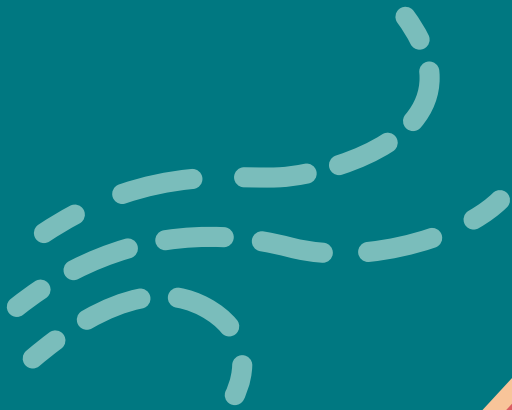




ACT
Government

Suburban Land
Agency

Your Resilient Home Guide



We live and work on Ngunnawal country

We acknowledge the Ngunnawal people as Canberra's first inhabitants and Traditional Custodians.

We recognise the special relationship and connection that Ngunnawal people have with this Country.

Prior to the displacement of Ngunnawal people from their land, they were a thriving people whose life and culture was connected unequivocally to this land in a way that only they understand and know and is core to their physical and spiritual being.

The segregation of the Ngunnawal people from Culture and Country has had long-lasting, profound, and ongoing health and well-being effects on their life, cultural practices, families, and continuation



of their law/lore. We acknowledge the historic interruption of the Ngunnawal people of Canberra and their surrounding regions.

We recognise the significant contribution the Ngunnawal people have played in caring for Country. For time immemorial they have maintained a tangible and intangible cultural, social, environmental, spiritual, and economic connection to these lands and waters.

Welcome to your resilient home!

You might be buying land and preparing to build a new home, choosing a house and land package, or thinking of renovating the home you live in. Whatever your situation, this guide will help you to make your home resilient.

A resilient home is designed to keep your family safer, more comfortable and spending less on energy bills, especially during extreme weather. It's also designed to be long-lasting, cost effective to run and environmentally friendly.

I hope this guide helps give you the confidence to make the best decisions for you and your family.



Yvette Berry MLA
Minister for Housing and Suburban Development

Accessibility



To read this guide in large print, call Access Canberra on **13 22 81** or email suburbanland@act.gov.au



To access the teletypewriter service, phone **13 36 77** and ask for Access Canberra on **13 22 81**.



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To access speak and listen call **1300 555 727** and ask for Access Canberra on **13 22 81**.

What you'll find in this guide

This guide has three parts:

- Why make your home resilient?
- Making your home resilient
- Responding to threats



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Part 1

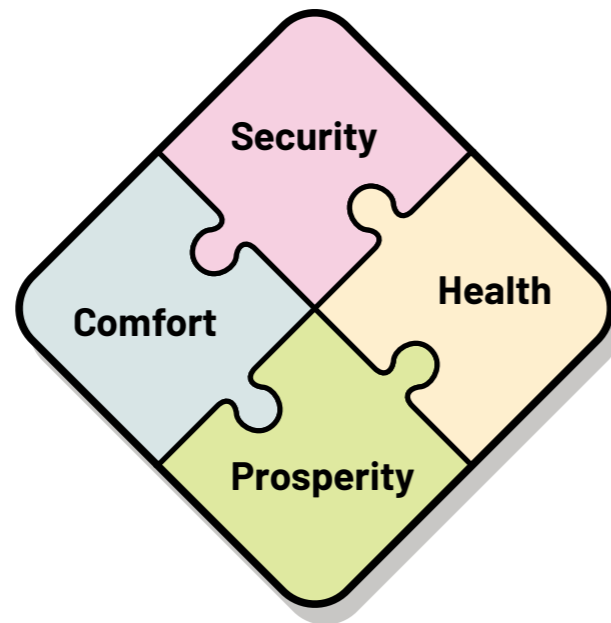
Why make your home resilient?

What is a Resilient Home?

The climate is changing, and so is the way we need to design homes.

Resilient homes are robust, flexible and ready to withstand extreme weather, keeping your family safe and minimising the likelihood of repair or rebuilding costs. They're also designed to protect you from rising energy and water costs.

A resilient home doesn't have to be a particular style or look a certain way, the real difference is in the benefits it delivers. A resilient home is simply a good quality home, designed with your future, wellbeing and comfort in mind.



Why make your home resilient?

1 Protect your family and your house

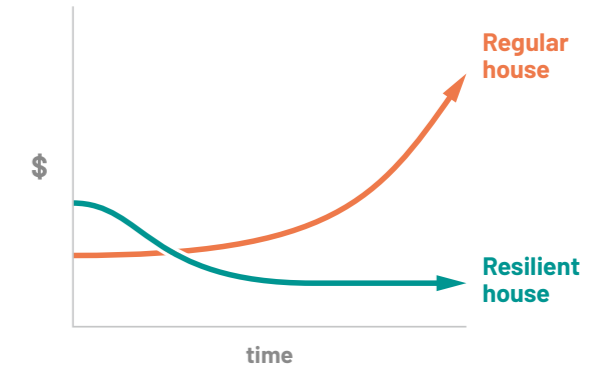
Resilient homes are designed to last a long time and withstand extreme weather, which helps to keep your family safer and more secure in the event of a heavy storm, bushfire or other emergency. A resilient home can also improve your ability to cope during electricity blackouts or water shortages.

My family's wellbeing and safety is my priority, and I want a home that's a good long-term investment. I feel like I'm doing the best thing for our future by making our home resilient.

Deepti
Home buyer

2 Reduce the cost of bills and repairs

A resilient home is designed to save energy and water, enabling a lifetime of lower utility bills. It's also less likely to be damaged in extreme weather, which means less money spent on repairs, replacing household contents or relocating while repairs take place. There are also examples of insurance premiums being reduced for resilient home design.



3 Feel comfortable

A resilient home is designed to the highest standards of thermal comfort, a 'must have' in Canberra's extreme climate. It costs less to heat and cool and is easier to keep comfortable all year, even during heatwaves and cold winters.

4 Stay healthy

A resilient home is healthy, well ventilated and able to keep out temperature extremes, bushfire smoke and pollen. This is particularly important for the wellbeing of young children, pregnant women, elderly people and people with respiratory conditions.

5 Add value to your home

For all these reasons, making your home resilient is likely to improve its value, now and into the future. As time goes on, awareness of resilience and its benefits will only increase, and this is likely to be reflected in market values and expectations. There is already evidence of improved sale prices for energy efficient homes in Canberra.

A resilient home is simply a good quality home, designed with your future in mind. Follow the tips in this guide to create the home that's perfect for you and your family.

Over time, resilience will almost certainly save you money. It might cost a little more upfront, depending on your approach and the details of your design. One thing is certain: there is a cost to *not* making your home resilient.

Mary
Architect









Climate Change and your home

Canberra's climate is changing, and there are many ways this can affect your home and family.

Most people consider their future when buying or building a home – will it still suit us as our family expands or as we grow older? Fewer people think about what the future climate will be like and whether the home will suit these conditions.

Canberra's climate is cool, but with climate change there will be longer, hotter summers as well as an increased likelihood of very cold winters. Weather will be less predictable and more extreme. Bushfires will become more frequent and severe. Heatwaves will become hotter, longer and more frequent. Rainfall will be more variable, leading to more frequent and longer periods of drought as well as more frequent and severe storms, flash flooding and high winds.

Threats you may face

 Threat to life	 Risk to health and wellbeing	 Property damage	 Bill shock
 Water outage or restriction	 Power outage	 Phone line outage	 Internet outage

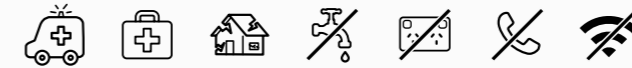
Bushfires and smoke



Longer, hotter, drier summers make bushfires more likely, putting lives and homes at risk. Smoke inhalation, even from distant fires, can damage health. Understand your site's bushfire risk and what it means for home design.



Storms, hail and floods



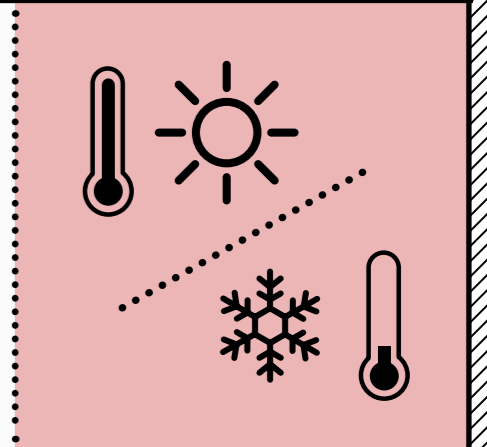
Rainfall is likely to be more intense when it occurs, leading to severe storms, wind, hail and flash flooding. This can put lives and property at risk. Good design and careful choice of building materials can reduce these risks.



Extreme temperatures



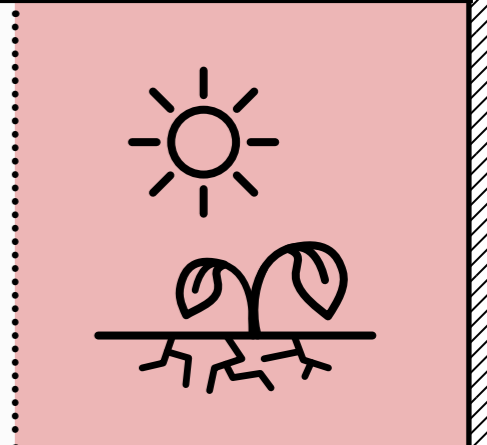
Extreme temperatures will be more common, with longer, hotter and more frequent heatwaves and colder winters. This creates health risks, particularly for the very young and old. A home designed for comfort is essential in Canberra.



