

Echlin Street Terrace Apartments

David Stefanovic of Architects North and developer Brendon Douglas' refurbishment of a warehouse site in Echlin St, West End (Townsville) achieves good climate responsive design, resource efficiency and affordability. The result is sixteen contemporary 2 and 3 bedroom terrace apartments that are naturally cool and better to live in socially, economically and environmentally.

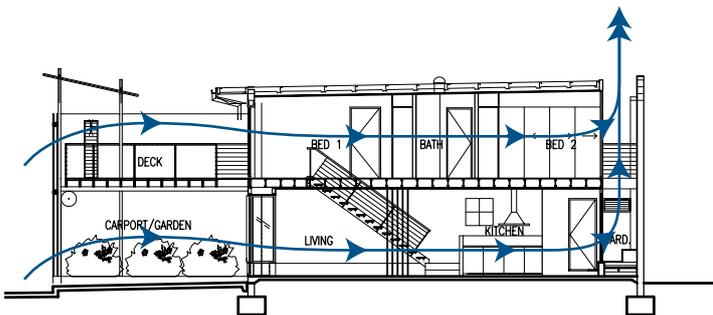


Overview

Each terrace home has two storeys and four separate outdoor spaces. The lounge, dining, kitchen and laundry areas are on the ground floor and either 2 or 3 bedrooms and a study nook are located on the second storey.

A large deck at the front of the second level, provides great outdoor living space and can easily accommodate 8-10 people. A small private balcony is located at the rear of the second storey.

A six metre deep paved courtyard entrance and a secure covered car park are located at the front of the home. This space could also be used as a breezy, shaded outdoor living space. A small courtyard out the back is a great place to sit but also serves an important function as a light and breeze vent.



Breezes flow through the length of the apartment on both levels

Key Sustainability Achievements in the Echlin St Terraces are:

- Resource Efficiency
- Affordability
- Climate Responsive Design

Resource Efficiency

Part of the refurbishment involved the retention of the concrete floor and sections of the walls and roof from the pre-existing warehouse.

Extending the life of these structural elements resulted in multiple benefits including reduced quantity of demolition waste, avoided use and purchase of new construction materials and a decrease in the labour required for the construction process.



Affordability

With a typical unit occupying only 84m² of land area, more people are able to live in this inner city suburb.

As the availability of local services improves (eg more and closer shops, schools, and public transport) daily living becomes more convenient and relative costs of living are reduced.

The ability to refurbish an existing building has reduced construction costs improving the developer's investment and creating a more affordable housing option for buyers.

These terrace homes were completed in late 2005 and were valued at an affordable \$270,000.



Echlin Street Terrace Apartments...cont...

Climate Responsive Design

Key principles for good climate responsive design in the tropics are:

- ✓ Keeping the heat out (ie orientation, shade, reflection of radiant heat, insulation, and the appropriate use of thermal mass)
- ✓ Maximising cooling breezes and cross-ventilation

