



Guide 1

Orientation for Townsville Homes

Planning the orientation of your house correctly will enable you to create a climate-responsive, energy-efficient home. Housing in Townsville should be designed to work with the prevailing breezes and the daily and seasonal movements of the sun.

Keeping your home at a comfortable temperature almost all year round without the use of artificial heating or cooling will help you to save money, minimise environmental impacts and enjoy our tropical lifestyle.

Introduction

Correct orientation is a fundamental design feature for any home. It is the foundation for achieving maximum sustainability. This guide seeks to give you a better understanding of:

1. The characteristics of Townsville's climate and location;
2. The importance of sun movement and angles; and
3. The optimum orientation of your home and rooms.



1. Townsville's Climate and Location

Climate

Townsville has a dry tropical climate that is dominated by two distinct seasons:

- The wet season, summer (November to April); and
- The dry season, winter (May to October).

Characteristics of the above are discussed in the following sections.

Warm to Hot Temperatures

Summer months are generally considered to be hot and muggy. Day temperatures often average around 29°C to 31°C. Night temperatures average around 20°C to 24°C. It is important to note that during summer there is little relief from the heat and humidity, even at night.

Winter months are generally considered to be warm to mild. Day temperatures often average around 25°C to 29°C. Night temperatures average around 13°C to 18°C.

These temperature ranges dictate that protection from the heat and accessing cooling breezes, particularly in summer, should be the highest priority when designing a home in Townsville.

High Summer Rainfall

Rainfall is typically associated with monsoon troughs and cyclonic or semi-cyclonic activity in the summer

months. The average annual rainfall is approximately 1143 mm which is often delivered as either short sudden downpours or several weeks of constant rain. There is generally no significant rainfall in the winter months.

High Humidity

Hot, muggy and uncomfortable conditions are common, particularly during the summer. Humidity is frequently between 60% and 75% during this time. It is thought that because of the humidity a 32°C day in Townsville will often feel like a 37°C day in a drier climate.

Moderate to Low Breezes

Throughout the year most of Townsville experiences a prevailing (or dominant), cool, north-easterly afternoon sea breeze especially during the summer months (Figure 1). Other breezes vary both seasonally and over the course of a day but are mainly from the east and south-east. Breeze strength is generally low to moderate. Notwithstanding, in Townsville even a low to moderate breeze can provide cooling benefits.

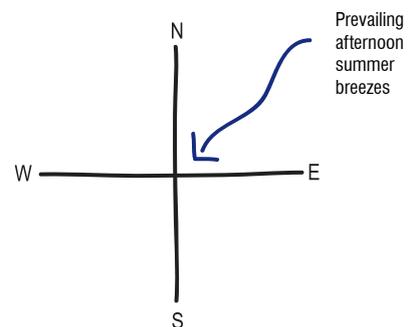


Figure 1 Prevailing breeze direction for Townsville.



FACT 1

The prevailing north-east breezes come in over the ocean and are particularly important for cooling the home during summer months when the weather is hot and humid.

Location

Townsville is at approximately 19 degrees latitude, which is north of the Tropic of Capricorn, the southern border of the tropics. At this latitude the winters are warm and dry, rather than cool and wet.

2. The Importance of Understanding Sun Movement and Angles

Sun Movement in Townsville

Knowing how the sun moves through the Townsville sky is a key element in understanding how to design a more climate-responsive, sustainable home.

Due to Townsville's location the mid-summer sun rises approximately 20 degrees south of east, moves to an overhead position at midday and sets approximately 20 degrees south of west (Figure 2). This means that the walls predominately on the south eastern and south western side of the house will receive direct heat for several hours from the low morning and afternoon sun.

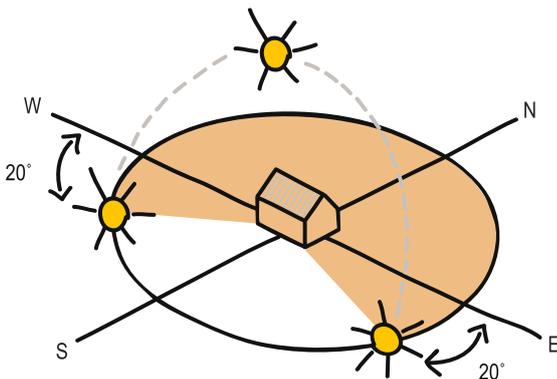


Figure 2 Sun-path in summer.

