Sustainable Housing Principles

2.4 Environmental Sustainability
2.4 ENVIRONMENTAL SUSTAINABILITY

CONTENTS

Introduction 5
  Background 5
  This Design Guideline 6

Passive solar design 7
  Solar radiation 7
  Air movement 8
  Passive solar heating 8

Sun shading 9
  Introduction 9
  Sunshading guidelines 10
  Northern orientation 10
  Eaves overhang equation 12
  Internal layout and zoning 15
  Windows 15

Energy efficiency 16
  Overview 16
  Insulation 17
  Fixtures and fittings 17
  Hot water system 17
  Electrical appliances 17
  House energy rating 18
  Solar technologies 18

Water conservation 19
  Overview 19
  Fixtures and fittings 20
  Landscaping 20
  Irrigation systems 20
  Rainwater tanks 21
  Greywater reuse 21
  Blackwater reuse 21
Urban wastewater management 23

Overview 23
Stormwater management measures 23
Water sensitive urban design 24
EPA’s code of practice for stormwater pollution prevention 24

Building construction and waste management 25

Overview 25
Asbestos management 25
Land development and construction works 26
KESAB’s clean sites program 26
Allotment filling material 27
Earthworks 27

Soil contamination 28

Overview 28
Residential developments 28
Site contamination legislation 29

Noise abatement 30

Overview 30
Noise control 30

Built urban environment 31

Overview 31
Urban design principles 31
Streetscape 31
Reserves 32
Regulated and significant trees 32
Native flora and fauna 32
Public transport 32
Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Sun path diagram</td>
<td>10</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Solar penetration</td>
<td>11</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Vegetation as sun shading</td>
<td>12</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Vegetation and site contours</td>
<td>12</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Sun hood</td>
<td>12</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Angled louvers</td>
<td>12</td>
</tr>
<tr>
<td>Figure 7</td>
<td>Western sun shading</td>
<td>13</td>
</tr>
<tr>
<td>Figure 8A</td>
<td>Orientation of allotments</td>
<td>14</td>
</tr>
<tr>
<td>Figure 8B</td>
<td>Orientation of houses</td>
<td>14</td>
</tr>
<tr>
<td>Figure 9</td>
<td>Port Augusta</td>
<td>15</td>
</tr>
<tr>
<td>Figure 10</td>
<td>Adelaide</td>
<td>16</td>
</tr>
<tr>
<td>Figure 11</td>
<td>Mount Gambier</td>
<td>17</td>
</tr>
<tr>
<td>Figure 12</td>
<td>Energy use in a typical South Australian household</td>
<td>7</td>
</tr>
<tr>
<td>Figure 13</td>
<td>Water use in a typical South Australian household</td>
<td>19</td>
</tr>
<tr>
<td>Figure 14</td>
<td>Standard detail for the installation of a plumbed</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>rainwater tank</td>
<td></td>
</tr>
</tbody>
</table>

Acronyms

- EPA: South Australia Environment Protection Authority
- BCA: Building Code of Australia (AKA NCC - National Construction Code of Australia)
- SAHT: South Australian Housing Trust
- LHA: Livable Housing Australia
- NDIS: National Disability Insurance Scheme
- NCC: National Construction Code (AKA BCA - Building Code of Australia)
- DPTI: Department for Planning Transport & Infrastructure
- DCSI: Department for Communities & Social Inclusion
- BRAC: Building Rules Assessment Commission

Copyright

Although the SAHT owns copyright on this document on behalf of the Crown, it licenses its contractors to use the latest available version for SAHT design or construction purposes, and grants non-exclusive licences to others, as long as:

- They do not falsely claim copyright in the SAHTs’ work;
- They indemnify the SAHT and the government of South Australia against claims arising from the use of SAHTs’ work.
2.4 ENVIRONMENTAL SUSTAINABILITY

Introduction

Background

Established in July 2018, the SA Housing Authority (the Authority) is a statutory corporation that administers the South Australian Housing Trust (SAHT) Act 1995.

The Authority consolidates housing-related services and management of the housing stock; including strategy, service delivery, assets and related corporate supports; and plays a key role in enabling and supporting the State’s modern, multi-provider housing system and in establishing an environment that promotes shared responsibility and ownership.

The Authority is committed to providing housing that is socially and environmentally affordable and sustainable. To help achieve this, a suite of design guidelines for sustainable housing and liveable neighbourhoods that are applicable to all types of new residential construction, both rental and affordable have been developed.

The suite of design guidelines comprise the following:

1.1 House Design Guide
1.2 Amenity Targets
1.3 Apartment Design BCA Class 2 Construction
1.4 Housing Accommodation Schedules
1.5 Affordable and Market Housing
2.1 Land Titling and Service Infrastructure
2.2 Design Guidelines for Site Layouts
2.3 SAHT Universal Housing Design Criteria
2.4 Environmental Sustainability
3.2 Row and Terrace House Design
4.1 Housing Modifications
4.2 Generic Design Guidelines for House Renovations

Designers must understand and incorporate the requirements of these guidelines on all residential projects that involve land and properties owned by the SAHT. These guidelines assist designers to interpret current policies and practices and include applicable features of the Good Design Guide SA historically published by Planning SA.

