YourHome

6TH EDITION

AUSTRALIA'S GUIDE TO ENVIRONMENTALLY SUSTAINABLE HOMES

DESIGN FOR CLIMATE • PASSIVE HEATING & COOLING • MATERIALS • REDUCING ENERGY • RETROFIT & RENOVATE

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YourHome

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Getting started

Welcome to *Your Home*

Your Home is Australia's independent guide to designing, building or renovating homes to ensure they are energy-efficient, comfortable, affordable and adaptable for the future.

Your Home was first published in 2001 as a technical manual and website, providing expert advice on sustainable building practices for the building and design industries.

Now in its 6th edition, *Your Home* has been regularly reviewed and improved to ensure the content remains comprehensive, accurate and up to date with current best practice.

Today, a broad audience uses *Your Home*, including householders, builders, designers, architects, students, researchers and policy makers.

We hope that you too find *Your Home* useful in helping to design, build and live in a sustainable and energy-efficient home.

Designing homes for the future

Buying or building a home is one of the most important financial investments people make. And many of the homes we build today will still be in use in 50 or even 100 years.

The decisions made early on can affect the liveability of your home and the cost of living for decades to come. These choices can support your home to be liveable and adaptable to changing needs so that it remains comfortable, efficient and cost-effective in the long term.

The design principles and climate-appropriate features described in *Your Home* can make a home more affordable and comfortable over its lifespan.

What is a sustainable home?

A sustainable home incorporates climate-appropriate design features like correct orientation, thermal mass, insulation, shading and glazing to take advantage of natural sources of heating and cooling. When incorporated in the right way for your climate, they can keep a home's occupants comfortable throughout the year.

Sustainable homes maximise the use of energy-efficient products and environmentally durable materials for long-term lifestyle benefits. This can reduce ongoing household costs due to lower energy bills and reduced maintenance costs. Other benefits may include improved indoor air quality, thermal comfort and a sense of wellbeing, thus reducing ongoing health costs.

Take a seat: the future of sustainable homes is here.

Photo: © Tatjana Plitt Photography

Who is *Your Home* for?

Your Home is for everybody. If you want to know more about buying, building, renovating or living in sustainable homes, *Your Home* will help.

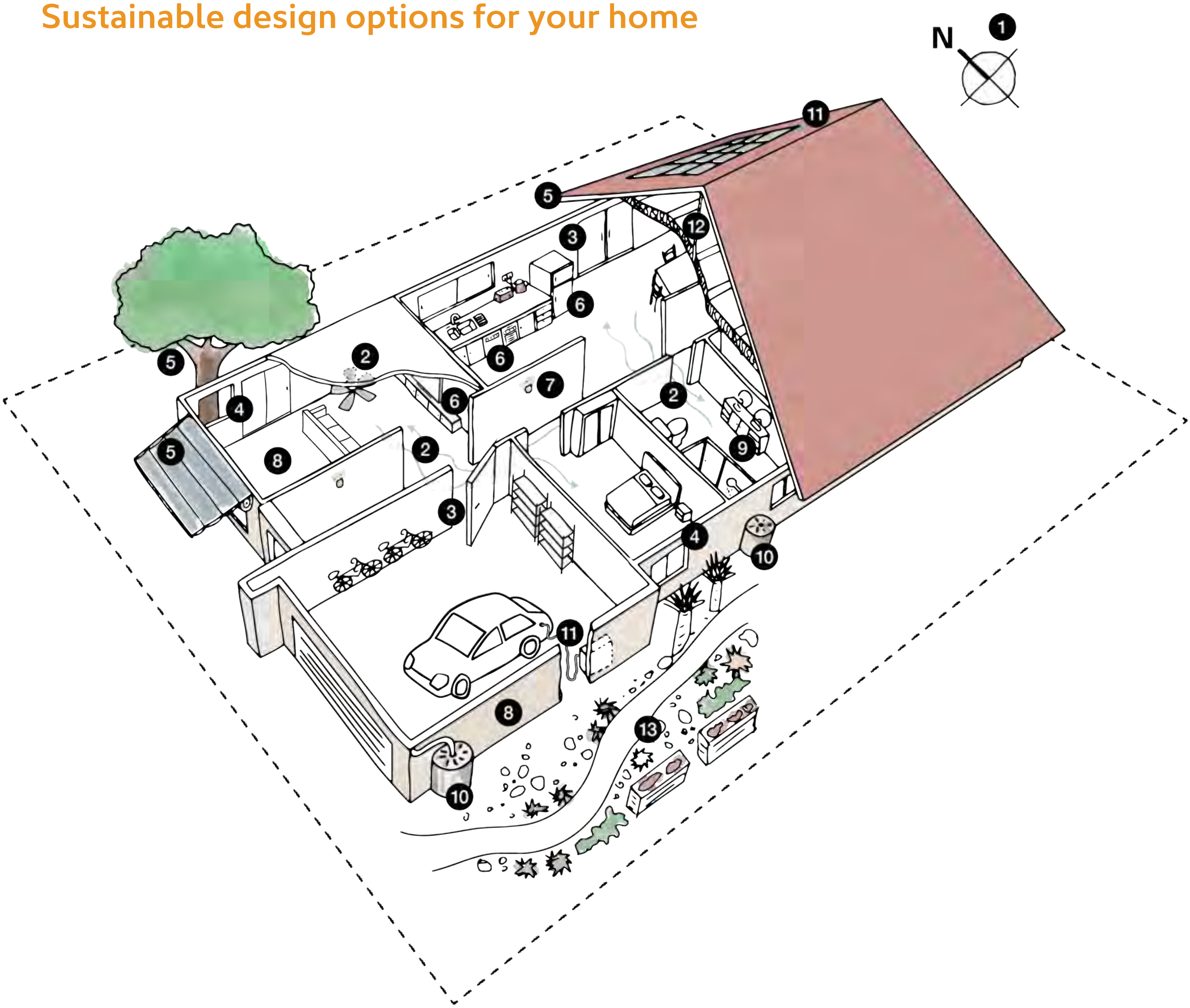
Your Home helps householders understand how to design and live in a sustainable home. It explains the process of building and renovating and the things to ask your designer and builder to ensure you make informed choices and get the home you want.

