



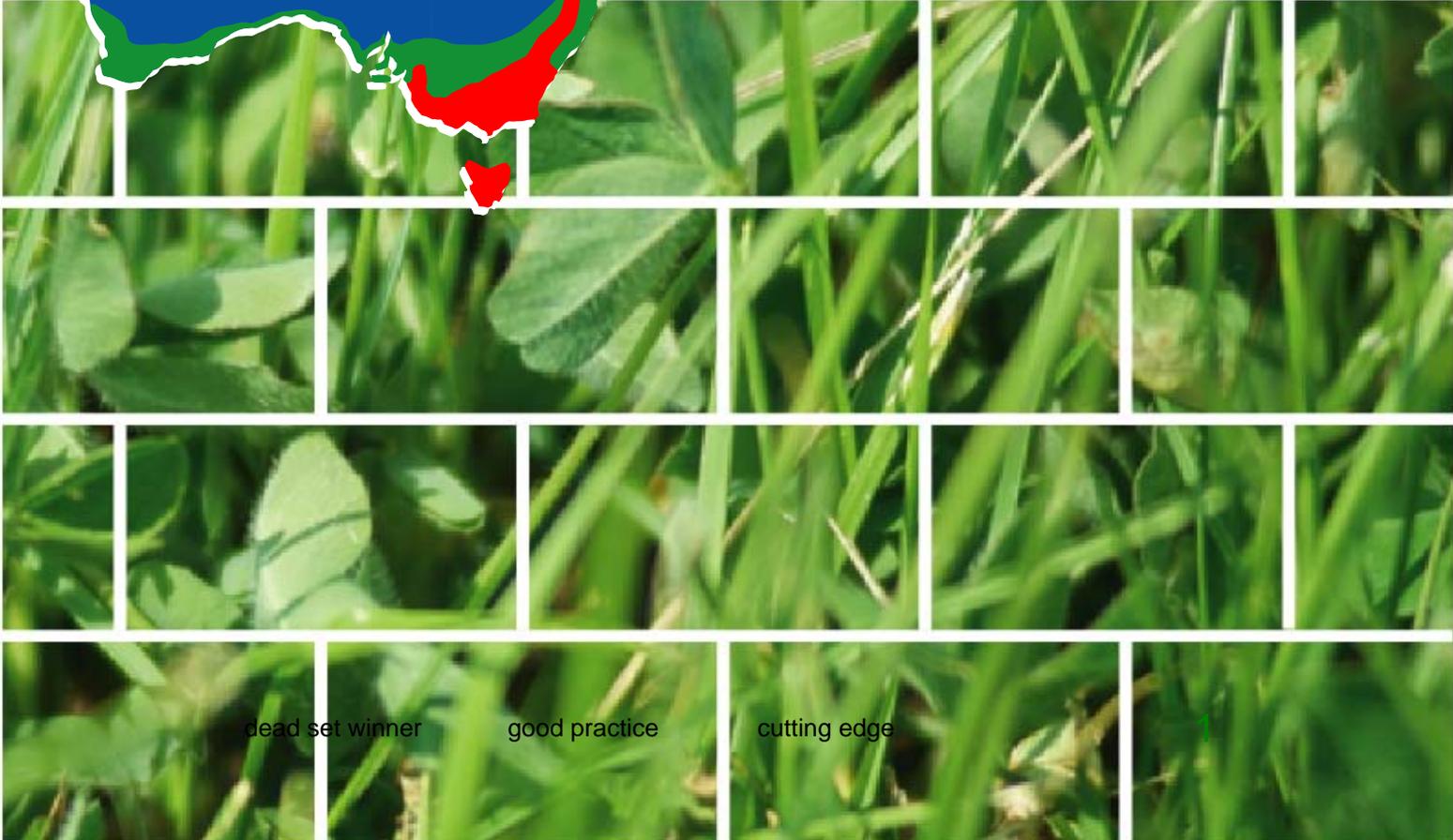
MASTER BUILDERS
GREEN LIVING

GREEN LIVING PROGRAM HUMID CLIMATES

CHECKLIST



cooling climate
mixed climate
heating climate



dead set winner

good practice

cutting edge

CHECKLIST FOR HUMID CLIMATES

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Introduction

Using the checklist

The purpose of the checklist

The checklist follows the stages of the design and construction process

- ⇒ So you can easily use it for QA and self-assessment

The checklist links goals and suggested actions

- ⇒ So you know what the goal behind each suggested action is
- ⇒ So you can either 'follow the recipes' or come up with creative alternatives that meet the goal

The checklist ranks the actions to reflect ease of implementation

- ⇒ So you know which ones are the deadset winners and which ones will require more effort, helping you to stage your approach

Which sections of the checklist are relevant to you?

If you are responsible for design:

- ⇒ Use the design checklist to guide you through the design process

If you are tendering for a job that someone else has designed:

- ⇒ Check the tender drawings against the design checklist to help you identify risks and opportunities

If you are building and/or managing the project:

- ⇒ Use the construction checklist to guide you through the construction process
- ⇒ Use the handover checklist to improve your follow-up service to clients

If you are managing your own business:

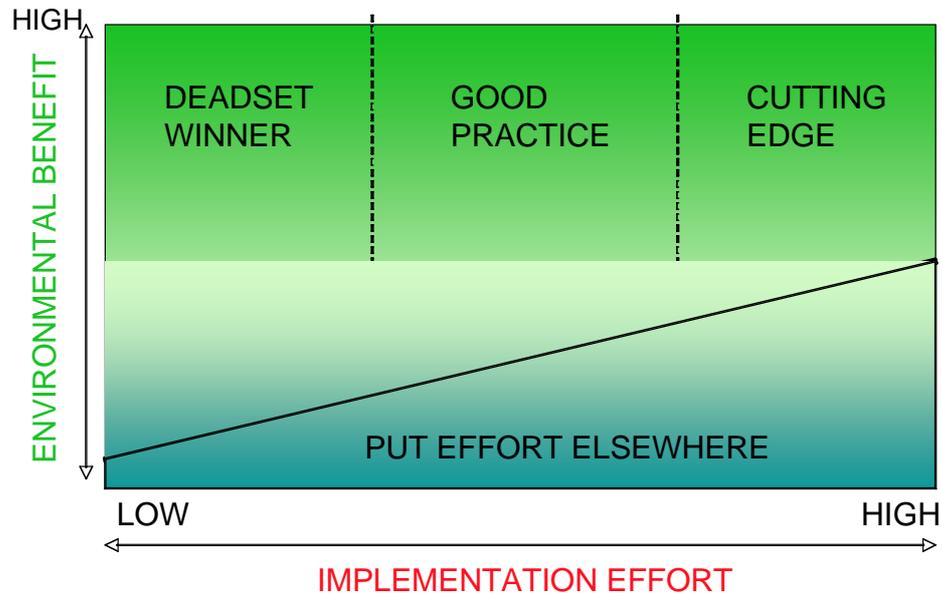
- ⇒ Use the business strategy checklist to help you maximise benefits to your business

The ranking of actions: 'deadset winner' to 'cutting edge'

Deadset winner: simple and effective, no or marginal added cost - no reason not to do these!