Some design compromise is acceptable to take into account site constraints and local planning conditions. All designs will be considered by the Authority on merit. However, the minimum spatial dimensions needed to meet universal housing living requirements are generally not negotiable.
This Design Guideline

The SAHT is committed to developing sustainable communities with environmental sustainability a major issue. By targeting this important issue the SAHT will reduce the impact of urban development on the environment by identifying and appropriately managing within its finite resources and funding its activities that aim to:

- Provide a sustainable physical environment for urban areas;
- Provide a sustainable environment for current and future Housing SA tenants and private residents;
- Comply and where practicable exceed the requirements of Federal, State and Local government legislation, standards, regulations and codes of practice;
- Seek to continually improve on current methods of environmental management through internal experience and consultation;
- Develop community awareness and involvement in managing the environment; and
- Encourage the urban development and building industry to be aware of and be involved in advanced environmentally sustainable practices.

Within these aims the SAHT will reduce the impact of urban development on the environment through specific initiatives targeting:

- Energy efficiency;
- Water conservation;
- Urban wastewater management;
- Building construction and waste management;
- Noise and acoustics; and
- Built urban environment.
2.4 ENVIRONMENTAL SUSTAINABILITY

Passive Solar Design

Solar Radiation

The location and orientation of a house and its rooms should take advantage of the thermal, hygienic and psychological benefits of sunlight. In South Australia the management of solar radiation requires a balance between maximizing the winter sun penetration during cooler months and minimizing summer sun and overheating in warmer months.

Each individual site will vary in response to solar radiation with respect to latitude and climate. The SAHT currently provides housing in three main zones throughout South Australia with differing solar angles. The latitudes defining these zones equate to those first published by the CSIRO and are readily available documents.

Northern Zone Latitude 32.5 degrees south (exact for Port Augusta)
- Includes Port Augusta, Whyalla and Port Pirie.

Central Zone Latitude 35 degrees south (exact for Adelaide)
- Includes Adelaide, Murray Bridge and Port Lincoln.

South East Zone Latitude 37.5 degrees south (exact for Mount Gambier)
- Includes Kingston, Naracoorte and Mount Gambier.

Sun path diagrams from a resource such as Sunshine & Shade in Australasia (CSIRO 1999) should be used to establish the relevant sun angles for summer and winter seasons. Relevant sun angles for differing times of the day, and year, are necessary in the determination of siting a building for:

- Overshadowing to neighbouring dwellings and private open space; and
- Northern orientation to private open space and avoiding overshadowing from neighbouring buildings.

The orientation of individual rooms within a house should provide:

- Northern orientation and aspect to living rooms wherever possible; and
- Living rooms to open directly to private open space.

Figure 1: Sun Path Diagram

Example sun path diagram for Mount Gambier
2.4 ENVIRONMENTAL SUSTAINABILITY

Air Movement
Air movement affects the perceived temperature and greatly influences comfort. In temperate and warm arid regions, hot winds during summer can create a need for energy intensive means of cooling the interior of a building. In winter, cold winds can increase heat loss from houses and consequently raise the demand for energy intensive heating.

In most locations the predominant winter winds come from a different direction to those of the predominant summer winds, so blocking the winter winds does not conflict with the funnelling of cooling breezes.

Some attention should be given to existing vegetation as this forms the best wind protection screens. Generally, proposed new vegetation should be avoided as screening solutions due to the conflict in tenant or trust responsibility for landscaping / maintenance.

Passive Solar Heating
Passive solar heating refers to using solar energy to heat the interior spaces of a building without relying on mechanical devices that require additional energy. The Building Code of Australia (BCA) requires every new domestic building to comply with new energy efficiency requirements aimed at reducing the demand on mechanical ventilation systems. These energy efficiency measures are required to be verified by one of three methods:

- BCA deemed to satisfy requirements;
- Independent energy audit using computer software (ie AccuRate or First Rate); and
- Independent energy audit by professional opinion.

Figure 2: Solar Penetration
*Solar penetration heats concrete slab. Slab radiates heat during the colder nights.*
2.4 ENVIRONMENTAL SUSTAINABILITY

Sun Shading

Introduction

Shading devices shield windows and other glazed areas from direct sunlight in order to reduce glare and excessive solar heat gain in warm weather. Their effectiveness depends on their form and orientation relative to the position of the sun. A sun path diagram is essential in determining the position and altitude of the sun. Eaves overhang may provide some level of sun shading although horizontal shading is only generally effective on the northern façade. Eastern and Western façades can benefit from vertical shading devices. Southern façades generally do not need shading. Any sun shading device should be sympathetically designed within the overall building design.

