

SUSTAINABLE BUILDING PROCEDURES

At Baxter Construction we are accredited with the Master Builders Green Living Program and our aim is to utilise the most durable building techniques at the lowest cost, - focusing on energy efficiency, water savings and indoor air quality - so you can build in a stronger, more sustainable and resilient way.

This document has dozens of different technologies to help build a more sustainable home including building design, building materials, power, water, heating and cooling, appliances, floor coverings, paints and finishes, backyards and more.

BUILDING MATERIALS

The types of materials selected at the design stage of building a home will impact fundamentally on its longer-term sustainability. These choices have implications for saving energy, improving bushfire resilience and improving comfort. Building materials typically considered to be 'green' include renewable plant materials like straw and mud brick, timber from forests certified to be sustainably managed, recycled materials and other products that are non-toxic, reusable and renewable.

Concrete

Concrete is an excellent material for creating thermal mass in a passive solar designed home. In temperate and cool climates thermal mass helps regulate a home's temperature and keep it warm in winter and cool in summer.

ICF blocks

These are a relatively new building system that started here in Australia with thermacell blocks. Generally, these systems consist of a range of wall blocks and corner blocks that are assembled onto a solid foundation, such as concrete slab or footings, to make a complete wall.

Timber

Timber is probably the most commonly used building material there is. It is strong, flexible, readily available and, providing it is sourced properly, is a renewable resource. It is an easy material to work with and requires relatively basic skills, making it ideal for owner-builders.

Mudbrick

Mudbricks are pretty much what they sound like - bricks made of mud. Often, they are made on site from local soil, providing there is enough clay content. The soil is mixed with water and reinforcing materials such as straw and even cement and then pressed into wooden forms and allowed to set. The forms are removed and the bricks set aside to dry for up to several weeks. As they are made from natural materials they are a sustainable, recyclable, non-toxic and healthy form of building construction.

Straw-bale

Straw-bale building, like mudbrick, is a good sustainable choice. As it is made from natural materials they are a sustainable, recyclable, non-toxic and healthy form of building construction. Rectangular straw-bales are stacked up to form walls, fixed in place with metal or wooden pins, and then trimmed and shaped (often using a chainsaw!) before being rendered with mud or cement based renders.

Timbercrete

Timbercrete is an interesting material, being a combination of timber waste (sawdust) from various sources and concrete. This results in a material that is lighter than solid concrete, but of greater strength and with better insulating capabilities. Some Timbercrete products can produce walls with R ratings of 3.7, which is higher than most other materials except strawbale.

Rapidwall

Rapidwall is a load-bearing wall construction system that uses large prefabricated panels to assemble both inner and outer walls in one go. The panels are made of fibreglass reinforced water resistant gypsum plaster, which is moulded to the required size. Panels are available up to 12 metres long and 3 metres high, so entire walls can be prefabricated and then installed onsite using a crane.

Brick

Common clay house bricks as a building material have the advantage of high thermal mass, so they can be used to store or absorb heat to help provide temperature stability inside a home. However, to do this, they must be on the inside of a home, not on the outside.

Rammed Earth

Not to be confused with mud brick, rammed earth is a precisely controlled mixture of gravel, clay, sand, cement, and sometimes lime or waterproofing additives. The contents are carefully proportioned and mixed, and then machine-compacted in removable formwork to yield a stone-like wall that is massive, water resistant, load bearing and long lasting.

