

Do you know that space heating typically accounts for 37% of the average household's energy use? Ensuring that your house is well-insulated and airtight is an important investment to consider. Paying attention to building orientation, shading and draft sealing are equally important for reducing energy consumption while still making your house as comfortable as possible.

## Insulation

Insulation is essential for keeping your home warm in winter and cool in summer. An often-forgotten element of this is draft proofing; sealing gaps around windows and doors is critical, even for well-insulated houses. This combination of draft-proofing and insulation will help achieve year-round comfort as well as reduced energy costs and thus reduced greenhouse gas emissions.

The performance of insulation products is expressed in its so-called "R value". The higher the R value, the higher the level of insulation. This means that the house will maintain a comfortable internal temperature for longer periods without having to start either the heater or the air conditioner.

The maximum amount of insulation that can be installed in an existing home is often constrained by the building construction type and access to the roof cavity, wall cavity, and underfloor areas. For the Tatura region, the recommended level of insulation is generally R4.0 in ceilings and R 2.5 for walls and under floor areas. Higher R value insulation is not recommended as the insulation can retain too much summer heat and this will slow the overnight cooling process (purging).

Different types of insulation can be used. **Bulk insulation** contains pockets of air within a thick material blanket which slows the transfer of heat. **Reflective insulation** material reflects heat back to where it came from and, if double sided, will re-radiate very little heat on the opposite side. **Composite insulation** consists of bulk insulation with a reflective surface.

Insulation should be installed carefully, following the product specifications, to optimise performance and reduce the risk of condensation or fire. It is important to fully cover the area to be insulated. For example, if insulation only cover 95% of a ceiling area, the insulation performance is reduced by 50%. In 2017, GV Community Energy surveyed 1,032 homes in the GV region and found 70% had such poor insulation coverage in the roof cavity that the insulation was mostly ineffective. It is advisable to engage professional insulation installers due to specific installation techniques for different products, buffer distances around electrical appliances and dangers of working in the roof cavity which usually has poor air quality, potentially extreme heat, and exposure to electrical circuits.

For insulation to be effective, it should work in conjunction with good passive design principles. For the Tatura region this means having summer shade on east and west facing

sides of the house to prevent unwanted early-morning and late-afternoon summer heat gain. This can be achieved by using retractable vertical awnings or fixed vertical louvers on the outside of the house, which, when adjusted at the correct angle, will provide summer shade and allow winter sun to pass through onto the east and west facing walls and windows. Verandas and eaves provide little summer shade on these sides of the house. Fixed (near horizontal) awnings on the north facing side can provide both summer shade and winter sun exposure onto walls and windows.

The first step in creating a comfortable living environment in the home would be to prevent summer sun to hit walls and windows. This should be done **before** money is spent on sealing drafts and improving ceiling and/or wall insulation

Overnight purging of unwanted summer heat in the house is easily achieved with a routine of opening windows after sunset and closing them in early morning.

### **Glazing**

Another way to improve the thermal performance of a home is to install either double glazed windows with insulated frames or, for a lesser cost, to use thicker glass panes with embedded thermal film. Up to 40% of a home's winter heating energy can be lost through windows and up to 87% of unwanted summer heat gain can come in through old-fashioned traditional single-glazed windows.

However, as discussed above, providing summer shade over all windows is the best and cheapest way to prevent unwanted summer heat in. Even double-glazed windows allow significant unwanted heat gain if exposed to direct sun. Internal blinds and curtains provide additional protection and slow down the transfer of summer heat into the house.

During winter, double glazed windows are effective in retaining heat inside the house. Where possible, it is desirable to allow direct sunlight to hit windows to allow natural light in and add warmth to the building. Window furnishings can then be used during the evenings to improve the thermal performance by adding another layer of material over the glazed area. Heavy curtains, with multiple layers of fabric that fit close to the window, with a fixed pelmet above preventing air within the room from circulating along the glass is an effective way of reducing heat loss. Even roller blinds or light weight window furnishings, when combined with pelmets, will restrict air movement around the glass and provide significant insulation compared to unfurnished windows.

If considering the purchase of new windows, the key item to consider is its insulation value, called 'U value'. This is the inverse of an R value, so a lower number is better. A good quality double glazed window, with thermally broken frame (insulated) can achieve a U value of 3.0 or below and this is what new buildings should be aiming for. Lower quality (cheaper) double-glazed aluminium-framed windows, not thermally broken, can have a U value of 4.0 or above, which only offers a performance similar to better quality single glazed windows.

