Important guidelines on how to create an energy efficient home.

What is an energy efficient home?
A home which incorporates common sense design principles......

1. To reduce the need for expensive heating & cooling appliances/equipment
2. To reduce appliance running costs and therefore energy bills
3. To reduce energy related greenhouse gas emissions

......without compromising on comfort.

In fact, an energy efficient home is generally more comfortable, easier to maintain and costs no more to build than a conventional home.

How can I design my house to be Energy Efficient?

General Guidelines
For a house to be really energy efficient you need to have all the right elements of design. These include a consideration of:
Orientation & Siting
Layout & Zoning
Insulation
Windows/Shading/Landscaping
Ventilation/Draught Proofing
Thermal mass

Orientation & Siting
By carefully considering the position of your house on your chosen block, you can maximise the passive solar design advantages which will make your home more comfortable all year round.

The following points should be considered when selecting a block of land:
1. Size and orientation of the block
2. Solar access to the north side of the house
3. Slope of the block
4. Tree coverage and height
5. Height and proximity of surrounding buildings

The orientation and siting of your home can make a huge difference to your energy bills. The ideal home is sited with the living areas facing north with the long axis of the house running east-west. Large windows on the north side of the house let the sunshine in during winter, but can be easily shaded from the summer sun. This will make the house warmer in winter and cooler in summer.

To prevent overshading from neighbours, allow a set back of at least 6 metres from a single storey house to the north, and at least 11 metres from a double storey house. If this is not possible, you might be able to use a clearstorey window to allow adequate sunlight into the home. Note that this window will require sufficient shading for summer comfort.

Layout & Zoning
Locate the living areas facing north and have north facing windows capture the winter sun. All bedrooms and utility areas should be located on the south side. Following an open plan style of home will also help. Not only does it make the best use of all available space, it should allow light to penetrate easily and air to circulate freely around the home. Design open areas so they can be reduced in size by closing doors, to minimise the areas needing heating and cooling at any one time.
Insulation

The single most important measure to make your house energy efficient is the addition of insulation to the walls and ceilings. Insulation is the material that slows down heat transfer through the external surfaces of your home. It can make your home up to 10°C cooler in summer and 5°C warmer in winter.

In an uninsulated house approx. 40% of heat loss takes place through the roof and ceiling, whilst around 35% of heat is lost through walls and floors.

The performance of insulation materials is specified with an ‘R-value’. The greater the ‘R-value’, the more effective is the insulation at resisting conducted heat flow into your house in summer, and out of it in winter.

For the Adelaide plains, the recommendation is R3.0 for the roof and R1.5 for the walls. For other locations within SA, please refer to our insulation fact sheet.

Insulation materials

Blanket & Batt insulation. There are a range of insulation materials which come in two forms, either in long rolls (called blankets) which must be cut to fit the length of space, or in precut lengths (called batts).

Loose fill insulation has no backing and is supplied loose. It is simply poured or pumped into a wall cavity or roof space.

Rigid insulation comes in precut boards which are used primarily in new home construction and are ideal for insulating areas such as raked ceilings, solid brick external walls, under wooden floors and around concrete slabs.

Reflective foil insulation works by reflecting large amounts of heat from its highly polished metallic surface. Due to its reflective ability it is more effective in summer than winter.

Windows

The sun’s rays pass easily through normal windows. This can provide welcome heat in winter, but can lead to overheating in summer, as the heating power of sunlight shining directly on east and west facing windows is around 1,000 watts per square metre. About 88% of this heat will pass through a window made of 3mm float glass.

Ideally all north facing windows should be full length, so when the winter sun is low in the sky, the heat will penetrate well into your home. Use minimum or zero glass on the east and west sides, and small glass areas on the south side of the house.

The total window area should be less than 25% of the total floor area of the house. If windows are made too large they can make the house uncomfortably hot in summer and hard to keep warm on cloudy winter days and nights.

Shading

The shading of sun is vital in keeping your house cool in summer.

Well designed shading greatly reduces heat entry, adding significantly to summer comfort in the home. It can also significantly reduce the need for, and running costs of, airconditioning equipment.

The most effective way to keep summer heat out of the house is to use adequate external shading.

North facing windows can be easily shaded with fixed shading devices, such as an eaves overhang, horizontal shade or awning, and pergolas.

These shading devices must be designed so that they allow sun entry in winter and totally shade the windows in summer. In Adelaide, to achieve this, the width of the fixed shading on the north side should be 0.5 times the vertical height of the window (at the top of the window). Attention should be paid to adequately shading east and west facing windows; whilst south facing windows generally do not need shading.

Whilst important, internal shading such as curtains and blinds will never be as effective as external shading because the radiant heat from the sun has already passed through the glass. To get the best performance from curtains and blinds you need to ensure that they should be opaque and of light colour, to maximise the reflection of sunlight. Tinted or reflective glass is a good way to reduce heat loss. Tinted or reflective glass should be used where it is not desirable to obstruct the view, and internal shades with a reflective backing should be used where it is not possible to install external shading devices.

Solar Rebates

A truly energy efficient home harnesses energy from the sun.