In mid-winter, the sun is in the northern sky. The sun rises approximately 20 degrees north of east, moves to an elevation of 50 degrees above the horizon at midday and sets approximately 20 degrees north of west. It shines predominately on north, north-eastern and north-western facing walls (Figure 3).

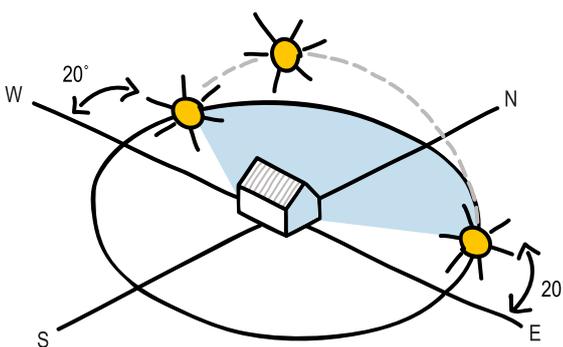


Figure 3 Sun-path in winter.

Angle of the Sun

It is important to understand that the sun is at different angles in the sky at different times of the year.

Winter - during the middle of the day in winter the sun will be at approximately 50 degrees elevation in the sky (Figure 4). In the mornings and afternoons, at around 8 am and 4 pm respectively, the sun is at an angle of approximately 17 degrees in the sky which is near the horizon.

Summer - during the middle of the day in summer the sun will be at approximately 90 degrees elevation in the sky (directly overhead). In the mornings and afternoons, at around 8 am and 4 pm respectively, the sun is at an angle of approximately 35 degrees in the sky which is notably higher above the horizon compared to the winter months (Figure 4).

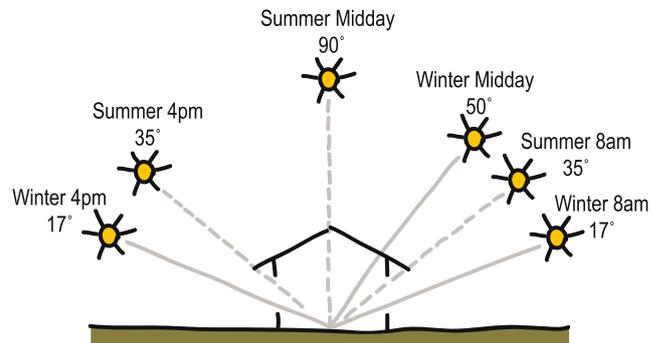


Figure 4 Position of the sun in Townsville at different times of the day in different seasons.

Knowing these angles will help you determine the correct width of roof overhangs, shade structures and other shading devices on different sides of the building to keep the sun out.

3. The Orientation of the House

When designing a home suitable for Townsville, the orientation of the building is the most critical design aspect of a home. It is important to get this correct early in the planning stages.

By using knowledge of the sun's movement across the sky and its consequent angles, it is possible to design a home that will minimise heat gain and provide shade where most needed (living areas). This simple concept is a fundamental principle behind energy efficiency in the tropics.

Home orientation - orientate the home so that the longest side is on an east-west axis (Figure 5). This will minimise the surface areas that face the west and east, thereby reducing the effects of the afternoon and morning sun, which will be low in the sky.

Avoid orientating the house on a north-south axis (Figure 5) as this will present a large amount of wall and window surface area to the low-angled sun. Allowing direct sunlight into the home, especially during the hottest part of the year, will create a hot and uncomfortable environment.

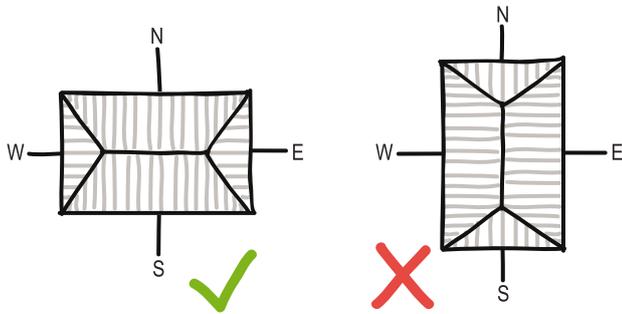


Figure 5 Design your house on an east-west axis for less direct sun and consequent heat gain.