Droughts



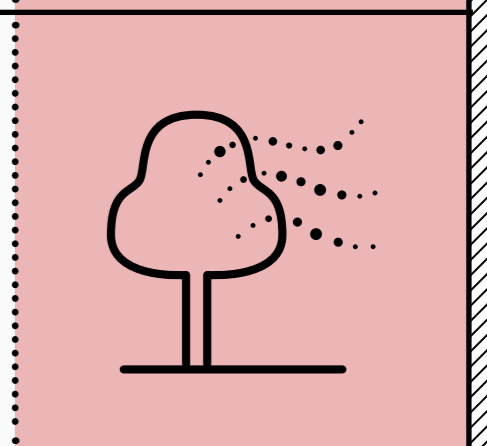
Although rainfall will be more intense when it does occur, there will be less rainfall overall and extended dry periods, which may lead to drought and water restrictions. A water saving home and garden improves resilience to drought.



Pollen storms



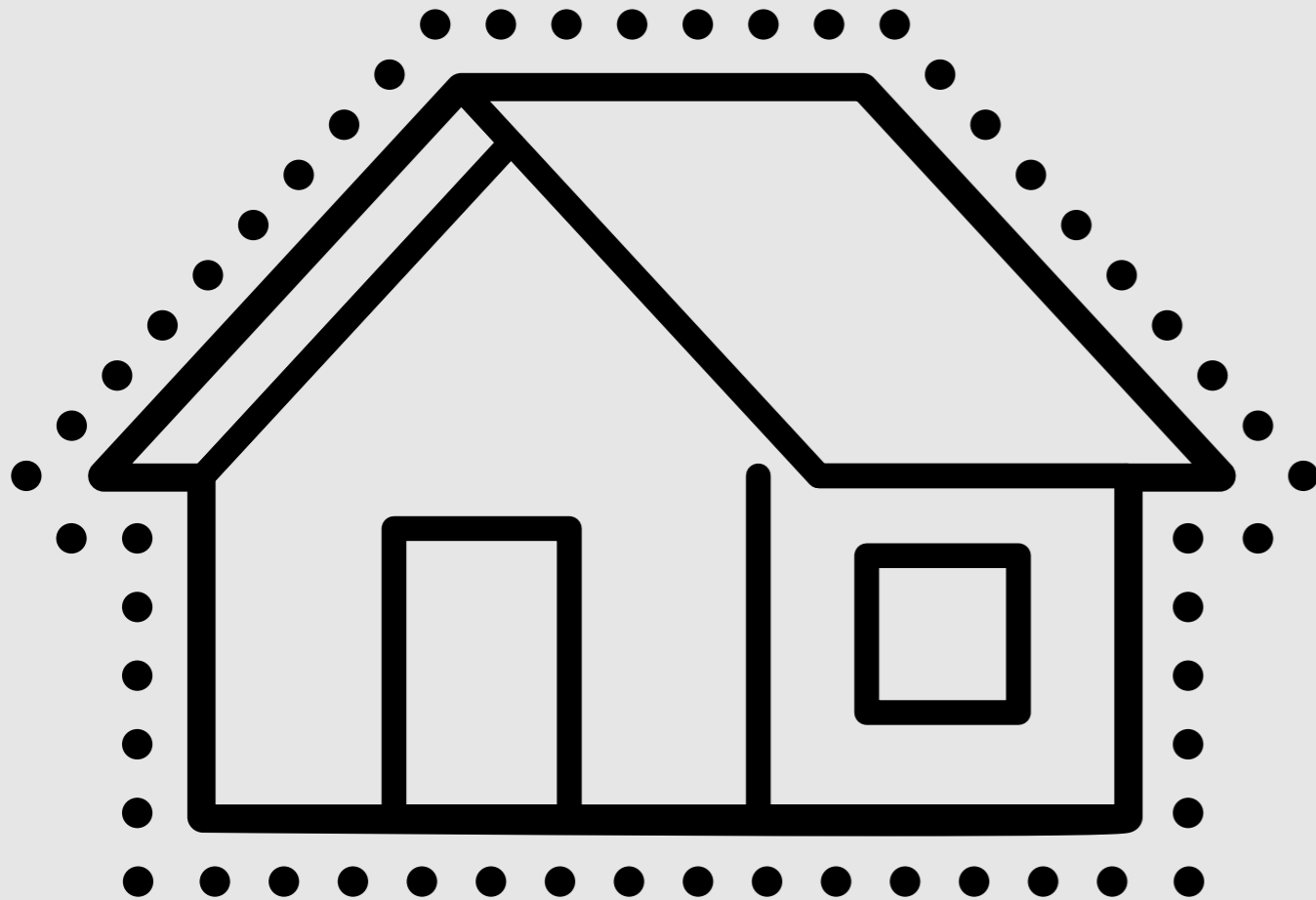
Higher levels of carbon dioxide in the atmosphere lead to more days when the pollen level is high. Pollen can worsen asthma, hayfever and other health conditions. It's possible to limit exposure through good design and air filtration.



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Part 2

Making your home resilient



Features of a resilient home

The home on the right shows some of the features you could include in your own resilient home.

You will find more detail about these features in this guide. You can apply them in a way that suits your household's unique needs and talk to your designer or builder about which to prioritise.

If you're building a new home




All the options in this guide apply to new homes. Planning them in from the start is the easiest and cheapest way to achieve a resilient home.

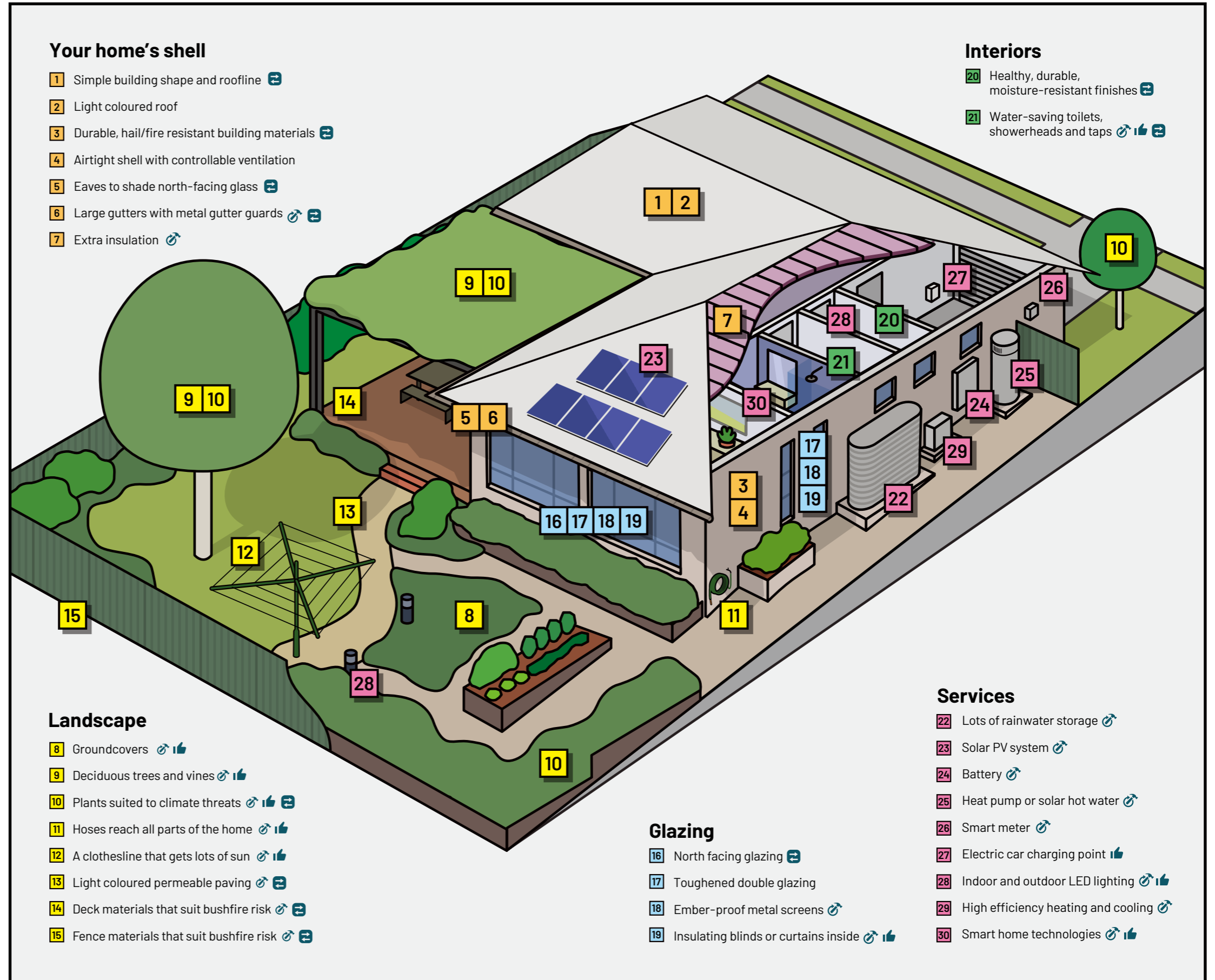
If you're buying off the plan

Don't be limited by what you see, ask your builder how the design can be customised to include these resilience features.

If you're already living in your home

Most of the resilience features described in this guide can be added to an existing home. Renovations or home improvements are a good chance to include them. Look for the symbol below.

