

## Award Winning Thermal Efficiency

2013



Thermal efficiency was a significant driving force in the design of this Award winning home in Beechworth. Developed by the Clients in conjunction with Tracey Toohey Design, the completed design offered an outstanding energy rating of 8.4 Stars and won the **Award for Best Sustainable Home at the 2013 Master Builders Regional Awards – North East**.

But beyond thermal efficiency, our Clients had very specific requirements regarding the design for the building. Having previously lived on a rural property, the shift into the urban environment of Beechworth is designed to cater for their future needs as access to health services and less demanding property maintenance becomes increasingly important to them. 'Future proofing' the house for accessibility and ease of use as they grow older was an important issue for the Clients and led to design and fit out choices that address these issues.

In making the shift there was a strong desire to keep the privacy they had previously enjoyed as well as the ease of living in a well designed, thermally efficient home. The site is bordered by a Park on one side and a high hedge on the other, on a street that only attracts local traffic offered the advantages they sought in regards to privacy. The ability to make good use of the Northern aspect completed the picture for them.

The end result has been a dwelling with a level of functionality and thermal efficiency that means the Clients comfort and lifestyle is catered for in a home that complements its surrounds and achieves low levels of energy consumption.

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## Quality of Construction

This is an outstanding example of an energy efficient design that has been achieved without sacrificing contemporary standards of finish and aesthetic design.

The total list of energy efficient and sustainable design features is impressive:

- Solar passive design using northern aspect for best effect.
- Waffle pod concrete slab with higher insulating value and lower concrete use.
- Feature Timber Doors to External and Internal openings.
- Porcelain tiles in North facing living areas for thermal mass properties.
- Detailed painting and tiling finishes throughout.
- Complete sealing of wall fabrics against openings, proprietary seals for doors and windows to allow for maximum control of air movement.
- Custom Kitchen, Laundry and Bathroom joinery design using a blend of natural and contemporary finishes.
- Discreet mounting of a Venmar Heat Recovery Ventilator (HRV). This transfers heat from exhaust air that is expelled from the house to the fresh air entering the house, without mixing the stale air and the fresh air.
- Cross flow ventilation – windows and doors on North and South faces allow cross-flow ventilation for cooling with proprietary seals that prevent heat loss when closed.
- 8.4 Star thermal performance rating – This can only be achieved with attention to the detail of the thermal performance features including sealing and insulating the House thoroughly.
- Consideration of Wall fabric design to minimise heat gain in Summer and heat loss in Winter. A battened facade system was used for the wall fabric, using a variety of external finishes over a insulated frame with an additional reflective air space.
- Selective use of different Window options, all double glazed, mostly timber aluminium composite construction, for cost effective thermal performance.
- No recessed down lights of any type in the internal ceilings of the house to ensure a well-sealed envelope and no gaps in insulation.
- Provision of Grid connected photo voltaic panels with Battery bank storage.
- Northern pergola for passive shading of glass in Summer. Stainless steel wires have been provided to assist with deciduous creepers.

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- Air lock door to the Entry for ease of ventilation, air conditioning and functionality. The main living area can also be sealed off from the Hall for energy conservation.
- Provision of highly efficient Solar Tube skylights to deliver light to the Laundry and part of Living area.
- Reverse Brick veneer walls, complete with rendered finish, for Thermal Mass.
- Masonry wall behind the Wood Heater for Thermal mass.
- Lighting – selection of LED lighting to maximise efficiency and reduce electricity use. A lighting audit reflects a total of 502.6W for every internal light in both house and garage, including all under-bench, feature and task lights as well as all the external LED flood and feature lights. With incandescent and 35W halogen down lights the potential total could be estimated at 1930 Watt. The current lighting specification would reflect a 74 per cent reduction in power consumption for lighting.
- Solar Star” roof ventilation system – solar powered roof-mounted devices that generate enough air movement to expel damaging heat and moisture and to maintain a steady flow of beneficial air circulation. The result is properly ventilated roof spaces which prolong roof life, lower cooling costs and make life considerably more comfortable.
- Gas boosted Solar Hot Water Service – Evacuated tube type for peak efficiency. A high angle frame supporting the evacuated tubes provides for peak winter efficiency to minimize LPG boosting.
- Autonomous water supply with on site rain water storage of 27,500 litres – There is no connection to Town Water supply.
- Grey water is diverted to dedicated diversion system, for use in Garden.
- Smart flo spout system for cleaner water and reduced maintenance.
- Insulating additive to Ceiling paint.
- High quality polyester insulation batts to Walls and Ceilings.
- Extensive use of Plantation grown pine, chosen specifically as a renewable resource that locks up Carbon.
- Ceiling fans – provision of ceiling fans to every living area and every bedroom.
- SolarTube sky lights for superior day lighting in Kitchen and Laundry.
- 32 amp circuit provided to Carport for potential use charging Hybrid vehicles.

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The completed house was handed over in January 2013 and the Clients have continued to progress the landscaping of the site. During this time they have monitored their energy use for gas and electricity consumption and are very happy with the success of this dwelling in reducing greenhouse gas through lowered energy consumption.

This house generates enough electricity to easily provide for the Clients daily needs as well as generating sufficient kilowatts to return energy back into Victoria's power grid. As a grid connected supplier of electricity, produced from a 4.41 kilowatt installation with 18 x 245W photovoltaic panels, our Clients have become a net exporter of electricity. In the 4 months since October 25th 2012 they have exported 2188kWh to the grid but imported only 183kWh.

