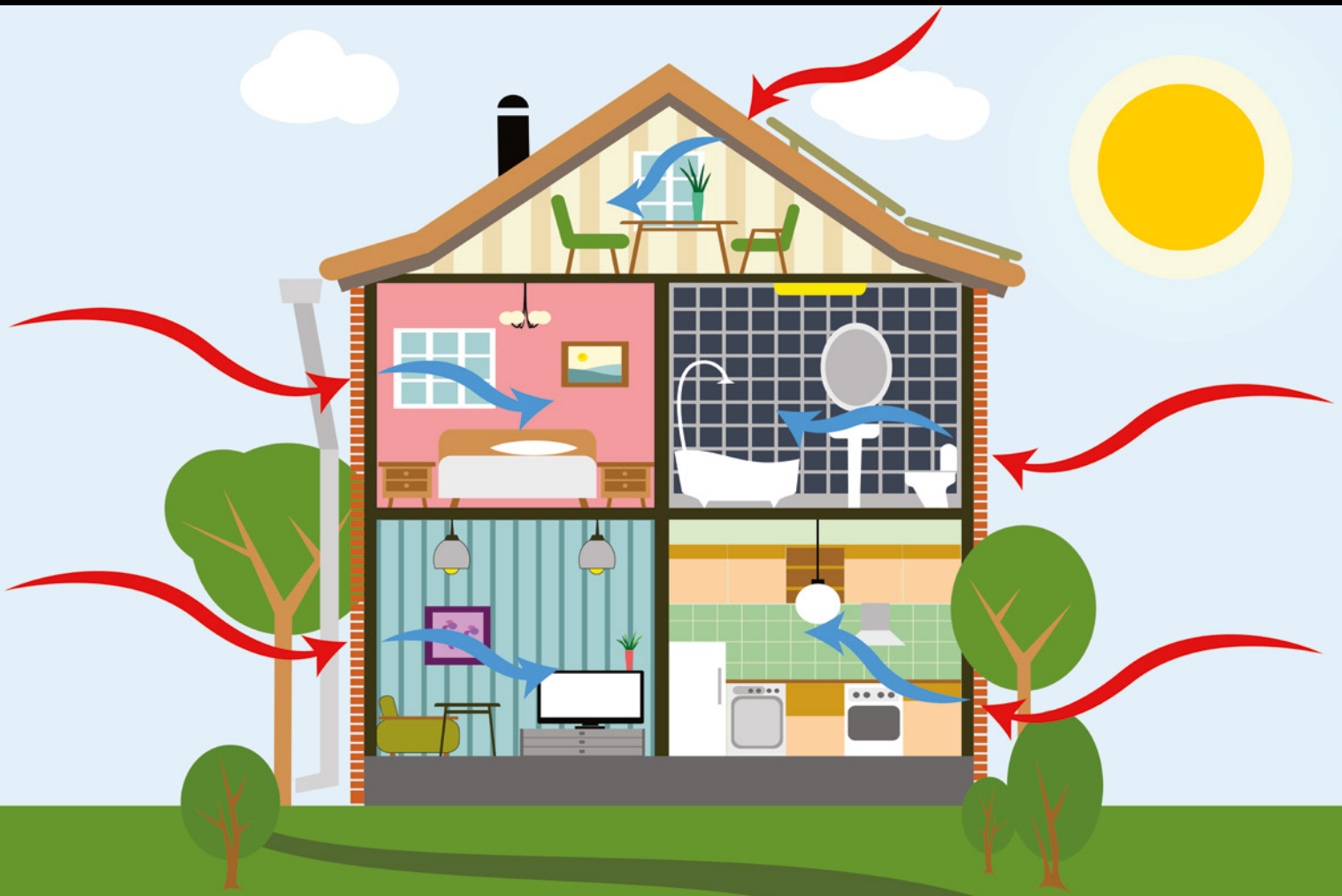


# Designing energy efficient homes with minimal power bills



## Introduction

Energy usage and sustainability is a growing concern in Australia, with home energy consumption a significant contributor to greenhouse gas emissions.<sup>1</sup>

The size and characteristics of Australian homes greatly impacts on household energy use, with the amount of floor space affecting the amount of energy needed to heat or cool a dwelling. The size of homes are increasing, but household sizes in Australia are decreasing.