Interior finishes

Choosing the right interior finishes has a huge impact on indoor air quality and consequently the health of the inhabitants. Many popular products and finishes are made with dangerous chemicals that can off-gas for years in a home. Here at Baxter Construction we have the opportunity to help my clients choose finishes that are environmentally friendly and won't cause health problems. Here are some key considerations:

- **Toxicity** - Some common building products emit unpleasant and even dangerous fumes that can persist long after homeowners have moved in.
- **Durability** - Building materials that hold up to the rigors of family life are worth the investment over the long term.
- **Resource conservation** - Reusing salvaged materials or choosing products that have been made with recycled material means fewer resources have to be committed to making something new.
- **Sustainability** - As with other building materials, floor and wall covering come from a variety of sources. The best choices are products that are renewable

WHAT'S IN THE STARS - DOMESTIC STAR RATING SYSTEM

The BCA rates homes thermal performance in terms of star ratings with 1 being the worst and 10 being the most efficient. Currently Victoria's domestic Star Rating System is 6 Star. This means that more than ever the importance of passive design and dwelling orientation should be incorporated into your homes design.

Energy rating is achieved by either the deemed to satisfy provisions of the building code or a computer simulation that estimates the amount of energy required to heat and cool the home. The software factors in the building fabric and location. The software used is either, FirstRate, Accurate or BERS and the rating must be completed by an accredited energy rater.

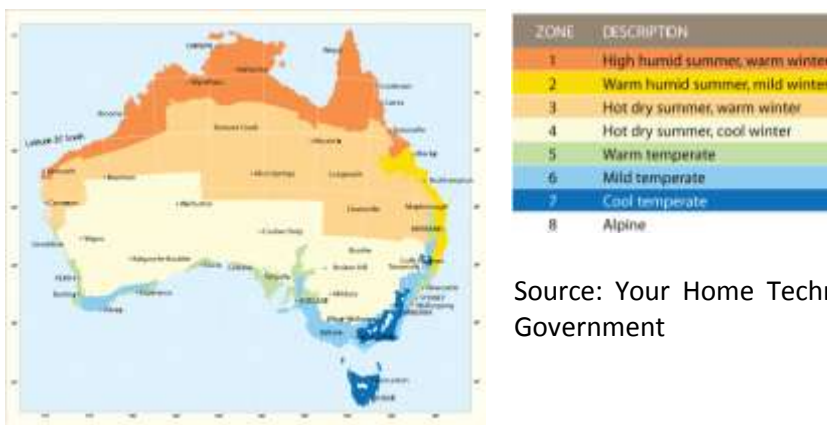
- Factors to consider:
 - Orientation, Zoning, Design;
 - Ventilation;
 - Insulation;
 - Glazing Avoid overly glazed houses;
 - Shading; and
 - Thermal mass.
- It does not take into account add ons such as solar power.

SUSTAINABLE BUILDING PROCEDURES – CLIMATE ZONES

It's important to know which climate zone the house will be built in; as you will need to adapt your homes design to suit the correct climate. By doing this your home will be more comfortable and easy to heat or cool.

Australia has a wide range of climate zones on a scale from 1 being high humid summer and warm winter to 9 being alpine conditions. In Victoria the climate will vary depending on where you are located but will be in between zones 4 and 8.

See the table below to learn which climate zone your dwelling will be located in as this will then enable you to design the home correctly.



Source: Your Home Technical Manual: Australian Government

In Victoria all the climate zones 4 to 8 recommend solar passive design principles with good insulation and use of thermal mass. It is important to note that differences with reference to glazing and shading depend on your specific climate zone.

SUSTAINABLE BUILDING PROCEDURES - CONSTRUCTION

Planning/ Design Stage

Building a sustainable home starts with careful lot selection. **Avoid** long thin sites that run north-south as it is harder to achieve the 6 Star standard.

Avoid building houses larger than they need to be:

- Plan efficiently, consider building to allow easy future staged extensions;
- The larger the house the more resources needed to construct it and the more energy needed to heat and cool it; and
- See how you achieve the same functionality using less m² (e.g. efficient layouts, good storage design, etc.)