	Practical to add to an existing home
	Quick win: cheap and easy to do
	Better choice: more resilient than the alternatives, but costs about the same



Your home's shell

- 1 Simple building shape and roofline
- 2 Light coloured roof
- 3 Durable, hail/fire resistant building materials
- 4 Airtight shell with controllable ventilation
- 5 Eaves to shade north-facing glass
- 6 Large gutters with metal gutter guards
- 7 Extra insulation

Interiors

- 20 Healthy, durable, moisture-resistant finishes
- 21 Water-saving toilets, showerheads and taps

Landscape

- 8 Groundcovers
- 9 Deciduous trees and vines
- 10 Plants suited to climate threats
- 11 Hoses reach all parts of the home
- 12 A clothesline that gets lots of sun
- 13 Light coloured permeable paving
- 14 Deck materials that suit bushfire risk
- 15 Fence materials that suit bushfire risk

Glazing

- 16 North facing glazing
- 17 Toughened double glazing
- 18 Ember-proof metal screens
- 19 Insulating blinds or curtains inside

Services

- 22 Lots of rainwater storage
- 23 Solar PV system
- 24 Battery
- 25 Heat pump or solar hot water
- 26 Smart meter
- 27 Electric car charging point
- 28 Indoor and outdoor LED lighting
- 29 High efficiency heating and cooling
- 30 Smart home technologies

Before you build

Think about your resilience priorities. Your priorities will depend on your location and the needs of your household.

- Are we in a bushfire or flood prone area? Find out in the information provided by the SLA or visit [www.act.gov.au/act/act-slavery](#). Your flood risk may also be influenced by local landscape features. Your designer or builder can advise you.
- How do site features influence comfort? For example, is the site exposed to high winds or is it protected? Is there good access to winter sun, or do trees or buildings overshadow the site?
- Is there a history of water restrictions? Knowing about this will help you understand the risk of extended dry periods and drought.
- Is anyone in the household at high risk? For example, people with respiratory conditions who are sensitive to smoke or pollen, babies or older people who are sensitive to temperature extremes.

IMPORTANT THINGS TO KNOW

- **The earlier you plan resilience in, the lower the cost of your resilient home.**
- **The right advice can save you money.** For the best quality resilient home at the least cost, choose designers and builders who understand resilience.
- **A resilient home could potentially mean a lower insurance premium.** Consider talking to your insurer about this.
- **If you're building in a bushfire prone area,** ask an accredited bushfire consultant for a bushfire risk assessment.

Get the right advice

It's important to get advice from qualified experts such as architects, building designers, builders, tradespeople and landscapers.

Getting the right advice early on can save a lot of time and avoid costly mistakes. Make sure your chosen professionals understand how to make the most of your climate and work with the advice in this guide.

Questions you might want to ask:

- How will this design keep us comfortable in Canberra's climate?
- What are the resilience features, and how will they benefit us?
- How does this home exceed the minimum standards required by regulation?
- How can landscape improve the resilience of our home?

Know the regulations

Regulations apply to the planning and building of new homes in the ACT. Your designer and builder should be familiar with them. You'll also find specific guidelines for your community on the SLA website.

If your block is in a Bushfire Prone Area, your home and garden must meet standards to reduce the risk of bushfire damage. These standards will depend on the Bushfire Attack

Level (BAL) rating for your site, which the SLA can tell you. The higher the level, the more protection you need.

While many of these regulations improve your home's resilience, it's important to remember they are the minimum standards required. There is always more you can do, and this guide will help you to add an extra layer of protection and long-term value.

Resilient design

Investing the time to get the design of your home right will give you the best value for your money.

If it's well designed and built, your new home is more likely to last a long time and remain cost effective to run and maintain. Take the time to read this guide and think through what you want before you

commit to a particular design or package. Talk to your designer or builder about how to achieve a resilient home that meets your needs. If you find an 'off the plan' design you love but it doesn't suit your block, talk to your builder about how it could be adapted. This could be as simple as flipping the plan (like a mirror image) or moving some rooms or windows around. You'd be surprised at what's possible with a little imagination.

IMPORTANT THINGS TO KNOW

- **Resilient design is basically good design.** All homes should be designed to work with the changing climate and protect the occupants from risk.
- **A design that suits Canberra's climate is essential.** It will provide year-round comfort, reduce heating and cooling bills, and help you cope with extreme weather.
- **Taking the time to think through your design before you build is well worth it.** It avoids costly mistakes and ensures the best outcomes for the least cost.
- **Home and garden design should be considered together,** so that they can complement each other.
- **Different blocks will need different designs** – make sure your chosen design makes the most of your block!

Until we moved here, we had no idea what a difference north facing living areas make. Thanks to good advice from our designer, our home feels light and sunny most of the day, and stays naturally warm for longer in cold weather. It's probably the best thing about our house and it cost us nothing.



Design that works with Canberra's climate

A good design works with your climate, making your home comfortable and cheaper to heat and cool. This has always been important, now the projected changes in the climate make it more so.

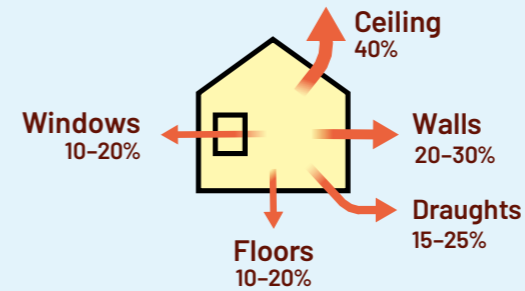
In the ACT, all new homes must meet a minimum star rating. More stars means you will be more comfortable, need less heating and cooling, and cope better with extreme temperatures. It's wise to exceed the minimum star requirement – go to 8 stars.

The tips in this guide will help you achieve a high star rating cost effectively. Your designer or builder may ask a professional energy assessor to model different design options to see which achieve the best results for your site.

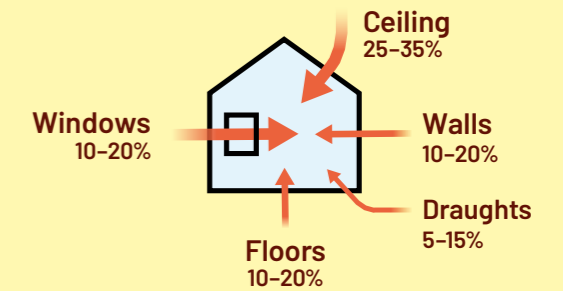
If you're buying off the plan, be aware that the rating depends not only on the design, but how it sits on your site in relation to the sun. Ask how the design could be modified to suit your site and achieve the best possible rating.

Where is heat lost and gained in a typical Canberra house?

Winter



Summer



Adapted from Actsmart Energy Saving Guide

A design that suits your growing, changing family

Consider how you'll make your home liveable and adaptable for people of all ages and abilities, including young children in prams, or older parents. Think about including features such as wider corridors, step-free pathways and bathroom walls that are designed to

accommodate grab-rails if you need them when you are older. These features don't cost much upfront but can be expensive to add later. You can find more about liveable, adaptable homes at:

Things to think about early on

If you're using a designer, they'll start by preparing some 'design concepts' for you to consider. This first stage of design is focused on the layout and shape of the home on your site, and some general decisions about construction materials. If you're buying off the plan the designs will have more detail. Either way, check your design against these tips:

- Keep the building shape and roof design simple to avoid embers catching during a bushfire or leaks in heavy rain.
- Design with Canberra's winter and summer extremes in mind. You'll need adequate summer shading, especially to west-facing windows and concrete floors.
- Avoid excessive glass, locate most glass on the north side and shade it in summer. Eaves are enough to shade the north side, additional types of shading are needed on the east and west.
- Ensure there's unshaded north-facing roof space for solar PV. Though most should face north, additional panels on the west and east can be an advantage. Panels should be angled to the sun so a sloping roof is ideal.
- Provide clotheslines with a northerly aspect for all-day sun, reducing the need for a dryer.
- Locate rainwater tanks on the south or west side of the house, or under floors or decks.

