Sustainable Development Information Sheet

1. General

There are several advantages to living in a sustainable home including saving money on utility costs, reducing the impact on the environment through the decreased use of fossil fuels, the increased comfort of effective natural lighting and ventilation and the improved resale value of dwellings due to lower utility bills they create.

The Town encourages the implementation of both energy efficiency design (EED) and water sensitive urban design principles. This Information Sheet provides all of the necessary supporting information which outline simple and effective initiatives that can be applied to increase the sustainability of your development.

2. Energy Efficient Design Principles

2.1 Energy Efficient Design

The objective behind EED is to ensure energy efficiency by designing dwellings to suit the local climate. By taking advantage of free natural warmth from the winter sun and cooling from breezes, it will reduce the costly use of fossil fuel energy for heating and cooling. Careful building design can easily achieve internal temperatures 5°C warmer in winter and 10°C degrees cooler in summer than in typical, poorly designed homes in the southwest.

Any style of home can be designed for energy efficiency, to ensure savings on future energy costs, and to assist the environment. The main features of energy efficient housing relate to:

- Building orientation
- Window placement, sizing and shading
- Use of insulation
- Ventilation
- Draught proofing
- Use of heat absorbing building materials
- Landscaping
- Use of energy efficient appliances

Most features such as improved layout, appropriate window placement and sensible garden design, will make little difference to initial building cost. Although insulating a house will add initially to construction costs, the savings in energy and carbon emissions will make for a positive return over the life of the building. It would be false economy to do otherwise.

2.2 Project Homes vs. Individual Design

While it is easier to incorporate energy efficiency features if dwellings are designed specifically to a particular lot of land, Council recognises that this could significantly add to the cost of construction. However, in some cases this is unavoidable and economic cost does not justify a relaxation of this policy where higher density codes are being sought by applicants.

Nevertheless, there are excellent opportunities to meet basic energy efficient principles even with a standard project house. There are many standard house designs available which would allow good energy efficiency, provided they are built facing the right direction. A minor modifications such as moving or reducing the size of windows or relocating the carport, along with good insulation, may be all that's needed to reduce unnecessary and expensive energy use and act to noticeably create increased internal comfort levels.

3.3 Energy Efficient Design Elements

3.3.1 Orientation

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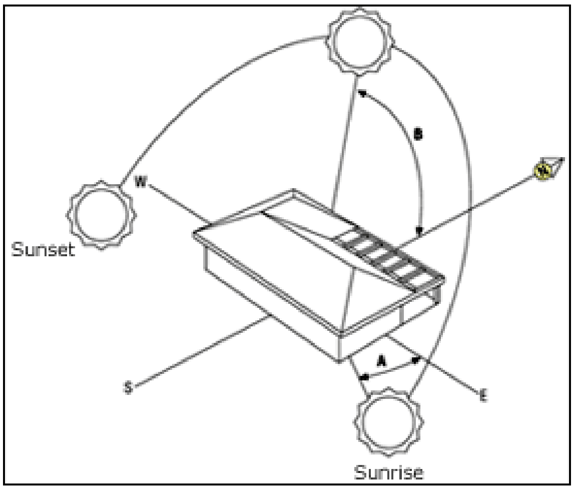
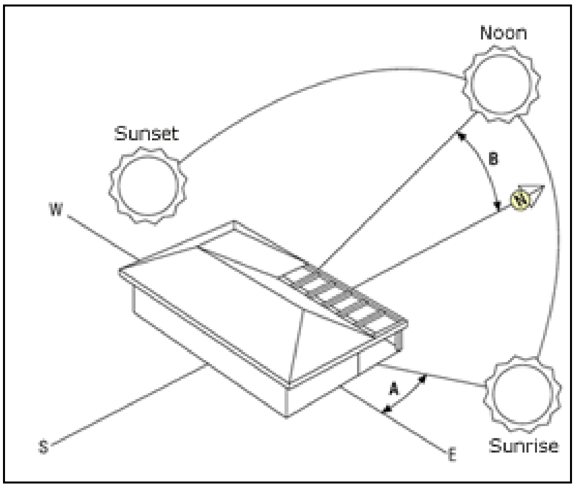
The Sun's Movement during summer (Dec)



Legend:

	Horizontal Rise /Set Angle (A)	Noon Altitude (B)
Perth	28.5° south	80.7°

The Sun's Movement during winter (Jun)

