Guide 2
Harnessing Cooling Breezes

Harnessing breezes and creating air movement inside the house is one, if not the most, important requirement for keeping your Townsville home cool and comfortable throughout the year.

By capturing natural breezes the need for air-conditioning will be reduced and possibly even eliminated. Ultimately your home will be more desirable and cost-efficient.

Introduction

Any air movement across the skin creates a cooling effect through increased evaporation. This works in high humidity areas, as long as the temperature is below 40°C. Townsville is a high humidity area with average summer temperatures in the low thirties. This makes it a perfect region to utilise prevailing breezes for maximum cooling benefits.

You can harness breezes by:

1. Maximising access to breezes;
2. Enabling ventilation by convection; and
3. Creating air movement.

1. Maximising Access to Breezes

Townsville's prevailing summer breezes come from the north-east. A well-designed house should allow these cooling breezes to flow through the entire home. This is known as cross-ventilation. To achieve cross-ventilation the following principles should be applied.

Living Areas

To catch the prevailing breezes, living areas should always be located on the north or north-eastern side of the home. As many shaded external openings to these areas as possible should ensure that breezes can channel through (Figure 1).

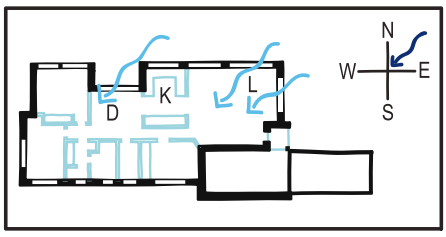


Figure 1 *Example of good orientation to capture breezes.*

Single Room Depths

The ideal design solution is a home with single room depths. This provides optimal cross-ventilation as every room has an entry and exit area in the walls for breezes to pass through (Figure 2).

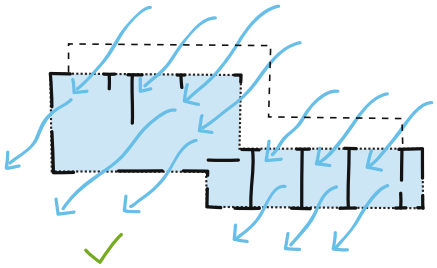


Figure 2 *A well designed home with single room depths.*

Poorly designed homes with internal areas that do not enable cross-ventilation will create stagnant hot-spots (Figure 3).

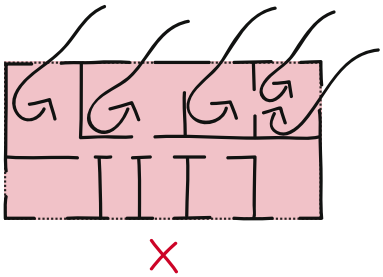


Figure 3 *A poorly designed home that will create hot stagnant areas.*

Elevation

Access to prevailing breezes increases with height (Figure 4). Elevated homes not only receive faster, cooling breezes, they also allow breezes to pass underneath. This helps cool the floor, preventing hot air rising up into the home. In the evening, elevated homes cool down faster as the internal heat can quickly dissipate from the cooling breezes. Internally, ceiling heights in Townsville should be no less than 2.7 metres and well ventilated. Ceiling heights of 2.4 metres are legal but are realistically too low for effective ventilation in Townsville.

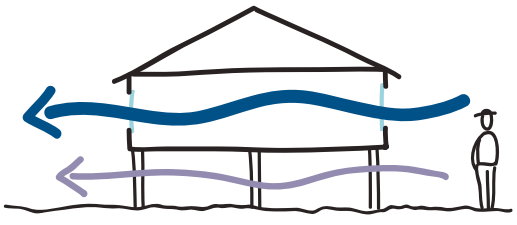


Figure 4 *Elevated homes in Townsville receive faster, cooling breezes.*

FACT 1

Many elements of Queenslander style homes are not only aesthetic, but functional. The cooling benefits of elevated floors are why traditional Queenslander style homes are raised off the ground. This was to cope with hot tropical climates in the times before air-conditioners were available.

Internal Walls

Orientate internal walls to allow uninterrupted cross-ventilation (Figure 5).