Good practice: small extra cost and effort for reasonable return

Cutting edge: innovative, best practice, terrific return and could add significant cost and/ or



effort

Where to go for more information

Each section of the checklist contains references to the *Your Home* Technical Manual for further information. The *Your Home* Technical Manual is available in print from the MBA, or you can access the full online version at: www.yourhome.gov.au.

Some other useful websites are:

EcoSpecifier (sustainable materials and products database): www.ecospecifer.org.au

Timbershop (Wilderness Society guide to specifying sustainable timber): www.timbershop.wild.net.au

Energy rating of appliances: www.energyrating.gov.au

Water rating of appliances: www.wsaa.asn.au

DESIGN

You can use the design checklist to guide you if you are designing a building, and to identify areas of risk and opportunities during tenders. It will help you identify risk areas where the design may not comply with sustainability regulations, as well as opportunities for proposing alternative, cost effective strategies that achieve the same or better sustainability outcomes.

Analysis and Pre-design Planning

Goal: ensure the design fits in with its surroundings and makes the most of opportunities

	Investigate the planning controls and regulations that apply to the site	
	Conduct a site analysis to identify opportunities and constraints	
	If renovating, conduct an audit of the existing house to identify opportunities and constraints	
	Analyse changing housing needs in the local area (demographics, household size & structure, etc)	
	Analyse the character of the local area (streetscape, predominant building forms & materials, etc.)	

Goal: meet the short and long term needs of your market

	Talk to your clients about what they need (custom builders)	
	Use your analysis of changing housing needs to shape the brief (spec. builders especially)	
	Build in some flexibility for changing occupants and living patterns over time	

Goal: develop specific sustainability goals and strategies to guide the project

	Identify the sustainability regulations that apply to the site	
	Set project-specific sustainability goals	
	Develop strategies to achieve the goals, using this checklist	
	Lock in all of the applicable 'deadset winners' from the checklist	
	Include many of the 'good practice' actions	
	Include some of the 'cutting edge' actions	

For more information: Your Home Technical Manual

^ 1.2 Choosing a Site
^ 6.1 Streets & Communities

Concept Design

Adaptive reuse

Goal: reduce waste going to landfill and the need for new materials

	Incorporate parts of existing buildings or structures in the design where practicable	
	Reuse demolition material (eg. bricks, concrete, timber, sheet metal) in the design where feasible	
	Recycle demolition material where reuse isn't feasible	
	Allocate suitable space for separation and stockpiling of materials during demolition and construction	
	Reuse excavated rock and topsoil in landscape	

For more information: Your Home Technical Manual

^ 3.2 Waste Minimisation

Planning and basic building form

Goal: contribute positively to the character of the street

	Ensure the building harmonises with adjacent buildings and streetscape (height, bulk, setbacks etc)	
	Use construction materials and colours that are appropriate to the local area	
	Retain clear sight lines between house entrances and the street (avoid high walls to the street, etc)	
	Minimise driveway widths and ensure garages don't dominate the streetscape	

Goal: minimise negative impacts on neighbours, and by neighbours

These actions apply to both the home you are designing, and neighbouring buildings

	Minimise overshadowing of solar collectors (or roof space suitable for future installation)	
	Locate noisy areas (eg. pools, driveways, pumps) away from neighbouring bedrooms/ living areas	
	Locate windows and balconies to avoid overlooking of neighbouring windows, balconies and gardens	

Goal: provide suitable space on-site for sustainability features

	Allocate suitable space for storage of domestic waste and recyclables (multi-unit housing especially)	
	Provide secure, convenient and accessible bike storage (multi-unit housing especially)	
	Allocate outdoor space for clothes drying	
	Identify suitable locations for water storage tanks (figure out your basic water management strategy)	
	If you will be reusing wastewater, identify suitable locations for treatment and storage	

Goal: use space and materials efficiently

	Avoid unnecessary circulation space inside the house (eg. long corridors, large entryways)	
	Design to standard material sizes where possible to avoid offcuts	
	Avoid unnecessary finishes and linings	
	Consider a multi-purpose living space in preference to separate formal and informal living spaces	
	Plan houses efficiently and design for easy future extension rather than providing unnecessary rooms	

Goal: ensure building form and layout suits your climate and reduces energy use

	Shade the building and outdoor living space all year round	
	Group wet areas (bathrooms, laundries, etc) together	
	Create separate zones that can be independently cooled	
	Locate living areas and bedrooms to capture any cooling summer breezes where possible	

For more information: Your Home Technical Manual

^ Section 1 *Passive Design*: 1.1, 1.2, 1.3, 1.4, 1.5
^ 6.1 Streets & Communities

Construction systems selection

Goal: use construction systems that suit the site and have low environmental impact

	Minimise use of heavyweight construction if the materials need to be transported long distances	
	Use predominantly lightweight construction unless there is a clear thermal or durability benefit in doing otherwise (in many cases there can be	

For more information: Your Home Technical Manual ^ 3.1 Embodied energy
^ 3.4 Construction systems

Basic building envelope design

Goal: locate openings to reduce energy use (heating, cooling and lighting)

	Use a moderate total amount of glazing and locate most of it facing north or south where possible	
	Minimise the amount of glazing that faces west, or ensure it is properly shaded	
	Locate openings in the path of cooling summer breezes where practicable	
	Provide openings on opposite or adjacent walls of living areas to encourage cross ventilation	
	Use operable skylights or high windows to encourage stack ventilation	

Notes: If site constraints prevent you from locating glazing as suggested above, you'll need to pay particular attention to glazing type and shading.