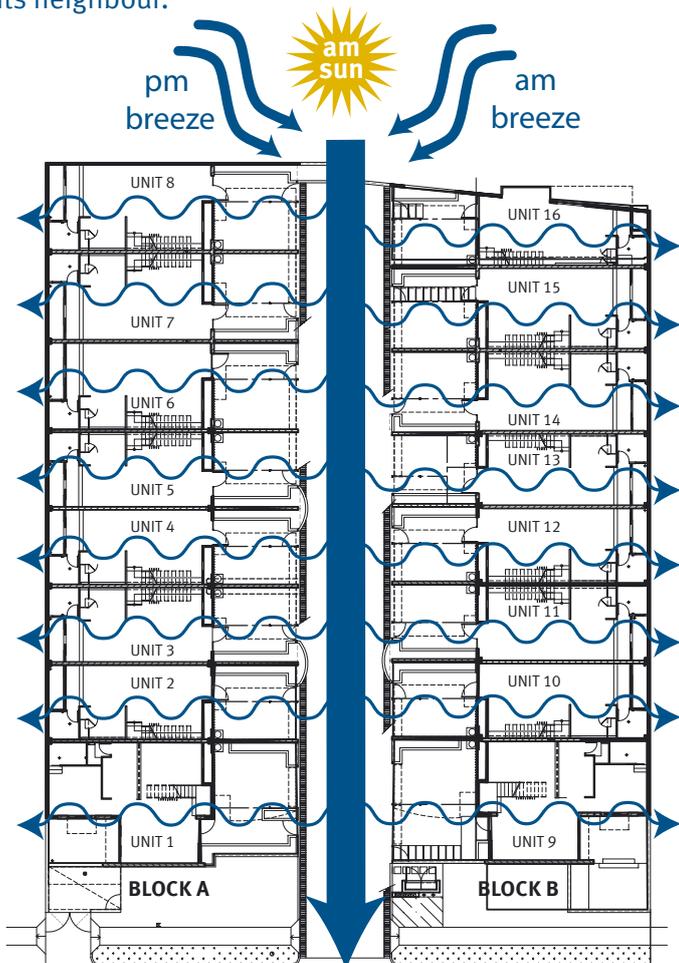
KEEPING THE HEAT OUT

Orientation & Shade

Terrace style housing oriented to face north or south is an ideal foundation for achieving a naturally cool home in the tropics.

With the majority of windows facing north or south, windows are easily shaded by eaves and overhangs.

Low angle sun from the east (in the am) and west (in the pm) will only impact on the end wall of each unit block, with each terrace in the row effectively 'shading' its neighbour.



Breezes flow in through the front of each unit and exit out the rear



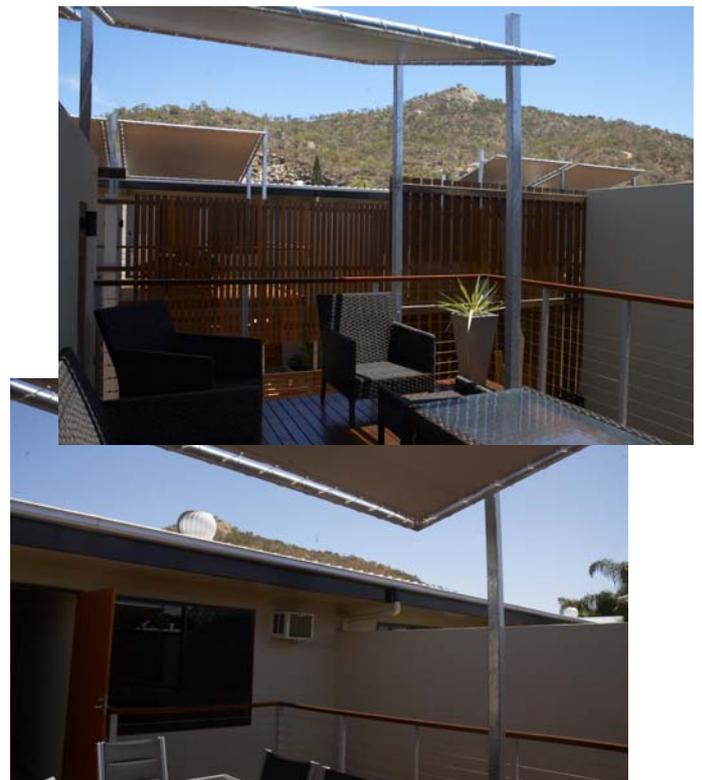
ECHLIN STREET

East or west facing windows in the end terrace are kept small, tinted and high up under the eaves to minimise heat gain.



Grey tinted glass was used throughout, mainly for privacy but it is also effective in reducing glare and UV.

Shading of outdoor spaces is also important. Polycarbonate sheeting, shade sails, partition walls, the vent well and the main deck itself, were used to shade outdoor spaces.



The Roof

The existing colourbond roof from the warehouse was retained. It is a good roofing choice as it cools down quickly after dark, unlike clay or concrete tiles which continue to radiate heat well into the night.

The original roof ventilators remove warm air from the roof space.

A reflective solar paint (Insulpro) was applied to the roof. This has been highly effective in reducing the roof temperature and achieving noticeable improvements in comfort levels in the upstairs rooms.

A combination of reflective and bulk insulation in the roof (reflective foil and polyester batts) achieves an insulation rating of R3.

Echlin Street Terrace Apartments...cont...

Appropriate use of thermal mass

High thermal mass materials like concrete are often used inappropriately in the tropics.

During the day, high thermal mass materials absorb and store heat and then slowly release it as the air temperature cools in the evening, resulting in homes that stay warm long after its cooled off outside.

Used appropriately, the negative aspects of high thermal mass materials can be minimised and the thermal mass even used to an advantage. The key for appropriate use in the tropics is to prevent the concrete from heating up significantly in the first place.