Your Home helps architects and designers understand the principles of sustainable design and how they can be practically applied in different climates. It can be used as a tool to support the design process or to develop knowledge and expertise on industry best practice.

Your Home helps builders understand the range of materials and technologies available to support the construction of sustainable homes and to understand specific issues like condensation or waste management.

Your Home helps students, researchers and policy makers to understand sustainable home design, energy efficiency rating schemes and other aspects affecting residential sustainability.

Sustainable design options for your home



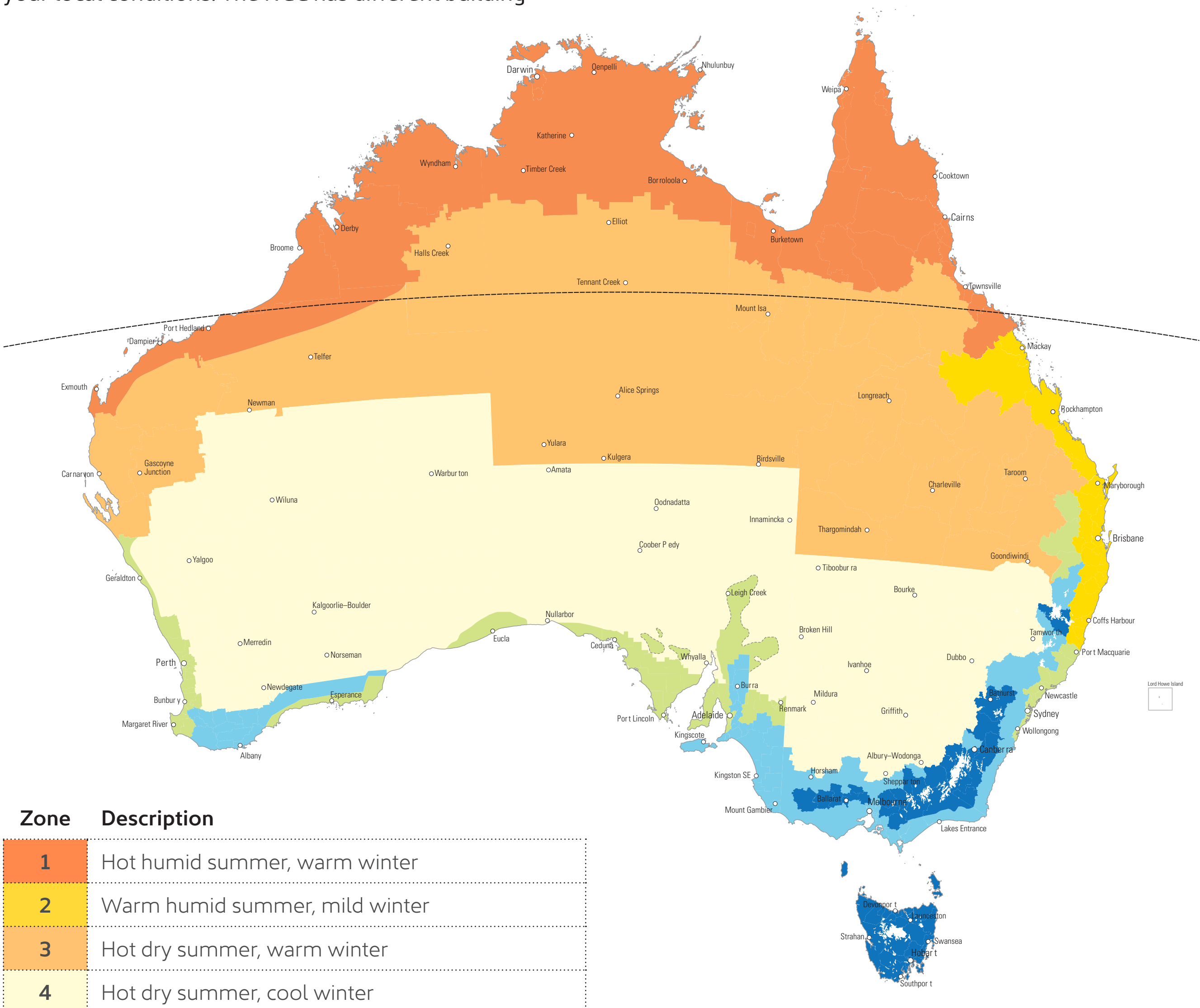
1. Good orientation of the home on your block
2. Design for cross-ventilation/breezes and/or install ceiling fans
3. Zone your home and seal gaps to reduce air leakage
4. Glazing units suited to your climate
5. Shading to suit your climate (fixed, adjustable and natural, depending on orientation)
6. Appliances with high energy star ratings
7. LED lighting
8. Floor and wall material to suit your climate and site conditions
9. Plumbing fixtures with high water star ratings
10. Rainwater collection and greywater recycling
11. Solar PV system (optional battery storage)
12. High levels of insulation to external walls and roof to suit your climate
13. Drought-tolerant landscaping

Note: There are lots of ways to incorporate sustainability into the design of your home. The features chosen for the illustration are not exhaustive. Throughout Your Home there is information on how to make your home sustainable with lots of practical design principles and ideas.

Australian climate zones

Your Home uses the 8 climate zones defined by the National Construction Code of Australia (NCC, published by the Australian Building Codes Board).

