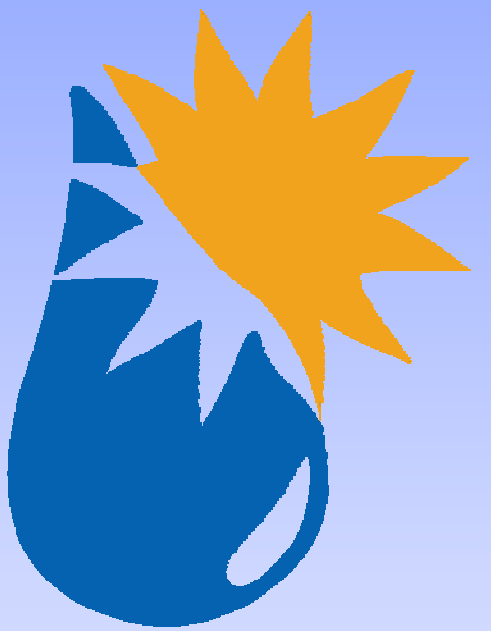
Development Control Plan No 32



Energy Smart Water Wise

As amended 5 November 2001

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Some Quick Tips for Using This Document

1. The Controls you must comply with:

Refer directly to the **Part B – The Approvals Guide** on Page 11.
It tells you what you need to comply with, and what information you need to supply with any application. You will find that there are differences in requirements for both small and large-scale developments*:*

- **Smaller developments, such as alterations and additions to dwelling houses, minor changes to existing commercial, retail and industrial buildings.**

  The key issues that Council considers for these applications are orientation and overshadowing, as well as insulation, water efficient fixtures and energy-efficient appliances.

  We suggest that you obtain a copy of Council's Energy Smart Water Wise Information Kit. It provides more ways to improve the energy and water efficiency of your home or business.

- **Larger developments, such as new dwelling houses, residential flat buildings, commercial and retail buildings.**

  More detailed energy and water efficiency assessments will need to be carried out for these proposals, requiring submissions and certification from experts in these fields.

2. If you want more information and explanation of the new DCP requirements, see the following sections:

Part A – **Introduction** contains the primary reasons for addressing energy and water efficiency measures and defines the key terms used in this document.

Part C – **Design Principles and Controls** – provides the underlying intention and design recommendations for each main energy and water efficiency principle. Part C also sets out the mandatory controls for each development type.

The design principles in Part C will mainly be used by the energy and water consultants of larger developments, and also provide a useful information source for all types of developments.

Contents

List of Figures

Part A
Introduction

Some Basic Facts About This Document

What is a Development Control Plan?

A Development Control Plan (DCP) is a commonly used town planning document which provides detailed guidelines for the assessment of new developments.

What developments are affected by the DCP?

The DCP introduces new controls and design guidelines for most new building works, ranging from home renovations to larger residential developments as well as commercial, retail and industrial buildings, and other non-residential developments (e.g. cafés, restaurants, hotels and motels).

It's more than just Development Control

Whilst the DCP mainly deals with new development, we will also be promoting the economic and environmental benefits of efficiency measures through educational programs on the fitting out of existing homes and businesses (also known as retro-fitting) and encouraging a change in our basic lifestyle patterns.

What were the origins of the DCP?

This DCP addresses a required action of Council's 1997 Environmental Strategy – "Marrickville Agenda 21".

This Strategy responds to recent state and federal government legal and policy directives to address world-wide issues such as ecologically sustainable development (ESD), the impacts of greenhouse gases and global warming.

What do we mean by energy and water efficiency?

Efficiency is a term generally used to describe how to gain advantages or benefit from performing a task in the best possible way.

It is evident that there is a lack of efficiency in the way we collect, obtain, use and dispose of natural resources for energy and water products. The current methods waste natural resources, create relatively expensive consumption costs, and result in serious global environmental problems.

Local councils have been called upon to encourage more efficient practices through the assessment of new developments.

What are we aiming to achieve through the DCP?

The main aims of the new controls are*:*

- To make our living, working and business environments more comfortable.
- To improve the quality of buildings in Marrickville.
- To save money for people by using less energy and water.
- To give greater protection to our natural environment by reducing the wastage of resources as well as reducing the amount of greenhouse gas emissions.

What other energy and water initiatives are Council involved in?

Council has been working with the NSW Sustainable Energy Development Authority (SEDA) and the Inner Metropolitan Regional Organisation of Councils (IMROC) to obtain the most up-to-date and experienced range of expertise in preparing the new DCP, as well as investigating the ways of increasing the efficiency of its own operations.

Council is now part of SEDA's Energy Smart Homes and Energy Smart Business Programs.

More information on current initiatives can be obtained by contacting the Manager of Council's Environmental Services Section on 9335 2198.

Where to get more information

For any further enquiries on this document please contact Council's Development and Environmental Services Section by phoning 9335 2000.

Legal Reference

This Development Control Plan has been prepared pursuant to the requirements of section 72 of the Environmental Planning and Assessment Act, 1979.

It may be formally cited as "Marrickville Development Control Plan No. 32 – Energy Smart Water Wise." The DCP applies to all land within the Marrickville Council area.

The DCP was adopted by Council on 15 March 1999, and takes effect from the date of its advertisement on 21 April 1999.

Amendment No.1 of the DCP was adopted by Council on 4 July 2000 and takes effect from the date of its advertisement on 9 August 2000.

Further amendments were adopted by Council on 5 November 2001 and take effect from 4 February 2002.

Our Reasons for Preparing the DCP

1. To make our living, working and business environments more comfortable.

It is ironic that we give the comfort of our homes and workplaces a high priority in our lifestyles, yet fail to take advantage of the most basic sources of comfort generated by natural energy and water efficiency practices.

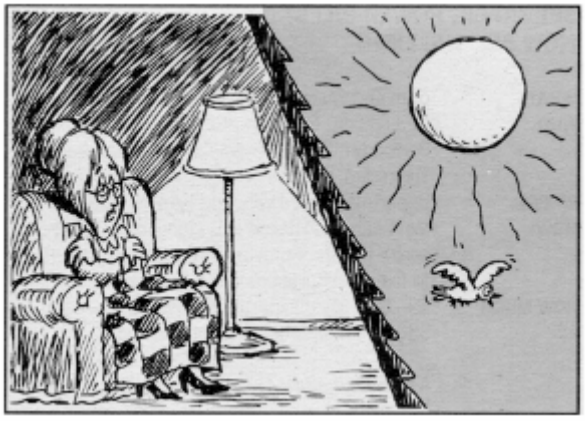
A good indication of how ill-equipped our homes are in terms of thermal comfort is the rush for portable fans and heaters at the first hint of extreme hot or cold weather. Even in Sydney, where we have a relatively moderate climate, people tolerate the extremes of uncomfortable living conditions.

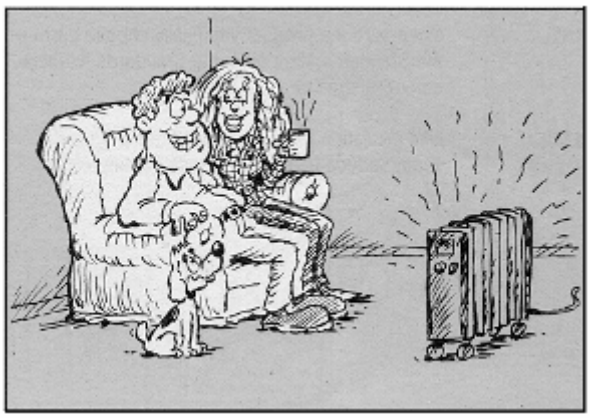
2. To improve the housing and business building stock of Marrickville.

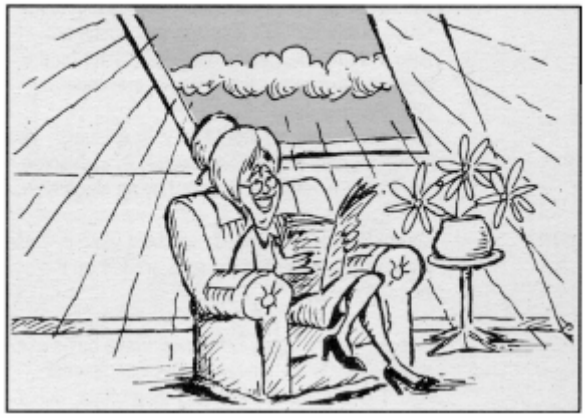
Council's role in the assessment of new building works has traditionally been limited to ensuring that external appearance and structural capacity are satisfactory, and adjoining properties are protected against unreasonable impacts.

This DCP provides a greater emphasis on the actual functioning of a building, in terms of the efficiency of its internal layout, the type of materials, the choice of appliances and the type of energy and water sources it uses.

The improvements that can be made to the efficiency of the functioning of a building can greatly enhance its quality, comfort and saleability for current and successive property owners.







3. To save money by using less energy and water.

Energy and water efficient design and systems can save money as a result of reduced dependence on conventional energy and water suppliers.

The Australian Consumers Association (July, 1997) estimate that an energy efficient home is almost $1,000 a year cheaper to run than an average new home.

The amount you can save will vary, depending on the type of efficiency measures, how they relate to the design of your home or workplace, and the immediate site conditions.

Whilst energy and water efficient appliances are cheaper to run, the initial purchase price for some products (or design measures) may be higher.

The “pay back period”, that is, the time it takes to pay off the capital cost through reduced energy and water bills, will vary a lot.

Rainwater tanks for example have a longer “pay back” period because water for residential use in Sydney is quite cheap.

Other products, such as some gas heating systems can have quite a quick payback.

Over a longer term, it is more likely that significant savings will be identified.

Council’s “Energy Smart, Water Wise” Information Kit provides information on government funded rebates that can lower the initial purchase price of certain products.

4. To give greater protection to our natural environment by reducing the waste of resources in energy and water production and use, as well as reducing the amount of greenhouse gas emissions.

Energy Smart

Global Warming

Global warming is one of the world's most critical environmental issues, and local councils are under increasing pressure to take action to address its impacts.

The earth is covered by a blanket of gases which allow light energy from the sun to reach the earth's surface, where it is then converted into heat energy.

Some gases in the atmosphere trap the heat before it escapes into space. This natural "greenhouse effect" keeps the earth warm.

The problem that has arisen is that human activity is generating more of these greenhouse gases. Most scientists are convinced that this will trap more heat and raise the earth's average temperature, hence the term "global warming".

Global warming can create extreme and complicated changes in weather conditions such as severe droughts, and floods and higher rainfall intensity, and is contributing to higher sea levels.

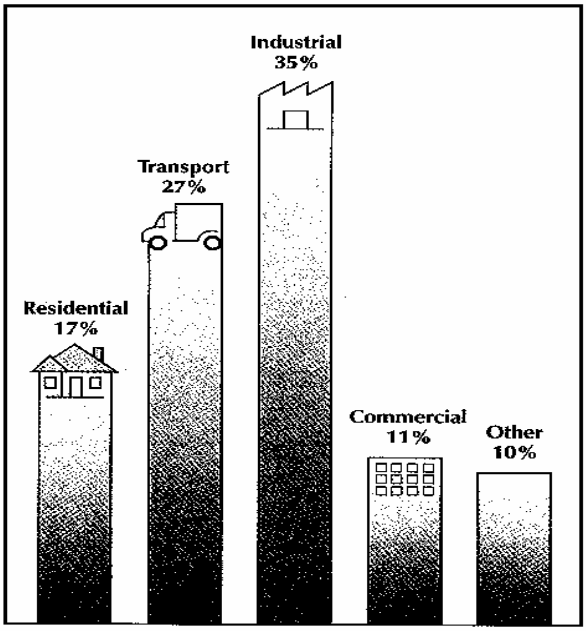


Figure 1: Contribution of each sector to carbon dioxide emissions.

Source: *Ecologically Sustainable Development Working Group 1992 (As published in Nick Hollo's "Warm Cool House")*

The main greenhouse gases generated by human activity are carbon dioxide, methane and nitrous oxide.

A major proportion of these gases are produced through the burning of fossil fuels (such as coal and gases) to create electricity. Other main sources include motor vehicle exhaust, industrial emissions and methane production through waste landfills.

Fuel	CO_2 (kg/GJ)
Natural Gas	55.0
Petroleum Products	77.0
Black Coal	91.7
Brown Coal	95.3
Electricity	286.0

Table 1 Carbon Dioxide Emissions from Different Fuels

Source: *Ecologically Sustainable Development Working Groups 1991, Final Report-Energy Use, AGPS, Canberra, 168.*

Implications for Energy Use

There is a need to change our current dependence on inefficient production and usage practices.

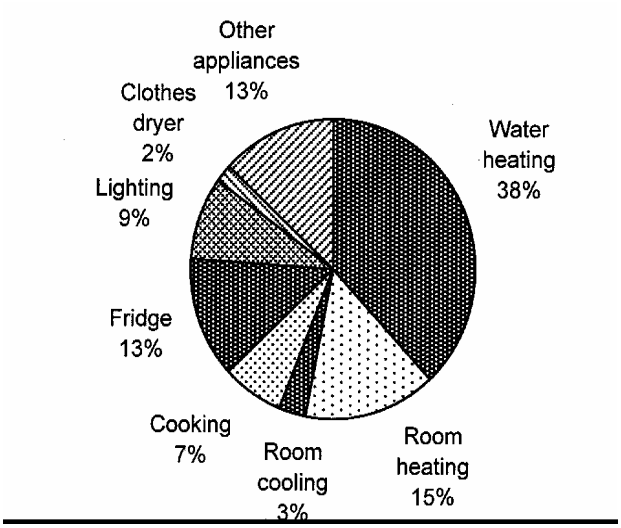


Figure 2: Energy use in a typical Sydney household.

Source: *"The Institute of Sustainable Futures, 1999.*

Alternative natural energy sources like the sun and the wind have the best potential to reduce greenhouse emissions.

However, there are many opportunities to combine natural climatic conditions, appropriate building design and materials and vegetation with low energy consuming machinery to reduce energy use and greenhouse gas emissions.

Water Wise

The Natural Water Cycle: A System in Crisis

Water is one of our most precious natural resources, and is vital for the survival of our ecosystems. The impacts of urban development have greatly threatened all stages of the natural water cycle. It is a priority of this DCP to encourage better management of this cycle through appropriate development controls and education.

Water Use and Supply

Growing populations and growing water use patterns require greater water storage capacity and infrastructure. Dams are very costly to construct and maintain, they use up valuable land and often destroy or displace wildlife.

An increased water supply generally means increased sewage disposal problems.

Toilet flushing and outdoor irrigation accounts for almost half of all residential water use. The irony is that the water needed for these uses need not be from the potable water supply.

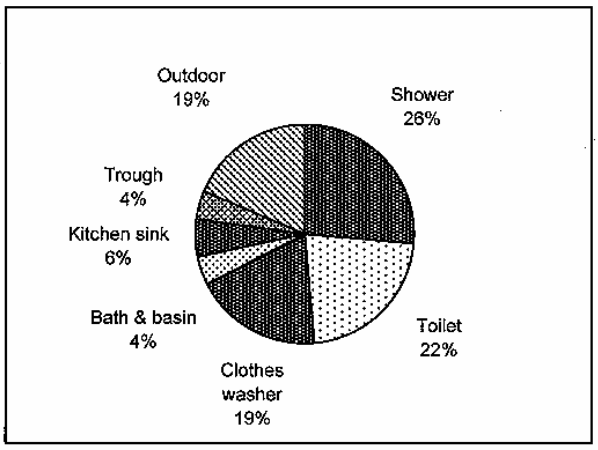


Figure 3 **Water Use in Inner Sydney**
Source: *The Institute of Sustainable Futures, 1999.*

Water Pollution

Water systems quality is a major environmental problem, particularly through the discharge of wastewater into our rivers and oceans.

Water Cycle Disruption

Massive changes to the natural water cycle are altering water tables and river flows throughout Australia. The widespread removal of vegetation has dramatically reduced the rate of transpiration, which is the process where the water absorbed by plants is conducted back into the atmosphere. The loss of vegetation has also caused water tables to rise, which is often accompanied by salinity problems.

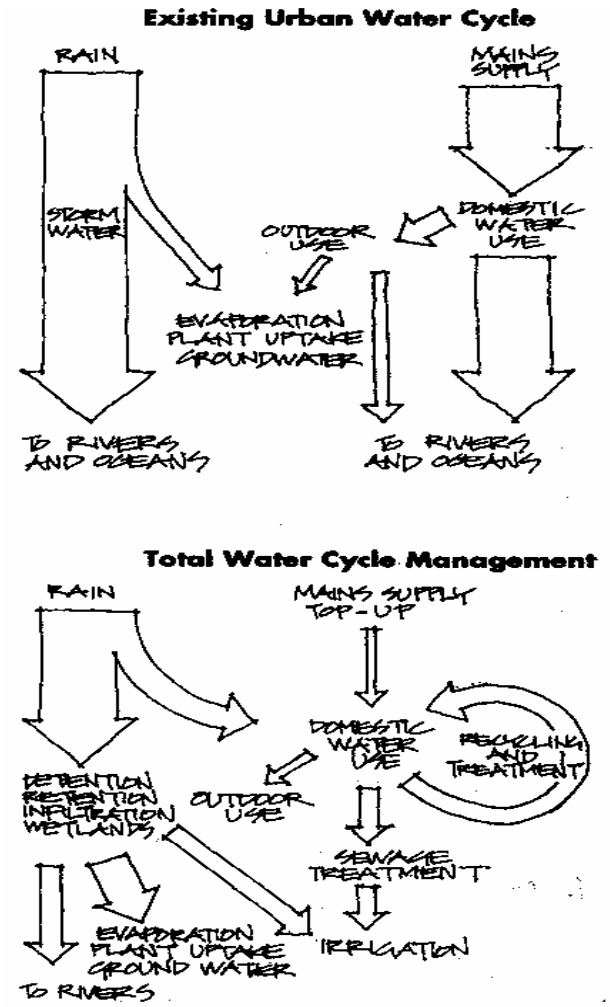


Figure 4: **Existing Urban Water Cycle and Total Water Cycle.**
Source: *RAIA's "Environment Design Guide".*

Increasing amounts of non-porous, or hard surfaces, are preventing water from naturally infiltrating the ground, and making stormwater management more difficult for local councils.