Between 1994 and 2008, the number of homes with four or more bedrooms rose from 21 per cent to 29 per cent, while the number of one, two and three bedroom homes all decreased. The 2.6 people per household in 2001 is projected to decrease to 2.2 and 2.3 people per household in 2026. This means that more space needs to be heated and cooled per person, requiring more energy.<sup>2</sup>

Furthermore, Australians are looking to reduce their energy consumption (and consequently, their energy bill). Between 2007-08, almost nine in ten Australians said they took steps to limit their personal energy use.<sup>3</sup>

Heaters and coolers are major contributors to household energy use. In 2005, they accounted for more than two-fifths (41 per cent) of household energy use and nearly one-fifth (19 per cent) of residential sector greenhouse gas emissions. Nearly eight in ten dwellings (77 per cent) across Australia had a heater in 2008 and more than one-third of households (39 per cent) nominated 'Comfort/convenience' as the main reason for their choice of heater.

Cooling has a low contribution to household energy consumption compared to heating, although energy consumption for cooling has been growing rapidly. Two-thirds of Australian homes used some form of cooling (i.e. air conditioner or evaporative cooler) in 2008, up from 59 per cent in 2005 and 35 per cent in 1999. The use of coolers has been rising, with households using their cooler for 3 to 6 months, rising from 26 per cent in 2002 to 33 per cent in 2008.<sup>4</sup>

A well designed house needs very little energy to maintain a comfortable temperature. If the home is built with appropriate insulation, passive solar design and is weathersealed, it can require low or no energy for heating and cooling. Even for existing homes there are many ways to reduce energy bills, improve comfort and help the environment.<sup>5</sup>





## Building efficiency into the design

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On average across Australia, 40 per cent of the energy used at home is for heating and cooling (not including heating hot water). Most homes will need heating or cooling at some time of the year, although highly efficient, carefully designed homes can avoid the need for additional heating and cooling appliances altogether.<sup>6</sup>

Taking into account current consumer preferences and industry practices, the Australian Government has predicted that halving the rate of energy used at home for heating and cooling from 40 per cent to 20 per cent is a highly achievable in the short term. The rate could be cut to almost zero in new housing through sound climate responsive design.<sup>7</sup>

The eight climate zones in Australia are defined by the Building Code of Australia (BCA).<sup>8</sup> The zones start at climate zone 1 – high humidity summer, warm winter, through to zone 4 – hot dry summer, cool winter and to climate zone 8 – alpine.

There are a number of areas of consideration, which should be tweaked to suit the climate zone where the house is built. This includes:<sup>9</sup>

### Design considerations

In warmer zones it's important to orientate the building to take full advantage of cooling breezes and the landscape. Shaded outdoor living areas should be provided and night time sleeping comfort should be prioritised. Ceiling fans are also ideally installed in all rooms. Climate should be considered when choosing type, location and quantity of thermal mass.

In cooler zones, the principal is the same, except you are taking advantage of sunlight and building in a high glass to mass ratio. Living areas should be built on the north and bedrooms and service areas on the south. High ceilings

should be avoided and airlocks should be provided between lower and upper floors.

### Windows and shading

In warmer climates, it's best to shade all east and west-facing walls and glass year round and use appropriate levels of passive shaded north-facing glass as heating requirements increase in more southerly and inland regions. Use 100% openable windows area such as louvre or casement.

For cooler climates, careful sizing and orientation of windows is essential. Passive solar shading to northerly windows is essential and you should minimise and shade all east and west-facing glass in summer. Consider using adjustable shading to some west-facing glass areas to boost afternoon solar heat gains in winter and allow variable solar access in spring and autumn.

### Insulation

Insulation acts as a barrier to heat flow and helps keep homes warm in winter and cool in summer. It can help with weatherproofing and soundproofing. The climatic conditions will determine the appropriate level of insulation as well as the most appropriate type to choose — bulk, reflective or composite. The most economical time to install insulation is during construction, however it is possible to retrofit houses with insulation.<sup>10</sup>

### Construction systems

Depending on the zone, use a combination of low/high mass construction, light reflecting or light/dark coloured materials, elevated floors, lightweight wall constructions, earth coupled slabs and embodied energy walls, roofing and finishes.<sup>11</sup>

## Improving heating/cooling

Not all houses are built to perfectly suit their climate and even those that are often require additional heating or cooling options as the weather fluctuates.

