

Fact Sheet 5

Building shell improvements



Residential Efficiency Scorecard

The Scorecard is a home energy rating program.

An accredited assessor will visit your home, look at the building features and fixed appliances, and generate a certificate showing an energy star rating, hot weather rating and appliance efficiency ratings.

Your Scorecard assessor will give you advice on how to make your home more comfortable and energy efficient, so you can keep energy costs down.

To find out more about the Scorecard or to request an assessment, visit www.victorianenergysaver.vic.gov.au/scorecard.

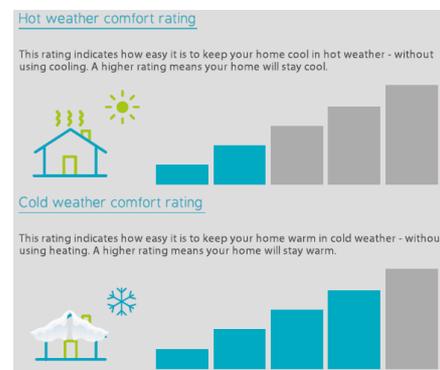
Why is the building shell rating so important?

The building shell consists of the roof, walls and floor of your home, as well as windows and insulation. The materials used to build your home all have different properties. Some allow heat to move through them easily, others help retain heat. How well your home is sealed is another factor that determines how much it costs to heat and cool and how comfortable the house is to live in.

The building shell rating gives a guide to determine how good the house is at retaining heat in winter and excluding heat in summer. It has a direct relationship with the cost to heat your home and can also impact strongly on your comfort. A Scorecard assessor will be able to explain which are the best opportunities to improve your home's building shell.

Using the Scorecard ratings

A good way to start is to look at the first page of the Scorecard certificate. Look for the *Hot weather comfort rating* and the *Cold weather comfort rating*. These ratings tell you how well your home performs in hot weather without using cooling and in cold weather without using heating:



The more squares the better. For any rating of 3 or less it is recommended you consider upgrades to improve comfort levels and reduce energy costs. If the building shell performs poorly, it doesn't matter how efficient your heating and cooling are, there will still be heat leaking into and out of the house depending upon the season.

With this information you can understand the features of your home that are weak and the greatest priority to upgrade. Suggested improvements are listed on the certificate. The options provided have potential to improve the rating. This allows you flexibility to make the decisions that suit you depending upon your biggest issues and priorities.

About your home's building shell

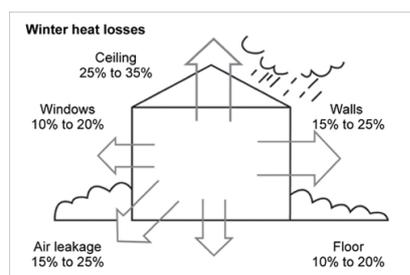
There are four parts to look at to improve the building shell. If the improvement options on the certificate will highlight the weaker elements of your home.

- **insulation**, which acts to slow the rate of heat transfer through a material or building element, helping to keep the inside of your home warm in winter and cool in summer.

- **thermal mass**, which affects the rate your home heats up and cools down. Materials like concrete and brick have high thermal mass and help to slow down the rate that a room may heat up or cool down.
- **windows**, which have the combined function of letting in light and allowing heat movement in summer and winter.
- **air leakage**, which occurs through any gaps between the inside and outside of your home. These include deliberate openings like wall vents and chimneys, as well as gaps and cracks that develop over time.

Improving insulation

The R value provides a measure of how quickly heat will move through a material. The higher the R value, the slower the rate of heat transfer.



Source: SEAV, 2002.

Ceilings and roofs

Between 25 and 35 per cent of heat loss or gain occurs through the ceiling. Adding ceiling insulation will make a huge difference to the comfort of the home, helping to keep it warm in winter and cool in summer.

If the ceiling space is easy to access you can add or top up insulation so that you have a minimum of R3.5. If the ceiling space isn't easy to access, consider adding insulation when the roof needs replacing or install an insulated false ceiling below the current one.

Walls

Between 15 and 25 per cent of heat loss and 25 to 35 per cent of heat gain occurs through walls. Walls are difficult to insulate, so it's best to do it while you are renovating and can replace lining or cladding.

