

# VENTILATION AND COOLING

FACTSHEET

12

## NATURAL VENTILATION

Natural ventilation relies on natural air movement and is primarily associated with the provision of adequate cooling in summer.

*It can save significant amounts of fossil fuel based energy by reducing the need for mechanical ventilation and air-conditioning.*

The principal factors affecting natural air movement around and within buildings are:

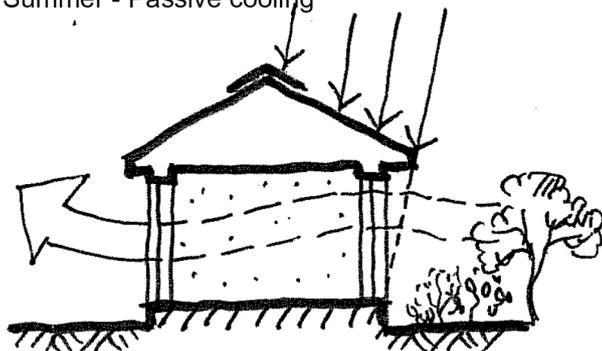
- The site and local landscaping features
- The building form, orientation and envelope design, including position and size of openings
- The internal planning of the building and room design

## INFLUENCE OF SITE AND LANDSCAPING FEATURES

Local factors, such as wind conditions, topographic features such as hills, ridges and escarpments and landscaping elements such as trees, shelter belts and shrubs will influence the way air moves around the site. Local wind speeds can be estimated from Bureau of Meteorology wind data which needs to be moderated for the abovementioned local factors.

In summer, the ideal would be for light winds to provide sufficient internal air movement for thermal comfort during all but extreme conditions and for night time cooling of the building ('night purging').

Summer - Passive cooling



The problem for temperate and cold climates in winter is to avoid excessive wind through ventilation openings and leaks in the building envelope.

Vegetation can help modify the external wind direction so as to enhance ventilation as well as cool incoming air. Dense shrubs and tree canopies should be kept clear of windows and other openings to minimise obstruction to air movement.

Sketches of summer passive cooling and winter passive solar heating and active heating from roof space

The main design elements for passive cooling of buildings in a climate like Googong are:

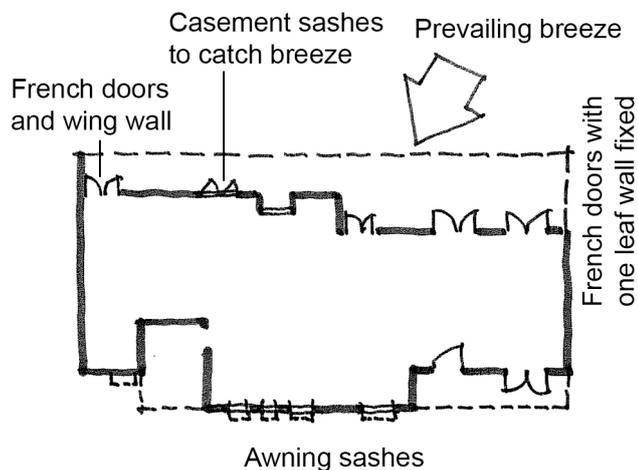
- Orientation for exposure to cooling breezes
- Increase natural ventilation
- Effective shading to reduce heat load
- Adequate levels of insulation
- Floor plan zoning to maximise comfort for daytime activities and sleeping comfort
- Appropriate windows and glazing to minimise unwanted heat gains and maximise ventilation
- Landscaping for shade and cooling
- High thermal mass construction (see Passive Solar Design fact sheet)

Winter - Passive solar heating with active heating from roof space



## THE BUILDING FORM, ORIENTATION, ENVELOPE DESIGN AND WINDOW OPENINGS

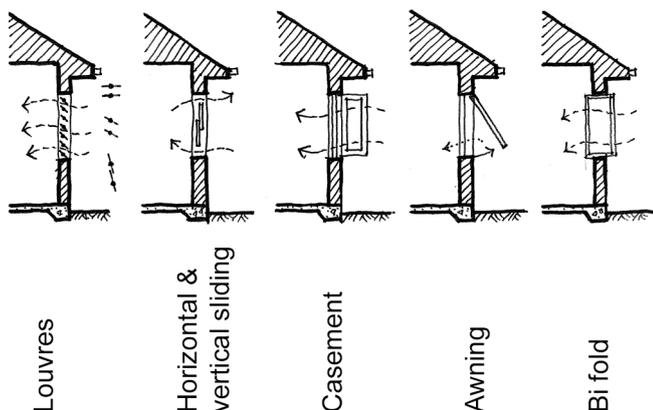
Naturally ventilated buildings should be oriented to maximise their exposure to the prevailing (summer) wind direction, with a relatively narrow plan form to facilitate the passage of air through the building (cross ventilation). Passive solar requirements (see Passive Solar Design fact sheet) will need to be optimised with ventilation requirements so both can contribute to thermal comfort.