Existing vegetation can also function as a sun shading device. Individual site conditions will affect this feasibility and must be investigated on a case by case basis. For example, shading a north wall (but not the roof top solar hot water collector) may be desirable in summer. Therefore, house location may be relevant to adjacent vegetation height.

![Figure 3: Vegetation as Sun Shading](image)

Sun shading may be provided by existing vegetation. Vegetation would need to be deciduous to allow the penetration of winter sun.

![Figure 4: Vegetation and Site Contours](image)

Existing vegetation will cast different shadows depending on site contours.

![Figure 5: Sun Hood](image)

Northern elevation sun hood may match roof pitch. Generally sun shading below the window head should be avoided as it can restrict views and light.

![Figure 6: Angled Louvers](image)

Northern elevation angled louvres stop summer sun.
2.4 ENVIRONMENTAL SUSTAINABILITY

Sun Shading Guidelines

**Note:** The following information is intended as a guide only. The simple equation for eaves overhang below is only a quick check measure. Sun shading design can be a complex combination of a number of competing factors including - site location, site orientation, local climate, building occupant and design brief.

The guide equation has been developed from the following sources and makes the following assumptions:-

- Climate averages available from the ‘Australian Government Bureau of Meteorology’ with a summer shading season of above 26 degrees celsius for the monthly mean daily maximum temperature;
- A brick veneer house with all window & sliding door heads to the underside of a 2100 high eaves. North facing elevation only;
- Sun path diagrams available from *Sunshine & Shade in Australasia* (CSIRO 1999).

**Northern Orientation**

Northern orientation is generally regarded as the optimum position and location for living areas of houses. With the addition of living areas opening up to private open space, this provides the best opportunity to provide effective architectural (fixed) sun shading for windows during the summer months and solar penetration during the winter months.

Conversely, the western elevations should be avoided. In the South Australian summer time the low angle of western afternoon sun provides unrelenting heat loads at the hottest period of the day.

Effective ways of reducing heat loads on western elevations include:

- Deciduous vegetation (trees);
- Vines on a vertical trellis (which may be combined with a pergola);
- Provision of vertical louvres (fixed architectural louvres can restrict views);
- External blinds on windows.

(The SAHT does not provide these facilities and therefore prefers to avoid or minimise windows on western elevations).

Houses orientated obliquely to compass points generally cannot take full advantage of fixed sun control devices and windows are further compromised by unavoidable penetration of low angle sun. Houses orientated within the quadrant 20 degrees West of North and 30 degrees East of North are preferred - refer to the figure 9 for details.

**Note:** The 10 degrees discrepancy between these angles takes into account a time lag difference between morning and afternoon heat loads.

Southern elevations generally require no shading although eaves overhangs and/or porches may still be required to provide protection from weather.
2.4 ENVIRONMENTAL SUSTAINABILITY

Figure 8A: Orientation of Allotments

Suggested northern orientation to houses on sites with varying aspects. For more information refer to Planning SA Guide ‘Land division - how best practice land division can contribute to household energy efficiency’.

Figure 8B: Orientation of Houses

houses on these blocks must be skewed

preferred daytime living zone

houses orientated in intermediate quadrants are to be avoided
2.4 ENVIRONMENTAL SUSTAINABILITY

Eaves Overhang Equation

Divide the window height by the eaves ratio to establish the eaves overhang.

Window Height / Eaves Ratio = Eaves Overhang

Port Augusta

<table>
<thead>
<tr>
<th>Window Height</th>
<th>Eaves Ratio</th>
<th>Eaves Overhang</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 mm</td>
<td>1.5</td>
<td>650 mm</td>
</tr>
<tr>
<td>1500 mm</td>
<td>1.5</td>
<td>1000 mm</td>
</tr>
<tr>
<td>2100 mm</td>
<td>1.5</td>
<td>1400 mm</td>
</tr>
</tbody>
</table>

Figure 9: Port Augusta

This diagram is based upon brick veneer construction with window and sliding door heads to the underside of a 2100 mm high eaves. North facing elevation only.

Noon - Start & finish of summer shading - November 1 to March 30 - 56 Degrees
Noon - Mid Summer - 81 Degrees sun angle at midday
Noon - Mid Winter - 34 Degrees sun angle at midday

typical kitchen window
1000 mm high

typical bedroom window
1500 mm high

typical sliding door
2100 mm high
2.4 ENVIRONMENTAL SUSTAINABILITY

Adelaide

<table>
<thead>
<tr>
<th>Window Height</th>
<th>Eaves Ratio</th>
<th>Eaves Overhang</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 mm</td>
<td>1.2</td>
<td>850 mm</td>
</tr>
<tr>
<td>1500 mm</td>
<td>1.2</td>
<td>1250 mm</td>
</tr>
<tr>
<td>2100 mm</td>
<td>1.2</td>
<td>1750 mm</td>
</tr>
</tbody>
</table>

Figure 10: Adelaide

This diagram is based upon brick veneer construction with window and sliding door heads to the underside of a 2100 mm high eaves. North facing elevation only.