Understanding which climate zone you're in is important to ensure that your home is built to suit your local conditions. The NCC has different building code requirements for each climate zone. Within each zone are many regional subzones determined by local geographic features such as wind patterns and height above sea level. These local conditions should also be considered when designing your home.



Zone	Description
1	Hot humid summer, warm winter
2	Warm humid summer, mild winter
3	Hot dry summer, warm winter
4	Hot dry summer, cool winter
5	Warm temperate
6	Mild temperate
7	Cool temperate
8	Alpine

Australian climate zones, National Construction Code.
Source: Australian Building Codes Board

Key points

- Renovations and additions can improve the energy and water efficiency of your home, at the same time as improving liveability and comfort.
- Do your homework to find out how your home can be most cost-effectively improved. Expert assessment and advice can help you to get the best design.
- Simple things that you can do to improve the energy and water efficiency of your home are:
  - sealing all draughts with silicone or other sealant, or with weather strips
  - installing water-efficient showerheads
  - replacing old appliances with new, more energy-efficient models.
- More extensive changes you can make are:
  - improving insulation to ceilings, walls and floors
  - changing your windows to more efficient types (double glazing; timber, uPVC or thermally broken metal frames)
  - removing carpets and installing tiles or polished concrete to increase thermal mass.
- Additions and extensions should be treated as if you are planning a whole building. Assess how an addition will change the energy efficiency of your home. Include insulation, thermal mass, appropriate glazing and termite proofing.
- Many projects are likely to require local government approval before you start. A certification is provided by the relevant authority after an inspection to ensure your project complies with the conditions of approval. This depends on the scope of the work and whether changes to the exterior are included, and can vary with jurisdiction. Check with your local government.
- You may want to do your own small changes and renovations, but you will need experts for any electrical and plumbing work, plus other larger or more specialised tasks.

In this chapter

Achieving design for climate

This section provides an overview of key design objectives and responses to creating thermally comfortable homes in each main climate zone in Australia. These should be customised to your individual site, locality and design brief. Confirm the best strategy for your climate by using NatHERS software (see *Building rating tools* in the *Buy, build, renovate* section).

Climate zone 1: Hot humid summer, warm winter

Climate characteristics

- Moderate to high temperatures year round
- Low to moderate temperature variation between seasons
- Low day–night (diurnal) temperature range
- High humidity year round, though there is a mild dry season during winter

Design objectives

The main aim in this zone is to achieve effective cooling in a humid climate.

Your building design and cooling method need to work together. There are 3 main design approaches; the approach should be chosen at the beginning of the design process, because it can be difficult to change this in the future.

You can choose a design that is:

- **free running** – these homes are cooled using air movement from fans, whirlybird ventilators, stack ventilation and cross-ventilation. These buildings should not be air-conditioned without substantial alteration (for example, reducing the size of openings, adding bulk insulation around the areas to be conditioned, careful detailing to prevent condensation)
- **conditioned** – these homes must be well insulated and able to be made airtight while the air-conditioning is running. Both inward and outward condensation issues should be addressed
- **hybrid** – these homes have air-conditioned, insulated core rooms in the centre of the house (for example, a TV room), surrounded by free-running spaces.

Homes using conditioned and hybrid design approaches should be designed to provide sleeping comfort without air-conditioning, so you can choose to switch the conditioning off at night.

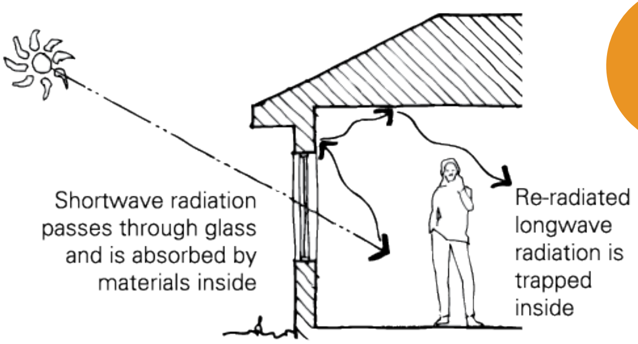
Design considerations

- Orientate the building to take advantage of cooling breezes, and position landscaping and outbuildings to funnel breezes over, under and through the building (see *Orientation and Passive cooling* in the *Passive design* section).
- Make sure your design maximises night-time sleeping comfort. Locate sleeping spaces in lower levels. Use low or no thermal mass in sleeping spaces to prevent radiant heat. Consider sleep-out spaces.
- Install ceiling fans in all rooms.
- Ventilate roof spaces well with fans or whirlybirds and design for condensation removal (see *Passive cooling* in the *Passive design* section).
- Locate cooking areas and heat-generating appliances (for example, fridges) on external walls and away from sleeping areas.
- Provide shaded outdoor living areas.
- Locate pools and spas on the northern side of the building where they will be shaded in the hot humid season and warmed during the dry season.
- Use light colours on roofs and walls.
- Maximise planted areas in landscapes.

In free-running buildings

- Use high or raked ceilings to promote convective air movement.
- Encourage natural air flow through the home with large, high level openings (for example, shaded openable clerestory windows, roof vents or ridge vents).

Passive solar houses look like other homes, but cost less to run and are more comfortable to live in.
Photo: © Tatjana Plitt Photography



Solar heat gain through standard 3mm glazing.

Thermal mass and thermal lag

Thermal mass is the ability of a material to store heat. When used correctly, thermal mass can significantly increase comfort and reduce energy use in your home (see *Thermal mass* in the *Passive design* section).

