

Sustainability Guide

Sustainable House Design for Cairns

Information sheet 1

Where do I start?

All new homes and major renovations in Australia must now meet basic energy performance requirements. By going beyond the minimum, you can further cut your energy bills and improve your comfort.

Your builder, designer or architect will help you to achieve the best energy and greenhouse performance from your new home or renovation.

One of the most important considerations in designing or renovating a sustainable home is the climate.

This information sheet includes:

1. Climate
2. Passive solar design principles
3. Orientation
4. Glazing & shading
5. Ventilation

Information sheet 2 includes:

6. Thermal mass and building materials
7. Insulation
8. Landscaping
9. Outdoor living

1. Climate - The Cairns Region

The Cairns region has a Tropical climate, with generally hot and humid summers and milder dryer winters. The average annual rainfall is 1992mm on an average 154 days. The majority of the region's rainfall occurs between January and March.

The monsoon trough is close to Cairns from December to March bringing with it warm to hot, humid conditions and the possibility of thunderstorms and tropical cyclones.

From May to October the region is dominated by the sub-tropical ridge, under the influence of the south east trade stream.

Temperatures

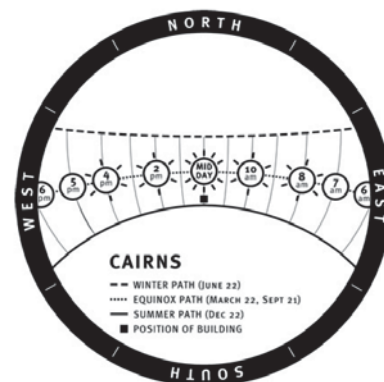
The tropics has fairly uniform temperatures throughout the year. Typical daytime min/max temperature ranges in Cairns are 23C/31C in mid-Summer and 18C/26C in mid-Winter.

Breezes

The prevailing winds are East to South-easterly with strongest winds (cyclones excluded) usually occurring during April and August. During the summer months, North to North-easterly sea breezes dominate the winds along the coast.

The cyclone season is normally confined to between December and April but exceptions do occur.

Changing movement of the sun



The path of the sun changes throughout the year between summer and winter. Above is a sun path diagram for Cairns illustrating the sun to the south in winter and north in summer. Designing for the sun and its angles will assist in determining width of roof overhangs and structures for shading windows and thermal mass.



In hot humid climates and hot dry climates with no winter heating requirements, house orientation should aim to exclude sun year round and maximise exposure to cooling breezes.

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2. Passive solar design

When planning a new home or renovation, think about the layout. For example:

- Locate frequently used hot water outlets near each other and the hot water service.
- Locate bedrooms away from hot afternoon sun, or protect them with shading.
- Locate living and outdoor areas where they receive winter sun and protected from summer heat and strong winds, or protect them with shading and wind breaks.

To optimise thermal comfort there are five principles to consider:

- Orientation
- Glazing/Shading
- Ventilation
- Thermal Mass
- Insulation

3. Orientation

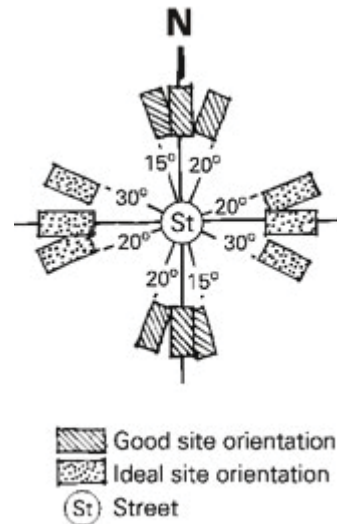
Choosing the right orientation for home placement is sometimes restricted by the aspect of land chosen, however it is an important element to consider.

Orientation can reduce the heat load of a house, reducing the need for costly artificial cooling. The most fundamental rule is to restrict direct sun light from entering the house all year round and increase access to prevailing breezes.

If possible, position a house to face north with the long axis running on an east-west axes. This minimises the surface area of the house exposed to the east and west morning and afternoon sun.

Due to the sun passing overhead in the southern part of the sky in the summer months and in the northern part of the sky in the winter months, it is important to shade the long sides of the house facing north and south.

Prevailing breezes in this area tend to come from the south-east so it is important to orientate openings to receive these. Another consideration is obstructions to airflow such as internal walls. Try to direct airflow to maximise the breeze either around, over, or through them.




4. Shading/Glazing

The use of shading is crucial to keep a house cool as heat entering through windows is the largest source of unwanted heat gain in any home.

Windows to the north and south require shading in the tropics. Glazing to the east and west is different as the angle of the sun rising and settling cannot be entirely excluded.

It makes good design sense to allow for flexible shading in these directions so you can control when to shade. In the summer months restricting the hot afternoon sun is a blessing but in winter it can be cool enough to bask in the sunny glow.

 Use external shading devices over openings. Lighter-coloured shading devices reflect more heat. Internal shading will not prevent heat gain unless it is reflective.