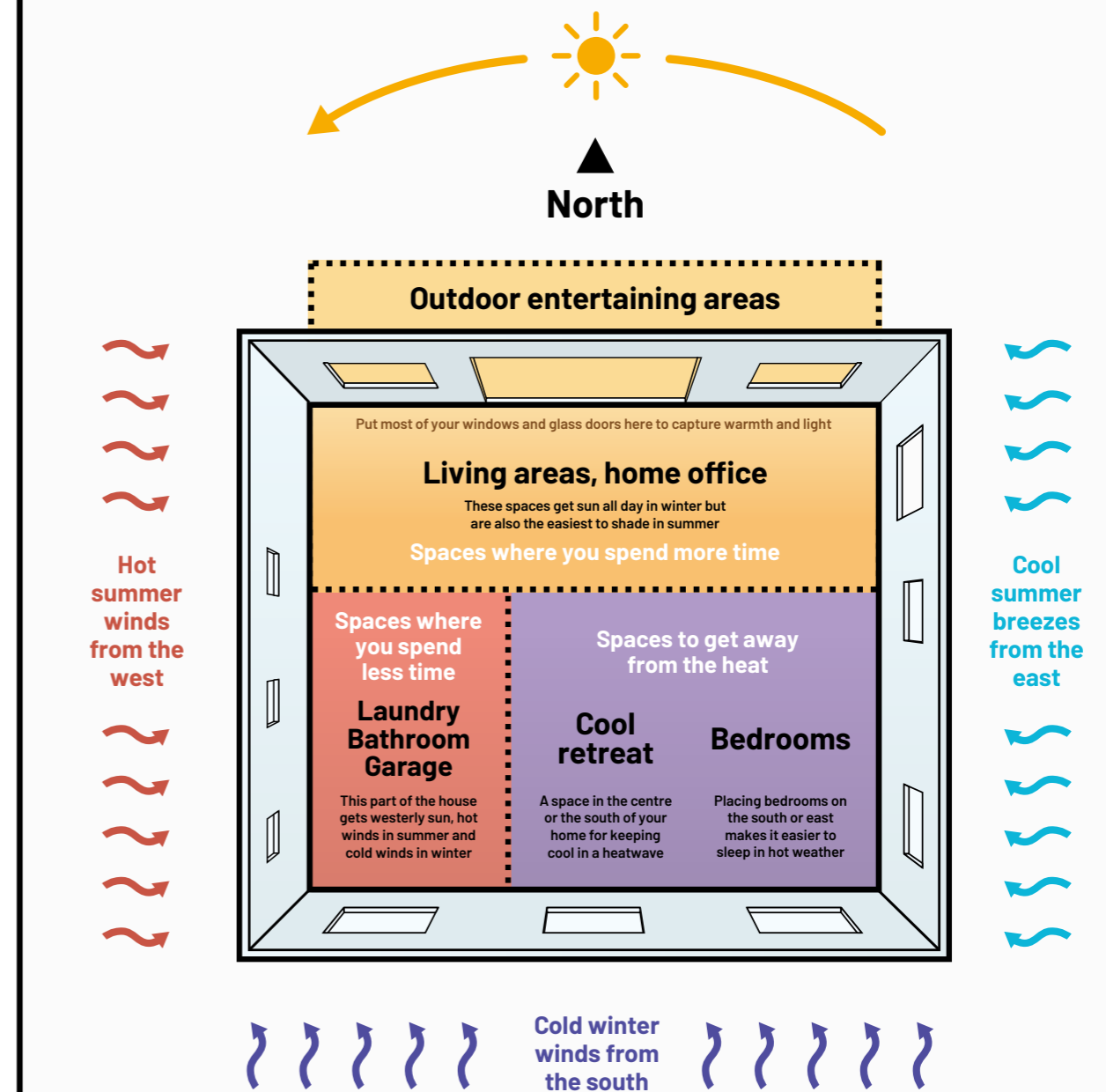


Bushfire Attack Level (BAL) requirements				
Higher BALs mean more restrictions – ask your builder or designer.				
Bushfire Attack Level (BAL) requirements	BAL: LOW	BAL: 12.5	BAL: 19	BAL: 29
Ember protection		●	●	●
Some limits on materials		●	●	●
Glazing requirements		○	●	●
More limits on materials			○	●

What goes where?

This diagram shows you how to arrange your home to suit Canberra's climate and make a huge difference to your comfort. This can be challenging on some sites, but a skilled designer can help you. Few sites face exactly north, but anywhere between 10° west of true north and

20° east of true north will work very well. Be careful: this guide refers to true north, which is different to magnetic north. In Canberra, true north is about 11.5° west of magnetic north.



Starting from the ground up

The first part of the building process is about preparing your block and laying the foundations for your home.

Essential services such as water, energy, stormwater, sewer and telecommunications are already installed in your community. You or your builder will simply need to arrange to connect these services to your home.

The SLA will provide details about your block, such as levels, slope, easements and an estimate of the likely excavation and fill required to build on your block. You'll also find information on bushfire risk, which may influence the design of your home.

Some building materials, like timber, are combustible, meaning they can burn easily in a fire. Others, like concrete, bricks and steel, are 'non-combustible' because they do not burn. Depending on your site's bushfire risk, there may be limits on which materials can be used, and requirements about glass and window protection.

Your garden can play an important role in making your home resilient. Design your garden to cool your home in summer and filter harsh winds in winter.

Earthworks and foundations

- Sloping blocks often need a split-level design for a cost-effective solution that works with the natural slope of the land. The SLA website has more advice about building on sloping land.
- You must have good site drainage to prevent flooding on rainy days. Sloping blocks will need to pay particular attention to drainage design. Landscape can help to improve drainage.
- Ground slabs are ideal in bushfire prone areas, as elevated floors can capture heat underneath them and create a fire risk.
- Enclose the area under elevated floors with non-combustible walls and access doors, or make sure the floor system and its supporting structure meet the relevant bushfire regulations.
- Insulate the edges of ground slabs and the underside of suspended floors to improve comfort and reduce heating bills. If your ground slab is heated, insulate it on the underside too.
- A tiled or polished ground slab can help make your home more comfortable if it is exposed to sun or another heating source. Doing this well requires expert knowledge or your home can overheat in summer.
- Build the groundwork (footings) for outdoor shade structures over decks or within gardens, even if you plan to include them in the future as summers get hotter. Shading can be adjustable or removable to allow winter sun through.

IMPORTANT THINGS TO KNOW

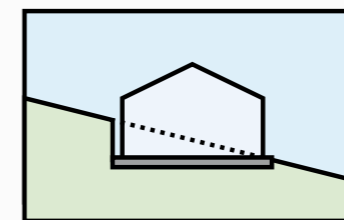
- **Make sure the design of your home suits your block**, taking into account its slope and the guidance in 'what goes where'.
- **Think about rainwater storage now**, so you can maximise storage capacity and put tanks in the most practical location.
- **Think about how landscape can make your home more resilient**, helping to manage heavy rainfall, cope in a drought, keep you cool in summer and reduce risk in bushfire prone areas.

Although landscape is often something that happens last, to get the most out of it you should begin planning at the start.

Amelia
Landscape designer

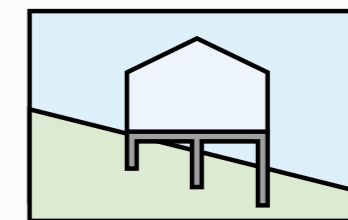


Designs for a sloping block



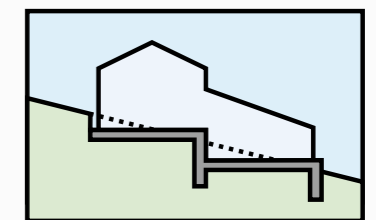
EXCAVATED

Excavation adds to cost and can lead to problems in heavy rain. You'll need to pay extra attention to drainage.



ELEVATED

Access can be more difficult. You'll need to insulate the sub-floor well, and enclose it in bushfire prone areas.



SPLIT LEVEL

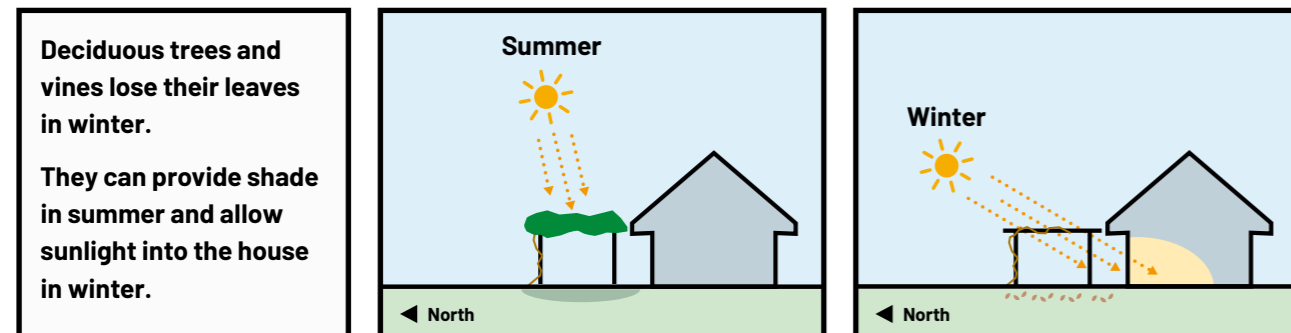
Usually the best solution on a sloping block in terms of practicality, thermal comfort and cost.

Water storage and reuse

- Build in extra rainwater storage (larger or extra tanks) to save water and increase resilience.
- Tanks can be above ground, under raised floors or decks, or underground. In bushfire prone areas tanks should be steel or concrete.
- Connect your rainwater tank to indoors (laundry, toilet) as well as to the garden to maximise the benefits you receive from it.
- Consider a greywater recycling system to cope with extended dry periods. Expert advice is required on its suitability and design.
- Use your plants to 'store' water, helping you to deal with flash flooding and stay cool in summer.

Landscape

- Use features that slow the flow of heavy rain, allowing it to soak into the ground, like swales (sunken planted areas), permeable paving and pebbles.
- Minimise concrete and paved surfaces to reduce heat on hot sunny days. Keep hard surfaces light in colour and maximise planted surfaces, including on walls and fences.
- Use shade trees and planted pergolas to keep your home cool in summer, bushfire regulations permitting. In Canberra's climate, deciduous trees or vines that lose their leaves in winter are ideal, so your home can enjoy winter sun.
- Use LED or solar powered garden lights. Wire them at the same time you wire indoors.
- **Tips for bushfire prone areas:**
 - Don't plant tall trees near the house. Some plants resist or even slow down fire. Talk to your landscaper or local nursery about using them as a firebreak.
 - Use non-combustible decking and metal or masonry fences. Avoid using brush or timber.
 - Ensure you have multiple taps with hoses so you can reach all parts of your home. Long hoses are easily damaged by heat and fire.
 - Use non-combustible garden mulch like pebbles, shells and gravel. Mulch keeps your soil and plants hydrated in dry weather.



If you've bought a new block in the ACT, you're entitled to free plants

Contact the ACT Government's Yarralumla Nursery to make an appointment.

Everyday Climate Choices

This website provides advice about water efficient gardens, designing for your micro-climate, creating a firewise garden and more.

Gawari Ngilanmanyin

This detailed guide draws on wisdom from Traditional Custodians of Ngunnawal Country and covers planning, design, construction and maintenance of a climate-wise garden in Canberra. It has been written for landscape professionals and homeowners alike.

Choosing the right plants

Choose plants suitable for the Canberra climate, combining drought-tolerant plants, plants that cope with heavy rain, native Australian species to support bees and wildlife, and edible plants. Plant selector helps you search for plants that suit your needs and find out more about them.

Climate Wise Garden Design

This guide provides tips for creating the perfect garden in Canberra's climate, with sample designs and species lists.

Plant a Tree in Your Canberra Garden

A practical guide to choosing the right tree.

Designing your garden to retain water can provide your plants with access to moisture during water restrictions and droughts.