This DCP concentrates on the following strategies for more effective water cycle management:

a) Reducing Demand for Water
b) Stormwater Management
c) Control of the Quality of Stormwater
d) Water Collection and Re-use.

Definitions

In using this document you will come across a series of commonly used terms and concepts. The main ones are defined below.

AAA Rated Water Fixture

Is a fixture (e.g. a tap or shower head) which is given an Australian Standards water conservation rating. AAA is the water efficiency of an appliance displayed on a rating label on the appliance at the point of sale. The more 'A's, the more water efficient the appliance.

Active Solar Energy Systems

The use of mechanical devices to harness the energy of the sun to achieve thermal comfort.

Clerestory

A small row of windows high in the wall below the ceiling.

CO_2

Carbon Dioxide.

Commercial Premises

A building or place used or intended for use as an office or for other business or commercial purposes.

Double Glazing

A form of window which uses two panes of glass separated by a vacuum of stationary air.

Dwelling House

A dwelling on a single allotment of land

Ecologically Sustainable Development (ESD)

The conservation and use of resources which will allow our quality of life to be maintained forever.

Embodied Energy

The total amount of energy used in the production, manufacture and transportation of a building material.

Energy

The capacity to perform work. All work is a consequence of a change of energy from one form to another.

Greenhouse Effect

The warming of the earth's atmosphere believed to be due to the emission of gases from human activities such as the burning of fossil fuels to produce electricity.

Greywater Recycling

A process which involves the storage and re-use of water that has been used once for non-sewage utilities (such as showers, baths and washing machines). The used water is filtered and then re-used for certain functions such as flushing toilets and irrigating gardens.

Gross Floor Area

The sum of the areas of each floor of a building where the area within the outer face of the external enclosing walls as measured at a height of 1,400 millimetres above each floor level, excluding:

- columns, fin walls, sun control devices and any other elements, projections or works outside the general lines of the outer face of the external wall; and
- lift towers, cooling towers, machinery and plant rooms, and ancillary storage space and vertical air conditioning ducts; and
- car parking needed to meet any requirements of Council and any internal access thereto; and
- space for the loading and unloading of goods.

Heat Pump

A system designed to remove heat from one medium and transfer it to another medium, cooling the former and heating the latter.

Major Alterations and Additions to Dwelling Houses

Works affecting more than 50% of the existing floor area.

Major Alterations to Motels, Hotels , Backpacker Hostels and Boarding-Houses

Works affecting more than 50% of the existing floor area.

Major Residential Torrens Title Subdivisions

New subdivisions involving the creation of ten or more allotments.

Minor Alterations and Additions to Dwelling Houses

Works affecting less than 50% of the existing floor area.

Multi-Unit Housing

Means two or more dwellings in a group and includes terrace houses, villas, townhouses, cluster housing and integrated housing.

NatHERS

The Nationwide House Energy Rating Scheme or NatHERS, is a computer program for rating the thermal performance of houses across Australia.

Non-renewable Fuels

Fuels which are derived from fossil remains such as coal, oil, or gas and are not capable of being replenished.

North or True Solar North

In any discussion relating to solar orientation, a reference to “north” is a reference to true solar north and not magnetic, or compass north. True solar north varies from magnetic north depending on the location. In Sydney, for example, true solar north is approximately 12 degrees west of magnetic north.

Orientation

Siting a building to obtain the maximum benefit from the sun’s energy.

Passive Solar Energy Systems

The use of energy from the sun to achieve thermal comfort by incorporating local climate characteristics in building designs.

Payback Period

The time taken to recover savings in running costs of the extra capital investment in an energy efficient system over and above the capital cost of a conventional system.

Potable Water Supply

Supply of water of drinking quality.

R insulation value

A measure used to describe the insulation performance of different materials. The greater the R value, the greater will be the effectiveness of the insulation on resisting heat flow into a building in summer or out of it in winter.

Renewable Fuels

Sources of energy which do not deplete the supply. Solar energy includes wind and ocean waves which are derived from the effects of the sun.

Residential Flat Buildings

Buildings containing two or more dwellings.

Shops

A building or place used or intended for use for the purpose of selling, exposing or offering for sale by retail goods, merchandise or materials.

Solar Collector

A device for capturing the sun’s energy.

Solar Radiation

Radiation that is emitted from the sun.

Stormwater

Is pure rainwater, together with anything the flowing rainwater carries along with it.

Thermal Comfort

The internal temperature and degree of comfort of a building.

Thermal Insulation

A material having a relatively high resistance to heat flow and used principally to retard heat flow.

Thermal Mass

A measure generally used in the energy assessment of a house, involving the amount of potential heat storage capacity available in building materials.

Ventilation

The process of supplying or removing air by natural or mechanical means to or from any space.

Part B
The Approvals Guide

Using the Approvals Guide

The Assessment Table

The starting point for using The Approvals Guide is to refer to The Assessment Table on Page 13.

This Table will tell you how Council assesses the energy and water efficient factors of your development, as well as the information you need to submit with your application. **The Table states the things you must comply with.**

An explanation of the main terms used in the Table is provided in the previous section of this DCP.

It is strongly suggested that you consult with your architect, builder or draftsperson on these requirements prior to lodging an application to Council. You should also seek advice from Council officers in the formative stages of your proposal.

The Assessment Table

The following table provides a summary of Council's mandatory requirements for different types of development. Part C of the DCP provides more detailed information on additional water and energy efficient practices which are encouraged by Council (see pages 23 onwards).

To use this Table, choose your development type from the left hand column, and then refer across to the next two columns to find out Council's planning controls, and the types of information you need to submit with your application.

YOUR DEVELOPMENT TYPE	WHAT YOU MUST COMPLY WITH	INFORMATION TO BE SUBMITTED WITH YOUR APPLICATION
1. Minor alterations and additions to a Dwelling House	♦ Core Energy Efficient Design Principles (see later section in Part B of DCP): a) Orientation b) Overshadowing ♦ Insulation of additional or replacement ceiling or roof to an R3 rating. ♦ New or replacement toilets to be dual flush. ♦ New or replacement hot water systems, must have a minimum 3.5 star greenhouse rating. ♦ Bathroom/ kitchen taps, showerheads, toilet cisterns clothes washers and dishwashers, must be AAA rated where new or replacement fixtures are proposed. ♦ Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	♦ Discussion of Core Design Principles within Statement of Environmental Effects (see later in this section of the DCP).
2. Major alterations and additions to a Dwelling House	♦ Core Energy Efficient Design Principles (see later in this section of the DCP): a) Orientation b) Overshadowing ♦ Insulation of existing ceiling or roof to an R3 rating. ♦ New or replacement toilets to be dual flush. ♦ New or replacement hot water systems, must have a minimum 3.5 star greenhouse rating ♦ Bathroom/kitchen taps, showerheads, toilet cisterns clothes washers and dishwashers must be AAA	♦ Discussion of Core Design Principles within Statement of Environmental Effects (see later in this section of the DCP): ♦ Details of insulation on plan information.

YOUR DEVELOPMENT TYPE	WHAT YOU MUST COMPLY WITH	INFORMATION TO BE SUBMITTED WITH YOUR APPLICATION
	rated where new or replacement fixtures are proposed. ♦ Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	
3. ♦New Dwelling Houses or Dual Occupancies ♦New Residential Flat Buildings (RFBs) including those contained in mixed RFB/Commercial Developments ♦New multi-unit housing ♦Residential Conversion of Former Industrial Buildings, ♦Major Residential Torrens Title subdivisions.	♦ A minimum 3.5 star NatHERs energy rating of internal thermal comfort for each new dwelling. ♦ A hot water system with a minimum 3.5 star greenhouse rating for each new dwelling. ♦ Reticulated gas for new RFBs and major residential Torrens Title subdivisions. ♦ AAA rated showerheads, bathroom and kitchen taps, clothes washers, dishwashers, and toilet cisterns ♦ Toilets to be dual flush for each new dwelling. ♦ Energy efficient clothes dryers to be installed where clothes drying areas are not already provided. ♦ Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	♦ Certification from an accredited NatHERs Assessor ♦ Energy Efficiency Performance Report. ♦ Comprehensive Water Cycle Assessment (only for sites with an area greater than 1000m^2) ♦ Water Efficient Landscaping Assessment (Excluding New Dwelling Houses) ♦ Site Analysis
4. New Commercial Premises, Shops and Industrial Buildings. (Involving a gross floor area of greater than 1000m^2)	♦ The total anticipated energy consumption be no greater than 450 MJ/am^2 (commercial) and 900MJ/am^2 (retail). ♦ New or replacement hot water systems of domestic/ residential scale being 3.5 star greenhouse rated. ♦ Compliance with the Design Principles in Part C of the DCP (to be discussed in the Statement of Environmental Effects). ♦ AAA rated fixtures for bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and	♦ Energy Efficiency Performance Report. This report shall include evidence from a suitably qualified consultant to confirm compliance with the total anticipated energy consumption. ♦ Comprehensive Water Cycle Assessment ♦ Site Analysis ♦ Discussion of Design Principles in Part C within the Statement of Environmental Effects.

YOUR DEVELOPMENT TYPE	WHAT YOU MUST COMPLY WITH	INFORMATION TO BE SUBMITTED WITH YOUR APPLICATION
	urinals. ♦ Toilets to be dual flush. ♦ Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	
5. Commercial, Industrial, Retail, Restaurant and Café Developments between 100m^2 and 1000m^2 (including new developments and alterations and additions).	♦ New or replacement hot water systems of domestic/ residential scale being 3.5 star greenhouse rated. ♦ Compliance with the Design Principles in Part C of this DCP (to be discussed in the Statement of Environmental Effects). ♦ AAA rated fixtures for bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and urinals where these fixtures are new or replacement. ♦ New or replacement toilets to be dual flush. ♦ Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	♦ Discussion of Design Principles in Part C within the Statement of Environmental Effects.
6. New Developments and Alterations and Additions to Motels, Hotels, Backpacker Hostels and Boarding-Houses	♦ New or replacement hot water systems must have a minimum 3.5 star greenhouse rating. ♦ New or replacement toilets to be dual flush. ♦ Five star electrical appliances. ♦ AAA rated water fixtures for bathroom and kitchen taps, showerheads, toilet cisterns, urinals, dishwashers and clothes washers where new or replacement fixtures proposed. ♦ Insulation of additional or replacement ceiling or roof to R3 rating. ♦ Air conditioning in new hotels to operate on a demand or room occupation basis only. ♦ Energy efficient SEDA rated air conditioners where natural	♦ Discussion of Core Design Principles within the Statement of Environmental Effects (see later in this section of the DCP).

YOUR DEVELOPMENT TYPE	WHAT YOU MUST COMPLY WITH	INFORMATION TO BE SUBMITTED WITH YOUR APPLICATION
	ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	
7. All Other Developments	♦ Core Energy Efficient Design Principles*:* a) Orientation b) Overshadowing ♦ New or replacement toilets to be dual flush. ♦ New or replacement hot water system of domestic/ residential scale to be minimum 3.5 star greenhouse rating. ♦ AAA rated fixtures for bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and urinals where these fixtures are new or replacement. ♦ Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	♦ Discussion of Core Design Principles within the Statement of Environmental Effects (see later in this section of the DCP).

How Council Assesses Your Application

The Core Energy and Water Efficient Design Principles

Council has recognised that the densely built-up nature of the majority of Marrickville's residential areas, makes it difficult for people undertaking smaller developments to satisfy the full range of energy efficiency principles. Therefore, in the development types, "Major" and "Minor" alterations and additions to dwelling houses, as well as "Other Developments", will be required to meet the most basic and effective design requirements*:*

Orientation (Solar Access)

The windows of main living areas of a residential use being orientated, or located, within a range of 30o east and 20o west of true north.

Exemption from this requirement may be granted by Council if the applicant demonstrates one or more of the following site constraints*:*

- The overshadowing from existing structures or vegetation negates any benefits from the appropriate orientation.
- The costs of re-orientating the entire layout of an existing dwelling is impractical in terms of a loss of access to existing views and private open space, or is uneconomic in relative terms to the total building cost estimate

Overshadowing

Applicants shall minimise the overshadowing impacts upon any adjoining residential properties through compliance with the detailed provisions contained in DCP 28: Business Centres and DCP 35: Urban Housing (Volumes 1 and 2)

Insulation for Major Home Renovations

Any proposal to make alterations and additions to make alterations and additions to a dwelling house, affecting more than 50% of the existing habitable floor area, must provide insulation to the building's roof or ceiling. The details of this insulation must be provided in any plan information, or specification.

NatHERS Certification

Certification must be provided from an accredited SEDA energy consultant to confirm that the internal thermal comfort of a new building will achieve a minimum 3.5 star NatHERs rating.

NatHERs certifiers are accredited by the NSW Energy Rating Management Board (HMB). Lists of the Accredited Assessors can be obtained by contacting SEDA on 92915260.

Greenhouse Rating

All new dwellings are required to install a hot water system with a minimum 3.5 star greenhouse rating. This rating has been published in SEDA's Energy Smart Homes Model Policy, and is based on comparative energy efficiency ratings of the main water heating technologies. The Greenhouse Rating Table is provided below.

Table 2 Typical Greenhouse Scores for water heaters

Water Heater Type		
Solar-Gas Boost	Storage	5
Gas	Instantaneous	4
Gas-Storage	High Efficiency	4
Electric-Storage	Heat Pump	4
Gas-Storage	Low Efficiency	4
Solar-Electric Boost*	Continuous	4
Solar-Electric Boost*	OP2	4
Electric	Instantaneous	2
Electric	Continuous	1
Electric-Storage	Storage (OP1,0P2)	1

*greater than 50% solar contribution

Anticipated Energy Consumption Certification

An energy target has been incorporated as a guideline to provide a basis for the assessment of the annual estimated energy consumption of new commercial and retail buildings with gross floor areas exceeding 1000m^2. In line with current practice, the energy targets of 450 Mega Joules/annum/metre square (MJ/am^2) for commercial buildings and 900 MJ/am^2 for retail buildings have been set.

A report from a suitably qualified energy consultant will be required to confirm that the above targets can be achieved.

Water Efficient Fixtures

The water efficiency of new residential dwellings can be greatly improved by providing AAA rated fixtures. This is an Australian Standard and restricts the flow rates of different fixtures to the following*:*

- Showerheads – 9 litres or less per minute
- Basins – 6 litres or less per minute
- Kitchen sinks – 9 litres or less per minute.

Information Required to be submitted with Applications for Development Approvals.

Compliance with Core Design Principles

All development applications are required to provide an accompanying Statement of Environmental Effects. This Statement should include a brief written assessment of how the proposal complies with the core design principles.

Energy Efficiency Performance Report

A report by an accredited energy consultant that discusses how a proposal incorporates the DCP's Part C General Design Principles, and relate these to the energy rating assessment findings.

Comprehensive Water Cycle Management Assessment

This assessment should be made by a suitably qualified person to outline how a major development proposal (on sites greater than 1000m^2 in area) incorporates the DCP's water and efficiency design principles, with particular reference to the following water cycle management matters*:*

- Estimates of all water, wastewater and stormwater flows for the proposed development.
- How demand for water and discharge of wastewater will be minimised.
- Details of the potential for the treatment and re-use of effluent or stormwater.
- The hydrology of the locality and its relationship to the proposed drainage system.
- The distribution of soil types and the scope for on-site infiltration.
- Any expected rise in ground water level.

The assessment should be submitted with the information required by Council's Stormwater Detention and Sedimentation Code, as well as its Soil and Sedimentation Plan.

A Site Analysis

A Site Analysis should address energy and water efficiency issues. The types of information needed to assess these matters include*:*

- Site context, eg. adjacent buildings, roads.
- The arrangement of new lots, and the footprint of buildings for each lot (for major residential subdivision proposals).
- Topographical characteristics.
- The direction of true north.
- Existing causes of overshadowing, eg. adjacent buildings, trees.
- Other features, such as views and any prevailing winds.
- Shadow diagrams of the overshadowing created by the existing and proposed development, at 9am, 12 noon, and 3pm, on June 21.