NOTE

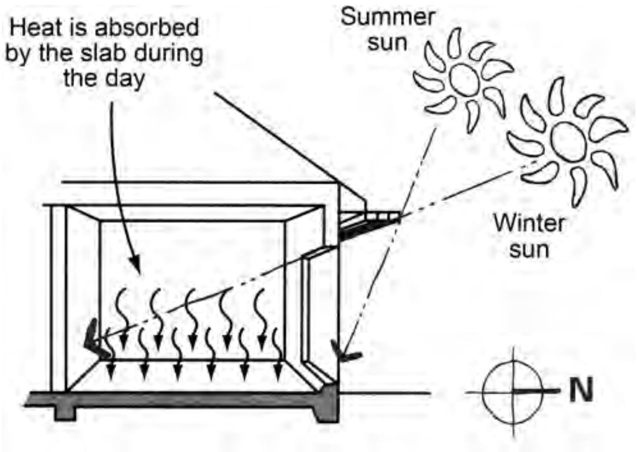
High thermal mass inside the home (for example, brick walls or tile floors) store heat from the sun during the day and release it when it is required, to offset heat loss to colder night-time temperatures or cloudy days. It effectively 'evens out' temperature variations between day and night.

This is because of a property known as thermal lag — the amount of time taken for a material to absorb and then release heat, or for heat to be conducted through the material.

Thermal lag times are influenced by:

- conductivity of the material
- difference in temperature (known as the temperature differential, ΔT or delta T) between each face of the material
- thickness of the material
- surface area of the material

- texture, colour and surface coatings (for example, dark, matt or textured surfaces absorb and re-radiate more energy than light, smooth, reflective surfaces)
- exposure of the material to air movement and air speed.



Thermal mass can significantly increase comfort and reduce energy consumption. Source: Sustainable Energy Authority Victoria

Thermal mass is very useful for some climates, but can be a liability if used incorrectly. Thermal mass must be exposed to the home's interior (so solar heat can flow easily into the material) and externally insulated (so the stored heat is not lost).

Rates of heat flow through materials are proportional to the temperature differential between each face of the material. External walls have much greater temperature differential than internal walls, which is why thermal mass must be insulated externally. The more extreme the climate, the greater the temperature differential and the more insulation required. Even 300mm-thick adobe and rammed earth walls need external insulation in cool and cold climates.

The useful thickness of thermal mass to be used in passive heating is the depth of material that can absorb and release heat during a day–night cycle. For most common building materials, this is 50–150mm (depending on their conductivity). Longer lag times are useful for lengthy cloudy periods, but must be matched by solar input (that is, if the material is needed to release heat over a long period, it will need to be able to first absorb that amount of heat; see *Glass-to-mass ratios* in this chapter).

Relative thermal lag of some common building materials

Material	Thickness (mm)	Time lag (hours)
Double brick	220	6.2
Concrete	250	6.9
Autoclaved aerated concrete (AAC)	200	7.0
Adobe	250	9.2
Rammed earth	250	10.3
Compressed earth blocks	250	10.5
Sandy loam	1,000	30 days

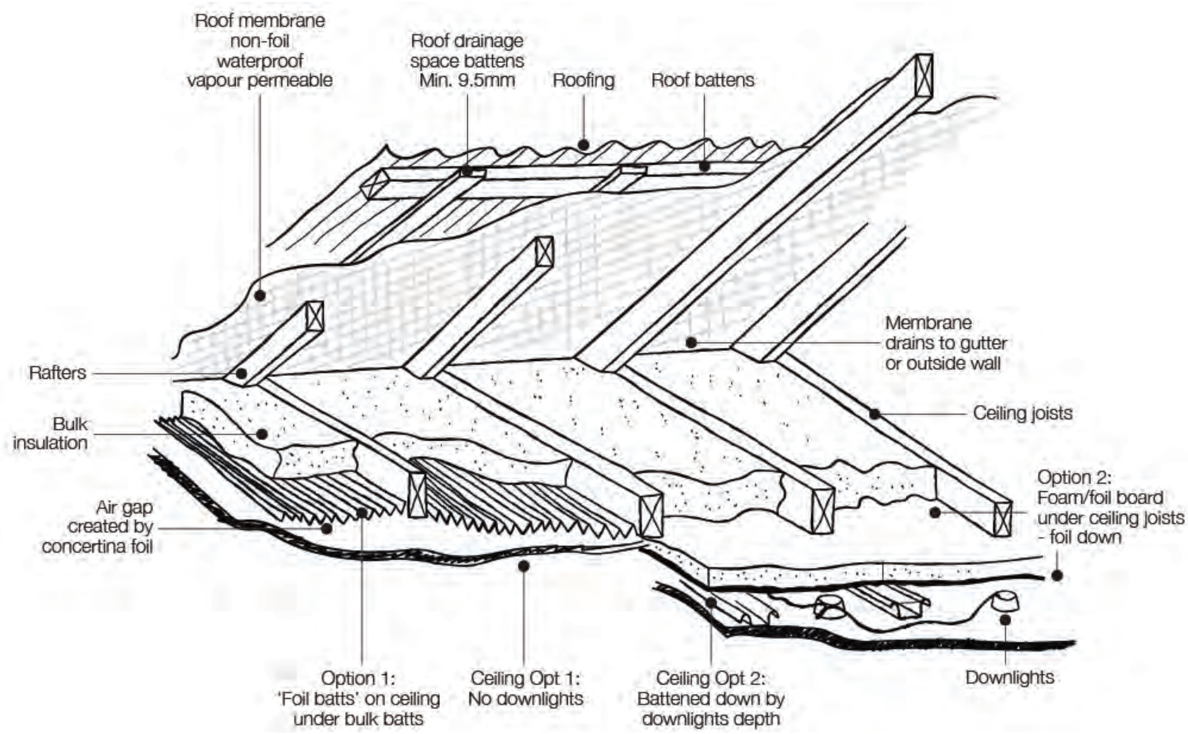
Source: Baggs et al. (2009)

In mild climates with low day–night temperature ranges, low-mass solutions with high insulation levels work well. Low-mass construction responds faster to internal heating and is more flexible as the climate warms. Flexible thermal mass options are also available (see *Thermal mass* in the *Passive design* section).

