

# PASSIVE SOLAR DESIGN

## FOR NEW ZEALAND HOMES

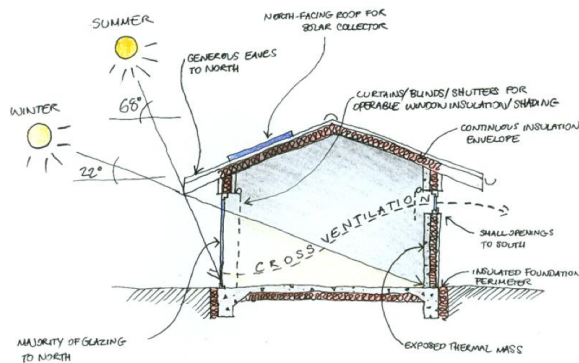


### INFORMATION SHEET 4

In passive solar building design, windows, walls, and floors are made to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer. This is called passive solar design because, unlike active solar heating systems, it does not involve the use of mechanical and electrical devices.

### KEY FEATURES OF PASSIVE DESIGN

- The key elements of passive design are: **building location** and **orientation** on the site; **building layout**; **window design**; **insulation** (including window insulation); **thermal mass**; **shading**; and **ventilation**. Each of these elements works with others to achieve comfortable temperatures and good indoor air quality, retrofitting of insulation difficult.



The first step is to achieve the right amount of solar access – enough to provide warmth during cooler months but prevent overheating in summer. This is done through a combination of location and orientation, room layout, window design and shading. Insulation and thermal mass help to maintain even temperatures, while ventilation provides passive cooling as well as improving indoor air quality.

All of these elements work alongside each other and therefore should be considered holistically. For example, large windows that admit high levels of

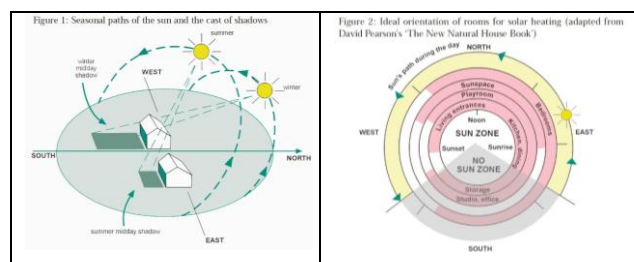
natural light might also result in excessive heat gain, especially if they cast light on an area of thermal mass. Similarly, opening windows that provide ventilation will also let in noise. While ventilation provides passive cooling as well as improving indoor air quality.

### BUILDING LOCATION & ORIENTATION ON THE SITE

#### Location / Orientation

Orientation is the positioning of a building in relation to seasonal variations in the sun's path as well as prevailing wind patterns. Good orientation can increase the energy efficiency of your home, making it more comfortable to live in and cheaper to run.

Orientation for passive heating is about using the sun as a source of free home heating by letting winter sun in and keeping unwanted summer sun out — desirable in the majority of New Zealand homes. It can be done with relative ease on northern elevations by using horizontal shading devices to exclude high angle summer sun and admit low angle winter sun.

