

## Thermal efficiency in a larger home

2014



After a distinguished career in the Australian Army, our clients wanted a home that accommodated them and their collection of furniture and memorabilia in a way that would match their new lifestyle. Their expansive home offers superb rural views, provides for formal and informal living and offers a level of energy efficiency and sustainability uncommon in houses of this kind.

Retiring from an extensive and successful career in the Australian Defence Force, our Clients looked to return to North East Victoria to be near family and friends in their retirement.

Our Clients were able to purchase a large block in an established estate that overlooked the Ovens River on the Northern boundary. This was an important first step as it provided potential for including solar passive design principles in the design.

A lifetime in the service of the Australian Army had meant constant relocations. After a life of living in other people's house's, the clients brief to designer Tracey Toohey was detailed. This was their chance to have a house that accommodated them, their family, their collection of furniture and memorabilia in a way that would match their intended lifestyle.

The house needed to address the following important needs:

- Expansive open plan living that took advantage of the rural aspect in the North
- Well-appointed Outdoor dining area
- Formal dining and entertaining rooms
- Private suite of rooms for their personal use
- Access to high quality views of the River

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- Display of key pieces from their collection
- Extensive wardrobe and storage spaces
- Dedicated, climate stable storage for their Wine collection
- Accessibility for their Senior years
- A Guest room with large En suite
- Energy Efficiency for living comfort
- Hydronic heating that was easily controlled
- Low maintenance materials
- Highly secure and private
- Incorporation of technology for comfort and efficiency

All of these needs had to be met in a seamless manner that meant the rooms had a natural flow, the operating systems of the house were located discreetly and the façade of the house fitted well into the Streetscape.

The final result is a testament to the effective planning the Clients and Tracey Toohey put into the design, drawing out specific needs, addressing Planning and Building regulation and incorporating positive solar passive design features.

There is a significant amount of feature detail internally and externally that has been successfully executed to a very high standard. The Clients had a very clear vision of the style and interior decoration of the house. We worked with them to fashion a blend of specific features against a backdrop of highly finished surfaces.

- Two storey in construction with a feature brick skin to the lower floor and Scyon Linea to the Upper cladding, the façade fits nicely into the surrounding houses, understating the very high quality and features of the home.
- Large partially cantilevered Balcony, tiled with Aquabocci A40 grated drain, which is accessible only from the Master Bedroom suite.
- Red gum floors to the main entry and hall, leading to a Red gum Stair that provides access upstairs.
- Domuslift high quality Italian Hydraulic Lift from the main Living to the Master Bedroom Suite is the alternative route upstairs.
- Clipsal C Bus microprocessor-based control and management system for lighting and other electrical services such as sensors, Security cameras, Audio etc.
- Extensive custom made Cabinetry including Redgum Bar and granite bench tops.
- Timber lined steel framed Outdoor Gazebo with custom cabinetry and C-Bus connectivity.

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- Double Glazed Rylock AA series windows featuring substantial aluminium frames that blend commercial aesthetics and domestic functionality.
- Extensive Exposed Aggregate paving that flows around the House perimeter.
- Dedicated Plant room to efficiently and discreetly house Gas boilers, Hot water service, Solar Power inverter and Lift Control box.
- Walk through Robe in the Master Bedroom featuring sophisticated hanging hardware.
- Two En suites, Main Bathroom and a Guest toilet, all fitted with high quality fittings and Ceiling height tiles.
- Extensive Large format tiles to the main Kitchen Living area.
- Phantom retractable fly screen to the Kitchen Servery.
- Invisiguard security doors with triple point locks to the external sliding doors.
- Finger Jointed and Primed Pine Victorian Colonial Architrave and Skirting.
- Kiln dried hardwood internal door jambs.
- Corinthian Quick Slide, Sliding Units with Balmoral PBAL2 Doors to Laundry and Linen Cupboards.
- Colorbond Roof sheets including Metal Fascias and Blue Mountain Mesh gutter guard.
- 75mm Symphony plaster cornice to wall-ceiling junctions generally.
- Hydronic radiator heating with two high efficiency condensing gas fired boilers and 24hr 17 day programmable thermostats.
- Thermann Natural Gas Boost Solar HWS, Tg-315-GI026n-30, inter connected to the Hydronic's boilers.
- Two corrugated iron Slimline Water Tanks (4212 L) with inbuilt Evolution MKII Integrated Submersible pump.
- Mitsubishi reverse cycle air conditioner, ducted to six outlets upstairs, including bedrooms, en-suite, bathroom and sitting room. A three head Mitsubishi reverse cycle air conditioner installed downstairs services the guest, dining and lounge areas.