Your home's shell

The building shell is the protective barrier between you and the weather: the walls, roof and floor of your home.

Paying attention to the building shell is essential to making your home resilient. A well designed building shell is airtight, watertight, well insulated and built with materials that suit your climate and level of bushfire risk.

In an airtight home, unintended air leakage through the building shell is minimised. This prevents embers, smoke or pollen getting inside and helps to keep you comfortable in extreme temperatures.

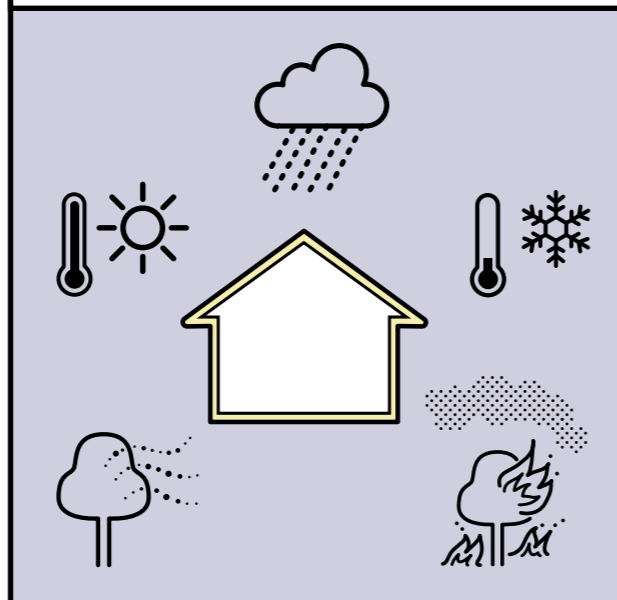
There must be good enough ventilation to keep you healthy and reduce the risk of water condensation and mould. In airtight buildings, this is achieved by fans, air conditioning or mechanical ventilation heat recovery systems for very airtight 'passive' homes. Relying on open windows isn't practical in Canberra's extreme weather or during bushfires.

While an airtight home is not necessary in all parts of Australia, it is advisable in Canberra. A watertight home is important in all circumstances, and even more so as rainfall intensity increases.

IMPORTANT THINGS TO KNOW

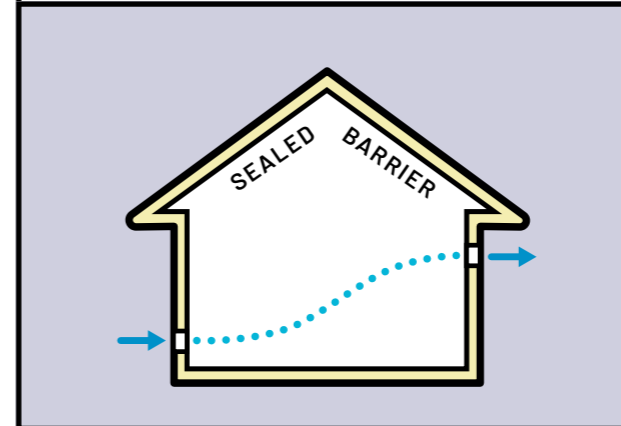
- **Always think of resilience when choosing building materials.** For example, resistance to fire and hail, ability to keep your home cool in a heatwave.
- **Choose designers and builders with a quality track record.** It takes skill to design or build a home that can be well sealed when required, whilst maintaining healthy ventilation and avoiding condensation. Ask to see past projects.
- **Good waterproofing and drainage is critical,** especially with the increased likelihood of intense rainfall. Gutters and downpipes need to be bigger, and properly connected to the drainage system.

A well designed shell protects you from dangerous or uncomfortable conditions outside your home

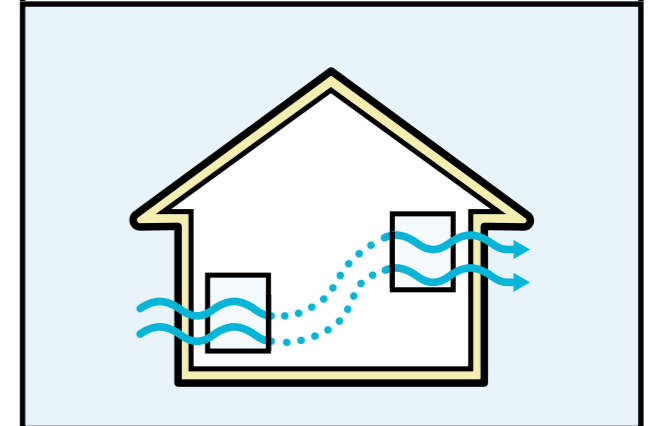


Making the building shell airtight and watertight

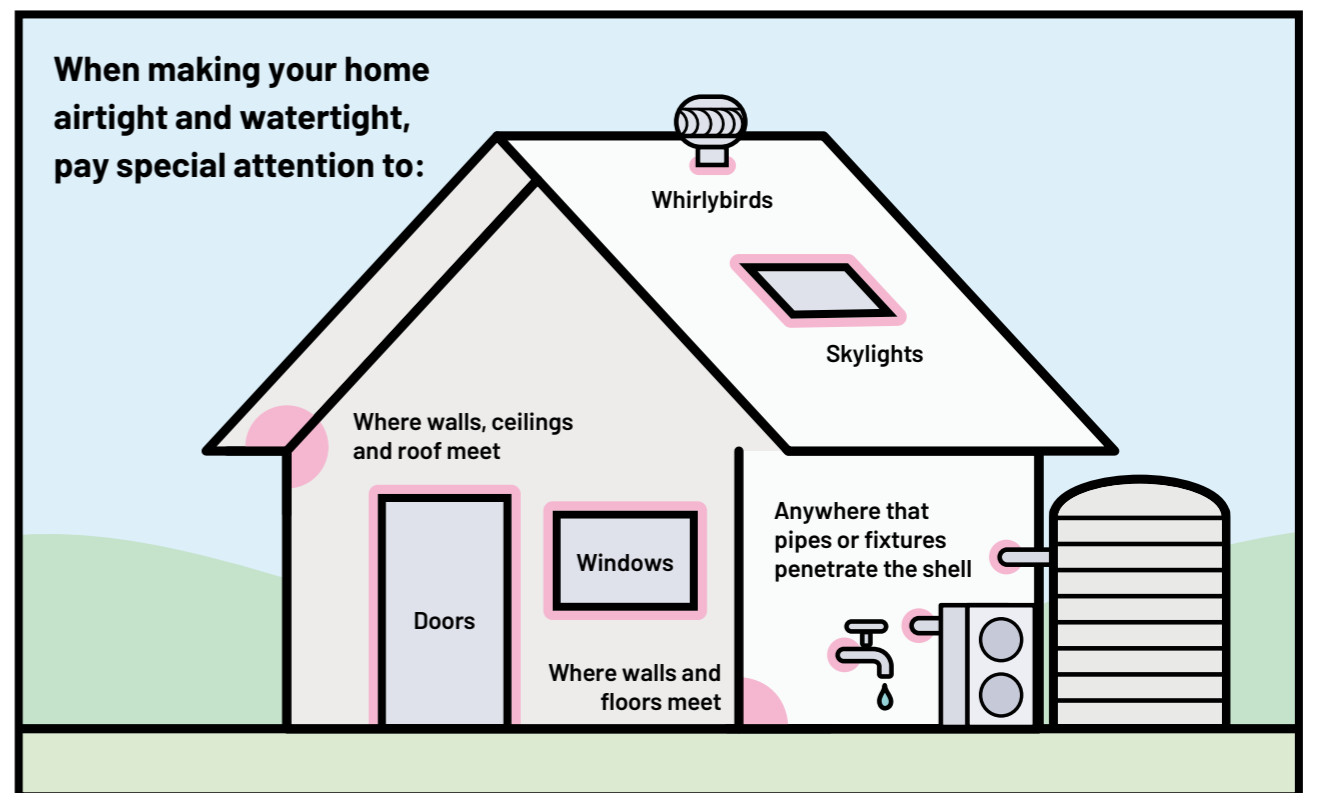
A ventilation system provides fresh air when you need to seal your home



You can open windows and doors to maximise airflow in good weather



When making your home airtight and watertight, pay special attention to:



- Include ventilation systems such as extractor fans with draught stoppers, air conditioning or mechanical ventilation heat recovery systems. Ventilation relying on open windows isn't practical in Canberra's winter or during fire season.
- The enclosed space inside your roof should also be ventilated in summer to stop heat building up, but able to be sealed in winter, using automated fans or closable roof ventilators.
- When renovating, take the opportunity to install appropriate membranes and insulation behind cladding and beneath roofing that's being replaced.
- Renovations provide a good opportunity to install or upgrade ventilation systems and add or replace insulation.
- Make sure your designer and builder have paid attention to good waterproofing and drainage design, including adequate waterproof barriers (flashing) in roofs, walls and around vents and penetrations. Consider engaging a waterproofing specialist to check these details in your plans before construction.

Condensation

If air can't escape, neither can the moisture in the air from activities like showering and cooking. Warm moist air condenses into water on cold windows, walls or ceilings. This can lead to damp, rot and mould. You can avoid this with good design, including careful choice of building membranes, insulation and ventilation systems.

The diagram shows a room with a window on the left. A dotted line labeled 'moisture in warm air' starts from the window and moves towards the ceiling and walls. On the window, there are blue droplets labeled 'Damp' and 'Mould'. On the ceiling and walls, there are green spots labeled 'Mould' and blue droplets labeled 'Damp'.

Insulation

Insulation reduces heat flow through the building shell. In Canberra, it's wise to exceed the minimum requirements for insulation. Thermal bridges are pathways for heat transfer through the building shell, often through metal building frames and window frames. They can reduce insulation's effect and cause condensation. Good design can minimise thermal bridges.

