CHAPTER 4

SITING AND SOLAR ACCESS

This chapter outlines the relationship between site layout, solar access and energy smart house design. It also provides a guide to selecting a lot with good solar access and includes tips on siting a home on a block and internal planning for maximum energy efficiency.

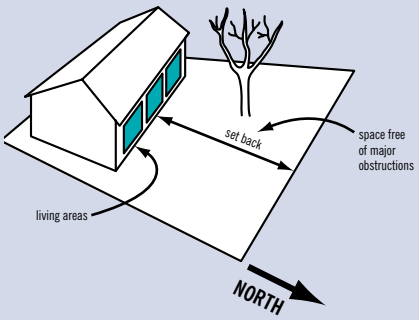

Figure 4.1: Unobstructed space to the north for good solar access

Benefits of solar access

Solar access refers to the amount of the sun's energy available to a building. Good solar access means reduced energy requirements, improved comfort levels and environmental benefits.

Siting for solar access

Correct orientation and siting to achieve a high level of unobstructed winter sunshine is essential (see figure 4.1). A house should be designed to respond to site conditions to maximise free solar energy.

SOLAR ACCESS AND HIGHER DENSITY HOUSING

All forms of housing, including medium and high density housing, can save significantly on energy use for heating and cooling if solar access is good.

It is a myth that solar access can be too difficult to achieve at higher densities. Practical examples and research demonstrates that good orientation (the precursor to solar access) can be achieved. This is particularly important for housing types such as terraces, which can end up with only east-west windows if a northern orientation is not adopted at the outset. Smart subdivision design can aid solar orientation of housing at most densities.

The next step with higher density housing is to provide adequate separation between buildings for good solar access. This requires more design skill than needed at lower densities but is definitely achievable and provides other sought-after benefits such as privacy.

Research shows that the use of shared walls and buildings above one storey can save additional energy and reduce greenhouse gas emissions. When coupled with good solar access, less energy is used compared to many single-storey detached houses.

Diffuse and direct solar radiation

Solar radiation encompasses both direct and diffuse solar energy. Direct solar energy is the sunlight that falls upon the window, whereas diffuse solar energy is the reflected energy that is still provided through the window even when in shadow. In Victoria, up to 40% of the energy contribution from north windows in the colder months is from diffuse solar radiation.

Solar access for lots

Good solar access for new housing depends very largely on the site. Energy efficient housing can be provided more easily and economically if the lot allows a home to be sited with good solar access. Characteristics such as orientation, slope, existing or potential overshadowing from the north, and lot shape, size and width are important considerations. For this reason, choosing the right lot (one with good solar access potential) and correctly siting the home to utilise the solar access, are fundamental design decisions.

Choosing a block

If you have not yet purchased your block of land, you should select a house block that allows you to design and build a north-facing, energy smart home. An inappropriate block can make it more difficult to build one. Likewise, a home designed to be north-facing on one block can become uncomfortable and energy wasteful if placed incorrectly on a block of different orientation.

The block should not be overshadowed in winter by buildings, large trees, fences or other obstructions to the north, so that the home can be placed to catch the winter sun for light and warmth.

DESIGN GUIDELINES

You will get the best solar access from the following listed sites.

- Large blocks which allow the greatest opportunity to place the home facing north.
- Rectangular blocks with long boundaries running east-west, especially if the blocks are less than 500 m^2.
- Blocks where the long side of the lot runs north-south and that are likely to have:
  - a one-storey building to the north, and where lots are wider than 13 m; and
  - a two-storey building to the north (or where the height of the home is unknown), and where lots are wider than 14 m.
- Blocks where the long side of the lot runs east-west and that are likely to have:
  - a one-storey building built to the north, and where lots are wider than 13 m; and
  - a two-storey building to the north (or where the height of the home to the north is unknown), and where lots are wider than 17 m.