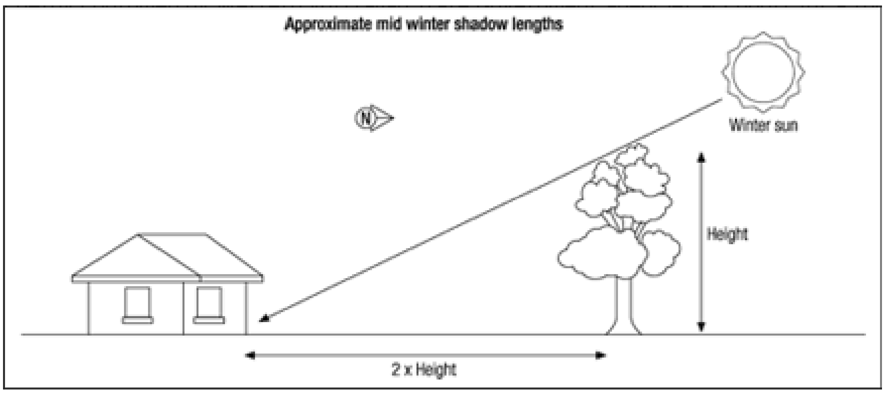


Legend:

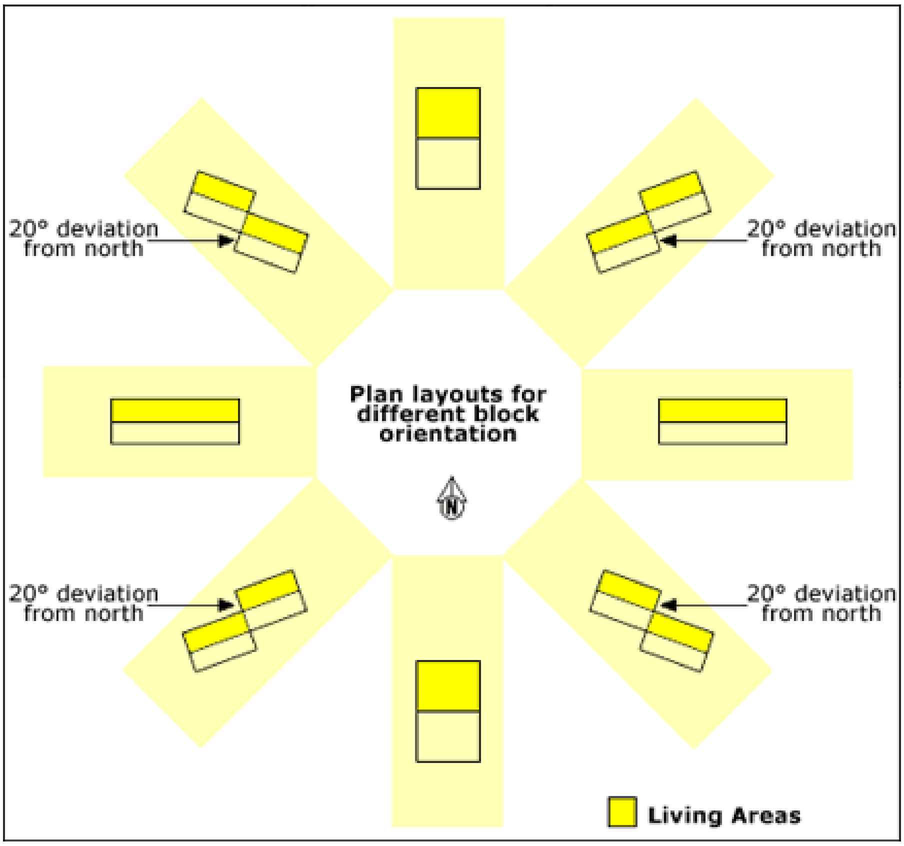
	Horizontal Rise/ Set Angle (A)	Noon Altitude (B)
Perth	27.8° south	34.2°

For residential development, it is recommended that land which permits the living areas of the dwelling to face north, be free of obstructions such as buildings or evergreen trees on this side of the home. Orientation is the key factor in achieving EED. While items such as pergolas, shutters and insulation can often be retro-fitted at a relatively low cost, the orientation of a building is often set in `concrete' and if poorly orientated it is virtually impossible to correct.

Objects cast a shadow southwards approximately twice their height in mid-winter, and it is therefore essential that sufficient allowance is made between tall objects and the north side of a dwelling to ensure that winter solar access is maintained.



The ideal lot layout is one with the rear courtyard/garden facing north. However, there are a number of ways of varying the design of a house and its interior layout to optimise solar orientation.



To achieve the design goal of optimal energy efficiency, an effective rule of thumb for a house in the southwest is to have north and south facing walls 1.5 to 2.0 times the length of east and west facing walls. This allows reasonable access to the winter sun from the north of the home, while reducing the exposure of walls and windows to early morning and late afternoon sun on the east and west sides of the home.

True north is the ideal orientation for windows. However, if the eaves are designed correctly, windows oriented between approximately 20° east or west of north still allow good solar penetration in winter while excluding most of the direct summer sun.

3.3.2 Internal Room Layout

Indoor living and entertaining areas should be oriented on the north side of the home where possible, with other rooms to the south. This will create warm and bright living areas in winter since north facing windows and walls receive maximum winter sun. The south side of a house receives a small amount of direct sun in summer, and therefore by locating bedrooms to the south, will be more comfortable for sleeping in summer.

Rooms should be grouped with similar uses together to create zones and doors be used to separate these zones. This type of design is more energy efficient than open plan living because you can close off rooms which are cooled or heated from those that are not.

