Building a Sustainable House

Information to help guide the design of your new house or retrofit of your existing house.

What is sustainable design?

Sustainable design includes optimising solar access, maximising energy efficiency, conserving water and choosing environmentally friendly building products. Houses designed and built according to sustainable design principles can save energy, water and money while being naturally comfortable to occupy.

Why is sustainable design important?

Building a home using sustainable design principles can save energy, water and money – while remaining comfortable all year round. The City's aim is to encourage residents to reduce the amount of resources consumed in building and operating their homes.

Australian households are directly responsible for about one-fifth of Australia's greenhouse gas emissions (www.yourhome.gov.au/energy). The average household's energy use generates over 7 tonnes of greenhouse gas emissions from its premises, which could be significantly reduced by:

- reducing energy use through good design, energy efficient technologies, and behaviour that focuses on energy conservation; and
- using renewable energy sources such as solar and wind, which produce very low greenhouse gas emissions.

Non-renewable energy comes from burning fossil fuels, which produces greenhouse gas emissions. Most electricity comes from coal-fired power stations that release high levels of carbon dioxide and other pollutants into the atmosphere. Losses in the transmission system from the power station to your home also create inefficiency.

Perth is situated within a climatic band that follows the south-western coast of Western Australia, known as the 'Mediterranean' climate. The main characteristics of this climatic zone are:

- low day/night temperature range near the coast;
- four distinct seasons. Summer and winter can exceed human comfort range. Spring and autumn are ideal for human comfort;
- mild to cool winters with moderate humidity; and
- hot to very hot summers with low humidity.

It is important to consider local climatic conditions when designing and building your home.

The City is committed to sustainability

The City of South Perth values and promotes development which:

(a) minimises pollution of soil, air and water and sustains natural ecosystems;

(b) minimises the consumption of non-renewable resources by using recycled materials; and

(c) maximises the health, safety and comfort of the occupants of the building and the wider community.

The City is committed to actively pursuing sustainable practices, recognising that this leads to enhanced quality of life for the community. This commitment is reflected in the City's participation in Federal and State Government programs aimed at achieving environmental sustainability, together with a number of the City's own initiatives, including the Sustainability Strategy and Policy, Sustainable Living Awareness Campaign and State of Sustainability reporting.

In considering development applications, the City is required by clause 7.5 of Town Planning Scheme No. 6 (TPS No. 6) to have due regard to any relevant 'Planning' considerations. Environmentally sustainable design is a relevant consideration.

City of South Perth

Sustainable design measures encouraged

The City strongly encourages the use of design solutions that will optimise solar access, maximise energy efficiency and conserve water. The following aspects of sustainable design may help achieve these goals in the design and construction of your home.

Site planning and building orientation

Good house orientation combined with a well-considered layout and design can substantially reduce household energy consumption and costs while improving the comfort of your home. If your house has a longer north-side orientation, greater opportunity exists to take advantage of winter sun for warmth and natural lighting. While longer north-side elevations are ideal for maximum energy efficiency, the diagram below shows how any house can be positioned to capture the benefits of passive solar design.

North-facing rooms are ideal for living areas such as family rooms, lounge rooms and kitchens. Grouping similar rooms together allows for easier control in heating and cooling different areas within your house. Similarly, grouping wet areas (bathroom, toilet, laundry) together can reduce plumbing costs and hot water heat loss.