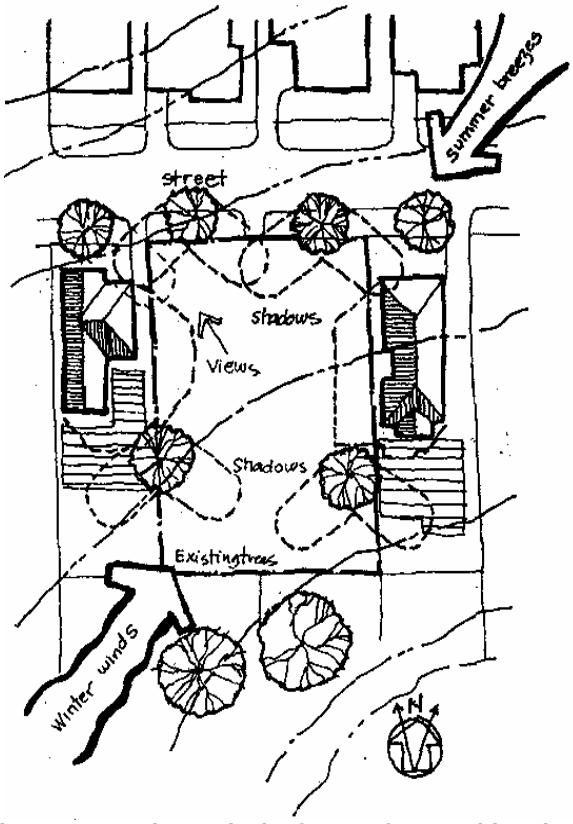


Figure 5: **Site analysis: factors for consideration**
Source: *Leichhardt Council, 1994 (As published in SEDA's "Energy Smart Homes Model Policy")*

Water Efficient Landscape Assessment

Most major development applications will require landscaping plans to guide planning and building assessment, which specify landscape themes, vegetation (location, number and species), paving and lighting.

This DCP requires that the following additional Water Efficient Landscaping matters be included in the Landscaping Plan*:*

- Low water use plant species.
- Hydrozoning, or grouping species of similar water needs together.
- Efficient use of lawn areas.
- Use of mulch.
- Landscaping designed to maximise capture of rainfall and prevent runoff.
- Deciduous trees to control solar access in summer and winter.

Part C
Design Principles and Controls

How to apply these Principles and Controls

The Marrickville Council area is dominated by a dense and relatively old building stock.

These conditions make it inappropriate to prescribe stringent technical and uniform building efficiency controls, particularly for smaller home renovation proposals, except where this represents accepted best practice and may be readily achieved. The controls in the Assessment Table (Part B) represent this best practice.

It is still considered that even smaller developments can accommodate certain efficiency measures and contribute to the wider environmental concerns of the DCP.

It must, therefore, be demonstrated in all developments that the full range of design principles have been considered in submissions for new developments. However, the mandatory controls and the manner in which they are to be met (as outlined in the Assessment Table in Part B of this DCP) must be complied with.

It is not expected that all the design principles within the following section can be satisfied. However applicants must show that they have thought about incorporating efficiency measures in their design, and applying those principles that best respond to the constraints and opportunities of each individual site.

This Part of the DCP concentrates mainly on the design principles, although the controls listed in the Summary Assessment Table in Part B are also provided in this part of the DCP. The energy efficiency principles have been divided into different development categories. You will note that many of the basic principles applying to home renovations are also relevant to the bigger developments.

There is a smaller range of water and stormwater efficiency principles and they have therefore been arranged together as one general group.

Each Design Principle is supported by a Good Design Practice section, which recommends the preferred methods of achieving the principles.

It is intended that the assessment will be performance based and that other methods outside of the Good Design Practice will be considered if they respond to the intent of the relevant Design Principle.

Energy Efficiency Principles and Controls

The basis of energy efficiency is the reliance on natural forces such as the sun and the wind to provide a more cost effective and environmentally friendly energy source.

Through a more careful analysis of the existing site conditions in the formative design stages, new developments and improvements to existing buildings can benefit from more comfortable and economic living and working environments. Environmental benefits, such as the reduction in the emission of greenhouse gases, can also be achieved.

It is important that the inter-relationship of energy efficient measures is considered, and the need to base the preferred design approach around the individual site characteristics, as well as any other relevant town planning considerations, is recognised.

There are two main types of energy efficient design principles, passive and active.

Development type: New Dwelling Houses and Alterations and Additions to Existing Dwelling Houses

DESIGN PRINCIPLES

Passive Design Principles

Passive design recognises that each site is unique. The shape of a building should be designed to take advantage of a site's prevailing cool breezes, vegetation, topography and solar access.

E1 – Orientation

Design Principles

- Getting the maximum benefit out of the sun's energy is the prime passive design principle, particularly in winter where the sun can provide a vital means of heating and lighting our homes and work places.
- Maximum solar access can be achieved by orienting the rooms and areas that are used most (living areas, family rooms and kitchens) to the north.
- This principle needs to be supported by other features such as appropriate size, materials and placement of windows, shading devices, and landscaping.
- Taking advantage of solar access to provide outdoor clothes drying areas, thereby reducing the need for energy consuming mechanical/ electrical dryers.
- Design for new developments should also be mindful of the impacts on the solar access of any adjoining residential properties.

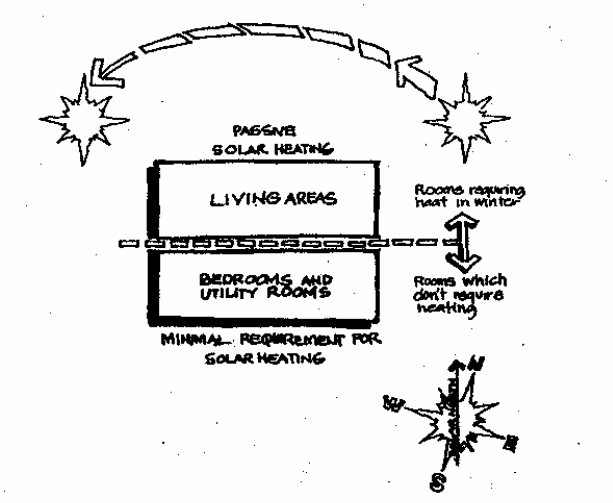


Figure 6: **Orientation of zones within a dwelling for maximum solar access.**
Source: *SEDA's "Energy Smart Model Homes Policy."*

Good Design Practice

- Orient the main living areas of a dwelling within a range of 30^0 east and 20^0 west of true north.
- Ideally, new buildings should be positioned with the long axis extending east-west to maximise the length of north facing walls and windows to living areas.
- Windows should be kept to a minimum in size and number on the east, west and southern facing facades of a building.
- The area of glazing on the northern façade should be limited to 30% of the total floor space of the living areas.
- Double glazing should be provided for all rooms, particularly for south facing rooms. It provides the benefits in summer months of retaining light transmissions. whilst still controlling the degree of heat gain.
- Curtains can be also be used to reduce heat loss through windows
- An invisible thin film coating (known as low emittance or low-E coating) can be applied to glazing, which allows most of the light from the sun to enter into the building, whilst still reflecting the long wave solar radiation heat forces.

E2 – Use of Natural Light

Design Principles

- The use of natural light can reduce the reliance on artificial lighting.
- Artificial light should not be necessary during daylight hours in most rooms.

Good Design Practice

- Glass roofs, skylights and clerestory windows should be used to improve access to natural light on constrained sites. These methods should be properly shaded and double glazed to prevent disproportionate heat loss or gain.
- The internal depth of a dwelling should be limited to allow efficient use of natural light.

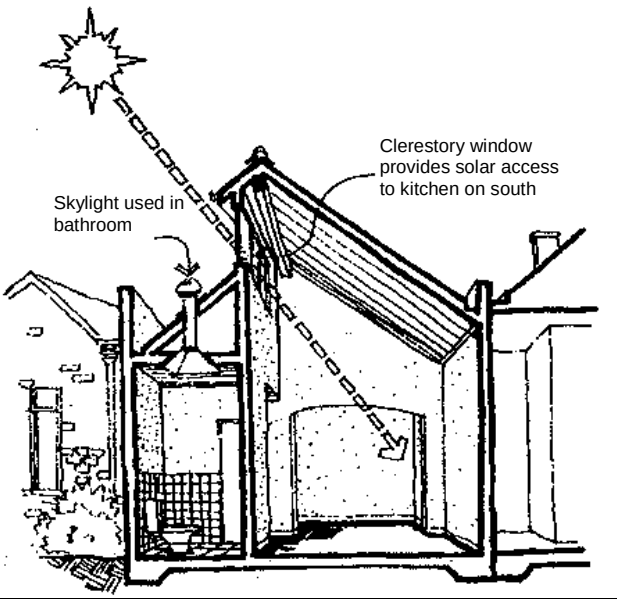


Figure 7: Use of skylights and clerestory windows provides better daylight conditions and minimises need for artificial lighting.

Source: SEDA's "Energy Smart Model Homes Policy."

E3 – Shading

Design Principles

- Shading devices should be used to control the penetration of excessive summer sunlight through glazing.

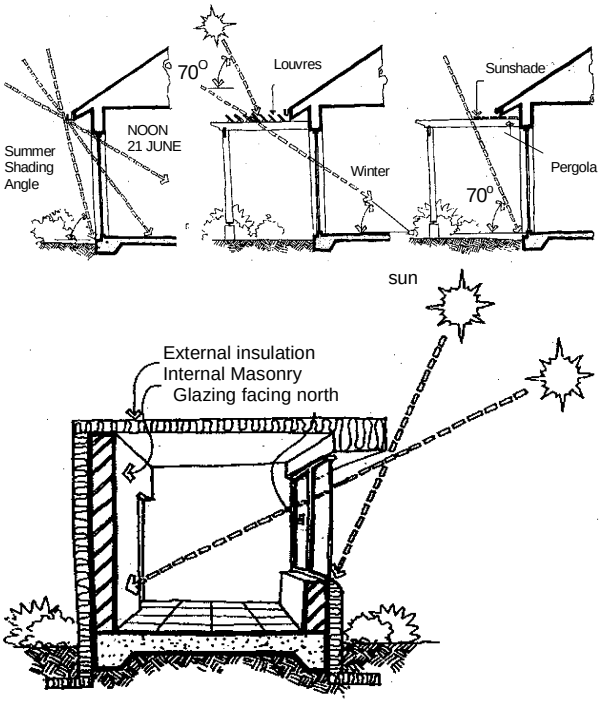
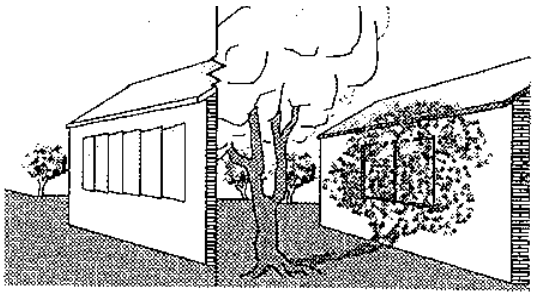


Figure 8: Principles for shading of north-facing windows and private open space.

Source: SEDA's "Energy Smart Model Homes Policy."



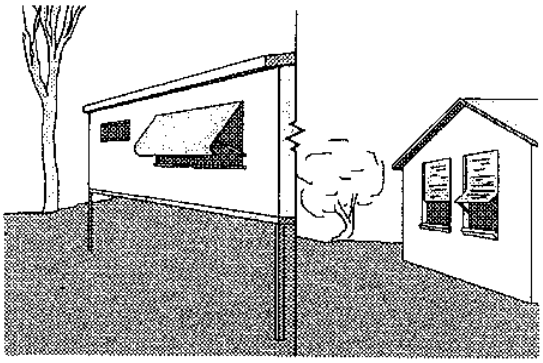


Figure 9: Shading devices for windows facing east.

Source: Building Better Cities in Newcastle – Inner Newcastle Housing Design Manual

Good Design Practice

Shading devices should be used in the following circumstances:

- On north facing walls, horizontal adjustable or fixed shading devices, such as eaves, overhangs, awnings, pergolas and upper floor balconies.
- For north facing walls, the shading devices should extend a distance of 0.45 x the height of the glazed area, measured from the bottom of the window; and
- On east and west facing walls, vertical shading devices, such as blinds, shutters, adjustable external awnings should be used to block the low rays of the rising and setting sun.

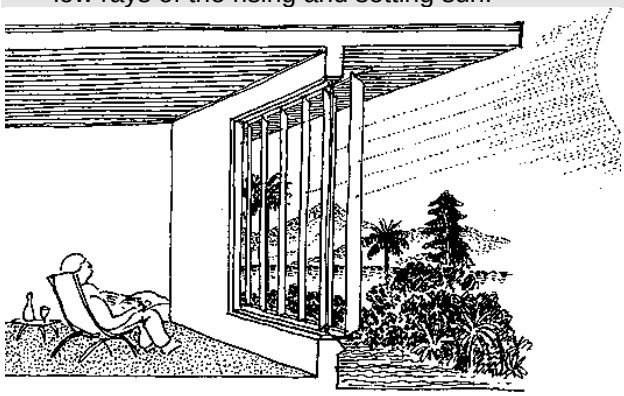


Figure 10: Vertical louvres can be used to shade from low angle sun while retaining views.

Source: Nick Hollo "Warm House Cool House."

E4 - Thermal Mass

Design Principles

- The building materials used for floors and internal walls can influence the heat storage capacity and comfort of your home.
- Heavy building materials such as concrete and brick have thermal mass – the ability to store heat.
- In winter, the thermal mass absorbs heat from the sun, and releases it into the room at night.
- In summer, during the day it absorbs any excess heat which enters the house, thus reducing the temperature of the interior. The heat is then slowly released at night.

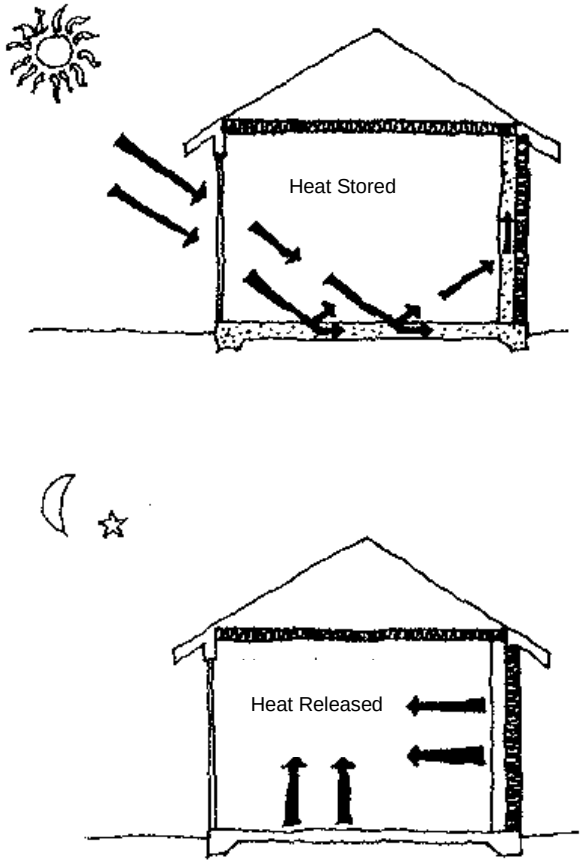


Figure 11: Basic thermal mass actions
Source: "Australia's Guide to Good Residential Design"

Good Design Practice

- Locate materials with higher thermal mass inside the house and in north-facing rooms, where they can benefit from winter heat gain. A concrete slab on the ground offers the best thermal mass opportunities, as it has an optimum angle for direct solar access, and generally has a large volume available. These areas should not be covered by carpets.
- Shading devices should be used to protect the materials from direct summer sun.
- Thermal mass must be supported by appropriate insulation measures.
- Areas of thermal mass should not be covered with materials such as carpet.