It is recommended that the kitchen, laundry and bathrooms be grouped together in order to minimise the need for long hot water pipes. This will reduce the amount of heat lost from the pipes.

3.3.3 Windows and Shading

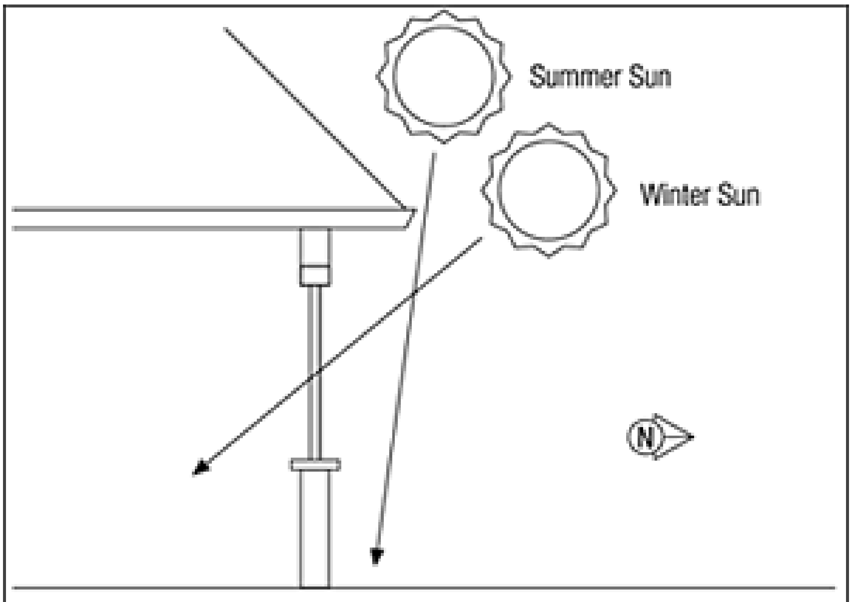
Appropriate window placement, sizing and shading are key elements to EED. Windows can act as solar collectors trapping heat from the sun, which is useful in winter but not in summer. They ventilate during summer, funnelling cool late afternoon and night time breezes to remove heat accumulated during the day and are an important source of light.

A balance needs to be struck between controlling the sun's access and allowing adequate cross ventilation from breezes, as well as allowing natural light to enter.

3.3.4 North Facing Windows

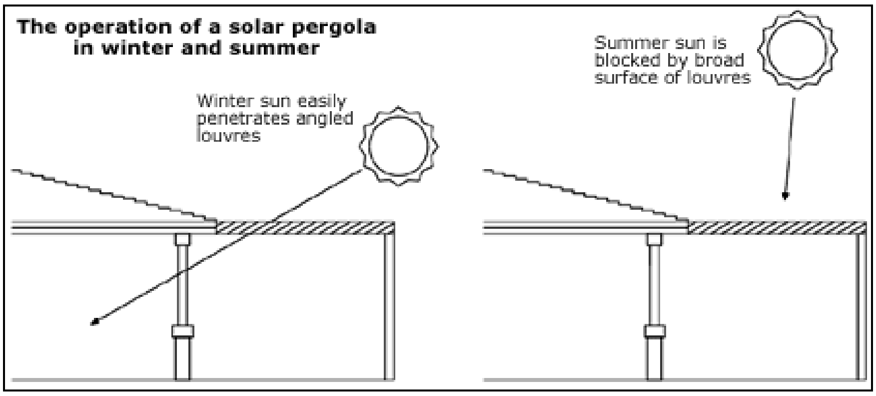
It is recommended that around a third to a half of the north face of the dwelling be glass, as it is very effective at trapping winter warmth and can be easily shaded from summer sun with correctly designed eaves.

To calculate the overhang needed, multiply the distance from the eaves-line down to the bottom of the window by 0.7. This will ensure the glass is adequately shaded from September until March. For cooler regions, multiplying by 0.4 will provide suitable shade from October until February.



Eaves design for excluding summer sun on north-facing windows

Deciduous trees and shrubs or creepers growing on an open pergola on the north face of a home can also provide window shading in summer, while allowing the sun through to warm your home once they've lost their leaves in winter. Alternatively, a solar pergola is designed to achieve the same result.



It is important that shading devices, whether in the form of eaves, pergolas or appropriate landscaping, do not block the sun's access to the interior of your home during winter.

3.3.5 East and West Facing Windows

East and west facing windows can provide unwanted solar heat gain during the summer months and therefore, if excessive, can contribute significantly to an inefficient house design.

To minimise heat gain during the summer months, a house should be designed with the majority of rooms facing either east or west being non habitable i.e. either laundries or garages etc and that the areas of windows are kept to the absolute minimum.

External shading devices provide some protection from the summer sun, with complete protection achieved only with full vertical screening, such as outside blinds or shutters. This is due to the fact that the angle of sun will be close to horizontal early in the morning (east) and in the late afternoon (west), and only vertical screening can block the sun at these angles. Deciduous trees or vines growing on a trellis can also provide shading during summer.