Thermal bridges can run through metals and other heat conductive materials in the building shell. They can cause heat loss in cold weather.

The diagram shows a cross-section of a wall. On the left is a yellow area labeled 'WARM' with a cat. On the right is a blue area labeled 'COLD' with a moon. The wall consists of an 'Insulated wall' (pink), a 'Thermal bridge' (blue), and another 'Insulated wall' (pink). Arrows show heat flowing from the warm side through the thermal bridge to the cold side.

Roof and gutters

- Ensure gutters and downpipes are sized large enough to cope with heavy rainfall.
- Include metal gutter guards to prevent leaves building up and save time spent cleaning gutters. Leaf build up is a risk during bushfires and can cause problems in heavy rain.
- Choose durable, hail and fire resistant roofing, such as metal sheeting or composite materials designed to resist impact and fire. You can compare a product's ratings for hail impact resistance and fire resistance.
- Use light coloured roofing to minimise heat gain in the roof space. Ask your supplier for the solar absorptance value of your chosen roofing product, which should be less than 0.5. Consider specially designed 'cool' roof materials and coatings to reduce heat build-up in hot weather.
- In some locations you might consider strengthening the roof structure and its connection to the ground, building to a higher 'wind-loading' than is required. Bushfires and storms can generate high-wind conditions.
- In bushfire prone areas avoid combustible material in roofing and roof cavities, for example, fascias, eave linings, framing, battens and insulation. How critical this is will depend on your BAL, your designer can advise you.

The diagram shows two houses. The first house has a simple roof with a tree in front. The second house has a box gutter and a tree in front. An arrow points from the first house to the second, indicating a transition or comparison.

Simplify your roof to prevent leaves building up and blocking drains or igniting

The diagram shows two houses. The first house has a box gutter and a tree in front. The second house has a simple roof and a tree in front. An arrow points from the first house to the second, indicating a transition or comparison.

Avoid 'box' gutters, which are more likely to leak and allow leaves to build up

In a bushfire, 90% of homes are lost due to burning embers. Embers can travel far and enter homes or ignite debris on or around homes. Good design can reduce these risks.

Solar absorptance

Solar absorptance is the amount of heat from the sun absorbed by a material. Dark coloured materials absorb heat from the sun and light coloured materials reflect it. Solar absorptance is expressed as a ratio between 0 and 1: the lower the number, the less heat is absorbed.

Darker building materials

The diagram shows a house with dark building materials. A sun is shown with arrows pointing towards the house, and a label indicates 'More heat build up'.

Lighter building materials

The diagram shows a house with lighter building materials. A sun is shown with arrows pointing towards the house, and a label indicates 'Less heat build up'.

Glazing

Glazing is windows, glass doors and skylights, including the glass, frames and sills.

- Use the right amount of glazing for Canberra's climate (don't overdo it), have most of it facing north, and make sure it's shaded in summer.

- Doors and windows must seal well when closed, to keep the home comfortable and avoid drafts or embers getting in.
- Choose energy efficient glazing for a real impact on comfort and energy bills. Double glazing provides good benefits in Canberra. Look for the Window Energy Rating label on your product. Windows should have at least 4 heating stars—ideally more. The rating is for the whole product, including frames.

- Use high performance toughened glass or protective shutters for glazed areas of your home that are exposed to hail or high winds, or if you are in a bushfire prone area.

In bushfire prone areas

- Use fire resistant or non-combustible frames and install mesh or shutters over glazing consistent with the requirement for your bushfire attack level (BAL).
- Shutters must protect the entire opening including frames and sills.
- Metal flyscreens can prevent embers entering. Mesh must be fine (openings of less than 2mm), and should not be made of plastic or fibreglass.
- Design window sills with a steep enough slope to keep debris from collecting that could be ignited by embers.

Walls

- Increase insulation levels above the minimum requirement to improve comfort during temperature extremes. Use at least R 2.5 for walls and R6 in ceilings.
- Choose non-combustible wall materials in bushfire prone areas, including non-combustible insulation, cladding and membranes.

- Seal all gaps larger than 2mm to prevent ember attack in bushfire prone areas. You can use fine aluminium mesh for vents and weepholes (in brick) and sealant or strips for wall joints.
- Your Home has more information about design and home improvements in bushfire prone areas.

Making your home resilient

Services

Services are all the electrical, plumbing, heating and cooling systems in your home. This section explains how to choose options that cost you less to run, and how to protect services from damage or failure in emergencies.

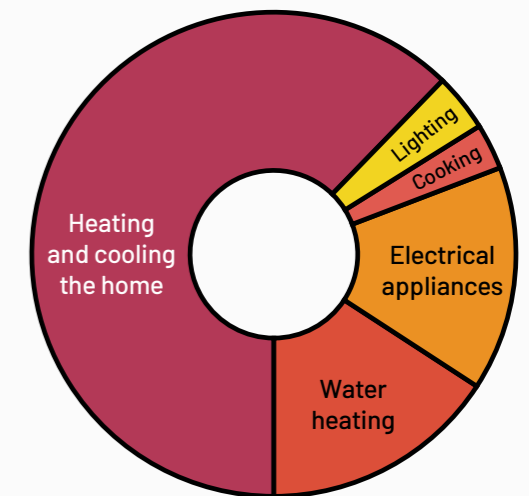
The Suburban Land Agency is committed to achieving zero-emission suburbs and precincts in Canberra. You'll be provided with the infrastructure to achieve an all-electric home. This saves you the cost of gas connection, plumbing and usage, as well as the health risks associated with gas combustion. It also sets you up to achieve a zero-emission home in the future, energy efficient and powered by renewable electricity from your solar PV or the grid.

IMPORTANT THINGS TO KNOW

- **Solar PV doesn't automatically provide power during a blackout**, but it's possible with the right system design.
- **Smart home technologies can reduce electricity bills** by helping you to understand and manage your household's energy use.
- **You can stay comfortable during a heatwave or a cold snap** without your electricity costs skyrocketing by choosing the right heating and cooling systems and operating them in a smart way.
- **Financial incentives may be available to reduce the cost of installing solar PV and energy-saving technologies.**

Where is energy used most?

This is how energy is used in a typical Canberra home. Your use may vary, but it gives an idea of which changes can have the biggest impact



Adapted from 'actsmart energy saving guide'

Solar PV

The solar panels on your roof are part of a solar photovoltaic (PV) system that generates electricity from the sun. Installing solar PV reduces your power bills and increases your resilience to rising energy costs. When the sun isn't shining, the electricity grid or batteries can provide backup power.

- Before installing solar PV, make your home energy efficient so the solar electricity you generate goes further towards meeting your needs.
- The Clean Energy Council provides advice about choosing the right system for your household.

- To prevent hail damage to panels, choose good quality brands that adhere to Australian Standards, which are designed to withstand medium-sized hailstones. You can also purchase protective covers that can be put on before a hailstorm approaches, but the panels will not work when the covers are on.
- If you're not including batteries, ensure your PV system is designed to easily accommodate them later when their costs decrease, and follow the energy management tips in this guide.

Batteries

Batteries store the electricity generated by your solar PV for later use when you need it, helping to bring down electricity costs.

- To retain power in a blackout, choose a battery with 'blackout mode', paired with a hybrid inverter. You can power the whole house but this may drain the battery, or your installer can isolate circuits to supply power to essentials. Solar PV with batteries is not reliable enough for those who depend on essential medical equipment.
- Batteries can present a fire risk and their installation must comply with safety regulations. A typical unit can be located on the wall or floor, out of direct sun.

Choose a Solar Retailer who is approved by the Clean Energy Council and uses accredited designers and installers. Get a few quotes for comparison and read online product reviews before you make a decision.

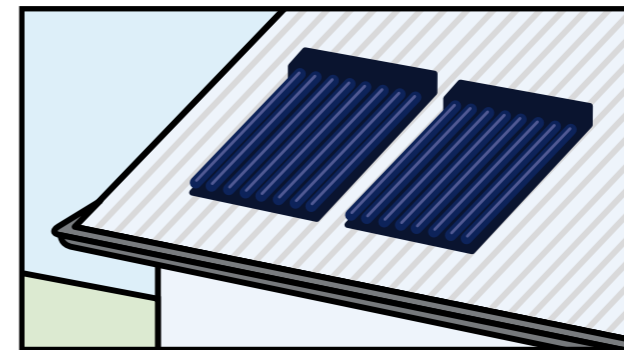


Hot water systems

Install an energy efficient hot water system, such as a high efficiency heat pump or high performance solar hot water system. This may cost more upfront but will save money over time.

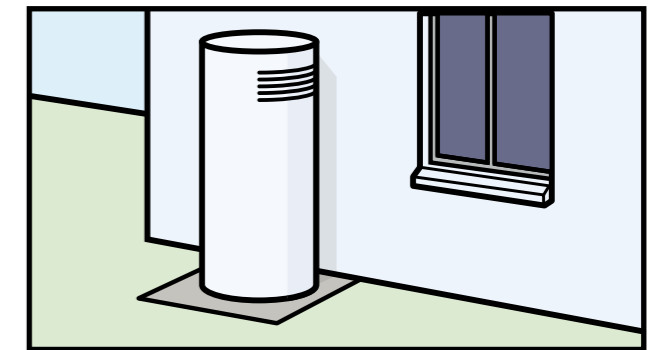
Solar Hot Water

Solar hot water needs north-facing rooftop collectors. Evacuated tubes are the best for Canberra's climate. Solar hot water can't provide all your needs and is boosted with gas or electricity.



Heat Pump

Heat pumps don't need roof collectors or direct sun, but do need good airflow around them. They can be noisy, don't put them near bedrooms. They have very low running costs when used with solar PV.