Goal: design-in appropriate shading

	Design correctly-sized overhangs (eg eaves, verandahs) to shade the north and south facades	
	Use a combination of fixed and adjustable shading (louvers, external blinds) to east and west facades	

Notes: Planting/ landscape elements can also be used to assist shading

Goal: if thermal mass is used, locate, shade and insulate it properly

	Locate thermal mass ideally where there is access to winter sun	
	Locate thermal mass in direct contact with the house interior	
	Shade thermal mass in summer and ideally provide it with access to night-time ventilation	
	Minimise the use of thermal mass in second-storey bedrooms	
	Insulate thermal mass on its exterior (not the surface in contact with the house interior)	
	Use a tiled or polished concrete surface on slabs if you want to utilise the thermal mass benefits	

For more information: Your Home Technical Manual

^ Section 1 Passive Design: 1.1, 1.3, 1.4, 1.5, 1.8, 1.9

Landscape design**Goal: use landscape to help minimise the development's environmental impact**

	Integrate storage space for waste and recyclables with landscape (multi-unit especially)	
	Allocate suitable space for composting facilities (shaded if a worm farm will be used)	
	Integrate outdoor clothes drying areas with landscape	
	Use landscape (planting/ other elements) to enhance the climate (shade, diverting of breezes/ winds)	
	Minimise impervious surfaces, and direct runoff to where it can soak into the ground	
	Maximise native grasses and plants with low water needs	
	Contour land to create depressions for peak stormwater detention	
	Allocate suitable space for food plants (vegetables, fruit, herbs)	

For more information: Your Home Technical Manual

^ 5.4 Sustainable Landscape ^ 2.5 Outdoor Water Use

Detailed Design

Site drainage, footings and slabs

Goal: minimise environmental impact

Dead set winner	Specify reinforcement with recycled content (if available)	
	Specify non-chemical termite barriers where practicable	
Good practice	Specify use of recycled crushed concrete aggregate in slabs (up to a third of total volume)	
	Specify cement extenders (up to a third extender, two thirds Portland cement)	
	If using waffle slabs, specify void formers with recycled content and low environmental impact	
Cutting edge	Specify use of recycled crushed concrete aggregate in slabs (35-100% of total volume)	
	Specify cement extenders (35-90% extender)	
	Specify polyethylene drainage pipes in preference to PVC	

Goal: maximise thermal performance (energy efficiency)

Dead set winner	Specify insulation under suspended slabs if air conditioning is used	
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Notes:

Use of recycled aggregate and extenders can affect workability, drying times and maximum strengths. The risk factor varies with the substitution rate and the application (highest risk for suspended structures). Look for contractors with previous experience who are willing to quality-assure the work.

Insulation under suspended slabs is recommended in most cases - see *Your Home* for the exceptions

For more information: Your Home Technical Manual

^ 3.4f Concrete Slab Floors
^ 1.6a Insulation Overview
^ 1.6b Insulation Installation

Framing

Goal: minimise environmental impact

Dead set winner	Use prefabricated frames and trusses where possible	
	Specify lightweight roofing materials such as steel to reduce framing requirements	
	Specify timber that is recycled, plantation, or FSC certified	
	Specify engineered timber or composite products for medium-long spans where practicable	
	Save use of steel for long spans	

Goal: maximise thermal performance (energy efficiency)

	Specify insulation under suspended timber floors if air conditioning is used	
	Specify insulation over steel framing to prevent thermal bridging	

For more information: Your Home Technical Manual

^ 3.4a Construction Systems Overview

Wall cladding & masonry

Goal: minimise environmental impact

	Select low embodied energy cladding unless there is a thermal or durability benefit in doing otherwise	
	Specify durable, low maintenance, recyclable cladding materials (avoid painting brickwork)	
	Select products that are reused or have recycled content where possible	
	Specify insulation with low environmental impact (recycled content, natural materials) where possible	

Goal: maximise thermal performance (energy efficiency)

	Specify reflective wall insulation (houses without air conditioning)	
	Specify minimum R1.5 wall insulation (air conditioned houses)	

Note:

Insulation levels recommended above are rules of thumb, and vary with climate and context. Use a thermal performance simulation tool (eg. Accurate) to check and refine your strategies.

For more information: Your Home Technical Manual

^ 3.4a Construction Systems Overview
^ 1.6a Insulation Overview
^ 1.6b Insulation Installation

Roof cladding

Goal: minimise environmental impact

	Specify durable, low maintenance, recyclable roofing materials	
	Select products with low embodied energy where possible	
	Select products with recycled content where possible	
	Specify insulation with low environmental impact where possible	

Goal: maximise thermal performance (energy efficiency)

	Specify reflective insulation under the roof material	
	Specify ceiling insulation with a minimum of R2.0 (if air conditioning used)	
	Design roof cavities with enough space for insulation to be installed without compression (bulk insulation) and with appropriate air gaps (reflective insulation)	
	Design roof cavities with enough space for controllable ventilation to occur	
	Specify insulation over steel framing to prevent thermal bridging	

Goal: allow for use of solar energy and rainwater

	Design north-facing roofs with a suitable pitch for solar collectors (20-30 degrees is generally ok)	
	Ensure north-facing roofs can support solar hot water systems (including roof-mounted tanks if used)	
	Design roofing to minimise pipework to the rainwater tank (simplify falls and collection points)	
	Specify an appropriate material (such as steel) if you will be collecting rainwater for potable use	

Notes:

Insulation levels recommended above are rules of thumb, and vary with climate and context. Use a thermal performance simulation tool (eg. Accurate) to check and refine your strategies.

For more information: Your Home Technical Manual [^ 3.4a Construction Systems Overview](#)
[^ 1.6a Insulation Overview](#)
[^ 1.6b Insulation Installation](#)

Glazing and framing (windows, doors, skylights)**Goal: minimise unwanted heat gain**

	Shade north and south facing glazing with correctly sized overhangs (eg eaves, verandahs)	
	Shade east and west facing glazing with adjustable external devices capable of shading the whole area	
	Specify shading (built into the assembly or external) and low-e glazing for all skylights	
	If specifying aluminium frames, ensure they are thermally improved (insulated)	
	Consider double glazing if air conditioning is used	

Goal: maximise the potential for natural ventilation

	Specify skylights that are openable or vented	
	Specify windows with large openable areas (keeping noise and security in mind)	

Goal: use frames with low environmental impact

	If using timber frames, avoid or minimise use of old growth timber (eg. LOSP treated plantation pine)	
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For more information: Your Home Technical Manual ^ 1.8a Glazing Overview

Water management

Goal: reduce household water use

	Specify 4A dual flush toilets (4.5/3L)	
	Specify 3A+ showerheads	
	Specify 3A+ rated taps (if using 4A, focus on flow-based uses)	
	[If included] Specify a 4A+ rated washing machine and a 3A+ rated dishwasher	
	Specify a garden with low water use (see the landscape design checklist)	
	Specify micro-flush toilets	
	Specify waterless (composting) toilets	

