

Insulation acts as a physical barrier to the transfer of heat and is essential to keeping your home cool in summer and warm in winter. In conjunction with passive design, ventilation and insulation can help to keep your home comfortable year round and cut your heating and cooling costs in half.

Climate will greatly affect what kind of insulation will work best with your home and where it should be installed. The first thing that needs to be established is whether you need to be keeping heat in, out or both. And remember that you need to account for both daily and seasonal variations in temperature.

Considering insulation in relation to passive design is also important. If a room that is not properly shaded has insulation installed it can lead to a build up of heat in the room creating an uncomfortable “oven” effect. Similarly, if a room is improperly sealed then any heat kept in by the insulation will leak out through the ventilation system.

The most cost effective time to install insulation is during construction when it will only represent a marginal increase in cost and can be installed easily. Retrofitting is still an option though but increases the costs and complexity of installation.

Most common building materials provide little insulating value but some materials, such as aerated concrete and straw bales, will not need additional insulation in most instances.

Choosing Insulations

Insulation comes in two broad categories; bulk and reflective insulation. These are sometimes combined to produce a composite insulation. To compare the insulating materials available look for their R-value which is a measurement of the materials resistivity to heat. Products with the same R-value will block the same amount of heat transfer per meter squared. A good R-value for the Hornsby Shire area would be 4.1R for ceiling insulation and 2.8R for wall insulation.

When choosing your insulation you should check the information that comes with the product especially the R-value, price per square meter and what kind of material it is made from. If you are concerned with your environmental footprint considering a recycled or recyclable product like glass wool, polyester and cellulose fibre insulation is a good idea.

When choosing insulation it is important to check whether the product must be installed professionally or if it can be done DIY. Some types of insulation need to be installed using masks and protective clothing and as such should not be installed by novices.

Insulation Types

Bulk insulation

Bulk insulation mainly blocks convective and conductive heat transfer. This is done through trapping pockets of air in a material. Its thermal resistance is basically the same in any direction and the R-value is increased by increasing the thickness of the material. These insulations are what will be most often used in Hornsby Shire and are often recognised as Insulation Batts.

“ Insulation acts as a physical barrier to the transfer of heat and is essential to keeping your home cool in summer and warm in winter. ”

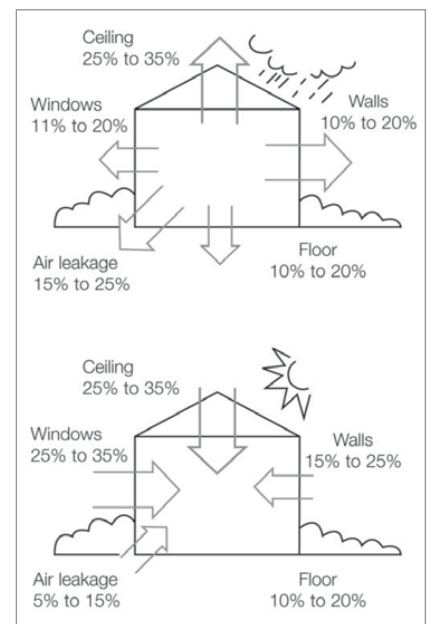


Figure 1: Typical Heat Loss and Heat Gain

Reflective insulation

Reflective insulation resists radiant heat flow due to its high reflectivity and low emissivity. It consists of an air layer of at least 25mm and a shiny surface, like aluminium foil. This form of insulation varies with direction and as such will sometimes have two R-Values; Up R-value, the resistance to heat flow upwards, and Down R-value, the resistance to heat flow downwards. This insulation is most often shiny Aluminium Foil that has been laminated onto paper or plastic and is referred to as sarking. Dust settling onto reflective insulation will greatly reduce its performance and as such it should be installed with the shiny side facing down or on verticals.

Where to install insulation

When considering insulation it is important to determine where it will provide the most benefit and where it is required.

Roofs and ceilings work well together when installing reflecting sarking under the roof and bulk insulation flush with the ceiling material. This will reduce radiant heat gain into the roof and conductive and convective into and out of the building. Doing this can save up to 45% of your heating and cooling costs.

External walls should be insulated; however, this is a relatively complex scenario when retrofitting but can be done. Insulation can be installed; within cavities, between stud frames, and on the inside or outside of buildings.

Floor insulation can be important in cooler climates (to keep the heat in) and in locations where artificial cooling is used a lot (to keep the heat out.) In situations where groundwater is present you should insulate the edge and underside of concrete slabs as well to prevent large amounts of heat being lost into the ground.

Installation

The performance of insulation within a building will depend greatly on how it is installed. The following are some points to consider;

- The building frame around the insulation can act as a thermal bridge allowing heat to be conducted through it. This is particularly true in colder climates and locations where metal frames have been used in construction. To overcome this issue you should insulate around these components with at least 12mm (R2) of insulation.
- Heat can build up in the roof space where insulation is installed and therefore installing ventilation in the roof will allow this to dissipate. Even in cooler climates ventilation in the roof space will allow moisture and summer heat trapped in the roof to escape.
- Avoid any gaps in the insulation as even a small gap will reduce the overall insulating value. You should fit batts snugly ensuring that gaps are not left around ducts and pipes. Ensure that the corners of walls, ceilings and floors are properly insulated as these are areas where heat leaking often occurs.
- Where condensation is an issue vapour barriers should be installed, these can be as simple as a polythene sheet or a well maintained water resistant paint.
- For safety reasons you must leave minimum clearances around hot objects, such as recessed down lights and their transformers, as well as flues from fires and some electrical wiring.
- You should wear protective clothing, gloves and a face mask when installing glass wool, mineral wool, and cellulose fibre insulation as these products can cause skin, eye and upper respiratory irritation.



Figure 2: Insulation Batts



Figure 3: Reflective Insulation

“ The first thing that needs to be established is whether you need to be keeping heat in, out or both. And remember that you need to account for both daily and seasonal variations in temperature. ”

Sources

Figure 1:
<http://www.yourhome.gov.au/technical/images/47b-large.jpg>
Figure 2:
http://commons.wikimedia.org/wiki/File:Glass_wool_insulation.jpg
Figure 3:
<http://www.gmagazine.com.au/news/1828/insulation-safety-inspections-ordered>