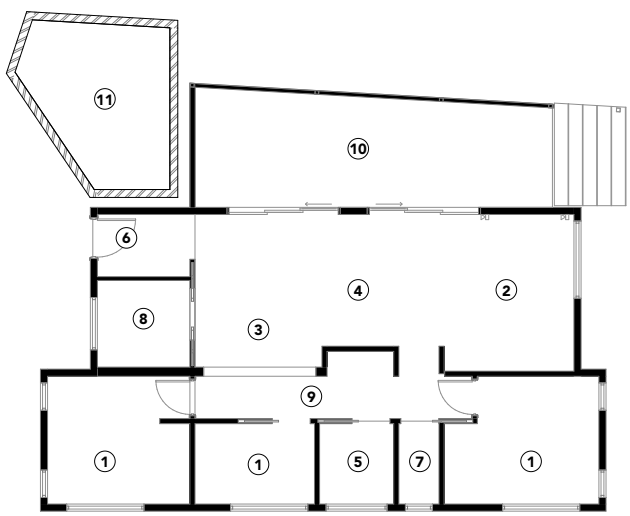
The small house makes the most of connections to outdoor spaces – the deck and the garden.

FLOOR PLAN



LEGEND

1 Bedroom
2 Living
3 Kitchen
4 Dining
5 Bathroom
6 Entry
7 Toilet
8 Larder
9 Hallway
10 Deck
11 Workshop

HOUSE SPECIFICATIONS

HOT WATER
- Solahart 302L close-coupled flat panel solar hot water system with electric boost

RENEWABLE ENERGY
- 6.5kW Canadian solar panels
- 5kW Sungrow inverter and battery management system
- 6.5kWh LG Chem battery
- PhiSaver energy and temperature monitoring system via tablet to improve energy consumption habits

WATER SAVING
- 3 to 5 Star WELS-rated fittings
- Caroma 977785W toilet with integrated hand basin filling cistern
- Toilet, outside taps and laundry on separate water circuit (for plumbing to future rainwater tanks)
- Bath separately drained (for future greywater system)

PASSIVE DESIGN, HEATING & COOLING
- Large 1200mm deep east and west eaves, with external operable shading
- Main glazing to north with 900mm eave for optimal winter solar gain and summer shading
- Smaller 600mm eave to south for maximum daylight
- Bedrooms to east and south, living areas to north
- Thermal mass via extra-thick plasterboard to walls, 22mm fibre cement subfloor, and BioPCM phase change material in ceiling

ACTIVE HEATING & COOLING
- Samsung 5.2kW ducted reverse-cycle system which covers whole house
- EcoHVAC 90L/s heat recovery ventilation system

BUILDING MATERIALS
- Cypress (naturally termite resistant) wall frames, fascias and weatherboards
- SteelMAX steel subfloor and posts
- Recycled timber floor, deck flooring and cabinetry from Kennedy Timber
- Hardwood for external shading and ply for internal ceilings from local demolition yard
- A and C/D grade plywood for cabinetry
- Ikea kitchen with homemade benchtops milled from onsite tree
- ProctorWrap breathable building wrap
- Insulation: underfloor R2 40mm polystyrene panels between joists; walls R4 batt insulation plus 40mm polystyrene to limit thermal bridging; roof R6 batt insulation with plywood deck to stop air leakage

WINDOWS & GLAZING
- GJames single-glazed windows with Solect low-e coating, SHGC 0.59 and visible light transmittance (VLT) 68%

LIGHTING
- LED lighting, most with dimmers
- Sensors to outside, larder and entry lights
- Master switch at entry turns off all lights and fans

PAINTS, FINISHES & FLOOR COVERINGS
- Mythic Classic zero-VOC paint to most areas
- Wattyl Solagard paint to weatherboards

OTHER ESD FEATURES
- Small footprint aided by doubling up functions of spaces and elements
- Sizing of rooms to suit only what is needed
- Detailed solar (Ecotect), thermal (AccuRate, EnergyPlus) and daylight (Radiance) modelling to inform design choices
- Long-life finishes, such as solid timber flooring and extra-thick roof sheeting
- Design for adaptability – removable ceiling, extra-wide hall and toilet space, on-grade entry
- All-electric house with induction cooking
- Repurposed antique furniture used for bathroom cabinets
- Beehives and food-producing gardens
- Owners use public transport and share a car to reduce vehicle ownership

DESIGNER
Brett Beeson, with concept design by Matt Levesque

BUILDER
Brett Beeson

PROJECT TYPE
New build

LOCATION
Brisbane, QLD

COST
$228,000 excluding owner-builder labour

SIZE
House 89m^2
Land 340m^2

ENERGY RATING
7 Stars (Note: software unable to model benefits of heat exchanger, air sealing and PCM thermal mass.)

ENERGY RATER
Brett Beeson

INSIGHTS
"Our study converts into a guest bedroom, our shower turns into a sunken bath, our coffee table flips up to make the lounge room an entertainment nook and our kitchen splashback is a large rectangular window that allows light into the hallway."

Josepha Dietrich
Homeowner