Room orientation - Not only should your house have correct orientation but the spaces inside the house should also be orientated accordingly.

Living areas, such as kitchen, dining, living and family rooms should face north or north-east. This will give them maximum shade protection from penetrating, low-angle sun and therefore make them the coolest areas of the home. This is important as the living areas are where people spend most of their time.

Furthermore, in Townsville, locating living areas on north-east or easterly locations is preferable. This is because the prevailing (generally north-east) breezes come from these directions. Refer to Guide 2 - Harnessing Cooling Breezes for more information on breezes.

Living areas on the west must be avoided as they receive direct sunlight during the hottest part of the day which is when humidity is also at its highest. These circumstances will add to the home being uncomfortable by remaining hot and humid in the afternoons and early evenings when they are used most. Rooms that are more suited for a westerly location are bathrooms, laundries and garages which are only occupied for short amounts of time.

These concepts may sound simple and easy to implement; that's because they are. Orientating your home the right way does not cost extra during building and will naturally improve comfort and energy efficiency, saving on long-term running costs.

Examples of Improving Bad Orientation on Building Plans and Established Homes

The following three diagrams demonstrate how a home with bad orientation can be improved.

The first example shows a house plan which has had no thought given to the orientation or design of its layout (Figure 6). The living room faces west and the location of the bedrooms prevent breezes from getting to the living areas.

The second diagram (Figure 7) shows how the original house plan (Figure 6), without any change to external walls and floor area and therefore cost, can be improved by re-distributing the internal spaces. This is an example of how a home that is already built can be upgraded to have better orientation. All living areas face north and easterly breezes can enter the dining/living rooms.

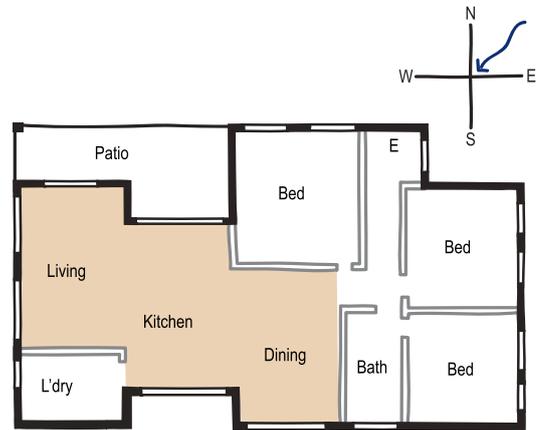


Figure 6 Example of a poorly designed house with regard to orientation.



Figure 7 Upgrading an existing home by relocating living areas. The living room has been moved to the north-east and the dining room to the north.

The third diagram (Figure 8) shows how the original house plan (Figure 6) can be improved by simply mirroring it and swapping the location of the dining room with that of a bedroom. This is an example of how building plans can be changed and improved before the home is built.



Figure 8 A Townsville climate-responsive house plan created by mirroring the original "bad" plan in Figure 6.

The above three diagrams demonstrate how easy, and at no extra cost, it is to attain a more energy-efficient climate-responsive house simply by using better design relevant to orientation.



FACT 2

If the orientation is wrong, the home's overall efficiency will be limited, even if all other energy-efficient and sustainable criteria are met. Therefore, spend extra time on the initial design stages if needed. It is much easier to correct mistakes on paper.

Examples of Good Orientation in Difficult Circumstances

It is thought that the ability to design your home in the most energy-efficient and appropriate way can be hindered by things such as: the size and shape of the lot, orientation of the lot, building and planning restrictions and the location of roads and services.

However, these hindrances need not be restrictive. Even lots that are not ideal can accommodate homes with better orientation. The four following examples (Figures 9 to 12) demonstrate that irrespective of street access and its relationship to north, good orientation and the best outcome for the situation can be achieved.