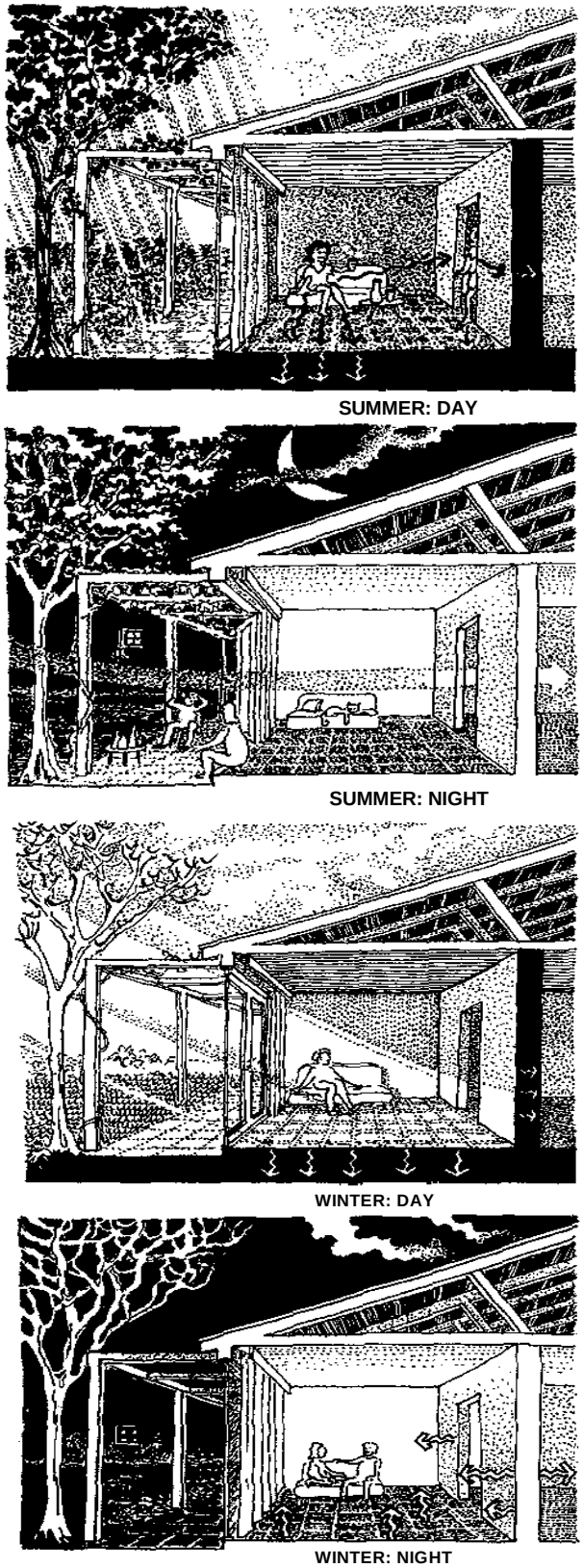


Figure 12: Thermal mass principles
Source: Nick Hollo "Warm House Cool House

In summer, heavy construction remains shaded and cool, absorbing heat from its surroundings. In the evening, the house is cooled by ventilation. In winter, the internal heavy construction heats up slowly from the sun during the day and release its warmth at night.

E5 – Insulation

Design Principles

- Insulation controls the rate at which a building loses or gains heat. In summer, insulation will help reduce heat entering through the walls or the roof, increasing the thermal comfort of your home.
- Insulated buildings maintain comfortable temperatures for much longer periods.
- Insulation is not a heat store, but it does make it harder for heat to pass through different building features.
- It is the most effective energy efficient measure and should be installed in the roof, walls and ceiling of the house.
- Insulation is more effective when combined with a balanced internal mass, and should be accompanied by appropriate sealing measures.
- In order to reflect heat from the sun in summer, roofs and east/west facing walls should be a light colour.

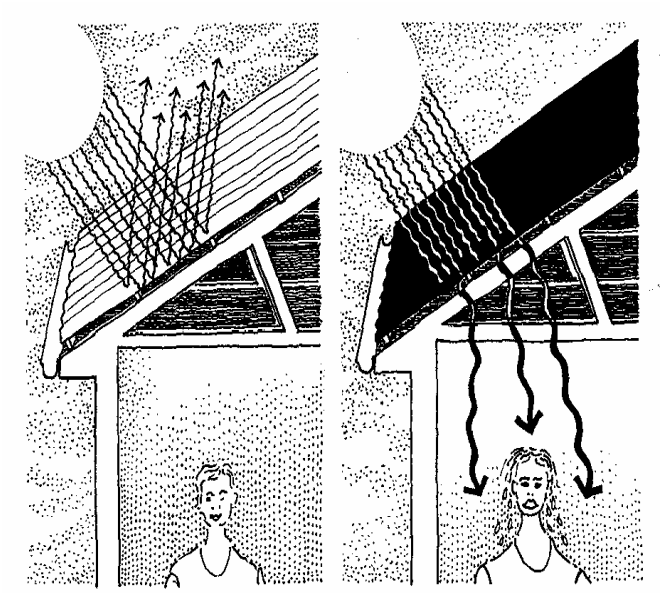


Figure 13: Use light colours externally to reflect heat in summer.
Source: Nick Hollo's "Warm House Cool House."

Good Design Practice

There are two main types of insulation:

Bulk Insulation – traps millions of tiny air pockets of still air or other gas within its structure. This still air provides the material's resistance to heat flow by preventing heat being conducted through the insulation.

The main types of materials include fibreglass and expanded plastics.

Reflective Insulation – thin sheets of highly reflective aluminium foil laminate which reflects large amounts of heat from its polished surfaces, while absorbing and emitting small amounts of heat. It is also referred to as "sarking".

- Dwellings should be built of well insulated materials to achieve an "R" value, of*:*
  Roofs and ceilings – 3.0
  Walls – 1.5
- In order to reflect heat from the sun in summer, roofs and east/west facing walls should be a light colour.
- Insulation can be offset by draughts coming through minor openings. Care should be taken to seal any areas of air leakage.

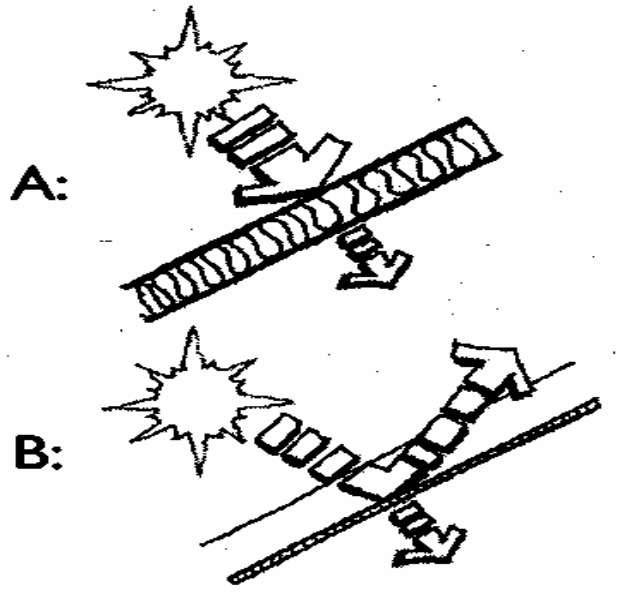


Figure 14: Two main types of roof insulation
A): bulk insulation
(B): reflective insulation
Source: SEDA's "Energy Smart Homes Policy."

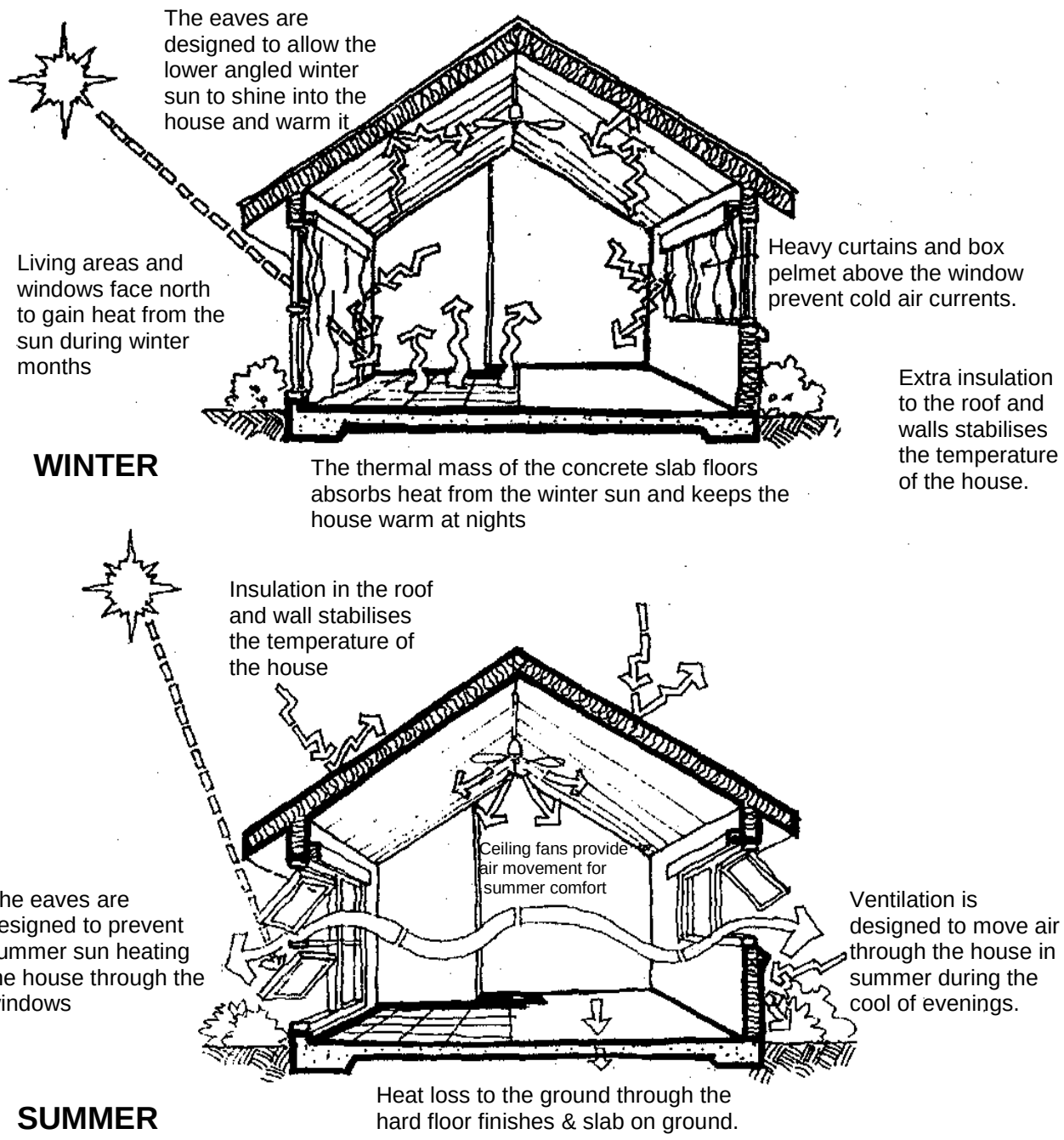


Figure 15: Integrated dwelling design principles for thermal performance, solar access and ventilation.
Source: Amcord, 1995 (as published in SEDA's Energy Smart Homes Model Policy.)

E6 – Ventilation

Design Principles

- Natural ventilation is a practical way of controlling air movement through a house, particularly for cooling in summer.
- It requires orienting buildings to capture prevailing breezes, and providing appropriate location of openings and vegetation to enhance the air movement and temperature.
- In Sydney, cooling summer breezes generally come from the north-east.

Good Design Practice

Use site conditions to orient and design houses to achieve a cross-ventilation effect*:*

- Locate openings on opposite sides of the room.
- Locate windows and openings in line with each other, and where possible, in line with prevailing breezes; a low level input and high level output is preferred.
- Use water features such as fountains in strategic positions to cool breezes.
- Consider strategic positioning and types of vegetation to modify wind direction.
- Ceiling fans can be used to assist the degree of cooling in summer.
- In some instances buildings in Marrickville are required to incorporate noise-proofing measures to address aircraft noise. Notwithstanding this, Council encourages the inclusion of some openable windows in residential developments to enable natural ventilation during aircraft curfew hours. The absence of aircraft noise between 11.00 pm and 6.00 am allows opportunities for fresh air to be brought into a building and stale air to be expelled.

E7 – Zoning

Design Principles

- Zoning is a practice more suited to retaining heat within certain rooms in winter months. It involves grouping rooms with similar uses together and closing off unheated rooms from heated rooms.
- The use of both zoning and ventilation can create reductions in energy consumption.

Good Design Practice

- Zoning, or the closing off of certain areas, should be accompanied by adequate sealing of windows and doors.
- Further efficiency can be achieved by providing an air lock to the main entry and/or exit doors

E8- Landscaping

Design Principles

- The design of landscaping around houses can improve their thermal performance, through its seasonal variations in solar access, shade and shadows, wind breaks and deflection of breezes.
- Vegetation can lower air temperature in the vicinity of a building, reduce the ground temperature around the building, and reduce the heat load during summer.

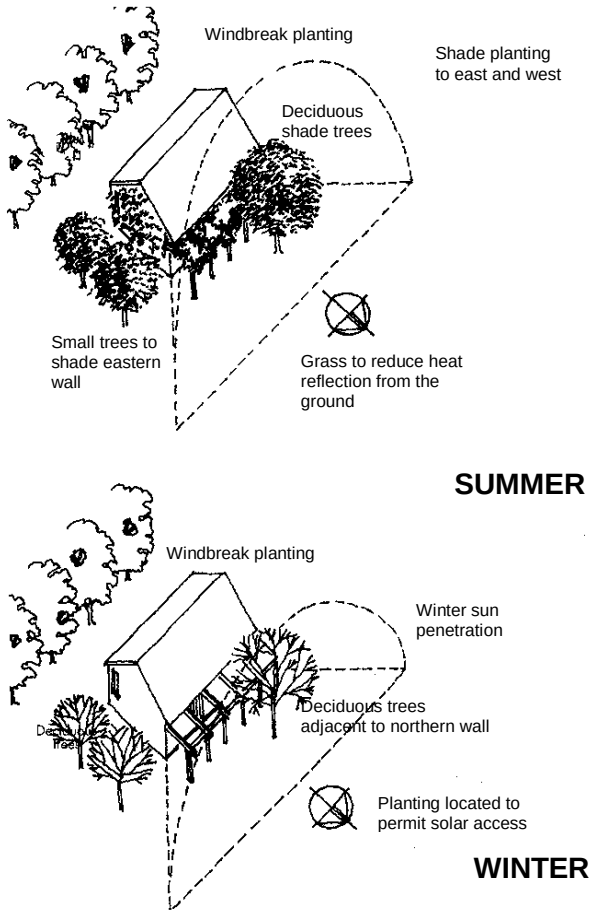
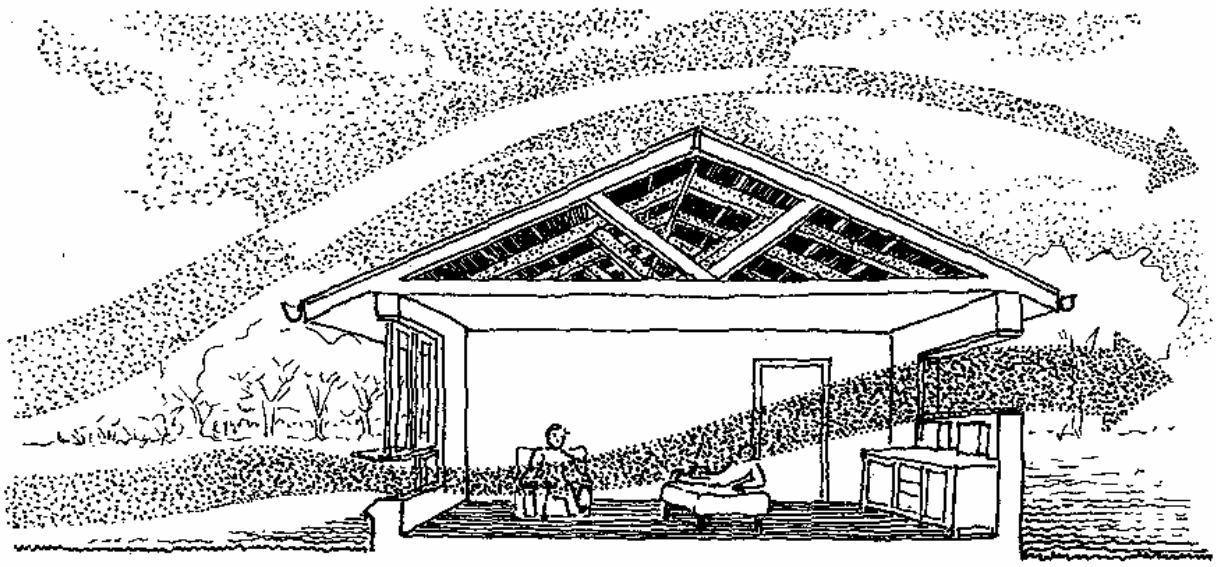


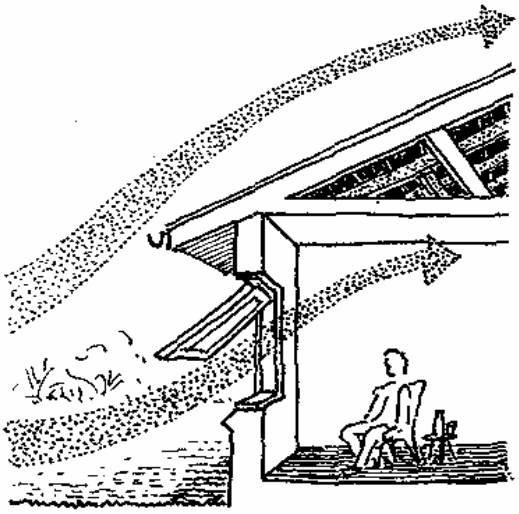
Figure 16: The use of landscaping for energy efficiency.
Source: *"Australia's Guide to Good Residential Design."*

Good Design Practice

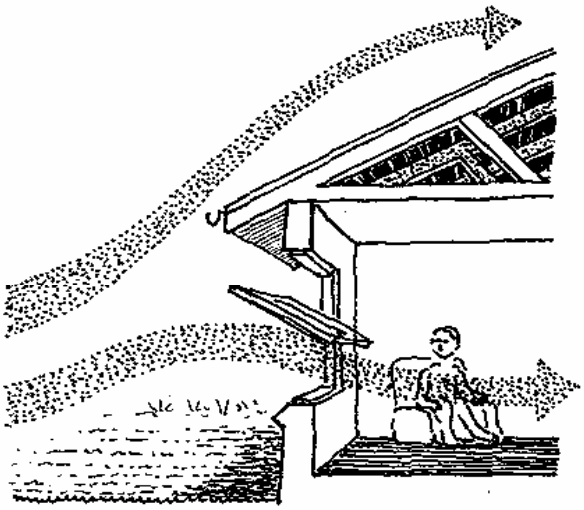
- Wide canopied deciduous trees, vines and pergolas should be provided to the north of a dwelling to provide shade and reduce glare in summer months and allow for solar penetration during cooler months.
- Evergreen vegetation should be provided to the west, east and south of dwellings to prevent glare, and heat intake.
- Care should be taken not to overshadow adjoining residential properties.