Choose energy efficient LED lighting to reduce your energy use and make the most of any solar electricity you generate

Electric Vehicles

The sale of petrol and diesel vehicles will be phased out in the ACT by 2035. Electric vehicles (EVs) will soon be the norm, as their cost decreases and model choice improves. Whether you own an EV or not, preparing your garage now for easy, safe charging will save time and hassle later on.

An EV can help protect against rising fuel costs, especially if you charge it from your solar PV. EVs

also help improve local air quality and reduce your greenhouse gas emissions compared with a vehicle that uses petrol or diesel.

Include the wiring for EV charging in your carport or garage. This requires a dedicated 32 amp circuit with a 15 amp powerpoint. Label the powerpoint, isolator and circuit breaker as 'EV charging point'.

Heating and Cooling

- First, ensure that your house has a high star rating. This will reduce the amount of time you need to use heating or cooling.
- Choose systems with settings that allow you to only heat and cool the areas you are using.
- High-efficiency reverse cycle air conditioners or hydronic systems are a good fit for Canberra's climate, and provide both heating and cooling.
- Very airtight homes use mechanical ventilation heat recovery (MVRH) systems, which run continuously but don't use much energy.
- Ensure air conditioners have a high energy rating for Canberra's climate.
- Locate the outside part of a reverse cycle air conditioner in a shaded location so that it operates more efficiently.

Air filtration

A HEPA filter is the best way to filter out fine particles, such as smoke, pollen and mould spores. HEPA filters can be fitted to the MVHR systems used in very airtight homes, but they increase the system's power consumption and the filters need regular cleaning or replacement. This may be warranted for households with sensitivities. HEPA filters aren't compatible with the typical air conditioning used in homes (the airflow is too high for the HEPA filter to work properly). The typical filters used in domestic air conditioners will capture around 10% of smoke particles, higher quality 'F6' filters will capture around half.

Plug-in air purifiers are probably the best solution for most people during bushfires or pollen storms. A typical home may need several, operating continuously if your home is very leaky. An airtight home with good filters in the air conditioning will reduce your reliance on your air purifier.

Electricity metering and management

All new homes are provided with 'smart' electricity meters that provide information you can use to understand and manage your electricity use. This information is usually accessed through an app, web portal or in-home display. Smart meters also give you access to different electricity pricing packages. If you don't have a smart meter, your energy provider can install one at no cost. It's very important to select the right pricing package for your needs.

Consider 'smart' home technologies to manage your energy use. These range from simple 'plug and play' options to 'whole of home' systems. Whole of home systems may need wiring, so consider their needs before you wire your home. Make sure wiring connects to all phases of your PV system and all inbuilt energy systems.

In flood prone areas, raise vulnerable equipment such as electricity meters, batteries and inverters (follow their installation requirements).

Making your home resilient

Interiors

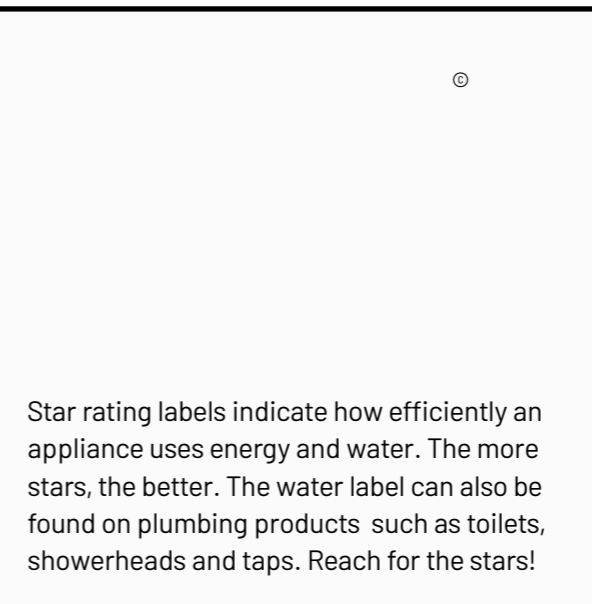
The choices you make about your home's interior design can also contribute to its resilience, cost effectiveness and comfort.

Materials and finishes used indoors, such as cabinets, flooring and paints, can have an impact on the air quality inside your home. Some release low-level fumes that can cause or worsen respiratory problems and are toxic when heated or burned.

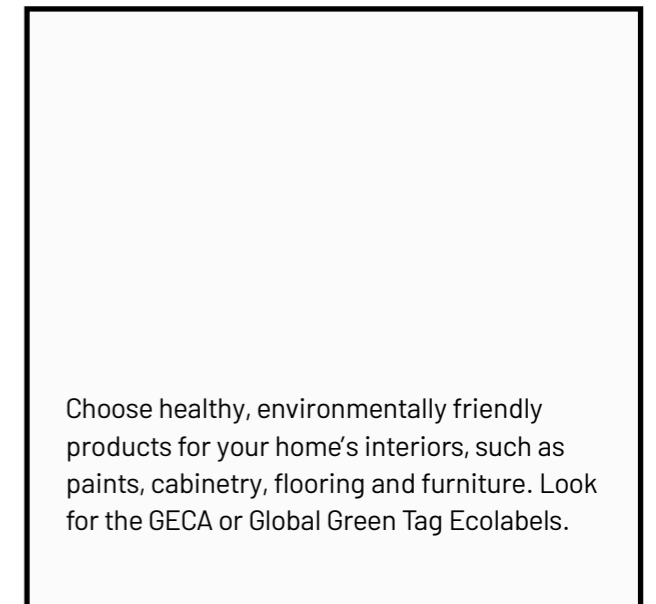
Gas heating and cooking has been linked to health risks including asthma and other respiratory issues. All-electric homes deliver better indoor air quality.

Choosing appliances and plumbing fixtures that use energy and water efficiently is also important, and can considerably reduce your utility bills.

- Choose durable, low-maintenance products. For example, tiled or polished concrete floors, moisture-resistant cabinetry.
- Avoid hard-to-clean carpets or furnishings. They harbour dust, mould and allergens.
- Add tightly fitted honeycomb blinds or heavy curtains with pelmets to windows, to reduce heat loss in cold weather. Blinds to reduce summer heat gain are also available, but external shading is a much more effective way to do this.
- Indoor plants can improve indoor air quality. Ask your local plant nursery for guidance on the best plants for this purpose.
- Induction cooktops are the fastest and most energy efficient cooking method, and will need a dedicated electrical circuit – so think this through when your home is being wired.



Star rating labels indicate how efficiently an appliance uses energy and water. The more stars, the better. The water label can also be found on plumbing products such as toilets, showerheads and taps. Reach for the stars!



Choose healthy, environmentally friendly products for your home's interiors, such as paints, cabinetry, flooring and furniture. Look for the GECA or Global Green Tag Ecolabels.

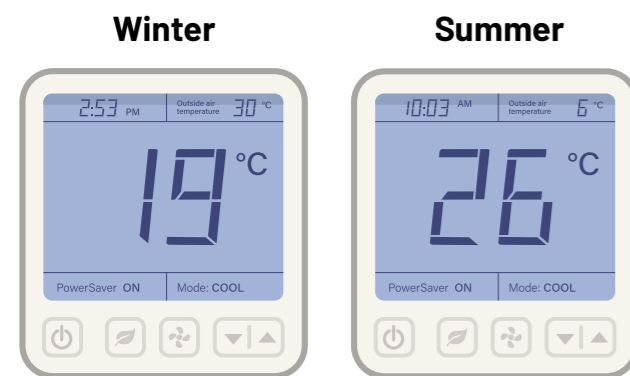
Making your home resilient

Living in your resilient home

A resilient home works best when you know how to make the most of it. Here are some tips for everyday living.

Stay comfortable and save energy

- In winter, open your curtains or blinds to let in daytime sun, and close them when the sun goes down. Wear extra layers of clothes indoors.
- In summer, adjust external shading to keep windows fully shaded. Open windows at night to let in cool air and close them in the morning.
- Only heat or cool rooms you're using, and close doors to unused rooms. Turn fans off when you're not in the room (they cool you, but not the room).
- Heat or cool your home to suit the season:



Reduce energy and water bills

- Have short showers: three to five minutes is ideal.
- Use the cold setting on your washing machine: in a typical heated cycle, 90% of the energy is used to heat water and only 10% to wash your clothes. Wash with a full load on economy cycle.
- Dry clothes on a clothesline rather than in a dryer, this saves money and is better for clothes.
- Locate your fridge and freezer in a cool and well ventilated spot, check the door seals are in good condition and working properly.
- Turn off appliances at the power point when you're not using them, and use power saving settings on computers, televisions and game consoles.
- Fix plumbing leaks as soon as possible. A barely visible leak can waste over 4,000 litres a year, a dripping tap over 12,000 litres a year.
- If you have a pool, operate your pump and chlorinator in the afternoon and invest in a good quality pool cover.

If you have solar PV

- Use appliances like washing machines and dishwashers between 10am and 3pm (the 'solar peak') when your PV is generating the most free power. Use delay timers if you won't be home.
- Turn on heating or cooling for a few hours during the solar peak so your home is comfortable when you return in the evening, then turn it off. This works best in homes with a high star rating.
- Schedule pool pumps and electric storage hot water systems to run during the solar peak.

Building a resilient community

Resilience goes beyond your home and the people living in it, it's also about having a supportive community around you. There are everyday benefits, like making new friends, feeling settled and safe in your new home, and feeling like you belong. A supportive community can also be a lifeline during

an emergency and help you get back on your feet afterwards. The people most likely to help you in an emergency are your family, neighbours and friends. There are many ways to get to know your community through activities, events and volunteering. Find the opportunities that match your needs and interests.

The Mingle team helped us to come up with some great ideas for our community. From playgroups to market stalls and walking groups, there's something for everyone!





Part 3

Responding to threats

Responding to threats

Prepare in advance

A resilient home can improve your peace of mind, knowing you're better equipped for any surprises the weather might have in store.