The other criterion for glazing is its Solar Heat Gain Coefficient (SHGC) which measures how well the sun's radiation can pass through the window. This should be considered based on the orientation of the window in the building and whether sun penetration is desirable.

There are many different types and combinations of glass and frame to choose from. Both single and double or triple glazed units will allow solar heat gain, but double or triple glazed units are better for preventing heat loss. The **Window Energy Rating Scheme** allows you to compare the performance of different types of windows, doors, and skylights. You can also use the **Australian Glass and Window Association tool** to calculate the potential savings that may be achieved by installing energy-efficient glazing.

## Heating

Household heating generally consist of natural gas heaters, reverse cycle air conditioners (split systems), and to a lesser extent electric resistance heating (radiators or blowers) and wood stoves and fires the latter of which are less efficient and difficult to maintain.

Combined heating and cooling appliances are great options for heating in winter and cooling in summer. These include reverse cycle air-conditioners, hydronic systems, and ground-source heat pumps. Reverse cycle air-conditioners are the most energy-efficient and cost-effective combined heating and cooling systems you can currently buy.

Modern reverse cycle air conditioners (heat pumps) are up to 3 times more efficient in heating your home compared to other methods of heating, such as wood fires or natural gas heating.

Evaporative air conditioners are highly efficient at cooling and are often used in preference to split systems because of their lower running costs and the relaxing effect of the high volume of air moving through the house. However, under extreme heat or high humidity conditions, split systems will perform better.

By setting your thermostat in the range of 19-21°C in winter and 23-25°C in summer you can save on energy costs. Each additional degree of extra heating in winter or cooling in summer increases energy consumption by about 5 to 10%, depending on how well the building is insulated (winter) or shaded (in summer).

You can use the **Australian Institute of Refrigeration, Air Conditioning and Heating's on-line calculator** or get quotes from installers to ensure you are getting a system that is correctly sized for your space. The energy rating label on appliances tells you how efficient the appliance is compared to other models of the same size and type. Zoned energy rating labels shows the efficiency rating for different seasons for 3 Australian climate zones, so you can see how the appliance will perform in your region. You can also refer to the following website <https://www.energyrating.gov.au/>.

## Government Rebates

The "**Home Heating and Cooling Upgrades Program**" is a Victorian Government initiative designed to help 250,000 eligible households reduce their costs and improve their health through replacing gas heaters, wood heaters and inefficient electric heaters with energy-efficient split-system reverse-cycle air conditioners/heaters.

Eligible households can receive:

- \$1,000 towards the cost of an energy-efficient reverse-cycle air conditioner;

- \$200 towards the cost of decommissioning their old gas heater (if an existing gas heater is being replaced); and
- \$500 towards the cost of upgrading their switchboard (if an upgrade is required to install the rebated reverse-cycle air conditioner).

To be eligible for this program you must hold a valid concession card, or your annual household income must be below \$90,000.

For landlords of rental properties to be eligible, they must:

- own a property that is either earning \$500 or less in weekly rent, or occupied by renters either holding a valid concession card or with a combined household income below \$90,000; or
- if unoccupied but with a potential to earn \$500 or less in weekly rent;
- declare the rental property is not used for holiday accommodation (such as Airbnb);
- replace an existing gas, fixed electric or wood heater, or no fixed heating at all, with an energy efficient reverse-cycle split system.

New reverse-cycle systems installed under the Scheme should be from an approved products list and installed by a supplier approved under the program. More information can be found at [www.heatingupgrades.vic.gov.au](http://www.heatingupgrades.vic.gov.au).

## Sources Cited

Castles and Cars, s. i. (2021, October). *Castles and Cars Rewiring Australia. Discussion Paper*. Retrieved from Rewiring Australia: [https://global-uploads.webflow.com/612b0b172765f9c62c1c20c9/615a513770739cc6477e67f4\\_Castles%20and%20Cars%20Rewiring%20Australia%20Discussion%20Paper.pdf](https://global-uploads.webflow.com/612b0b172765f9c62c1c20c9/615a513770739cc6477e67f4_Castles%20and%20Cars%20Rewiring%20Australia%20Discussion%20Paper.pdf)

Milne, G. R. (2020). *Your home-Energy-heating and cooling, insulation, glazing*. Retrieved from <https://www.yourhome.gov.au/energy>

Victoria, S. G. (2022, February 28). *Home heating and cooling upgrades*. Retrieved from <https://www.heatingupgrades.vic.gov.au/>