



Going up in the world

Careful attention to retrofitting the original house has resulted in a net-zero renovation and addition for this Melbourne family. A creative approach to the new roofline also allowed the inclusion of a second storey without overshadowing the neighbours.

WORDS Anna Cumming

PHOTOGRAPHY Simon Black



KEY FEATURES

- 7.9 Star energy rating achieved for the whole house
- No longer a 'slave to bills': all-solar-electric house, gas connection removed as part of renovation
- Phase change materials used to improve thermal performance
- Distinctive design to allow for neighbours' solar access.



The renovation has added a storey, with two bedrooms and a bathroom tucked under a roofline designed to maximise internal space without impeding the solar access to their neighbours' courtyards.

IT'S A FREEZING, BLOWY LATE WINTER

afternoon with the promise of hail when I arrive, damp and shivering, on Jasmine's front doorstep in Coburg, but all thoughts of the weather outside quickly fall away when she ushers me into the warm, draught-free home she shares with her partner James and young daughter. We sit around the dining table in the new living space at the back of the house, with its tiled concrete slab floor and folding double-glazed doors that open to the small back garden.

The front of the house is still recognisably the single-fronted Edwardian weatherboard cottage Jasmine and James bought in 2010. "It was terribly cold in winter and very, very hot in summer; it had big gaps in the floorboards and the kitchen and bathroom were just tacked on the back," says Jasmine. "We loved it though. It was quaint." They had always planned to renovate, but weren't sure what that would look like. "We like smart spaces – we're not interested in a big house. We wanted something that was easy to heat and cool, and to clean. We didn't want to be slaves to energy bills."

After collecting ideas – and using *Sanctuary* as a resource – and one misfire with a designer they felt didn't listen to their requirements, they found the team at Positive Footprints, who designed the renovation and managed the build for them. They asked for a more family-friendly home: a new kitchen and dining space, two more bedrooms (for a total of four; one is used as a study) and a second bathroom. The brief also requested a thoughtful design with no wasted space, and the use of materials with a low environmental impact. "We wanted to be sensitive not only to the environment generally, but to our environment," explains Jasmine. "So we asked for natural, zero-VOC materials as far as possible." (The family also has a policy of avoiding bringing plastic items into their house as far as they can.)

The team at Positive Footprints came up with a design that retained the front three rooms of the original house. The lean-tos were demolished and replaced with a passive solar designed two-storey extension with an Envirocrete slab floor, reverse recycled-brick veneer east wall, insulated timber frame walls and Colorbond roof.



⬆
 The eastern wall of the extension is of reverse recycled-brick veneer, providing thermal mass benefits and an attractive texture. And a second external door with ramp entry to the new part of the house means that no more prams will need to be left on the front porch.

➡
 James and Jasmine opted for Australian-made tiles on their concrete slab floor, as it was a cheaper option than polished concrete and they were advised that the tiles wouldn't significantly impede the floor's thermal mass benefit.



Downstairs, a short corridor leads past a new bathroom and European-style laundry cupboard to the kitchen and dining area; upstairs there are two modest bedrooms and a compact bathroom.

As part of the building works, the retained part of the house received an upgrade: the weatherboards were removed and the walls tightly sealed and insulated; underfloor insulation was installed; new bamboo floorboards were laid over the unsalvageable originals; and the windows were replaced with double glazing. "All too often in our industry the existing house is left leaky and uninsulated, a drain on an otherwise sustainable extension," says Positive Footprints' Sarah Rickard. "We're proud of how tightly the front part of

Jasmine and James' home was wrapped up – it meant that the whole house achieved 7.9 Stars."

The roofline of the new part of the house is curved on the east and angled on the west side; the shape, reminiscent of a wedge of cheese, has given the Cheese House its nickname. "It's a narrow site, and we had to comply with side setback lines," says Sarah. The angle was calculated to avoid blocking the sun to the limited private outdoor spaces of the three flats on Jasmine and James' west side. "We wanted to be sensitive to our neighbours – they have been here a lot longer than us," says Jasmine.