Noon - Start & finish of summer shading - December 1 to March 30 - 50 Degrees
Noon - Mid Summer - 78 Degrees sun angle at midday
Noon - Mid Winter - 31 Degrees sun angle at midday
2.4 ENVIRONMENTAL SUSTAINABILITY

Mount Gambier

<table>
<thead>
<tr>
<th>Window Height</th>
<th>Eaves Ratio</th>
<th>Eaves Overhang</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 mm</td>
<td>3.7</td>
<td>250 mm</td>
</tr>
<tr>
<td>1500 mm</td>
<td>3.7</td>
<td>400 mm</td>
</tr>
<tr>
<td>2100 mm</td>
<td>3.7</td>
<td>550 mm</td>
</tr>
</tbody>
</table>

**Figure 11: Mount Gambier**

This diagram is based upon brick veneer construction with window and sliding door heads to the underside of a 2100 mm high eaves. North facing elevation only.

Noon - Start & finish of summer shading - January 1 to February 30 - 72.5 Degrees
Noon - Mid Summer - 76 Degrees sun angle at midday
Noon - Mid Winter - 28 Degrees sun angle at midday
2.4 ENVIRONMENTAL SUSTAINABILITY

Internal Layout and Zoning

The internal spaces of a dwelling should be designed so that rooms used most during the day obtain as much benefit from natural lighting, heating and cooling as possible. As a result living, dining, kitchen and family rooms (rooms with long periods of daytime use) should be located where possible on the northern side of the dwelling. Sleeping and service areas such as bathrooms and laundries (rooms that are used for short periods of time during the day) should be located where possible on the southern side of a dwelling. This will then reduce the energy that may be needed to supplement and maintain a comfortable living environment.

An open plan style designed for living spaces is desirable. Not only does it make the best use of all available space, it also allows light to penetrate easily and air to circulate freely around the dwelling. However, open areas should be designed so they can be reduced in size by closing doors, to minimise the areas that may require heating or cooling at any one time. Zoning can assist with conservation of energy. The grouping of rooms into similar use patterns or zones will allow heating and cooling resources to be focused on particular areas being used most frequently for that part of the day. Bathrooms, bedrooms and laundries would make up a typical zone, while living areas such as living rooms, kitchens and dining rooms would make another zone. Each zone would then be designed so that it could be isolated from the adjoining zones. For instance, during the day the living areas would be most frequently used and accordingly heated and cooled as necessary. The bedrooms would not be in use and therefore heating or cooling would not be required in this area of the dwelling.

Windows

The sun’s rays pass easily through normal windows. This can provide welcome heat in winter, but can lead to overheating in summer. Ideally the majority of windows should be on the northern side of the dwelling to allow sun penetration into the dwelling to be maximised. Use minimum or zero glass on the eastern and western sides, and small glass areas on the southern side of the dwelling. The total window area should be less than 25% of the total floor area of the dwelling. If windows are made too large they can make the house uncomfortably hot in summer and hard to keep warm on cloudy winter days and nights. The following table indicates the recommended window area as a percentage of the wall area.

<table>
<thead>
<tr>
<th>Facing Direction</th>
<th>Recommended % of wall area</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>60</td>
</tr>
<tr>
<td>South</td>
<td>30</td>
</tr>
<tr>
<td>East</td>
<td>15</td>
</tr>
<tr>
<td>West</td>
<td>0-7</td>
</tr>
</tbody>
</table>
2.4 ENVIRONMENTAL SUSTAINABILITY

Energy Efficiency

Overview
The pie chart (refer figure 1) shows a breakdown of the average energy use in a typical Australian Household. As the pie chart shows, water heating and general heating and cooling are the two most energy intensive areas in most homes.

The energy efficient strategies incorporated in this guideline are designed to produce an energy efficient house that:

- Reduces the need for expensive heating and cooling appliances and systems;
- Reduces appliance and system running costs, and therefore energy bills; and
- Reduces energy related greenhouse gas emissions.

Figure 12: Average energy use in an Australian home

*Chart sourced from the SA Government’s Energy and Environment website*
2.4 ENVIRONMENTAL SUSTAINABILITY

Insulation
The single most important measure to make a house energy efficient is the addition of insulation to the walls and ceilings. Insulation is the material that slows down heat transfer through the external surfaces of the home. In an uninsulated house approximately 40% of heat loss takes place through the roof and ceiling, whilst around 35% of heat is lost through walls and floors. As a result all new housing is to have as a minimum:

- R1.5 insulation material in the external walls; and
- R3.0 insulation material in the ceilings.

Fixtures and Fittings
All new plumbing fittings and fixtures are to be selected for their efficient use of resources and hence energy potential (through limiting the amount of water heated). This applies to the following:

- Shower roses to have a maximum flow rate of 9 litres per minute;
- Taps and outlets to have a 3 star rating; and
- Tap washers (provide a good maintenance free seal).