These terraces use a lot of high mass materials specifically: concrete block walls, concrete slab floors, ceramic floor tiles and concrete pavers. Particular attention in the Echlin St Terraces has ensured that concrete products are given minimal opportunity to heat up.

For the most part, the concrete is kept out of direct sunlight. The walls are fully shaded by the neighbouring terrace, the front and back walls are shaded by eaves and overhangs.

The shared driveway is one exception, but within each property, sunshine on paving is limited.

Walls on the end terraces which receive direct sunshine have been insulated to limit heat transfer into the interior.

The result is that the 'thermal mass' of the concrete is used to an advantage, with the temperature of the concrete staying reasonably constant and fairly cool. The effect is a mass of material that is cool to the touch and that cools the air around it.



BREEZES AND CROSS VENTILATION

Breeze accessibility to both inside and outside living spaces is critically important for those wanting to achieve a naturally cool home in the tropics.

Capturing the breeze

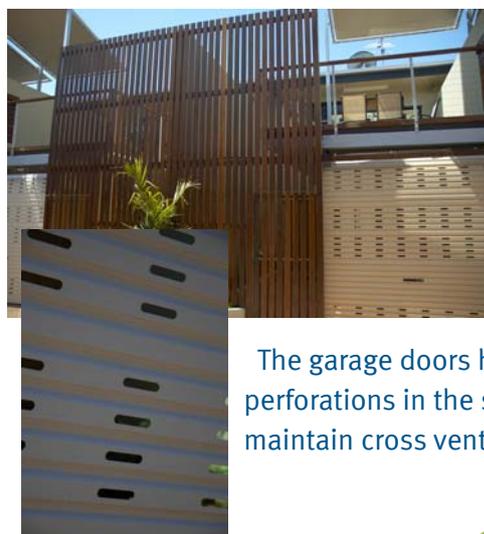
Prevailing breezes from the north-east (pm) and south-east (am) are funnelled into the complex along an east-west aligned breeze corridor.



Minimising barriers to breezes

Special care was taken to ensure that barriers to prevailing breezes were minimised.

Mesh screens were installed along the eastern fence line to maximise airflow through the centre of the complex.



Gates and privacy screens at the front of each home are slatted.

The garage doors have perforations in the steel to maintain cross ventilation.

Echlin Street Terrace Apartments...cont...

Inside, open timber partitions replace dividing walls, visually defining the space, yet maximising openings and air circulation.



The stairwell and safety railings are open, maximising airflow both in the stairwell and between floors.



Multiple panel internal sliding doors separating the bedroom from the small study nook are removable, enabling a choice between two separate rooms or one open room with improved breezes.

Mechanical cooling

Ceiling fans are fitted extensively throughout.

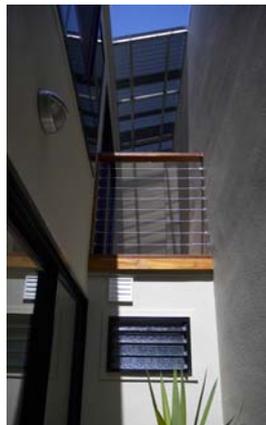
Air-conditioners are also installed but as they are only used occasionally, consumption and bills are significantly reduced.

Light Well / Breeze Vent

A clever element in each terrace is a rear courtyard. In addition to providing a pleasant outlook, it serves as a 'light well' and 'breeze vent', without compromising privacy.

With the walls of the original warehouse retained along the side boundaries, a new rear wall for each home was built metre in from the external wall. The result is the creation of a tiny private outdoor courtyard only 1m deep but two storeys high.

Windows and doors opening onto the courtyard allow natural day-light to filter into the rear of the home and air to flow through the length of the apartment.



Lessons Learned

Even the slightest oversight when it comes to shading of walls, windows or outside spaces adds unwanted heat gain.

Additional shading would be beneficial for:

- The front deck. The existing shade sail only covers a third of the deck area, limiting the usefulness of this space in the daytime.
- The eave at the rear was minimised to maximise light access down the light well, but it also increased the heat gain through rear windows.
- The rear upstairs deck. The retrofitting of tinted polycarbonate roof sheeting has shaded this space and reduced heat gain into the adjacent window.

It is thought that using tiles or polished concrete in the bedrooms instead of carpet would be beneficial in cooling the second storey which is noticeably warmer than the ground floor.

Sliding windows were selected over louvres as a cost saving measure.



Use of louvres instead of fixed glass would enhance cross-ventilation

Casestudy compilation:



Photography:
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