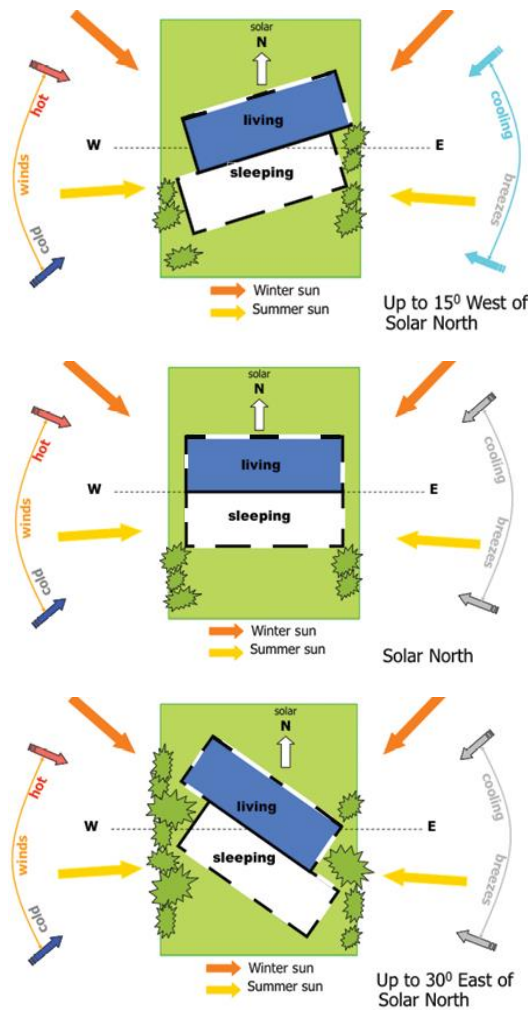


Principles of good orientation



## THE SITE

You can achieve good passive solar performance at minimal cost if your site has the right characteristics. Where possible, choose a site that can accommodate north-facing daytime living areas that flow to outdoor spaces with similar orientation. In tropical areas, northerly solar access is not desirable: sites that allow maximum exposure to cooling breezes and designs that draw or funnel them through the building are preferable.



This simple configuration allows for passive heating of living areas during the day and cooler, southerly sleeping area.

### Other useful links:

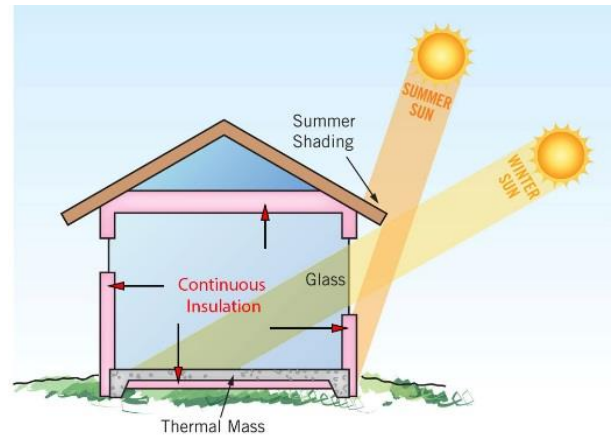
- Smarter Homes ([www.smarterhomes.org.nz](http://www.smarterhomes.org.nz))
- Sustainable building authority Level ([www.level.org.nz](http://www.level.org.nz))
- Energy Efficiency and Conservation Authority ([www.eeca.govt.nz](http://www.eeca.govt.nz))
- Building Research Association of New Zealand ([www.branz.co.nz](http://www.branz.co.nz))
- Department of Building and Housing ([www.dbh.govt.nz](http://www.dbh.govt.nz))

## INSULATION

### The thermal envelope:

Insulation is not a source of heat, it acts as a barrier to heat flow, reducing heat loss in winter to keep the house warm or reducing heat gain in summer to keep the house cool. Inadequate insulation and air leakage are the main causes of heat loss in homes.

Current building codes specify only a minimum level of insulation that may be less than the optimum for heat conservation. Installing insulation above the building code requirements is beneficial, especially in colder climates.



When thinking about insulation, it's important that you think of all the following areas:

Ceiling, under the floor, walls, windows.

These four areas form the 'thermal envelope'. The thermal envelope is the barrier between heated and unheated spaces. (Here in pink) It protects the inside of the home from the outside climate. The better insulated your thermal envelope is, the warmer your home will be.

### For further information,

- Check out complementary Passive solar info sheets: Thermal mass, window design, shading and ventilation.

- Contact an eco-design advisor– a source of free, independent advice on how to include sustainable features in your building or renovation project [www.ecodesignadvisor.org.nz](http://www.ecodesignadvisor.org.nz)