Hot Water System
Around one third of home energy use is associated with heating water - which is the largest single use of energy in the home. This use of heated water also contributes around 30% of household greenhouse gas emissions. To minimise this energy use:

- Install an energy efficient hot water system that complies with State Government requirements. For further information refer to the State Government’s website at www.sa.gov.au/topics/energy-and-environment. For SAHT dwellings complying units are part of a supply contract which is to be used.
- Ensure that bathrooms, laundry and kitchen are as close as possible to the hot water system; and
- Use insulation around external hot water pipes to reduce heat losses, especially the first few metres from the cylinder. The specified product can be found in the SAHT Minimum Design and Construction Specification.

Electrical Appliances
The SAHT has a range of approved and specified electrical appliances for owned rental dwellings. Refer to the SAHT Minimum Design and Construction Specification for schedules of approved products. For affordable and market housing refer to the website www.energyrating.gov.au
House Energy Rating

All new homes and extensions built in South Australia must achieve a 6 star level of energy efficiency. The energy efficiency requirements are included in the Building Code of Australia (BCA). To meet these requirements designers/builders can engage a qualified house energy rating assessor to undertake a house energy rating using a computer based energy rating program such as the FirstRate or AccuRate software or alternatively, use the deemed to satisfy provisions in the BCA. The SAHT’s preference is for designers/builders to use the option that requires the engagement of a qualified house energy rating assessor to undertake a house energy rating using an approved energy rating program.

Solar Photovoltaic (PV) Systems

The Authority continues to investigate the feasibility of installing grid-connected solar PV systems to SAHT dwellings.

The Authority supports and encourages the installation of these systems, where feasible, in housing associated with demonstration, pilot or special projects.

The design of new dwellings should allow, where ever possible, for the future installation of grid connected solar PV systems.
2.4 ENVIRONMENTAL SUSTAINABILITY

Water Conservation

Overview
The efficient use of water is vital for South Australia’s environmental, social and economic well being. The pie chart (figure 13) shows a breakdown of water use in an average suburban South Australian home. As the pie chart shows, an average home uses about 280kL a year with garden and outdoor use and bath/shower accounting for approximately 60 percent of this use. The measures outlined in this guide will ensure that best practice water conservation principles are incorporated into SAHT owned housing.

Figure 13: Water use in an average suburban South Australian home
Data sourced from SA Water
2.4 ENVIRONMENTAL SUSTAINABILITY

**Fixtures and Fittings**

It is a requirement that the following products must have a minimum 3 star rating:

- Toilets suites must be dual flush;
- Shower heads to have a maximum flow rate of 9 litres per minute;
- Taps and tap outlets to have a 3 star rating minimum.

**Landscaping**

Up to 40 percent of household water is used outdoors, much of which is wasted. Using water conservation techniques in the garden will save money, time and effort. In addition, it is even more important that any landscaping is designed so that water use is minimised and the plants and vegetation selected are drought tolerant. The measures to be considered in landscape planning and design include:

- Selection of appropriate plants and vegetation for the geographic area;
- Selection of appropriate plants and vegetation suited to the specific open areas (amount of sun/shade);
- Use of plants and vegetation that are drought tolerant and will require less water at all times;
- Minimisation of lawn areas. Where lawn is required drought tolerant species (eg Couch, Kikuyu, Buffalo and Paspalum) shall only be used; and
- Recommending the use of mulch in all garden bed areas to reduce evaporation, soil erosion and topsoil run off.

For further information refer to section on Native Flora and Fauna.

**Irrigation Systems**

Where installed (typically common garden areas within grouped housing sites), the design of irrigation systems should:

- Deliver the appropriate amount of water appropriate to the garden / landscaping;
- Minimise the loss of water; and
- Allow flexibility so as not to water at inappropriate times and conditions.

Appropriate advice should be sought on the selection and installation of an irrigation system most suited to the landscaping.

It should be noted that in times of drought the State Government may impose water restrictions that prohibit the use of these irrigation systems at certain times of the year. For further information on the use of irrigation systems refer to the SA Water website under Environment - water wise measures.
Rainwater Tanks

It is mandatory in South Australia that a rainwater tank is plumbed into a new dwelling. To comply, a 1,000 litre gravity fed tank that is plumbed to the toilet is required to be installed into SAHT owned dwellings. To ensure there is always sufficient water in the tank to flush the toilet, mains water will need to be connected to the tank to enable automatic top up of the tank water when water levels have reached a predetermined minimum level (refer figure 14 for standard detail).

Greywater Reuse

Greywater is wastewater from the hand basin, shower, bath, laundry and kitchen. Essentially, it is all household wastewater apart from the toilet (which is known as blackwater). Greywater may appear quite harmless, but it often contains harmful microorganisms. Direct contact with greywater should be avoided and greywater should not be stored for any length of time as it will turn septic, giving rise to offensive odours and providing conditions for microorganisms to multiply.

The Authority is aware of the potential for reuse of greywater for residential purposes (primarily for watering gardens). However, the Authority considers it more appropriate that greywater generated in SAHT properties be effectively managed, treated and reused through the established sewerage systems and treatment plants given:

- the potential health risks; and
- the need to effectively maintain and monitor the installed greywater system.

