TROPICAL SUSTAINABLE DESIGN CASE STUDIES

Kamerunga Rainforest House

Project type: Residential

Location: Kamerunga, Cairns, QLD, Australia
Year completed: January 2007

- **Extensive use of passive design for shade and natural ventilation**
- **Sustainably sourced materials suitable for durability and low maintenance in the tropical climate**

OVERVIEW

The design for Kamerunga Rainforest House commenced using CAD software on a laptop computer while sitting on a log in the forest on site. The design was conceived as two narrow, elevated pavilions connected by a generous, central timber deck. The configuration provides deep shading from the sun and allows natural breezes to penetrate easily throughout the house. One pavilion contains all shared living areas, while the second pavilion contains all bedrooms and bathrooms. The house commands views westward to the nearby Kuranda mountain range while the eastern end of each pavilion provides views of the forest and seasonal creek below. Louvre windows are used extensively to maximize cross-ventilation, and the lightweight, elevated and well shaded construction retains no heat.

SITE

The site is on a heavily forested north-west facing slope with views towards Red Bluff and the Kuranda Railway to the west. The site is fairly steep, with a narrow spur line at the rear which plunges steeply into a seasonal creek gully below. The dense tree cover on the nearby steep slopes creates a local microclimate that produces cool air movement even on the stillest of days. Trees to be removed during construction were carefully tagged, but in the builder's absence the earthworks sub-contractor wrongly removed several critical shade trees to the west of the house. This was a lesson in the need to provide clear instruction and continuous site supervision. This area was immediately replanted, and the trees are now beginning to provide afternoon shade several years after the event.

DESIGN

The design was conceived as two lightweight, elevated pavilions with functions split between shared living areas and bedrooms/utilities. The pavilions follow the site contours at different heights, and have a central connecting deck in between.

The higher, southern pavilion contains three bedrooms, a bathroom and an ensuite. All rooms one room wide to allow unimpeded cross ventilation through the banks of louver windows. The main bedroom has a partially outdoor ensuite that overlooks the seasonal creek below. The slightly lower-level northern pavilion contains the kitchen, meals area and two separate living areas, one of which can double as guest accommodation. This pavilion is also one room wide to promote natural cross ventilation. Deep verandahs to the west provide covered outdoor living and retreat areas and critical afternoon shade to the interior.

The linking verandah between the pavilions is not permanently shaded, providing a pleasant sun-trap on cool winter mornings. A shade sail is erected over the central deck area in the summer months. Below the living pavilion are a concrete and blockwork cyclone shelter/store, external laundry and carport.

MATERIALS

The construction budget determined the need for cost-effective construction methodology and materials. The engineering design minimised the amount of steel and used timber infill framing. This system was effective from both cost and carbon footprint aspects. The wall cladding is sustainably sourced Shadowclad plywood sheeting. Decking and steps are of sustainably sourced (PEFC compliant) hardwood. Internal linings are plasterboard. Roofing and gable end cladding is of Colorbond steel. Internal flooring is plantation grown Tasmanian Oak. Windows are Breezeway

louvres in cedar frames. Insulation is in the form of double sided foil in the walls and roof, with additional foam/foil board above the ceilings.

ENERGY

Attention to the local climate and responsive passive design means the house functions comfortably throughout the year without the need for air-conditioning. The guest room has a split system air-conditioner for the comfort of visitors from cooler climates, but it is seldom used. Ceiling fans are installed in every space and provide adequate cooling. Roof spaces are kept cool with good airflow from venturi vents along the ridge, and with rows of small air inlets along the top of each wall.

There is no requirement for heating and cool nights are simply dealt with by closing windows. The house's operational energy is generally limited to lighting, cooking and appliances such as a washing machine, refrigerator and television. It was determined that the extensive shading provided by the surrounding trees made the use of PV solar power unviable, so the house uses mains power.

PROJECT TEAM

Base building architect/ designer and interior designer: Dick Clarke, Envirotecture
Project manager: Marty Rowe
Structural engineer: Voycheck Kolber
ESD consultant: Envirotecture
Energy efficiency rating consultant: Steve Collins, Concept Designs Australia
Base structure: Malcolm Arthur Builder

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

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