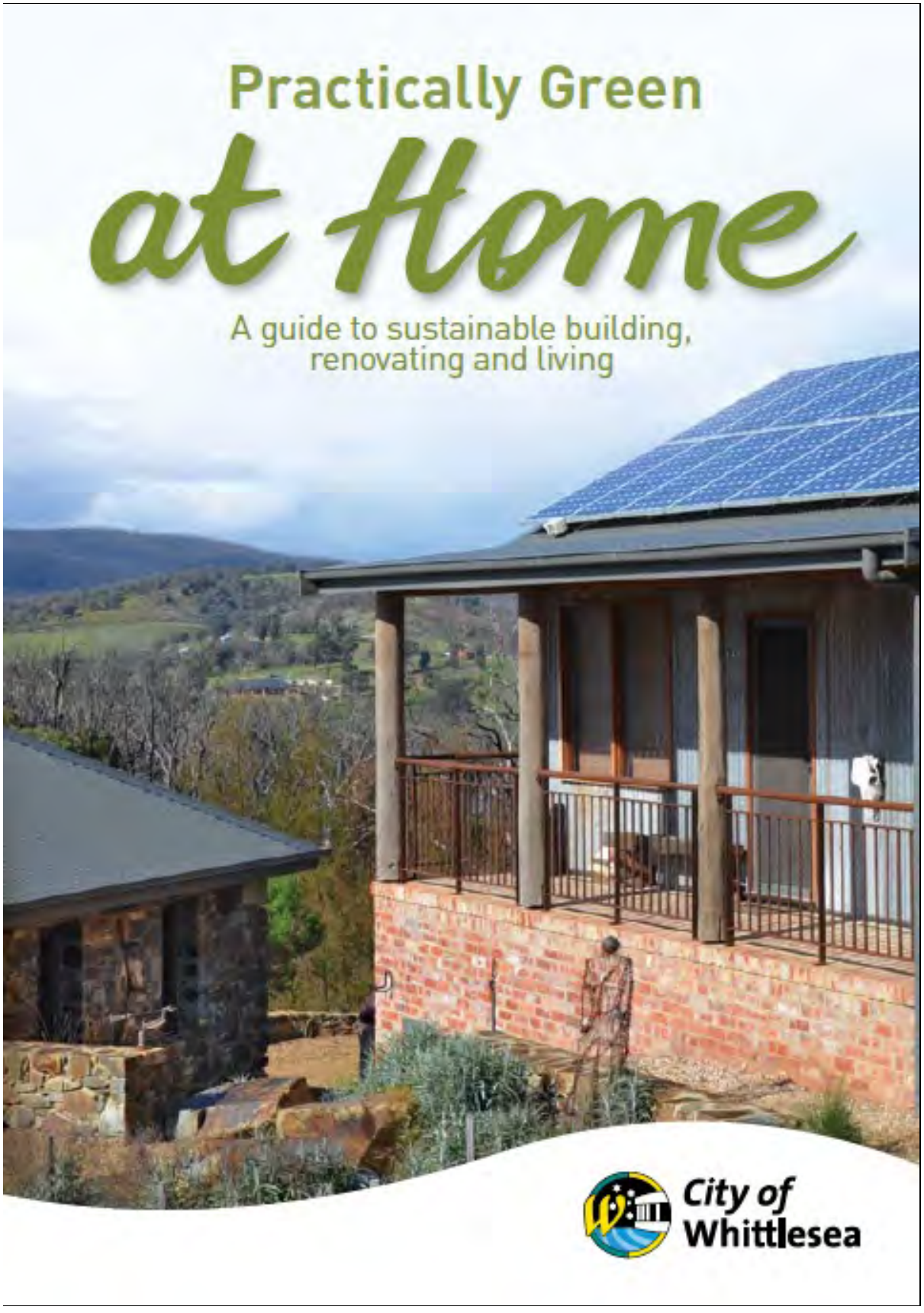
Practically Green

A guide to sustainable building, renovating and living



Acknowledgements

This booklet was produced by Nillumbik Shire Council and the City of Whittlesea.

Photographs by Nillumbik Shire Council, www.morguefile.com, Naina Knoess.

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Contents

Introduction

Why build a sustainable home?

Your home and the way you live are two of the main ways in which you can influence your impact on the planet. This guide for residents has been designed as a resource to help you create an environmentally sustainable home and lifestyle.

Some of the benefits of making your house more sustainable are:

- a more comfortable environment to live in
- cheaper heating and cooling
- reduced exposure to harmful chemicals
- better connections to the external environment
- reduced reliance on mains water
- fewer new and non-renewable resources used in building and maintaining your home
- attraction of native birds and other wildlife
- improved biodiversity.

The main objective of building sustainably is to reduce the pressure of your home on natural resources and the surrounding environment, both during the building or renovation phase, and throughout its life. Household energy use accounts for about 26 per cent of Australia's total energy use, with the main sources being petrol, electricity and natural gas. If you think that your efforts alone don't matter, consider what the impact on our health and the environment would be if everyone across the municipality or even Melbourne decided to make their homes more sustainable.

Rising energy costs have impacted on all households recently. In parts of the municipality there is no access to reticulated natural gas, so the use of electricity and wood as fuel is common. These fuels contribute to higher greenhouse gas emissions than some alternatives and are expensive to purchase. It makes a lot of sense to have a home that doesn't require large amounts of energy to heat, cool and light, yet remains comfortable and pleasant to live in.

Re-using building and landscaping materials, minimising the use of harmful chemicals around the home and eating locally produced foods can all contribute to a healthy and satisfying life.

Key Considerations

Key sustainability considerations when building or renovating are:

- building size, design and site issues
- indoor environment quality
- construction materials
- energy efficiency
- water efficiency
- managing rainfall and stormwater
- gardens and landscaping
- waste management
- transport
- everyday purchasing patterns.

About This Guide

This guide aims to provide information on more sustainable choices for residents building new homes or renovating existing homes and highlights opportunities for a greener lifestyle.

Included in this guide are:

- considerations when building or renovating
- lifestyle options
- information about appliances
- resource guides and support for your choices[1].

[1] The lists of resources are current as of mid-2013. Research and development of sustainable building products and efficient appliances is occurring rapidly so there will be new products emerging on the market all the time. Unless you are owner-building, your builder would normally access most of these products on your behalf.

How are the products contained in this guide assessed for sustainability?

The sustainability of each product is determined using a combined assessment of:

- embodied energy – the amount of energy used in the raw material extraction, production and associated transport of the products.
- resource consumption – the responsible use of natural resources from material production, through to its end use. Using salvaged and recycled materials and considering the environmental, social and economic aspects of a resource are favoured.
- recycled products – whether products are manufactured from pre- or post-consumer waste. Ideally a product should be made from post-consumer material recovered from households, commercial or industrial premises. Pre-consumer recycled products – material diverted from the waste stream during manufacturing are also listed.
- biodiversity impacts – the environmental or socio-cultural impacts on an ecosystem or community living within or relying on an ecosystem, i.e. harvesting rainforest timber from Southeast Asia.
- timber choices – recommended timbers are certified through the Forest Stewardship Council (FSC) or salvaged and/or recycled timbers.

Some products are certified through Good Environmental Choice Australia (GECA). The GECA Ecolabelling Program offers global best practise in product certification and ecolabelling.

Planning Matters

- Check Council's planning controls. Each property sits within a planning zone, and each zone has specific requirements for building and earth works. It is important to have an understanding of Council's Planning Scheme and any controls that are relevant to your property. The planning scheme can be accessed online at www.nillumbik.vic.gov.au or www.whittlesea.vic.gov.au.
- A Pre-application Meeting with a Planning Officer and a Sustainability Officer is a valuable way to determine the type of planning controls affecting your site as well as how you can incorporate sustainability into your project as early as possible.
- Consider the desired outcome of your new home or renovation. What would you like to achieve in terms of the aesthetics and functionality from your project?
- Consider the site orientation and access, views and how you can utilise building design to gain your ideal living arrangements.
- Consider which building materials would be most appropriate to deliver a completed home that meets your objectives.

Resources

- Sustainable Design Assessment in the Planning Process (SDAPP) Fact Sheets: a suite of fact sheets relating to the different aspects of designing a new home or renovation. For Nillumbik residents they are available online at www.nillumbik.vic.gov.au, and printed copies are available at the Shire Offices, Civic Drive, Greensborough. For Whittlesea residents they are available online at www.whittlesea.vic.gov.au, and printed copies are available upon request from sustainability@whittlesea.vic.gov.au or by calling 9217 2042.
- STEPS: free software designed to rate the sustainability of a new home or renovation project. STEPS is available online at www.morelandsteps.com.au. Assistance is available from Council's Sustainability Officer by calling 9433 3111 in Nillumbik or 9217 2042 in Whittlesea.

Our Climate

Melbourne lies in Climate Zone 6 – Mild Temperate, as classified by the Australian Building Codes Board.

The main characteristics of this classification are:

- large diurnal temperature ranges (cool nights and hotter days)
- four distinct seasons, with summer and winter extremes being outside of human comfort levels and spring and autumn being ideal temperatures

- cool winters with low humidity
- hot to very hot summers with moderate humidity.

Key design approaches in responding to a mild temperate climate include:

- passive solar design
- insulated thermal mass
- use of north-facing windows
- minimising east- and west-facing windows
- using cross ventilation and night purging in summer
- sealing draughts and placing airlocks in entrances
- bulk-insulating walls, ceilings and exposed floors to keep heat in during winter, coupled with reflective insulation to keep heat out in summer
- protecting skylights and windows with external blinds or adjustable shading in summer
- zoning spaces to reduce heating and cooling requirements.

Energy Ratings Explained

Since 2011 in Victoria, new homes and some extensions require a minimum six star energy rating.

The energy rating is a calculation of how much energy would be required to heat and cool the house for a year given local climatic conditions and the construction of the house. A one star house would require very large amounts of heating and cooling, whilst a ten star house at the other end of the scale, would require little or no mechanical heating or cooling. A six star rating is somewhere in the middle. Six stars are the minimum legal requirement, but there are many opportunities to achieve a better rating for little or no additional cost. A higher rating will reduce ongoing energy costs for the life of the building.

Whilst the requirement for a six star energy rating is helping to improve the thermal performance of new homes, it is only one aspect of sustainable buildings and lifestyles and does not apply to older homes.

Some of the factors considered in an energy rating are:

- type of floor and floor coverings
- type of walls and roofing material
- colour of walls and roof
- type and R-value of insulation to roof, ceiling, walls and floor
- types of window glass and frames and the direction they face
- any permanent shading structures
- sealing of openings such as exhaust fans, down lights, doors and windows.

Some of the factors not considered in an energy rating are:

- the embodied energy of building materials
- type and efficiency of heating and cooling
- number and efficiency of household appliances such as dishwasher, washing machine, dryer, entertainment equipment and computer
- type and efficiency of the hot water system
- water efficiency of tapware and appliances
- stormwater management
- type, quality and chemical composition of cabinetry, furnishings and paint
- any renewable energy system installed.

The tips included in this guide will help to achieve better energy ratings as well as addressing many other sustainability issues.

Energy ratings must be performed by an accredited Thermal Performance Assessor using approved software. You may engage your own assessor or ask your designer or draughtsperson to organise the report. You may also request that the assessor make recommendations to improve the energy rating. Different options can be modelled in the software prior to printing the final report. The cost of the report will vary depending upon the complexity of your design and the skill and experience of the assessor.

Accredited Thermal Performance Assessors can be found at:

- Building Designers' Association of Victoria www.bdav.org.au
- Association of Building Sustainability Assessors www.absa.net.au

Further information about energy ratings can be found at www.nathers.gov.au

1. Building Design and Site Considerations

Passive Solar Design

Passive solar design refers to a number of elements of a home that are designed to take advantage of the path of the sun and prevailing winds throughout the year.

Good passive solar design can result in a significant improvement to the energy rating of a house with little or no additional cost involved. It also contributes to lower ongoing running costs by reducing the need for mechanical heating and cooling with a combination of elements including building orientation, the amount and type of glass, thermal mass and insulation. These elements are explained in more detail below.

Orientation

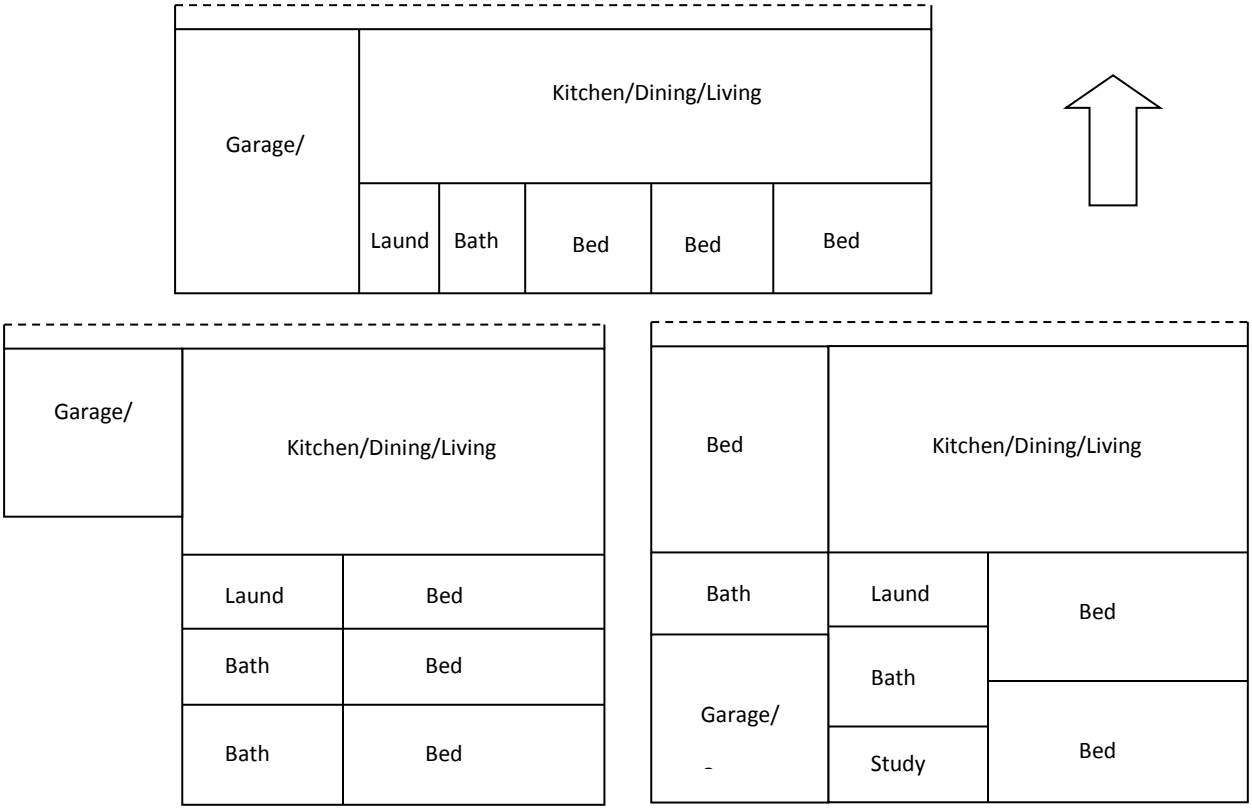
A well-oriented home will be more comfortable to live in and require less mechanical heating and cooling.