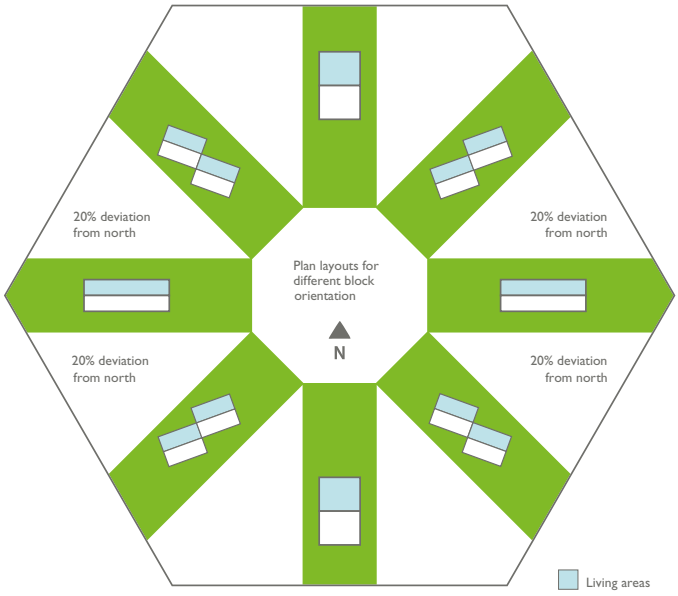

Figure 1: Building orientation to reduce household energy consumption

Passive solar design

Wherever practicable, the site planning and design of dwellings should employ basic passive design principles, including:

(i) orientation of the dwelling maximising north facing walls and glazing, especially in living areas with solar access;

(ii) siting homes for solar access, exposure to cooling breezes and protection from cold winds;

(iii) minimising all east- and west-facing glazing and using adjustable shading techniques and strategic planting of shade trees;

(iv) eaves to provide protection against summer sun;

(v) cross ventilation opportunities;

(vi) use of bulk insulation of walls, ceilings and exposed floors to keep heat in during winter, and reflective insulation to keep heat out during summer;

(vii) correct use of thermal mass;

(viii) use of convective ventilation and heat circulation; and

(ix) use of entry airlocks and thorough sealing to reduce draughts.

Correctly placed windows and well-planned natural ventilation can substantially reduce cooling and heating costs. Minimise windows in east and west elevations to avoid excessive heat gain, as these windows are exposed to morning and afternoon sun. Eaves and verandas on the east and west side of your house will also help protect against unnecessary heat gain.

When planning door and window locations for your house, consider which directions breezes come from and place openings in these areas. Locating windows opposite each other will allow air to flow through your house. If possible, windows on the prevailing breeze side of the house should be lower than those on the opposite side to assist natural airflow.

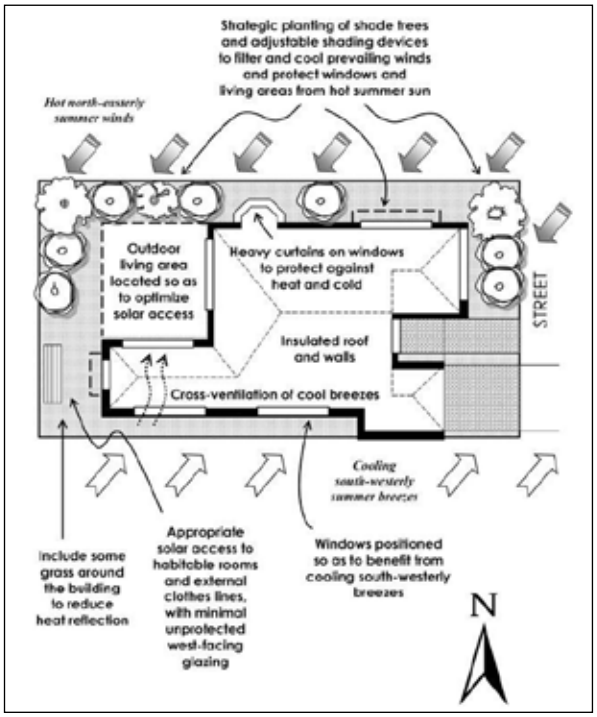

Figure 2: Recommended passive solar design elements

Insulation, roof colour and thermal mass

Roof-space insulation is a great way to improve your house's energy efficiency, and is also a Building Code of Australia (BCA) requirement for all new houses. Consider insulating other parts of your house as well, such as walls (including the cavity in double brick walls). When selecting insulation, compare the 'R' values, which are a measure of resistance to heat transfer. Generally the higher the 'R' value, the greater the resistance.

In addition, choosing light coloured materials for roofs and walls can help reduce the amount of heat absorbed. Light coloured materials reflect the sun's energy and stay cooler than dark coloured materials.