In warmer temperate climates, external wall materials with a minimum thermal lag time of 10 to 12 hours can even out day–night temperature variations.

Extremely high thermal mass levels (for example, earth-covered housing) can even out high temperature variations between seasons. Summer temperatures warm the building in winter and winter temperatures cool it in summer. In these applications, lag times of 30 days are required.

However, the use of high-mass solutions may be less suitable in the future, as climate change increases summer temperatures and causes longer and more extreme heatwaves. In general, moderate mass or well-insulated lightweight construction is a more appropriate solution for the lifespan of housing built today.



A pitched roof with a flat ceiling, showing 2 options for using reflective foil on the inside of bulk insulation; this is useful in all but warm tropical climates. Source: Envirotecture

Roof

In Climate zone 1 (high humidity summer, warm winter), a layer of reflective insulation (either sarking or foil batts) beneath the roof increases resistance to radiant heat. In air-conditioned buildings in warm tropical climates, reflective foil should be used on the outside (or warm side) of bulk insulation.

In other climate zones, reflective insulation can be used on the inside of bulk insulation to keep heat inside the home in winter. There must be an appropriately specified vapour-permeable moisture barrier (sarking) below the roof to carry away any condensation (see *Condensation* in the *Passive design* section).

Generally, ensure that there is an effective air gap between reflective surfaces and other materials – depending upon what the material and construction system is. If assembling non-rigid materials on site, it is wise to allow at least 25mm between layers to ensure the air gap is maintained. Rigid board materials can be installed with air gaps of as little as 10mm, and some pre-manufactured products may have 5mm gaps. Some products form their own air gap, such as a concertina profile. Always refer to the product manufacturer regarding installation.

Ceiling

In most climates, it is appropriate to place ceiling insulation between the joists. Suitable bulk insulation includes batts, loose-fill and rigid foam boards such as XPS, PUR or PIR (but preferably not EPS, because it can break into small particles that escape into the external environment).

In alpine climates, it may be necessary to use multiple layers of insulation to achieve the very high R values needed. This may require innovative detailing in the roof and ceiling design.

Install insulation in accordance with manufacturer's instructions. Failure to do so can significantly reduce insulation values.

If ceiling joists are covered with insulation, safe places to walk cannot be seen when accessing the roof space, and platforms or access planks should be installed. For this reason, bulk insulation is usually installed so that the top of ceiling joists or roof trusses remain exposed, even though this diminishes the insulation somewhat. If insulation is removed or moved when the roof space is accessed, it must be reinstalled in accordance with the Australian Standard.

Understanding ventilation and airtightness

What are ventilation and airtightness?

Ventilation is the intentional introduction of outdoor air into a building. All homes require ventilation to maintain good indoor air quality. It increases oxygen levels and dilutes and displaces carbon dioxide and airborne pollutants. It can also be used to increase thermal comfort and reduce humidity.

Airtightness is about limiting the unintentional introduction of outdoor air into a building, or limiting the loss of air to the outside. The greater the airtightness, the less unintended air movement occurs.

Windows and doors that have been designed to encourage ventilation and cool breezes when open are beneficial. But windows and doors that are poorly sealed, allowing cold draughts in winter or hot draughts in summer, are a problem.

Air typically leaks through:

- unsealed or poorly sealed doors and windows
- unsealed vents, skylights and exhaust fans
- gaps in or around ceiling insulation and around ceiling penetrations (for example, downlights, pipes and cables)
- gaps around wall penetrations (for example, pipes, conduits, power outlets, switches, air-conditioners and heaters)
- gaps between building envelope junctions (for example, floor–wall or wall–ceiling)
- poorly fitted or shrunken floorboards.

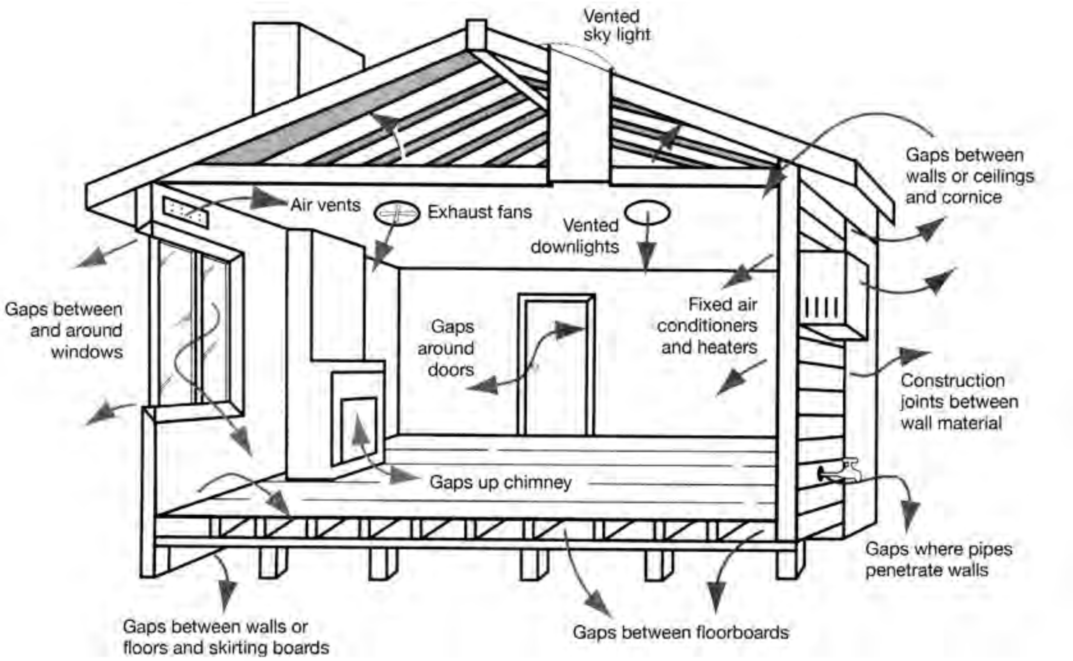
Why are ventilation and airtightness important?