Ideally, a house should be designed to allow access to winter sun. Living areas are best located on the north side of a house, with utility areas (bathroom and laundry) and bedrooms located on the south side. A garage or carport on the west side of a house helps to exclude the hottest of summer sun from the house.

It is possible to design eaves on the north side that allow a large amount of winter sun through windows yet exclude all hot summer sun, reducing the need for both heating and cooling. In Melbourne, ranch-style homes with wide verandahs around the whole house require more artificial light and heating because of the angles of the sun: they are best left for the northern-most parts of Australia where the hot sun is directly overhead all year round.

Windows should be predominantly north-facing and sized at a minimum of 16 per cent of the floor area of the room. More detailed information is included in the Windows and Glazing section of this chapter.

Some suggested floor plans:



Avoid being overshadowed by trees or neighbouring buildings, especially on the north side. Solar access for solar electricity, solar hot water and clothes drying should be factored into siting your home on the property. If it is impossible to gain solar access through north windows, roof windows may be appropriate.

What can you do with an existing house?

Think outside the box:

1. Can you change how you use rooms in your home? If you have north-facing bedrooms, could you change them into living areas and move your bedrooms to the south side of the house?
2. Do your windows allow the cool breezes through on summer evenings? You may consider changing the type of window you have to maximise the cool breezes in summer.
3. Make your home flexible so that you can separate rooms that need to be heated or cooled. Consider where you could place a wall or door so that you don't need to heat or cool the whole house if you are only using part of it.

Windows and Glazing

Windows are windows, right? Not these days! There are two important aspects to your windows.

Position

The position of windows in relation to the sun has a significant impact on the need for mechanical heating and cooling. Larger windows are best located on the north side of a house with a fixed eave. In winter, sun should be allowed to come into the rooms to reduce heating requirements. In summer, the eave should be just deep enough to prevent the sun from hitting the glass, reducing the need for cooling.

East- and west-facing windows should be strategically placed to allow only winter sun access and provided with adjustable vertical shading to exclude the hot summer sun. South-facing windows should be small and be openable to allow for summer evening breezes that will help cool the house.

Type

The types of windows and their frames should be considered. Windows are usually the weak link in the construction of a thermally efficient building. Standard single glazing offers little resistance to heat flow, so the windows in most homes are a windscreen at best. Double glazing, secondary glazing, coatings and some window films are effective at reducing the amount of heat lost or gained through windows.

There are two factors used to work out how well a particular product will work in different circumstances:

- U-value. This figure relates to the rate at which heat will travel through the window. Generally, the lower the U-value the better the resistance to heat flow.
- Solar Heat Gain Coefficient (SHGC). This figure relates to the amount of heat that will travel through the window. Generally windows on the south, east and west aspects of a house benefit from a window that has a low SHGC so that the heat entering from summer sun is reduced. North-facing windows that receive good winter sun should have a higher SHGC to allow the heat into the house. External shading on these windows prevents the summer sun from entering the house. Low-e coatings are a product applied during the manufacturing process that reduce the SHGC and prevent heat loss during winter.

Simple aluminium frames should be avoided as they conduct large amounts of heat. Timber, u-PVC, thermally broken aluminium and composite frames work best because they don't conduct heat well. "Thermally broken" aluminium frames provide a gap filled with a non-conductive material between the interior and exterior layers of the frame to prevent heat being conducted. Timber generally has the lowest environmental impact of all framing materials. U-PVC frames are a petroleum product, and aluminium requires a very large amount of energy in the manufacturing process. These considerations also need to be balanced against any bushfire risk and cost.

Many windows and films are now rated for their energy efficiency through the Windows Energy Rating Scheme (WERS) and the information can be found at www.wers.net.au.

What can you do with an existing house?

Think outside the box:

1. Do you have north-facing windows? Moving windows is usually not as difficult as it seems. Consider whether you could add a north-facing window to your living area and reduce or remove east-or west-facing windows.
2. Retrofit your timber window frames with new double glazed units. You can do this yourself or hire an expert. This is a much cheaper option than replacing the entire window.
3. Secondary glazing can be applied to some windows. Typically this consists of a sheet of clear acrylic placed inside the existing pane of glass, using a spacer to create an air gap and it is held in place by strip magnets.
4. Window films can be applied to existing glazing. These products are useful where access, height or heritage issues do not allow for double glazing or external shade devices. Ensure

Thermal Mass

Thermal mass is the term used to describe the capacity of building materials to absorb and store heat. It is an essential part of a thermally efficient home in Melbourne as it plays an important role in both summer and winter. Thermal mass works by absorbing heat during the day, storing it and releasing it at a later time, usually over a 6 to10 hour period. The process helps to stabilise the internal temperature of a house and is usually incorporated into floors or walls.

In winter, this process helps to reduce heating costs by absorbing heat during the day and releasing it overnight. It works with any heat source, but the best way to use thermal mass is to position it so it is heated by direct sunlight in winter, which helps heat the house for free. It is important to insulate thermal mass so the heat is not lost outside the building, for instance, through the edge of a concrete floor slab. In Melbourne, it is also desirable to insulate under the concrete slab to prevent heat loss to the ground underneath.

In summer, thermal mass absorbs heat during the hottest parts of the day, drawing heat out of the surrounding air. The heat is released overnight as outside temperatures drop, and so the thermal mass is ready to perform again the next morning.

What can you do with an existing house?

Think outside the box:

1. Create a floor surface of tiles, bricks or polished concrete where there is access to direct sunlight.

Trombe Walls

A Trombe wall is a thick masonry wall that sits inside a sealed north-facing pane of glass. There are vents located in the top and bottom of the wall.
The sun warms the wall through the glass during the day. Some of the heat then moves through the wall and is released into the room over many hours. Heated air also rises within the cavity and moves through the vents in the top of the wall and into the room. Cooler air from inside is drawn through the vents at the bottom of the wall to be heated. One-way flaps installed over the vents prevent heat moving in the opposite direction at night.

A suitably sized eave should be designed to stop summer sun hitting the glass and allowing unwanted heat into the house.

Phase Change Materials

Phase change materials are substances that melt and solidify at certain temperatures. These substances store heat and release it at desired times to stabilise the internal temperature of a home. They work in a similar way to thermal mass but are generally much lighter weight products.
Phase change materials can be installed into wall and roof cavities and are especially good for flat roof structures. Care should be taken to use an appropriate material, such as sustainably harvested palm oil, to ensure the safety of building occupants and the responsible use of resources.

Insulation

Insulation comes in many different forms, but its primary purpose is to resist heat flow. In winter, we want to keep the heat inside and, in summer, to keep it outside. The resistance to heat flow is labelled as the R-value. In Melbourne, we have large temperature fluctuations, so we use higher R-values than somewhere with a lower temperature range, such as Brisbane. There are optimal levels of insulation, which means that anything greater than that level will give only minor performance improvements for the extra cost.

Minimum R-values required by the Construction Code for Melbourne's climate:

Location	Minimum required (with a light coloured roof)[2]
Ceiling	R4.1
Walls	R2.4
Under Floor	R2.25

Note that these R values include building materials used in the construction of the roof, ceiling, walls and floor to give a total R value.

There are three basic types of insulation:

(i) Bulk insulation. As the name suggests this type of insulation is bulky and can be used in ceilings, walls and under floors. Generally, the thicker the product the better it performs, but some materials perform better than others. All bulk insulation products should be treated with fire-resistant chemicals and tested to Australian Standards. Bulk insulation comes in various forms:

a. Glasswool, made from spun glass or silica. This type of material should not be used without eye, skin and respiratory protection as it contains small glass particles that can cause itching, as well as eye and lung damage. Some products contain some recycled material.
b. Rockwool, made from spun volcanic rock. Good for sound insulation. This type of material should not be used without eye, skin and respiratory protection as it contains small glass particles that can cause itching, as well as eye and lung damage.
c. Earthwool, a glasswool that contains a proprietary binder to reduce the health issues associated with glass fibres.
d. Polyester, a petroleum-based product. No known health issues. Some products contain some recycled material.
e. Wool, straight off the sheep's back and treated with anti-vermin and fire-retardant products. A renewable resource.
f. Expanded polystyrene board, a petroleum-based product. Rigid board, resistant to moisture. Can be used in small ceiling cavities, on external walls which can then be rendered, or on internal walls attached to plasterboard. These boards can also come with foil attached for use in the ceiling.
g. Extruded polystyrene board, a petroleum-based product. Semi-rigid board. Can be used in small ceiling cavities and on external walls which can then be rendered.

Bulk insulation works by trapping heat in the small air pockets throughout the product. If bulk insulation is compressed it will not work effectively, so a batt should fit snugly into the allocated space, but not be squashed in.

(ii) Reflective insulation. This type of insulation helps to reflect heat. In Melbourne we use most of our energy for heating, so it is installed with the shiny side facing into the house to reflect heat back inside. However, this type of product installed in the roof cavity also helps to reflect heat away from the roof in summer. Reflective foil insulation comes in various forms:

a. Foil Laminate, using glasswool reinforcement on one side. This is a thin layer, usually with only one shiny side (known as anti-glare foil).
b. Multi-cell Foil Batts, two or three layers of foil with layers of plastic containing air bubbles in between them. Slightly more effective than foil laminate.

(iii) Combination insulation. This is also known as builder's blanket or anti-con (anti-condensation) blanket. It is generally used under a tin roof to prevent the formation of condensation on the underside of the tin. Without the blanket, condensation can drip on roof timbers and ceiling insulation causing long term structural problems. It can also be used to line tiled roofs which can also reduce the amount of breeze that travels through the roof cavity.

[2] National Construction Code 2013, Australian Building Codes Board.

What can you do with an existing house?

Think outside the box:

1. New types of insulation in rigid board form can have a higher R-value for the depth than traditional batts. As boards range in depth from 10mm upwards, there are boards available that will fit into flat or raked rooflines.
2. Insulation can be blown into the wall cavities of some existing homes. Wool or recycled polystyrene materials are usually used for retrofitting, although batts can also be used if weatherboards or plaster are able to be removed.
3. Elevated houses with timber floors achieve significant gains in comfort levels by insulating

Insulation Source Guide

Application	Product	Sustainable Features	Source
Insulation – reflective	Air Cell	A range of products for different applications and ideal for limited spaces. Suitable for roofs, walls and under floors. Manufactured without toxic adhesives. Durable.	Kingspan 1300 247 235 www.kingspaninsulation.com.au
Insulation – bulk	Wool and wool blend batts	Natural renewable fibre, treated with fire retardant.	Gerster Insulation Bayswater 1800 641 101 www.gersterinsulation.com.au Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au
	Polyester batts	Made from 80% recycled PET bottles, non-toxic and 100% recyclable.	Masters South Morang www.masters.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au
	Kooltherm K8 Boards	Suitable for flat or raked ceilings and walls.	Kingspan 1300 247 235 www.kingspaninsulation.com.au
Insulation – retrofitting walls	Rockwool	Molten rock can be blown in from inside through holes in plasterboard or from outside by removing weatherboards. Can be blown down into brick cavity walls by removing roof tiles.	Just Rite 1300 932 202 www.justrite.com.au

2. Indoor Environment Quality

Recent research strongly suggests that the quality of our indoor environment has a direct effect on our health and wellbeing. Indoor environment quality is influenced by access to natural light, ventilation and external views, thermal comfort, exposure to harmful chemicals and noise levels.

Natural Light

Good access to natural light assists with regulating the body's clock as well as reducing the need to turn lights on. In combination with external views, natural light gives us a sense of connection to the outside and a perspective of time and place.

Thermal Comfort

Thermal comfort relates to the temperature and humidity levels at which the body is comfortable. This is slightly different for everyone, but it is important that individuals are able to control the building to suit them. A sustainably built home will rely less on mechanical heating and cooling to remain comfortable.

In recent years there has been a considerable focus on sealing up homes to improve energy efficiency and thermal comfort. However, when this is done without considering ventilation it can lead to some problems with indoor air quality, including mould growth and increased exposure to harmful chemicals. For people with weakened immune systems this can lead to poor health, including respiratory and skin conditions.

Ventilation

Ventilation solutions should allow fresh air into a building without compromising thermal comfort. In our relatively mild climate, this is often about having opening windows in the right position to allow cross breezes to cool the house. In cooler months, opening a window to get some fresh air simply allows all the heat to escape the house, which then costs more to re-heat.

A relatively simple solution is a heat recovery and ventilation (HRV) system. Common in Europe and North America where the climate is harsher than Melbourne, these systems use a heat exchanger to transfer fresh air from outside to inside and stale air from inside to outside, retaining up to 90 per cent of the heat inside the house. They are cheap to run and help to retain heat inside during winter and outside during summer. These units also assist in removing moisture and odours from the house, keeping condensation from forming, mould from growing and reducing exposure to harmful chemicals.

Material Selection

Material selection also forms an important role in improving indoor environmental quality. Certain chemicals known as volatile organic compounds (VOCs) are contained in many modern building materials and decorating products. Items such as paint, fabrics, furniture, cabinetry and insulation products can all contain VOCs at harmful levels. The more natural form a product is in, the less likely it is to contain VOCs. There are also many new alternative finishes available that contain few or no VOCs.

Noise Levels

Minimise the impact of external noise by placing windows on walls away from the road or noisy neighbourhood activities and/or using double glazing or landscaping elements to stop noise penetration. Using sound-insulating batts in internal walls will minimise noise moving between rooms.

What can you do with an existing house?

Think outside the box:

Indoor Environment Source Guide

Application	Product	Sustainable Features	Source
Air quality and heat retention	Heat recovery and ventilation	Recovers up to 90% of the heat from inside while providing fresh air. Improves indoor air quality, prevents growth of moulds and mildews and removes odours.	Air2Energy Woodend 03 5427 3175 www.air2energy.com.au Atlantics Australasia Hawthorn 03 9852 9599 www.atlantics.com.au
Safe disposal of chemicals and items containing toxic elements	Mobile and permanent detox sites	Remove toxic fumes and odours from inside the home.	Detox Your Home 1300 363 744 www.sustainability.vic.gov.au

3. Construction Materials

Most people build a house from all new materials, so it is not surprising that the construction industry accounts for around 40 per cent of raw materials used worldwide. A large number of these materials are either not sustainably produced or are a finite resource. In addition, many new building materials incorporate harmful chemicals that can impact human health and/or air quality.

