

Sanctuary

MODERN GREEN HOMES

ISSUE 48 | SUSTAINABLE HOUSE DAY SPECIAL

Find a green builder; hempcrete home with heart; playspaces; budget house from repurposed pods

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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Building community

LOCATION Denmark, WA • WORDS Rachael Bernstone • PHOTOGRAPHY Michael Hemmings



At a glance

- Community-focused medium density housing with shared facilities, including gardens, workshop and a community house
- Passive solar design and hempcrete construction provides excellent thermal performance
- Simple overall design and uniform floor plans kept costs down
- Shared 49kW solar PV system with battery storage

This new co-housing development boasts twelve high-performance hempcrete homes, all over 8.5 Stars, and a host of shared facilities – all without breaking the bank.

When Jess Prince and her partner Dave first became involved with a co-housing project in Denmark, in WA's Great Southern region, their friends urged caution.

"It was a great leap of trust for us," Jess says. "We were very drawn to the idea, although our friends told us that it was very unlikely that this type of development would actually get off the ground. As resident investors, we were basically shareholders contributing as much as we could to its eventual realisation."

The project was spearheaded by Pam Rumble, a social worker and counsellor, and Paul Llewellyn, a former Greens MP. Jess and Dave joined not long after its inception, once the group had bought the land – a 6500 square metre site just 400 metres from the centre of town, with local schools and other amenities close by.

Thanks to Pam and Paul's oversight and everyone's dedication to driving this project forward, Jess and Dave proved their doubters wrong and were able to move into their new home in April this year, after Dave transferred his public service job to nearby Albany. Pam and Paul and the other co-housing partners – now neighbours – moved into their homes from September 2018, just after the project was completed.

It's true that many co-housing developments turn out to be pie-in-the-sky dreams, and this one overcame many hurdles over its four-year development. Conceived and delivered by architect Tom Stevens of H+H Architects in Albany, the design is highly sustainable, and it's one of the largest residential projects in the southern hemisphere constructed using the innovative material hempcrete for its walls.

With few local precedents for this kind of project, Tom looked to co-housing exemplars in the UK for design inspiration, including Hockerton Housing Village in the Midlands and BedZed in south-east London. "Our clients also went on a tour of hemp projects in Europe to



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All the dwellings and the community house (right) open onto shared space and gardens at the heart of the development. The 168 panels that make up the communal 49kW solar PV system are distributed across all the north-facing roofs.

→
The family houses are compact, but still incorporate a light-filled living area, four bedrooms and basement storage.

Opening for
Sustainable House Day
Sunday 15 September 2019

For more information visit
sustainablehouseday.com
and search for 'DecoHousing
Denmark'





←

Hempcrete construction, excellent insulation and double glazing ensures very good thermal and acoustic performance; provision was made for installation of reverse-cycle air conditioners for heating and cooling, but it hasn't proved necessary. Like these two units, each pair of dwellings shares a Sanden heat pump for hot water.

↓

At the heart of the development, the community house has a kitchen and dining area and provides a gathering space for the residents.

find out more about that technology," he says.

The project hit its first major hurdle when the local council rejected the development application, imposing onerous conditions before it would be able to proceed. The group challenged the ruling at the State Administrative Tribunal and it was given the go-ahead. Then, part way through construction, the head contractor AK Homes had resourcing and scheduling issues, but again the co-housing group coaxed the development along and the builder completed the project, albeit adding one year to the schedule.

The project comprises 12 strata dwellings: eight 2-bedroom units of 80m² each and four 4-bedroom family homes measuring 130m². The houses are modest in size, but the shared facilities – including solar PV and battery storage, rainwater storage, greywater treatment and reuse, a shared workshop, communal vegetable beds, beekeeping facilities and a planned orchard – more than compensate.

The dwellings are placed to maximise passive solar orientation, with generous communal spaces between them. "The design also hides the retaining walls under the buildings," Tom says. "The houses at the lower end of the site have two-metre-high retaining walls beneath them, to help level out the central area where the communal landscaping and community house are. We also don't have front doors facing the street; all of the dwellings open to that central courtyard."





↑
The communal facilities include a workshop, also constructed from hempcrete.

The shared community house boasts a large kitchen and dining area, and guest accommodation. It's used for weekly shared meals, meetings, house concerts and yoga classes, while the future installation of audio-visual facilities will make it the ideal spot for movie nights.

During the design stage, each dwelling was individually rated using NatHERS, achieving impressive energy ratings of between 8.5 and 9.2 Stars. Tom believes the houses will exceed the predicted performance expectations, thanks to the hempcrete walls.