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Types of fixed shading include:

- Eaves
- Awnings and pergolas
- Louvres

Types of adjustable shading include:

- Sliding screens
- Louvers screens
- Shutters
- Retractable awnings
- Adjustable external blinds



Types of windows for the tropics

Although found mostly in Queenslanders the two most common types of windows are casement windows and louvers, usually timber louvers. These window types are great for angling to catch breezes while keeping out the rain, another benefit is that they can be left opened during the hot wet season.

Awnings positioned above windows provide further protection against rain and sun, particularly on gable and end walls.

The use of patterned and coloured glass casements can be also used to regulate light without the need for blinds or curtains which block the breeze.

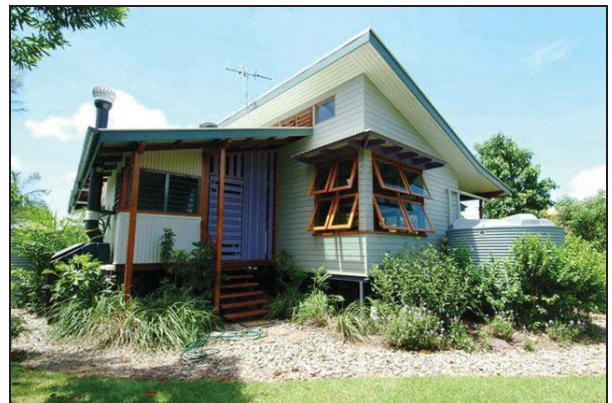
Glazing

To help maintain all year-round comfort and reduce the need for artificial cooling systems another option to consider is glazing. Some types of glazing aim to reduce the amount of heat entering a house via the windows.

Heat flow through glazing such as windows, doors and fixed glass panels is determined by the combination of the glass, the seals and the frame.

Consider the U-value of your glazing choice. The lower the U-value the less heat is transmitted.

When purchasing windows (glass), look for the WERS (window energy rating scheme) label which identifies how well it will protect you from unwanted summer heat. The maximum WERS indication for the best performing is 5 stars.



5. Ventilation

Passive cooling is the least expensive means to cool a home. Any air movement across the skin creates a cooling effect and is highly desirable in the hot, humid summer months.

Natural ventilation is an excellent means to naturally cooling a home. It involves deliberately controlling the movement of air between the inside and outside of the house.

Cross ventilation is air entering through an opening (window or door) and exiting through an opening on the opposite side. Openings placed on opposite sides of the building create a funnel effect which aids air movement.

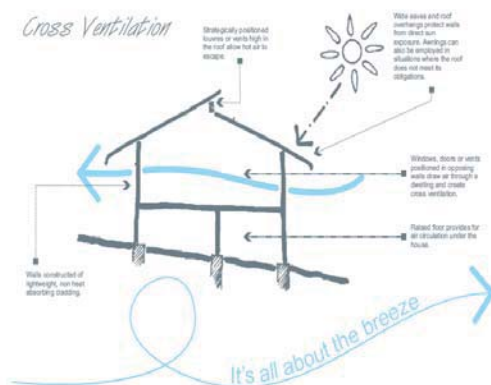
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Some guiding principles for passive cooling:

- Orientate windows and openings to prevailing breezes
- Reduce barriers to air paths in the building
- Provide paths for warm air to leave building
- Maximise convection with high and low windows
- Design eaves for permanent shading
- Design buildings with single room depth
- Avoid fixed glass panels
- Include ceiling fans in design
- As a general rule use light thermal mass in the tropics
- Use louvres, casement and awning windows to channel air into the house
- Deflect breezes into the house using vegetation or a fence
- Design corner rooms with windows on adjacent walls.




Retain the tropical style

- Retain existing roof profiles when adding extensions
- Include roof ventilators at the highest point of the roof and vented gables to assist in cooling the roof cavity
- Reinstate casement windows where these have been removed or restore damaged windows. Although second hand windows are becoming difficult to find, they can still be sourced
- Use window awnings constructed of traditional materials

- Use windows which can be left open in the rain and locate them where they will catch the breeze.
- When designing a new verandah or deck consider summer sun positions and access to cooling breezes
- Position trees and plants to shade verandahs and protect your house from the summer sun.
- Choose light colours to reflect heat.

Tips....

- ✓ Detailed information on appropriate methods for re-roofing or adding extensions can be found in 'The Queensland House' written by Ian Evans and The National Trust of Queensland.
- ✓ Maximise openings to enable cross ventilation. This assists to naturally cool dwellings.
- ✓ Maximise the number of south and east orientated windows to capture the prevailing south easterly and north easterly breezes.
- ✓ Increase natural ventilation by reducing barriers to air movements through the house thus creating flow paths through the dwelling.
- ✓ Avoid locating air conditioning units on or adjacent to verandahs as this greatly reduces the verandahs liveability.
- ✓ Include ceiling fans and insulate roofs where possible to keep the verandah cool.

 For further information, please feel free to contact Cairns Regional Council's, Planning Strategies Team on 4044 3542