If you have followed the tips in 'making your home resilient', you're already ahead. If not, many can be done as part of simple home improvements.

The following pages help you prepare for extreme weather. Planning ahead is the best way to keep your family and home safe and make sure you have everything you need in an emergency.

Our safety is the main priority and so we decided we'd leave rather than stay in a bushfire emergency. Knowing that our home is built to be resilient makes it easier to leave.

Deni
Resident



Things to do now

Understand your risks

Think through the risks to you and your family. This depends on where you live, how resilient your home is (for example, can it keep you cool in a heatwave?) and who lives in your household. Young children, the elderly, pregnant women and people with medical conditions can be more vulnerable to risks like heatwave and smoke. They can also be harder to evacuate in a hurry. Your ESA survival plan will help you think through and plan for these risks.

Learn information and skills

The ESA website has many resources to help you be prepared. It's a good idea to get familiar with them in advance. You might also consider downloading apps or subscribing to social media feeds that could help you during a disaster or health emergency. You'll find these in your ESA survival plan and on the following pages of this guide. Learning first aid is also valuable preparation. There are several course providers in Canberra and you can book online.

Review your insurance

Know the climate change risks relevant to your location, review your insurance very carefully with this in mind and consider getting professional advice. Be clear about the risks you're covered for, what you can claim and the excesses you are liable to pay. It's common for Australians to be underinsured, making it difficult to rebuild or replace items to the same standard after a disaster. The Insurance Council of Australia provides calculators to help you estimate the cost to rebuild your house or replace its contents.

Make a maintenance checklist

Some things are best done regularly, rather than in a rush when a threat approaches. Make a checklist of regular items, for example, clearing out gutters, replacing any damaged roof tiles, cutting back overhanging trees, removing dead branches, mowing grass, sealing gaps in external walls, making sure smoke alarms are working.

Check heating and cooling equipment is in good working order at the start of the season. In bushfire prone areas, avoid storing combustible items under the house or in attics, and keep pool chemicals and BBQ gas bottles away from the house.



To keep up to date, you might want to follow the social media feeds of local emergency services

Your survival plan

It's important to have a plan ready for what you and your family will do in an emergency. This should be done well in advance, so you can take time to think it through carefully.

To make your survival plan, use the link below, download a copy, discuss it with your family and fill it out together.

A survival plan guides you to decide what you'll do in the event of bushfires, extreme heat, storms and floods. It shows you how to get prepared and find the information you'll need during an emergency.

You'll also find survival plans in Arabic, Punjabi, Chinese and Vietnamese:

Your emergency kit

Put together a kit that will help you survive and recover during an emergency.

Items might include:

- Food and water
- Warm, waterproof clothing, shoes
- Torch, radio and batteries
- Device chargers
- Prescriptions and medications
- Cash and important documents
- First aid kit

For a full checklist that you can customise to your household's needs, see:

When a threat approaches

Bushfires may be in the region, or the weather forecast may be warning of heavy storms, hail or other extreme weather. Stay informed and monitor

the warning system, which provides information on the expected impact and consequences of hazards, and advice on what to do.

	<h3>Advice</h3> <p>An incident has started, but there is no immediate danger. Stay informed by listening to local radio, news reports and following weather apps and social media. It's wise to follow more than one source of media information.</p>
	<h3>Watch and act</h3> <p>There is a heightened level of threat. Conditions are changing. Have your survival plan and emergency kit at hand, and start preparing now to either leave or take shelter. Monitor the situation by following the ESA website, listening to local radio and checking the other sources listed opposite.</p> <p>Check in with neighbours to make sure they're aware of the warning. Discuss your emergency plans and how you might be able to help each other.</p>
	<h3>Emergency</h3> <p>You may be in danger, and you need to take action immediately. Any delay puts your life at risk. See the following pages for what to do in an emergency.</p>

The ESA website is the primary source of information on being emergency-ready in Canberra. You'll find local alerts, news, survival plans and other resources to help you prepare for bushfires, storms, floods and heatwaves.

The Bureau of Meteorology is another good source of information about severe weather warnings. The Bureau of Meteorology's 'BOM Weather' app can provide notifications for your location direct to your device.



These Fire Danger Ratings are used across Australia. They indicate the potential level of danger should a bushfire start. The levels range from minimal risk (the white wedge) to catastrophic, and there are actions for each level so you know what to do.

This site provides a 6 day forecast of pollen levels in the air in Canberra. If you suffer from hay fever or seasonal asthma, remain indoors as much as possible when levels are high, keeping windows and doors closed. Follow your asthma or allergies treatment plan and have your medication at hand.

Local radio is another good way to stay updated when threats are approaching. You can also follow the ESA, Fire, SES and Police on social media and download the Bureau of Meteorology's 'Fires Near Me' app. If you're preparing to leave, you may want to monitor

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What to do in an emergency

Getting emergency help



In a life threatening emergency, call Emergency Triple Zero for Police, Fire or Ambulance:



In a bushfire, storm or flood, the best source of up-to-date information is the ESA website:



If a storm has damaged your property or a tree may fall (or has fallen), call the ACT SES for help:



Health Direct provides non-emergency health advice. This service is free and available 24/7:

Getting back on your feet

Recovery after a disaster takes time and can be challenging on many different levels, but you don't have to go it alone. Once the immediate threat

is over, it's very normal to experience mental and emotional distress in the aftermath. Here are some practical tips to assist you on the road to recovery.

AFTER A DISASTER

A serious disaster can catch even the best prepared person off-guard. It's normal to feel overwhelmed, frightened and confused. It's important to know there is support available. Below are some tips for staying safe immediately after a disaster.

- **Be sure the threat has passed.** Listen to local radio and follow the advice on the ESA's website or social media feed.
- **Contact family, friends and neighbours.** Let them know you're OK and check that they are OK too.
- **Wait for the all-clear to return home.** Do not enter disaster areas or damaged homes until you have confirmation from authorities that it is safe to do so.

Returning home after a bushfire

- Check inside and outside for burning embers, including in the roof cavity and under the house.
- Wear protective clothing before entering your property. Try to avoid taking children with you.
- Avoid disturbing ash or dust. Burnt treated timber, gas cylinders and garden chemicals require special care during handling and disposal.
- Don't use your rainwater tank if there is debris or ash in it.
- Open up damaged or smoky homes to sunlight and fresh air.
- Some people are more at risk of health issues during a bushfire or when exposed to smoke.

Returning home after a storm

- Don't drive a water-damaged vehicle.
- If your roof is damaged, advise your insurer right away so they can arrange emergency work to minimise hazards and further damage.
- Remove water or mud-damaged goods that may pose a health risk, such as soggy carpets.
- If water has entered the house, ask an electrician to check wiring and wet electrical equipment (don't turn it on until it has been checked).
- Don't touch hail-damaged solar panels as they can still generate voltage. Call a licensed professional.

Practical tips for recovery

- Take photographs of the damage to your property and make a list of damaged items (with brand, model and serial number where relevant).
- Contact your insurer as soon as possible to lodge a claim and seek guidance on the claims process. If you can't find your papers, they'll have records.
- Get your insurer's pre-approval for emergency repairs, or they may not be covered by your policy.
- Be aware of fake tradespeople. Don't rush into a decision or pay cash upfront.
- If your home is unsafe to live in, tell phone and utility companies. Check if you can claim temporary housing expenses on your insurance.
- You may be eligible for government support and free financial counselling after a disaster:

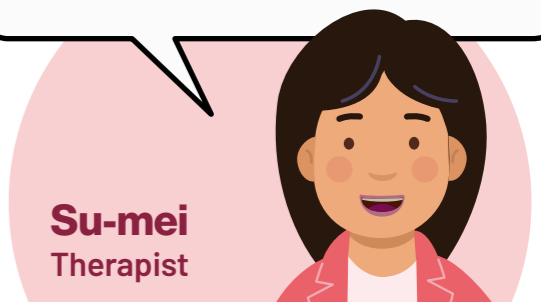
Taking care of yourself and others

It's important to take care of yourself and your family after a disaster. Put your wellbeing first.

Seek professional help to deal with panic attacks, thoughts of self harm or feelings of hopelessness.

Volunteering after a disaster can lessen anxiety, build community and restore purpose and optimism.

Normal reactions to a natural disaster might include feeling numb, anxious, tearful or overwhelmed. If these persist or affect your ability to function, talk to your GP or mental health service provider.



About the SLA

The Suburban Land Agency (SLA) is committed to creating great places where communities thrive.

We deliver sustainable urban environments and new suburbs that bring people and businesses together, and help our community and natural environments thrive. Our developments aim to balance social, economic and environmental benefits for all Canberrans.

Climate change is already presenting numerous challenges through more intense and frequent weather events. Improving the resilience of our communities and homes will help Canberra withstand these challenges and improve our ability to respond to change.

Visit our website to learn how the SLA's Sustainability Strategy supports our work.

Written by the Institute for Sustainable Futures at the University of Technology Sydney. Visual Design by Parallel Lines. This guide was developed collaboratively with the SLA's Sustainability Team and with expert input from Adam Hobill Design.

The Suburban Land Agency acknowledges the approval of the NatHERS Administrator to use the Nationwide House Energy Rating Scheme name and logo in the preparation of this guide, and the approval of the Commonwealth Department of Industry, Science, Energy and Resources to reproduce the Energy Rating Label in this guide.

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Important Contacts



In a life threatening emergency call **Emergency Triple Zero (000)** for **Police, Fire or Ambulance**

You can also access the **text emergency relay service on 106** for **text based communication in an emergency**



For up-to-date information during an emergency:

www.esa.act.gov.au



If a storm has damaged your property or a tree may fall (or has fallen), call the ACT SES for help:

 **132 500**



Health Direct: 1800 022 222
www.healthdirect.gov.au