Heating and cooling options range in energy usage and include:<sup>12</sup>

- **Passive design:** uses little or no mechanical heating and cooling.
- **Choosing appropriate heating:** there are many different types of heating with different sources of energy and levels of efficiency.
  - Central heating uses a gas heater, boiler or heat pump to distribute warmth or cooling through the house via ducts or pipes.
  - Gas space heaters: natural gas and LPG produce one quarter to one third the amount of greenhouse gases produced by standard electric heaters and these heaters may be either radiant or convection (or a combination of both), fixed or portable, flued or unflued heaters.
  - Electric heaters: this includes reverse-cycle air conditioners, split systems, electric portable heaters, electric column and flat panel heaters, radiant electric heaters, radiant lamp heaters, fan heaters and convection heaters.
  - Wood heaters: these aren't the most energy-efficient option. They can't be turned off when a suitable temperature is reached and are often supplemented by other forms of heating to warm the rest of the home.
  - Heat shifters: move air from heated areas of the house to unheated areas via ducting and a fan.
- **Cooling choices:** the three main options include
  - Fans, which are the cheapest option and often sufficient.
  - Evaporative coolers, which are particularly good in low-humidity areas.
  - Air conditioners.
- **Air conditioner size and type:** this will depend on your local climate, room and house size, ceiling height, insulation levels and area of windows and their orientation. The Australian Institute of Refrigeration, Air Conditioning and Heating has a calculator to help work out the capacity of the air conditioner required for the area you want to heat or cool.<sup>13</sup>

## When to act?

Many Australians will only think to seal their homes before winter sets in, but air leaks are year-round issues. In winter, air leaks allow hot air to escape and unwanted external cold air to enter and in summer, the reverse occurs.<sup>19</sup> Sealing your home will minimise the need to heat and cool your home from the extremes of the Australian summer and winter, which will reduce your contribution to

## Passive design

Passive design helps maintain the interior temperature of a home using little or no mechanical heating and cooling and is the cheaper option. Paying attention to the principles of good passive design suitable for your climate effectively 'locks in' thermal comfort, low heating and cooling bills, and reduced greenhouse gas emissions for the life span of your home.<sup>14</sup> It can be built into a design, but if the house is already standing, there are a number of ways to work it in. They include shading windows, installing insulation and weather sealing.

### Shading

Shading of your house and outdoor spaces reduces summer temperatures, improves comfort and saves energy. Effective shading — which can include eaves, window awnings, shutters, pergolas and plantings — can block up to 90 per cent of the heat emitted by direct sunlight. Shading of glass to reduce unwanted heat gain is critical, as unprotected glass is often the greatest source of heat gain in a house. By calculating sun angles for your location, and considering climate and house orientation, you can use shading to maximise thermal comfort.<sup>15</sup>

### Weather sealing

Even if your home is well-insulated, heated or cooled air can leak in and out through gaps and cracks.<sup>16</sup> Air leakage accounts for 15–25 per cent of winter heat loss in buildings. Sealing your home against air leaks is one of the simplest upgrades you can undertake to increase your comfort while reducing energy bills and greenhouse gas emissions.<sup>17</sup>

Weather sealing your home is an easy and cheap way of reducing your energy bills. It can save you up to 25 per cent on your heating and cooling bills and is easy and affordable to implement—even for renters.<sup>18</sup>



global warming. In Australia, households produce around 20 per cent of Australia's total annual greenhouse gas emissions, of which heating and air-conditioning account for around 27 per cent. Draughts can account for up to 25 per cent of heat loss from a home. Weathersealing can be very effective and many draught sealing measures are inexpensive and easily done yourself.<sup>20</sup>

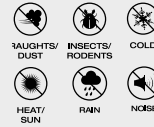
### INTERNAL DOORS

Available in a range of colours and materials to suit any kind of door and floor surface, an internal door seal will dramatically improve the functionality of your door by minimising the amount of light, sound and draughts from other areas of your home.

#### CM1



### CM48



### WINDOWS

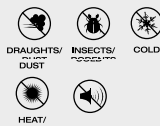
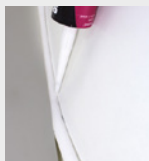
To further protect your home from heavy rainfall and strong winds, Cowdroy also provides Window Perimeter Seals which are easy to install and come in a variety of sizes.