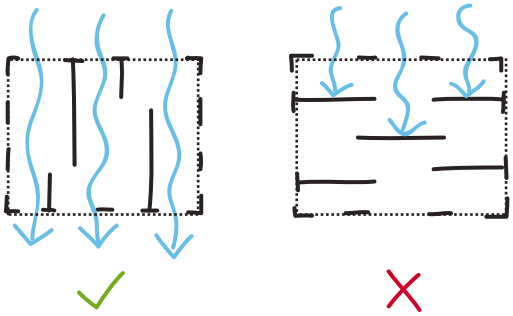


Figure 5 *Walls running parallel to the breeze, aid in cross-ventilation.*

If internal walls create a barrier for breezes, compensate by creating openings across the top of internal walls and doors (Figure 6). This will still allow some cross-ventilation, particularly for the hotter air that rises and gets trapped at ceiling level.

Figure 6 *Internal vents and other openings can allow ventilation through the house when walls interfere with natural breeze flow (Photo: Kelly Goodbun).*

On the other hand, where you have fixed walls, consider using permeable walls, such as lattice, adjustable timber louvres or inserting other alternatives, such as wide double doors. Such choices will allow air movement through the home when desired but can be closed off for privacy.

Windows and Doors

Windows, doors, and external wall openings that face north to north-east should be large for maximum benefit. Similarly, once a breeze has entered the house it must be able to leave easily through the opposite side.

The types of windows and doors you select for a house must allow for the maximum capture of breezes. There are many different types of windows and doors. Some important considerations are:

Doors

- Doors should be hinged so that they open flat against a wall.
- To maximize cross-ventilation, position doors on walls opposite where the breeze enters (Figure 7).

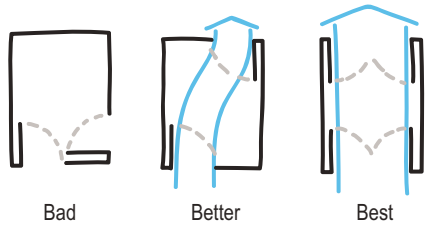
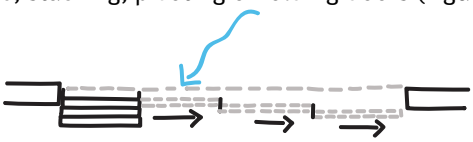
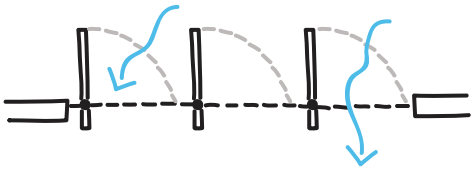


Figure 7 *An example of how doors on opposite walls maximise breeze access.*

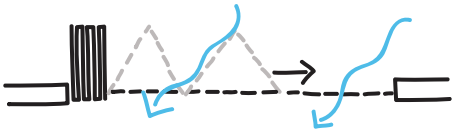
- Increase the size of the door space by selecting wider, double, stacking, pivoting or folding doors (Figure 8).



(a) *An example of stacking doors.*



(b) *An example of pivoting doors. These can also be used to direct breezes inside.*



(c) *An example of folding doors.*

Figure 8 *Stacking (a), pivoting (b) and folding (c) doors all increase the ventilation through an area.*

These doors are more effective than traditional sliding glass doors as they open a much larger wall area to the breeze. The door types in Figure 8 have the added benefit of opening up the home to external entertainment areas.

Windows

- Try to incorporate two windows per room wherever possible, ideally on opposite walls.
- For maximum cross-ventilation ensure windows can be fully opened.

Windows that do not fully open include traditional horizontal or vertical sliding windows. These windows only allow breezes to enter half of the total window space. This is because the half that you slide open ends up blocking the other half of the window space.

Furthermore, they cannot be left open when raining, unless under cover, and cannot be used to help direct breezes through the home (Figure 9).

