TROPICAL SUSTAINABLE DESIGN CASE STUDIES

Apex Residence

Project type: Residential

Location: Smithfield, Cairns, QLD, Australia
Year completed: 2000

- **A simple and effective study in passive design to suit its suburban location on a Cairns hill slope**
- **Early implementation of strategies to improve the ecological value o the site**

OVERVIEW

Apex residence was conceived as the designer's own residence. It is a place of retreat for a young working couple that blends the seemingly opposed paradigms of close connection to land and nature within a necessarily suburban location.

The house sits discreetly within the protective contours of a north facing slope. It is surrounded by dense native landscape which conceals the house from the streets below, yet allows vistas of the distant sea and adjacent mountains from all parts of the house. It remains hidden until the moment of discovery and delight.

It is not a large house and was delivered within a modest construction budget, yet the simple, outwardly-focussed design feels light, airy and spacious. The house is a simple and effective study in passive design applied precisely to suit its location. There is no air-conditioning – there has never been a need for it. The flexible living spaces link closely to the surrounding natural environment and promote comfortable outdoor living in all seasons.

The house was designed to have minimal impact on the site, to be energy and water efficient and to incorporate recycled materials. It was awarded the inaugural HIA energy efficient design award for the Cairns region in 2001.

PLANNING AND MANAGEMENT

The project was designed locally by a designer educated and experienced in tropical sustainable design.

Waste minimisation and recycling procedures were implemented during construction. Timber offcuts were used to make bespoke furniture for the house, for example.

Construction was programmed to commence at the beginning of the dry season to minimise wet weather delays and other wet weather impacts such as soil erosion and water damage to materials. Construction sequencing allowed the roof to be installed early to provide protection for the remainder of the build.

Durable, robust and mould resistant materials including colorbond steel roof and wall cladding, profiled FC chamferboards and FC sheet were specified. Timber flooring was allowed to acclimatise before installation.

SITE

The site was selected for its excellent amenity to local services, and proximity to Cairns city. It is within walking distance to primary, secondary and tertiary education facilities and to suburban shops, a major shopping centre, council library, public pool, doctor and dentist. It is only one block walk from a regular bus route. It is within walking distance to recreational cycle trails, state forest and conservation park areas. It is a short drive to local beaches and tourism centres.

It is a native bush block. When originally bought it was heavily covered in acacia regrowth from the original site disturbance during the 1970s original subdivision works. Strategies were implemented early to improve the ecological value of the site, including early reafforestation with endemic local rainforest species to the disturbed areas to restore and improve ecological value. The variety and frequency of local fauna sightings has grown exponentially as the landscape has developed. Sightings have included less common species such as the antechinus, striped possum, sugar gliders, and the Hercules moth.

Erosion protection strategies during construction included overland water flow management using swales and natural mulches to contain sediment.

The site's north facing slope allowed for an optimal building orientation to suit the local climate, to minimise solar heat gain and to capture breezes.

Part of the site has been dedicated to propagating native trees for reafforestation.

DESIGN

The house is a study in simple and affordable passive design for the Cairns climate. The house plan is designed as a single room depth, shallow footprint that hugs the contours of the land and promotes excellent cross ventilation. The house features excellent, controllable natural ventilation, and

effective thermal venting via high level clerestory windows. The main living level is a raised platform positioned high amongst the surrounding trees to effectively capture breezes. There are generous verandahs and overhangs to protect the walls from the sun and an ideal northern orientation to minimise solar heat gain. The spatial planning features simple, generous, flexible spaces and blurred boundaries for comfortable tropical living. There are insect screens throughout to maintain insect-free comfort year round. The two story construction allows the upper level to remain open and cool, whilst maintaining security. The staircase acts as a thermal flue to keep the lower level cool and comfortable, even if it is closed up.

MATERIALS

Locally sourced structural timber was specified, as were locally sourced recycled timber doors and recycled stone paving. Recycled cast iron oven doors were incorporated in the (recycled timber) mail box design and to the bespoke wood fired barbeque, which also features bagged, recycled concrete blocks.

Low VOC paints are used throughout. Specification of readily available, durable, low maintenance materials that are resistant to mould including light coloured, reflective colorbond steel to the roof, FC sheet and planking wall cladding, hot dip galvanised steel main framing members and timber floors to living and bedroom areas.

ENERGY

The effective use of simple passive design techniques completely obviates the need for mechanical cooling. There is abundance of evenly dispersed, indirect natural light which means there is absolutely no need for any artificial lighting until after sunset. The house has also been retrofitted with compact fluoro light fittings. There are ceiling fans to bedroom and living areas to create airflow on still summer

nights. The dense surrounding trees also help keep the house comfortably cool.

The house was part of a recent energy provider tariff-trial, and consistently rated well below average household energy consumption levels.

WATER AND WASTE

There is a 2000 litre colorbond steel rainwater tank for irrigation. The house has been retrofitted with low volume WC cisterns and tapware. There is no dishwasher. The site features a low water native bush landscape with green and recycled mulches applied annually. There are swales to control high volume overland flow. There is no lawn to water.

OWNERS/USERS STATEMENT

Outdoors, natural ventilation, flexible spaces, light, cool, views, close to nature, private yet central and convenient, low energy bills, low maintenance natural landscape and no lawn to mow.

PROJECT TEAM

Base building architect/ designer/ ESD consultant: Belinda Allwood
Structural engineer: CMG Consulting Engineers Pty Ltd
Builder: Len Harris

For more information visit: **www.jcu.edu.au/tsd**
www.greenbuild.com.au

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