Goal: manage risks associated with alternative water supplies

	Check the relevant regulations regarding alternative water supply	
	Match end-uses and alternative water sources appropriately to minimise treatment costs	
	If diverting wastewater for garden use, ensure the garden can properly absorb it	

Goal: manage stormwater effectively

	Check the local regulations for on site detention requirements	
	Maximise pervious surfaces (permeable paving, planting etc)	
	Retain vegetation on site where possible, particularly deep rooted trees	
	Integrate stormwater management and rainwater collection strategies where possible	
	Integrate stormwater management strategies with landscape (swales, ponds etc)	

Goal: reuse rainwater effectively

	Specify a suitable roofing material such as steel if you are collecting for potable use	
	Design roofs to minimise pipework to tanks	
	Specify suitable gutters and rainheads (mosquito proof for wet systems)	
	Maximise roof area for collection	
	Specify reasonable tank (5KL min)	
	Plumb to indoor water uses (toilet, laundry, hot water)	
	Plumb to slightly more uses than tank can supply, and ensure mains trickle backup	

Goal: reuse and recycle wastewater effectively

	Prioritise reuse of the highest quality sources (eg. collect water from shower, washing machine)	
	Ensure wastewater is used for appropriate end uses (eg. toilet, subsurface garden irrigation)	
	Engage a suitably qualified professional to help you choose an appropriate treatment system	

Notes: Apply the reduce reuse recycle rule of thumb

For more information: Your Home Technical Manual

^ Section 2: Water Use

Hot water service

Goal: minimise energy use and greenhouse emissions

	Specify a water efficient showerhead to reduce hot water use	
	Locate the system (tank) close to the most frequent draw-off point if possible	
	Minimise hot water pipe runs	
	Specify lagging on all hot water pipes (including plastic pipes) to AS/NZS 3500.4	
	Select the hot water system using the following matrix*	

	1 -2 people		3 people		4 people		5+ people	
	Gas	No gas	Gas	No gas	Gas	No gas	Gas	No gas
Gas 5 star storage					✓		✓	
Gas 5 star instantaneous	✓		✓		✓			
Heat pump		✓*		✓*		✓		✓
Solar electric [^]		✓		✓		✓		✓
Solar gas [^]			✓		✓		✓	

[^]Solar systems assume solar contribution of at least 60%.

* Only if poor solar contribution

Goal: reduce waste going to landfill

	Dimension joinery based on standard sheet sizes to avoid offcuts	
	Avoid unnecessary finishes and linings	
	Reuse or recycle recovered materials	
	Design a multi bin waste sorter into kitchen joinery (at least 4 separate containers)	

Goal: reduce energy use and greenhouse emissions

	Ensure joinery design allows adequate ventilation around the fridge (100mm clearances or slots)	
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Notes:

Typical plantation or renewably harvested timbers include radiata pine, cypress pine, NZ Douglas Fir and plantation grown Australian hardwoods. For more information go to *One Stop Timber Shop* www.timbershop.wild.net.au

The Australian E1 standard for reprocessed timber products currently requires formaldehyde emissions to be less than 1.5mg/litre. E0 standard reduces emissions to less than 0.5 mg/litre, and Super E0 to 0.3mg/litre. Currently most of the E0 and Super E0 standard reprocessed timber products manufactured in Australia are exported to countries with stricter regulations on emissions, but they are available if you are ordering reasonable volumes. Greater demand by Australian builders will increase their availability here.

For more information: Your Home Technical Manual

- ^ 3.0 Material Use Introduction
- ^ 3.3 Indoor Air Quality
- ^ 3.5 Biodiversity Off-site
- ^ 3.2 Waste Minimisation

Floor coverings

Goal: minimise negative health and environmental impacts of materials

	If specifying carpet, specify modular systems (eg. carpet tiles)	
	Specify natural, renewable, low allergenic floor coverings (eg. sisal, jute, cork, marmoleum, bamboo)	
	Specify low or no emission floor coverings (including glues/ solvents and varnishes if used)	
	Specify floor coverings that are reused or have recycled content	

Note: see *joinery and fitout carpentry* for more detail on timber floors (or timber finishes to floors)

Goal: reduce waste going to landfill

	Reuse or recycle recovered materials	
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For more information: Your Home Technical Manual

- ^ 3.0 Material Use Introduction
- ^ 3.3 Indoor Air Quality
- ^ 3.2 Waste Minimisation

Paints

First aim to reduce use: Leave surfaces unfinished/unpainted where practicable

Goal: minimise negative environmental and health impacts of outdoor paints

	Specify non-toxic, durable paints and/or acrylic render systems for external surfaces	
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Goal: minimise negative health and environmental impacts of indoor paints

	Specify water-based low VOC paints and finishes	
	Specify pre-finished skirtings, trimmings and joinery (stair balustrades, etc)	
	Specify natural plant or mineral-based (non petrochemical) paints	

For more information: Your Home Technical Manual ^ 3.3 Indoor Air Quality

Adhesives and fixings

Goal: minimise negative health and environmental impacts of adhesives and fixings

	Specify mechanical fixings in preference to adhesives	
	Specify water-based adhesives	

For more information: Your Home Technical Manual ^ 3.3 Indoor Air Quality

Plumbing fixtures

Goal: minimise water and energy use

	Specify 4A dual flush toilets (4.5/3L)	
	Specify 3A+ showerhead	
	Specify 3A+ rated taps (if using 4A, focus on flow-based uses)	
	Specify micro-flush toilets	
	Specify waterless (composting) toilets	

For more information: Your Home Technical Manual ^ 2.1 Reducing Water Demand ^ 2.7 Waterless Toilets

Appliances

Goal: minimise water and energy use

	Provide suitable outdoor drying space and capacity for indoor drying in preference to clothes dryers	
	Specify gas cooktops (where gas is available)	

If appliances are included in your contract:

	Specify a minimum energy efficiency rating of 1 star below the best available for each appliance type	
	Specify washing machines with a minimum water efficiency rating of 4A	
	Specify dishwashers with a minimum water efficiency rating of 3A	

Notes:

To select energy efficient appliances, see: www.energyrating.gov.au

To select water efficient appliances, see: www.wsaa.asn.au

For more information: Your Home Technical Manual ^ 4.0 Energy Use Introduction
^ 4.1 White Goods

