

ENERGY EFFICIENT HOUSING

Consideration to the design and orientation of a home will result in many energy efficient advantages for the occupants. Some of these savings include, savings in money on energy costs, and enjoying more comfort in your home all year round. Energy efficient housing is not a new concept. Man and nature for thousands of years have designed structures in order to make the most of ventilation, natural light and heat, protecting themselves from the extremes of hot and cold temperature variations. For example, the compass termites of Western Australia through correct orientation and design of the nests can keep the temperature inside their nest to within one degree of 31C while external temperatures can vary throughout the year between 3C and 42C.

Although homes are of a large size than termite nests, many similar design principles apply. Measures can be taken to maximise the energy efficiency of housing. The main considerations for energy efficient housing include:

- Correct home orientation and internal room layout.
- Position of Windows and doors to capture warmth from the sun in winter as well as providing adequate window shading in summer.
- Adequate use of high thermal mass (heat absorbing) materials inside the house to reduce uncomfortably high temperature variations.
- Sufficient insulation materials to reduce heat transfer from the external environment to the internal environment of a house.
- Sufficient draft proofing and control of ventilation both within the house and from the house.

How do I position my home in order to obtain a more energy efficient design?

Figure 1 & 2 below illustrate the differences in the sun's path in Perth during winter & summer. In summer the sun arises south of due east and climbs high till noon, and then sets south of due east. During this time, major heat penetration within the residence will occur through the east and west windows. In winter however, as illustrated in figure 2, the sun rises north of due east and stays lower in the northern sky till noon before setting north of due west. This results in north facing windows and walls receiving maximum winter sun and warmth.

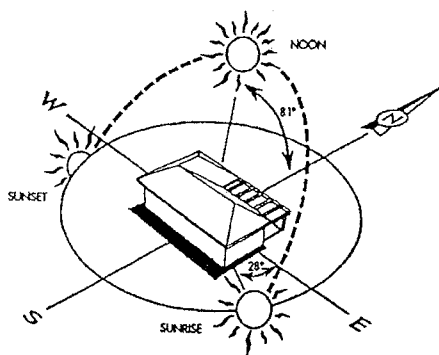


Fig 1 – Sun's movement in Perth during mid summer

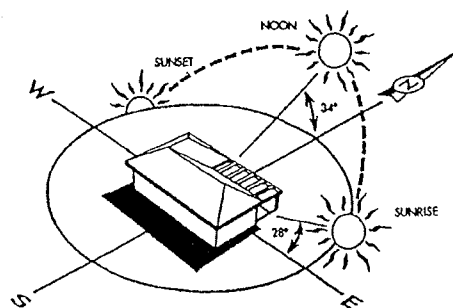


Fig 1 – Sun's movement in Perth during mid winter

In order to maximise the use of natural light, and winter warmth, it is best to arrange both indoor and outdoor living and entertaining areas on the north side where possible, with bedrooms and bathrooms to the south. Optimal energy efficiency is obtained further, by the north and south walls of the house being between 1.5 to 2.0 times the length of the walls facing east and west. With reference to a north point, figure 3 over page illustrates ideal plan layouts for different block orientations, allowing good sun entry in winter, while excluding most of the direct summer sun.

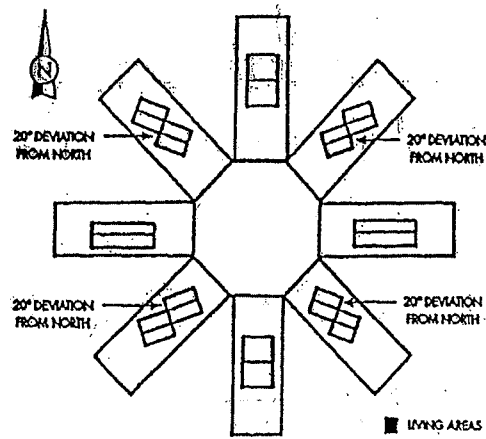


Fig 1 – Plan Layouts for different block orientations

What type of materials inside my home would be heat absorbing?

Heat absorbing materials include brick, stone, rammed earth and concrete. All of these possess what is known as “high thermal mass”. An energy efficient home of 200 square metres would need a thermal mass consisting of 20 to 25 cubic metres of concrete, and 30 to 40 cubic metres of brick, (or equivalent) to adequately store winter warmth and gradually release it at night. In summer, it is very important that thermal mass is not exposed to direct solar energy. If the thermal mass of cavity brickwork is exposed to direct solar energy, insulation in the cavities will minimise heat transfer from the external to internal environment of a home.

How does ventilation improve the energy efficiency of the home?

The Building Code of Australia Vol. II gives minimum requirements for lighting & ventilation within a residence. No direct consideration is given to obtaining an energy efficient design for a home. Mechanical ventilation such as evaporative coolers, refrigerated air-conditioning, as well as ceiling fans all contribute in different ways to provide a more comfortable internal environment within a house.

Energy efficient housing will result in minimising the use of mechanical ventilation. To obtain this you need to be able to harness and funnel cooling late afternoon, and night time breezes to rid the house of any heat accumulated during the day. It is very important to position the windows to facilitate cross ventilation. The best distribution of cooling cross ventilation is achieved by providing for the cool breeze entering through a small, low level opening and letting it out through a larger opening on the down side.

Where do I go from here?

If you are about to build or modify your home, you may wish to utilise the information provided in this information sheet remembering that any style of home can be made energy efficient. There are many advantages of making your home as energy efficient as possible, and you may need to ask your builder or designer to include simple, inexpensive features, which they may not normally include or consider. If you require any further information on energy efficient housing for Perth it can be obtained from the Office of Energy or Western Power.