"Hempcrete is such a good insulating material and the walls are 400mm thick, so it will probably perform better than expected," Tom says. "The ratings assumed that the walls were R3, but I suspect they are quite a bit higher. This is the first full winter the owners have lived there and, even though none of the houses have heating, the internal temperatures haven't dropped below 17 degrees Celsius yet."

Hempcrete is similar to rammed earth

in that it's a naturally derived product; it's made from industrial hemp that is mixed with lime and water to form a lightweight masonry that is poured into forms and tamped down, and then rendered with a layer of lime stucco. The hempcrete walls are non-load bearing – timber frames provide support for the upper floors and roof – and they are raised off the ground on brick plinths to reduce the chance of moisture damage, Tom explains.

The co-housing group's founder Paul Llewellyn would like to see hempcrete more widely used in Australian buildings because of its excellent thermal and environmental performance. "This is a breakthrough building technology that captures carbon into its structure; it's easy to use and it doesn't burn," he says. "It's a highly insulating, breathable membrane that's perfect for human beings to live in."

Jess and Dave, and their daughters aged eight and five, agree with this assessment, despite their initial misgivings. "Having moved down to this cooler climate from Perth, we

were apprehensive about the thermal performance," Jess says. "This winter has been a testing ground for everyone, and the hempcrete is amazing. We haven't needed to bring in a heater, and because of the mass of the walls and the double-glazed windows, it's very quiet inside, which is a positive."

She says that for her family, the community aspects of this project are possibly even more important and enjoyable than its environmental credentials. "The overall vision was to have a diverse mix of people, and we have families with teenage kids, another one with children younger than ours, and one of the original investors recently had a baby," Jess says. A couple of the houses are rented out, so there is also a mix of owner-occupiers and tenants.

Jess and Dave had dreamed of moving to the south coast for several years, and both are pleased that they've made good on that dream, in an affordable way: the build cost about \$1800 per square metre, which is comparable with off-the-shelf

project homes, despite being architect-designed and pushing the envelope in terms of new technologies.

Tom says the cost effectiveness was achieved by keeping the overall design simple and straightforward, limiting the scheme to just three floor plans, and the fact that the group maintained strict controls around internal material selections.

“From our perspective, it’s been smooth throughout,” Jess says. “During the build stage we were up in Perth, so we’ve stepped into a completed house

which is comfortable and great. The incidental connections with our neighbours are really lovely. Our kids have ready-made playmates and the freedom to move around, and seeing how the shared spaces will evolve over time is part of the fun.” ⑤

SITE PLAN



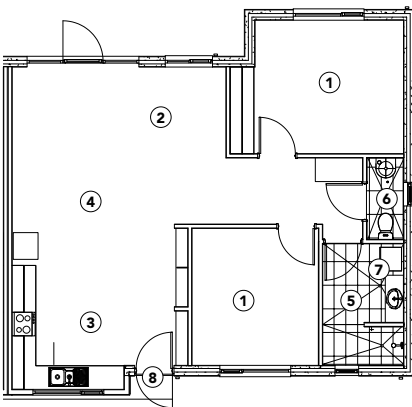
LEGEND

- ① Units
- ② Family houses
- ③ Community house
- ④ Central courtyard
- ⑤ Workshop
- ⑥ Water tanks
- ⑦ Carport
- ⑧ Creek



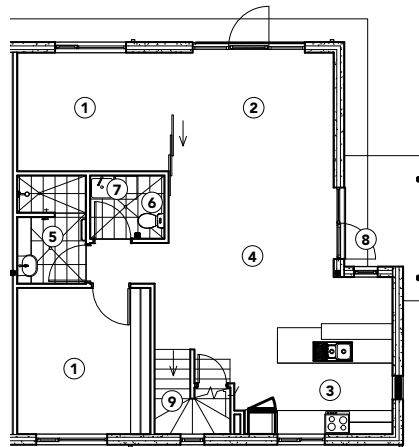
TYPICAL FLOOR PLANS

UNIT



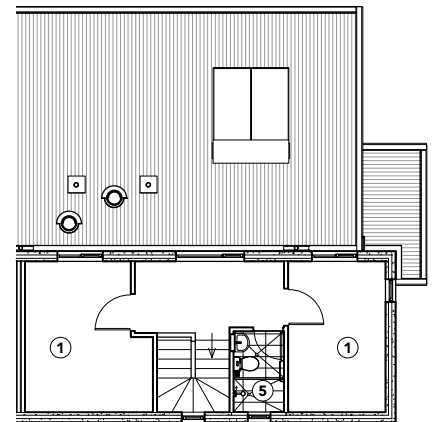
LEGEND

FAMILY HOUSE
GROUND LEVEL



- ① Bedroom
- ② Living
- ③ Kitchen
- ④ Dining
- ⑤ Bathroom
- ⑥ Toilet
- ⑦ Laundry
- ⑧ Entry