3.3.6 South Facing Windows

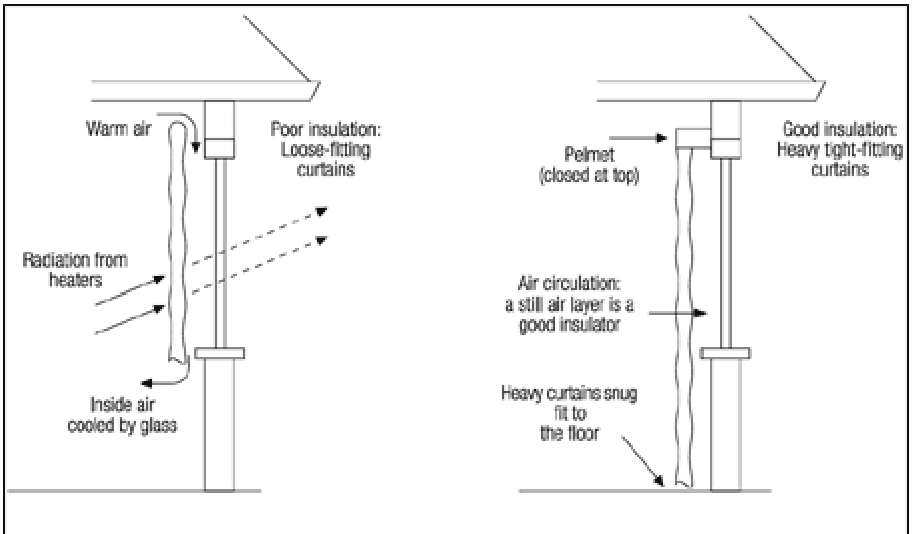
South facing windows receive no direct sun in winter but will receive a few hours of morning and afternoon sun in summer months . For this reason, they lose heat in winter and gain some undesirable heat in summer. South facing windows should be large enough to allow good ventilation and light to enter the home without losing too much heat in winter.

Vertical elements such as external screening or landscaping in conjunction with internal blinds will be most effective at shading south facing windows, since the majority of this sun is at low angle. Basic 'eaves overhang' in combination with internal window treatments will also assist solar control to south facing windows. In mid summer the sun can fall on an unshaded southern façade for approximately 4 hours in the morning and 4 hours again in the afternoon. For the more northerly latitudes (eg, Geraldton) provision of shading to south facing windows is even more important. This is because at this latitude there can be an additional 45 minutes of mid summer sun falling on the south face of a building, morning and afternoon.

3.3.7 Internal Window Treatments

While external window treatments are the best way to reduce summer heat gain, internal window treatments are most important for reducing winter heat loss. A window can lose heat five to ten times faster than an equivalent area of wall. This heat loss can be minimised by keeping warm air inside the room away from cold windows.

Closed curtains can be effective insulators and should be made from a heavy fabric with insulating backing for maximum effectiveness. They need to be long enough to reach the floor and should include a closed pelmet. The pelmet is an integral part of the curtain as it reduces air circulation and consequent heat loss through the window glass during winter and heat leakage into the home during summer when the curtains are drawn.



Poorly designed curtains allow heat to escape

Well designed curtains minimise winter night heat loss

3.3.8 Skylights

Skylights can reduce your daytime lighting needs. However, a typical Perth home consumes approximately six times as much energy for heating and cooling than for lighting, and heat can be lost from your home through skylights on winter nights and gained during hot days. To reduce this problem, position your skylight so it is shaded in summer or consider buying one with special glazing that minimises heat transfer and can be closed at night. Non-vented ducted skylights lose less heat in winter, as the air trapped in the duct acts as a thermal buffer.

3.3.9 Tinted Glass and Reflective Films

Tinted glass and reflective films absorb and reflect heat, keeping your home cooler. However, be aware that using them reduces the amount of light and heat entering rooms in winter as well as in summer. During summer the glass itself becomes hot as it absorbs energy, which will cause some heat to be radiated into the room. These products may be useful where large areas of east and west glazing are unavoidable due to design reasons. However, tints and films will generally not reduce heat gain as much as external shading.

3.3.10 Double Glazing

Two panes of glass separated by at least 10 mm can reduce winter heat loss but is generally only cost effective in situations with high heating requirements. Double glazing can also reduce conductive summer heat gain. However, when exposed to sun double glazed windows will still allow significant heat transfer, which means that full shading is still required.

3.3.11 Other Window Products

Windows are also available with other features, such as special coatings on the glass, which can offer improvements in thermal performance.

Insulation acts as a barrier to heat flow. It can make your home more comfortable by reducing the amount of warmth escaping in winter and reducing the amount of heat entering in summer. By insulating you can significantly reduce your heating and cooling bills and help to reduce greenhouse gas emissions.

