

Clayfield QLD

MEDIUM DENSITY

ZONE 2: Warm humid summer, mild winter



Topics covered

Passive design

Rain water

Renewable Energy production

Indoor air quality

Orientation

Embodied energy

AccuRate (thermal comfort) 5.1 (full rating)

These medium density walk-up apartments were developed to test the commercial viability of a multi-residential development which addressed issues of sustainability. The 14 two bedroom units were designed to make maximum use of the site in terms of town planning allowances and market demand. The project stemmed from a display by the architect as part of the 2003 World Environment Day Sustainable Apartment prototype in Brisbane.

SITE AND CLIMATE

The site is located in the Brisbane suburb of Clayfield around 6 km north-east of the CBD and is situated close to rail and bus transport. From Clayfield out to Morton Bay in the east there are few topographical obstructions so the location enjoys breezes off the bay as well as Brisbane's benign sub-tropical climate.

The block was an amalgamation of house lots as well as a central parcel of land which was a redundant piece of road terminating at the rail line; this was purchased from the council. Along the southern edge, the site is bounded by a minor rail line or 'spur' line, while busy Sandgate Road is off to the east.

There were a number of significant existing trees on the site, particularly to the north and west, which were retained and used to the advantage of the scheme. Boundary relaxations were granted in part due to this.

Much of the success of the scheme relies on achievements made during the development approval phase. The design team enjoyed working closely with Brisbane City Council's Sustainable Design Unit to get the best outcome in terms of sustainability.

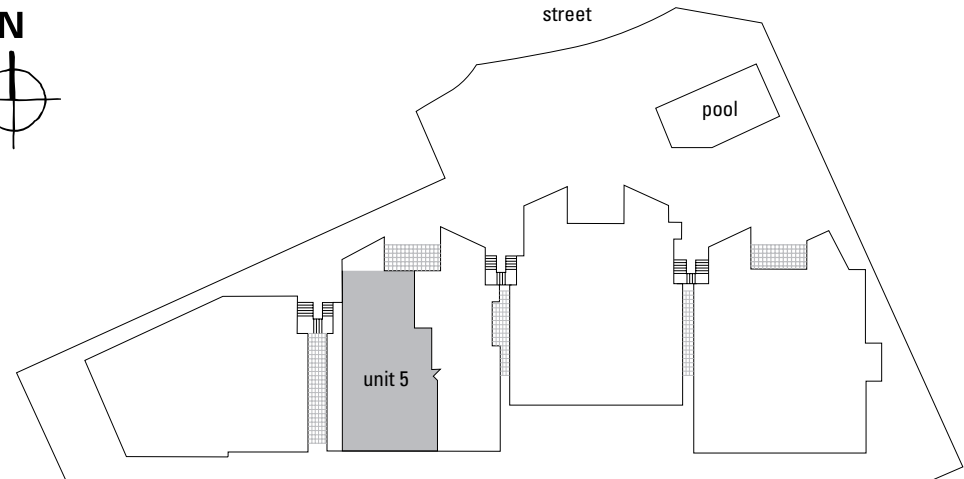
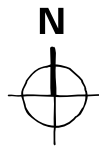
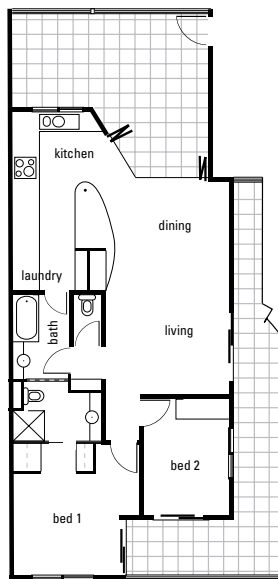
Construction system

The construction concept was to exploit the properties of both lightweight and thermal mass construction systems.

Thermal mass was provided by the use of concrete slabs and blockwork at the ground level to gain the benefits of earth coupling and to upper level walls protected from solar radiation. When protected from being heated up by direct sunlight, thermal mass serves to stabilise the temperature promoting cooler indoor temperatures in summer and buffering the cold in winter.

The upper level walls which are subject to direct solar radiation are largely comprised of lightweight timber stud framing with a proprietary autoclaved aerated concrete panel system. Lightweight construction systems respond better when subject to the heat of the sun by cooling down much faster than high thermal mass construction. Aerated concrete panels also have good insulation properties due to the amount of air in the composition of the material which means they will assist in heat retention in winter. [See: 5.11 Autoclaved Aerated Concrete]





Orientation

Despite being a challenging shape the site is well orientated with its length running north and south. The units are orientated with their outdoor living spaces to the north with adjacent indoor living, and with bedrooms generally to the south. North facing living areas enjoy low winter sun but are roofed to protect from the heat of the summer sun.

Shading

The covered verandahs provide shading, particularly in summer, to the north façade. To the south a large existing mango tree has been incorporated into the scheme to draw cool air from it through the breezeways. The west of the development gains protection from two significant existing trees. Additional hood awnings and batten sun shading is placed on windows that require extra protection as well as circulation and breezeway areas. Vegetated trellis screens provide shade to north facing basement walls. [See: 5.13 Green Roofs and Walls]

Glazing

Double glazed windows are provided to the south elevation which overlooks the train line, providing both thermal and acoustic benefit to the dwelling.

Ventilation

The main feature of the project is the cross ventilation achieved by having each apartment open on three sides; all living zones and most bedrooms feature cross ventilation

with windows on two sides of the rooms. Breezeways between each pair of apartments create opportunities to bring daylight and natural ventilation into the depths of each apartment. The breezeways were designed with blade obstructions which deliberately create a venturi effect, in inducing airflow past the units via the creation of positive and negative pressure zones.