There are a number of ways you can reduce the impact of your new house or renovation:

- use fully recycled materials, such as used timber, bricks, windows and decorative items, especially if you are demolishing an existing house
- use materials that have a long lifespan so they won't need to be replaced frequently
- choose a style that is classic so it won't need updating when the fashion changes
- use sustainably produced materials, such as FSC-certified plantation timber frames or insulation made from wool
- use materials that are locally produced to reduce transport emissions
- use materials containing some recycled content, such as insulation batts made from old PET or glass bottles, a concrete slab with fly ash, slag or silica fume and recycled aggregate
- consider the environmental and social impacts of the manufacturing process of any materials you choose
- consider whether your new house or parts of it can be pre-fabricated off-site to reduce waste and travel miles
- consider a building technique that uses natural, local, renewable and/or re-used materials, such as mudbrick, rammed earth, straw bale, earthship or timber.

Mudbrick

Mudbricks have been used in Australia for over 120 years and for thousands of years in other parts of the world. They are a low impact, cost-effective, sustainable building material and are made by mixing earth with water, placing the mixture into moulds and drying the bricks in the air.

Straw or other fibres that are strong in tension are often added to the bricks to help add strength and improve the thermal rating. Mudbricks are joined with a mud mortar and can be used in a large variety of applications including homes and garden walls.

Mudbricks have a high thermal mass, so they are a good way to stabilise the internal temperature of a home. The traditional mudbrick that Nillumbik is renowned for is 250mm wide and is laid as a single skin internally or externally. The thermal performance of a mudbrick home can be further improved by laying a double layer of bricks with a cavity that can be filled with insulation, or lining a single skin of mud bricks with an insulating product.

Mudbrick houses provide:

- very low environmental impact construction materials
- non-toxic materials
- good fire resistance
- excellent thermal mass
- long lifespan.

Earth Brick

Earth bricks are manufactured by compressing a mixture of water, earth and fine aggregate into a large block shape by machine. The blocks are uniform in size, shape and thermal properties. If local materials are used, the bricks are very low in embodied energy. Earth bricks are joined with a mud mortar, are quick to manufacture and erect and can be used in a large variety of applications. Earth bricks can be rendered or left in their natural state once laid.

Earth brick houses provide:

- low environmental impact construction materials
- relatively fast construction
- non-toxic materials
- good fire resistance

- excellent thermal mass
- long lifespan.

Rammed Earth

Rammed earth walls are made by mixing a combination of clay, sand, aggregate and water and compressing the material into formwork on site. It is a technique that has been used for centuries worldwide and creates a strong and resilient building with excellent thermal properties. In Australia, a small amount of cement is often added to the mix as a stabiliser then coated with a permeable sealer, ensuring the walls are protected from the weather. Formwork can be re-used many times, although it is sometimes cut to the individual specifications of the building. Rammed earth has a high thermal mass and insulation can be added to improve the thermal properties of the home.

Rammed earth houses provide:

- low environmental impact construction materials if un-stabilised
- non-toxic materials
- good fire resistance
- excellent thermal mass
- long lifespan.

Straw Bale

Straw has been used as a building material for centuries. Straw is derived from the stalk of grasses like wheat and rice, which are high in tensile strength and have the grain head removed. Straw bales are a renewable building material with low toxicity.

The structural capacity of straw bale construction is surprisingly good. In the load-bearing straw bale method, walls of up to three storeys have been constructed. Straw bale construction is more commonly ‘in-fill’ using straw bales within a frame constructed of timber or steel.

Straw bales themselves have very low thermal mass, however, the walls are usually built on a concrete slab floor and with the use of earthen renders a thick render skin of up to 75mm can be achieved, providing significant thermal mass.

A main feature of straw bales is their excellent insulation – both thermal and sound, which is the most cost-effective available.

Straw bale houses provide:

- renewable resource
- excellent thermal and sound insulation
- vermin resistance
- non-toxic materials
- a relatively easy medium to work with.

Weatherboard (radially sawn)

If you are considering building or extending a weatherboard home it is worth thinking about radially sawn timber as an alternative to conventionally sawn weatherboards. To further reduce its environmental impact the timber should be sourced from a FSC-certified plantation.

Optimal use of logs is achieved using this type of cut, which vastly reduces wastage in comparison to traditional milling. The cutting pattern results in the sawn timber having a wedge shape, the sapwood is on the wider edge and the pith or corewood is at the point.

As logs are not perfectly round and not perfectly straight, each radially sawn board reflects the longitudinal shape of the log. These details make interesting architectural use of the timber, coupled with a sustainable use of the felled trees. Radially sawn timber is also less prone to warping or cupping than conventionally sawn timber.

Weatherboard houses should contain large amounts of insulation to roof, walls and ceilings and contain some internal thermal mass to improve the thermal properties of the building.

Radially sawn weatherboard houses provide:

- a medium level of embodied energy
- relatively low environmental impact as they use a renewable resource
- non-toxic materials.

Autoclaved Aerated Concrete (AAC)

AAC is a lightweight concrete product that provides an innovative alternative to concrete blocks and clay bricks. AAC is produced by adding a foaming agent to concrete in a mould before cutting it into blocks or panels and then autoclaving.

AAC has moderate embodied energy content and contains good thermal and sound insulation properties, due to the number of air pockets within the blocks. AAC also has moderate thermal mass properties.

AAC blocks are lightweight, about one-fifth of the weight of concrete blocks, relatively easy to work with and can be cut and sculpted with hand tools. The manufacturer suggests laying the blocks in a thin-bed mortar, although conventional thick-bed mortar can also be used.

AAC blocks have a long life and do not produce toxic gases after installation. AAC has a high fire-resistance rating as it does not burn.

AAC houses provide:

- good thermal and sound insulation
- good fire resistance
- vermin resistance
- a relatively easy and fast medium to work with.

Concrete

Concrete slabs or walls provide great thermal mass. However, the manufacturing process uses large quantities of energy and raw materials. To reduce the environmental impact of concrete substances known as supplementary cementitious materials and recycled aggregate can be added to the mix.

Supplementary cementitious materials include fly ash (a by-product from burning black coal), slag (a by-product of smelting iron ore) and silica fume (a by-product from refining silica).

Recycled materials such as glass, concrete, masonry, sand, tyres and asphalt can also be used in the blend to reduce the use of new materials.

What can you do with an existing house?

Think outside the box:

1. Retrofit insulation. It is the most cost-effective way to make your home more thermally efficient and comfortable.
2. Insulated board, such as Kooltherm K5, can be applied directly to exterior masonry walls and can be rendered and painted

Construction Material Source Guide

Application	Product	Sustainable Features	Source
Concrete slab, footings and driveway – blended cement	Blended cement Ecoblend (GECA) Envirocrete E-crete	Supplementary cementitious materials are waste products from other manufacturing processes added to cement to reduce the use of new resources and embodied energy. They can also improve the strength and durability of the concrete. Most sites also use recycled water for washdowns.	Cement Australia Port Melbourne 1300 236 368 www.cemaust.com.au Independent Cement and Lime Port Melbourne 03 9676 0000 www.independentcement.com.au Boral South Melbourne 133 006 www.boral.com.au Aurora Construction Materials Epping 03 9408 0666 www.auroracm.com.au
Aggregate – recycled crushed concrete	Ecobase Recycled common aggregates	Reduces raw material use by recycling old concrete. Comes in various sizes. This product can have varying strength.	Alex Fraser Epping 136 135 www.alexfraser.com.au Boral South Melbourne 133 006 www.boral.com.au
Reinforcement – recycled mesh and bar	Reinforcing bar and mesh Ecoreo Mesh and bar	Australian product with 90% recycled content. Australian product with 66-89% recycled content. New Zealand product with 100% recycled content.	Smorgon ARC Sunshine 131 557 www.arcreo.com.au One Steel Reinforcing Ringwood 03 9879 5360 www.reinforcing.com.au Vicmesh Dandenong 03 8795 6666 www.vicmesh.com.au
Formwork	Formply	Lower impact on biodiversity by using local plantation timbers.	Gunnersens Derrimut 9647 9930 www.gunnersens.com.au Bunnings www.bunnings.com.au
Concrete slab – insulated slab system	Waffle Pod Unipod	Air pockets created by polystyrene blocks create an insulating layer between the concrete and the ground to reduce heat loss. Less concrete required for slab pour.	Waffle Pod Sunnybank, QLD 1300 923 353 www.wafflepod.com.au Unipod Derrimut 9394 1117

		Recycling of waste material from building sites.	www.unipod.com.au
	Cupolex	Air pockets created by recyclable polypropylene structure create an insulating layer between the concrete and the ground to reduce heat loss. Less concrete required for slab pour.	Australian Urethane and Styrene West Footscray 03 9687 7500 www.aus-styrene.com.au
Stumps	Concrete and steel	Concrete or steel stumps are lighter and stronger than timber and are resistant to termites. Fully recyclable.	Home Timber and Hardware Eltham 03 9439 5533 www.elthamhome.com.au Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Tek Stumps Mt Evelyn 03 9735 5706 www.tekstump.com.au
Floor joists and bearers	Composite beam	I-shaped beam reduces resource use.	Tecbeam Hallam 03 9792 2888 www.tecbeam.com.au
	Prefabricated beam	Plantation timber eliminates the use of old growth timber. Reduces waste.	Mitek Lyndhurst 03 9730 5555 www.mitek.com.au
	Flooring System	Lightweight steel joists and composite flooring system	Speedfloor Thomastown 9462 6010 www.speedfloor.com.au
	Recycled timber	Eliminates use of new resources.	Add the Beauty of Timber Kinglake 0438 792 164 www.botimber.com.au Australian Recycled Timber Campbellfield 03 9359 0300 www.australianrecycledtimber.com.au
Underfloor lining	EcoCore Multiply	Plantation timber, low VOC glue.	Global Ventures Australia Glenorie, NSW

			02 9457 7171 www.ecocore.com.au
	Plyfloor		Carter Holt Harvey 132 321 www.chhwoodproducts.com.au
	R-flor	Laminated with foil on the underside of the board to improve the R-value of suspended timber floors. Made from plantation pine.	Carter Holt Harvey 132 321 www.chhwoodproducts.com.au
Steel frames	Zincalume	High embodied energy but durable and termite-resistant. Includes 20% recycled content and is 100% recyclable.	Bluescope Steel 1800 022 999 www.bluescopesteel.com.au Stratco Australia Epping 03 9409 9200 www.stratco.com.au
Thermal spacers for steel frames	Deckmate	Reduces the thermal conductivity of steel frames, but made from Styrofoam.	Dynamic Composite Technologies Sunshine West 1800 051 100 www.dctech.com.au
	Polyair spacers	Polyethylene foam.	Polyair Ingleburn, NSW 1300 767 776 www.reflectiveinsulation.com.au
Timber frames	Studs, noggins, plates, LVL beams and roof trusses	Lower impact on biodiversity by using FSC-certified plantation timbers.	Home Timber and Hardware Eltham 03 9439 5533 www.elthamhome.com.au Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au A and A Timber Eltham 03 9439 3633 www.aatimber.com.au Tilling Kilsyth 03 9723 0222 www.tilling.com.au
	Hybeam LVL beam	Reduced use of resources as this beam is I-shaped and engineered using recycled or reconstituted wood.	Carter Holt Harvey 132 321 www.chhwoodproducts.com.au
	Roof trusses	Recycled.	Add the Beauty of Timber Kinglake

			0438 792 164 www.botimber.com.au
Bracing	Plywood	Uses FSC-certified plantation timber.	Gunnersens Derrimut 03 9647 9930 www.gunnersens.com.au
Walls – brick or concrete block	AAC or Hebel	Autoclaved Aerated Concrete (AAC) contains lower embodied energy than bricks and concrete is lightweight and easy to use. It has relatively good thermal and acoustic insulation and is non-combustible.	C & M Brick Campbellfield 03 9305 0900 www.cmbrick.com.au C & S Lightweight Moorabbin 03 9555 3890 www.candslightweight.com.au Paveworld Buildcor Lightweight Systems Greensborough 03 9434 6744 www.paveworld.com.au
Walls – concrete alternatives	Timbercrete	The main ingredient is recycled timber waste (cellulose), and it contains low embodied energy as it is air-dried. Timbercrete provides very good thermal insulation, is non-combustible and is very durable.	Paveworld Greensborough 03 9434 6744 www.paveworld.com.au
Walls - recycled brick	Blues and reds, creams, greys and bluestone	100% recycled.	Beaver Bricks Kilsyth 03 9728 8344 www.beaverbricks.com.au Melbourne Brick Bayswater 03 9720 6713 www.melbournebrick.com.au Paddy's Bricks West Melbourne 03 9687 238 www.paddysbricks.com.au
Walls-weatherboard	Radially sawn timber	Efficient use of whole log.	Radial Timber Sales Dandenong 03 9768 2100 www.radialtimbers.com.au Bowerbird Timber Wesburn 03 5966 5966 www.bowerbirdtimber.com
Walls – weatherboard alternatives	Shadowclad ply cladding	Lower impact on biodiversity by using FSC-certified plantation timbers.	Carter Holt Harvey 132 321 www.chhwoodproducts.com.au

Walls – alternatives	Kooltherm K5 insulated board	Insulation attached with R-values up to 4.0. Requires rendering.	Archiclad (accredited installers) Thomastown 1300 272 442 www.kingspaninsulation.com.au
	Mudbrick	A natural resource with very low embodied energy. Can be made on site.	Nillumbik Mudbrick Association www.mudbrick.org.au
	Compressed Earth Brick	A natural resource with low embodied energy. Can be made from on-site materials.	AMCER Earth Building Nutfield 03 9714 8688 www.amcer.com.au
	Rammed Earth	A natural resource with low embodied energy. Can be made from on-site materials.	Earth Builders Association of Australia www.ebaa.asn.au
Internal walls	Durra Panel	Durra Panel has excellent acoustic and thermal insulating properties, proven durability, high impact and fire resistance. Made from wheat and/or rice straw fibres, contains no formaldehyde or additional chemical binders.	Ortech Industries Braeside 03 9558 7766 www.ortech.com.au
	LaFarge Plasterboard	The lining uses 100% post-consumer recycled paper and the production process has low water use. 100% recyclable. Low VOCs.	Plaster Mart Thomastown 1300 666 055 www.knaufplasterboard.com.au
	Kooltherm K17 Plasterboard	The plasterboard is insulated to reduce heat movement through walls and ceilings. R-values range from 2.1 to 4.0.	Masterwall (accredited installers) Moorabbin 03 9553 3211 www.kingspaninsulation.com.au
Roofing	Recycled tiles	100% recycled product.	Melbourne Roof Tile Trading Preston 03 9484 1277 www.melbourneroofttiletrading.com.au
	Concrete tiles	Lower embodied energy than baked tiles, but can contain toxic sealants. Contains 80% slag.	Alice Roof Tiles Bacchus Marsh 03 5367 6212 www.barro.com.au

	Steel	Lower embodied energy and fewer raw materials required than baked tile. Victorian manufactured, 20% recycled content, 100% recyclable.	Colorbond 1800 022 999 www.colorbond.com
Complete Roofing Systems	Ritek Custom and Ecotek Roof Panels	Combined Colorbond with polystyrene insulation layer up to R6.1. Reduced requirements for roof structure materials.	Ritek Building Solutions Cooroy, Queensland 1300 929 782 www.ritek.net.au
Roof Ventilation	Draft Stoppa TopHat	Covers exhaust fan motors inside the ceiling to reduce hot air from flowing into the roof or outside. Sealed exhaust fan unit to reduce hot air from flowing into the roof or outside.	Home Timber and Hardware Eltham 03 9439 5533 www.elthamhome.com.au Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Bunnings www.bunnings.com.au
Plumbing	Greenpipe - drainage and stormwater pipes Roof garden drainage, pipes, natural textiles for weed and erosion control Neta, Pope or Garden Mate drip hose Nylex Bio-hose	100% recycled HDPE from post-consumer waste. Recycled HDPE, innovative garden ideas. 60% recycled rubber. Recycled plant material content.	Recycled Plastic Technology Moama, NSW 03 5480 7060 www.thegreenpipe.com.au Geofabrics Braeside 03 8586 9111 www.geofabrics.com.au Widely available Widely available
Termite Protection	Termimesh	Mesh barrier that must be installed around a concrete slab and penetrations during construction. Chemical-free.	Termi Home and Commercial Thomastown 03 9464 1733 www.termimesh.com.au

	Blockaid	Brush-on or gun-in physical termite barrier. It is made from rubber-modified bitumen and is water-based and non- toxic. Good for awkward joints, step downs, narrow cavities and retaining walls.	Granitgard Oxenford, QLD 1800 032 549 www.granitgard.com.au
	Homeguard	Polymer material impregnated with a chemical that will repel and kill termites. Chemical will not leach from product.	FMC Direct Cannon Hill, QLD 0417 648 064 www.homeguardptm.com.au Local installers: Specialist Termite Protection Research 03 9437 2700 www.termitespecialist.com.au Termite Preventions R Us Eltham 03 9439 1773

4. Managing Construction Waste

As much as 40 per cent of Australia's landfill is generated from demolition and construction waste. By reducing landfill waste during your project you can reduce the cost of remediating landfill at the end of its life, protect the environment against contamination from waste products, reduce the need to use new resources and possibly make some money from selling unused or recovered items. Steel, aluminium, concrete, timber, glass, bricks, plasterboard, roof tiles and plastics can all be either recycled or reclaimed. At least 70 per cent of site waste should be able to be diverted from landfill.