Windows should be located to receive the prevailing wind for summer conditions and should ideally be installed on both sides of occupied spaces for cross ventilation. The total area of windows on the outlet side of the building should be bigger than those on the inlet side to facilitate air movement.

Passive-design shade (eaves, roof overhang, awnings) will limit heat build-up in summer and admit the sun in winter.

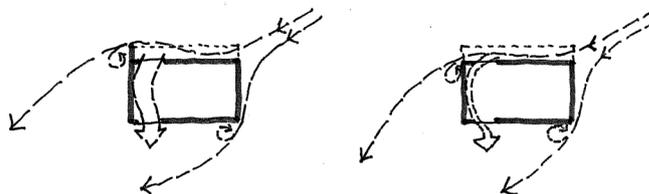
Different window styles and sizes will provide varying ventilation rates. See diagram below.



Different window styles offer different ventilation outcomes

*Louvre windows offer almost 100% opening area. Casement windows with friction stays can be up to 60% more efficient than other sash types or sliding doors on the windward side.*

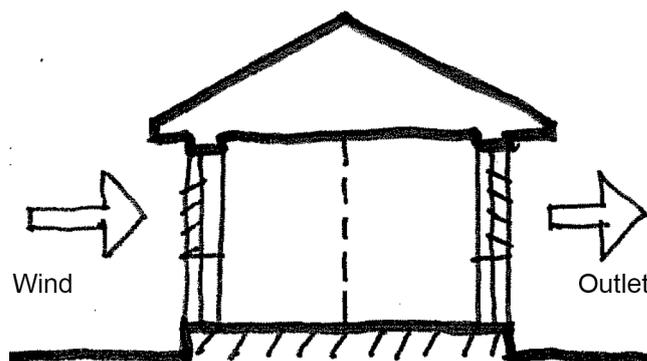
Sliding windows can be problematic in that they can only be opened half way and can't be adjusted according to wind direction.



Short 'wing walls' can increase air flow through windows when the prevailing wind is not perpendicular to the window wall.

## INTERNAL PLANNING AND ROOM LAYOUT

Internal planning and room layout



Natural ventilation of a building

To facilitate the natural ventilation of rooms, the resistance to airflow through the building needs to be minimised. Air movement will be facilitated by large openings and by reducing the number of rooms through which the air has to pass.

## LANDSCAPING FOR SHADE AND COOLING

*Prevention of unwanted summer heat build-up is important in reducing mechanical cooling requirements, in particular air conditioning, and landscaping can contribute by providing shading to buildings and ground surfaces.*

Care needs to be taken to ensure that shading is not extended to solar collectors which will generally be on the roof.

Vegetation helps lower surrounding air temperature by evaporative cooling resulting from transpiration.

Plants and grasses can also help to reduce the heat load on exposed surfaces by the provision of a vegetative ground cover which obstructs the heating effect of solar energy.

In Googong, a minimum of 30% of the front garden area is required to be planted garden beds, minimising reflective surfaces, which will go a long way to reducing heat load from both direct and reflected radiant solar energy.

Carefully located planting can also be used to assist in funnelling cooling breezes into and around the house in summer and blocking cold winter winds.

Benefits from landscaping are:

- Support for indigenous and endemic plant species and backyard food production
- Improved thermal and sound insulation
- Reduced heating and cooling requirements from the formation of microclimate
- Reduced stormwater runoff
- Increased biodiversity
- Encouragement for birds and other wildlife
- Amenity, aesthetics

## FOOD PRODUCTION

Using open space around the house for a vegetable garden can contribute to your food requirements, even if you only plant some herbs.

Permaculture gardening, no-dig garden beds and 'wicking' beds are simple ways to start creating a productive garden.

Your garden will benefit from the rich compost derived from a compost system or worm farm and will help to minimise the amount of waste generated from your house.

## GREEN WALLS AND ROOFS

Green walls (also known as 'Living Walls', 'Vertical Gardens' etc) are particularly useful where space is limited for a horizontal garden and if attached to a wall can help reduce

the temperature of a building by evaporative cooling through the process of transpiration.

Green walls can also help filter and purify water which can be continuously cycled through the soil medium.

Green roofs are roofs planted with vegetation which can provide many benefits as follows:

- Reduce heat load in summer and heat loss in winter
- Filter air and water pollutants
- Reduce stormwater runoff
- Adds thermal mass
- Encourages natural habitat creation