Blackwater Reuse

Blackwater is all household wastewater including the toilet. Blackwater requires biological or chemical treatment and disinfection before use.

Due to the potential health risks blackwater is not to be reused in SAHT properties. As for greywater all blackwater generated in SAHT properties is to be effectively managed, treated and reused through the established sewerage systems and treatment plants.
Figure 14: Standard detail for the installation of a plumbed Rainwater tank

Standard detail for a 1,000 litre rainwater tank to be installed on SAHT properties.
2.4 ENVIRONMENTAL SUSTAINABILITY

Urban wastewater management

Overview
Stormwater acts as a carrier for a significant amount of pollution which is picked up from properties and public places, and transported through both street drains and kerb and gutter to our waterways and oceans. The water quality of urban run-off is typically poor because of the multitude of small pollution sources.

As a result the urban wastewater management initiatives are aiming to:

- Reduce and where possible eliminate the causes or sources of stormwater pollution (litter, vegetation and sediments);
- Reduce the volume of stormwater run-off from residential sites;
- Reduce the volume of mains water used on public reserves; and
- Manage stormwater as a valuable resource.

The following measures detailed in this section will ensure that the initiatives outlined above will be effectively implemented on SAHT developments.

Stormwater Management Measures

The appropriate stormwater management measures should be determined on a project by project basis and in consultation with the relevant Council. Depending on the size of the project the appropriate stormwater management measures can either be at a catchment, neighbourhood or allotment level. Stormwater management measures can include:

**Catchment Level**
- Detention and/or retention basin;
- Wetlands and/or Aquifer storage transfer and recovery;
- Upgrading of existing stormwater infrastructure;
- Gross pollutant traps.

**Neighbourhood Level**
- Detention basin;
- Aquifer storage transfer and recovery;
- Upgrading of existing stormwater infrastructure;
- Detention pipe storage;
- Gross pollutant traps;
- Bioretention and swales.
2.4 ENVIRONMENTAL SUSTAINABILITY

Allotment Level

- Rainwater tanks (detention and/or retention with or without reuse);
- Bioretention soakage beds and/or wells;
- Permeable paving.

Water Sensitive Urban Design

Water Sensitive Urban Design (WSUD) is an approach to urban planning and design that integrates the management of the total water cycle into the urban development process.

A very useful reference is a technical manual produced by Planning SA “Water Sensitive Urban Design in Greater Adelaide”. This manual which can be downloaded from the SA government website helps apply water sensitive urban design (WSUD) principles to residential, commercial and industrial developments and buildings in Greater Adelaide. These range from the storage, treatment and use of runoff to water efficient landscaping. The manual includes information on legislative requirements, design processes and tools, construction, maintenance and operating requirements, case studies and a list of useful resources.

EPA’s Code of Practice for Stormwater Pollution Prevention

All building and construction sites are to comply with:

- EPA’s Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry; and

- EPA’s Handbook for Pollution Avoidance on Commercial and Residential Building Sites.

For further details refer to section on Management Strategy for Civil Works.
2.4 ENVIRONMENTAL SUSTAINABILITY

Building Construction and Waste Management

Overview
Australians generate approximately one tonne of waste per person per year, which goes to landfill. Up to 40 per cent of this is building waste. Minimising and recycling this waste can have significant social, economic and environmental benefits. To be cost effective, waste minimisation strategies must be agreed to and implemented by all parties involved in building a home at the design, construction and operation stages.

The measures outlined in this guide will ensure this is effectively implemented within SAHT developments through:

- Minimisation and improved management of waste materials;
- Use of building materials that can be recycled and/or reused; and
- Implementation of site management and construction practices that are environmentally sensitive.

Asbestos Management

Buildings
Many of the dwellings earmarked for demolition have asbestos products. As a result any demolition work must comply with the following SAHT policies:

- Asbestos management policy and procedures; and
- Demolition policy and procedures document.

Further information on asbestos is available from the government’s website at www.asbestos.sa.gov.au

Where asbestos building products may be found
2.4 ENVIRONMENTAL SUSTAINABILITY

Civil works

For many urban renewal areas there exists a potential for asbestos products to be associated with the underground infrastructure. Project Managers are to be made aware of this potential and in the types of product that asbestos may be present. Specific requirements need to be incorporated within the civil and building contract specifications for the identification and safe removal (in accordance with the SAHT’s asbestos policy) of any material containing asbestos.

Land Development and Construction Works

Demolitions

One of the key aspects associated with urban renewal projects is the extensive amount of waste material that is generated through the demolition of existing dwellings. Through the SAHT’s Demolition Specifications, demolition contractors are required to minimise the amount of demolition materials and construction waste that ends up in land fill sites by recycling, reusing or converting to usable products.