    An exception to the above is where a street or park is located to the north. In this case, the block can be narrower and still have good solar access.

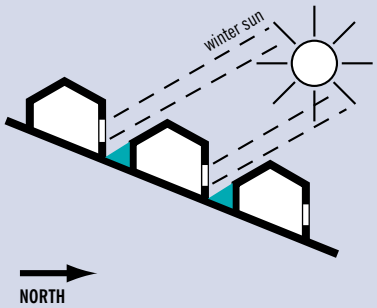

Figure 4.2: Distance between homes can be less on north-facing slopes

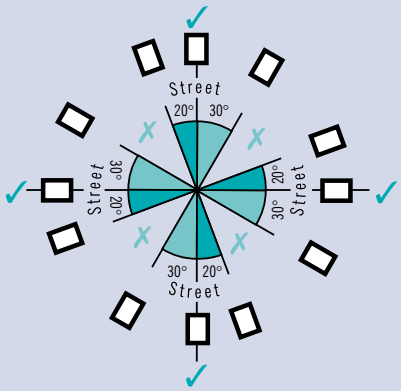

Figure 4.3: Preferred orientation range for lots

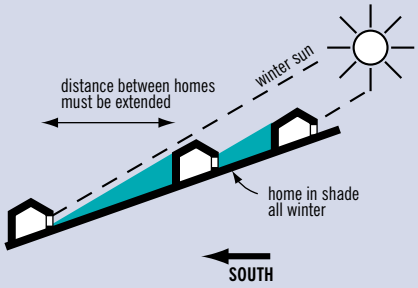

Figure 4.4: Avoid south-facing slopes

- Blocks that allow your home to be placed at a distance of:
  - 5.5 m from a single-storey building to the north; and
  - 10 m from a double-storey building to the north (or where the height of the building is unknown).
- Blocks that slope down to the north (see figure 4.2).
- Blocks that run north-south or east-west which face onto free open space to the north, such as a street, backyard or parkland (see figure 4.5).
- Avoid:
  - small, irregular-shaped blocks;
  - narrow blocks that slope steeply to the south (see figure 4.4);
  - blocks with obstructions such as buildings and tall trees to the north; and
  - long, narrow blocks with their long boundary not facing north or right angles to north.