## Client Relationship

This is the second time we've worked with these particular clients to build a custom designed and thermally efficient new home. The original house had been their home for 15 years and we were pleased to be invited be part of their next adventure, an invitation that reflects the quality of our relationship forged all those years ago. Working with our Clients is at once challenging and instructive as they are very well versed and researched in the principles and processes of construction. Ultimately the project was very much a collaborative partnership between Client, Designer and Builder.

We were invited to have input during the design stage and consulted closely with designer Tracey Toohey as the innovative construction detail came together. We were involved with the Clients in the specification of the finishes and fixtures and supplied multiple detailed Tenders as we tailored the project cost to their requirements.

Communication with our Clients is a key strength of our business. In this case the long relationship we have shared made it possible to approach the "rapids in the river" we came to with a sense of mutual respect and common purpose. We felt we understood their concept thoroughly and made every effort to execute that vision without compromise. At times the quality of the construction was challenged, particularly with the practices of sub-contractors but we were able to work together to return the project to the high standard we were all committed to achieving.

## Design

Energy efficient design, a floor plan to reflect the client's lifestyle, reduction of waste, attention to detail in every part of the construction and a flaw free finish were all part of our approach to meet our Client's needs.

- The floor plan features include:
  - Master Bedroom complete with a walk through robe and access to the Bathroom
  - Guest Bedroom complete with built in robes
  - Entry hall and Airlock
  - Combined Kitchen/Dining/Living area
  - Large Pantry room
  - Built in cupboards in the Hallway
  - Undercover connection to Garage
  - Attached Carport
  - Steel Pergola to the North
  - Western porch and Deck area
  - Bathroom, accessible from the Master Bedroom
  - Toilet



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- Solar passive design has maximised comfort levels in the House, preventing the levels of Summer heat gain and Winter Heat loss that the bulk of the adjoining buildings would experience.
- The wall fabric construction used two entrapped layers of air sandwiched between insulating layers to prove higher R values than normally available in 90mm stud walls. The building has an 8.4 Star thermal performance rating – nominally an energy consumption of 75.1 MJ/m<sup>2</sup>, 61 per cent better than the minimum 6 Star requirement.
- The siting of the building, within the constraints of an urban block, has provided for private open space without compromising the solar passive principles applied. The Western deck takes great advantage of the shading afforded by the mature oak tree in the adjacent Park.
- The custom design of the floor plan is very much designed around the lifestyle of the Clients. The floor plan is purposefully compact to suit two people with two bedrooms and a single bathroom. There is easy access to the Garage workshop from the House, behind a secure privacy fence. The approach to the Fence and Gate is via a ramp, something important to keen cyclists like our Clients.

## Execution of Design

There is a significant amount of feature detail internally and externally that has been successfully executed to a very high standard.

- Custom designed to make best use of slope in the building envelope, a great deal of effort was made to set out the building to make best use of the site.
- A battened facade system was used for the wall fabric, using a variety of external finishes over a sealed, battened and insulated frame. All membranes were sealed at all edges, joints taped with reflective tape. Particular care was taken sealing around openings and sealing joinery against the frame using expanding foam.
- The Double glazed Timber aluminium composite windows (along with the thermally improved aluminium windows) were all sealed internally using plaster returned into the frames that was square set. External feature hardwood door frames were matched with P50 plaster edge treatments.
- Reverse brick veneer masonry was built in the Living room, Study and Bedroom 1 for thermal mass, the brickwork rendered for aesthetic effect.
- Floor tiling throughout living areas, accessible to Northern Sun in Winter was matched to bamboo timber floors to Hall and Bedrooms, proprietary cork floor to Kitchen, Porcelain tiles to Wet areas.
- A fresh air Breather pipe was set in the slab to a precise location adjacent to the Fire wood storage adjacent to the Wood Heater. Through a custom made vent, this will provide fresh air to the Heater, something very important in a very well-sealed environment.
- The siting and fitting of the 'Venmar' Heat Recovery Ventilator (HRV) unit in a purpose built bulkhead cupboard ensure quiet operation and ease of access.
- The low maintenance Steel Pergola to the North wall was designed and built 'in house' by Ovens & King Builders and constructed with minimal visible fixings. Deciduous creepers will provide Summer shade.
- The Ritek Sandwich panel roof to Garage used for ease of construction and high R value has been fitted over beams specifically tailored for the clients storage needs.
- The elevated deck area to South and West, featuring Radially Sawn Silvertop Ash 'New Deck' as a sustainable, durable and cost effective alternative to Merbau. The decking has been completed with an eye to the detailing of the deck joints and edges.



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- Slide valve controls in the storm water pipes provide for flexibility in rain water harvesting.
- Locally harvested Red Box timber bench tops on Kitchen cabinets make for a spectacular use of feature timber whilst making great use of a low embodied energy product.
- Bespoke Walk in Robe fit out using locally harvested timber provides an out of the ordinary aesthetic in a room not usually associated with feature detail.
- As a Master Builders accredited 'Green Living' Builder we actively pursue waste management issues on building sites, including a strong focus on waste minimization and includes the provision of dedicated bins for recycling timber and steel. This has had a significant effect on reducing the number of general waste skips taken to landfill.
- Site management practices meant;
  - Site excavations were reduced to a minimum which is another benefit of Waffle pod slab designs.
  - Stripped top soil and vegetation was removed to a local landfill for their use. The Clients had specific requests regarding limiting traffic of heavy vehicles in parts of the block to minimise compaction of the top soil. These requests were respected and strictly adhered to by all trades.
  - The site, which is sloping to some extent, offered some risk of erosion or possibilities for soil to contaminate roadways or drains. Care was taken with issues such as Brick saw run off and plastering and painting clean ups.
  - The site was serviced from the outset with a clean, well stocked toilet and dedicated waste and recycling skips. Ovens & King Builders policy is to ensure all trades make use of these facilities.



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