Demolition activities must also be undertaken in a manner which does not allow demolished materials to enter the stormwater system. In addition uncovered work areas, storage, loading and unloading, plant and equipment cleaning areas and sediment and erosion control measures need to be in accordance with EPA requirements (for further details refer to section on Management Strategy for Civil Works).

Management strategy for civil works

In order to minimise the potential pollution associated with any site development during the construction phase, the Civil Works Design Consultant will:

• Develop a management strategy and prepare a soil erosion and drainage management plan (SEDMP).
  
  The SEDMP will be in accordance with the Stormwater Pollution Prevention Code of Practice for the Building and Construction Industry and Handbook for Pollution Avoidance on Commercial and Residential Building Sites published by the Environment Protection Authority (EPA) in March 1999 and June 2004 respectively.
  
• Submit the SEDMP to the relevant local council for approval as part of the engineering documents for the land division, prior to construction commencing.

In order to minimise the potential pollution associated with any site development during construction, the Civil Works Contractor will implement the works shown on the SEDMP including liaising with the Council at the commencement of the construction activities. The Contractor will not commence construction until they are in receipt of the SEDMP approved by Council.

KESAB’s Clean Sites Program

In association with the SEDMP, the civil works contractor will also be required to conform with KESAB’s Clean Sites Program.
2.4 ENVIRONMENTAL SUSTAINABILITY

Allotment Filling Material

All imported materials used to fill a SAHT site to design levels must be sourced from land that has not been subject to industrial or other activities which could have led to contamination of the fill material. Where the material is being sourced away from a recognised quarry the SAHT will require:

- Details of the previous land use(s) from where the material is being sourced. A site history report prepared by a recognised environmental consultant detailing the following is required:
  - Current and previous land uses;
  - An assessment of potential contamination issues (including identification of all potential contaminants of concern) arising from the current and previous land uses.

The site history appraisal needs to be undertaken in general accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999, Volume 3, Schedule B2, Guideline on Site Characterisation, Section 3.3 Site History.

On the basis of the site history report, testing to confirm that the fill material is free of any contaminants. Sampling and testing of the fill material is to be undertaken by an appropriately qualified environmental consultant in accordance with:

- **AS 4482.1** Guide to the investigation and sampling of sites with potentially contaminated soil - Non volatile and semi volatile compounds.
- **AS 4482.2** Guide to the sampling and investigation of potentially contaminated soil - Volatile substances.
- National Environmental Protection (Assessment of Site Contamination) Measure 1999.

The cost of the site history and contamination testing is to be borne by the contractor.

No fill material is to be brought onto a SAHT site until it has been approved by the SAHT. Any unauthorised fill will be removed as soon as practicable and at the contractor’s expense.

Earthworks

All earthworks undertaken on a SAHT site will need to comply with the following Australian Standards:

- **AS 3798** Guidelines on earthworks for commercial and residential developments; and
- **AS 2870** Residential slabs and footings.
Soil Contamination

Overview

The Authority is undertaking a significant program of urban regeneration in metropolitan Adelaide through major urban regeneration projects within selected suburbs and a significant number of smaller scattered sites created through the demolition of existing SAHT properties. This program aims to deliver more appropriate housing to meet current needs as well as assisting in the development of more balanced and sustainable communities.

Potential exists for significant problems to arise where land has been rezoned or development approved on sites which have subsequently been found to have contamination problems. The public health and environmental risks associated with the redevelopment of contaminated land can be avoided through early identification of sites which may previously have been used for contaminating activities.

Residential Developments

Where a sensitive land use is proposed where a contaminating activity of a kind prescribed by regulation has occurred, the EPA expects the use of an independent Environmental Auditor (Contaminated Land), accredited by the EPA, to assess and provide an expert opinion on the suitability of the site for its intended use.

For redevelopment or continuation of an existing residential site there is no requirement to use the above process (refer Planning SA Advisory Notice 20). However to minimise any contamination issues affecting the redevelopment it is prudent that a risk based assessment be undertaken on these sites. This assessment involves undertaking a site history appraisal. This appraisal would assist in identifying any previous non residential uses and potential contamination activities that may adversely impact on the proposed redevelopment site.

The site history appraisal needs to be undertaken in general accordance with the National Environmental Protection (Assessment of Site Contamination) Measure 1999, Volume 3, Schedule B2, Guideline on Site Characterisation, Section 3.3 Site History.

If the site history appraisal does not identify any potential significant issues then the development can proceed as planned, however if potential significant issues are identified then an environmental site assessment (including soil sampling and testing) will need to be undertaken prior to the development proceeding.
On the basis of the site history appraisal, the environmental site assessment (ESA) will need to be undertaken by an appropriately qualified environmental consultant in accordance with:

- **AS 4482.1** Guide to the investigation and sampling of sites with potentially contaminated soil - Non volatile and semi volatile compounds.
- **AS 4482.2** Guide to the sampling and investigation of potentially contaminated soil - Volatile substances.
- National Environmental Protection (Assessment of Site Contamination) Measure 1999.