Landscape design

Goal: contribute to the energy efficiency of the home

	Design landscape to assist summer shading to the building and outdoor living areas	
	Provide space for secure outdoor clothes drying	
	Use landscape to protect from harsh winds and/or to direct cooling breezes into the house	

Goal: reduce outdoor water use and stormwater runoff

	Specify local indigenous plant and grass species with low water requirements	
	Maximise pervious surfaces	
	Use stormwater, rainwater or wastewater for garden irrigation	
	Specify an efficient irrigation system (eg. drip) with moisture sensor based controllers	
	Integrate landscape with site drainage strategies (eg. swales, detention ponds etc)	
	Integrate landscape with water collection, reuse and recycling treatment and storage systems	

Goal: preserve/ introduce local indigenous plants

	Retain/ specify local indigenous species in gardens (at least two thirds of total planting)	
	Specify native grasses and groundcovers for any lawn areas	

Goal: reduce energy use associated with food production and distribution

	Allocate a suitable space for growing vegetables and fruit	
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Goal: minimise waste going to landfill

	Maximise the reuse of any excavated rock and topsoil	
	Allocate a suitable space for composting facilities (provide shade for worm farms)	
	Allocate a suitable space for separation and storage of household recycling and waste	

For more information: Your Home Technical Manual ^ 5.4 Sustainable Landscape
 ^ 2.5 Outdoor Water Use

CONSTRUCTION

Siteworks

Goal: minimise waste to landfill

	Design to standard sizes	
	Order only what you need	
	Use prefabricated products	
	Reuse what you can on site.	

Goal: minimise soil erosion and sedimentation of waterways

	Keep mud off roads and footpaths	
	Disturb as little of the vegetation and surface as possible	
	Cut materials on site	
	Use a sediment control fence and gravel access points	

Goal: minimise pollution of waterways

	Use a bin with a lid to store material and ensure people use it	
	Clean all equipment on site and make sure the wash water stays on the site	
	Collect water from concrete mixers into a wheelbarrow for on site disposal	

For more information: Your Home Technical Manual ^ 5.0 Site Impacts Introduction
 ^ 3.2 Waste Minimisation
 ^ 5.2 Sediment Control

Plumbing - site drainage

Goal: minimise environmental impact

	Use recycled demolition (or excavation) material for bedding and backfill in services trenches	
	Use polyethylene drainage pipes and fittings in preference to PVC	

Goal: manage stormwater effectively

	Check local regulations for on-site detention requirements	
	Immediately backfill and compact services trenches	
	Retain vegetation on site where practicable, especially deep-rooted trees	
	Integrate site drainage strategies (construction stage) with landscape design	
	[GP] Integrate site drainage strategies with rainwater/stormwater collection strategies	

For more information: Your Home Technical Manual ^ 2.4 Stormwater
 ^ 5.2 Sediment Control

Concrete (base & external work)

Goal: minimise environmental impact

	Use reinforcement with recycled content whenever available	
	If using waffle slabs, use void formers with recycled content and low environmental impact	
	Use recycled crushed concrete aggregate (up to a third of total aggregate volume)	
	Use cement extenders (up to a third extender, two-thirds portland cement)	
	Use recycled crushed concrete aggregate (from 35-100% of total aggregate volume)	
	Use cement extenders (from 35-90% extender)	

Notes:

Use of recycled aggregate and extenders can affect workability, drying times and maximum strengths. The risk factor varies with the substitution rate and the application (highest risk for suspended structures). Look for contractors with previous experience who are willing to quality-assure the work.

For more information: Your Home Technical Manual ^ 3.4f Concrete Slab Floors
 ^ 1.6a Insulation Overview
 ^ 1.6b Insulation Installation

Termite control

Goal: reduce negative environmental impacts associated with termite control

	Use physical (non-chemical) barriers where practicable	
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Building Envelope

When choosing building envelope materials, you'll need to manage the trade-off between embodied energy, thermal performance and durability

Framing

Goal: minimise materials use and embodied energy

	Use prefabricated frames and trusses where possible	
	Use lightweight roofing materials such as steel to reduce framing requirements	
	Use engineered timber or composite products for structural applications where practicable	
	Save use of steel for long spans	

Goal: minimise negative biodiversity and health impacts

	Use timber that is recycled, plantation or FSC certified	
	If treating timber, use low toxicity treatments such as LOSP or ACQ	
	Avoid hardwood brace ply from old growth forests	

Goal: maximise durability and life span

	Avoid using exposed decorative finish structural steelwork in corrosive environments	
	Protect framing materials from moisture (rain, condensation, etc)	
	Ensure the moisture content of timber framing is below the acceptable limit before sealing	
	Ensure steel framing has appropriate rust protection and is dry before sealing	
	Provide appropriate termite protection	

Goal: maximise thermal performance (energy efficiency)

	Build wall and roof cavities with enough space for insulation to be installed without compression (bulk insulation) and with appropriate air gaps (reflective insulation)	
	Build roof cavities with enough space for controllable ventilation to occur	
	Use insulation over steel framing to prevent thermal bridging (heat transfer through the steel)	

Goal: provide potential for solar energy use

	Ensure north-facing roofs are strong enough to support solar hot water systems	
	Pitch north-facing roofs at suitable angle for solar collectors (20-30 degrees is generally ok)	

For more information: Your Home Technical Manual ^ 3.4a Construction Systems Overview

Wall cladding and masonry

Goal: minimise embodied energy

	Use low embodied energy materials unless there's a thermal or durability benefit in doing otherwise	
	Reuse materials where practicable (eg. second hand bricks)	
	Buy pre-scored bricks for more accurate splitting, and store half bricks in one area for reuse	
	Use materials with recycled content	
	Use cement extender in mortar	

Goal: maximise thermal performance (energy efficiency)

	Use predominantly lightweight construction	
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Goal: maximise durability

	Use durable materials with low or no maintenance finishes (don't paint brickwork)	
	Ensure termite barriers are protected during cladding/bricklaying	
	Use ironed or flush mortar joints in preference to raked mortar joints	
	Ensure the moisture content of timber framing is below the acceptable limit before cladding	

Goal: minimise waste going to landfill

	Dimension to standard sheet sizes where feasible	
	Recycle offcuts	

For more information: Your Home Technical Manual [^ 3.4a Construction Systems Overview](#)
[^ 3.4e Straw Bale](#)

Roofing & roof plumbing

Goal: minimise materials use

	Use lightweight roofing materials to reduce framing requirements	
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Goal: minimise environmental impact of materials

	Use roofing materials that are easy to recycle at the end of their life	
	Use products with recycled content	

Goal: maximise thermal performance (energy efficiency)