Thermal mass is the ability of a material to absorb and store heat energy. A lot of heat energy is required to change the temperature of high-density materials like concrete, bricks and tiles – these have high thermal mass. Lightweight materials such as timber have low thermal mass. Appropriate use of thermal mass throughout your home can make a big difference to comfort and heating and cooling bills. As concrete and tiles store heat longer than timber floors, they are very useful for absorbing and storing heat from winter sun.

Sealing

External doors should be sealed to keep cool air in during summer and out during winter. Window frames should also be well sealed to minimise heat loss in winter and heat gain in summer.

Materials selection

Carefully analysing and selecting environmentally friendly materials for construction can significantly improve the health, comfort, cost effectiveness and energy efficiency of your home. Also consider the lifecycle of materials and the processes used to extract, process and transport them to the site. Informed decisions about materials and construction systems can reduce the environmental impact of a home without adding to the cost. The following guiding principles should be considered:

(i) where possible, use recycled materials or materials with recycled content;

(ii) Understand how chemicals used in the manufacture of some materials might affect your health;

(iii) consider how and where the materials are sourced and the impacts of this;

(iv) design and build for de-construction, re-use, adaptation, modification and recycling; and

(v) use durable and long lasting materials.

Solar power

Solar power systems use solar photovoltaic panels on the roofs of buildings to capture the sun's energy to generate electricity and/or hot water. In most locations solar panels can be installed on the roof or other parts of buildings. For more information please contact the City's planning team.

Appliances

Enhance the sustainability of your house by using energy efficient appliances. All new homes must use taps and showerheads with a minimum WELS (Water Efficiency Labelling Standards Act 2005) rating of three stars. Toilets must have dual flush and a minimum rating of four stars.

Gas-boosted solar hot water systems or heat pump systems can save hundreds of dollars on energy bills annually, compared to standard electric systems. Consider star ratings when purchasing appliances.

Application of sustainable design principles can reduce the use of appliances that consume electricity and water. For example, provision of 'open air' clothes drying facilities can reduce the need for mechanical dryers.

Water-sensitive design

Water is our most precious natural resource and one that is often taken for granted. There is a growing awareness of the importance of water to our survival and its limited supply in a place as dry as Western Australia. Cutting back our fresh water use can significantly reduce household water bills and demands on public water supply.

Consider the following in the design of your home and garden:

(i) landscaping designed for low water use;

(ii) installation of rainwater tanks; and

(iii) use of 'grey water' where appropriate.

Collecting water from the roofs of buildings and storing it in rainwater tanks for later use directly and significantly reduces reliance on water storage dams and other expensive technologies, for example, desalination plants. Collected rainwater can be used for toilets, laundries, pools, gardens and even for drinking if treated correctly. For detailed information regarding drinking rainwater, contact the City's Environmental Health Department.

Wastewater from non-toilet fixtures such as showers, basins and taps is known as grey water. With proper treatment, grey water can be used for laundries, toilet flushing and irrigation of plants and lawns. Reusing grey water can save thousands of litres of fresh water usually used for watering gardens or lawns – this is especially beneficial during long periods of hot, dry weather when water conservation is essential. The nutrients found in grey water, including phosphorus and nitrogen, can be an excellent food source for a wide range of plants. When treated correctly, grey water can even be used to irrigate food-producing plants.

Only water from the bath, shower, washing machine and bathroom sink can be used as grey water. Kitchen wastewater contains fat, oil and food residues that pose a potential health and environmental risk. The Western Australian Department of Health provides a large list of suitable grey water reuse systems approved for domestic use. A landowner wishing to install a grey water recycling system must first submit an application to the City of South Perth Environmental Health Department for assessment, in compliance with council and state government requirements.

Relevant Information

Your Home - Australia's guide to environmentally sustainable homes
www.yourhome.gov.au/

Synergy
www.synergy.net.au/at_home/solar_residential.xhtml

Water Corporation
www.watercorporation.com.au/save-water

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