

Sustainability Guide

Sustainable House Design for Cairns

Information sheet 2

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The Cairns region experiences a Tropical climate which is characterised by hot and humid summers and milder dryer winters.

A sustainable home is more comfortable, uses less energy and costs less money because it uses passive design techniques suitable for the climate.

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

In the tropics, passive design makes the most of natural cooling techniques as opposed to artificial options such as air conditioning. That is not to say that there may be times of year where air conditioning will be necessary. Adopting sustainable design options means you can reduce your dependence on air conditioning to be comfortable.



Information sheet 1 covers:

1. Climate
2. Passive solar design principles
3. Orientation
4. Shading/glazing
5. Ventilation

This information sheet covers:

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

6. Thermal mass and building materials

Thermal mass refers to the ability of a material to absorb heat energy. Thermal mass is a design principle but can also be used to refer to a type of building material.

Materials with a high thermal mass act like a battery. In a cooler climate this is advantageous. Materials such as bricks and concrete absorb heat during the day. When the external temperature drops the thermal mass releases the stored heat which can be flushed out of the house with passive ventilation.

In winter the same principle can be used to store the heat from the sun to be released at night keeping the house warm.

Most of the year in the tropics, it is warm enough without a thermal battery.

The Cairns region has a low average diurnal heat range (difference between day and night temperatures) of 8.2 degrees. This means that a high thermal building mass is not highly recommended unless it is with careful consideration of house design.

Materials of low thermal mass react well to cooling breezes and cooling is what we are after. Ideal thermal mass for the tropics includes materials which do not store heat but react quickly to external conditions.

Some low thermal mass materials:

- Timber
- Corrugated iron
- Brick veneer

However, it is possible to couple well insulated and shaded thermal mass in innovative ways to achieve a lower evening temperature in the tropics. Good integrated design is the key.

Some heavy thermal mass materials include:

- Brick
- Concrete
- Reverse brick veneer

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When designing paths or pavers around the house consider using light coloured materials. This will reduce the heat absorption of the materials.



Under the [Energy Efficient Homes Package](#), the Australian Government is offering:

- ceiling insulation worth up to \$1,600 to all Australian home owner-occupiers of currently uninsulated homes; or
- \$1,600 rebate on the costs of installing solar hot water systems
- help for renters, with a rebate for landlords on the costs of insulating their rental properties.

See www.environment.gov.au for more information

7. Insulation

Insulation acts as a barrier to heat flow through the roof and walls. In the Tropics the predominant concern is to keep heat out of the house.

Insulation should be used in conjunction with other passive design techniques to be fully effective. For example shading is important to prevent heat from entering a building in addition to insulation. Both used together will provide the best results.

Insulation is an extremely cost effective measure and can pay itself back within a few years from the savings on energy bills.

Types of Insulation

Effectiveness of insulation is measured by R-values; the higher the R-value, the better the thermal performance.

For the Cairns region it is recommended the minimum R-value for the roof/ceiling is 2.7 and for walls 1.9.

There are two main types of insulation:

- Bulk
- Reflective

Bulk Insulation

Bulk insulation is effective in reducing the amount of convected and conducted heat entering a building. It does this by trapping hot air in the bulk material resisting its transference to the interior of the building.

Types of bulk insulation include:

- Glasswool
- Wool
- Cellulose fibre
- Polyester
- Polystyrene

Reflective Insulation

Reflective insulation is effective in reflecting radiant heat away from a surface due to its high reflectivity. It will generally reflect up to 95% radiant heat.

It usually comprises a shiny aluminium laminate on plastic or paper.



Reflective foil is generally more effective under the roof than on the ceiling – 95% of radiant heat reflected

Types of reflective insulation:

- Reflective foil sheeting (sarking)
- Multi cell sheeting (like foil coated bubble wrap)
- Concertina sheeting

Insulation can be installed in a variety of ways however reflective insulation under the roof prohibits heat from entering the roof cavity.

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Installing bulk insulation on the ceiling will provide benefits when operating air conditioning.

In the Tropics its good practice to insulate veranda roofs to make outdoor living areas more comfortable.

The degree to which air conditioning will be used can impact on where and how much insulation to install.

8. Outdoor Living

The Cairns region is well known for its outdoor living potential all year round. Whether it's having a BBQ outside or relaxing with a book on the veranda, there are certain design elements required to maximise the comfort of outdoor living.

Verandas are a significant architectural element of traditional Queensland houses and in the Cairns region were often built in with louvers or lattice.

It is important outdoor living areas are designed for year round comfort and take into account privacy, aspect to breezes and refuge from heat and wet season rain.



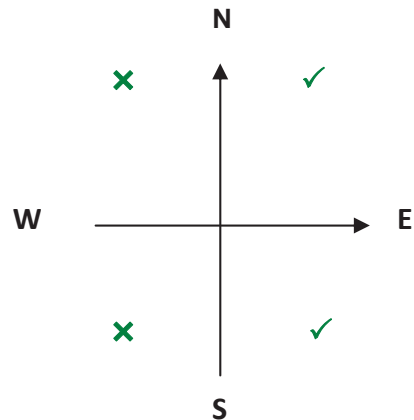
In planning outdoor living areas consider:

- Location
- Openness
- Shade from rain and sun

Location

The best options for outdoor living spaces in the Cairns region are on the north, north-east side of the house or the south, south-east side of the house.

This allows for access to breezes and reduces exposure to hot afternoon sun. Shading can be used to screen out the morning sun in the hotter times of the year.



Openness

Open living spaces are more comfortable especially in summer when air movement is maximised. This can be facilitated by large openings, ceiling fans, cross ventilation and access to prevailing breezes.

A high ceiling (no less than 2.7 m) provides a space for hot air to rise and cool air to circulate. It will also allow enough space for a ceiling fan to be effective.



Outdoor living areas to the west should be avoided because of exposure to hot afternoon sun and no breeze

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Shade from Sun and Rain

A covered roof providing year round protection from the sun and rain is important to ensure usability of the outdoor space.

Wide roof overhangs are an important design element of a living space to reduce rain entry and morning sun. It is a good idea in the tropics to insulate the roof of verandas with reflective insulation to prevent radiant heat.

There are various options available to create outdoor living areas and they don't necessarily need to be part of the house. An outdoor pergola surrounded by cooling vegetation, shade sails, trees or climbers over archways are all viable options.

There are ways to screen outdoor living areas if insects are a bother and differencing levels of personal comfort will dictate how your outdoor living area works for you.



9. Landscaping

Integrating landscaping with home design can improve the liveability of the home by providing natural cooling and shade, colour and interesting focal points. Planted gardens also reduce glare, and enhance our sense of space.

In addition sustainable landscaping around the home can enable us to build biodiversity into our urban areas and supplement our diets with freshly grown vegetables.

Food gardens can be watered by rainwater tanks and the soil can be improved by compost or worm farms. Closing the loop on our resource inputs and outputs can save us money and reduce the impact we have on the natural environment.



Lawn is a common feature in Australian landscapes but it generally requires high levels of water, fertilisers and energy to maintain its appearance. These impacts can be minimised by:

- Removing lawn and replacing it with a mix of groundcovers and non-woody plants and permeable surfaces such as gravel.
- Reducing the extent of lawn and increasing the area of hardy garden beds.
- Substituting exotic grass species with drought tolerant low maintenance native grasses that retain the appearance of a conventional lawn.



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