	Use light roof colours to prevent excessive heat gain	
	Use reflective insulation under roofs	
	Allow for controllable ventilation within the roof space	
	Use roof overhangs to help shade the house	

Goal: allow potential for roof water collection

	Specify a suitable roofing material such as steel if collecting for potable use	
	Design roofs to minimise pipework to tanks	
	Pitch gutters with an adequate fall (1:100 is best practice)	

	Fit gutter outlets to the underside of the gutter to prevent ponding	
	Install suitable rainheads and gutters to protect tanks from leaves and debris	

Notes: see the *Plumbing- rainwater use* checklist for more detail

For more information: Your Home Technical Manual ^ 1.9 Shading
^ 1.6 Insulation
^ 2.2 Rainwater

External structures (eg. pergolas, decks etc)

Goal: minimise negative environmental and health impacts

	Use recycled, plantation or FSC certified timbers	
	Use low toxicity, low emission stains and coatings to seal exterior timbers	
	Avoid timber treated with CCA (use LOSP or ACQ instead)	

Goal: maximise durability and minimise maintenance requirements

	If using timber, select the appropriate durability class	
	If using metal, select durable products such as powdercote aluminium or stainless steel	
	Use concrete in preference to timber for retaining walls	

Insulation

Use building performance modelling to ensure that the insulation you propose (in combination with other energy efficient passive design strategies) will give you a minimum of 5 stars. Following are some tips to help you get there. Note that the appropriate level and type of insulation depends on the application and the climate. The tips have been ranked based on new construction. Good insulation is a 'deadset winner' for new buildings. Retrofitting insulation to an existing building can sometimes be more difficult.

Goal: maximise the energy efficiency of the building envelope*

	Use reflective insulation under the roof and in walls	
	Use ceiling insulation with a minimum of R2.0 (if air conditioning used)	
	Use wall insulation with a minimum of R1.5 (if air conditioning used)	
	Use insulation with a minimum of R1.0 under suspended floors (if air conditioning used)	
	Insulate steel framing to prevent thermal bridging	
	Install bulk insulation without gaps or compression	
	Install reflective insulation with an air gap of at least 25 mm next to the reflective surface/s	

Goal: minimise the environmental and health impact of insulation materials

	If using glass fibre insulation, ensure it is certified biosoluble	
	Use insulation with recycled content where available	
	Use insulation from natural, renewable sources	

Notes:

* R values are 'added' values (for the insulation only). There are some exceptions to these rules of thumb. For more information, see *Your Home*

For more information: [Your Home Technical Manual](#) ^ 1.6 Insulation

Glazing**First:**

Do you have any influence over the size and location of windows, skylights and glass doors? This has a significant impact on the energy efficiency of the house. If you have responsibility for design, or have some opportunity to modify what the designer specified, see the Concept Design checklist.

Goal: shade glazing from unwanted heat

	Shade north facing glazing with correctly sized overhangs (eg eaves, verandahs)	
	Shade all skylights (inbuilt shading is generally the most practical approach)	
	Shade east and west facing glazing with adjustable external devices capable of shading the whole area	

Goal: install energy efficient glazing

	Use windows that have a large openable area but can be well sealed when closed	
	use vented or openable double glazed skylights with low-e glass and inbuilt shading	
	Choose glazing with a high WERS rating for cooling performance	
	Consider double glazing if air conditioning is used	

Goal: use frames with good thermal performance and low environmental impact

	If using aluminium frames, ensure they are thermally improved (insulated)	
	If using timber frames, minimise use of old growth timber (eg. treated plantation hoop pine)	

For more information: Your Home Technical Manual

- ^ 1.8a Glazing Overview
- ^ 1.8c Glazing – Temperature
- ^ 1.8e How to use WERS
- ^ 1.9 Shading

Plumbing

Plumbing - panware and fixtures

Goal: reduce water use indoors

	Use 4A dual flush toilets (4.5/3L)	
	Use 3A+ water efficient showerheads (ensure compatibility with instantaneous gas HWS)	
	Use 3A+ taps (if exceeding 3A, concentrate on flow-based uses)	
	Retrofit flow restrictors on existing taps	
	Retrofit flush arrestors on existing single flush toilet pans or install displacement devices	
	Fix any leaks in existing toilet pans and taps	
	Choose durable seals and washers	
	Use micro-flush toilets	
	Use waterless (composting) toilets	

For more information: Your Home Technical Manual

- ^ 2.1 Reducing Water Demand
- ^ 2.7 Waterless Toilets

Plumbing - water supply

Goal: reduce energy and water use

	Minimise hot water pipe runs	
	Use lagging on all hot water pipes (including plastic pipes) to AS/NZS 3500.4	
	Use 13mm diameter hot water pipes to supply appliances and showers	
	Use 10mm diameter hot water pipes to supply basins with water efficient taps	
	Use pressure reduction valves in areas with high water pressure	
	(If using rainwater for shower) Use a pressure pump with stable pressure and/ or a thermostatic mixing valve in the shower to cope with pressure variations. This also solves the problem of temperature variation if taps are turned on elsewhere in the house while the shower is being used.	

Plumbing - hot water system

Goal: reduce energy use and greenhouse emissions

	Install a 3A+ water efficient showerhead to reduce hot water use (check compatibility with HWS)	
	Locate the system (tank) close to the most frequent draw-off point if possible	
	Install individual household hot water metering in multi unit developments	
	Select the hot water system using the following matrix	

	1 -2 people		3 people		4 people		5+ people	
	Gas	No gas	Gas	No gas	Gas	No gas	Gas	No gas
Gas 5 star storage					✓		✓	
Gas 5 star instantaneous	✓		✓		✓			
Heat pump		✓*		✓*		✓		✓
Solar electric [^]		✓		✓		✓		✓
Solar gas [^]			✓		✓		✓	

[^]Solar systems assume solar contribution of at least 60%.

* Only if poor solar contribution

	(Instantaneous gas systems) Choose high efficiency electronic ignition models with temperature controls	
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Notes:

In hot humid climates solar contribution can be 90% or more, which makes solar systems attractive even for smaller households.

Some instantaneous gas hot water systems are not compatible with 3A showerheads, so it's important to check. If you're installing a new instantaneous gas system, choose a high efficiency electronic ignition model with temperature controls- these work with 3A showerheads.

Consult a professional about the most appropriate system for multi unit developments. Depending on the context, the best approach could be either individual systems for each unit, a central system or a number of distributed systems supplying a group of units.