The sloped ceiling allows for capacious built-in cupboards in the upstairs

bedrooms; the curve on the east allows for the required two-thirds of the bedrooms' floor area to achieve the minimum ceiling height. Far from feeling cramped, the solution gives the rooms a quirky character while maximising the internal useable space. Bulk insulation in the roof is supplemented with phase change sheets in the ceiling which perform like thermal mass, helping to mitigate the overheating that can be a problem in upper storeys.

The house is not connected to gas, as Jasmine and James "just didn't want to be investing in something that wasn't renewable." Appliances are all chosen for their energy efficiency, and a 'green switch' in the kitchen allows multiple appliances to be switched off via a single switch



Upstairs, the interesting roofline enhances rather than impedes the useability of the spaces. Phase change sheets in the ceiling help to mitigate overheating, a common problem for double-storey builds.

The layout of the bathroom with wet areas grouped together minimises the need for shower screens and streamlines cleaning; wide doorways and stepless thresholds makes the ground floor accessible to all.

when leaving the room, cutting down on standby energy use. Two heat pumps provide hot water and run the hydronic heating system, and a 4.7kW solar system, mounted on the east and west roof faces of the original house, provides more than enough electricity to offset the home's requirements. "The house is carbon positive in operation," says Sarah.

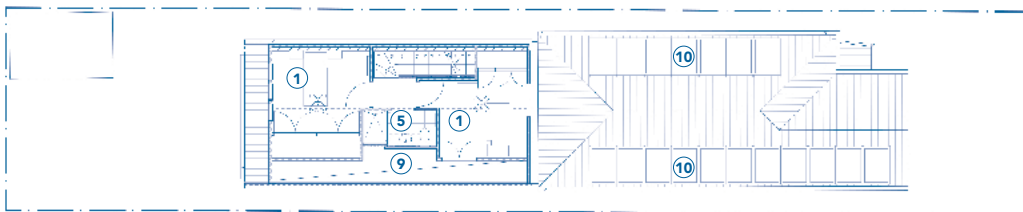
For periods of extreme hot weather,

there are small reverse-cycle air conditioners in the new living space and the upstairs bedrooms but Jasmine says, as hoped, they are rarely needed. She explains that by ensuring a tightly sealed building envelope, and in particular paying attention to the retrofitting of the original part of the house, a cooler indoor temperature in winter is fine: "There's so little draught that even when it's 16 degrees inside, it's

perfectly comfortable."

On hot days, they take their designers' advice and operate the house like a 'thermal battery', running the air-conditioners for a couple of hours during the day (using their own direct solar generation) to cool down the thermal mass and the phase change material, then turning it off to allow the stored 'coolth' to regulate the internal temperature into the evening. ⑤

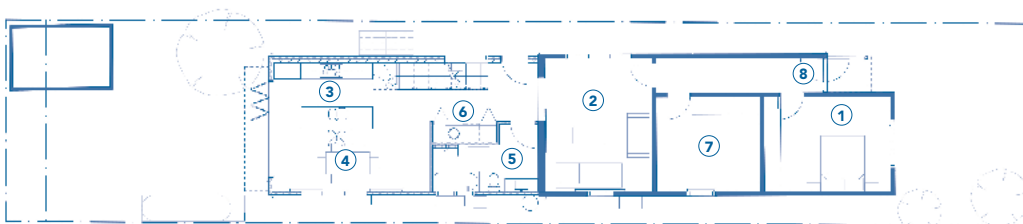
FIRST FLOOR PLAN



LEGEND

- ① Bedroom
- ② Living
- ③ Kitchen
- ④ Dining
- ⑤ Bathroom
- ⑥ Laundry
- ⑦ Study
- ⑧ Entry
- ⑨ Storage
- ⑩ PV system

GROUND FLOOR PLAN



The Cheese House

—Specifications

Credits

DESIGNER/BUILDER

Positive Footprints

PROJECT TYPE

Renovation and addition

PROJECT LOCATION

Coburg VIC

COST

\$400,000

SIZE

272 m²

BUILDING STAR RATING

7.9 Star (whole house)

Sustainable Features

RENEWABLE ENERGY

– 4.7kW solar PV system.