Good ventilation of your home is essential for your health.

Good airtightness (that is, reducing or eliminating air leaks) can improve thermal comfort and energy efficiency – air leaks can cause 15–25% of winter heat loss in buildings. Sealing your home is one of the simplest ways to increase your comfort while reducing your energy costs.

NOTE

An airtight house with inadequate ventilation may lead to condensation, mould and high internal levels of carbon dioxide. Build airtight for thermal comfort and energy efficiency, but not so tight that it compromises indoor air quality. Consult a qualified building professional on how to achieve this.

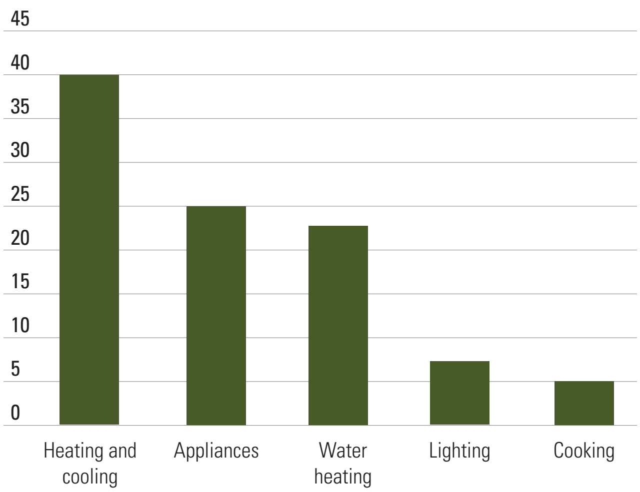


Common air leakage points. Source: Sustainable Energy Authority Victoria

Understanding heating and cooling

Heating and cooling together use the largest amount of energy in the average Australian home, accounting for around 40% of household energy use. So it is important to prioritise your investment when it comes to keeping your house comfortably warm or cool.

If you are building a home, the best long-term option is to use passive design principles to minimise your heating and cooling needs (see all chapters in the *Passive design* section). This should be combined with smart household behaviour. There are many free and low-cost strategies you can use to get the most out of your heating and cooling appliances. It is also important to choose the right system for your circumstances, to maximise your comfort for the lowest possible cost and environmental impact.



Percentage of household energy use.
Source: Energy Consuslt (2015)

Climate

Your first consideration in making heating and cooling decisions for your home will be your climate. Do you need more heating, more cooling, or a balance of both? See *Design for climate* in the *Passive design* section.

Consider what changes you can make to your home to improve its thermal performance. Improving your home's thermal performance may mean that you do not need as much heating or cooling as you think (see *Renovations and additions* in the *Buy, build, renovate* section).

Sizing

One of the most important tips for buying a heating or cooling appliance, is to buy one that is correctly sized. If you buy a one that is too large for your needs, it will cost you more money and you will waste energy and money in operating it. If you buy one that is too small, the appliance will need to run 'harder', using more energy to keep the room at the desired temperature.

Consider the area in your home that you want heated or cooled; how often and for how long is heating or cooling needed? For example, if temperatures in your climate zone fall sharply at night, you may only need to cool a small living area during the heat of a summer day, then open the bedrooms to cooling breezes at night.

Central versus space

Central heating and cooling systems are designed to heat or cool a whole house (for example, through ducted vents in most or all the rooms). Space heating and cooling systems have a single source of heating or cooling, and are designed to heat a small area or one room.

Choosing between central heating and cooling systems, or appliances that heat or cool individual rooms or spaces, is an important consideration for your home. If rooms are unused or a home is mostly vacant, central systems can often waste energy by conditioning empty spaces. For an energy-efficient home, using a space heating or cooling device only in rooms where it is needed, is the best option.

Some central systems have zone settings allowing heating or cooling to be switched on or off in different sections of the home that are used less frequently, which can make them more efficient.

Another alternative is to use a combination of systems. For example, you may wish to have a central system that heats and cools the main living areas of your home, but then use electric space heaters for brief times in a bedroom or study.

Choosing heating and cooling

Some systems combine heating and cooling options and you can switch between them depending on the season. Others offer only heating or cooling. Your choice will depend on both your climate and the thermal performance of your home.

Bushfire attack levels

Bushfire attack level	Radiant heat flux exposure	Predicted bushfire attack mechanism	Building and material requirements
BAL – Low	Not applicable	Nominal risk	There is insufficient risk to warrant specific construction requirements Most materials OK
BAL – 12.5	<12/5kWm^2	Ember attack	Ember protection required Most materials OK
BAL – 19	>12.5kWm^2 – <19 kWm^2	Increasing levels of ember attack and burning debris ignited by windborne embers, together with increasing radiant heat flux	Ember protection required Slightly limited material choices
BAL – 29	>19kWm^2 – <29kWm^2	Increasing levels of ember attack and burning debris ignited by windborne embers, together with increasing radiant heat flux	Ember protection required Limited material choices, glazing requirements increase
BAL – 40	>29kWm^2 – <40kWm^2	Increasing levels of ember attack and burning debris ignited by windborne embers, together with increasing radiant heat flux with the increased likelihood of exposure to flames	Strong ember protection required Very limited material choices, strong glazing requirements
BAL – Flame Zone	>40kWm^2	Direct exposure to flames from the fire front, in addition to radiant heat flux and ember attack	Special construction details apply, full shielding required to glazing