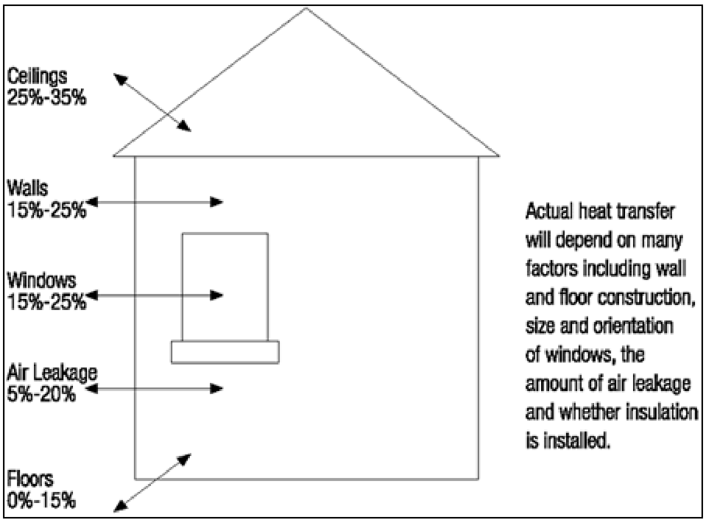
In an uninsulated house most heat is lost or gained through the ceiling and roof – this is the most important part of the home to insulate. Insulating external walls can bring further benefits. Sealing air gaps will also help.

Opening and closing windows and window coverings at appropriate times to control air flows and heat transfer will also increase your comfort levels. This is particularly important in summer to prevent your house overheating. If you allow too much direct summer sun into your home through windows then insulation may act to keep the home warmer for a longer period of time.

3.3.12 Insulation Works

The two main types of insulation are bulk insulation and reflective insulation. Bulk insulation works by trapping small cells or layers of air within the insulating material. Many pockets of still air are very effective at retarding heat transfer. Reflective insulation works by reflecting significant proportions of light and heat. Some reflective foils can be used both as a vapour barrier and to reduce heat transfer.

Typical Areas of Heat Transfer



3.3.13 Construction Materials

Building materials make a significant difference to the performance and comfort of dwellings. Dense materials such as brick, stone, concrete and rammed earth heat up and cool down slowly – they have what is called a high ‘thermal mass’. Lightweight materials such as weatherboard and fibre cement allow the home to heat up and cool down quickly. These materials have a low thermal mass.

Thermal mass is simply the ability of a material to store heat. A 200 square metre home in the south west with good solar access to the north needs about 20 cubic metres of concrete and 20 to 30 cubic metres of internal brick or equivalent depending on your location (30 cubic metres for Perth) to adequately store winter daytime warmth and gradually release it at night.

Thermal mass is most beneficial in homes which have good solar access to north facing windows. If solar access is limited, large amounts of thermal mass can increase a dwellings heating requirements during winter.

During summer, thermal mass will act to keep your home cooler during the day, provided the dwelling is ventilated overnight. The aim is to allow the night air to cool down the mass inside your home, resulting in more comfortable conditions the next day.

3.3.14 Masonry Walls

Double brick walls heat up slowly and stay warm for long periods. This is an advantage during short periods of hot weather, but can make your home uncomfortable over extended hot spells. Insulating double brick walls will add to initial costs, but will help to prevent heat transfer to the interior of the home during summer and help to retain heat during winter.

Brick veneer walls consist of a single external layer of brickwork, with a lined stud frame inside. These walls have less thermal mass than double brick walls and therefore respond more quickly to temperature changes. Homes with brick veneer walls are better at cooling down during extended periods of hot weather – making conditions more comfortable at night during summer. Brick veneer walls are also easier to insulate.

Reverse brick veneer walls have the brickwork inside and lightweight frame and cladding outside. This has the advantage of providing the thermal mass on the inside of your home which will retain any heating used in winter. Conversely the external lightweight cladding (weatherboards etc) will not absorb and store summer heat in the same way as masonry wall are know to do.

With both double brick and brick veneer walls (or any type of wall for that matter), it is important to ventilate your home in summer once the temperature outside becomes cooler than the temperature inside.

This will help cool your home down and make conditions more comfortable. Retained night time coolness achieved through ventilation can also keep your home cooler during the day.

3.3.15 Lightweight Walls

Weatherboard, fibre cement and other lightweight walls get hot quickly in the sun, but also cool down quickly once shaded and after sunset. During winter, they lose heat far more quickly than brick walls. The thermal performance of lightweight walls will improve significantly with insulation, which is cheaper and easier to install at the building stage.

3.3.16 Floors

Concrete floors store heat from the sun shining through northern windows in winter and return some of that heat during the evening. Laying dark tiles where the low angle winter sun hits the floor will maximise the absorption of heat to be re-radiated. It is important that this thermal mass is not exposed to direct solar energy during summer, as this can lead to uncomfortably warm internal conditions.