### FILLING INTERNAL GAPS

Increase the energy efficiency in your home by installing Cowdroy's easy to use gap fillers. They have been developed to easily maneuver around corners and come in a range of sizes to suit your needs. Cowdroy's Gap Fillers offer even further protection as they are moisture resistant and highly durable.

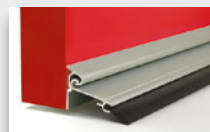
#### CM11A



### EXTERNAL DOORS

Install a Cowdroy Weatherseal to suit your front or back entry door and minimise the effects of external elements such as wind, rain, light and sound on your home and its contents while improving the energy efficiency in your home

#### CM3



## Putting it to practise

The first step to passive design and sealing your home is to seal the gaps and cracks. They're often found around doors and windows. For a quick, easy option for filling gaps around door architraves and along skirting boards, pick up some gap filler and a caulking gun from your local hardware store.

The next step is installing weather seals (or draught stoppers). There are a number of different products on the market including flexible strips that attach permanently to the bottom of your door.<sup>21</sup> Fitting a weather seal to your window or door may also help eliminate or minimise problems such as light, sound, dust, draughts, wind, rain, insects and rodents. It seals the gap and acts as a barrier to anything trying to creep through, blocking out the heat or cold and other pests.<sup>22</sup>

## Where to start

When fitting a weatherseal to your home, the best places to start are:<sup>23</sup>

- In your roof area and underneath your home, check that all openings for pipes, ductwork, and chimneys are well sealed.
- Look for gaps where pipes and wires pass through floors and walls and check for air leaks along the edge of the flooring and around door frames.
- Seal gaps between floorboards.
- Outside, look for any cracks and holes in the mortar and foundations.
- Inspect windows and doors for air leaks.
- Check around exhaust fans, ceiling mounted ducts, wall vents or vented skylights.
- Seal off unused fireplaces.

You can find a wide range of draught sealing products at your local hardware store, such as the range offered by Cowdry.

Cowdry an Australian company that offers a complete weatherseal and door seal range. Cowdry was established in 1890 and has always placed its emphasis on the design and development of new products according to market demands. Independent design, research and development has and always will be, an ongoing issue at Cowdry's to ensure the continuation of new and exciting products. Cowdry has maintained the highest standard in the design and manufacture of its products throughout the past century and will continue to maintain that excellence in the future.<sup>24</sup> This is why you can choose from the Cowdry range with confidence that you are choosing a quality product that is fit for purpose.



You can choose from the Cowdry range with confidence that you are choosing a quality product that is fit for purpose

## The Cowdry Weatherseal range



Cowdry's Weatherseal range may be integrated into any design, or fitted by the consumer to existing doors or windows. The range is made as easy as possible to install and come complete with fitting instructions and self-adhesive backing tape. They are readily available in retail stores and are a cost-effective way to seal gaps and reduce energy bills. The range of weatherseals and gap fillers can be fitted to jambs, faces or edges of most windows and doors.

Choosing the right product, depends on your needs:

### CM11 Gap Filler

Gap Filler seals gaps in most windows and doors that are 3mm - 4mm. It is easy to apply and saves time and money on expensive sealants when large gaps or cracks require filling. It is suitable for domestic and commercial applications and is available in 6mm, 10mm and 15mm diameters. It comes in a 5m roll and is available in white.

### CM14 Foam Windows & Door Seal

This continuous foam seal may be fitted to jambs, faces or edges of most windows and doors. It is suitable for most windows and doors and seals against the heat, cold, dust, draughts, noise and insects.

It is available in three different sizes:

**CM14:** is 9mm x 6mm, suitable to seal gaps 3mm-5mm and is 5m long. It is available in grey and white

**CM14A:** is 19mm x 6mm, suitable to seal gaps 3mm to 5mm, is 5m long and is white.

**CM14B:** is 12mm x 12mm, seals gaps 8mm to 11mm, is 2.5m long and is white.

### CM48 Rubber Windows & Door Seal

This continuous rubber seal may be fitted to jambs, faces or edges of most windows and doors. It suits most windows and doors and will seals against the rain, heat, cold, dust, draughts, noise, insects and seals against rodents. It will seal gaps 3mm to 5mm, is 5m long and comes in white or brown.