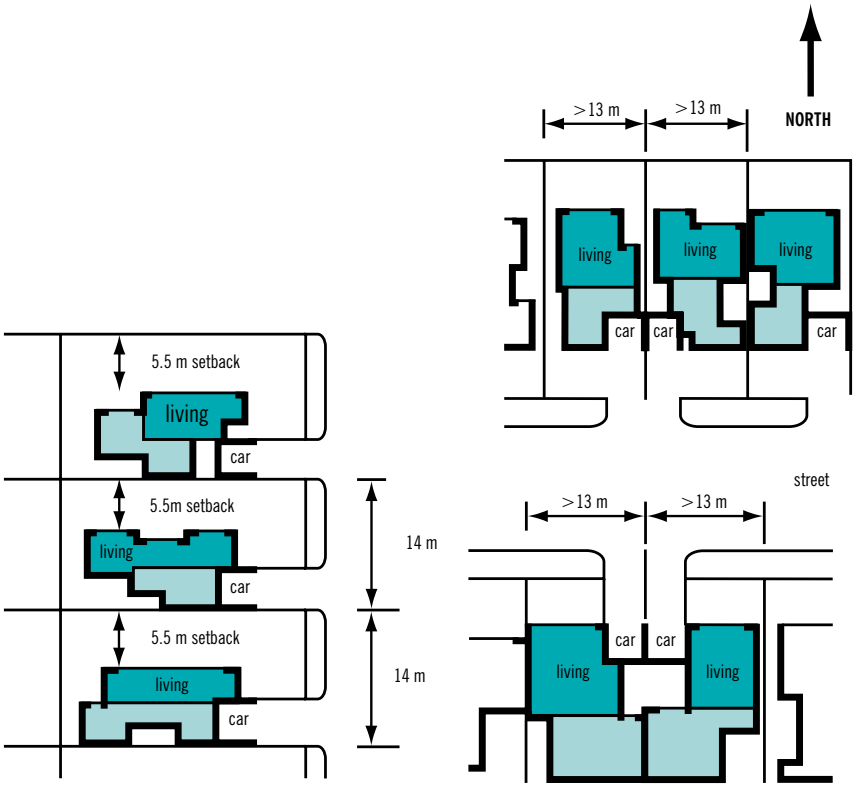

Figure 4.5: Blocks that run north-south and east-west can provide good solar access if minimum boundary widths are provided

Placing your home on the block

Ideally, the home should be placed on the block so that living areas and major windows face north. Renovations and extensions to existing homes should also use this principle to make them energy efficient. If you cannot do this on your block, a high level of energy efficiency can still be achieved by turning your attention to other higher cost, energy efficient features such as extra insulation and double glazing.

Alternatively, your home can be specifically designed to catch the winter sun even on a block with otherwise poor solar access.

DESIGN GUIDELINES

- Keep north-facing walls and windows well back from large obstructions to the north such as buildings, trees or fences, as they cast shadows two to three times their height in mid winter. A distance of at least 5.5 m from a single-storey obstruction to the north, or at least ten metres from a double-storey obstruction, is recommended (see figures 4.7 and 4.8).
- If solar access is poor, consider alternative methods to gain northerly winter sunlight into the home, such as using high clerestory windows (see figure 4.9).
- Consider building on the south, east or west boundaries. If this is not possible, at least place the home close to the southern boundary.
- Avoid placing garages, carports and other buildings on the northern side of the block.
- Consider sharing walls with neighbours, particularly on the east or west boundaries (see figure 4.6).

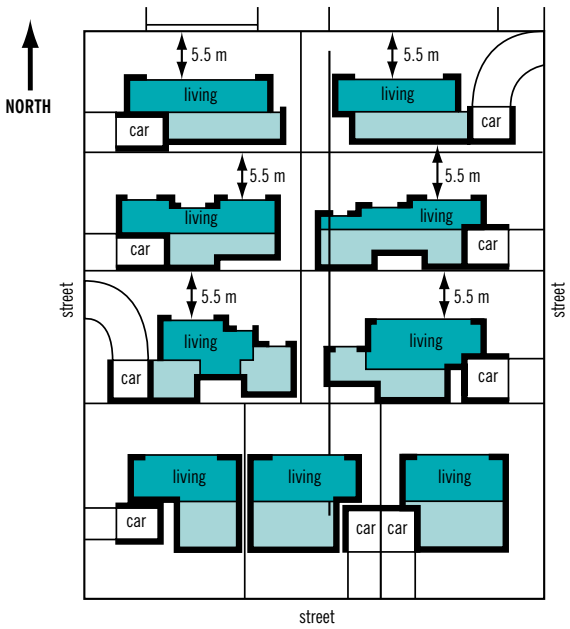

Figure 4.6: Wise house placement close to east, west and south boundaries maximises solar access