Lower, smaller opening on the side of the breeze, larger openings on the side away from the breeze



Awning windows deflect breeze up



Need to tilt awning windows or louvres downwards

Sliding doors and windows do not help to deflect breeze but external walls or landscape do; casement windows can also help

Figure 17: Window design for cross-ventilation
Source: *Nick Hollo's "Warm House Cool House."*

E9 – Outdoor Drying Areas

Design Principles

- The use of outdoor clothes drying areas reduces the dependence on energy consuming electrical drying appliances.

Good Design Practice

- Provision should be made for clothes drying areas within the private open space of residential properties.

E10 – Maintaining Solar Access For Adjoining Properties

Design Principles

- Maintaining appropriate solar access to adjoining residential properties is a key issue of Council's building and town planning assessment.

Good Design Practice

- Applicants must refer to Council's current Overshadowing Policy.
- The main requirements of this policy are: In proposals for the erection of a new two storey dwelling house, or a first floor addition, applicants must demonstrate that any adjoining residential property will receive a minimum of two (2) hours of sunlight between 9am and 3pm on 22nd of June to private open yard areas at the front or rear, and that windows of habitable rooms are not substantially overshadowed.
- This shall be demonstrated through the submission of shadow diagrams showing the shadows on adjoining properties at 9.00am, 12.00pm, and 3.00pm on June 22. The Shadow Diagrams are required to show the effect in plan and elevation of any existing overshadowing and any additional overshadowing from the proposal, particularly in respect to its effect on any windows, private yard areas (front and rear) and any solar hot water system collectors.

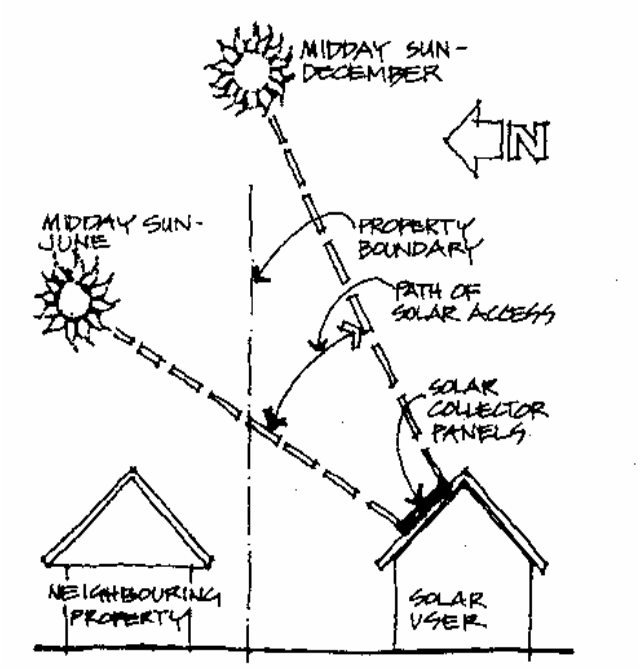


Figure 18: Path of solar access
Source: *RAIA's "Environment Design Guide."*

Active Design Principles

Active design systems combine the sun's energy and local climatic conditions with mechanical devices to perform energy functions such as water heating, and the internal heating and cooling of buildings. Council strongly encourages but does not mandate the installation of solar technologies which use solar energy 'actively'.

There are a range of technologies that are currently available. The two most common technologies are*:*

Solar Thermal Systems

These systems convert solar energy to heat and electricity. They involve the absorption of solar radiation by either a flat collector panel or concentrating collector, and its conversion into either heat (solar water and space heating) or electricity.

They are generally used for*:*

- The heating of domestic, commercial and industrial hot water systems
- Swimming pool heating
- Space heating and cooling

Photovoltaic Cells

Solar energy is photovoltaic when solar radiation is transformed into power or electricity by means of a photovoltaic (PV) cell, also known as a solar cell. It works on the same principles as solar powered calculators and watches. A PV cell consists of a thin laminate of two layers of silicon joined together, which, when exposed to solar radiation, produces an electric current.

In practice, these cells are connected together to form a panel called an array, and are generally placed on the roofs of buildings, and oriented to the north to maximise solar access.

In addition to the environmental benefits, PV cells provide the advantages of low maintenance costs, reliability in energy production, and can be used as an aesthetically appealing design feature.

There are also other new solar technologies becoming available such as Photovoltaic Tiles (P V Tiles).

Photovoltaic Tiles

PV Tiles are a relatively new form of PV technology and have been used in Australia since 1995. One Solar Tile is made up of a bank of solar cells. Solar tiles are mounted in a UV resistant frame and have a dual role in forming the roof surface of a building and in generating electricity.

The tiles may also be used in other roof structures such as walkways, awnings and carports. While the tiles can be used in any type of development, including retial, commercial and industrial buildings they are well suited to residential development because the tiles replace traditional roof tiles or metal roofing and may be used in both new roofs and alterations and additions. Power generated by the tiles may be connected on the consumer's side of the meter to supplement the conventional supply or, directed back and sold to the grid. The tiles have many benefits as they are durable, easy to install by tradespersons (electricians, roofers, solar installers), low in maintenance, weather resistant and are less bulky in appearance than other forms of solar technology. For further information on PV tiles, contact Council's Development and Environmental Services Division on 9335 2000.

E11 –Hot Water Systems

Design Principles

- The use of energy efficient hot water systems can result in significant reductions in the use of environmentally degrading non-renewable energy sources.
- The most energy efficient of systems are those which rely purely on solar energy. However, the densely developed inner suburbs of Sydney often have difficulties in optimising solar access and therefore often rely on boosted energy sources from conventional energy sources such as gas and electricity.
- This DCP allows people to choose from a variety of energy efficient systems, including gas and heat pumps, as long as they achieve SEDA's minimum 3.5 star greenhouse rating.
- The visual and heritage impacts of these systems should also be an important part of the design process.

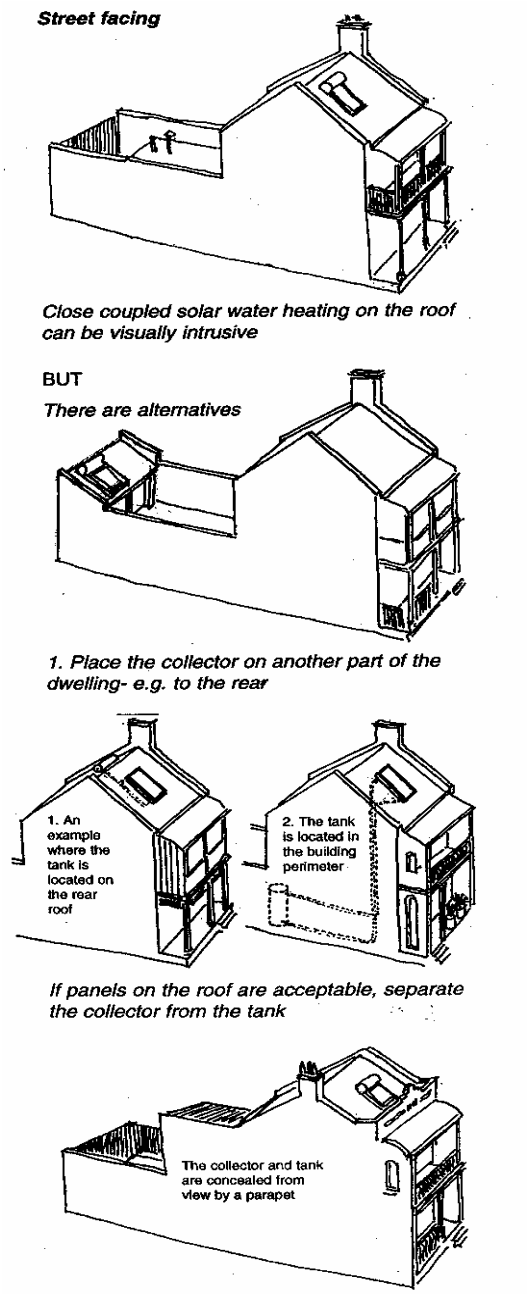


Figure 19: Some options for the location of solar roof collections.
Source: *IMROC's "Regional Energy, Water and Stormwater Efficiency Policy.*

Good Design Practice

- All new dwellings must provide a hot water system which achieves a minimum 3.5 star greenhouse rating. The details of this system shall be included in the development applications plans.
- In terms of the design of solar systems, collecting panels should be located on the north, or near north facing roof.
- A roof angle of 34^{o} is preferred, but angles between 15^{o} and 55^{o} are acceptable.
- Solar collectors should receive direct sunlight between 9am and 3pm at all times of the year.
- The panels need to cover a sufficient area of roof space. The average household (2 adults, 2 children) generally needs a hot water tank with a 300 litre capacity, which will require a solar collector of approximately 4 square metres (2 panels).

You should ensure that the size of any hot water system matches your hot water requirements.

As a guide, an average four person family should be adequately served by a:-

- 300-360 litre solar system
- 135 litre gas storage unit
- single element 400 litre off peak electric storage unit
- twin element 315 litre off peak electric system

Instantaneous systems are sized according to their flow rate, but are generally quite small and compact. The details on specific sizing requirements should be confirmed with the supplier or manufacturer.

In terms of visual impact, the system should be*:*

- Positioned to be as unobtrusive as possible, both to the street and neighbouring properties.
- Where possible, designed as part of the roof, set back from the street frontage and positioned below the ridge line.
- Complementary to the colour of the roofing materials of the building. Tanks are available in colours matching most roof materials.

E12 - Minimising Heat Loss from Hot Water Systems

Design Principles

- Efforts should be made to minimise heat loss from hot water systems.

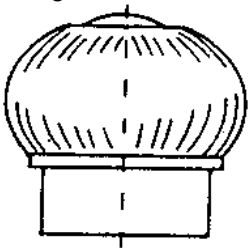
Good Design Practice

- Hot water storage tanks should be located indoors. (With the exception of solar systems)
- Outdoor tanks and piping should be suitably insulated.
- Hot water outlets should be grouped close to water heaters to reduce pipe lengths.
- High efficiency continuous (often called instantaneous) gas heaters should be fitted with electronic ignitions rather than pilot flames which waste energy.

E13 – Mechanical Space Heating and Cooling.

Design Principles

- Automated space heating and cooling systems such as air conditioners can also combine passive design elements to help reduce their overall energy consumption. Taking advantage of solar energy and natural ventilation, as well as zoning, piping and duct insulation, and targeting the system to required areas, can all contribute to more energy efficient systems.
- Low energy consuming features such as ceiling fans and wind driven roof ventilators have the capacity to perform effective cooling and heating functions.



Wind driven turbine in roof

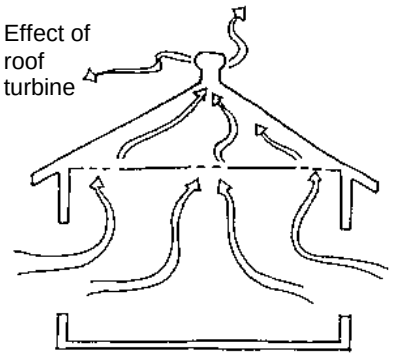


Figure 20: Wind driven turbine and effect of roof turbine.

Source: *Better Cities in Newcastle – Inner Newcastle Housing Design Manual.*

Good Design Practice

- Where space heating is required, and a natural gas supply is available, heating systems should be gas fuelled, or connections for portable gas heaters should be provided.
- If gas is unavailable, heat pumps should be considered (i.e. reverse cycle A/C).
- Heating or cooling systems operate most efficiently where the building is properly insulated and rooms are draught proofed.
- Ducted air conditioned systems should be closed off or zoned into different sections to allow targeting of specific spaces.
- Where financially feasible, zoned control systems should be activated by programmable thermostats in each zone.
- Duct work should also be adequately insulated to at least R1.5 and any refrigerant lines insulated with at least 20mm of foam insulation.
- Artificial ventilation can be created by the use of fans.

CONTROLS

The following mandatory controls for energy efficiency must be complied with:

For Minor Alterations and Additions

- The development must comply with Core Energy Efficiency Design Principles (see Part B of the DCP) including:
  a) Orientation
  b) Overshadowing
  These principles are to be discussed in the submitted Statement of Environmental Effects
- Insulation of additional or replacement ceiling or roof is to be to an R3 rating with details shown on the plans submitted with the Development Application.
- New or replacement hot water systems must have a minimum 3.5 star greenhouse rating
- New or replacement air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

For Major Alterations and Additions

- The development must comply with Core Energy Efficiency Design Principles (see Part B of the DCP) including:
  a) Orientation
  b) Overshadowing
  These principles are to be discussed in the submitted Statement of Environmental Effects
- Insulation of existing ceiling or roof to an R3 rating with details shown on the plans submitted with the Development Application.
- New or replacement hot water systems must have a minimum 3.5 star greenhouse rating
- New or replacement air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

New Dwelling Houses or Dual Occupancies

- A minimum 3.5 star NatHERS energy rating of internal thermal comfort for each near dwelling with certification from an accredited NatHERs Assessor being submitted with the Development Application.
- An Energy Efficiency Performance Report is to be submitted with the Development Application.
- A hot water system with a minimum 3.5 star greenhouse rating is to be provided for each new dwelling.
- Energy efficient clothes dryers are to be installed where clothes drying areas are not already provided.
- New or replacement air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

Development Type: New Residential Flat Buildings, New Multi-Unit Housing and the Residential Conversion of Former Industrial Buildings

DESIGN PRINCIPLES

Principles E1 to E13 should also be read as a background to the following principles –

Passive Design Principles

E14 – Orientation

Design Principles

- Due to the climate-moderating effects of common walls, medium density and attached dwellings are potentially more energy efficient than other dwelling types.

Good Design Practice

- Economies of scale in Residential Flat Building (RFB developments can be used to achieve a greater range of energy efficient measures.
- At least 65% of the units should provide living area windows positioned within 30^{o} east and 20^{o} west of true north, and to allow for direct sunlight for at least two hours between 9am and 3pm on 21 June.
- Applicants will need to confirm that each dwelling will achieve a minimum 3.5 star internal thermal comfort rating, through certification from an accredited energy consultant (See Assessment Table – Part B).
- North facing windows should be shaded from direct sun during summer and insulated with opaque, close-fitting curtains.
- Alternatively, high performance glass, such as variable transmission glass (glass that only transmits wavelengths of light) can be combined with curtains.
- Where facing other aspects, double glazing, or external awnings or shutters should be provided to minimise low angle summer sun and heat loss.

E15 – Insulation

Design Principle

- Insulation should be used to minimise heat loss from buildings.

Good Design Practice

- Walls between garages and dwellings should be insulated.

E16 – Zoning

Design Principle

- Residential flat buildings will generally have common areas that can influence climate control.

Good Design Practice

- Major entrances, opening into lobbies or vestibules, should be isolated from living areas by doorways to provide air locks.

E16a – Natural Ventilation

Design Principles

- Ventilation is required for cooling the apartment and to avoid stale air. The BCA requires all habitable rooms be ventilated. This can occur by providing permanent openings or by mechanical means.

Source: DUAPs "Better Urban Living."

Figure 21: Cross ventilation is best achieved through narrow floor plans.

- Natural ventilation is preferable for a high quality living environment and energy efficiency.
- Where natural ventilation is not available to all rooms, such as in a loft style conversion, mechanical ventilation may be necessary.
- Adequate natural ventilation requires cross ventilation. Cross ventilation is easily achieved in apartments that allow unimpeded air movement through the full depth of the apartment. Changes in height between incoming and existing air also encourages cross ventilation.
- In situations where apartments cannot extend the full width of the building, ventilation and courtyards can make it possible for cross ventilation to occur.

Good Design Practice

Natural ventilation is best achieved in residential flat building design by combining an assessment of both the requirements of the BCA, as well as the following elements of good practice:-

- Adequate and well located windows and doors to enable flow-through ventilation, and preferably having window openings facing different directions.
- Narrow floor plan layouts.
- Where dependant on natural ventilation, dwellings should not have sole access to outside air via light wells or enclosed building setbacks.
- In double orientation apartments, having split levels and corridors on alternate floors.

Given Sydney's inner city temperate climate, ventilation for dwelling units solely by air conditioning is considered to be an unacceptable alternative to natural ventilation.