WATER SAVING

- 5000L rainwater tank to laundry, toilets and garden; rain harvesting via Leafeater Ultra Rainhead on downpipes
- Redwater thermal transfer valves to direct ‘cold’ hot water, normally wasted, to a tank
- 5-star WELS tapware; 7.5L per minute shower roses; and 3/4.5L flush toilets
- Greywater plumbed for future potential pickup and reuse.

PASSIVE DESIGN

- Heating and cooling requirements minimised through passive solar design, including glazing to the north, correctly designed eaves to prevent summer overheating and high-level venting through openable skylight
- Thermal mass provided through tiled concrete slab and reverse brick veneer wall; BioPCM phase change material for upstairs ceiling
- Whole building fully insulated and draught-sealed; Deflecto self-closing gravity louvres for wall and under-eave vents, as well as for rangehood and bathroom exhaust fans
- Distinctive building shape avoids shadowing neighbours
- Steep roof creates a raked ceiling allowing warmer air to rise up the stairwell and out through the roof window
- House designed to enable zoning to minimise heating and cooling requirements.

HOT WATER, ACTIVE HEATING & COOLING

- Hot water: Sanden heat pump

- with 315L storage tank and condensing hot water unit
- Hydronic space heating: Bosch ‘Air to Water’ heat pump
- Daikin reverse-cycle air conditioners in kitchen and upstairs bedrooms
- Martec ceiling fans in all bedrooms and living room.

BUILDING MATERIALS

- Materials chosen for their reduced embodied energy and sustainability credentials, including recycled Reds bricks and Independent Cement and Lime Ecoblend concrete (30 per cent cement replacement)
- Slab: Foamex Diamond waffle pod (40 per cent recycled content); Boral Envirocrete with 60 per cent cement replacement, 100 per cent recycled steel reinforcement and plastic membrane and 100 per cent recycled aggregate.
- Flooring: Bamboo Evergreen pre-finished click boards, Bostik Ultraset SF low-VOC adhesive
- Insulation: roof CSR foil backed blanket R1.8, 70 per cent recycled glass wool; ceiling Fletcher Pink Batts R5.0, low-VOC; walls R2.7 with Enviroseal reflective foil; under-floor R4.0
- Timber: combination plantation and PEFC or FSC certified, including D&R Henderson orange tongue particleboard 75 per cent pre-consumer recycled content
- Colorbond corrugated cladding; Boral Enviro Plasterboard and 100 per cent recycled paper.

WINDOWS & GLAZING

- Stegbar Sitaline composite windows: aluminium external,

- Auralast pine timber internal with 14mm spaced argon-filled double glazing, high solar heat gain low-emissivity coating; primarily casement for better air scooping ventilation and sealing ability
- Velux automatic opening, double-glazed roof windows.

PAINTS & FINISHES

- Ecolour zero-VOC paints
- E0 (minimal formaldehyde off-gassing) kitchen, cabinetry and trims; FSC accredited Evener laminates to cabinetry
- Engineered quartz stone (Caesarstone) and stainless steel (recyclable) benchtops
- Ardex low-VOC waterproofing membrane, glues and grouts
- Sikaboom foam gap filler for windows and door jambs
- Easy to clean surfaces to living spaces; bright, natural light filled rooms throughout to inhibit mould growth.

OTHER ESD FEATURES

- Clipsal standard switch plate or ‘greenswitches’ used to reduce standby loads
- Low-wattage LEDs throughout
- Stepless thresholds inside and 870mm wide doors to allow for future ground floor accessible living and visitors
- Energy efficient appliances, including induction cooking
- Owners have disconnected their gas supply in order to save on bills and go 100 per cent renewable
- Mobius Recycling was employed to manage site waste: 90 per cent of potential waste was recycled; all wash-ups were done on site and not down drains, stormwater managed correctly through the build.