If the ESA does not identify any significant contamination then the development can proceed as planned. However, if contamination is identified then further investigations and the engagement of an environmental auditor may be required.

If remediation of a site is required please refer to the EPA document titled ‘EPA Guidelines for Environmental Management of on-site remediation’ for appropriate advice on the environmental management of remediation activities so as to minimise any actual or potential adverse impacts and to provide adequate protection to the community.

### Site Contamination Legislation

The Environment Protection Act 1993 was amended in 2007 in relation to site contamination to include provisions which assign responsibility for site contamination, establish a statutory audit system for South Australia and give the EPA powers to deal with site contamination.

The legislative forms part of a set of measures to ensure that site contamination is adequately managed in South Australia.

These measures comprise:

- The Environment Protection Act 1993;
- The Environment Protection Regulations 2009;
- A series of supporting publications including codes of practice, guidelines and information sheets.
- Amendment to regulations under the Land and Business (Sale and Conveyancing) Act 1994; and
- Appropriate amendments to planning processes under the Development Act 1993;
2.4 ENVIRONMENTAL SUSTAINABILITY

Noise abatement

Overview
While construction activity is often inherently noisy, the general environmental duty under the Environment Protection Act requires all reasonable and practicable measures to be taken to prevent, or minimise, any unreasonable impacts.

Noise Control
All contractors working within a development must comply with the section on noise control in the EPA’s Handbook for Pollution Avoidance on Commercial and Residential Building Sites published in June 2004.
2.4 ENVIRONMENTAL SUSTAINABILITY

Built urban environment

Overview
Good urban design leads to quality public places that in turn have the capacity to revitalise neighbourhoods and reinforce a sense of place. As a result the designs for public places and their interaction with private buildings and spaces should reinforce the urban environment as liveable, efficient, creative, sustainable and socially inclusive.

Urban Design Principles
Good urban design is an integral component of the SAHT operations. As a result, the SAHT through working closely with Planning SA has developed a set of Sustainable Housing and Liveable Neighbourhoods guideline documents that incorporate good urban design principles.

These guideline documents that will apply to all SAHT projects can be accessed and downloaded at www.dhs.sa.gov.au/services/sa-housing-authority/housing-design-guidelines

Streetscape
The streetscape is the visual identity of a neighbourhood and plays an important role in facilitating interaction between residents and creating a community. The designed streetscape should encourage connection, understanding and community spirit among residences. The objectives to achieve this in urban development projects include:

• Ensuring the construction of buildings that assist the creation of an attractive streetscape;
• Provision of adequate space for landscaping;
• Provision of surveillance of public domains; and
• Protection of the amenity of adjoining properties.

The design guidelines documents provide a range of design elements that with compliance will meet the above objectives.
2.4 ENVIRONMENTAL SUSTAINABILITY

Reserves
The SAHT is aware of the importance of reserves within redevelopment areas not only for recreation space but also for the general improvement of the urban landscape. In conjunction with the local council opportunities for enhancing existing reserves and the creation of new reserves should be explored within redevelopment areas. The incorporation of pedestrian access ways through the reserves should also be considered. In addition, to enhance a redevelopment area, the planting of new indigenous species (where possible) trees and shrubs within public areas is encouraged.

Regulated and Significant Trees
It is important to identify and retain where possible all regulated and significant trees within a development. Apart from these trees, trees and vegetation species suitable for transplanting elsewhere within a development should also be identified and retained where possible.

For further information on regulated and significant trees go to the SA government website at www.sa.gov.au/topics/planning-and-property/land-and-property-development then clicking the "regulated and significant trees" box.

Native Flora and Fauna
Where practicable indigenous species are to be planted within reserves and other public places in the development in accordance with the Government’s Planting Indigenous Species Policy and the SAHT’s Horticultural (Landscaping) Policy and Guidelines. Implementation of these policies will:

• Re-establish some of the native vegetation of SA lost due to human activity;
• Plant species that have a low environmental impact, low ongoing maintenance requirements and low allergenic properties; and
• Encourage biodiversity values by providing suitable habitat.

Public Transport
Where practicable roads, footpaths and accessways within reserve areas should be designed within development areas so as to encourage the use of existing public transport wherever possible. This may involve limiting the creation of new roads while retaining as many of the existing roads, the creation of new footpaths and the incorporation of pedestrian accessways within reserve areas.

Regulated Tree
Generally any tree with a trunk circumference of 2.0 m or more (measured at a point 1.0 m above natural ground level). In the case of trees with multiple trunks, regulated trees are those with trunks having a total circumference of 2.0 m or more and an average circumference of 625 mm or more (measured at a point 1.0 m above natural ground level).

Significant Tree
Generally a regulated tree with a trunk circumference of 3.0 m or more (measured at a point 1.0 m above natural ground level). In the case of trees with multiple trunks, significant trees are those with trunks having a total circumference of 3.0 m or more and an average circumference of 625 mm or more (measured at a point 1.0 m above natural ground level).

Note:
All new pedestrian linkages are to be disability code compliant.