The design process was a lengthy one and engaged the Clients, the Designer Tracey Toohey and Lachie Gales from Ovens and King Builders. The process involved several concept versions being developed which were refined into the final vision. This allowed the clients to explore their ideas through the process whilst being guided by experienced practitioners. The custom design reflects not only the Owners needs but also their values. The close relationship that developed between the parties provided great insight into what would be important to our Clients.

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 superior finish were all part of our joint approach to meet their needs. The wall fabric construction

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used two different mediums on the upper and lower floors designed for economy of construction as well as an aesthetic effect.

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. Cross ventilation was also considered to reduce the requirement for air conditioning. The building has a 6.4 Star thermal performance rating which is better than what might be expected in a large two storey home like this one— nominally an energy consumption of 173.2 MJ/m<sup>2</sup>, 12% better than the minimum 6 Star requirement. This is a remarkable achievement on a block with a predominately Western orientation.

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 Outdoor living and upper floor Balcony takes great advantage of the views of the Ovens River and farm land beyond providing the sense of seclusion of rural living by cleverly eliminating the view of neighbouring houses.

Double glazed windows capture specific features the Client valued most, a favourite tree, the distant ranges and a view of the river from the upper floor en-suite whilst still ensures privacy to the room.

The list of the sustainability and thermal efficiency measures employed includes:

- Creative building design to enable Solar passive design principles to maximise energy efficiency and comfort as the block did not naturally lend itself to this.
- Insulation of all external walls with high performance R2.5 batts to minimise heat gain in Summer and heat loss in Winter.
- Cantilevered Floor joists creating a balcony that also provides effective Summer shading on the Ground floor without the need for posts or columns.
- Air lock door to the Main Entry for ease of ventilation, air conditioning efficiency and functionality.
- Provision of R.1 styrene insulation to the underside of the Concrete Slab.
- All ceilings including Veranda's are insulated. Reducing heat retention under the pitched veranda roof and reducing heat transfer to the house.
- Sealing of vapour barriers to windows and door frames to reduce uncontrolled air flow.
- Cross flow ventilation – windows and doors sited to prevailing winds to facilitate cross-flow ventilation for cooling.
- Double glazing of thermally improved Aluminium Windows for cost effective thermal performance. Opening styles chosen to maximise ventilation without compromising performance.
- Ceramic tiles in North facing living areas for thermal mass properties.

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- Two corrugated iron Slimline Water Tanks (4212 L) with inbuilt Evolution MKII Integrated Submersible pump were integrated into the House water supply.
- Hot Water for the Hydronic panel radiators as well as the boost for the Solar HWS is provided for by high efficiency condensing gas fired boilers and 24hr 17 day programmable thermostats.
- Evacuated Solar tube collectors for the hot water unit to maximise water heating efficiency even on cloudy days.
- Lift Elevator motor is powered by a Single phase low power supply with Reduced-start hydraulic system. It uses 100% biodegradable green oil and has Auto-off LED lighting in the lift car, all of which ensures very low running costs.
- 5kw Photovoltaic system in split locations to maximise solar gain and effective energy production. The system is grid interactive, exporting excess power.
- Automated control and integration of electrical systems with Clipsal C-Bus to enhance management of power usage.
- Extensive use of Australian plantation grown timber to lock up Carbon.
- As a Master Builders accredited 'Green Living' Builder we actively pursue waste management issues on building sites, including the sorting and recycling of hard waste with a view to reducing landfill use and maximizing recycling opportunities.

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 the River views, and Solar orientation, a great deal of effort was made to set out the building to make best use of the site. Locating the House to minimise overlooking and over shadowing of adjoining properties was an important focus. We worked hard to site the building precisely to the site plan dimensions
- Prefabricated termite resistant wall frames, Engineered Timber and Steel floor frames all provide for a robust and enduring structure. Brick Veneer and Scyon wall fabrics were used over a sealed and insulated frame. Proctorwrap breather membrane was used in lieu of traditional plastic wrap. All membranes were sealed at all edges, joints taped with proprietary tape.
- The Double glazed aluminium windows fitted were Rylock AA series. Each AA Series window features an inline Kiln dried hardwood reveal that improves the energy efficiency, as the aluminium area to the interior is minimised. All were sealed internally using expanding foam to reduce air movement.