There is some potential to naturally ventilate the bathrooms, despite a lack of external walls, by way of using high level internal windows and the laundry to separate bathrooms from the kitchen.

The ground floor of the building is taken up by basement car parking. With most of the apartments raised to the first and second level they are better positioned to catch prevailing breezes. Additionally this arrangement means that the basement requires no mechanical ventilation.

Insulation

The insulating qualities of the AAC panel wall cladding reduced the general need for additional bulk insulation to the walls of the building. Some bulk insulation was used to provide acoustic insulation from nearby noise sources. Reflective foil sarking was provided to all walls and insulation was provided to the roof with R2.5 foil backed polyester blankets.

BERS rating

The project was initially modelled using the BERS software with all units meeting a 4 to 5 star rating level.

Embodied energy

Consideration has been given to the selection of materials with low embodied energy in their manufacturing process. The architect also adopted a holistic approach by considering the impact of the lifecycle maintenance for various materials, as well as the potential of materials to be recycled in the future. There has also been an effort to source locally manufactured products where possible. Such materials include:

- > Low toxicity external paint and coating systems from local manufacturer.
- > Battening and decking made from a pre-finished hardwearing composite material of recycled plastic and sawdust that requires no initial painting or finishing and no maintenance in the long term, whilst providing the vernacular aesthetic of timber.
- > Hardwearing pre-finished bamboo flooring from a renewable source was specified to reduce the need for on-site coatings to assist in indoor air quality.



- > Autoclaved aerated concrete panels.
- > Low-emission particle board.
- > A low VOC (volatile organic compound) paint was used for internal finishes as well as selected external painting to promote good health with a higher indoor air quality; this product was certified by the Australian Greenhouse Office as being 'Greenhouse Friendly' (100 per cent greenhouse neutral.)
- > Floors on the basement level were specified as 'eco-concrete' with recycled crushed aggregate mix.
- > Crushed concrete was used in the landscaping instead of riverstone pebbles.

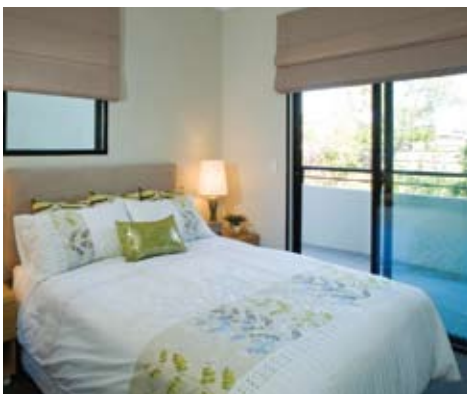
Heating/cooling system

While perceived market demand meant that split system air-conditioning units were provided, the apartments were designed to reduce if not eliminate the need for active heating or cooling systems. An energy efficient model of air-conditioner was specified.

Ceiling fans have been provided to all bedrooms and living rooms.

Lighting

Light fittings have been selected for their energy efficiency comprising mostly of compact fluorescents with some low voltage IRC dichroics. Common areas have timed sensor lighting which in the larger basement areas is also zoned.



Designing for cross ventilation to all habitable rooms has the added benefit of providing enhanced daylighting to the units. The quantity and depth of daylight penetration increases with the number of glazed fenestrations provided but just as importantly the quality of light is enhanced due to the provision of multi-directional light sources. This helps to reduce the effects of glare and provides overall good quality lighting reducing the need for artificial lighting during the day.

Solar tube roof lighting has been added to the upper level units to provide natural daylighting to the bathroom areas. Vertical openings in the breezeways bring light down into the lower level breezeways, assisting in providing diffused light to these spaces.

Fixtures and Appliances

Another feature of the development is the relatively inexpensive addition of an energy monitor to each unit. The proprietary simple monitoring device provides constant real-time feedback to the resident, assisting in educating them on the amount of energy various appliances require and empowering them to make lifestyle decisions and changes to further contribute to saving energy.

Gas stovetops and water heating also help to reduce energy consumption.

Drying courtyards and external clothes lines encourage residents to use passive means of drying clothes.

The development is fitted with water efficient tapware, showerheads, toilets and dishwashers.

Hot water

The development is supplied with a reticulated central gas hot water system, further reducing reliance on mains electrical power.

Rainwater

Rainwater is collected in two 30,000L concrete tanks which are buried underground and coupled with variable speed submersible pumps. The rainwater is used for toilet flushing, balcony taps, subsurface irrigation of the garden, car washing and to top up the pool, overall providing 55 per cent of the project's water requirements.

Renewables

A 1kw photovoltaic system provides power to the communal areas of the building. The system is connected to the grid and provides the economic benefit of greatly reducing the body corporate fees.

Site impact

The design largely balanced the cut and fill which occurred on site. The development collects a lot of the water the site receives and the landscaping has been carefully designed to filter any groundwater run-off through garden beds before it enters the stormwater drains.



Landscaping

A local nursery provided great assistance in the selection of plants that require little water and were appropriate to the area; this included a mix of exotic and native species.

Other issues

The development encourages recycling; there are recycling stations in the common areas and each apartment is fitted with a recycling cupboard for the temporary storage of rubbish. Provision has been made for composting in communal areas and the wormfarm in particular has been a big success.

Over half of the apartments sold prior to completion of the project and the majority of them are owner occupied. Most of the owners did not cite sustainability as a reason for purchasing the apartment however many of the residents have now engaged with the optional environmentally friendly measures.

PROJECT DETAILS

Architect:	Mark Thomson, TVS Partnership
Developer:	QM Properties Pty Ltd

Principal Authors:

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