FAMILY HOUSE
UPPER LEVEL



- ⑨ Stairs to upper level, and to storage area in basement

HOUSE SPECIFICATIONS

HOT WATER

- 315L Sanden heat pumps each supply hot water to a pair of dwellings

RENEWABLE ENERGY

- Grid-connected communal 49kW solar PV system with battery storage from DSR Energy systems: 168 x 290W JA Solar panels, 48 x Narada REXC800 lead-carbon batteries, 6 x Schneider Xantrex inverters, Schneider Xantrex XW+ 80-600 regulators, Schneider CoMex digital communications

WATER SAVING

- 2 x 90,000L Pioneer GT90 rainwater tanks for non-potable and garden use
- Flowgen WPBE 5-62 pressure pump with 50L pressure vessel and PM Rain system for automatic switchover to mains water
- Houses plumbed to allow connection of showers, hand basins and laundries into planned Grey Flow Pro greywater system, a fully automated pumped diversion system to provide irrigation to communal garden areas
- Caroma 5 Star WELS-rated taps
- Stylus water-efficient toilet suites

PASSIVE DESIGN, HEATING & COOLING

- Optimised northern glazing to all dwellings for winter sun and minimal glazing on east and west facades to reduce heat gain in summer
- Insulated concrete slabs for thermal mass
- Roof forms maximise solar harvesting potential while maintaining solar access to rear rooms
- Compact floor plans and shared party walls minimise heat loss from the houses
- Windows positioned to maximise cross ventilation

ACTIVE HEATING & COOLING

- Ceiling fans to living areas
- Provision for future installation of reverse cycle air conditioning (as yet not required)

BUILDING MATERIALS

- Hempcrete installed over timber framing and raised above ground level on brick plinths; rendered externally with lime render and internally with lime plaster
- Colorbond Custom Orb cladding

- Colorbond Custom Orb roof sheeting over timber scissor trusses provide cathedral ceilings in living spaces
- Insulation: R2.5 Polymax acoustic batts to timber framed walls; R6 Bradford Gold fibreglass batts to ceiling; R1.3 Anticon blanket to roof; R1.25 Reflex polyisocyanurate (PIR) to underslab and slab edge

WINDOWS & GLAZING

- Nu Way argon-filled uPVC double-glazed doors and 'tilt and turn' windows

LIGHTING

- LED downlights and pendant lights

PAINTS, FINISHES & FLOOR COVERINGS

- Taubmans Endure low-VOC paints
- Lime exterior render made on site using lime putty and sand
- Interior walls: lime plaster, with some Venetian plaster as feature walls and splashbacks
- Concrete slabs lightly ground and finished with Crommelin water-based paving sealer

OTHER ESD FEATURES

- Site was carefully selected using a scoring matrix to ensure it met sustainable benchmarks including walkability to town centre, brownfield site and ability to create wildlife habitats
- Many shared facilities including community house, solar PV and battery storage, rainwater storage, greywater treatment and reuse, guest accommodation and a workshop
- All-electric houses with induction cooking
- Sub meters provided on electricity, rainwater, hot water and mains water supplies to all houses, networked to the community house to provide logging and monitoring
- Owners walk, use bikes and car-share to reduce vehicle ownership
- Provision made for electric car charging stations
- Food-producing gardens and beehives
- The creek area has been vested as public open space and revegetated to create a wildlife habitat
- Stormwater surface runoff is into vegetated filtration basins for nutrient and pollutant stripping prior to discharge into the creek

DESIGNER

H+H Architects, Albany

BUILDER

AK Homes

PROJECT TYPE

New build

LOCATION

Denmark, WA

COST

\$4.9 million for entire project including 12 dwellings, community house and workshop, landscaping, hardscaping; Jess and Dave's house cost them around \$490,000

SIZE

Dwellings: 8 x 80m² units, 4 x 130m² houses
Community house 125m²
Land 6500m²

ENERGY RATING

8.5 - 9.2 Stars

ENERGY RATER

Sid Thoo

INSIGHTS

"The solar system is designed to prioritise power loads, charge the batteries before exporting any excess power to the grid and operate in off-grid mode if there is a power cut."

Tom Stevens
H+H Architects