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- Care was taken in every aspect of the finished external appearance
  - downpipes located discreetly;
  - edge treatment of the weatherboards done in a Scyon frame;
  - paving in a particular exposed aggregate mix;
  - drainage grates considered for appearance.
- The external Balcony to the Master Bedroom suite was provided with an Aquabocci low profile architectural drain that collects surface water and disposes it through downpipes cleverly concealed within the steel supporting columns. The rainwater from the roof above is dealt with in the same downpipes.
- Large format Floor tiling throughout living areas, accessible to Northern Sun in Winter for solar gain, was matched to polished Red gum timber floors to Hall and Entry. The flooring system is sourced from a local Timber mill and uses 14mm pre polished Red gum boards stuck directly to a sealed concrete slab
- Custom made Red gum Stair, landing and Handrails which is aesthetically appealing, durable and manufactured to the highest standard. The use of Red gum through the joinery in the House is thoughtful connection to the riverine forest outside the house.
- Waterproofing of all wet areas provided by Wet Seal Australia to ensure security of the structure and prevent costly and inconvenient leaks. This is a reinforced Class 2 system that gives maximum strength and long term durability. The system uses innovative chemical formula based upon latex, hybridised with polyurethane and a tile adhesive keying agent that provides low water absorption, robustness against building movement and a consistent dry film thickness.
- Sizing and placement of Hydronic heating radiators planned in conjunction with the Clients to provide the best aesthetic effect while providing a very quick reaction time, heating an area within a short amount of time, using little energy. Hydronic heating offers a more natural and efficient way to heat homes with no drying of the air and no forced air movement or noise. The running costs for any form of Hydronic system will be cheaper than an air based heating system.
- The majority of the mechanical services are discreetly placed in a dedicated Storeroom that is itself well finished. Gas Boilers, Lift motor, photovoltaic inverter and Hot water service are co-located in this room with exhaust fumes vented externally.
- The same boilers that heat the Hydronic's also provide the boost to the Evacuated tube hot water service. A reticulated hot water line provides continuous and quick delivery of hot water throughout the house without the need to draw off large amounts of water.

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- A Clipsal C-Bus home automation system was installed providing integration of most aspects of the home's electrical services into one system. From a centrally located keypad access to control the Multi room audio, Curtain controls, Security system, Fan controls, Starserve TV and Cable system is all possible. Conventional light switches are replaced by Clipsal Saturn glass-look switches and eDLT controllers. Occupancy sensors control Hallway lights for safety and economy
- The Electrical switchboard and C-Bus control panels are discreetly and conveniently located in an under stair cupboard that has been fitted with a ventilated door.
- The siting and fitting of the 5kw Photovoltaic system in split locations to maximise solar gain and effective daily use of the power generated. All componentry involved is of premium standard and the aesthetic design of the house is not diminished by the roof top panels.
- The frame for the Outdoor Living area to the North was fabricated off site and craned in to provide for quick and efficient construction. A feature brick wall provides privacy and protection from the prevailing winds and Western Sun. Red gum lining boards to the ceiling continue the link from the House interior. The custom cabinetry is manufactured from moisture resistant board and masonry walls were extended to protect the cabinets from prevailing weather. Stainless steel splash backs; granite bench top and exposed aggregate paving all provide functional but pleasing features in an outdoor setting.

This is a contemporary dwelling, constructed using largely conventional materials on an insulated concrete raft slab. The floor areas include:

- Lower floor Living area of 217.2m<sup>2</sup> or 23.35 squares.
- Garage and Storerooms area is 65.2m<sup>2</sup>.
- Upper floor Living area of 152 m<sup>2</sup> or 16.34 squares
- External Balcony area of 26.6 m<sup>2</sup> or 2.8 squares

The floor plan features include:

- Master Bedroom Suite complete with adjoining private Study, a walk through robe and En Suite
- Northern Balcony to Master Bedroom Suite
- Guest Bedroom complete with En Suite
- Entry hall and Airlock
- Combined Kitchen/Dining/Living area
- Formal Lounge and Dining rooms

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- Domuslift Elevator
- Large Pantry room
- Dedicated Wine store
- Joinery standard Robe and cupboard shelving
- Internal connection to Garage
- Attached Carport
- Outdoor Living area with undercover walkway
- Main upstairs Bathroom and Bedrooms
- Downstairs Toilet adjacent to Kitchen/Living areas
- Dedicated mechanical services Storeroom

The Owners provided the Domuslift Elevator that was built into the structure we provided and the domestic appliances. They also implemented the grid connected photo voltaic power system that allows them to generate power for sale back into the Electricity Grid

The completed house was handed over in July 2014 and the Owners have continued to progress the landscaping of the site.