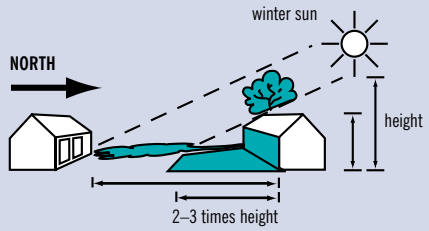

Figure 4.7: Objects cast shadows two to three times their height in winter

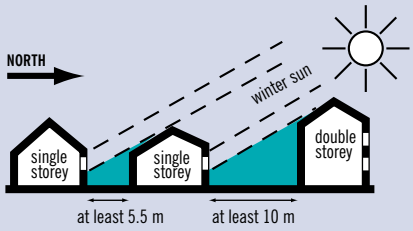

Figure 4.8: Allow adequate distance from obstructions to the north

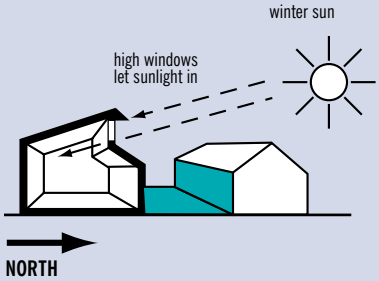

Figure 4.9: Overcoming problems of winter overshadowing with clerestory windows

Internal planning and room placement

Rooms are used for different purposes at different times of the day and their location will influence energy efficiency and comfort levels.

Avoid large, open-plan living areas which have to be heated at the one time when only small areas may be in use.

Creating zones by grouping rooms with similar uses and closing off unheated rooms reduces heating and cooling needs. Grouping together rooms which use hot water also improves the efficiency of hot water usage.

Daytime living zones (family rooms) with northerly aspects are warm and bright during winter and can be easily protected in summer, improving energy efficiency and making them comfortable all year-round.

Stairwells and high ceilings can increase your home heating requirements by more than 40%. They allow heated air to rise, leaving cooler air at the lowest floor level, increasing the volume of air which has to be heated.

Correctly-placed windows and doors with short distances between them are essential to encourage cross-ventilation to help cool the home on summer evenings.

DESIGN GUIDELINES

- Group rooms with similar uses together and use doors to separate the various areas of your home into zones. Use glass doors or bi-fold doors to retain the open-plan aesthetic where necessary.
- Use doors to separate formal living areas from other living areas, and heated areas from unheated areas.

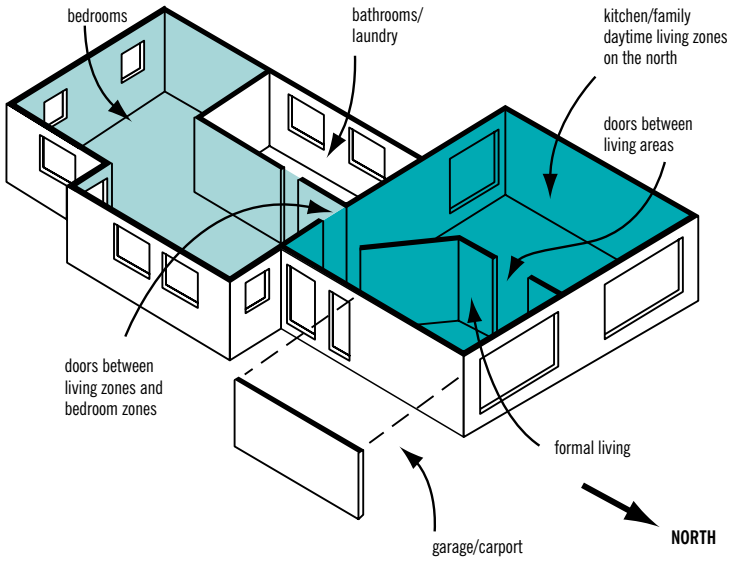

Figure 4.10: Zoning of a home for a narrow north-south block

DESIGN GUIDELINES (continued)