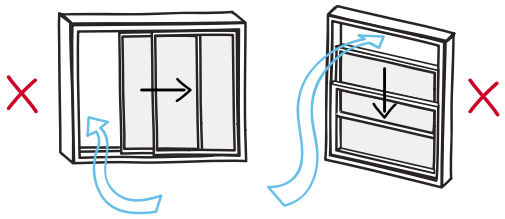


Figure 9 *Sliding windows, whether horizontal (left) or vertical (right) offer less ventilation.*

Awning style windows that are top-hinged also restrict the amount of air that can enter as the breeze is unlikely to bend around and go up through the opening at the bottom (Figure 10).

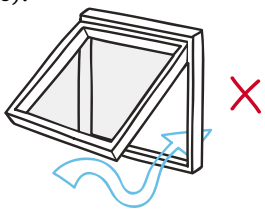


Figure 10 *Awning windows, restrict air flow unless fully opened.*

Therefore, these window options are not ideally suited to Townsville conditions.

Some window styles that are suited to Townsville conditions, and are readily available, are casement windows and louvres.

Casement windows are side-hinged and are an excellent choice as long as they are hinged to allow the prevailing breezes to be directed into the house rather than blocking them (Figures 11 and 12).

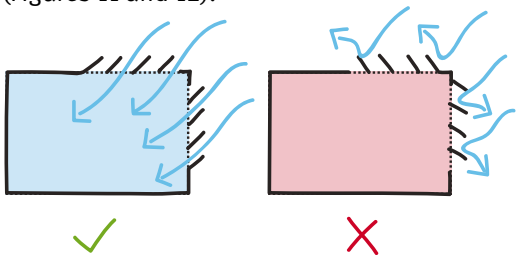


Figure 11 *Casement windows should be hinged the right way to direct breezes into the home.*

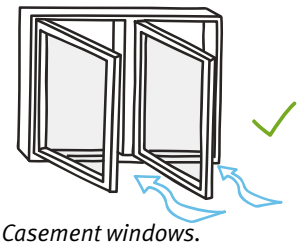


Figure 12 *Casement windows.*

FACT 2

Select windows that extend from the floor to the ceiling. This allows breezes to cross the entire room height, removing pockets of hot air that would normally accumulate underneath the ceiling or below window sill level in houses with smaller windows.

Louvres are one of the best window choices for hot humid areas such as Townsville. They allow breezes to enter through the entire window space and can be used to direct breezes at different angles. This gives more control over the direction you wish the breeze to take (Figure 13).

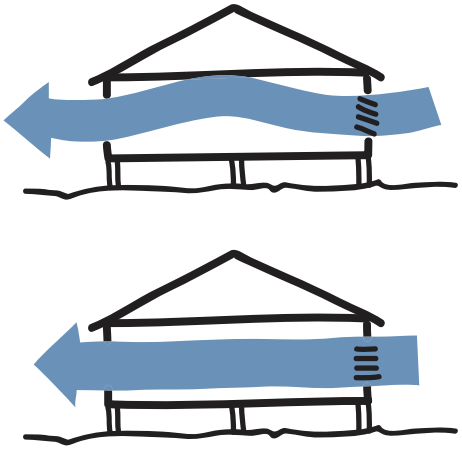


Figure 13 *Controlling the breeze direction with louvres.*

In Townsville, where rain does not necessarily mean cooler temperatures; louvres can be kept open without disrupting airflow.

FACT 3

Avoid positioning structures, such as garages, carports and sheds where they will block prevailing breezes.

2. Enabling Ventilation by Convection

Convection cooling occurs when hot air naturally rises and draws in cooler air from below to replace it. During the summer months Townsville often experiences periods of weak or nil breezes. During these times convection air movement can help remove heat from the home.

Convection only works when cooler air can be drawn from under the home or the lower areas around the home and, as it warms, is vented through ceiling or roof vents. The process will not work if the surrounding area is radiating heat. Potential heat sources include concrete or paved driveways and other types of hard ground finishes that absorb heat.

Convection can be enhanced by devices in the ceiling or roof. Some of the methods for hot air removal include roof ventilators, louvred clerestory windows, grills, gable vents, open eaves, vented ridges, exhaust fans, solar-driven ventilators and raked ceilings (Figure 14). Devices that increase convection will remove hot air even in calm or mild wind conditions.