Timber floors do not have the high thermal mass of concrete floors. This means that a home with a timber floor will lose far more heat than one with a concrete floor. For homes on stumps which are open at the sides, it is recommended that insulation be installed to the underside of all exposed floorboards. Another solution is to fully enclose the area between the ground and the floor with a solid material like brick, but this will not be as effective as using insulation. An enclosed space under the floor will also require some permanent ventilation to control subfloor dampness.

3.3.17 Colour of External Building Materials

As a general rule, light colours tend to reflect the sun's heat while darker colours absorb it. You can take advantage of this fact when selecting the colour of your roof and wall materials. In summer, lighter coloured materials will help to keep your home cooler by reflecting heat from the sun. However if your home is properly insulated, which is a much more effective method of controlling heat transfer, the effect of external building colour on your comfort will be greatly reduced.

3.3.18 Ventilation

Doors and windows should be positioned to achieve cross ventilation in summer. A larger opening on the leeward side of the home will maximise the airflow through rooms. If this has been allowed for in the design of your home, doors and windows opened late on a summer's day will make use of cooling late afternoon and night time breezes to rid your home of heat accumulated during the day.

3.3.19 Draught Proofing

Air leaks and draughts can add significantly to your heating and cooling bills by allowing cold air into your home during winter and warm air during summer. You can prevent these unwanted leaks by installing draught excluders on the bottom edge of doors and sealing strips around doors and windows.

These are easy to fit and can be purchased from your local hardware store. When draught proofing you should also check for spaces between walls and skirtings and block off any unused fireplaces. Note that homes with heaters that burn a fuel inside are required by law to have fixed ventilation for safety reasons. (NB this is for information only and is generally a requirement under the Building Code of Australia).

3.3.20 Landscape Design and Planting Selection

Gardens can provide significant climate modification effects, and have the ability to further enhance or detract from the other factors influencing EED mentioned above.

For example, deciduous trees or vines which provide shade in summer but allow the winter sun to shine through. When their leaves have dropped they provide an effective and simple option.

Deciduous creepers can keep west facing walls cool on hot summer afternoons. Shrubs or trees to the south can be placed to direct south-westerly sea breezes into and through your home.

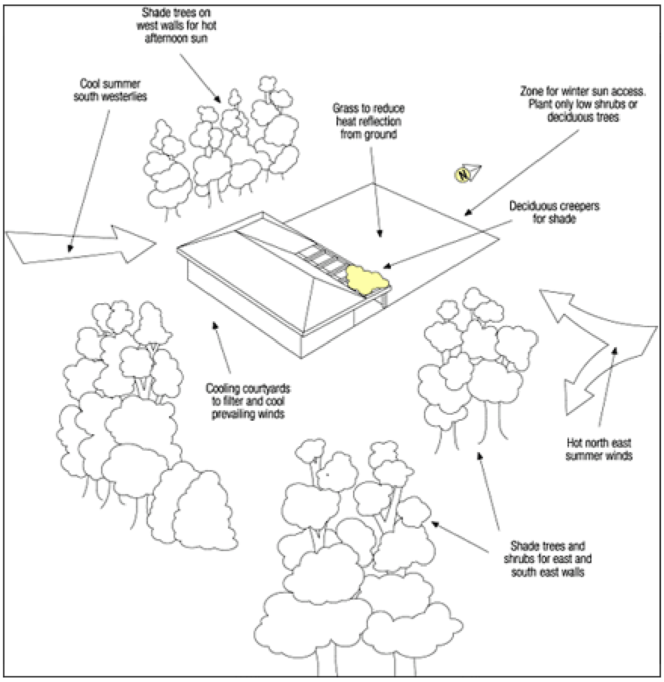
Plantings to the west and north-west can shield houses from winter storms, but close plantings may lead to damage in certain circumstances.

Unshaded paving to the north, east and west of your home should be avoided as it can cause heat to be reflected into windows during summer. Lawns and other ground covers will help reduce this problem.

South facing courtyards with moist cool ferneries will also assist summer cooling.

Overall plant selection should adhere to water wise gardening principals to minimise water usage

The diagram below indicates wind patterns for the Perth region. You should investigate the 'wind regime' particular to your location, to make the most of desirable cooling summer breezes, or to reduce the impact of hot summer or gusty winter winds.



4. Water Sensitive Design Principles

4.1.1 Increased star Water Efficiency Labelling Scheme (WELS) appliances

The Water Efficiency Labelling Scheme (WELS) is a system of easily identifiable and user friendly ratings for household appliances, supported by commonwealth and state legislation to reduce demand for high quality drinking water by informing consumers about water efficiency at the point of sale.

The Town recommends appliances installed into any new dwelling are to have a minimum WELS rating 1 star less than the highest WELS rated appliance. For example, the highest rated dishwasher on the current market may be 5 stars under the WELS. Therefore, any appliance installed into the dwelling must be 4 stars or higher under the WELS.

Information regarding the appliances recognised by this system are found on https://www.waterrating.gov.au/.