If minimising waste is an important issue for you, let your designer and builder know as early as possible so they can be involved in helping to develop a waste plan and make decisions about re-using or recycling materials up front. A contract clause incorporating minimum recycling levels can help. Other ways to make the process easier are:

- ensure space is available for placing skips to hold different materials for recycling
- ensure all contractors on site are aware of the waste management requirements
- ensure loose rubbish is picked up off the ground regularly so it is not washed into drains and waterways
- consider using your labour to clean any materials you will be re-using in your new home
- approach a salvage company or hold a demolition sale if you are demolishing an old house.

To see a list of recycling companies, go to www.recyclingnearyou.com.au and fill in the search details.

Construction Waste Source Guide

Application	Product	Sustainable Features	Source
Demolition and Recycled Materials	Demolition and construction	By diverting a demolished house from landfill, greenhouse gas emissions are reduced and the materials can be cleaned up and re-used in a new home or renovation.	Pace Demolition and Salvage Bulleen 03 9850 9226 www.pacedemolitions.com.au eco bricks group Clayton 1300 326 274 www.ecobricks.com.au Hughes Online Huntingdale 03 9544 3263 www.hughesonline.com.au Steptoes Collingwood 03 9419 9366 http:///www.steptoes.com.au A & R Secondhand Dealers Campbellfield 03 9357 2900 www.secondhandstuff.com.au The Junk Company Melbourne 03 9328 8121 www.thejunkcompany.com.au
	Buy and sell materials		Salvage Bazaar www.salvagebazaar.com.au Build Bits www.buildbits.com.au

5. Fixtures and Fittings

General Lighting

In recent years there have been significant advances in lighting technology. Most of us have replaced our old incandescent lights with compact fluorescent lamps. Some are now venturing into the latest technology of Light Emitting Diodes (LEDs).

LEDs have several advantages over other types of lamps:

- a lower wattage is required to generate the same amount of light
- a lifespan 10 to 30 times greater than that of other technologies
- they contain no mercury
- full colour range
- very small compared to other types of lamps.

LEDs also run at much lower temperatures than other types of lamps, so in combination with their small size this makes them extremely flexible in their application. We are starting to see new purpose-built LED light fittings emerge for residential and commercial applications which will become more common as time goes on.

Recessed Down Lights

With changes to the building requirements, it is almost impossible to use halogen down lights in a new home or renovation. Halogen down lights are a problem for numerous reasons. Usually they are installed with a 50 Watt lamp. If there are four or more in a room, this can add up to significant energy consumption. Halogen lamps also generate a lot of heat. In combination with insulation or cramped spaces, this is a fire risk.

Down lights of any type present another larger problem in a house. To reduce the risk of fire, insulation is required to be laid with a gap of 100mm around each light fitting. This provides a clear area of approximately 452cm^2 for each light fitting. If you have 30 down lights in your home, this adds up to a staggering 13.6m^2 that is not covered by insulation, an area equivalent to a bedroom. These cleared areas provide an easy way for heat to leave or enter the room and have a significant effect on heating and cooling costs.

If you already have recessed down lights installed, consider the cost benefit of removing them or replacing the halogen lamps with LED lamps and installing a down light cover over each light inside the roof.

A cost comparison of halogen and LED down lights is shown below:

Type of Lamp	Lifespan (hrs)	Purchasing Cost	Lifetime Running Cost	Total Lifetime Cost	Lifetime Saving
Halogen	5000	$10	$1,800	$1,810	
LED	30000	$45	$600	$645	$1,165

Note that the same electricity cost per kWh was used for both types of lamp. As electricity prices increase and the cost of LED lamps comes down, the saving per light will increase.

> Test your LEDS – sometimes compatibility issues occur between the LED lamp and transformer, so purchase one lamp first and test it before buying replacements for all lights.

Taps and Showerheads

From late 2011 specified water products have been required to be registered under the Water Efficiency Labelling and Standards Scheme (WELS). These include taps, showerheads, flow restrictors, toilets, washing machines and dishwashers. For a product to be sold in Australia it must be registered and meet minimum standards. The scheme was introduced with the aim of reducing

domestic water consumption across Australia by 100,000 Megalitres per year. New homes must now have efficient taps, showerheads and toilets installed.

A WELS label showing the star rating and water use should be attached to any product in the scheme: for taps and showerheads the label will show the number of litres used per minute. When buying new products always compare the water use rather than just the number of stars. More information is available at www.waterrating.gov.au.

What can you do with an existing house?

Think outside the box:

1. If your taps are still in good condition, fit aerators to the faucet to slow the water flow rate. These are available from hardware stores for only a few dollars.
2. Change your showerhead over to a low flow version. Yarra Valley Water provides good quality showerheads that are available free at Nillumbik Shire Council, Civic Drive, Greensborough and through selected Australia Post outlets, including Epping Post Office, 571 High Street, Epping. To swap at Council, bring your water rates notice and the old showerhead to the Shire Office. To swap at Australia Post, download a letter from www.yvw.com.au and bring it along with your old showerhead to the post office.
3. Change over any remaining incandescent globes for LEDs. Even though they cost more to buy, they will save you a lot in running costs and replacement costs over their lifespan.

Fixtures and Fittings Source Guide

Application	Product	Sustainable Features	Source
Doors	Blokdor/Coritech	Uses laminated plantation pine in construction. Insulated with polystyrene. Some doors use FSC-certified timbers.	Corinthian Doors Campbellfield 03 9308 6977 www.corinthian.com.au
	Recycled doors	100% recycled.	Pace Demolition and Salvage Bulleen 03 9850 9226 www.pacedemolitions.com.au eco bricks group Clayton 1300 326 274 www.ecobricks.com.au Hughes Online Huntingdale 03 9544 3263 www.hughesonline.com.au Steptoes Collingwood 03 9419 9366 www.steptoes.com.au A & R Secondhand Dealers Campbellfield

			03 9357 2900 www.secondhandstuff.com.au Salvage Bazaar www.salvagebazaar.com.au Build Bits www.buildbits.com.au
Windows	Timber-framed	Double glazed, sealed and BAL rated, various styles suitable for the best ventilation outcomes.	Paarhammer Ballan 03 5368 1999 www.paarhammer.com.au
	uPVC-framed	Double glazed, sealed and BAL rated, various styles suitable for the best ventilation outcomes. Imported from Europe.	Australian Double Glazing Eltham 1300 656 448 www.australiandoubleglazing.com.au CozyHome Campbellfield 1300 657 510 www.cozyhome.com.au Weatherall Windows Campbellfield 1300 132 095 www.weatherallwindows.com.au
	DIY for timber frames	Double glazed, sealed and made in Melbourne.	DIY Double Glaze Lower Plenty 03 9431 2190 www.diydoubleglaze.com.au
	Windows Energy Rating Scheme		WERS www.wers.net.au
Lighting	LED lighting	Lower wattage means lower energy consumption and LED's do not contain mercury.	Beacon Lighting Heidelberg and Thomastown 03 9459 2211 or 03 9464 6800 www.beaconlighting.com.au Creative Lighting Eltham 03 9439 0570 www.creativelightingvic.com.au Enviroshop Northcote 1300 305 833 www.enviroshop.com.au Ikea Richmond 03 8416 5000 www.ikea.com.au
	Light Fittings	Recycled and reclaimed light fittings	Mulbury Fitzroy and Highett 03 9532 3424

			www.mulbury.com.au 2nd Hand Shop Montmorency 03 8364 0301 www.thesecondhandshop.com.au
Flooring	Recycled timber	100% recycled product.	Add the Beauty of Timber Kinglake 0438 792 164 www.botimber.com.au Just Old Flooring Thomastown 03 9460 1477 www.justoldflooring.com.au Bowerbird Timber Wesburn 03 5966 5966 www.bowerbirdtimber.com Australian Recycled Timber Co Campbellfield 03 9359 0300 www.australianrecycledtimber.com.au
	New timber	Plantation timbers, FSC certified reducing the impact on biodiversity.	Home Timber and Hardware Eltham 03 9439 5533 www.elthamhome.com.au Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au A and A Timber Wholesalers Eltham 03 9439 3233 www.aatimber.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Australian Recycled Timber Co Campbellfield 03 9359 0300 www.australianrecycledtimber.com.au
	Bamboo	Fast growing, plantation bamboo that is hard wearing. Imported from Asia.	Bamboo Floors Melbourne Preston 03 9078 6690 www.bamboofloorsmelbourne.cm.au Style Plantation View at: Timber Merchants Association Blackburn 1300 343 332

			www.styleplantation.com.au
	Cork and cork/rubber	100% recycled cork combined with rubber. Renewable resource, good thermal properties, low VOC, low flammability. Take back policy at end of life	Comcork Flooring Distributor: Logic Australia Oakleigh South 1300 883 762 www.comcork.com.au
	Rubber	100% recycled tyre product. Long lasting. 100% Australian made and owned.	Envirorubber Cheltenham 03 9555 2964 www.envirorubber.com.au
		Natural, renewable resource with some recycled content. Resilient and long lasting.	iRubber Chirnside Park 03 9726 8899 www.irubber.com.au
	Natural fibre carpets (jute, coir, seagrass and sisal)	Renewable resources, not dyed.	
	Cavalier Bremworth wool carpet	Renewable resource, low VOC with a recycled backing. Flashbac recycling program at end of useful life.	Slocum Floor Coverings Eltham 03 9439 6066 www.slocum.com.au
	Villa Natralis Carpet	Undyed wool carpet, woven fibres	Slocum Floor Coverings Eltham 03 9439 6066 www.slocum.com.au
	Sunburnt Country Carpet	Woven fibres are long lasting with lower embodied energy and low VOC.	International Floor Coverings Australia Cheltenham 1800 339 379 www.interfloors.com.au
	Carpet underlay	Airstep - 85% recycled fibre and plastic.	Allfloors Carpets Carnegie 03 9752 2111 www.sunburntcountry.com
		Dunlop Springtred – low chemical use, 100% recyclable.	Specify your choice of underlay with your chosen carpet retailer.
		Tontine Fibres Wunderfelt – Goats hair and jute	

		are renewable resources. No chemicals used in manufacture. Return to manufacturer at end of useful life. Tontine Fibres Superfelt – 100% recycled textiles.	
Cabinetry	X-Board Ply	Made from 100% recycled wood fibre waste.	Hazelwood and Hill Burwood 03 9808 5522 www.sharpplywood.com.au
	PYNEboard	Renewable resource from plantation pine.	Carter Holt Harvey 132 321 www.chhwoodproducts.com.au
	Manufactured cabinets	Low VOC moisture resistant MDF. Renewable resource from plantation pine. Low VOC.	Masters South Morang www.masters.com.au Cantilever Interiors Brunswick 03 9387 5421 www.cantileverinteriors.com
Benchtops	Recycled or reclaimed timber	Recycled or renewable resource.	Add the Beauty of Timber Kinglake 0438 792 164 www.botimber.com.au Bowerbird Timber Wesburn 03 5966 5966 www.bowerbirdtimber.com Salvage Bazaar www.salvagebazaar.com.au
	Bamboo	Fast-growing renewable resource with natural antiseptic properties. Can also be used for cupboards.	Bunnings www.bunnnings.com.au Logan Leigh Benchtops Taree, NSW 02 6551 5022 www.loganleigh.com.au
	Laminex Greenfirst	Using FSC-certified timbers, this product is also low VOC.	Laminex Group www.laminex.com.au
	ECO by Cosentino stone	75% recycled materials (glass, ceramics and vitrified ash), polyester resin.	Silestone Widely available www.silestone.com

	Reconstituted stone	42% reclaimed quartz, long lasting.	Caesarstone Widely available www.caesarstone.com.au

6. Furniture and Finishes

Decorating and furnishing your home is one aspect where your choices can have a significant impact on the indoor environment quality. Paints, sealers, polishes, fabric, furniture stuffing and ornamental items often contain chemicals which can be harmful to our health. The term 'off-gassing' is commonly used to describe the process in which chemicals are released from the product into the surrounding air. These chemicals are often known as volatile organic compounds or VOCs. Some familiar VOCs cause the 'new car' smell and the odours associated with new carpet and fresh paintwork.

The United States Environment Protection Authority lists eye, nose, and throat irritation, headaches, loss of coordination, nausea and damage to liver, kidney, and central nervous system as some of the potential adverse health effects of VOCs. More disturbingly, some organics can cause cancer in animals and some are suspected or known to cause cancer in humans.[3]

Even though indoor air quality is affected by VOCs much more than outdoors, it is still worth considering the chemicals released into the surrounding environment when painting the exterior or landscaping.

Using recycled timbers and steel in furniture items is a good way to avoid introducing VOCs into your home, provided there is no old paint on the items that could contain lead. Recycled materials also mean fewer new resources are consumed when we change our décor. Choose classic pieces that will last through fashion styles. If you are getting rid of items no longer required, try selling them at a garage sale or a website such as eBay, Gumtree or the Trading Post. If they don't sell, give them away to a charity organisation, friend or colleague rather than taking them to landfill.

