

6 Energy and water

The Mullum Creek vision is based on a widely accepted set of environmental principles and objectives. The use of natural resources is an integral part of this, and few resources are more precious than energy and water.

Objectives

- Minimise the consumption of potable authority-supplied mains water.
- Promote energy efficient buildings that reduce greenhouse gas emissions due to or arising from their ongoing operation.
- Promote solar access to buildings and private open space.
- Minimise the use of dark coloured building or hard landscaping materials where they will be exposed to sunlight and therefore absorb heat.

6.1 Solar design, thermal mass and ventilation

Applying passive solar design principles will help you create a home that can be effectively heated and cooled at little cost. The aim is to invite the winter sun's warmth into the home and retain it, while in

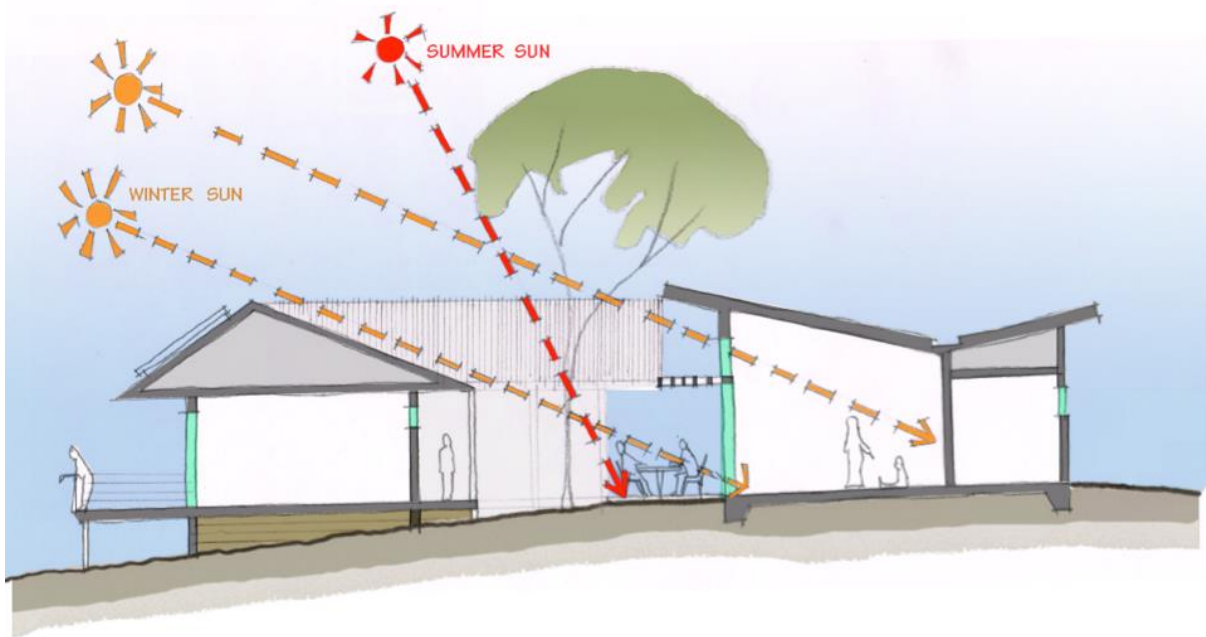


Figure 21. *Clever design of building forms and careful selection and positioning of trees and shrubs can invite low winter sun into courtyards and living spaces, whilst also shading out high summer sun.*

summer the aim is to exclude and purge heat from the building. The key to good passive solar design is understanding how the sun moves across the sky at different times of the year, and to design your home accordingly.

Strategic placement and detailing of doors and windows allows for natural ventilation. And providing floors, walls and ceilings with good thermal mass enables the home to absorb heat or coolth.

Please see **Section 6.2** for more information.

Objective

- Maximise the use of design strategies and measures that optimise thermal performance.