Note: kWm^2 is heat flux density measured in watts per square metre. Source: Adapted from Australian Standard AS3959:2018

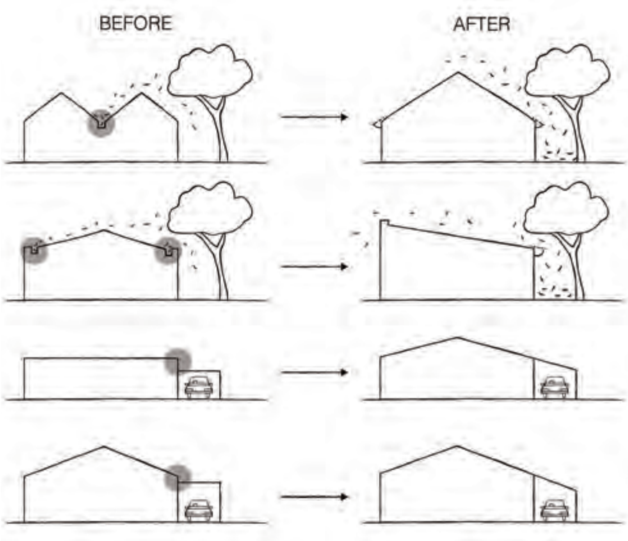
Building elements

The following areas are addressed in the standards and should be considered for the assessed BAL rating of the building:

- subfloor supports if not enclosed
- floors, but slabs on ground have no requirements
- walls including up to 400mm from the ground
- external glazed elements (doors and windows)
- roofs including penetrations, guttering, gables, eaves, and fascias
- verandahs, decks, steps and landings
- water and gas supplies.

One of the key considerations in the standards is preventing the build-up of debris (that is, flammable material) and embers.

Some design features that are not part of the standards include simple rooflines and building outlines which can aid in the removal of debris and help to prevent the build-up of embers. Avoid complicated or saw-tooth roof lines. Reducing the number of re-entrant corners on a façade will also reduce the accumulation of debris. Also take care with gutter design. Avoid box gutters, and consider including non-combustible gutter guards to prevent leaf and other litter on roofs.



Suggested rooflines to help prevent the build-up of debris. Source: Adapted from Ramsay and Rudolph (2003)

- Size and orientate windows, and use appropriate glazing and window styles for your climate (see *Glazing* in the Passive design section).
- Install curtains with pelmets, external blinds and shading to reduce the need for additional heating and cooling (see *Shading* in the Passive design section).

Good orientation and smart external shading can make a big difference to the thermal efficiency of your home. Photo: Simon Wood Photography

Appliance efficiency

Look for energy efficiency in all areas of your home:

- Install the most efficient heating and cooling system available (see *Heating and cooling* in the Energy section).
- Install a high efficiency (or renewable) hot water system (see *Hot water systems* in the Energy section). Install water-efficient showerheads to reduce hot water use. Consider the layout of building services to minimise heat loss from pipework during winter.
- Select smaller energy-efficient appliances with low stand-by power use, and avoid unnecessary purchases (see *Appliances and technology* in the Energy section).

Solar hot water services absorb renewable energy from the sun to heat water. Photo: Nic Granleese

Renewable energy generation

To be zero energy, zero carbon or carbon positive, consider installing on-site renewable energy generation, such as:

- solar hot water
- solar PV system
- heat pump hot water system.

It is a good idea to first increase the efficiency of your home and reduce the amount of energy you use. This will then reduce the size (and therefore cost) of the system you need. Minimising your peak energy demand is also an important aim, as this reduces the required capacity of your on-site renewable energy and storage, meaning you can install smaller and less expensive systems.

For more information on choosing renewable energy systems, and system design and sizing, see *Renewable energy* and *Photovoltaic systems* in the *Energy* section.

New energy retailing models are emerging that seek to support peer-to-peer (P2P) energy trading, shared ownership of PV systems, and other options to increase access to renewable energy. This aims to make it easier to share excess renewable electricity that is generated on site between different households (see *Batteries* in the *Energy* section).

Cape Paterson, Victoria

A house that aims to balance energy efficiency and material selection to achieve affordability and sustainability.

NatHERS thermal comfort rating

91 NATIONWIDE HOUSE ENERGY RATING SCHEME www.nathers.gov.au

Heating: 16.5MJ/m²/year
Cooling: 8.8MJ/m²/year
Total: 25.2MJ/m²/year

Project details

Building type:	Low density housing.
NCC climate zone:	6 – mild temperate.
Developer:	The Cape
Designer:	Beaumont Building Design
Builder:	TS Constructions
Energy management:	Phillip Island Energy Rating
Building Size:	167m² (house 131.59m², garage 35.59m²)
Land size:	456m²
Cost:	$420,000 including garage (excluding land cost)

Sustainability features

- Sealed airtight building
- Recycled solid bricks for thermal mass
- Insulated concrete slab with cement replacement and recycled aggregate
- Electric clerestory windows
- Argon-filled double-glazed low-emissivity (low-e) windows
- Solar photovoltaic (PV) system with battery for energy storage
- Heat pump hot water system
- Energy-efficient appliances
- LED lighting
- Rainwater tanks
- Water-efficient toilet suite and tapware
- Low-formaldehyde joinery (E0 rating)
- Low volatile organic compound (VOC) paint
- Food production

Design response

The new 2-storey house design was based on the existing footprint, orientation and streetscape. Passive House principles were employed to make the house airtight. Passive solar design elements were used to heat and cool the home.