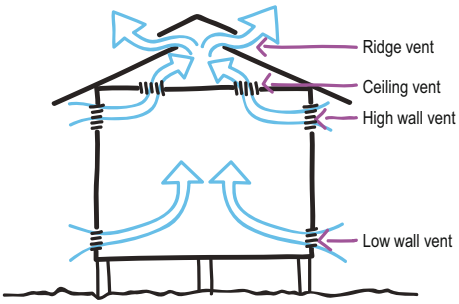


Figure 14 *There are a variety of ways to increase convection in the house and roof space.*

Poorly ventilated roof-spaces get incredibly hot and can reach up to 70°C. When the sun hits the roof it transfers heat down and superheats the trapped air in the roof-space. In turn this heat is transferred down through the ceiling into the room below.

If the roof-space is ventilated and the air constantly renewed it will not superheat. Therefore, heat transfer to the inside of the home will be reduced.

Floor and low wall grills allow the cooler air from under and around the house to be drawn up into the home (Figure 15). Cool air can be created by shading external spaces such as planter beds, water features and similar landscaping items.

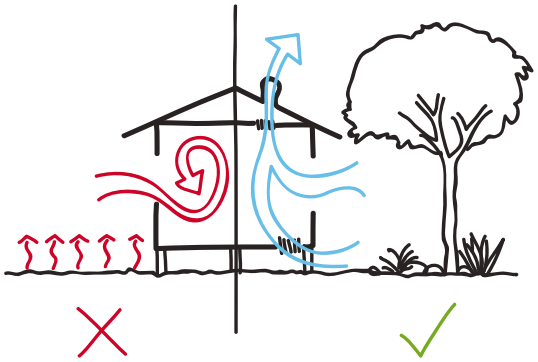


Figure 15 *On the right, hot air escapes though a roof vent and draws cool air in by convection.*

On the left, a lack of ventilation contributes to stagnation of hot air.

FACT 4

When building or renovating, map the direction of prevailing breezes so the home design utilizes their cooling effects.

3. Creating Air Movement

A fan, at the maximum comfortable air speed of 7.5m/sec, has an air speed approximately 2.1m/sec stronger than the afternoon summer breeze in Townsville. This speed however may be unsettling inside the home. Air speeds of around 0.5 m/sec to 1.0 m/sec can be pleasant and provide a cooling benefit of around 3°C - 4 °C. In hot humid climates, like Townsville, cooling benefits are generally achieved at around 2 m/sec. At this speed paper may be blown around the room.

FACT 5

Fans don't cool rooms; they cool people, so save energy and turn off fans in unoccupied rooms.

Correctly placed ceiling fans will maximise comfort and energy efficiency. In general, fans should be located over each activity area, such as sitting or sleeping, not necessarily in the centre of each room.

For example, a room large enough to contain both a dining and living area will need two fans (Figure 16) while in a bedroom a single fan should be located above the centre of the bed (Figure 17).

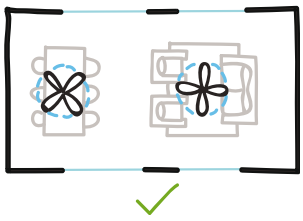


Figure 16 *Large rooms may require a fan over each activity area.*

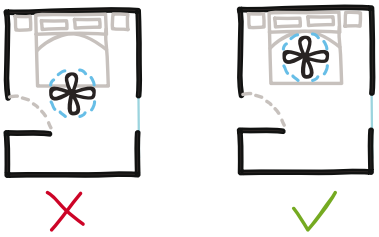


Figure 17 *Position fans directly above the area to be cooled.*

Installing fans over patio areas is also a great idea. This will enhance the cooling effect while enjoying the outdoors. A fan in the right location can determine whether or not an area gets used to its full potential. In higher humidity, greater airspeeds are required to achieve the same cooling benefits.

FACT 6

On average a ceiling fan uses 0.080 (kWh) of energy which is similar to using an old incandescent 80 watt light bulb. Air conditioners use much more energy than this, making them more expensive to run. So turn on your fans first; they may be all you need.

Employing the ideas presented in this guide will assist you to maintain a cool home and reduce your reliance on air-conditioning through the summer.

CONTACT

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