Circumstances where supplementary mechanical ventilation will be considered include:-

- Areas of high traffic noise and pollution.
- Areas where aircraft noise insulation is required. Notwithstanding this, Council encourages the inclusion of some openable windows in residential developments to enable natural ventilation during aircraft curfew hours. The absence of aircraft noise between 11.00 pm and 6.00 am allows opportunities for fresh air to be brought into a building and stale air to be expelled.
- Where site constraints prohibit apartment layout that facilitates natural ventilation.

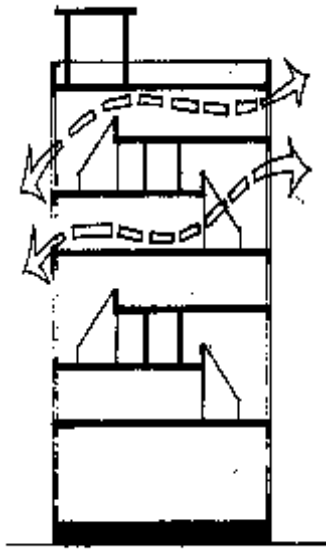


Figure 22: Good cross ventilation can be achieved with double orientation apartments having split levels and corridors on alternate floors.

Figure 23: Ventilation can be achieved through air vents and roof shafts. Mezzanines and two storey apartments assist in air movement.

E17 – Thermal Mass

Design Principles

- The building materials used for floors and internal walls can influence the heat storage capacity and comfort of your home.
- Heavy building materials such as concrete and brick have thermal mass – the ability to store heat.
- In winter, the thermal mass absorbs heat from the sun, and releases it into the room at night.
- In summer, during the day it absorbs any excess heat which enters the house, thus reducing the temperature of the interior. The heat is then slowly released at night (see Figure 11 on page 26).

Good Design Practice

- Locate materials with higher thermal mass inside the house and in north-facing rooms, where they can benefit from winter heat gain. A concrete slab on the ground offers the best thermal mass opportunities, as it has an optimum angle for direct solar access, and generally has a large volume available. These areas should not be covered by carpets.
- Shading devices should be used to protect the materials from direct summer sun.
- Thermal mass must be supported by appropriate insulation measures.
- Areas of thermal mass should not be covered with materials such as carpet.

Active Design Principles

E18 – Gas Infrastructure

Design Principle

- Providing gas infrastructure within a new major development provides the potential for significant reductions in greenhouse emissions.

Good Design Practice

- Where natural gas supplies are available, all new RFB developments must provide reticulated gas supplies (i.e., separate meters for all units).

E19 – Appliances

Design Principle

- New major developments often provide standardised electrical appliances as part of the sale package for new units. It is considered reasonable in costs terms that these appliances meet minimum energy efficient standards.

Good Design Practice

- Any new electrical appliance that is provided as part of the sale of units in a new residential flat building should be an energy smart appliance as rated by SEDA.
- External yard space, or sheltered, well ventilated spaces should be provided for clothes drying, as an alternative to tumble dryers. Where drying spaces are not practical, use high efficiency (3.5 star or greater) dryers.

E20 – Hot Water Systems

Design Principle

- There are opportunities in the economies of scale of a new residential flat building design to provide more efficient hot water systems.

Good Design Practice

- Each unit in a new residential flat building development is required to be served by a hot water system with a minimum 3.5 star greenhouse rating.
- Centralised hot water systems should be considered in new residential flat building developments. However, if this system requires long pipe runs, distributed units, serving groups of dwellings, may be more appropriate.

CONTROLS

The following mandatory controls for energy efficiency must be complied with:-

- A minimum 3.5 star NatHERS energy rating of internal thermal comfort for each near dwelling with certification from an accredited NatHERs Assessor being submitted with the Development Application.
- An Energy Efficiency Performance Report is to be submitted with the Development Application.
- A hot water system with a minimum 3.5 star greenhouse rating is to be provided for each new dwelling.
- Energy efficient clothes dryers are to be installed where clothes drying areas are not already provided.
- Reticulated gas must be provided.
- New or replacement air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

Development Type: Major Residential Subdivisions

DESIGN PRINCIPLES

Principles E1 to E20 as well as the EA Advisory Measures should also be read as a background to the following principles.

Whilst Marrickville Council does not receive many multi-lot subdivisions, it is still important that there be appropriate energy efficient design measures in place, particularly given the recent demand for the residential redevelopment of large, former industrial sites.

The larger sites provide opportunities for more favourable orientation, and economies of scale in providing for new facilities and services.

E21 – Orientation

Design Principles

- Orientation is a vital consideration in maximising solar access, and issues should be thoroughly examined through a site analysis drawing.
- There needs to be a balance of solar access considerations for the facades of the main living areas, areas of private open space and solar roof collection.
- Other factors such as topography and prevailing breezes should also be taken into account.

Good Design Practice

The Site Analysis Diagram should demonstrate the following*:*

- that the size and orientation of allotments will maximise solar access;
- the living areas of buildings as well as principal open space areas are oriented within the range of 30o east and 20^{o} west of true north;
- the majority of lots being rectangular in shape.
- buildings are oriented so that their long axis extends east-west to maximise the length of north facing walls and windows of living areas.
- lots are oriented to take advantage of any prevailing winds
- applicants of each subdivision will need to demonstrate through certification that at least 80% of the dwellings and allotment pattern of a new subdivision will achieve a minimum 5 star internal thermal comfort rating as in SEDA's ESHP.

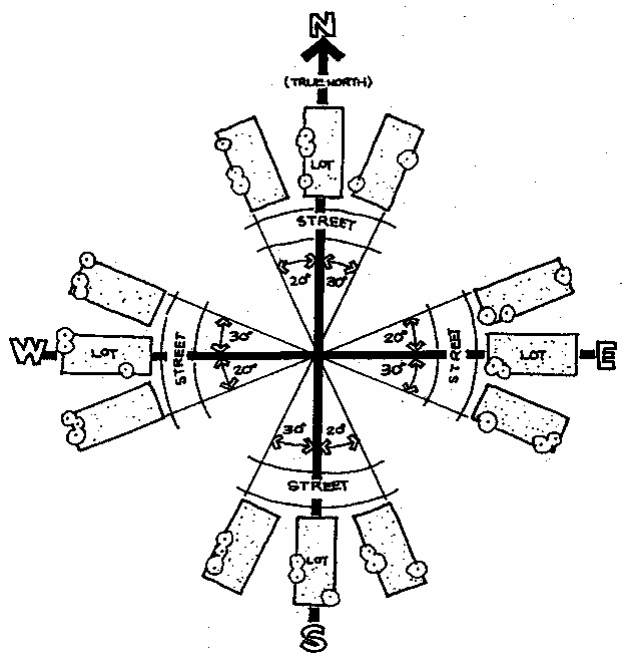


Figure 24: Preferred orientation of lots in an energy efficient subdivision

Source: *Amcord 95 (As published in SEDA's "Energy Smart Model Homes Policy."*

E22 – Gas Infrastructure

Design Principle

- Providing gas infrastructure within new major residential subdivisions provides the potential for significant reductions in greenhouse emissions.

Good Design Practice

- Reticulated gas supplies (i.e., a meter for each dwelling) must be provided in any new major residential subdivision.

E23 – Provision for Cycling and Pedestrians

Design Principles

- Planning for large subdivisions also provides opportunities to address "bigger picture" ESD measures. Once again, the emphasis is on reducing the amount of greenhouse gas emissions, and a major source in a new development comes through the use of private motor vehicles.
- This document encourages the provision for more environmentally friendly forms of transport, such as cycling and walking. Links with public transport are also important.

Good Design Practice

- Safe, direct and visible pedestrian routes are designed to link up with public transport routes in the locality.
- Subdivision design should include a clearly marked bicycle network and have regard for any linkages with Council's Regional Bike Plan.
- Accessible, safe and secure storage for bicycles should be provided.

CONTROLS

The following mandatory controls for energy efficiency must be complied with:

- Reticulated gas must be provided to serve the new subdivision.

Development Type: Commercial, Retail and Industrial Buildings and Other Non-Residential Development
(including Restaurants, Cafes, Hotels and Motels)

DESIGN PRINCIPLES

Passive Design Principles

E24 – Orientation

Design Principles

- As with residential buildings, non-residential buildings should be designed to maximise the benefits of solar energy through appropriate orientation.
- The size and placement of windows should correspond to the areas that require the highest lighting levels.

Good Design Practice

- Orient the main facades of the building to the north.
- Reduce areas of east, west and south facing glass to the smallest practical amount, still permitting views, daylight and market appeal.

E25 – Use of Natural Light

Design Principles

- Natural light can be used to minimise reliance on artificial lighting, thereby cutting energy costs.
- The shape of a building influences the amount of floor area that can benefit from daylight through windows.

Good Design Practice

- Design non-residential buildings to ensure that much of the floor area is within 4 to 6 metres of an external window.
- An elongated plan shape, preferably with maximised northern and southern facades, can produce greater access to daylight.
- The use of atria and courtyards should be considered.

E26 – Shading

Design Principles

- Solar orientation should be controlled to cater for seasonal variation in the sun's angle and intensity.

Good Design Practice

- North facing windows should be shaded from direct summer sun by external, horizontal devices such as awnings, upper floor balconies, eaves and overhangs.
- East and west facing windows are difficult to shade and should be minimised. Vertical shading devices such as blinds, shutters, adjustable awnings and landscaping should be used for this orientation.
- Shading devices such as flexible canvas devices should be used to shade those shopfronts which receive direct summer sunlight.

E27 – Thermal Mass

Design Principles

- Thermal mass , the measure of a building material's ability to absorb and store the sun's heat, is an energy efficient way to improve the thermal comfort of a development.

Good Design Practice

- Use building materials that have a higher "thermal mass", such as bricks, concrete and stone.
- To be more effective, locate the materials within north facing rooms, whereby they can benefit from winter heat gain, whilst ensuring there is appropriate shading from direct summer sun.
- Use lighter, more reflective colours for external walls and roofs to reduce heat gain in summer.

E28 – Insulation

Design Principles

- Insulation should be used in external walls and roofs to reduce heat escaping from a building in winter, and to maintain lower internal temperatures in summer.

Good Design Practice

- Buildings should be insulated to achieve an "R" value of*:*
  - R 2.5 for roofs and ceilings
  - R 1.5 for walls.
- Insulate pipes and storage tanks for hot water systems.

E29 – Ventilation

Design Principles

- Methods of natural ventilation should be encouraged where practical. They can also be used in combination with artificial ventilation appliances.

Good Design Practice

- The E6 best practice measures for achieving natural ventilation in residential buildings can also be relevant to non-residential buildings.
- The position of internal walls and partitions should allow for any prevailing passage of air through the building.
- Where mechanical ventilation is needed for specific office equipment, or plants in an industrial unit or warehousing, it should be located separate from other activities.
- In restaurants or buildings where mechanical ventilation is needed, use those which operate directly above cookers, rather than generating high ventilation rates throughout the kitchen.
- In some instances buildings in Marrickville are required to incorporate noise-proofing measures to address aircraft noise. Notwithstanding this, Council encourages the inclusion of some openable windows in residential developments to enable natural ventilation during aircraft curfew hours. The absence of aircraft noise between 11.00pm and 6.00am allows opportunities for fresh air to be brought into a building and stale air to be expelled.

E30 – Space Heating and Cooling

Design Principles

- As with ventilation, attempts should be made to combine environmentally friendly methods of space heating and cooling with any mechanised system.
- The usage patterns and location of a building's occupants should be considered in the initial design.

Good Design Practice

- If air conditioning is required, the unit should have sufficient controls to ensure that it is used only when required.
- Any air conditioning system should be well insulated, particularly those systems located in roof space.
- The practice of directing air conditioning only to areas where it is needed, and relying on natural ventilation for the remaining part of the building should be considered.
- A combination of passive methods, such as direct solar access, window shading, appropriate insulation and sealing, and natural ventilation can be used to reduce the overall use of mechanised systems.
- Applicants using cooking exhaust systems should ensure that they are not oversized in respect of their proposed use. Timer controls can be fitted to exhaust fans so that they switch off after a few minutes, or sensors that can activate them during cooking.
- In industrial units and warehousing goods doors should be located away from areas that may require mechanised heating or cooling.
- Depending on the amount of movement, rapidly closing doors, plastic strip curtains or pneumatic seals should be considered for commercial and industrial buildings.
- Small office buildings can be air conditioned by reverse cycle air conditioning units. These can be controlled individually and operated independently of the rest of the building if needed out-of-hours.
- Hotels should use a 'Hotel Card' system so that air conditioning and lighting in each guest room is switched off when the room is vacated.

Active Systems

E31 – Heating and Energy Systems

Design Principles

- Solar energy can be used as the primary energy source for a range of functions in both commercial and industrial buildings, thereby reducing the consumption of non renewable resources.

Good Design Practice

- Applicants should choose the solar energy technology which best suits their operations.
- Any hot water systems should have thermostatic controls, and the hot water tanks and pipes should be well insulated.
- The design and location of any solar energy systems should be complementary to the overall building envelope and materials.
- The State Government's Green Power Program is directed at larger business operations, providing an opportunity for businesses to use energy derived from renewable resources, "Green Energy", rather than fossil fuels.

E32 – Appliances and Lighting

Design Principles

- The use of more energy efficient lighting and electrical appliances in commercial and industrial developments can result in major energy costs savings and subsequent reductions in greenhouse gas emissions.
- In excess of 50% of energy consumed in commercial buildings is for the occupant's thermal and visual comfort.

Good Design Practice

- Applicants will need to submit a report from an energy consultant to demonstrate that they have addressed the general energy efficient principles.
- Applications for retail, commercial and industrial developments involving a gross floor area of greater than 1000m^2 will also need a report from a suitably qualified consultant that the estimated energy consumption of the proposal will not exceed 900 MJ/am2 and 450 MJ/am2 respectively (See Assessment Table)
- Energy efficient lighting is a critical factor in achieving the required energy consumption rating. The most efficient measures include*:*
  - The use of compact fluorescent lights or tubular fluorescent lamps with high frequency ballasts instead of tungsten light bulbs (i.e. standard bulbs).
  - The extent of lighting should be relative to the use of different areas, eg. high lighting levels should be provided for workstations and service areas.
  - Controls should be fitted to ensure that lights are not left on when not required. Time sensors or movement sensors are common techniques.
  - Energy efficient lighting such as solar, metal halide or sodium discharge lamps should be provided for the security of external spaces, such as car parks.
- Energy efficient appliances should be used in offices, such as computers, printers, photocopiers, fax machines, and microwave ovens.
- Those appliances which give off high degrees of heat should be separated from the main work areas.
- The internal layout of shops should ensure that cooling devices such as fridges and freezers do not receive direct sunlight.
- Businesses which involve food preparation and/or sales of food should use energy efficient cooking and refrigeration appliances.
- Fridges should be fitted with doors
- Open fridges must be fitted with insulating night covers.

Controls

The following mandatory controls for energy efficiency must be complied with:

For New Commercial Premises, Shops and Industrial Buildings (Involving a gross floor area of greater than 1000m^2)

- The total anticipated energy consumption is to be no greater than 450 MJ/am^2 (commercial) and 900 MJ/am^2 (retail) and is to be verified by the submission of an Energy Performance Report. This shall include evidence from a suitably qualified consultant to confirm compliance with the total anticipated energy consumption.
- New or replacement hot water systems of domestic/ residential scale shall have a 3.5 star greenhouse rating.
- The development shall comply with the Design Principles in this section (Part C) of the DCP with this to be discussed in the Statement of Environmental Effects;
- Any new air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models;

Commercial, Industrial, Retail, Restaurant and Cafe developments between 100m^2 and 1000m^2 (including new developments and alterations and additions)

- New or replacement hot water systems of domestic/ residential scale are to be of a minimum 3.5 star greenhouse rating.
- The development shall comply with the General Design Principles in this section (Part C) of the DCP with this to be discussed in the Statement of Environmental Effects.
- New or replacement air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

Other Non-Residential Development

- The development must comply with Core Energy Efficiency Design Principles (see Part B of the DCP) including:
  a) Orientation
  b) Overshadowing
  These principles are to be discussed in the submitted Statement of Environmental Effects
- New or replacement hot water systems of domestic/ residential scale are to be of a minimum 3.5 star greenhouse rating.
- New or replacement air conditioners of domestic / residential scale must be SEDA rated and must have a minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

Other Information for Commercial (Office) Buildings

The SEDA Building Greenhouse Rating Scheme

The Sustainable Development Authority (SEDA) has developed a scheme known as the Building Greenhouse Rating Scheme (BGR). This is a National program to benchmark the greenhouse performance of commercial office buildings and tenancies. The scheme gives a rating of up to five (5) stars to buildings and tenancies and this can be used to promote the greenhouse performance of the building. Once rated, prospective tenants can select buildings based on their performance, and a high rating can also enhance the sale price of a building.

By achieving a high SEDA greenhouse rating (trade-marked), applicants can gain a competitive advantage by being able to promote the building or tenancy as a cost-effective, greenhouse friendly place to work. The scheme can also lead to financial savings by encouraging buildings which use energy more efficiently, thereby saving on energy bills at the same time as reducing greenhouse gas emissions.

The BGR scheme is voluntary and only applies to commercial office developments (i.e.: not industrial or retail). For information on how to join the scheme, contact SEDA by phone on 9249 6100, by fax on 92991519, or write to SEDA at PO Box N442, Grosvenor Place NSW 1220. Their website address is www.seda.nsw.gov.au.