If you are buying new furniture for your home, don't forget you can buy second hand online or try your local op shops for a bargain. Search the internet for 'recycled decorating ideas' and see what sparks your interest.

Furnishing and Finishes Source Guide

Application	Product	Sustainable Features	Source
Paints, stains and renders	Grimes paints, stains and renders – interior and exterior	Low toxicity paints, low emissions with sustainably sourced additives, low embodied energy.	Grimes and Sons Research 03 9437 0733 www.grimesandsons.com
	Porters Paints – interior limewash, acrylic, milk, mineral and silicate paints	Low toxicity paints, no- and low- VOCs using plant, milk and mineral bases.	Grimes and Sons Research 03 9437 0733 www.grimesandsons.com
	Ecolour Paints – interior and exterior	No-VOC paints, certified carbon neutral.	Ecolour Trade Store Braybrook 1300 937 686 www.ecolour.com.au
	Livos Paints – interior and exterior, oils, waxes, paint	No-VOC products, natural tints, plant based ingredients grown without	Livos Australia Pty Ltd Bayswater 03 9762 9181 www.livos.com.au

[3] http://www.epa.gov/iaq/voc.html#Health_Effects, 2013.

	stripper and tile adhesive	pesticides.	Enviroshop Northcote 1300 305 833 www.enviroshop.com.au
	BIO Paint – interior and exterior paints, oils, varnish and waxes	Low-VOC products, natural tints, plant and mineral based ingredients.	Going Green Solutions Hurstbridge 03 9718 0126 www.goinggreensolutions.com.au Enviroshop Northcote 1300 305 833 www.enviroshop.com.au
	Rockcote Ecostyle	No-VOC clay paint.	Paint Worx Campbellfield 03 9357 5452 www.rockcote.com.au
	Oikos Paints – interior and exterior	Low toxicity, solvent free, biodegradable, low-VOC.	Designer Paint Company Surrey Hills 1300 303 802 www.designerpaintco.com
	Berger BreatheEasy Haymes Interior Expressions Bristol Easy Living	Commonly available low-VOC interior paints.	Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Paintright Eltham Eltham 03 9439 9696 Bristol Paints Eltham 03 9439 4900 www.bristol.com.au Bunnings www.bunnnings.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Paintspot Bundoora 9467 5114 www.paintspot.com.au
Floor and timber polishes	Grimes floor and timber products	Low toxicity varnishes and oils, low emissions with sustainably sourced additives. Low embodied energy.	Grimes and Sons Research 03 9437 0733 www.grimesandsons.com

	Livos Paints –oils and waxes	No-VOC products, natural tints, plant-based ingredients grown without pesticides.	Livos Australia Pty Ltd Bayswater 03 9762 9181 www.livos.com.au Enviroshop Northcote 1300 305 833 www.enviroshop.com.au
	BIO Paint –oils, varnish and waxes	Low-VOC products, natural tints, plant- and mineral-based ingredients.	Going Green Solutions Hurstbridge 03 9718 0126 www.goinggreensolutions.com.au Enviroshop Northcote 1300 305 833 www.enviroshop.com.au
	Organoil	Product derived from plants, lower toxicity and low emissions.	Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Masters South Morang www.masters.com.au
Furniture	Furniture made from recycled and reclaimed materials	Recycled and reclaimed timber and metal items made locally.	Gumtree Road Furniture Research 0421 801 062 www.gumtreeroad.com.au Mark Tuckey Fitzroy 03 9419 3418 www.marktuckey.com.au Bespoke Furniture Richmond 03 9429 2977 www.bespokefurniture.net.au Ridgy Didge Richmond 0412 403 814 www.ridgydidge.com.au John Najjar Brunswick 03 9399 0021 www.johnnajjar.com.au Deep In the Woods

	Furniture and decorative items made from recycled and reclaimed items		Kensington 0414 738 112 www.deepinthewoods.com.au Australian Recycled Timber Campbellfield 03 9359 0300 www.australianrecycledtimber.com.au Mulbury Fitzroy and Highett 03 9532 3424 www.mulbury.com.au PFS Furniture Sales Murrumbeena 03 9579 0140 www.furnituresales.com.au 2nd Hand Shop Montmorency 03 8364 0301 www.thesecondhandshop.com.au The Junk Company Melbourne 03 9328 8121 www.thejunkcompany.com.au

7. Heating and Cooling

The best way to improve comfort levels and reduce ongoing heating and cooling costs is to implement the passive design elements as discussed in Section 1 of this Guide.

Winter:

- allow for winter sun to warm living areas
- have heavy curtains or blinds with pelmets and close them in the evenings
- insulate roof, ceiling, walls and under floor or slab edge as required
- include thermal mass to smooth diurnal temperature fluctuations
- seal gaps around doors, windows, skirting, exhaust fans, chimneys/flues and down lights.

Summer:

- apply external shade to windows that receive direct sun
- include screened, opening windows on opposite sides of the house and open on cooler evenings
- insulate roof, ceiling and walls as required
- include thermal mass to smooth diurnal temperature fluctuations
- seal gaps around doors, windows, skirting, exhaust fans, chimneys/flues and down lights
- design upper storey or clerestory windows that can act as a thermal chimney.

There are many different options for heating and cooling a home, although choices for some areas in the municipality are limited by not having a reticulated natural gas supply. Heating and cooling accounts for around 38 per cent of household energy use throughout Australia[4]. In Victoria this figure is thought to be higher due to the large variation in summer and winter temperatures that require heating for six months of the year yet only a few days of cooling over four months over summer.

The trend is now towards space heating rather than central heating, as most households don't need to heat the whole house all the time. Some high efficiency central heating options can now be zoned. This means that heating can be switched on and off independently in different areas of the house.

> Try not to place space heaters opposite windows as they can create draughts which make those sitting in the room feel cold.

Heating Options

Wood and Pellets

Wood is a renewable resource, so provided the supply of firewood is sustainably managed it is a reasonable alternative. The disadvantage of wood is that most commercial firewood supplies are red gum from New South Wales that are not sustainably managed. A better alternative is plantation sugar gum that is grown in western Victoria. Sugar gum has a higher calorific value than red gum which means you get more heat out of the same sized piece of wood. Firewood is generally also very expensive compared with gas and electricity. Wood pellets are usually made from waste created from timber milling and cost around the same amount as wood.

The way you burn wood also affects its efficiency. Open fires are the most inefficient way to heat a home. Around 80-90 per cent of the heat disappears up the chimney, with any remaining hot air being sucked up the chimney as fire dies down. When the fireplace is not being used, cold air comes down the chimney creating large draughts in the room. A high efficiency wood or pellet heater with a fan produces more heat and pushes the warm air around the room instead of straight up. There is some heat loss up the flue, but these flues are usually sealed.

Gas

Natural gas is usually the most efficient way of heating your home and is cheaper than other alternatives. Gas is also a much "cleaner" fuel, contributing far less to greenhouse gas emissions than electricity or oil. If there is access to natural gas in your street, have a consultant work out what your

[4] Your Home Technical Manual, 4th Edition, Department of the Environment, Water, Heritage and the Arts, 2011.

annual savings would be to change from electric to gas heating. Space heating is generally cheaper than central heating, although zoned central heating systems can be just as efficient if used well. Zoned systems give such significant ongoing savings over non-zoned central heating systems that they are worth the additional up-front cost.

Electricity

Electricity in Victoria is generated primarily from burning brown coal. Brown coal creates a large amount of greenhouse gas. In fact, Hazelwood Power Station in the Latrobe Valley is the least efficient electricity generator in all developed (OECD) countries. If you decide to use electricity for heating consider whether you could install a solar power system to generate all the energy you need to run the system. If solar on your own roof is not an option, purchasing GreenPower is a way of buying renewable energy from the grid and ensuring that we move away from burning coal to generate electricity in the future.

Some common heating options are detailed below:

Fuel	Heater Type	Details	Best Use	Relative Running Costs
Wood				
	Open Fire	Poor efficiency as most heat rises up chimney rather than into room.	None.	High - Low[5]
	Wood Heater	Suitable for whole of small house or small to large living areas. Sustainable supply of firewood should be used.	Living areas, regions with no access to gas.	High - Low
	Pellet Heater	Suitable for whole of small house or small to large living areas. Waste wood shavings should be used to form pellets.	Living areas, regions with no access to gas.	Med - Low
Gas				
	Space Heater	Includes a fan to push heated air through room, suits small to large rooms.	Living areas.	Low
	Ducted Heating	5-star efficient units are available with zoning options to allow flexible heating patterns.	Whole of house (zoned for heating different areas at different times).	Med
	Hydronic (in combination with solar pre-heat and boosted with gas or gas only)	Gas/solar heats water that runs through in-room panels or under floor.	Whole of house (zoned for heating different areas at different times).	Med - Low
Electricity				
	Radiator	Radiates heat at a person, does not heat air space.	None.	High
	Column/panel	'Efficient' units have thermostats but still use a lot of energy.	None.	High
	Fan	Pushes heated air around room. Not suitable for bathrooms or large rooms.	Small rooms for short periods of time.	High
	Underfloor	Coils located in slab. Can be zoned and used at low temperatures	None.	Very High
	Inverter (air to air heat pump)	Highly efficient units are now available. They come as air heaters or water heaters for hydronic heating and can be used for hot water as well.	Whole of house, regions with no access to gas.	Med – Low
	Geothermal (ground to air heat pump)	Highly efficient units are now available. They use heat from in the ground to heat air or water. High up front cost.	Whole of house, regions with no access to gas.	Med – Low

Whichever method of heating you choose, the ideal temperature range is 18-21 degrees Celsius in winter. For every degree higher you set the thermostat, it will cost around 10 per cent more to heat. It is often air movement that makes you feel cooler, so draught proofing is a great way to control this.

[5] Depending upon whether or not you pay for your wood supply.

Always turn heating off if you leave the house, even for a short time. It is a common myth that it takes more energy to heat a home from scratch than to leave the heating on low all day then boost the temperature when you get home.

Patio heaters have become increasingly popular in recent years. They are one of the most expensive ways to provide heating and are not efficient because they are used in the open air. If we're all busy trying to reduce our energy use inside our homes, does it make sense to use large amounts of energy to warm us outside our homes? If it's cold enough for a heater, it's probably too cold to sit outside.

Cooling Options

Melbourne has a good diurnal temperature range where, generally, our nights are much cooler than our days. If you invest $12-15 in an inside/outside thermometer to show when the temperature outside is lower than inside, you can open windows to allow cool breezes through the house.

In two-storey homes or those with clerestory windows, high windows can be opened to create a thermal chimney. Heat will rise, move out through the window and draw cooler air throughout the house. This will work even on very hot days, but you might need to experiment with which windows work best in your home.

If you need some additional cooling, the cheapest method that consumes the least amount of energy is a pedestal or ceiling fan. A fan works by helping to evaporate sweat from the skin, so we feel cooler rather than reducing the temperature of the room. A little spray bottle with water can be used to create a mist that will enhance the effect.

Evaporative cooling is the next most cost-effective way to cool. The main cost is to run the fan motor. This type of cooler also uses some water, so if it runs for many hours each day you will see a slight increase in the water bill.

Air conditioning is the most expensive way to cool a home. New air conditioners must have an energy rating, so choose a model that has a high star rating and it will save on running costs over its entire life. Make sure the unit is the right size for the space you want to cool. Ideally the thermostat should be set to 23-27 degrees Celsius. Each degree cooler will increase the running cost by around 10 per cent.

Compare the costs:

Type of Cooling	**Power**	**Hourly Running Cost***	**Cost Over Summer***
Pedestal or ceiling fan	30-75 Watts	1-2 cents	$0.68-$1.70
Evaporative cooler	800 Watts	23 cents	$18.17
Air conditioner**	1500-3000 Watts*	43-85 cents	$34.08-$68.16

*Based upon a cost of 28.4 cents/kWh and running 80 hours over summer.
**Air conditioners vary in size and this is a relatively small unit.

How to choose the right reverse-cycle air conditioner (heat pump)

Air conditioners sold in Australia must comply with Minimum Energy Performance Standards (MEPS) and be labelled with an energy star rating as well as information about how much energy is consumed by the appliance and how much energy it emits.

1. Determine the required output. You will need information about the type of materials and insulation used in the ceiling, walls and floor of the area you want to condition, as well as the size of the area. You will also need to know the size and U-value of all windows in the area to be conditioned. Your appliance sales person or electrician should be able to help you determine the correct size required. Be conservative with sizing as a larger unit will use more energy to build and run.

2. Check for brands that are reliable. You don't want to have to replace the unit after a short time or buy one that needs frequent repairs. Online or Choice reviews are often helpful.

3. Choose the most efficient model possible. Divide the Output Energy by the Input Energy. This figure is known as the Coefficient of Performance (CoP). An efficient model should have a CoP of five or higher. This means that the unit puts out five times as much energy as it uses. As new models emerge, this figure should improve. A full list of models available in Australia can be found at www.energyrating.gov.au.

To ensure your appliance is running at maximum efficiency, ensure the filters are cleaned regularly (at least every six months) and the unit is serviced periodically.

8. Hot Water Systems

Water heating accounts for around 25 per cent of a household's energy use. In some outer urban areas of Melbourne there is no access to reticulated natural gas so a large number of homes are reliant on electricity for water heating. There is a range of options that will suit different household circumstances.

Solar with gas booster

This type of system comprises either solar panels or evacuated glass tubes and a storage tank. The addition of an instantaneous gas unit means that on cold and cloudy days when there may not be enough sun, there will still be hot water available. This is generally the cheapest type of system to run, although the purchasing cost is quite high, however water heating costs can be reduced by as much as 85 per cent. It is best suited to a household of three or more people.

Solar with electric booster

This type of system comprises either solar panels or evacuated glass tubes and a storage tank that contains a heating element. The element means that on cold and cloudy days when there may not be enough sun, there will still be hot water available. This type of system generally saves about 65 per cent of costs compared to an off-peak electric storage hot water system, although the purchasing cost is quite high and it requires moderate levels of boosting over winter. It is best suited to a household of three or more people.

Heat pump

A heat pump is an electric system comprising a storage tank and a heat exchanger. A pump draws air into the heat exchanger and removes the heat, transferring it into the water. Heat pumps can be linked to a solar panel or evacuated glass tubes to give even greater efficiency, although this is an expensive solution. This type of system is suited to any sized household, especially where there is no access to reticulated gas.

Gas instantaneous

A small box located on the wall outside the home is all this system needs to generate continuous hot water. It achieves savings because it only heats the water that is required. There is no storage tank to re-heat. The system can be configured to run on natural gas or LPG and still provide significant savings over an electric storage unit.

Electric instantaneous

This type of system consists of a small wall-mounted box that heats water as it runs through the unit. As it heats water on the peak daytime tariff it can be expensive to run for a large amount of water. If you have a small household of one or two people, with irregular water use patterns, it may be the best option if you do not have access to reticulated natural gas.