Most stud walls have a 90 mm stud that allows insulation up to R2.5 to be installed. Alternatively, wall cladding is now available that can be retrofitted internally or externally that includes an insulated layer.

Floors

Between 10 and 20 per cent of heat loss or gain occurs through floors. Insulation is most effective on floors that have a large space underneath – and these are also often the most accessible. Raised floors are generally timber floors that can be insulated using batts or insulating boards affixed between the joists.

Slab on-ground concrete floors can't be insulated after construction, so insulating the slab is only an option for new homes.

Installing insulation should be done in accordance with the Australian Standard (AS3999:2015) and the wiring rules (AS/NZS 3000:2007) to ensure it is done safely and will give the best possible results.

Improving thermal mass

Appropriately installed thermal mass inside your home can make it more comfortable. High thermal mass elements, such as brick, rammed earth, tile and concrete, tend to be slower to change temperature than low thermal mass elements. In winter, thermal mass exposed to the sun or your heater will mean your home remains comfortable for longer. In summer, thermal mass connected to the ground or other cooling sources will mean your home remains comfortable for longer.

Thermal mass should be positioned so they are exposed to sun in winter but shaded from sun in summer.

Think about how you can do this; through careful positioning of eaves, deciduous plants or blinds.

You can also consider insulating high mass external walls, ideally with the insulation located on the outside of the thermal mass. This allows the mass to interact with the air temperature inside the room, giving you greater benefits.

Improving windows

It is very important to understand how to make your windows work to your benefit. While ten to 20 per cent of heat is lost through windows in winter, the potential for heat gain in summer is much higher at between 25 and 35 per cent. There are many ways to manage windows to make your home more comfortable, including replacement or improvement.

Windows have three important properties:

- insulation
- letting the sun in (light and heat)
- ventilation

Even the best performing windows will not insulate your home as well as an average wall. This means that windows can be a major weak spot, letting heat out in winter and heat in during summer. Both the frame and

the type of glass effect the performance of windows.

Replacing windows

Different types of frames perform differently, with some materials allowing for large amounts of heat transfer. In order of best performing to worst performing frame are available in the following materials:

	timber or u-PVC
	composite (aluminium outside, timber inside)
	thermally broken aluminium
	aluminium or steel

Glazing also comes in many different forms. Double glazing helps to slow heat movement by having a still layer of air or argon gas between the two panes of glass. There is also an option to add a low-emissivity (low-e) coating to the glass which further reduces heat transfer. Single glazed low-e coated glazing is also available but do not perform as well as double glazed units.

Improving existing windows

If you have single glazing and are not going to replace your windows you can add secondary glazing. This is done by adding an additional pane of glass, rigid acrylic sheets or soft plastic. Adding a second pane also helps with noise reduction.

Internal Window coverings

For the best effect, the curtain or blind should create a still air space between the covering and the window, with no gaps at the edges. One of the most effective ways to do this is with heavy floor-length curtains with pelmets, honeycomb blinds or Roman blinds which are affixed to the wall or window frame at the top.

External shading

To minimise the amount of heat coming into your home in summer, external shading is essential for north, east and west facing windows. Double glazing alone does not significantly reduce the amount of heat entering the house. Eaves are most effective on north-facing windows, as they can be sized to allow sun in winter when the sun is low in the sky and block it when it is high in the sky in summer.

For east and west-facing windows, vertical shading is a better solution, for example external shutters or blinds. The aim is to stop the sun from hitting the window.

Deciduous plants can be effective in blocking the summer sunlight on a window, while allowing dappled sunlight in winter. Low cost temporary shading, like matchstick blinds and foils can also work well.

Fixing gaps and cracks

For many homes the best way to improve comfort and save on your energy bills is to deal with gaps, cracks and other points that allow draughts. Between five and 25 per cent of heat loss or gain is due to gaps and cracks. Draughts also create airflow over your skin which make you feel colder in winter.

If your home has fixed ventilation, such as ceiling or wall vents, only remove it after seeking expert advice. Wet areas often need ventilation to avoid mould. You may need to install alternative ventilation such as exhaust fans.