For more information: Your Home Technical Manual [^ 4.2 Hot Water Service](#)
[^ 4.3 Solar Hot Water](#)

Plumbing - rainwater

Goal: manage risks associated with alternative water supplies

	Check the relevant regulations regarding alternative water supply	
	Match end-uses and alternative water sources appropriately to minimise treatment costs	
	If diverting wastewater for garden use, ensure the garden can properly absorb it	

Goal: reuse rainwater effectively

	Use a suitable roofing material such as steel if you are collecting for potable use	
	Design roofs to minimise pipework to tanks	
	Install suitable gutters and rainheads (mosquito proof for wet systems)	
	Maximise roof area for collection	
	Install reasonable capacity tank/s (5KL min)	
	Plumb to indoor water uses (toilet, laundry, hot water)	
	Plumb to slightly more uses than tank can supply, and ensure mains trickle backup	

For more information: Your Home Technical Manual [^ 2.2 Rainwater](#)

Plumbing - stormwater

Goal: manage stormwater effectively

	Check the local regulations for on site detention requirements	
	Maximise pervious surfaces (permeable paving, planting etc)	
	Retain vegetation on site where possible, particularly deep rooted trees	
	Integrate stormwater management and rainwater collection strategies where possible	
	Integrate stormwater management strategies with landscape (swales, ponds etc)	

For more information: Your Home Technical Manual [^ 2.4 Stormwater](#)

Plumbing - wastewater

Goal: reuse and recycle wastewater effectively

	Prioritise reuse of the highest quality sources (eg. collect water from shower, washing machine)	
	Ensure wastewater is used for appropriate end uses (eg. toilet, subsurface garden irrigation)	
	Engage a suitably qualified professional to help you choose an appropriate treatment system	

For more information: Your Home Technical Manual

^ 2.3 Wastewater Re-use

Electrical

Electrical - space cooling

Goal: minimise energy use and greenhouse emissions

	Avoid the need for cooling with energy efficient building envelope design	
	Use cooling only where it is needed in preference to cooling the whole house	
	Ensure systems are correctly sized for the space you want to cool	
	Use fans in preference to other active cooling options	
	If air conditioning will be used, select a system with a 4-star energy rating	

Notes:

The first step is to reduce the need for auxiliary heating and cooling through good design. A house with 6 stars or more will need little or no auxiliary heating and cooling. Look at the heating and cooling loads on the energy report to work out whether you need to focus on heating, cooling or both. (Also, think about whether you'd be better off spending the heating and cooling budget on improvements to the building envelope instead of systems- this will save your clients money).

For more information: Your Home Technical Manual

^ 4.4 Heating & Cooling

Electrical - lighting

First, optimise natural light levels within the home through good building design.

Goal: minimise energy use

	Provide low level background lighting and higher level task lighting	
	Ensure lighting layout (type, number and distribution of fittings) is efficient for the purpose	
	Ensure the intensity of fluorescent lighting is no more than 5 Watts per square metre	
	Install energy efficient fluorescent lighting with high frequency electronic ballasts	
	Install dimmers on switches to non-fluorescent lighting in living areas	
	Install separate switches for different zones within the living areas	
	Install 2 way switches (hallways, living areas) so lights can be switched when entering and leaving	
	Install dimmable ballasts to fluorescents in living areas	
	Use alternatives to PVC light switches and cables where available	

For more information: Your Home Technical Manual

^ 4.5 Lighting

Electrical - renewable electricity

Goal: minimise use of non-renewable electricity

	Use efficient electrical appliances and lighting to maximise energy returned to the grid	
	Ensure roof orientation and pitch is appropriate for roof mounted photovoltaic panels	
	Ensure roof area will not be overshadowed now or in the future	
	Allow about 10m ² of roof space per 1kWp of photovoltaic panels	
	Where grid connection is available, install two way metering	
	Ensure panels are well-ventilated, consider using heat generated by panels for preheating water or air	
	Consider using building integrated systems to replace roofing material and offset costs	
	Engage a qualified specialist to advise you on system choice	
	Ensure the system is designed and installed by a certified contractor	

For more information: Your Home Technical Manual

^ 4.6 Renewable Electricity Overview
^ 4.7 Photovoltaic Systems

Fitout

Fitout carpentry and joinery

Goal: minimise negative environmental and health impacts of timber products and finishes

	Use fast-cycling renewable timbers such as bamboo for floors	
	If using reprocessed timber products, use E1 standard (low emission)	
	Use pre-finished timber products where practicable	
	Use only timber that is recycled, plantation or FSC certified (avoid rainforest and old growth timber)	
	Avoid gluing of timber floors (makes recycling at end of life difficult)	
	Use natural oils or waxes to seal timber in preference to products containing solvents or synthetics	
	If using reprocessed timber products, use E0 or Super E0 standard (lowest emissions)	

Goal: minimise materials use and waste

	Avoid unnecessary finishes and linings	
	Dimension based on standard sheet sizes where practicable to avoid offcuts	
	Reuse or recycle recovered materials	

Goal: minimise household waste going to landfill

	Include a waste sorter in kitchen joinery (separate bins for containers, paper, organics and waste)	
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Goal: improve the energy efficiency of the fridge

	Ensure joinery allows for adequate ventilation around the fridge (clearances or vents)	
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Goal: minimise negative environmental and health impacts of adhesives and fixings

	Use mechanical fixings in preference to adhesives	
	Use zinc-plated fixings in preference to cadmium	
	Use water-based adhesives	

Notes:

Typical plantation or renewably harvested timbers include radiata pine, cypress pine, NZ Douglas Fir and plantation grown Australian hardwoods. For more information go to *One Stop Timber Shop* www.timbershop.wild.net.au

The Australian E1 standard for reprocessed timber products currently requires formaldehyde emissions to be less than 1.5mg/litre. E0 standard reduces emissions to less than 0.5 mg/litre, and Super E0 to 0.3mg/litre. Currently most of the E0 and Super E0 standard reprocessed timber products manufactured in Australia are exported to countries with stricter regulations on emissions, but they are available if you are ordering reasonable volumes. Greater demand by Australian builders will increase their availability here.