Heat Recovery System

This type of product is suited to installation during building, usually in a two storey home. It is installed in addition to a hot water heater. It works by transferring the heat remaining in shower water that goes down the drain to the cold water that is refilling the hot water tank. The hot water is passed through a copper pipe that surrounds another copper pipe containing the cold water. As the hot and cold water pass each other, the heat is conducted through the copper pipe and into the cold water, reducing the amount of energy required to heat the cold water. Further information is available at www.recohvert.com.au.

All new hot water systems should be installed with lagging (insulation) covering all the hot water pipes. This helps to prevent heat loss as the water sits in the pipes either as the water travels to its destination or when the tap is turned off and on.

If you are designing a new home, try to group rooms that will use hot water close together and place the hot water system as close to these rooms as possible. This will reduce the amount of water wasted waiting for the hot water to arrive at the tap and reduce the amount of heat lost when hot water is sitting in the pipes.

Hot water systems are required to have an energy rating displayed on the unit. Make sure you compare the energy use of different types of heaters, not just the number of stars.

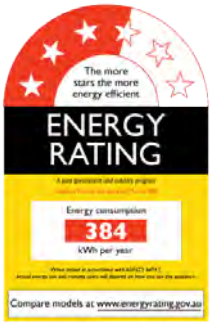
What can you do with an existing house?

Think outside the box:

1. Change showerheads over to low flow models. These can save between 24 and 52 litres of water per shower. For a four person household this could add up to 76,000 litres per year. Not only does it save water, it also means you have to heat less water which reduces the cost in two ways.
2. If you are not ready to replace your current hot water system, install lagging on all hot pipes that you can access. They may run between your hot water system and the wall, around the outside of your house buried in the ground or through the roof cavity. Lagging is inexpensive and can be purchased at hardware stores.
3. Install a Valve Cosy over the relief valve on the storage tank. It is claimed that a Valve Cosy reduces heat loss from the tank by 7 per cent and it is very cheap to purchase.
4. If your hot water system is highly exposed to the elements, consider enclosing it inside screens to help reduce heat loss from the walls of the tank. Make sure you can still access the tank if you need to make repairs and ensure that pipes and wires are safe distance from

9. Household Appliances

Choosing appliances to finish your new home or renovation is one of the exciting parts. Most of us think about form and function when we select our appliances and put very little thought into how these might affect our energy and water bills.



A number of common household appliances are now required to meet a Minimum Energy Performance Standard (MEPS) and display an Energy Rating label.

Appliances that also use water are also required to meet a Minimum Water Efficiency Standard (MWES) and display a Water Rating Label. These labels enable a direct comparison of the efficiency of appliances.

Check the stars to get an idea of the efficiency, then read the conditions of use underneath the stars and the amount of energy or water that appliance will use under those conditions. If the label is missing, ask the store staff to find it. If it doesn't have a label, it means the appliance has not been tested under the rating schemes. Be wary of buying products that have not been tested as they are usually not very efficient.

Appliances that are required to display an energy rating label are:

- air conditioners
- dishwashers
- washing machines and clothes dryers
- refrigerators and freezers
- televisions.

Appliances that are required to display a water rating label are:

- dishwashers
- washing machines
- taps and showerheads
- toilets and urinals
- flow restrictors.

Resources

- Information about the Equipment Energy Efficiency Program, which products have MEPS and research into models available in Australia is online at www.energyrating.gov.au
- Information about the Water Efficiency Labelling and Standards Scheme, which products have MWES and research into models available in Australia is online at www.waterrating.gov.au

Standby Power

Standby power is the term used for the energy used by appliances when they are turned off or in standby mode. Any appliance that is turned on and off with a remote control or an electronic switch will use standby power. Standby power controllers can be used on almost all appliances to eliminate standby power. Washing machines, printers, computers, televisions, games consoles and other entertainment equipment are the usual culprits. Test them with a power meter when they are turned off to check. You can borrow a power meter in the Home Audit or HEAT Kits available through the Yarra Plenty Regional Library.

Dishwashers

Ensure the dishwasher is the right size for your household. If you have a small family, you might like to consider a half or three quarter size dishwasher. Dishwashers are now available that store the water from the final rinse cycle to use during the next wash cycle. Ensure your dinner plates or other large items fit into the dishwasher you are considering. If your hot water system is close to the kitchen, choose a model that connects to hot water. If not, it may be more efficient to choose a model that heats its own water.

Washing Machines

Generally, front loading machines are more energy- and water-efficient than top loader machines and give better washing and drying results. If you have problems bending, some models have specially built cabinets to go underneath the washing machine to raise it off the ground or you can have a cabinet made to order. These cabinets also offer additional storage. Wash full loads only, and use cold water except for greasy clothes or nappies.

Clothes Dryers

Clothes dryers are high consumers of energy, simply because they use electricity to heat the air. Choose an efficient model and try to use only the cooler cycle. The hot cycle can use up to ten times as much energy to run as the cooler cycle, but it only dries the clothes two to three times faster than the cooler cycle. Partially air-dry the clothes before putting them into the dryer, ensure the dryer is not overfilled and that drying time does not over dry the clothes. The lint filter should be cleaned after every load. Not only does this make your dryer run more efficiently, it also reduces the risk of fire from overheating.

If you use your dryer frequently, consider installing a gas dryer. These are more expensive to purchase but have much lower running costs and greenhouse gas emissions.

Refrigerators and Freezers

Fridges and freezers are left on 24 hours per day every day of the year, so they consume a large amount of energy. If you don’t need a separate freezer, don’t buy one. Buy a fridge that is just big enough for your needs. The temperature of the fridge section should be between three and five degrees Celsius. The temperature of the freezer section should be between minus 15 and minus 18 degrees Celsius. Reduce the need for the fridge or freezer to keep re-cooling by locating it in a cool area of the house where there is no direct sun on the appliance. Do not locate your fridge or freezer next to the oven. Ensure there is a 75mm gap around the sides, back and top of the appliance to allow heat to escape.

If you need a second fridge for entertaining, consider whether you can turn it off most of the time and only turn it back on before guests are expected. Ensure a working fridge or freezer is kept about 80 per cent full so that the mass from the cold food and drink can help keep the temperature stable, yet still provide enough room for air flow. Check the door seals to make sure they are clean and that you can’t slide a piece of paper in the door. If you can, have the seals replaced or the door re-hung so that it closes properly. Ice makers and chilled water functions use additional energy, so consider whether you really need them.

Televisions and Entertainment Equipment

Most of our entertainment equipment these days is operated by remote control. This means that they all use a little bit of power when turned off with the remote. Ensure the appliances are turned off at the wall or with a standby power controller when not in use. Consider how you use all the different equipment and whether it would be best to have them all attached to one power outlet or different outlets so they don’t all have to be turned on at the same time.

Usually, the larger the television the more energy it uses. When comparing models ensure you look at the amount of energy the unit will use rather than just the star rating. Generally speaking, LED/LCD models use far less energy than a plasma screen. MP3 players use far less energy than large stereo systems.

Office Equipment

Laptop computers use less energy than most desktop computers. If you have a customised computer that requires additional fans for cooling, it will use a lot more energy than a regular unit.

If you will be away from your computer for a short time, turn the monitor off. If away for a longer time, turn the computer off. All computers and printers consume power when they are turned off, so the office is one area where a standby power controller will save you money if you cannot access the power outlet.

Pool Pumps

Pool filters and heaters need to run four to eight hours each day depending upon the size of the pool. They can cost hundreds of dollars each year and contribute a significant amount of greenhouse gas to the environment. Double that if you have a pump for solar heating as well.

A FutureWave Power Saver is a device that regulates the voltage and frequency needed to run a pump more efficiently and can save up to 75 per cent of a pump's running costs. Payback is generally under two years. Another alternative if you are installing a new pump is a variable flow type which is more efficient than a regular pump. Ask your pool shop for their recommendations.

Pool blankets reduce evaporation and heating requirements. They are a must for every pool!

10. Renewable Energy

Electricity accounts for about half of the energy used in most households, but it accounts for around 87 per cent of the greenhouse gas emissions as most electricity in Victoria is generated by burning brown coal.

Renewable energy comes from an energy source that can be replenished within a human lifetime. Sometimes the sources of energy are not so clean, such as methane gas from landfill. However, other sources, such as solar, hydro and wind power are considered clean sources of renewable energy, as they produce no greenhouse gas emissions. The two types of renewable energy most suitable for domestic use are solar and wind power.

Solar Panels

Solar electricity systems use photovoltaic (PV) cells to convert sunlight into electricity. Most systems located in metropolitan Melbourne are connected to both the house and the national electricity grid and these are known as 'grid-connected' systems. This enables any energy generated in excess of the needs of the household to be fed into the grid for use elsewhere. Some homes, mostly located in rural areas, have what is known as a 'stand alone' system. This type of system feeds excess energy into a bank of batteries instead of the grid so it can be used at a later time, either at night or during a very cloudy day. Some systems are known as 'hybrids' where they are both connected to the grid and have a battery bank. Hybrid systems are useful for times when the mains power goes down and for controlling the ongoing cost of electricity use.

Solar panels have an approximate lifespan of 25 years. Minimal maintenance is required over this timeframe, consisting mainly of regular washing with water. The panels work more efficiently when free of dust, leaves and bird droppings.

Solar panels come in different types and sizes. Most domestic systems installed to date use monocrystalline panels and range in size from 1.5 to 5 kilowatts. As a general rule 1 kilowatt of panels would provide you with roughly 4.5 kilowatts of power each day in Melbourne, provided the panels are not shaded.
Before deciding on how large a system to install, it is wise to reduce your daily electricity use as much as possible. This means a smaller system can be installed at a lower cost.

Inverters

The other major component of a solar electricity system is the inverter. This is a box located on a wall which converts the power generated by the system (DC electricity) into a useable current (AC electricity), to be used in the home and fed into the electricity grid. The inverter must be sized appropriately for the system or slightly larger than the power output of the panels to allow for future expansion.

New technologies emerging include:

- micro-inverters that attach to individual panels to improve system efficiency in shady situations
- Building Integrated Photovoltaics (BIPV) that are designed to form part of the building structure, such as windows and wall cladding.

Siting a Solar System

When siting a solar system there are several factors to consider to achieve the best results:

- Panels work most effectively when facing north. They will work when facing in other directions, but the efficiency will decrease significantly.
- Obstructions on your roof may shade the panels. Common examples of this are television antennae, chimneys, air conditioner/cooling motors and uneven rooflines.
- Trees to the north, east and west of your roof could shade the panels. Can you move the panels to a less shady position? Can you trim the top of the trees? If the trees are on the nature strip or in your neighbour's garden, it may be wise to have a conversation with Council or your neighbour to find out if pruning will be a problem.
- Is there a possibility of a future higher storey extension to the north of your house? If so, consider placing the panels in a position where they would not be affected.

- Consider the view from the street and your neighbours' yards. If you need frames to tilt the panels what would they look like from a distance? Will they create any problems for other households?
- If your home is heritage-listed, consult with Council's Heritage Advisor prior to committing to a purchase.

More detailed information about installing a solar electricity system is available through the Clean Energy Council's *Consumer Guide to Solar PV*, available at www.cleanenergycouncil.org.au.

Wind Generators

Wind generators use wind to rotate blades or turbines. This movement is turned into electricity using an alternator. Like a solar system, a wind generator can be grid-connected, stand alone or a hybrid. It is also possible to have both solar and wind systems installed to produce a more consistent supply of electricity. Maintenance of a wind generator is greater than for solar as there are constantly moving parts. A six-monthly check should be done on oil levels and greased parts. Seals, blades and other parts should be checked every 12 months and oil changed every two years.

Wind generators are not common in built-up urban areas for several reasons. Firstly, the average wind speed in many areas of metropolitan Melbourne, including the outer northern areas, is relatively low compared with coastal and some inland country areas. This reduces the cost-effectiveness of an installation. Secondly, wind generators work best when they have a smooth flow of wind from one direction. In urban areas with many buildings, infrastructure and trees it is almost impossible to find an area not affected by turbulence. To overcome the issue of turbulence, the height of the generator must be increased, providing loss of amenity to surrounding households and the risk of damage should the tower fall. Thirdly, wind generators do produce some noise. Most of the time this is not a problem and there are designs available now that virtually eliminate noise all together. However, certain types of blade arrangements produce noise when turning out of the wind, so this should be considered.

Siting a Wind Generator

When siting a wind generator there are several factors to consider to obtain the best results:

- An anemometer should be used to monitor the wind speed at your intended installation site for 12 months. This will give an accurate average wind speed so the size of the turbine and electricity output can be calculated.
- The tower should stand at least ten metres higher than any surrounding objects. Remember that trees grow, so consider if you will need more height in the future.
- Never attach a tower to the house.
- Consider the view from the street and your neighbours' yards. Also think about noise levels and whether there could be damage to neighbouring property if the tower falls or needs repairs.
- Consider whether there would be any impact on local fauna and flora.

More detailed information about installing a wind generator is available through the Alternative Technology Association's *Wind Power, Plan your own wind power system*, available at www.ata.org.au.

If you are not able to place a solar or wind system on your property, there are other options that allow households to purchase renewable energy:

GreenPower

Green Power is the only voluntary government accredited program that enables your energy provider to purchase renewable energy on your behalf.

A joint initiative of the Australian Capital Territory, New South Wales, South Australian, Queensland, and Victorian governments, GreenPower guarantees that the renewable electricity you buy from energy suppliers meets stringent environmental standards. The energy you buy is helping to develop new infrastructure in the renewable energy sector. This means that all the renewable energy purchased for GreenPower must come from generators built since 1997. Payments made under this system assist the renewable energy industry to grow.

GreenPower only costs a few cents per kilowatt hour on top of your regular tariff. Accredited products can be identified by the GreenPower logo.

Community Solar or Wind Projects

Creating a solar or wind system large enough to distribute energy to the local community is an emerging concept. Various models exist but are yet to come to fruition. If you are unable to have renewable energy at home but are keen to invest in renewable energy contact Council's Sustainability Officers to register your interest.

11. Water Capture and Use

A well-designed home can reduce water (and energy) use, take advantage of water captured on site and improve the quality of water flowing back into waterways. Whether there are official water restrictions in place or not, a good target to aim for is no more than 155 litres of water per person per day. This should include mains water and any water used from a tank.

Placing kitchen, bathrooms, laundry and the hot water system close together will reduce the amount of pipework required and reduce the amount of energy required to heat water. Taps, showerheads and toilets are all required to meet minimum water efficiency standards under the Water Efficiency Labelling and Standards Scheme. When comparing different models ensure you check the number of litres per minute rather than just the number of stars.

Capturing and Using Rainwater

Rainwater tanks have become a common sight throughout Melbourne in recent years. They now come in numerous shapes, sizes, colours and applications, including those designed specifically for very small spaces, mobile versions and tanks that can also be used as retaining walls and garden beds.

When planning a new home, provision should be made for tank location and connection to toilets and laundry to reduce the demand for mains water. Typically, a tank of at least 4,000 litres would be required for toilet flushing, laundry and a small amount of garden watering in most homes. If you plan to grow fruit and vegetables, the amount of water required will be far greater. For a home not connected to mains water, a supply of at least 50,000 litres is recommended.