- Place daytime living areas such as kitchens, family and rumpus rooms to the north. Other zones can be arranged around the family area depending on their use.
- A northerly aspect for formal living and dining areas though not essential, is desirable. A westerly aspect should be avoided.
- Avoid a westerly aspect for bedrooms. An easterly or northerly aspect is desirable for children's rooms and playrooms. Rooms with a southerly aspect will be cooler all year-round.
- Group together areas that use hot water to minimise plumbing costs, heat loss from pipes, and water wastage.
- Use utility areas such as bathrooms, laundries and toilets as buffer zones on the west and south sides of the home.
- Be careful not to place rooms or garages where they will overshadow northern windows during winter mornings or afternoons. Avoid deep north-facing courtyards (see figures 4.12 and 4.13).
- Locate garages and carports on the east, west or south sides to protect the rest of the home from summer sun and winter winds (see figures 4.10 and 4.11).
- Create airlocks at external doors to limit the escape of heated air when the external doors are opened.
- Keep ceiling heights low, preferably no higher than 2.7 m. Voids and cathedral ceilings are not recommended.
- Place doors at the base of stairwells to prevent heated air being lost. Avoid 'open' stairways in heated areas.
- Place openable windows and external doors on different sides of the home. Keep paths short and direct (less than 8 m) to encourage cross-ventilation (see figure 4.14 and refer to Chapter 8).

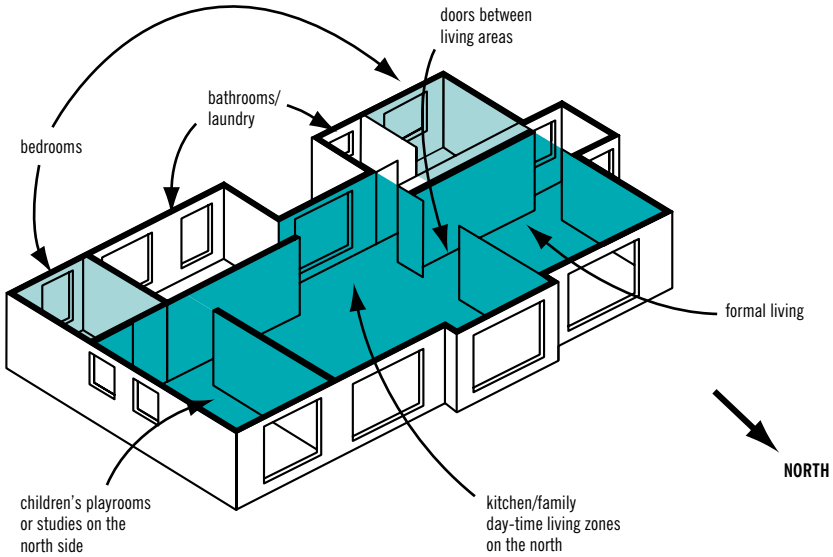

Figure 4.11: Zoning of a home for a narrow east-west block

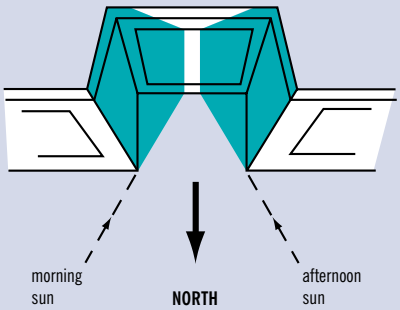

Figure 4.12: Deep north-facing courtyards are overshadowed by the side walls in winter

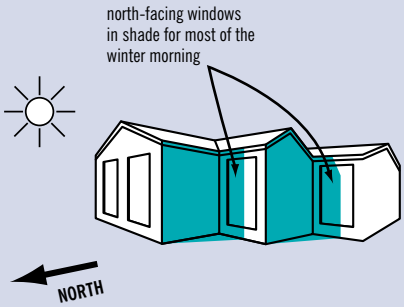

Figure 4.13: East and west-facing walls can shade adjacent north-facing windows in winter

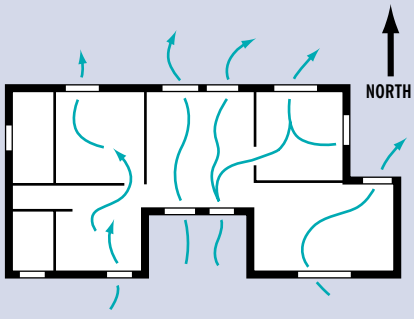

Figure 4.14: Cross-ventilation can provide most of your summer cooling needs