Target these areas for sealing:

Exhaust fans

Exhaust fans should have louvres or flaps that close when not in use to reduce unwanted air leakage. If you can't do this, try to keep doors closed to these rooms. You may even consider draught proofing internal doors if a room is particular problem.

Chimneys

Chimneys for open fires can cause large amounts of air leakage. If you want to use your fireplace, you can fit a damper that blocks the chimney when it's not in use.

You can block the chimney permanently if you don't intend to use the fireplace. Often it is good to block the fireplace from the bottom or within the room. If the blockage is visible someone is less likely to try to use the fireplace in future.

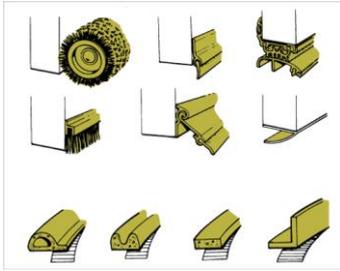
Door and window seals

It is very common that windows and external doors are a source of draughts. Signs are that windows rattle, dust accumulates around the inside of the frame or you feel cold air movement in winter. If you can see light around a door this indicates a big problem.

There are many window and door seal products available that are suitable for different situations. If you're looking for a less-permanent solution, you can stop gaps at the bottom of doors with a door snake.

Gaps can also occur around the outer edges of the frames where they meet the wall. These can be sealed with caulking and painted over.

This picture shows a range of door and window seals:



Source: *Your Home. Australia's Guide to Environmentally Sustainable Homes*, 2013.

Wall vents, ceiling vents and vented skylights

Homes built before the mid-1980s often incorporated wall or ceiling vents. You can seal or remove these vents unless you intend to use a portable un-flued gas heater or an open-flued gas heater in the room. Never use a portable gas heater in a sealed space.

Vented skylights incorporate a permanent opening, usually covered by flyscreen or mesh. These are generally found in bathrooms and laundries. You can replace the skylight with a new type of sealed roof window or install a sheet of acrylic at the bottom of the shaft that blocks the entire hole.

A cheaper option is to close the door to the area with the venting. You may even consider draught proofing internal doors if it is a big problem.

Downlights

Older style incandescent downlight fittings and gimbaled (swivel) halogen fittings allow significant amounts of air leakage.

You can replace these with high-efficiency, sealed LED fittings that reduce air leakage, as well as energy use.

Floorboard gaps

Older floorboards may develop gaps between them and allow air leakage. Floorboards tend to shrink, expand and bend when walked on, causing fillers to fall out. This is a difficult issue to solve. The simplest approach might be to install carpet or rugs.

If the under-floor space allows it, you can insulate the floor from below with a product that provides an air seal like foil or insulating boards.

Skirting board gaps

Air leakage can occur in gaps between the skirting and the floor, especially in older homes. On a raised timber floor, there is likely to be significant leakage.

These gaps can be addressed by using a flexible caulking material, or you can use a foam noodle or filler on large gaps.

Other places where air leakage occurs

There are many other places where air leakage can occur. These include pipework penetrations, pet doors and evaporative cooler ducts.

Simple things you can do now

If you're renting or you don't want to make big changes, there are easy and inexpensive things you can do to boost your home's thermal performance.

These include:

- focusing on a single room, usually the living area where you spend most of your time, which can perform well in extremely hot or cold weather
- changing your energy use habits, like keeping external doors and windows closed when the outside temperature is too hot or cold
- draught-proofing your home's doors and windows
- closing internal doors so you only heat or cool a small area within your home – bathrooms and laundries tend to have high air leakage rates, so keep these doors shut
- change light globes to LED under the Victorian Energy Upgrades program (if you need to change the fittings, you may need to seek permission from your landlord)
- add an aerator to your showerhead to reduce the water flow rate (this reduces the amount of energy used to heat water) or change your showerheads under the Victorian Energy Upgrade program with your landlord's permission
- asking your landlord to install roof insulation
- installing drapes that act as an air flow barrier when they are closed.

The Victorian Energy Upgrades program information can be found here:

<https://www.victorianenergysaver.vic.gov.au/save-energy-and-money/discount-energy-saving-products>

These small changes can make a big difference to your energy bills and the comfort levels in your home in both winter and summer.