The existing strip foundations and 40m^2 concrete slab informed the footprint of the house. This saved money and embodied energy. Additional foundations were poured to support the walls of the improved configuration.

The front gable frames the verandah, carport, and recreation and storage areas. There are 2 bedrooms and a multipurpose room on the ground floor, while the master bedroom and a second adaptable space are upstairs. These rooms can be converted into second living areas or additional bedrooms to cater for changing family circumstances. The bathrooms are mobility-friendly.

A side courtyard garden opposite the kitchen brings in northern light and an outdoor connection to the middle of the house, and the north and south walls of the living area are rammed earth. The kitchen island doubles as a dining table and desk, and furniture in the living area can be rearranged depending on seasonal light.

A rear deck steps down to the garden, and a bungalow at the back of the property serves as a multi-functional space. It will be refurbished in the future with a green, productive roof (see *Green roofs and walls* in the *Materials* section).

The kitchen island doubles as a dining table and desk. All appliance are efficient electric to run on solar-generated electricity. Photo: © Tatjana Plitt Photography

Cladding

Natural materials are used on the home's interior and exterior, and there is no plasterboard used in the house. The interior is lined with radiata pine plywood with a whitewash. The owner made this choice because of aesthetics, the robustness of the material compared with plasterboard, and its potential to be recycled.

The external cladding is yellow stringybark shiplap, the floors are blackbutt, the hallway and kitchen ceilings are wormy chestnut shiplap, and the kitchen joinery is birch plywood with a laminate pre-finish.

A courtyard garden brings northern light and an outdoor connection to the middle of the house. Photo: © Tatjana Plitt Photography

Windows and doors

The windows are positioned to allow more sunlight and ventilation into the home in winter. Their placement was informed by seasonal sun movement, as an adjacent single-storey home was found to cast significant shadows in the cooler months.

High clerestory windows on the northern wall allow for passive solar gain in winter, as warmth from the winter sun is stored in the southern rammed earth wall. During summer, low openable windows on the southern side of the house work in conjunction with a fernery zone to purge hot air. External blinds shade west-facing sliding glass doors and windows.

Abatement

Activity that leads to a reduction in the level of greenhouse gas emissions.

Abutment

A structure built to support the lateral pressure of an arch or span, for example at the ends of a bridge.

AccuRate

Software tool used in rating the thermal performance of homes in Australia. Designed by the CSIRO, based on decades of scientific research about the way buildings operate in Australian conditions, AccuRate is accredited for use under the Nationwide House Energy Rating Scheme (NatHERS). Accurate is used as the NatHERS benchmark against which the performance of other software tools is assessed.

Acid sulfate soil

Soil that contains iron sulfides, which when exposed to oxygen by drainage or disturbance, produce sulfuric acid, and often release toxic quantities of iron, aluminium and heavy metals.

Aggregate

A term for any particulate material. It includes gravel, crushed stone, sand, slag, recycled concrete and geosynthetic aggregates. Aggregate may be natural, manufactured or recycled.

Airlock

A transitional space that typically has 2 doors in series to separate a controlled internal environment from external environments.

Airtightness

The level of uncontrolled movement of air in to and out of a building. Measured as the air tightness metric (air changes per hour at 50 pascals; ACH50).

Angle of incidence

In relation to windows, the angle that solar radiation strikes glass. When the sun is perpendicular to the glass it has an angle of incidence of 0°. As the angle increases, the effective area of exposure to solar radiation reduces, more solar radiation is reflected, and less is transmitted.

Assessor

Person qualified and/or accredited to use energy rating tools (for example, NatHERS tools) to determine the thermal performance of a building.

Autoclaved aerated concrete (AAC)

Concrete that has been manufactured to contain lots of closed air pockets. Lightweight and fairly energy-efficient, it is made by adding a foaming agent to concrete in a mould, then wire-cutting blocks or panels from the resulting 'cake' and 'cooking' them with steam (autoclaving).

BERS Pro

Software tool used in rating the thermal performance of homes in Australia. BERS Pro is accredited for use under NatHERS.

Biodiversity

The variety of all life, including plants, animals, microorganisms, the genes they contain, and the ecosystems of which they form a part.

Blackwater

Water that has been mixed with waste from the toilet.

Buildability

The extent to which the design of a building facilitates ease of construction.

Building Code of Australia (BCA)

Contains technical provisions for the design and construction of buildings and other structures in Australia. It comprises Volumes 1 and 2 of the National Construction Code (NCC). It is maintained by the Australian Building Codes Board on behalf of the Australian Government and state and territory governments.

Building envelope

A building's walls, roof, ceilings and floors that separate the interior of the building from the outside air and elements.

Building Sustainability Index (BASIX)

A measure of a building's water and energy consumption and thermal comfort. BASIX is part of the development application process in New South Wales and applies to all new residential dwelling types and large renovations.

Cantilever

A rigid structural element that extends horizontally and is supported at only one end. Typically it extends from a flat vertical surface such as a wall, to which it must be firmly attached. A cantilever can be formed as a beam, plate, truss, or slab.

Carbon dioxide equivalent (CO_2-e)

A standard measure that is used to compare the emissions from various greenhouse gases on the basis of their global warming potential. It allows a common metric to be used across all gases by converting them to an equivalent amount of carbon dioxide with the same global warming potential.

Carbon offsetting

A process that removes greenhouse gases or averts their emission into the atmosphere and stores or 'sequesters' them for periods of varying duration. Carbon offsets are usually purchased by individuals or companies and used to 'offset' the emissions they generate.

Carbon positive

Describes buildings that go beyond achieving net zero carbon emissions to produce more renewable energy on site than the building requires, and feeds excess renewable energy back into the grid.

Cementitious material

Describes materials that make up the concrete mixture.