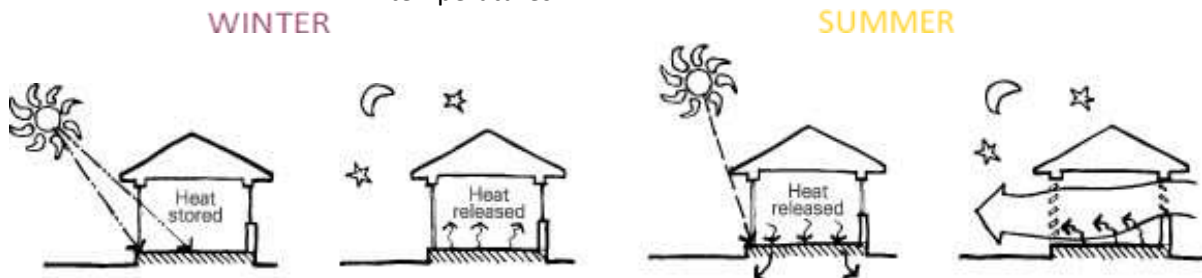
Building Orientation is an important component to passive design.

- Place your living areas to the north side of the home to assess the winter sun;
- Maximise winter sun to living areas and solar collectors;
- North-facing facades receive the sun for the longest part of the day and are easiest to shade in summer;
- Put utility rooms such as laundries and bathrooms to the south side as they don't need a lot of light; and
- Create separate zones that can be independently heated or cooled.

Thermal mass

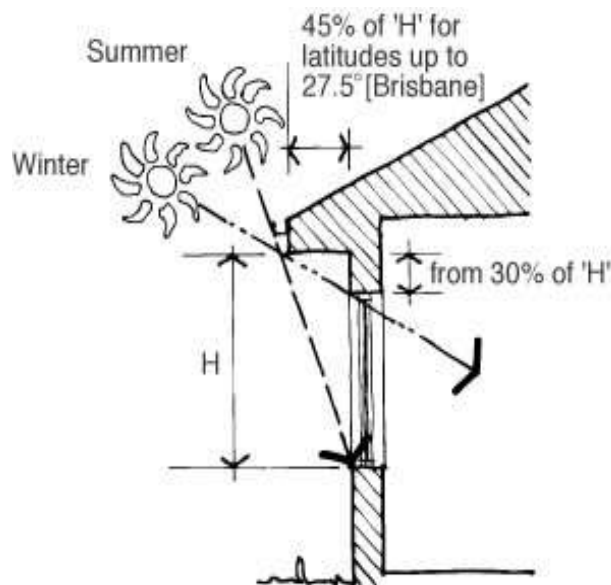
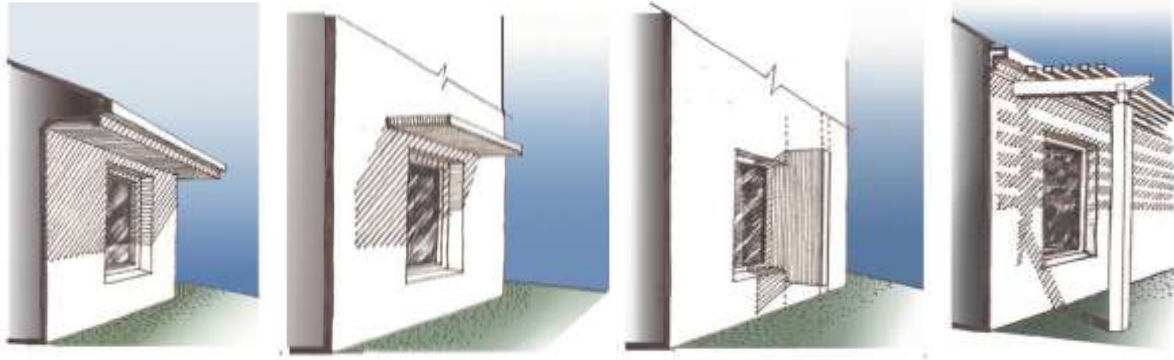
Works by using high-density materials (less trapped air) such as concrete on a floor slab or on a wall in the interior of your home. As part of a passive design, thermal mass is helpful in regulating the internal temperatures in comparison to the outside world.