### CM59 Rubber Window & Door Seal

This continuous rubber seal can be fitted to jambs, faces and edges of most windows and doors. It suits most windows and doors and seals against the rain, heat, cold, dust, draughts, noise, insects and rodents. It seals gaps 2mm to 3mm, is 5m long and comes in white and brown.

### CM61 Brush Window & Door Seal

This continuous brush seal may be fitted to jambs, faces or edges of most windows and doors and seals against the heat, cold, dust, draughts and insects. It suits all windows and doors and seals gaps 3mm to 5mm. It is 5m long and comes in grey.



## The Door Seals range

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Cowdroy's Weatherseals range is suitable for sealing the door jambs, but for an effective seal at the base of the door, there's Cowdroy's extensive range of door seals. The seals cater for a range of different door needs, eliminating lights, sounds, dust, rain, draughts and insects. Cowdroy's door seals increase the energy efficiency of homes, ensuring it is kept cooler in Summer and warmer in Winter, whilst saving money on your bills.

There are eight options in the range:

### **CM1 Rolling Door Seal**

The Mercury CM1 is a furry door seal which hangs off hooks at the base of the door and rolls as the door is opened and closed. It suits single and double hinged, inward opening doors and will seal gaps up to 19mm. The Mercury CM1 is especially suited to uneven and rough surfaces, seals against the heat, cold, dust and draughts and comes in light grey.

### **CM17 Extruded PVC Door Seal**

This extruded PVC door seal comes with a self-adhesive backing tape, but can also be screw fixed. It suits single and double hinged, inward and outward opening doors, as well as sliding security doors and sliding screen doors. It seals gaps up to 15mm, blocking out heat, cold, dust, draughts and insects. It is 915mm wide and comes in brown.

### **CM2 Brush Strip Door Seal**

This extruded aluminium door seal comes with a brush strip insert and self-adhesive backing tape, but it may also be screw fixed. It suits single and double hinged inward or outward opening doors and is suitable for sliding doors and security screens. It seals gaps up to 19mm from heat, cold, dust, draughts and insects. It is available in three colours: bronze anodised, clear anodised and gold anodised.

### **CM3 Automatic Door Seal**

This extruded aluminium door seal includes a rubber insert with a cam operation that automatically lifts and drops the seal as it is opened or closed. It suits single and hinged inward opening doors and seals gaps up to 16mm against the heat, cold, dust, draughts and insects. It is available in 915mm and 1220mm wide and comes in bronze anodised, clear anodised and gold anodised.

### **CM4 Weather Proof Door Seal**

This extruded two-part aluminium door seal includes rubber inserts. The seal fixes to the door while the tread plate fixes to the floor. It Suits single or double hinged and inward or outward opening doors. A gap of 25mm is required between the bottom of door and sill and it is ideal for doors exposed to the weather. The CM4 Weather Proof Door Seal will seal against the rain, heat, cold, dust, draughts, noise and insects. It is 915mm wide and comes in bronze anodised, clear anodised and gold anodised.

### **CM5 Rubber Strip Door Seal**

This extruded aluminium door seal with rubber insert screw fixes to the bottom of the door. It suits single and double hinged doors - inward and outward opening and is also suitable for sliding security and sliding screen doors. It seals gaps up to 19mm against the heat, cold, dust, draughts and insects. It is 915mm wide and is available in three colours: bronze anodised, clear anodised and gold anodised.

### **CM54 Weather Proof Door Seal**

This extruded aluminium tread plate fixes to the floor while the extruded rubber seals fix beneath the doors. It suits single or double hinged doors that are inward opening and a gap of 22mm to 25mm is required between bottom of door and sill. It seals against the rain, heat, cold, dust, draughts, insects and rodents. The CM54 Weather Proof Door Seal is 915mm wide and comes in clear anodised.

### **CM60 Automatic Door Seal**

This extruded aluminium door seal features rubber inserts. The pin trigger automatically lifts and drops the seal when door is opened or closed. It suits single and double hinged, inward opening doors and seals against the heat, cold, dust, draughts, noise, insects and rodents. It is 915mm wide and is available in bronze anodised, clear anodised and gold anodised.

**For more information on how Cowdroy can help seal your home, head to [www.cowdroy.com.au](http://www.cowdroy.com.au).**

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