

# TROPICAL SUSTAINABLE DESIGN CASE STUDIES

## Tranquil Place Residence

Project type: Residential

Location: Tranquil Place, Smithfield, QLD, Australia

Year completed: 2011

- Sections of the building were prefabricated
- Passive design enhanced by patented breathable wall system

### OVERVIEW



This elevated three storey home combines sustainability with elegance and luxury. Constructed from recycled materials and plantation timber, passive building design principles have been enhanced by Gateway Constructions' patented breathable wall system. Ventilated roofing, window and door positioning for cross ventilation and site orientation all maximise energy efficiency.

#### Awards:

Finalist 2012 HIA Australian Energy Efficiency and Spec Home of the Year

Winner 2011 HIA Cairns and North Queensland Spec Home of the Year

Winner 2011 HIA Cairns and North Queensland Energy Efficiency Award

### PLANNING AND MANAGEMENT

The feasibility of multi-storey buildings using prefabricated construction techniques was researched, and the builder and architect designed and patented a distinctive construction system. Using the system they decided to create a unique sustainable house.

Sections of the building were prefabricated thus minimising waste as the majority of offcuts and sawdust are recycled or reused. All plantation timber sourced was H3 treated in order to repel termites and the structure itself is constructed to a C3 cyclone standard. Recycled building materials and energy efficient appliances were sourced locally wherever possible.

## SITE

The site slopes steeply from the front to the rear with a minimal flat area at the front. The land adjoins rainforest on the rear boundary. The landscaping was designed to enhance the natural environment and includes native plants, a fruit orchard and a vegetable garden.

The house was designed to make the best use of the steep slope. The rainforest was left untouched, although walking tracks were laid throughout to promote the natural environment. The difficult site limited opportunities to orientate the buildings but applying other principles of passive design has counteracted this difficulty in terms of delivering energy efficiency.

## DESIGN

The home is a light weight post and beam construction and the main frame is mostly steel with some use of laminated veneer lumbers.

Three structures are joined by enclosed walkways. A single level structure is dedicated to cars, laundry and storage. The main structure has three levels. The top floor has two verandahs that take in panoramic views of the coastline. The third structure is single level. The design suits the pre-fabrication process used by the construction company.

A patented breathable wall system has been built. The wall cavities draw air through from openings in the bottom plate where the air is generally cooler and drawn towards the warmer air that has been heated by the sun on the walls. As the hot air rises it moves through openings in the top wall plate into a ventilated roof system where it is exhausted into the atmosphere. This innovation is ideally suited to hot tropical climates as it helps cool down the building envelope limiting heat transfer into the building. It also assists control of condensation, keeping materials dry along with use of thermal reflective insulation.

The roof is a contemporary design with aesthetically pleasing sweeping curves. It has overhangs to all elevations, decks and verandahs, protecting walls from sun. The roof is ventilated and a light colour thus repelling heat.

Each structure has long east and west facing walls. The walls are

exposed to heat and the breathable wall system counteracts this. The garage structure is situated on the western side of the site and plays a part to shield the main middle structure at this level. The structure to the eastern side has bedrooms and also plays a part to shield the main middle structure. Where the walls are exposed to the sun, there is very minimal window openings where glass can transfer heat.





The main elevations for window and door openings are the north and south facing elevations that open to prevailing breezes. During the hot humid wet season the prevailing breeze is from the north and during the dry cooler season from the south east. The decks and verandahs are also positioned to benefit from the prevailing breezes.

The home is situated in the foothills of the Macallister Range so also benefits from katabatic winds from the west and sea breezes from the east. As the home is constructed of light weight building materials, it cools down quickly and does not retain heat.

## MATERIALS



The main structural frame is steel that is fully recyclable, and laminated veneer lumbers made of Forest Stewardship Council certified wood that is a natural carbon store.

There are multiple decked areas, where ModWood made of recycled milk cartons and sawdust has been used. All floor and wall framing and particle board for substrate flooring and wall linings is H3

treated plantation timber.

Thermal reflective insulation from Green Insulation is under roof sheeting that is Thermatec solar reflective technology by Colorbond. All glass is tinted to reduce heat transfer.

Timber floors are Quick Step ReadyFlor that is only sourced from controlled or ecologically certified forests. As a middle layer, they use HDF or wood that is sourced from Hevea (ie rubber wood) plantations.

Benching is made of re-constituted stone products and recyclable plastics.



### **ENERGY**

The home achieved a certified BERSPro 9 star energy rating for building approval. The design has reduced the demand for electricity as it operates comfortably without air-conditioning.

In addition a heat pump hot water system is installed along with an instantaneous hot water system in the kitchen. Specifically selected energy efficient appliances and lighting has also reduced demand.

### **WATER AND WASTE**

Two water tanks (5000L and 2500L) are installed and the irrigation system used for the gardens is computer zoned and controlled.

Tapware and shower heads are fitted with water control restrictors and dual flush toilets are installed to meet mandatory requirements.

### **OWNERS/USERS STATEMENT**

“There was very little need to use air conditioning, even in the really hot conditions over the Cairns summer. The solar system kept our energy bills down even lower and we were in credit the majority of the time. The house was incredibly comfortable and a real pleasure to live in.” *Jim and Penny Margach*

### **PROJECT TEAM**

Base building architect/ designer: Gabriel Poole  
Other architect/ designer: Jim Margach  
Interior designer: Jim & Penny Margach  
Civil engineer (Site and traffic): Kel Bruce & Associates  
Structural engineer: Kel Bruce & Associates

Services engineer: (mechanical electrical, hydraulic, fire):

Project manager: Jim Margach

Energy efficiency rating consultant: Green at Heart

Green Star rating consultant: Green at Heart

Builder: Gateway Constructions

Photographs courtesy of Jim Margach

For more information visit: [www.jcu.edu.au/tsd](http://www.jcu.edu.au/tsd)  
[www.greenbuild.com.au](http://www.greenbuild.com.au)



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