Thermal mass is the ability to absorb, store and rerelease heat, which moderates indoor room temperatures.



Shading

Having your living rooms orientated to north means it's important to have external shading devices to prevent the summer sun entering the living rooms. As the sun is higher in the sky in summer they can be appropriately sized to keep out the summer sun, but let in the winter sun, which is lower in the sky to warm the house.



Glazing

Glazing is an important thermal efficiency and glazing to the northern utility windows to the amount of glazing on the

component of your homes design. Concentrate your and eastern sides, put south and use a small west side.

Other considerations:

- Locate openings ventilation;
- Double Glazing can reduce heat loss by 30-45% (Note you may not have to use double glazing if you house is designed correctly with living areas facing north);
- If installing double glazed aluminum windows make sure the framing uses a thermal break in the structure; and
- Make sure that windows and doors are correctly sealed in order to reduce heat loss.

to encourage natural

Insulation

Adds marginal extra cost for a big impact on thermal comfort and contributes to achieving the new mandatory 6 star standard.

Important factors to consider:

- Add as much insulation as you can,
- Insulate to the right level for your climate
- Use simulation tools to check performance
- Ensure insulation is properly installed. If insulated area has 10%, its effectiveness is reduced by 50%.

Where possible, choose products that:

- Are from natural, renewable sources;
- Have recycled content; and

- Have no negative health impacts.

Design Tips

- Build housing that can easily be adapted to cater for changing household sizes and needs so that the elderly can stay at home longer. Cater for people with less mobility.
- Instead of having large rooms, independent zoning can help achieve a more sustainable home with less heating and cooling costs involved. Also make these rooms adaptable in size to cater for different occasions.
- An air lock at the entry of your home can assist in keeping the living room warm or cool depending on the season. An Airlock works by creating a buffer between the outside world and the living area. Having an airlock in your home can contribute to a better star rating on your house plans.

Consider the materials you use

Be aware of where the timber you're using is coming from. Ensure that it is recycled, plantation, Forest Stewardship Council Certified or Australian Forestry Standard Certified. Consider using recycled materials or products that have recycled content such as concrete or steel.

Indoor Air Quality

It is important to consider what fitout materials are made from. Many materials can contain harmful airborne pollutants such as Volatile organic compounds (VOCs). These can be found in commonly in paints, manufactured wood products, adhesives, vinyls, Carpets and synthetic underlays. Use materials which are low in or have no VOCs. For more information see www.greenpainters.com.au

Renewable electricity

Photovoltaic systems are used for domestic renewable electricity systems in Australia and are good way reduce the houses impact on the environment and achieve lower power bills.

- Grid connected is preferable to stand alone;
- Use efficient electrical appliances and lighting to maximise energy returned to the grid;
- Provide adequate north facing roof area at the right pitch for photovoltaic panels to be installed;
- Ensure roof area will not be overshadowed now or in the future;
- Allow about 10m² per 1kWp of PV;
- PV panels get hot and need good ventilation; and
- All renewable electricity systems must be designed and installed by a certified contractor.

Water Management

As well as building a sustainable home it is important to consider external factors such as water management. In Victoria as part of the 5 star requirements you need to have either a water storage tank plumbed to the toilet and laundry or solar hot water needs to be installed.

To make your home more water efficient consider having both a water tank and a solar hot water system this will save you money on your hot water bills and you will have more water from rainwater to use on toilet flushing, laundry or the garden.

If your client was interested in recycling their water they could use the waste greywater from showers, laundry and basins. It is also important to consider the safe use of this water as many laundry powders are high in salts and nutrients and can kill plants. If this water is not being treated it must not be stored for

more than 24 hours and should only be distributed via subsurface irrigation. This water must also not leave the property on which it is generated.

Landscaping

Consider creating raingardens to control stormwater runoff and reduce the amount of watering your garden consumes using plants which grow locally. When creating paths and driveways use materials that are pervious so that storm water will run into the soil beneath instead of clogging the stormwater drains.