



## Stellar result

Using the latest and best available in thermally efficient design and materials has delivered a design with an 8.8 Star House Energy Rating and a 'net zero' energy objective that looks every bit as good as it sounds.

The eco approach to the new Launceston home spanned design, materials, thermal efficiency, strict infiltration controls, lighting design, appliance choices, waste water re-use, rain water collection, PV power and solar hot water with heat pump boost.

"We had the privilege of working with a wellinformed client who was open to various energy saving tactics," says Mark Dewsbury, project designer from environmentally aware building and landscape design company, Carawah.

Once the sketch design was agreed, the palette of possible materials was explored in the context of sustainability, cost, maintenance requirements and aesthetics.

### Toward 'net zero'

"In this case, given that our aim was to achieve a net zero requirement for heating and cooling, we suggested the use of precast concrete," says Mark.

"Precast minimises construction waste when compared to in-situ or core-filled block walls, while the flexible combination of structure and mass that sandwich panels offers enabled us to optimise the passive thermal capabilities of the house. Add economics into the equation and the client's initial caution was overcome, especially after some careful aesthetic planning to ensure the house would not be too industrial and cool – the aim was for a warm family home."

To soften this 'industrial' look, the final palette of materials for the project was mixed to include exposed precast concrete panels, complemented by

### Architect and Project Superintendent

Carawah

### Service Engineer

Engineering Edge

### Builders

John Faulkner

### Precast Manufacturer

Duggans

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a 'woodform' timber cladding system at ground level and insulated precast panels with a soft metallic finish at higher levels.

Sandwich panels exceed BCA requirement A key part of achieving the net zero result and 8.8 star energy rating was use of the insulated precast concrete sandwich panels, made offsite at Duggans Precast in Launceston.

The wall panels provided a durable external and internal surface with good R-values. With an inner precast concrete layer of 120mm, 100mm expanded polystyrene and an external concrete layer of 120mm, an R-value of R3.3 was able to be achieved, well above the minimum BCA requirement for Climate Zone 7 of R1.9.

Insulated precast sandwich panels are commonly used internationally due to their superior thermal performance. Whilst they are increasingly being specified here in Australia for BCA compliance, Mark Dewsbury is intrigued that in Australia we are

still arguing about insulation in buildings – even though it can dramatically reduce energy use – as have the sandwich panels in this case.

To ensure the thermal integrity of the building, particular attention was paid to reducing thermal bridging throughout. Non-conductive connectors were used in the sandwich panels to tie the two concrete layers together. In addition, thermal breaks were provided at all wall junctions, within walls and between walls, floors and roof spaces. This required the extensive review of all precast shop drawings to ensure that the sandwich panels provided a consistent thermal break wherever they were used.

### **Pooling resources**

From the outset of the project, it was clear that the swimming pool would require the most energy. The design therefore relied on the use of wellinsulated concrete, concrete block and precast concrete, all of which played a role in thermal storage principles of the pool and pool house to reduce energy use dramatically.

### **Scoring the final result**

The completed project ticks all of the required boxes, delivering the desired aesthetic and, more importantly, energy performance – and precast has played a strong part in both.

In terms of appearance and finish, the main spine wall, for example, has been left in its original off-form precast concrete finish, grounding the structure over two storeys with the perpendicular walls painted white to lighten and define living and 'gallery' spaces.

In terms of thermal performance, Launceston is a cool temperate climate mainly calling for heating of homes. Although it does not have the prolonged hot spells of mainland states, there are weeks of very warm weather.

To date, inside the house has been predominantly 20-22 degrees Celsius regardless of the exterior condition, thanks to the precast concrete elements, adequate levels of insulation throughout and the use of a suspended rammed earth floor for the second level of the house. Rammed earth is quicker to absorb and re-radiate solar radiation on a day to day cycle, whereas the other concrete elements moderate heat and cold over much longer periods.

### **What makes for star performance?**

The completed project has achieved an impressive 8.8 Star House Energy Rating via simulation with the AccuRate software, following a thorough submission detailing all fabric matrices including floor, walls, ceilings, roof and windows to demonstrate that the design exceeds BCA requirements.

#### **Passive design features:**

- Southern face of the ground floor is fully bermed
- High levels of external wall, subfloor, ceiling and pool-house insulation
- Northern orientation with calculated levels of glazing and shading
- Large amount of active and insulated thermal mass: Level 1 - insulated waffle pod floors and precast walls; Level 2 - Rammed Earth Floors and precast walls
- Thermally broken aluminium windows
- Thermally improved aluminium doors



#### **Active design features:**

- Evacuated tube solar hot water with heat pump boost (to date boost not required)
- 3.6kw grid connect roof top PV
- Geothermal refrigerant ground loop system
- Rain water harvesting
- Black and grey water treatment and reuse on site.