Water Efficiency Principles and Controls

DESIGN PRINCIPLES

As pointed out in Part A, it is critical that the DCP provisions address the wider environmental issues affecting the natural water cycle. The main strategies include:

Reducing Demand for Water

Water consumption can be reduced in households through the following measures*:*

- Using water efficient showerheads and taps that reduce the water flow, yet still maintain sufficient pressure to ensure a comfortable shower (see element WA1 over page).
- Installing flow control valves that adjust the pressure differences between hot and cold water supply and prevent sudden drops in pressure.
- Dual flush toilets.
- Composting toilets can serve the dual purpose of eliminating water usage and sewage output.
- More efficient management of hot water systems can be achieved through the insulation of piping.
- More efficient landscaping practices should be adopted

Stormwater Management

Stormwater control has traditionally involved the construction of pipes and channels to drain water downstream through local council systems to receiving water bodies. The main sources of rainwater run-off are hard, impervious surfaces such as roofs, paving and footpaths.

More recent methods of stormwater control involve techniques to store water during rainfall through detention tanks, and then slowly release the water to Council's drainage system. This process acts as a safeguard against overflows in periods of heavy rainfall.

This traditional approach is being increasingly undermined by the economic and physical burden it places on the capacity of local council drainage systems, as well as the environmental costs of the polluting output to natural waterways and oceans.

The most environmentally sound method of addressing this problem is to support the greater use of natural drainage systems.

The first step in this process is to reduce the amount of hard surfaces in new developments. This measure needs to be supported through a more water efficient use of open space and landscaped areas, with particular attention paid to the plant and soil structure characteristics.

Control of the Quality of Stormwater

This measure generally applies to larger developments where there are greater quantities of stormwater to be dealt with. It requires applicants of these larger developments to consider ways of maximising the water quality of the proposed stormwater arrangements in the early design stages. The main issues to be dealt with include*:*

- Design for source control, so that, for example, the stormwater does not pass through oily, fertilised or muddy garbage areas.
- Emergency Spill Plans.
- Treatment and settlement prior to discharge.
- Pit cleaning and maintenance and monitoring of water quality performance.

Water Collection and Re-Use

Alternative water supplies can be sought through the following*:*

- ***Rainwater Collection Tanks***

  Draining rainfall from roofs into collection tanks can not only provide an alternate water source for households and business functions, such as toilet flushing, showers, clothes washing and irrigation (even drinking water under treated circumstances), they can also act as an alternative stormwater detention system, provided adequate storage is available. Refer to detailed Design Principles and Good Design Practice under WA2, below.

- ***Greywater Recycling***

  This process involves the storage of water that has been used once for non-sewage utilities (such as showers, baths and washing machines), which is filtered and then used for certain functions such as toilet flushing and irrigating gardens.

  The use of rainwater tanks and greywater recycling measures are strongly encouraged by Council but are not mandatory requirements.

  The only requirements are Principle W1, applicable to development on sites above 1000m^2 in area, and WA1 – Water Effective Fixtures, applicable to all development types (see Controls later in this section). W1 requires applicants of larger developments to provide a more detailed assessment of the potential water efficiency methods they can use, in association with the general requirements of Council's Stormwater Detention Code.

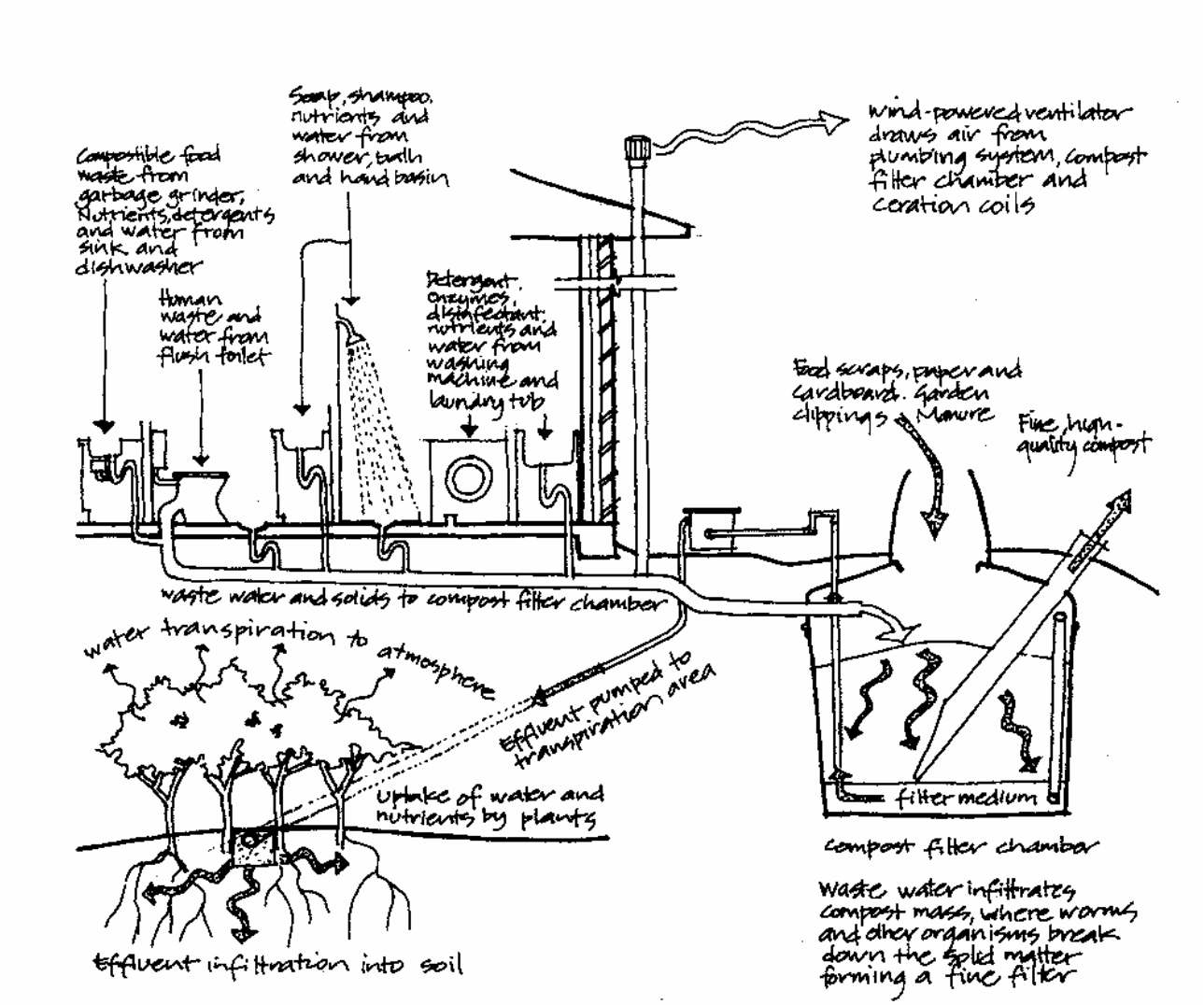


Figure 25: Domestic total water cycle management (water and organic waste recycling system).
Source: RAIA's "Environment Design Guide."

W1 Comprehensive Water Cycle Management

Design Principles

- Large developments can have a major influence on the natural water cycle of an area.
- It is important that the applicants for these developments provide evidence that they have considered the potential impacts upon the natural water cycle and demonstrated what water and stormwater efficiency measures they will be implementing to address these issues.

Good Design Practice

A Comprehensive Water Cycle Management Plan is to be provided for all developments on sites with an area greater than 1000m^2. This Plan is to supplement the information required in Council's Stormwater, Retention and Sediment Code, and Council's Soil and Sedimentation Plan requirements, including the following*:*

- Estimates of all water, wastewater, and stormwater flows
- How demand for water and discharge will be minimised
- An analysis of the potential for the treatment and re-use of effluent or stormwater on the development site.
- The proposed impacts on the hydrology of the surrounding locality.
- The scope for on-site infiltration
- A Strategy for Improving Stormwater Quality*:*
  - Design for source control, so that, for example, it does not pass through oily, fertilised, or muddy garbage areas
  - Emergency Spill Plans
  - Treatment and settlement prior to discharge
  - Pit cleaning and maintenance
  - Monitoring of water quality performance.

WA1 Water Efficient Fixtures

Design Principles

- The use of water efficient fixtures in both the bathroom and kitchens of a household can result in substantial reductions in water use.

Good Design Practice

- The most efficient water fixtures are*:*
  - AAA rated water efficient shower heads
  - AAA rated flow regulators for bathroom basins and kitchen sinks.
- Fixtures with AAA rating must achieve the following flow rates*:*
  - Shower heads – 9 litres or less per minute.
  - Basins – 6 litres or less per minute.
  - Kitchen sinks – 9 litres or less per minute.
- The piping for hot water sources should also be insulated.
- Dual flush toilets should be used, and are required if new or replacement toilets are to be used.
- Front loading washers are also very efficient.

WA2 Rainwater Collection and Re-use

Design Principles

- Rainwater is a valuable natural resource that can be collected for household use.
- The use of a rainwater collection system is a way of conserving potable water supplies, as it can provide a water source for a range of household tasks, including toilet flushing, irrigation of landscaped areas and clothes washing.
- Using rainwater can reduce water bills, provide a chlorine-free supply of fresh drinking water, and reduce community infrastructure costs.
- Using rainwater can also aid self-sufficiency, providing a back-up supply in case of water restrictions caused by drought, peak supply shortage, or water quality problems.
- Rainwater tanks can also provide cost-effective on-site detention of stormwater.
- The design of a rainwater collection system needs to consider health issues and impacts on the main building form.
- Particular attention needs to be given to regular maintenance of the rainwater collection system to minimise the health risks which may be associated with a stored body of water.
- The main contamination risks come from animals or birds leaving droppings on the roof and gutters or accidentally entering the tank and becoming trapped. In urban areas, there is also a risk of contamination from airborne pollution. However these risks may all be minimised by appropriate design and ongoing maintenance.
- Use of an appropriately installed rainwater collection system is strongly encouraged by Council for non-potable uses (eg: garden watering and car washing) and may be used for single dwellings, new residential flat buildings and commercial and industrial developments.

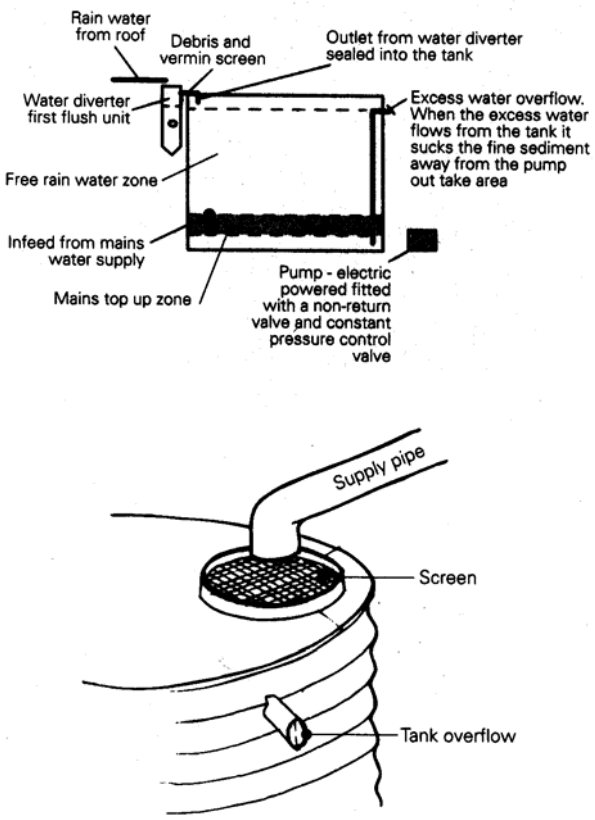


Figure 26: Design of a Typical Rainwater Tank
Source: 'Your Home, Your Future, Your Lifestyle' 2001 A Joint initiative of the Commonwealth Government, the Building and Design Industries and the NSW Department of Urban Affairs and Planning.

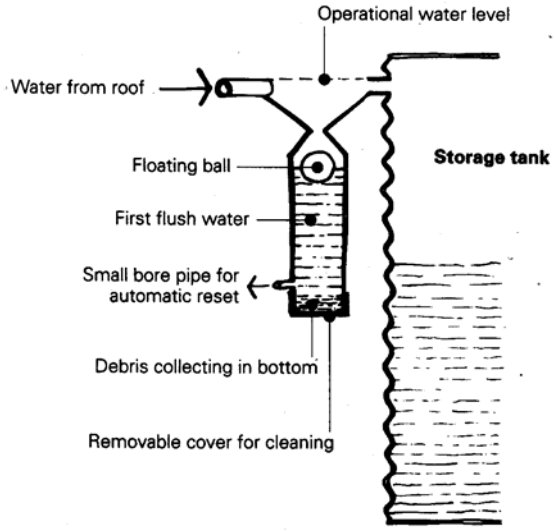


Figure 27: A First Flusher Diverter
Attached to a rainwater tank to prevent the initial flow of contaminant-laden water from the roof entering the tank when it rains.
Source: 'Your Home, Your Future, Your Lifestyle' 2001 A Joint initiative of the Commonwealth Government, the Building and Design Industries and the NSW Department of Urban Affairs and Planning.

Good Design Practice

- Use of stored water for gardening/ drip irrigation is an ideal use of collected rainwater. Water can be distributed by a regular hose (wide bore-19mm preferred) or perforated seeper hoses either 'fixed' (eg: buried under mulch) or moved around a garden. The seeper hose laid out in one position is the ideal connection as the only operation needed is turning the tank taps on/ off.
- Use of collected rainwater for toilet flushing requires a connection from the rain-tank to a toilet cistern and is an active use of stored water.
- The following matters should be considered in the design of a domestic rainwater collection system:

Materials and Design

- Rainwater tanks are generally made from either galvanised steel, fibre glass, concrete or masonry. Many new models can be purchased or custom made to blend in with the colour and shape of an existing residence.
- The tank should be designed and located so as not to be visually obtrusive or impact upon adjoining properties.

Siting and Installation

- The tank and support structure must be set on a suitable foundation.
- Installation and plumbing must be carried out by a person licensed by the NSW Department of Fair Trading.
- Polyethylene tanks can stand on level ground, e.g. a bed of 50mm of sand. Make sure that this base cannot be washed out by ground or surface water.
- Metal tanks should be installed on a tank stand or concrete slab to prevent corrosion.
- The proposed rainwater tank should comply with the relevant Australian Standards:
  AS/NZ 2179-1994 'Specifications for Rainwater Goods, Accessories and Fasteners'.
  AS2180-1986 'Metal Rainwater Goods – Selection and Installation'.
  A Certificate of Compliance showing that the tank meets these standards should be easily available from the tank manufacturer.
- Pumps should be located away from adjoining properties and be suitably sound insulated.

Support Structure

- The support structure for any water tank must be in accordance with the requirements of a qualified practicing structural engineer. You can seek advice from the manufacturer, a builder, or a structural engineer.

Mosquito Proofing

- The tank must be mosquito proof to prevent the breeding of mosquitoes. This can be achieved by installing a strainer with mosquito net in all openings including inlet and outlet pipes (see Figure 27).

Tank Enclosure

- Tanks should be covered or enclosed entirely and any lid must be directed to Council's stormwater system and be child-proofed.
- Tanks should have suitable contaminant screens to prevent entry to any animals or pollutants (see Figure 26).

Overflow

- Any overflow should be piped directly into the Stormwater drainage system and not be diverted into existing sewer connections.

Plumbing Connections

- The water collected in the tank should be kept entirely separate from the existing mains water supply. Sydney Water allows no direct cross connection with water mains plumbing. This means that tank water cannot be fed into the existing plumbing system and must be kept in separate pipes.
- The tank can be directly connected with a hose to an outdoor sprinkler (a wide bore hose is recommended, e.g. 19mm), a basin or washing machine, as long as the tank water pipe is not connected with any other pipe that brings water in from the mains system or drains to the sewage system.

Taps

- Tank water supply taps are to be marked 'Tank Water Only – do not use for human consumption' to prevent use for drinking water and cooking.

Maintenance

- To minimise health risks, the following should be undertaken:
  regular checking of roofs and gutters for vegetation (eg: weekly)
  keeping the roof clear of overhanging vegetation
  checking and maintaining screens around the tank
  draining and cleaning the tank every few years to remove sediment
  and installing a first flush diverter which prevents the initial flow of contaminant-laden water from the roof entering the tank when it rains (see Figure 27).

Other Information

- NSW Health has produced a *Rainwater Tanks* brochure which provides further advice on the use and maintenance of rainwater tanks. Copies of the publication can be obtained from the NSW Health website:
  www.health.nsw.gov.au/public-health/ehb/water/rainwater/htlm

WA3 Water Efficient Landscaping

Design Principles

- The water used for irrigating landscaping in households, on average, accounts for 25% of all residential water use in Sydney.
- Reduced water consumption in the yard areas of households can be achieved through a more efficient use of landscaping.
- Water efficient landscaping can also improve infiltration into the ground, which can act to reduce the amount of stormwater entering Council's drainage system. Marrickville's built - up environment provides major constraints due to infiltration of a limited amount of private open space. The predominant clay soil type of Marrickville's area is also a deterrent to the degree of infiltration. Nonetheless, the encouragement of water efficient landscaping practices, combined with conventional on-site detention tanks can only improve the overall impact on Council's drainage system.