Maintaining the quality of your rainwater supply is essential, especially if it is your only source of water. You can ensure a good quality water supply by:

- regularly cleaning gutters of leaves, twigs and dust
- installing a first-flush device to prevent the initial flow of water entering the tank
- ensuring there is a fine mesh over the inlet and overflow outlet to prevent insects entering the tank
- ensuring no light enters the tank to prevent algal growth
- ensuring the tank is drained and the sediment removed every few years.

Gardens should be watered using tank water where possible. Early morning is the best time of day to water as evaporation rates are low. Consider installing a drip watering system rather than sprinklers so that water is directed to the roots of the plants and evaporation is minimised. Attaching a trigger nozzle to the hose means that control is totally in your hands.

Raingardens

Raingardens are garden beds specifically designed to capture and slow stormwater from hard surfaces such as roofs, driveways and paths. Overflow water from rainwater tanks can also be filtered through a raingarden. Layers of sandy soil are placed at the bottom of the raingarden to slow the passage of water and filter pollutants from the water before it goes into waterways.

Raingardens can be constructed in a number of different ways:

- planter box: an above ground garden that collects water from a diverted downpipe and is connected back into the stormwater drain
- green roof: plants are located on top of a roof to filter rainwater as it falls
- inground raingarden: water is collected from hard surfaces or a diverted downpipe and is connected back into the stormwater drain
- infiltration raingarden: a garden bed at ground level that collects water from hard surfaces or a diverted downpipe and allows the water to infiltrate into surrounding soil
- swale: a depression or ditch containing plants that collects water from surrounding hard surfaces and allows the water to seep into soil below or connects to a stormwater drain
- porous paving: paving that allows water to flow through it and into soil below.

Further information about raingardens and how to construct them is available at www.raingardens.melbournewater.com.au.

Grey Water Re-use

Grey water is wastewater from non-toilet fixtures such as showers, basins, washing machines and taps.

Treated grey water (using an EPA-approved system) can be used for toilet flushing and clothes washing, and untreated grey water can be used to irrigate the garden on a short term basis. Blackwater (toilet wastewater) and water from the kitchen sink are not suitable for re-use.

When using grey water in the garden, keep in mind the following for environmental and health reasons:

- do not store untreated grey water for longer than 24 hours
- apply grey water using drip irrigation and only when the soil is dry
- prevent over-watering to avoid site runoff; so as not to inhibit plant growth or clog soils with organic matter
- do not use grey water on leafy vegetables, herbs or fruit
- use biodegradable detergents, cleaners and shampoos that are low in salt and phosphorus.

Wastewater Treatment

Low-impact toilets and alternative treatment systems may be worth considering, although, it is always worth first checking with Council's Environmental Health Team about the appropriateness of your planned wastewater treatment system.

Composting Toilets

Composting toilets have a single container in which waste is deposited to decompose as it slowly moves through the container. It is then removed as compost from the end-product chamber. Single containers are fitted under a bathroom and can easily replicate a flush toilet.

The container is permanently fitted under the toilet seat and never has to be fully emptied, as the compost can be gradually removed when it reaches the end-product chamber. A composting toilet looks much the same as a conventional toilet. One disadvantage of continuous composting systems is that they can allow fresh material and pathogens deposited on the top of the pile to contaminate the successfully decomposed end-product at the bottom of the pile.

When a composting system is approved it will also require an approved system to treat grey water.

Worm Farm Systems

Worm farms are single-chamber composting units that use worms to treat effluent. They can treat all household waste including toilet, kitchen and bathroom waste and organic waste such as food scraps, cardboard and newspapers. It is important to use mild cleaning and washing products when using a worm farm to ensure the worms stay healthy. You can purchase products labelled as safe for septic tanks or refer to the Living Sustainably section of this guide.

Reed-bed Systems

Reed-bed systems are an alternative wastewater treatment system, which can be designed for tertiary treatment. Wastewater passes through a series of reed-bed systems before either sub-surface irrigation (secondary treatment) or UV treatment (tertiary treatment) prior to re-use. Domestic applications will usually be secondary treatment systems and commercial applications will be tertiary treatment. It is important to use mild cleaning and washing products when using a reed-bed system to ensure the reed plants stay healthy. You can purchase products labelled as safe for septic tanks or refer to the Living Sustainably section of this guide.

Resources

- Information about the Water Efficiency Labelling and Standards Scheme, which products have MWES and research into models available in Australia is online at www.waterrating.gov.au

What can you do with an existing house?

Think outside the box:

1. Rainwater tanks can often be plumbed into the toilets and laundry of existing homes. Check with

Water Capture Source Guide

Application	Product	Sustainable Features	Source
Water capture	Poly rainwater tanks	Reduces reliance on mains water	Nillumbik Nursery Diamond Creek 03 9438 1211 www.nillumbiknursery.com.au Enter Shop Eltham 03 9431 0006 www.enter-shop.com.au Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Bunnings www.bunnings.com.au
	Steel rainwater tanks		Tankworks Somerton 1300 736 562 www.tankworks.com.au

12. Landscaping and Garden Design

Landscaping usually occurs once a new house is complete, and only then do households start to think about what they might want from their garden. To achieve the best results possible and enable the creation of a truly sustainable garden, planning the garden should be done in conjunction with the house.

A sustainable garden not only looks great and is fun to be in, it can also enhance the passive design features of the house, improve air quality and water management and assist with food production. Sustainable gardens also provide habitat and are important links for biodiversity.

Site Considerations

Do you want to grow herbs, fruit or vegetables in your garden? If so, think about the path of the sun over the seasons and how your house, neighbouring houses, established trees and fences will affect access to the sun in your proposed garden beds. Local topsoil is often nutrient-poor, so consider whether or not you will need to bring in some soil and organic matter to get your productive garden going?

Indigenous plants are native to the local area and they will generally survive in your garden better than exotics or native plants from other parts of Australia. Indigenous species have adapted to local soil and climatic conditions over many years, including seasonal temperature fluctuations, long periods of drought and rainfall. Planting indigenous species will also help attract native birds rather than introduced species. A mixture of trees, spikey shrubs and grasses will ensure large and small creatures all have somewhere to live.

If you are on a sloping block, managing stormwater runoff will be a challenge. Consider how to provide landscaping elements to capture and retain stormwater. Swales (depressions or ditches), ponds, raingardens and other types of water features can assist with slowing or capturing water on site. Further information can be found in the Water Capture and Use section of this Guide.

Consider how much water you might need for your garden and what size and style of water tank might suit, where the tank will fit and whether you need a pump to get water uphill. Plan ahead for power and shelter to protect your pump.

Handy Design Hints

- Avoid paving directly in front of north-facing windows. Paving in this location will reflect large amounts of hot summer sun into the house.
- Consider positioning a pond or water feature close to your living area windows to assist cooling breezes in summer.
- If you have a problem with excessive stormwater runoff, position a swale or pond to capture and hold the water during significant rain events.
- Save the sunniest positions for your fruit and vegetables and locate them close to the kitchen for easy access. If that is not possible, ensure there is a light so you can harvest crops for dinner as you cook.
- Consider inter-planting fruit and vegetables with exotic or indigenous plants if their water and nutrient requirements are similar. The visual effect is amazing and you can use companion planting to keep pests away.
- Group plants with similar water needs together and divide plants into low, medium and high water use zones in the garden.
- Mulch, mulch and more mulch will protect plant root systems from extreme temperatures and help to retain moisture in the soil.
- Replacing conventional lawn with indigenous grasses, ground covers or garden beds will provide significant water savings.
- Consider building a raingarden to filter pollutants out of rainwater and help manage stormwater runoff.

Soils and Additives

Organic gardening is all about making the most of your landscape and environment without the introduction of synthetic fertilisers, pesticides or fungicides. When we add chemicals to the soil,

especially where we grow edible plants, those chemicals are absorbed by the plants and are found in the produce we eat. Those same chemicals are often washed out of the soil and into our waterways during rain events. Waterways include our rivers and creeks and the sea, not just the stormwater pipes, and provide important habitat for indigenous flora and fauna. We should try to keep them as healthy as possible by reducing chemical contamination.

Remember that the soil from your property is the best soil for your garden. Retain as much topsoil from your land as possible for re-use in your new landscape.

Landscaping Materials

Many landscaping items include a high percentage of new materials. A large number of these materials are either not sustainably produced or are a finite resource. In addition, some landscaping materials incorporate harmful chemicals that can impact human health and/or air quality.

There are a number of ways you can reduce the impact of your new landscaping:

- consider re-using or purchasing pre-loved pavers, bricks, sleepers and other timber.
- use recycled materials for fill, such as crushed brick, concrete or tumbled glass.
- if you can't use recycled timbers, use FSC-certified plantation timbers rather than imported rainforest timbers.
- use small amounts of quarried rocks that have been tumbled rather than river stones.
- add organic matter to improve your soil such as local manures, certified organic products and, best of all, your own compost.
- consider permeable paving that allows stormwater to penetrate the ground rather than runoff into stormwater drains.
- choose Ecowood timber sleepers treated with non-arsenic-based chemicals suitable for vegetable gardens and children's play areas.
- use organic mulches that are free from chemical treatments, such as dyes.
- re-use old pots for seedlings. If you have ceramic pots that are no longer fashionable, re-paint them, apply mosaics or take them to the Re-use Shop on Yan Yean Road.
- use a certified ECLIP's landscaping professional to assist in design and construction of your garden. Visit www.sgaonline.org.au and go to Green Landscapers.

Landscaping Materials Source Guide

Application	Product	Sustainable Features	Source
Fencing	Ironbark and silvertop ash, fire-rated timbers	Recycled timbers	Bowerbird – Saved Timbers Wesburn 03 5966 5966 www.bowerbirdtimber.com
	Ecowood	Tanalised wood suitable for vegies and children's garden	Ecowood Plus Bayswater 03 9720 5055 www.ecowoodplus.com.au
	Modwood and Flameshield fire-rated.	Recycled plastic and waste timber, no treatment required.	Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Eltham Home Timber and Hardware Eltham 03 9439 5533 www.elthamhome.com.au
	WonderWood		Whittlesea Sawmill

			Whittlesea 03 9716 2226 www.wonderwood.com.au
Decking, screens, posts and retaining walls	Slabs, posts and timber suitable for milling. Range of species.	Recycled.	Add the Beauty of Timber Kinglake 0438 792 164 www.botimber.com.au
	Decking and posts. Range of species.	Recycled.	Bowerbird – Saved Timbers Wesburn 03 5966 5966 www.bowerbirdtimber.com Australian Recycled Timber Co Campbellfield 03 9359 0300 www.australianrecycledtimber.com.au
	Modwood	Recycled plastic and waste timber, no treatment required.	Diamond Valley Mitre 10 Diamond Creek 03 9438 2077 www.mitre10.com.au Kinglake West Mitre 10 Pheasant Creek 03 5786 5451 www.mitre10.com.au Eltham Home Timber and Hardware Eltham 03 9439 5533 www.elthamhome.com.au
	WonderWood		Whittlesea Sawmill Whittlesea 03 9716 2226 www.wonderwood.com.au
Paving	Pebblite	Porous paving allows water to drip through to the soil, retaining more moisture in the garden.	Safe T Surfaces Thomastown 1800 870 109 www.safetsurfaces.com.au
	Turf Cell Gravel Cell Flo Grid	100% post-consumer recycled polypropylene, porous paving.	Atlantis Water Management Victoria Sunshine West 1300 382 838 www.porous-paving.com.au
	HydroSTON	Permeable paving.	Hydrocon NSW 02 8303 2423 www.hydrocon.com.au
Landscaping supplies	Spalls (quarried rock)	Quarried, not removed from river beds.	Coldstream Quarry Coldstream 1300 650 564 Donnybrook Quarry Donnybrook 03 9745 2522

	Mulch	Compost and organic mulches	Bulleen Art and Garden Bulleen 03 8850 3030 www.baag.com.au

Timbers to avoid (rare or threatened species):
Merbau (PNG and Indonesia)
Teak (Burma)
Ramin (SE Asia)
Meranti (Indonesia)
Mahogany (Africa)

Better alternatives (managed plantations):
Eucalyptus (Australia)
Bamboo
Teak (PNG)
Rubberwood (SE Asia)

Resources

Nillumbik Shire Council has several publications that can help with plant selection.

- *Live Local Plant Local* is a guide to Nillumbik's indigenous plants
- *Common Weeds of Nillumbik* contains information on noxious and environmental weeds, how to identify and eradicate them
- *Home Harvest* contains information about growing food at home and improving your soil
- *Rabbit Control in urban and peri urban areas* brochure

Pick up a copy from the Shire Offices, Civic Drive, Greensborough or a download a copy from www.nillumbik.vic.gov.au.

Whittlesea Council has a number of resources that can help with plant selection, including gardening guides, indigenous plant guides and pest plant information. Visit www.whittlesea.vic.gov.au to download or request a hard copy.

Sustainable Gardening Australia has hundreds of fact sheets, blogs and videos to help with every aspect of your garden. Visit www.sgaonline.org.au

ECLIPs Certified Garden Centres
Rivers of Yarrambat
28 Kurrak Road, Yarrambat 3091
03 9436 3200

Diamond Valley Garden Centre
170 Yan Yean Road, Plenty 3090
03 9432 5113

Indigenous species and vegetable seedlings propagated locally are available at:
Edendale Indigenous Plant Nursery
30 Gastons Road, Eltham 3095
03 9433 3703

Habitat Links
950 Kangaroo Ground – St Andrews Road, Smiths Gully 3760
03 9710 1340

Keelbundoora Indigenous Nursery, La Trobe Wildlife Sanctuary
La Trobe University Bundoora Campus, La Trobe Avenue, Bundoora 3083
03 9479 2871

Raingardens
Melbourne Water
www.raingardens.melbournewater.com.au

Vertical Gardens for Small Spaces
Enter Shop
4/38 Bridge Street, Eltham 3095
03 9431 0006
www.enter-shop.com.au

Council runs a number of information sessions and workshops to assist residents, including how to improve soil, composting and worm farming, seed saving, rabbit control, weed management and many other topics.

Check out Nillumbik's current Environmental Activities Program for the next session at www.nillumbik.vic.gov.au/enviroevents.

For Whittlesea's upcoming environmental events, visit www.whittlesea.vic.gov.au.

Feeding Birds and Animals

Feeding birds and animals is discouraged as it eventually makes them dependent upon humans for their food supply. We often unintentionally feed them the wrong foods or only part of what they need in their diets and it makes them sick. When they gather in large numbers it is an ideal situation for diseases to be passed on, and the problem spreads.

You can assist birds and animals on really hot days by leaving large dishes of clean water around the garden. Make sure some are elevated so birds are safe from other animals.

13. Living Sustainably

Every day we make choices about what we buy and use in our lives. In Australia, we are spoiled for choice – just look at the range of clothes washing detergents or toilet paper the next time you are in the supermarket. Just as our homes have an impact on the environment, so do the products we buy, how much we buy and what we use in our homes and gardens. Every product we buy is made from something that came out of the earth and, generally speaking, exists in limited quantities.