Guides

- G27 Orient and size windows so they capture the energy of low winter sun, and use thermal mass (materials with good heat storage capacity) appropriately placed within the home to absorb the resulting heat gain and passively warm your home throughout the night. Well insulated floors, walls, roof/ceilings, windows and doors will then hold this warmth inside your home for extended periods, without the need to resort to mechanical heating.
- G28 Selecting highly insulating window frame and glass systems can be particularly important, and the Mullum Creek website contains a **Windows Selection Guide** to help with this.
- G29 Place windows and retractable external shading devices to exclude radiant summer heat. Correctly designed eaves also control summer sun and help with roof design, proportion and scale. Consult the 'YourHome' manual or website <http://www.yourhome.gov.au/passive-design> for more tips on how to provide appropriate sun shading to your home.
- G30 Allow for cross (horizontal) and stack (vertical) ventilation to purge any hot air from the home in the cooler nighttime hours. Here again thermal mass within the home can absorb the 'coolth' of the night and passively cool your home well into the day. Well insulated floors, walls, roof/ceilings, windows and doors will then hold this coolth inside your home as long as possible without the need to turn on mechanical air-conditioning.
- G31 Building materials that provide good thermal mass include tiled or polished concrete floors, internal brick and rammed earth walls directly exposed to the interior air.
- G32 Ceiling fans with dual summer/winter controls improve cooling air movement within the home in summer, whilst in winter they help to gently return to our body level the warm air that would otherwise rise and settle near the ceiling.

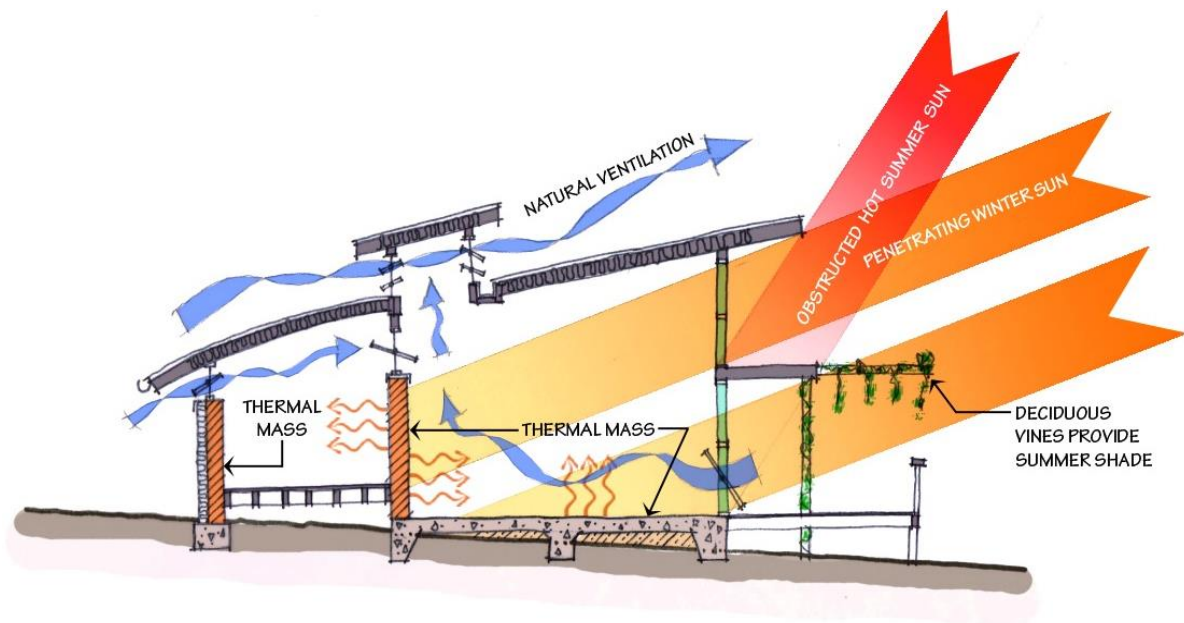


Figure 22. Carefully proportioned glazing, eaves, and summer sunshade systems. Ample internal mass. Cleverly located openings for cross and stack ventilation. These all contribute to keeping your home warm in winter and cool in summer, reducing your energy consumption and greenhouse gas emissions.

6.2 Energy rating

Mullum Creek uses the **AccuRate** energy rating program to assess all home designs and ensure they achieve a minimum 7.5 star energy rating. To ensure consistency across the estate, the DRC will commission its nominated energy assessor to undertake assessments at all three stages of the design approvals process. The DRC will provide you with reports and feedback arising from the earlier assessments, as well as a copy of the final NatHERS Certificate. This energy rating will give you an insight into how mechanical heating and cooling of your home will impact on your energy bills and carbon footprint. We recommend that you obtain early advice from the DRC on the energy efficiency of your design prior to submitting for Step 1 Preliminary Design Approval. This will enable you to alter your plans if necessary, before undertaking further costly design work.

Objective

- Reduce the amount of greenhouse gas emissions generated by mechanical heating and cooling, by achieving a high standard of thermal performance (energy efficiency) in the design of homes to be constructed at Mullum Creek.