Good Design Practice

- Water Efficient Landscaping Practices include*:*
  - Reducing your lawn area (lawns are generally water and fertiliser hungry), and replace with appropriate planting.
  - Planting low water use vegetation
  - Hydrozoning, or grouping species with similar water needs together
  - Landscaping designed to maximise the capture of rainfall and prevent runoff.
  - Controls on hoses and fixtures to prevent over-watering.
  - Watering for longer periods at a reduced frequency. This promotes deeper root growth and drought tolerance of vegetation.
- Soil management techniques are an essential way of reducing the amount of run-off flowing into Council's drainage system, particularly through the natural process of infiltration. Some of these principles include*:-*
  - enhancing soil structure of landscaped areas through plant growth;
  - Plant roots bind soil particles into aggregates, thereby improving permeability
  - Deep rooting plants increase infiltration into the soil
  - Decaying organic matter can improve the soil structure (mulches, green manure and compost)
  - Earthworms can also enhance the structure
  - The compacting of soils decreases the rate of infiltration
  - Many modern gardening practices are harmful to soil organisms (eg, fertilising chemicals)
  - A thorough analysis of the soil type is essential for natural drainage systems; some soils have poor infiltration rates, such as clay.

- The following functions of plants can act to reduce the amount of stormwater flowing into Council's drainage system*:*
  - A small proportion of rain is evaporated directly from a plant's surface, even during rainfall.
  - In many trees, water is collected in the upper canopies and flows down eventually into the soil
  - During rainfall, water is stored on the surface of leaves and stems, gradually making its way into the soil
  - During the growth of vegetation, water is removed form the soil by transpiration, where the water is then evaporated from the plants into the atmosphere, replenishing the original source of rainfall
  - Trees with large leaf areas and deep roots have higher rates of transpiration
  - Transpiration helps to dry out soils; during rain, water will infiltrate more readily into dry soil.

WA4 Greywater Recycling

Design Principles

- Greywater is wastewater from non-toilet plumbing fixtures such as showers, basins and taps.
- Greywater recycling provides numerous opportunities to reduce water use in the home by its re-use for toilet flushing and clothes washing, both of which are significant consumers of water. Greywater can also be used for garden watering.
- Re-using greywater for toilet flushing will save approximately 65 litres of potable water in an average household every day and using wastewater in a clothes washer will save approximately 90 litres of potable water;
- The benefits of greywater recycling include: reduced water bills, conserving water resources, reducing the amount of pollution going into waterways, and helping to save money on new infrastructure for water provision and water treatment.
- Greywater recycling systems must be carefully installed to industry standards to ensure the protection of surface water, ground water, vegetation, soil and public amenity. The siting, design, construction, operation and maintenance of the system are critical in this regard.

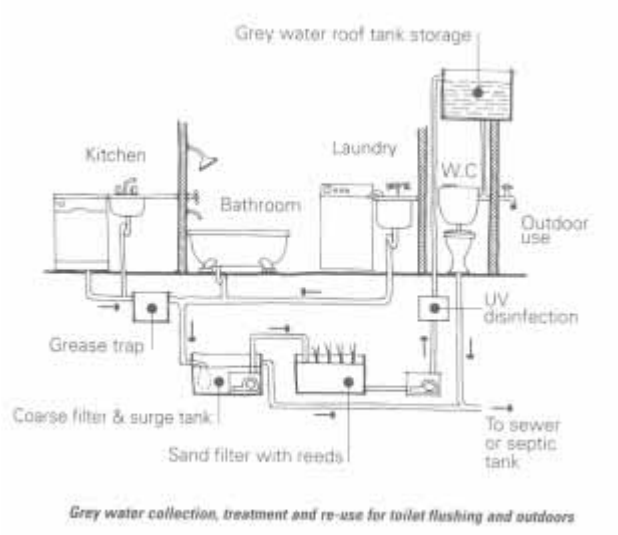


Figure 28: Grey water collection, treatment and re-use for toilet flushing and outdoors

Source: 'Your Home, Your Future, Your Lifestyle' 2001 A Joint initiative of the Commonwealth Government, the Building and Design Industries and the NSW Department of Urban Affairs and Planning.

- Greywater must be treated and disinfected before storage and general re-use. This is because it can contain significant numbers of pathogens which spread disease and it cannot be stored for longer than a few hours untreated as it begins to turn septic and smell.
- There are many different types of greywater treatment systems available. The main steps involved in the process of greywater recycling include filtering the water to remove large waste particles, feeding it through a reed bed and sand filter for secondary treatment, disinfection, and then pumping the water to a storage tank for re-use (see Figure 28).

Good Design Practice

- Landowners installing greywater recycling systems will need to ensure that persons do not come into contact with sewage or effluent in their ordinary activities on the premises.
- Effluent is not to be discharged into any watercourse or onto any land other than a designated effluent application area.
- It is important that the system is well maintained and operated in a sanitary condition.
- On-site greywater recycling systems need to be installed in accordance with Australian Standard AS/NZS 1547:2000.
- Applicants wishing to install a greywater system should also refer to the following three (3) key publications.

1. The Department of Local Government and NSW Health Guidelines *"Environment and Health Protection Guidelines: On-Site Sewage Management for Single Households"* (February 1998). The Guidelines set out the detailed requirements for the installation, maintenance and appropriate use of greywater. It is important that the Statement of Environmental Effects submitted with the Development Application adequately addresses the Guidelines. Council will assess the proposal against the Guidelines and any other relevant statutory or policy provisions
   [copies: www.dlg.nsw.gov.au/onsite.htm]
2. The NSW Department of Local Government *"The Easy Septic Guide"* is a plain language owners manual for the safe operation and *maintenance* of household septic systems (1998).NSW Health *"Greywater reuse in sewered single domestic premises 2000"*
   [copies: www.health/ehb/general/greywater-policy.pdf]
3. Useful information on the benefits, precautions and installation requirements for a greywater recycling system is contained in the technical manual *"Your Home: Your Future, Your Lifestyle" (2001)* - A joint initiative of the Commonwealth Government, The Building and Design Industries and the NSW Department of Urban Affairs and Planning.

- For further information about installing a greywater recycling system, contact the Department of Local Government on www.dlg.nsw.gov.au

CONTROLS

The following mandatory controls for water efficiency must be complied with:

For Minor alterations and additions

- New or replacement toilets are to be dual flush
- New or replacement bathroom and kitchen taps, showerheads, toilet cisterns, clothes washers and dishwashers must be AAA rated.
- The Statement of Environmental Effects submitted with the Development Application must discuss the Core Design Principles (Part B of the DCP).

For Major alterations and additions

- New or replacement toilets are to be dual flush
- New or replacement bathroom and kitchen taps, showerheads, toilet cisterns, clothes washers and dishwashers must be AAA rated.
- The Statement of Environmental Effects submitted with the Development Application must discuss the Core Design Principles (Part B of the DCP).

New Dwelling Houses or Dual Occupancies, New Residential Flat Buildings (RFBs) including those contained in mixed RFB/ Commercial Developments, Residential Conversion of Former Industrial Buildings, New Multi-unit Housing and Major Residential Torrens Title subdivisions.

- AAA rated showerheads, bathroom and kitchen taps, toilet cisterns, clothes washers, dishwashers must be provided.
- Toilets are to be dual flush
- A Comprehensive Water Cycle Assessment is to be submitted for sites with an area greater than 1000m^2.
- A Water Efficient Landscaping Assessment is to be carried out for all applications, excluding new dwelling houses.

For New Commercial Premises, Shops and Industrial Buildings (Involving a gross floor area of greater than 1000m^2)

- A Comprehensive Water Cycle Assessment is to be submitted for sites with an area greater than 1000m^2
- The development shall comply with the Design Principles in this section (Part C) of the DCP with this to be discussed in the Statement of Environmental Effects).
- AAA rated fixtures are to be provided for bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and urinals.
- Toilets are to be dual flush.

Commercial, Industrial, Retail, Restaurant and Cafe developments between 100m^2 and 1000m^2 (including new developments and alterations and additions)

- AAA rated fixtures are to be provided for bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and urinals where these fixtures are new or replacement.
- New or replacement toilets are to be dual flush.
- The development shall comply with the Design Principles in this section (Part C) of the DCP with this to be discussed in the Statement of Environmental Effects).

All Other Developments

- AAA rated fixtures are to be provided for all bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and urinals where these fixtures are new or replacement.
- New or replacement toilets are to be dual flush
- The Statement of Environmental Effects must discuss the Core Design Principles under Part B of the DCP.

Part D
Green Checklist

GREEN CHECKLIST

COMPLIANCE WITH DEVELOPMENT CONTROL PLAN N^{o} 32:
ENERGY SMART WATER WISE

The following **Green Checklist** ensures compliance with the requirements of Council's DCP No 32- Energy Smart Water Wise. It mainly addresses installation matters such as energy and water efficient fixtures and appliances which are not usually shown on architectural plans. The Checklist is to be completed by Council or the PCA **prior to the issue of an Occupation Certificate**. If completed by a PCA other than Council, a copy of the checklist must be forwarded to the Council for its records.

CONTROLS WHICH MUST BE COMPLIED WITH

DEVELOPMENT TYPE	DCP REQUIREMENTS	REQUIREMENTS MET?
Minor alterations and additions to a Dwelling House*	Insulation of additional or replacement ceiling or roof to an R3 rating	
	New or replacement hot water system has a minimum 3.5 star greenhouse rating	
	New or replacement: bathroom or kitchen taps, showerheads, toilet cisterns, clothes washers and dishwashers are AAA rated	
	SEDA rated air conditioners of domestic/ residential scale where new or replacement systems are to be installed***	
	New or replacement toilets to be dual flush	
Major alterations and additions to a Dwelling House**	Insulation of existing ceiling or roof to an R3 rating	
	New or replacement hot water system has a minimum 3.5 star greenhouse rating	
	New or replacement: bathroom or kitchen taps, showerheads, toilet cisterns, clothes washers and dishwashers are AAA rated	
	SEDA rated air conditioners of domestic/ residential scale where new or replacement systems are to be installed***	
	New or replacement toilets to be dual flush	
New Dwelling Houses or Dual Occupancies **New Residential Flat Buildings (RFBs) including those contained in mixed RFB/ Commercial Developments** **New Multi-Unit Hosing** **Residential Conversion of Former Industrial Buildings** **Major Residential Torrens Title subdivisions**	A minimum 3.5 star NatHERS energy rating of internal thermal comfort for each new dwelling (if evidence not already submitted at lodgement at DA stage)	
	New or replacement hot water system with a minimum 3.5 star greenhouse rating for each new dwelling	
	Reticulated gas for new RFBs and major residential Torrens Title subdivisions	
	New or replacement bathroom or kitchen taps, showerheads, toilet cisterns, clothes washers and dishwashers are AAA rated	
	Toilets to be dual flush for each new dwelling	
	SEDA rated air conditioners of domestic/ residential scale where new or replacement systems are to be installed***	
	Energy efficient clothes dryers where clothes drying areas are not already provided	
New Commercial Premises, Shops and Industrial Buildings. (Involving a gross floor area of greater than 1000m^{2})	New or replacement hot water systems of domestic/ residential scale being 3.5 star greenhouse rated.	
	AAA rated fixtures for bathroom and kitchen taps, showerheads, dishwashers, toilet cisterns and urinals.	
	Toilets to be dual flush.	
	Energy efficient SEDA rated air conditioners where natural ventilation is not possible and new or replacement air conditioners (of domestic/ residential scale) are to be installed. Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.	

Commercial, Industrial, Retail, Restaurant and Café Developments between 100m^2 and 1000m^2 (including new developments and alterations and additions)	New or replacement hot water system with a minimum 3.5 star greenhouse rating	
	New or replacement: bathroom or kitchen taps, showerheads and toilet cisterns, urinals, clothes washers and dishwashers are AAA rated	
	SEDA rated air conditioners of domestic/ residential scale where new or replacement systems are to be installed***	
	New or replacement toilets are dual flush	
New developments and alterations and additions to Motels, Hotels, Backpacker Hostels and Boarding-Houses	Insulation of additional or replacement ceiling or roof to R3 rating	
	New or replacement: bathroom or kitchen taps, showerheads and toilet cisterns, urinals clothes washers and dishwashers are AAA rated	
	SEDA rated air conditioners of domestic/ residential scale where new or replacement systems are to be installed***	
	Air conditioning in new hotels to operate on a demand or room-occupation basis only.	
	New or replacement toilets are dual flush	
	New or replacement hot water system with a minimum 3.5 star greenhouse rating	
	Five star electrical appliances	
All Other Developments	New or replacement: bathroom or kitchen taps, showerheads and toilet cisterns, urinals, clothes washers and dishwashers are AAA rated	
	New or replacement toilets are dual flush	
	SEDA rated air conditioners of domestic/ residential scale where new or replacement systems are to be installed***	
	New or replacement hot water system with a minimum 3.5 star greenhouse rating	

*Minor Alterations and Additions to Dwelling Houses = works affecting < 50% of the existing floor area.
** Major Alterations and Additions to Dwelling Houses = works affecting > 50% of the existing floor area.
*** Control: Minimum 4 star rating for cooling only, and minimum 4 star on one cycle and 3 star on the other cycle for reverse-cycle models.

DESIRABLE ENERGY AND WATER INITIATIVES – ENCOURAGED BY COUNCIL

ADDITIONAL ENERGY AND WATER SAVING INITIATIVE	PROVIDED IN DEVELOPMENT?
1. ADEQUATELY SIZED GAS OR ELECTRIC-BOOSTED SOLAR HOT WATER SYSTEMS	
2. HEAT PUMP HOT WATER SYSTEMS	
3. RAIN WATER TANKS	
4. GREYWATER RECYCLING	
5. PHOTOVOLTAIC CELLS OR TILES	
6. SEDA BUILDING GREENHOUSE RATING SCHEME - FOR COMMERCIAL OFFICES ONLY	

References

Leichhardt Municipal Council, "Draft Leichhardt Town Plan", 1998.

Keys Young with Mark Ellis, in association with Geoff Milne, Stuart White, Toby Fiander, Photovoltaics Special Research Centre UNSW, "Regional Energy, Water and Stormwater Efficiency Policy Toolkit Reference Manual", prepared for the Inner Metropolitan Regional Organisation of Councils (IMROC), February, 1998.

NSW Sustainable Energy Development Authority, "Energy Smart Homes Model Policy",

South Sydney City Council, "South Sydney Development Control Plan 1997".

NSW State Government, "Building Better Cities – Newcastle Housing Design Manual", July, 1995.

Nick Hollo, "Warm House Cool House", Sydney, 1995.

Ted Floyd, prepared for Friends of the Earth, Sydney, "Waste Management in Parks and Gardens", July, 1998.

Ted Floyd, Convenor, Friends of the Earth, Sydney, "Soil Water Infiltration", paper presented at Stormwater Industry Association, 4th Annual Conference, Sydney, September, 1996.

Sydney Morning Herald, 19 June, 1998, an article on a report by the Australian Bureau of Statistics, "Australian Social Trends".

Southern Sydney Regional Organisation of Councils, "Energy Efficient Development" – Discussion Paper", October, 1993.

Sydney Water, "Water Conservation Outside" and "Water Conservation in the Home" brochures, 1998.

Randwick City Council, Draft Development Control Plan for Multi-Unit Housing", 1998.

Queanbeyan City Council, "Building or Renovating Your Home?" brochure.

Royal Australian Institute of Architects, "Environmental Design Guide" Articles*:*

Bill Lawson, "Embodied Energy of Building Materials", August, 1995, Pro 2.

Peter Lyons, "The Energy Impact of windows in the Building Design", November, Pro3.

Energy Victoria, "Thermal Insulation in Domestic Buildings for Temperate Climates", May, 1996, Pro7.

Deo Prasad, "Energy Efficiency in Commercial Buildings", May, 1995, Des2.

Richard Lamb, "Biodiversity", February, 1995, Gen3.

Gareth Cole, "Residential Passive Solar Design", February, 1997, Gen12.

Alan Pears, "Greenhouse Gas Emissions and the Residential Sector", May, 1997, Gen13.

Tim Waldock, "Introduction to Water Sensitive Design", November, 1996, Des13.

Tim Waldock, "Design Solutions for Water Efficiency", November, 1996, Des14.

Environment Australia, "Global Warming Cool It – A Home Guide to Reducing Energy Costs and Greenhouse Gases".

Ku-ring-gai Municipal Council, "Energy Efficient Housing Policy", 1995.

Commonwealth Department of Housing and Regional Development, "Amcord", 1995.

The Natural Office of Local Government, "Australia's Guide to Good Residential Design".

Department of Urban Affairs and Planning, "NSW Model Code – A Model for Performance Based Multi-unit Housing Codes", 1997.

Sydney Electricity, "The Guide to Energy Savings Products".

Department of Urban Affairs and Planning, Urban Design Advisory Service, "Better Urban Living", 1998.