Current government rebates for photovoltaic systems (the generation of electricity from the sun) and solar hot water can make these renewable energy technologies cost effective – enabling significantly lower appliance running costs and reduced greenhouse gas emissions.
Landscaping

Landscaping can enhance your property and provide benefits to you in maintaining more comfortable conditions in your home. By carefully planning the landscaping around your home, you can control the entry of heat, as well as the quality and direction of the breezes you allow to blow through it.

Breezes entering your house will be cooler if they have passed through gardens or courtyards that have shade, pools or shrubs and lawns. The layout of your garden can also be used to screen or direct breezes.

Ventilation & Draught Proofing

In summer, a cool breeze flowing through the house helps cool down the house and its occupants at night. The house need not face directly into the prevailing summer breeze, but can be offset at an angle of up to 45° either way.

While adequate controllable ventilation is essential to provide fresh air, prevent condensation, and help cool a house on summer nights, draughts can create discomfort and lead to energy losses in both summer and winter.

In winter, draughts can account for up to 25% of heat losses.

Reducing these draughts can be a cheap and cost effective way of reducing heating and cooling costs. New houses should be built to minimise draughts, by avoiding gaps at construction joints between different wall materials, and where walls join or meet the ceiling and the floor, and by ensuring that doors and windows fit snugly in their frames. Draughts can be further reduced by:

- Draught proofing doors and windows
- Sealing up cracks and gaps
- Sealing unnecessary vents
- Sealing exhaust fans and outlet grills
- Sealing unused fireplaces
- Sealing vented skylights

Thermal mass

The term Thermal Mass refers to the ability of building materials to store heat. Building materials that have a high thermal mass, such as internal bricks and masonry and a concrete slab with hard floor coverings, can store large amounts of heat without a large temperature change.

In places where the difference between day and night temperatures is 8° or more, there are benefits in using high levels of thermal mass inside north living zones to stabilise internal temperatures in both summer and winter.

The correct use of thermal mass inside a house can significantly improve both thermal comfort and energy efficiency.

A balance, however, needs to be achieved between the thermal mass, window areas, and insulation levels, to suit the climatic conditions.

Floors

Energy efficient homes make good use of concrete, tiled or slate floors, because apart from being easy to clean, they play a big role in absorbing heat in winter. The floor must be able to absorb as much heat as possible during the day and then release the stored heat into the room at night. Carpets and rugs act as insulators, so the slab floor can’t absorb as much heat.

Tiles, slate or any other heat absorbing hard surfaces are ideal and work well when situated in rooms which have north facing windows.
Save money and cool global warming!

It is important that we all contribute to minimising Greenhouse Gas Emissions. Each of us can take the lead in reducing our own household’s use of energy through:

- Energy efficient housing design
- Selection of the most appropriate energy fuel source
- Selection of energy efficient appliances and technology
- Minimising our need for energy use

**FAQ’s**

**Q** If my chosen block does not face the right way, does this mean that I can’t build an energy efficient house?

**A** Correct orientation gives you the best chance to capture winter sun. If this can’t be done, more effort is required on the other aspects of the house design to achieve comparable efficiencies.

**Q** My new house plan has all the daytime areas facing south. How can I improve the layout?

**A** Often it can be as easy as asking the designer or builder to mirror image the plan for you.

**Q** Do open plan houses and two storey houses with large stairways need to be zoned?

**A** Large open plan homes and two storey houses allow heat to travel through them easily. This means more energy is required to heat them than if they were able to be divided into smaller areas. Zoning can often be done by incorporating doors to allow this in the early planning. They can be ‘in wall’ sliders if you only want them for winter periods, and don’t want them to show at other times.

**Q** What is an insulation R-value?

**A** The level or performance of an insulation product is measured by its Thermal Resistance or R-value. The greater the R-value, the more effective is the insulation at resisting conducted heat flow into the building in summer, and out of it in winter.

**Q** Are batts or loose fill insulation better?

**A** The important consideration is the R-value of the insulation material. For the same R-value, there should be no difference in performance between loose fill insulation and batts (providing both have been installed correctly). Note (1) that covering ceiling joists with insulation may create a hazard for anyone who needs to work in the roof space and (2) batt colour does not make a difference to the performance of insulation.

**Q** Should I consider energy efficient lighting?

**A** Yes! Whilst fluorescent lighting (globes and/or tubes) can be relatively expensive to buy, they will last much longer than ordinary incandescent globes, with a significantly reduced energy consumption. They’re great for areas where the light is on for long periods - like kitchens, family rooms and hallways or for outside night security lighting.

**Q** Can reflective foil laminate (RFL) be used as an insulator?

**A** Yes - but its positioning in the walls and ceilings is important in terms of its effectiveness.

**Q** Do louvres and venetian blinds reduce heat loss?

**A** Louvres, venetian blinds and vertical blinds are not good insulators, as they have air gaps that allow warm air in the room to contact the cool glass. Performance can be improved by lining with a closely woven, tight fitting curtain.

For further energy efficiency advice?

Log on to the Energy Division website for information and advice through the ‘Advisory - Residential’ links @ www.energy.sa.gov.au

Call our Advisory Service on 8204 1888 (FreecallTM for country callers 1800 671 907)

email us at energy.sa@sa.gov.au