4.1.2 Waste Water Recycling and Harvesting

In order to promote the recycling of waste water on the site and in order to satisfy this element of this policy, the Town encourages all dwellings to install a minimum 3000L capacity rainwater tank that is plumbed to either a toilet or laundry within the dwelling; or alternatively an approved grey-water reuse system that collects grey water from the laundry and bathrooms and re-directs it for garden irrigation/ground water recharge. Additionally, water permeable paving solutions should be used as much as practicable on development sites as opposed to hardstand areas, to allow for natural infiltration of stormwater into the soil.

Greywater disposal must be in accordance with the Code of Practice for the Reuse of Greywater in WA. The Code of Practice for Greywater Reuse in WA specifies minimum areas of garden or lawn required for greywater disposal. These are summarised in Table 1 below.

No. Bedrooms	Minimum area required for greywater disposal
1 Bedroom (1 person)	20m^2
2 Bedroom (2 person)	40m^2
3 Bedroom (4 people)	80m^2
4 Bedroom (5 people)	100m^2

Table 1 – Minimum area required for greywater disposal
(NB the above land areas are calculated on the design irrigation rate of a sandy loam. These may differ depending on the soil type on the property of interest (refer to the Code of Practice for the Reuse of Greywater in WA for different soil types.)

Where the applicant does not have the minimum land areas as specified in Table 1, the use of greywater is not an option. Where this is the case, applicants should opt for the rainwater tank instead.

4.1.3 Landscaping

The Town acknowledges the importance deep-rooted vegetation has on aiding maintenance of ground water levels as well as stormwater run-off from areas, which are not conducive to stormwater infiltration (i.e. new development). Professionally prepared landscaping plans reflect how the landscaping responds and contributes to the sustainable design of the development.

A landscaping plan is to include all details of soft and hard surfaces, plant species and density as well as information on deep soil planting areas and rain gardens to assist in providing natural infiltration into the soil. Also refer to the Town's Landscaping Information Sheet.

The Town encourages landscaping plan for the following elements:

- Is permeable paving being used to encourage water infiltration;
- Are there rain garden present;
- Does the proposal include elements of 'xeriscaping';
- Does the proposal grade the reduced sized hardstand areas on the site towards the landscaped garden beds;

- Are the plant selections native and endemic species that once installed, will not require additional watering to maintain their health and vitality;
- Are grassed areas reduced and/or removed on site in favour of low water use mulched garden beds; and
- Does the site contemplate an area for deep soil planting of shade providing plant/tree species.

4.2 Rain Gardens

A rain garden is of comprised of native shrubs, perennials and flowers planted in a small depression to filter and treat stormwater runoff. Rain gardens can play a key role in facilitating water sensitive design as they assist runoff to infiltrate into the underlying soil, recharging the groundwater, and reducing peak flows from the site.

The recommended size of your rain garden is 2% of the existing roof cover area on your property. Refer to Table 2 below for guidance.

Roof Cover Area	Rain Garden Size
$50m^2$	$1m^2$
$100m^2$	$2m^2$
$150m^2$	$3m^2$
$200m^2$	$4m^2$

Table 2 – Examples of Rain Garden Sizes at a 2% Proportion of Roof Cover Area

Then recommended locational criteria for your rain garden is one that:

- Is on a flat site or a slight natural slope. Although rain gardens can be excavated in steeper areas with enough depth for drainage, this can be an added cost;
- Located so that they can capture and treat stormwater from impervious services. Generally, it is best practice to locate a rain garden at the lowest point of your site, as that is where stormwater collects;
- Can provide for a total rain garden depth of 600-800mm (dependent on how large your rain garden is); and
- Setback at least 450mm from the dwelling and property boundaries.

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A standard rain garden has two layers of soil. The top layer acts as the filter layer and should be comprised of a sandy loam with good drainage and a very low clay content. The bottom layer acts as the drainage layer and should be course sand. It is recommended that larger rain gardens have a third gravel drainage layer.

For further information on how to establish a successful rain garden refer to Building a raingarden: step-by-step guide Archives - Healthy Land and Water (hlw.org.au).

4.3 Incorporation of Water Resource Issues Early in the Land Use Planning Process

The earlier that stormwater management is addressed in the land use planning process the more opportunity there generally is for integration of structural mechanisms to ensure water quality. Ideally it should form part of the initial site analysis prior to structure planning and sub-division. For small residential subdivisions (<5ha) and redevelopments in which ponds or wetlands may not be feasible inline controls such as pollutant traps may be more appropriate.

4.4 Addressing Water Resource Management at the Catchment and Sub-catchment Level

Sub-catchments should be used to determine drainage system design. Developments low in the catchment should be designed with due regard to existing and proposed land use as reflected in the Local Planning Scheme and the volumes and quality of stormwater or subsoil drainage water likely to be generated upstream.