Detailed Requirement

R34 Each home must achieve a minimum 7.5 star energy rating, as established by Mullum Creek's nominated assessor using AccuRate thermal modelling software.

Guide

- G33 To achieve a minimum 7.5 star home energy rating, it is likely that you will need to:
- Orient your home and its layout to maximise northern exposure for living areas.
 - Use thermally efficient windows and external doors (frame and glass systems).
 - Be frugal with glass area (have it not exceed 20% of floor area where possible) and/or use thermally efficient doors and windows with particularly high thermal efficiency ($U_w < 2.5$ and $SHGC > 0.5$) as listed in the Window Energy Rating Scheme (WERS) database <http://www.wers.net/werscontent/certified-products-residential>.
 - Have a more generous expanse of glazing facing solar north (or within 15 degrees thereof) that has clear exposure to low winter sun, but only if the dwelling also has a good amount of internally accessible thermal mass.
 - Provide comprehensive and effective external sun shading of all glazing from summer sun.
 - Have a reasonably compact plan form, to reduce the building's external surface area to floor area ratio, and hence also reduce unwanted conductive summer heat gains and winter heat losses.
 - Incorporate doors, screens and flexible walls (such as large sliding panels) to separate air compartments within otherwise open living zones, thereby allowing more effective containment of mechanically heated and cooled air.
 - Ensure that location, size and detailing of door and window openings provide broad and easy pathways for cross (horizontal) and stack (vertical) ventilation through the dwelling interior.
 - Use materials with high thermal mass (heat storage capacity and surface conductance i.e. ability to absorb and release heat) and broad surface area in direct contact with interior air.
 - Provide substantial insulation for floors, walls, roofs and ceilings.
 - Avoid recessed light fittings that require substantial gaps or cut-outs in ceiling insulation.
 - Provide airlocks to the home's most regularly accessed entries and exits.

6.3 Solar power

Homeowners can benefit greatly from on-site power generation. There can be significant cost savings and reductions in greenhouse gas emissions from generating and storing your own electricity on site. New technologies such as battery storage and electric cars are expanding the applications for home generated electricity.

Detailed Requirements

- R35** *Each homesite must have installed an array of photovoltaic panels rated with a minimum 4.0kW generating capacity.*
- R36** *Solar panels must be integrated into the overall design of the home.*

Guides

- G34 Consider on-site battery storage, so you can use the excess solar power generated during the day to meet your night time power needs. If you're not ready to install batteries yet, consider laying rough-in cabling for it in your initial build. This could save you considerable effort and cost down the track.
- G35 Even if you don't own an electric car now, consider installing rough-in electrical cabling between your meter and your proposed car charging point, so as to avoid the cost of expensive retrofit wiring in the future.

6.4 Light pollution

Lighting within the landscape provides ambience and can provide for passive surveillance through the evening hours. However external lighting can also contribute to light pollution. This usually relates to security lighting, street lights and garden lights. The stray light wastes electricity, unnecessarily contributes to greenhouse gas emissions, and can disrupt the normal day-night rhythms of wildlife.

Objectives

- Minimise the amount of light emitted to non-target areas beyond the immediate home environment.
- Reduce the amount of greenhouse gas emissions generated by artificial night lighting.

Guide

- G36 To minimise light pollution and greenhouse gas emissions:
- Select light fittings that illuminate only those areas that require lighting.
 - Select energy-efficient and solar-powered light fittings.
 - Select light fittings that minimise glare and uplight.
 - Avoid over-illumination where possible.
 - Where possible, install security lights controlled by motion sensors and/or timers.



Figure 23. Suitable lighting that is directing light downwards to illuminate the target area, keeping spill light to a minimum.

6.5 Heat island effect and site permeability

Urban development results in buildings, roads and other infrastructure replacing open fields and vegetation. Hard structures and surfaces absorb the sun's heat more intensely than does earth cloaked in greenery. This reduces the amenity of our homes and their surrounds. It also increases summer cooling loads and costs, as well as adding to heat stress on humans, plants and animals occupying our urban environment.

Hard constructed ground surfaces also encourage stormwater to race away to drains and creeks, without first hydrating soils and providing moisture for plants. In heavy downpours this racing stormwater can also cause local flooding, erosion and other environmental and economic damage.

Objectives

- Maximise areas of vegetation on homesites to reduce heat absorption.
- Minimise the use of dark-coloured building or hard landscaping materials where they will be exposed to sunlight and therefore absorb heat.
- Wherever possible maintain porous ground surfaces on your homesite, to capture and absorb surface water run-off.