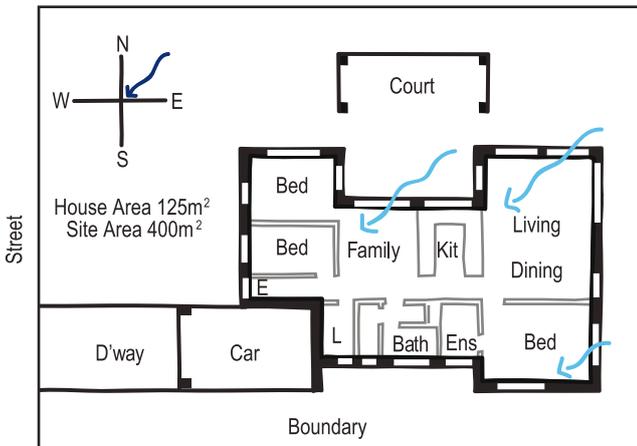


Figure 9 Road access from the west.

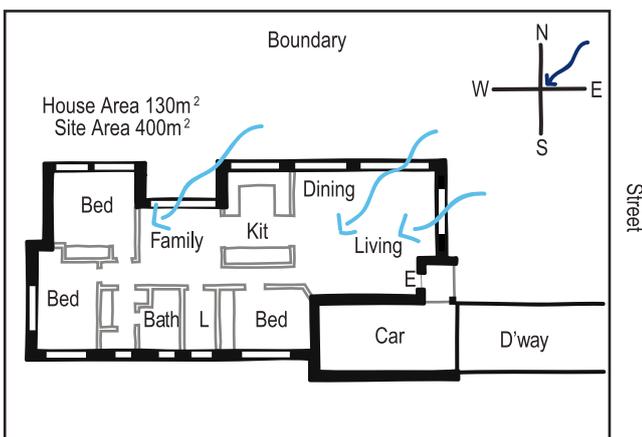


Figure 10 Road access from the east.

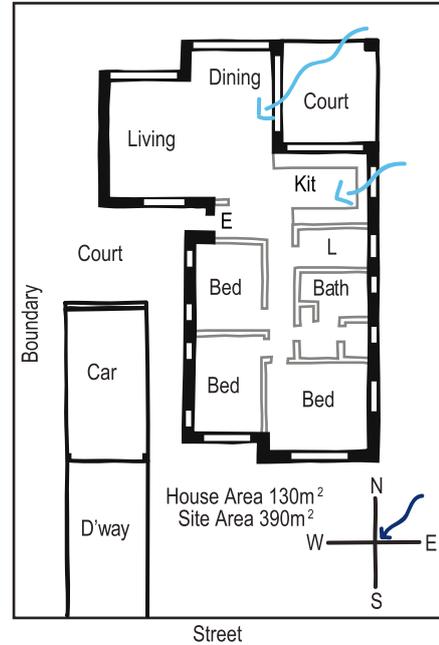


Figure 11 Road access from the south.

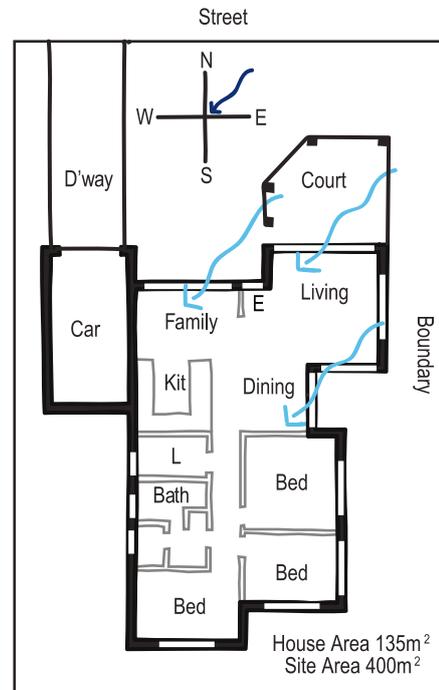


Figure 12 Road access from the north.

Every home needs to be designed specifically for the site that it is intended for. However, the main priorities should always be to locate living areas to the north or north-east for correct orientation, and to allow as much access to prevailing breezes as possible.



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