4.5 Storage, Stormwater Use and Stormwater Treatment Occur as High as Possible in the Catchment, a Treatment Train Approach is used and Components of Stormwater Management are Located so that they Follow Natural Contours

Stormwater treatment such as detention should occur at source or on-site if practicable. Structural best management practices are most effective when they can be combined in a series, as a treatment train preferably connected by grass or reed swales or multiple use corridors (through public open space). Storage areas should be an integral part of the landscape, wherever possible. The use of the treatment trains can increase pollutant removal effectiveness, allow for filtration of suspended solids, or overcome site factors that limit the effectiveness of a single measure.

The Department of Water and Environmental Regulation (in preparation with the Swan River Trust) have outlined the recommended key design principles to establish a effective treatment trains in their Stormwater Management Manual for Western Australia (pp. 149 - 151).

Wherever possible use should be made of stormwater runoff. Car parks in commercial developments should direct runoff water into landscaped swales by use of flush or broken kerbing to reduce the irrigation requirement and filter stormwater pollutants. Porous paving materials should be encouraged, especially for parking areas that are infrequently used or are low traffic volume areas. Mechanisms to trap sediment should be in place to remove sediment 100 microns or more.

4.6 Protecting property from flooding

4.6.1 Water Courses and main drains

All development along watercourses, main drains and overland flow paths for the 100 year storm recurrence interval shall have floor levels at 500mm above the 100 year flood level in accordance with the Draft State Planning Policy 2.9 - Planning for Water.

Watercourses and main drainage reserves should be of sufficient width to allow for 1:6 batters, appropriate access for maintenance or 1:8 (for revegetation) and the floodway associated with the 100 year event. This would normally result in a minimum reserve width of 30m. However, to allow for natural meandering of a watercourse and the floodplain a 50m reserve width is preferred.

4.6.2 Groundwater Levels

To protect housing from flooding and damage from groundwater, development in areas where the Average Annual Maximum Groundwater Level (AAMGL) is at or within 1.2m of the surface, the importation of clean fill will be required together with the provision of sub surface drainage placed at the AAMGL. In areas where the AAMGL is more than 1.2m from the surface, subsurface drainage may still be required to restrict the rise in groundwater and ensure that adequate separation of building floor slabs from groundwater is achieved.

The AAMGL should be determined to the satisfaction of the Department of Water and Environmental Regulation.

4.7 Maintaining Water Level and Flow Regimes

4.7.1 Water levels –Protected wetlands

Where it is deemed that a proposal is likely to have a potential impact on the hydrological regime of a protected wetland a hydrological study will be required to determine how the water level regime of the wetland can be maintained.

As a general guideline, a hydrological study is likely to be required where drains that alter groundwater levels (eg, subsoil drains) are used within 100m of a protected wetland, or if drainage into a wetland is proposed.

4.7.2 Water flows –Watercourses

In order to prevent instream erosion, peak flows in water courses should not exceed pre-development conditions for the particular storm average recurrence interval (eg, the peak flow reaching the water course from the catchment in a 10 year event should remain the same after development).

Longer duration low-level flows in watercourses to maximise detention times in detention ponds consistent with the advice in the Department of Water and Environmental Regulation are acceptable to enable increased water volumes to be discharged off-site.

Adequate on-site detention is required to ensure this criterion can be met.

4.8 Retaining and Rehabilitating Protected Wetland and Watercourse Fringing Vegetation

Fringing vegetation should not be removed from within the following buffer zones:

Watercourse Type	Buffer Zone
Watercourses with permanent water or protected wetlands	50m
Seasonally flowing watercourses	30m
Watercourses which flow in response to specific rain events	10m

Table 3 – Fringing Vegetation Watercourse Buffer Distances

Removal of non-native vegetation in a manner that replaces it with native vegetation and minimises potential soil erosion is encouraged, except where the non-native vegetation has identified landscape or heritage value.

Foreshore management proposals are assessed in terms of the achievement/ replication of natural processes, and integration of passive recreation whilst maintaining conservation values.

As a minimum watercourses should be revegetated with native vegetation for 10m either side of watercourses which flow in response to specific rain events and 15m either side of other watercourses.

As a minimum, protected wetlands should be revegetated consistent with vegetation zones that would naturally occur in a wetland to at least 15m from the high water mark or 1m higher than the high water mark whichever is the smaller.

Batters and reserve widths are addressed under “Protection of property from flooding” above.

4.9 Using Multiple Use Corridors and Open Drains

Existing open drains should be assessed for their potential to provide for the multiple uses of recreation, stormwater management and the restoration and maintenance of environmental values through conversion to meandering streamlined channels.

There should be no net loss of existing open drain habitat, based on the extent (ie area) of open water and wetland vegetation provided by the drain. Transfer of habitat to a multiple use corridor/streamlined meandering channel is acceptable, but timing to minimise the period when habitat is not available should be considered.

Multiple use corridors width may vary according to site characteristics. However, a minimum of 50m is recommended with additional width if needed for recognising floodway characteristics and protection of foreshore vegetation.

Management plans should be prepared for multiple use corridors. Multiple use corridors should be divided into zones or priority use areas for management purposes.