Detailed Requirement

R37 *At least 40% of each homesite must comprise vegetation (garden bed, grass) and/or other permeable landscape treatment. This applies equally to front, rear and side yards.*

6.6 Water tanks

The on-site collection and reuse of rainwater helps reduce the demand for potable authority-supplied mains water.

Objectives

- Reduce the demand for potable authority-supplied mains water through on-site capture, storage and use of rainwater.
- Minimise the overshadowing and aesthetic impacts on neighbouring properties of tanks located along a fence line.

Detailed Requirements

R38 *Each home must provide inter-connected water tanks with a capacity of at least 20,000 litres that collect rainwater from a minimum 80% of the roof area.*

R39 *A water tank located near a side or rear boundary must be sited a minimum of 1.0m from that boundary, and not extend above a line that rises 30 degrees off and perpendicular to that boundary at 1.8m above natural ground.*

R40 *Water tanks must be connected to the laundry trough, toilets and swimming pools.*

R41 *If an irrigation system is used, it must be of a water-efficient type and connected to your water tank.*

Guides

- G37 Water tanks may also be connected to washing machines, hot water systems and to kitchen sinks as a third tap, or connected to an appropriate treatment system for drinking water at the sink. Consult Melbourne Water for authority requirements.
- G38 There are many different types of water tanks available: above ground and underground, tall and squat, slimline, underfloor (PVC bladders), garden box, etc. They can be fabricated from galvanised (zincalume) and powdercoated (colorbond) steel sheet with or without internal polymer lining, stainless steel sheet, concrete or polyethylene. Choose a tank that minimises visual impacts, and harmonises with your home's materials and colour scheme. Refer to the **Water Tank and Irrigation Guide** on the Mullum Creek website.
- G39 If partially or fully burying your water tank into the ground, have regard to Guideline Requirements R11 and R12, as well as possible impacts on nearby dwelling foundations and footing systems. The DRC may give flexibility to the cut and fill requirements where it can be demonstrated that burying a tank results in a better outcome with regard to Mullum Creek's vision and objectives.

6.7 Services and appliances

The selection of services and appliances plays a key role in reducing your water and energy consumption, and therefore also your home's greenhouse gas emissions. Choosing the right appliances can also save you money in the long-term.

Objectives

- Maximise the use of highly water-efficient services and appliances.
- Maximise the use of highly energy-efficient services and appliances.
- Adopt energy efficient lighting techniques and fittings.

Detailed Requirement

- R42** *Appliances and services must meet the requirements listed in Table 1 below, and must be specified with your application for Step 3 Design Approval.*

| Service/Appliance | Required for compliance |
|---------------------------|---|
| Hot Water | Solar and/or heat pump hot water service must be provided. |
| Dishwasher | Must be energy rated to within one star of best available, and must be water rated to within one WELS star of best available. |
| Space Heating and Cooling | System must be within one star of best available. |
| Toilet Suites | Minimum 4 Star WELS rating. |
| Taps and Showerheads | Within one WELS star of best available* * does not apply to taps serving baths, laundry troughs, toilets or external taps |
| PV Panels | Minimum 4 kW system required |

Guides

- G40 Electric induction cooktops are highly energy efficient and can help reduce energy bills and carbon emissions.
- G41 Design and install task-focused lighting, avoid over-illumination, and use the most energy efficient lights available.
- G42 Consider not connecting your home to mains gas, instead sourcing your energy only from renewable electricity that you generate on site.
- G43 Consider purchasing green power from your electricity retailer.

There are a number of reference sites on the internet that compare and contrast the operational energy costs and greenhouse gas emissions attached to various readily available services and appliances. This includes information on split system air conditioners, space heating systems, domestic water heaters, dishwashers and other appliances. See: <http://www.energyrating.gov.au/products>.

6.8 Wood-burning stoves and fires

A 7.5 star energy-rated home should require minimal heating or cooling. To reduce urban air pollution and the ecological damage so often caused by the harvesting of firewood, the installation of wood stoves and wood burning fireplaces is strongly discouraged.

Objectives

- Minimise the impacts of firewood collection on the ecological values of native forests.
- Minimise the generation of wood smoke and associated particulate matter arising from the use of wood fires.

Guides

- G44 If you insist on installing a wood stove in your home, select the most energy efficient and lowest emissions system available. Please refer to the following website to select the very most energy efficient product you can find. See: <http://www.homeheat.com.au/wood-heaters/certified-wood-heaters>.
- G45 Refer to the **Timber Products Guide** on the Mullum Creek website for a list of firewood suppliers who source their wood in an environmentally sensitive manner.