Sustainable Purchasing

As a general principle we should be aiming to purchase less, especially new items. Next time you go out to purchase something new ask yourself if you really need it or can live without it. Could you get one second-hand, borrow one or could you re-purpose something that might end up as a unique piece?

There are many ways to make your shopping habits more sustainable:

- Supporting local businesses will help ensure we have a thriving economy and vibrant business communities. Shopping for locally made goods at local stores, Hurstbridge Farmers' Market and other markets and attending food swaps held in your area will also reduce your travel emissions and the food miles.
- There are many environmental and social issues surrounding the products we buy every day. We can't possibly be on top of them all. Carry the *Shop Ethical!* guide with you as a booklet or an app. www.ethical.org.au
- Buy seasonal and organic produce. Fruits and vegetables grown outside their normal season are usually grown somewhere else in the world and are flown or shipped to Australia. Organic produce means produce that is grown without pesticides or herbicides, which are normally absorbed by the food.
- Look out for excessive packaging. Can you buy in bulk or use re-fills to minimise containers? Could you choose a product that is packaged in paper rather than plastic, or in one layer rather than two? Give up plastic bags: Hurstbridge and Warrandyte are now plastic bag free!
- Ditch the plastic bottle and treat your family to a re-usable water bottle. Stainless steel bottles are a great option and are available in many different sizes and colours.
- Buy second-hand; online, at local op shops or at the Re-Use Shop in Yan Yean Road. Imagination is the only limitation on what you could do with your purchases.
- Buy recycled products: office paper, toilet paper and furniture are just a few examples.
- Combine your shopping with other errands to reduce the number of trips you make.
- Recycle everything at the end of its life by composting at home, giving to a friend, sending to the op shop or placing in the yellow Council bin. Keep a small lidded box in the laundry or shed for more unusual items such as corks, light globes, mobile phones and batteries which can be taken to local drop-off points when the box is full.

Building and Renovating Tips

Carefully plan your storage space so you can purchase and store items in bulk. Not only does this reduce

Resources

Look for your nearest markets:

- *Things to Do* section at www.nillumbik.vic.gov.au
- *Things to See and Do* section at www.whittlesea.vic.gov.au
- food swaps at www.localfoodconnect.org.au
- Farmers' Markets at www.vicfarmersmarkets.org.au

Recycling information for just about everything can be found at www.recyclingnearyou.com.au .

Green Cleaning

The quality of our indoor environment is strongly linked with our health and sense of wellbeing. Poor indoor air quality has been known to cause a range of health effects from headaches and lethargy to asthma and allergic responses. Some artificial substances called phthalates are commonly used in air fresheners, toilet bowl cleaners and some personal care items. Phthalates are considered to be

hormone-disruptors, which can cause a variety of congenital problems and increase the risk of testicular cancer.[6] Other substances that can contribute to poor indoor air quality are synthetic paints, stains, polishes and building materials, mould and moisture, pets, some heaters and cooling systems.

You don't need to spend a fortune on cleaning products to get great results. Some of Grandma's old recipes are brilliant and give better results than commercial products whilst reducing exposure to artificial chemicals. New technology has also brought us the microfibre cloth which can be used without anything other than water or diluted white vinegar for cleaning. These cloths are designed to pick up dust using static charges, so they can be used dry, and last through repeated cleaning and washing cycles. Polypropylene microfibre is fully recyclable.

Air fresheners that use essential oils (from plants) can be substituted for those containing fragrances (artifical).

Fresh air assists with eliminating odours and moisture, so open windows on mild days.

Resources

- Further information on green cleaning, improving indoor air quality and some recipes can be found on the internet by searching for 'green cleaning recipes'.
- *Spotless* by Shannon Lush contains many recipes and techniques using environmentally friendly products and items that most people have around the home.

Building and Renovating Tips

1. Carefully plan your storage space so you can store your preferred cleaning products within easy reach.
2. Use low- or no-VOC paints, stains and polishes to reduce off-gassing inside.

Household Maintenance

Anything that is powered by a two-stroke engine requires a mixture of petrol and oil to run. Oil produces a large amount of greenhouse gas. Better alternatives are four-stroke engines which only use petrol, or manual labour. Get fit as you mow your lawn with a hand mower and sweep the drive and path rather than using a blower.

If you are doing a small amount of work or a one-off task, consider whether you could borrow or hire a piece of equipment rather than buying it.

Waste

When we put 'rubbish' in our 'other waste' bin, it is taken to a waste disposal site known as a landfill. It sits in the landfill for many years, sometimes hundreds of years before breaking down completely. During this process the rotting of organic matter creates methane, a highly potent greenhouse gas many times worse for our environment than carbon dioxide. When any type of water comes into contact with landfill materials, it becomes what's called 'leachate'. Many landfills in Victoria are old and don't have new technology, such as landfill liners and leachate collection, to help mitigate adverse environmental effects. In these types of landfills, chemicals from items we have disposed of, such as batteries, televisions and bottles of cleaning products, can leach into the ground and eventually into our waterways. As our population increases, finding land to use for waste disposal becomes more difficult and we also have to find ways of containing and minimising the problems associated with former and current landfill sites and ways to rehabilitate the land so it can be used again.

Council's current landfill is a best practice bio-reactive landfill located in Wollert. This landfill captures 85 per cent of the methane created by the breakdown of organic material and converts it into electricity which is put back into the grid and supplies electricity to approximately 8,000 residences in that area. The owners are also trialling the use of solar panels to distil leachate from the landfill and use that distilled leachate as a fertiliser. While we are lucky to be able to use this kind of landfill, keeping as much

[6] Shanna Swan, Katharina M.Main, Fan Liu, Sara Stewart et al., "Decrease in Anogenital Distance Among Male Infants with Prenatal Phthalate Exposure," Environmental Health Perspectives 113, no.8 (2005): 1056

material out of landfill as possible is ultimately the best thing for the environment and the health of the community.

Recycling

Diverting waste away from landfill should be everyone's objective. What we consider rubbish in Australia is often considered a useful resource in other countries where the material is turned into something new. Most councils in Melbourne now have consistent recycling. That means that you can put the same products in any household recycling bin throughout metropolitan Melbourne without worrying about which council accepts which products. More information on exactly what can and cannot go into the recycling bin can be found at Council's website and www.getitrightbinnight.vic.gov.au. You can also call Nillumbik's Recycling and Recovery Centre on 9436 3555 or Whittlesea's Environmental Operations on 9401 0555 for information or advice.

Plastic bags should never be placed in the recycling bin. Recycling facilities are highly automated to prevent injury to staff and sort high volumes quickly. Plastic bags catch on conveyor belts and become twisted around other objects, jamming the equipment. To remove them before this happens, the whole plant has to be shut down, causing lost time and potential injury to staff. Operators at recycling plants do not open plastic bags for health and safety reasons, so always remember to put your recycling materials loosely into your yellow bin. To recycle plastic bags, simply take them to Coles or Woolworths supermarkets and place them in the bin at the front of the store. Why not make the switch to re-usable bags while you're there!

Green Waste

Green waste bins take garden materials including branches, prunings, leaves, grass and weeds. Placing your garden clippings in the garden waste bin helps divert waste away from landfill because everything collected is treated and processed to become compost, mulch, soil enhancers or horticulture products.

Nillumbik residents have also been able to place food waste in the green bin for many years. This service is gradually being rolled out to all municipalities across metropolitan Melbourne. This type of green waste will be composted at an in-vessel composting facility, removing all green waste from landfill and reducing greenhouse gas emissions from our landfill sites. Nillumbik's green waste can include meat, bones, dairy products, onions and citrus that most of us don't place in our own compost bins.

Composting at home is the best way to reduce greenhouse gas emissions. If you haven't tried composting or worm farming at home yet, get started today. Compost, worm tea and castings are some of the best natural and nutrient-rich products you can put on your garden. They are free if they are from your own backyard and your waste might just help you to grow your next season's fruit and vegetables. It sure beats paying for chemically enhanced fertiliser from the shop! A well-maintained compost bin does not smell and there are easy ways of keeping vermin out. There is a great sense of achievement when you have a bin full of compost ready to use on your garden.

If you would like to know more, check out Council's Environmental Activities Program for the next natural soil improvement or composting workshop at www.nillumbik.vic.gov.au/enviroevents or www.whittlesea.vic.gov.au.

Compost bins and worm farms are available at discounted prices from Council by contacting Nillumbik on 9433 3711 or Whittlesea on 9401 0555.

Building and Renovating Tips

One issue that often arises with waste is that people don't have space for sorting different types of waste. Ensure this forms part of your planning in your new home or renovation. Make sure there is handy space for Recycling, Green Waste and Other Rubbish bins in your kitchen and a spot to collect all those unusual little items. A small box in the laundry cupboard or shed in which to place batteries, fluorescent globes, corks and mobile phones until there is enough to take to a recycling point will help. Ensure you have sufficient space for your kerbside bins to sit when they are not out for collection. A spot that is hidden and

Nappies

The vast majority of families now use disposable nappies for their children. In 2010, Choice estimated that a staggering 2.1 billion disposable nappies end up in landfill each year[7]. Most disposable nappies are made from a combination of artifical petroleum-based products, including plastics, and take many hundreds of years to break down.

There are more sustainable alternatives available that are easy to manage and can be cheaper than traditional disposables.

Cloth Nappies

Cloth nappies have come a long way in recent years. There are many brands and styles to choose from, including versions made from fast-growing renewable resources such as bamboo and hemp. Cloth nappies will usually last through three children and they cost less than half that of disposables for one child and less again for subsequent children. This comparison includes the purchase cost, power, water and detergent. Flushable inserts are available for cloth nappies to make cleaning a whole lot easier.

It is a myth that cloth nappies cause nappy rash, which is more closely linked to the frequency of change and, if your baby has sensitive skin, the washing detergent.

Disposable Nappies

Disposable nappies that are kinder to the environment are widely available in Australia if cloth is not an option. Compostable nappies are a good choice as long as they are separated into their own bin for collection. There is a composting site for them in Melbourne which means these nappies don't go into landfill. The nappies are made from plant based materials that break down in around six weeks.

Nillumbik Shire Council runs several Re-usable Nappy workshops each year if you would like to find out more and see samples of what is available. Check out Council's Environmental Activities Program for the next session at www.nillumbik.vic.gov.au/Enviroevents. You can also keep an eye out for Whittlesea's upcoming events at www.whittlesea.vic.gov.au.

Re-usable Nappy Source Guide

Type	Product	Sustainable Features	Source
Cloth – Flat, pre-fold or fitted	Baby Beehinds	Made from fast-growing renewable bamboo	Baby Beehinds Wiberforce, NSW 02 4577 2777 www.babybeehinds.com.au
Cloth - Pockets	Green Kids Ecobums	Made from fast-growing renewable bamboo	Green Kids Joodalup, WA 0431 431 473 www.greenkids.com.au Ecobums Milend, SA www.ecobumsclothnappies.com.au
Cloth – All-in-ones	Ecobums	Made from fast-growing renewable bamboo	Ecobums Milend, SA www.ecobumsclothnappies.com.au
Disposable	Eenee compostables	Made from renewable plant-based materials, compostable	Eenee Compostables Northcote 03 9481 6044 www.compostablenappies.com.au
All types	Retailers	Advice and delivery of a range of re-usable nappies.	Going Green Solutions Hurstbridge 03 9718 0126 www.goinggreensolutions.com.au

[7] www.choice.com.au, 2010.

			The Nappy Shop Kew 1300 627 797 www.thenappyshop.com.au Enviroshop Northcote 1300 305 833 www.enviroshop.com.au

Transport

Greenhouse gas emissions from cars account for around 50 per cent of all transport emissions, the other 50 per cent coming from trucks, shipping, air transport and railways. Total transport emissions account for around 16 per cent of Australia's total emissions. In addition, vehicle exhaust contains a number of toxic chemicals. Emissions are often made worse by cars sitting in traffic jams and making short trips when the engine is turned on and off repeatedly.

In the outer regions of Melbourne, public transport options are more limited than the inner areas, although there are still some viable options for leisure and commuting.

Consider how you may be able to reduce the impact of your regular travel requirements:

- Walk or ride a bike for short trips: your health and fitness will also benefit.
- Grab a copy of Nillumbik's *Exploring Nilllumbik Map* at the Shire Office, Civic Drive, Greensborough. Visit Whittlesea Council's website to download or request local walking and bicycle path maps at www.whittlesea.vic.gov.au
- Plan your shopping and other needs so they are combined into a single trip rather than several trips.
- If you have a car, ensure it is well-maintained so it runs efficiently.
- When it comes time to purchase your next car, consider whether you really need something large or could get away with something a lot smaller for day to day use. If you need a large vehicle for a family trip or towing, consider hiring instead of buying.
- Is there an opportunity to car pool with a friend, neighbour or colleague? Even one day per week could reduce your emissions by as much as 20 per cent.
- Could you drive part of the way then catch a tram, train or bus for the rest of the journey?
- If there are shower facilities at work, could you ride a bike?
- When travelling for work, can you use public transport? Suggest that public transport tickets for business use are sponsored by your workplace. Lobby your fleet manager to buy more efficient vehicles.
- Purchase carbon offsets when you travel on your next holiday.

Building and Renovating Tips

1. Plan for bicycle storage that will enable you to keep you equipment secure, clean and within easy reach to encourage more use.
2. Include storage space for walking shoes and boots that come back wet or muddy.
3. Keep space on a notice board for the latest public transport timetables.

Appendix

FSC Certification

The Forest Stewardship Council (FSC) is an international, independent, not-for-profit, membership-based organisation. The FSC was founded in 1993 in response to the Rio Earth Summit to promote environmentally appropriate, socially beneficial and economically viable management of the world's forests. The FSC has developed standards based upon the "10 Principles of Forest Stewardship" to ensure:

- waterways are protected
- wildlife habitat and species are protected
- high conservation value forests are preserved
- forest management practices are monitored annually
- pesticide use is reduced
- worker safety and wellbeing is enhanced
- the rights of Indigenous Peoples are respected
- communities are respected and valued.

The organisation has a governance structure that includes all stakeholders to ensure that it is independent of any single group. Certification bodies are audited annually and a chain of custody system ensures that products are tracked from the forest to the end consumer.

Further information, including a list of certified timbers, paper and printers can be found at www.au.fdc.org.

GECA Certification

Good Environmental Choice Australia (GECA) is an independent, not-for-profit organisation whose mission is to transform the actions of business and consumers to drive a substantial increase in the sustainability of consumption.

GECA was founded in 2000 as an eco-labelling system and in 2002 created its first standards and commenced an accreditation program. The standards development and review process is transparent, consistent, and includes consultation with stakeholders, industry, experts and the general public.

The GECA Program follows the ISO 14024 standard and offers global best practice in product certification and eco-labelling to the Australian market. GECA certification is trusted, rigorous and relevant. Verifying a product's environmental performance claims will help consumers avoid 'greenwash'.

Further information, including a list of certified products can be found at www.geca.org.au.