For more information: Your Home Technical Manual

- ^ 3.0 Material Use Introduction
- ^ 3.3 Indoor Air Quality
- ^ 3.5 Biodiversity Off-site
- ^ 3.2 Waste Minimisation

Painting

First, Leave surfaces unfinished/ unpainted where practicable

Goal: minimise negative environmental and health impacts of outdoor paints

	Use non-toxic, durable paints and/ or acrylic render systems on external surfaces	
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Goal: minimise negative environmental and health impacts of indoor paints

	Use water-based low VOC paints and finishes	
	Use pre-finished skirtings and joinery (stair balustrades, etc)	
	Use natural plant or mineral-based paints (non-petrochemical)	

For more information: Your Home Technical Manual

^ 3.3 Indoor Air Quality

Floor coverings**Goal: minimise negative environmental and health impacts of floor coverings**

	Use natural, renewable, low allergenic materials (eg. sisal, jute, cork, marmoleum, bamboo)	
	Use low maintenance, durable materials	
	If using carpet, install modular systems (eg. carpet tiles)	
	Use materials that are reused or have recycled content (the higher the better)	

Goal: minimise negative environmental and health impacts of adhesives and fixings

	Use mechanical fixings in preference to adhesives (where practicable)	
	Use zinc-plated fixings in preference to cadmium	
	Use water-based adhesives	

Goal: use thermal mass effectively

	Use a tiled or polished concrete finish to floors intended as thermal mass	
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For more information: Your Home Technical Manual

^ 3.3 Indoor Air Quality

Appliance Selection**Goal: minimise water and energy use**

	Provide suitable outdoor drying space and capacity for indoor drying in preference to clothes dryers	
	Install gas cooktops (where gas is available)	

If appliances are included in your contract:

	Ensure a minimum energy efficiency rating of 1 star below the best available for each appliance type	
	Provide washing machines with a minimum water efficiency rating of 4A	
	Provide dishwashers with a minimum water efficiency rating of 3A	

Notes:

To select energy efficient appliances, see: www.energyrating.gov.au

To select water efficient appliances, see: www.wsaa.asn.au

For more information: Your Home Technical Manual ^ 4.1 White Goods

Landscape

Goal: contribute to the energy efficiency of the home

	Use landscape to provide shading to the building and outdoor living areas	
	Use landscape to protect from harsh winds and/or to direct cooling breezes into the house	
	Provide space for secure outdoor clothes drying	

Goal: preserve/ introduce local indigenous plants

	Plant local indigenous species in gardens (at least two thirds of total planting)	
	Use native grasses or groundcovers on lawns	

Goal: reduce outdoor water use and manage water sustainably

	Maximise pervious surfaces	
	Select grasses with low water requirements for lawns (native grasses/ groundcovers are ideal)	
	Use mulch over soil	
	Select plant species with low water requirements (local indigenous plants are ideal)	
	Integrate landscape with site drainage strategies (eg. swales, detention ponds etc)	
	Use rainwater, stormwater or wastewater for garden irrigation	
	Integrate landscape with water collection, reuse and recycling treatment and storage systems	
	Use an efficient irrigation system (eg. drip irrigation) with moisture sensor based controllers	

Goal: reduce energy use associated with food production and distribution

	Provide a suitable space for growing vegetables and fruit	
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Goal: reduce waste going to landfill

	Maximise the reuse of any excavated rock and topsoil	
	Allocate a suitable space for composting facilities (provide shade for worm farms)	
	Allocate a suitable space for separation and storage of household recycling and waste	

Goal: (if using wastewater for irrigation) improve the absorption capacity of soils

	Add organic matter to increase the water and nutrient holding capacity of sandy soils	
	Use a combination of sand, gypsum and organic matter to improve the absorption capacity of clay soils	
	Ask the wastewater expert to recommend suitable plant types	

For more information: Your Home Technical Manual

^ 5.4 Sustainable Landscap

^ 2.5 Outdoor Water Use e

HANDOVER

Induction and follow-up procedures

Goal: support the client to manage the house so it performs as intended

Conduct an on-site induction with your client at handover to explain the sustainability features of the house and how to keep them working effectively

Supply your client with a customised operations manual, which can cover sustainability matters including:

- How the sustainability features work in simple terms
- The benefits the sustainability features will deliver
- Operation and maintenance requirements of the sustainability features (eg. desludging and flushing out of tanks)
- Details of product warranties and suppliers (including spare parts)
- The main behavioural issues that impact on sustainability, e.g. setting thermostats appropriately (heating and cooling, hot water), use of shading, keeping thermal mass uncovered
- The use of phosphate free, environmentally preferred detergents and cleaning products if reusing wastewater for gardens

Arrange a follow-up meeting (3-6 months after handover) to check that the sustainability features are working as intended and that the client is operating and maintaining them as necessary.

Evaluation

Goal: learn from the experience so that the next time will be more valuable

Review what worked, what didn't, what your client liked and didn't, what was cost effective, and what was not. Track your lessons learned, adjust your marketing and policy materials, and make the necessary changes to the way you implement sustainability in your next project.

BUSINESS STRATEGY

All of the actions in the business strategy checklist are considered 'good practice'.

First:

Think about why you are adopting *Green Living*, what you want to deliver, and how you and your customers should benefit. For successful outcomes, integrate *Green Living* with your existing business practices, so sustainability becomes part of what you do, not an 'add on'.

Organisation

Goal: develop a sustainability policy to guide your business

	Develop a company sustainability policy that sets out your goals, targets and strategies for achieving them; ideally these will be an extension of your existing business vision, targets and strategies	
	Investigate all the relevant sustainability regulations (eg. BCA, state and local government)	
	Develop compliance and beyond-compliance targets and strategies that you can use across all projects	
	Ensure that all strategies lock in the 'deadset winners' as the first step	

Market analysis

Goal: ensure your products respond to the long-term needs of your market

	Investigate changing trends in housing needs (household size and structure, living patterns, etc)	
	Look at the relationship between current market demands and changing housing needs	
	Look at the relationship between current market demand and sustainability objectives	
	Identify opportunities and challenges related to 'doing things differently'	
	Define the benefits of 'doing things differently' to your customers	
	Feed this into your marketing strategy [see: Marketing]	

Design

Goal: ensure your designs meet goals in the most practical, cost effective way

	Consult with trades-people during the design process to get their input	
	Consider including all applicable 'deadset winners' from the checklist in your design	
	Consider including some of the 'good practice' actions from the checklist in your design	

Tendering

Goal: sell your capability to deliver sustainability outcomes

	Use the design checklist to assess the tender documents for risks and opportunities	
	Where relevant, propose different strategies for achieving the tender sustainability requirements	
	List the sustainability outcomes you will deliver (including outcomes beyond tender requirements)	
	Consider offering an optional extra package (higher sustainability outcomes for extra cost)	
	Include marketing material on the benefits of a commitment to sustainability	

Customer relationship

Goal: ensure the customer is supportive of the sustainability outcomes

	Explain the rationale behind the sustainability targets and strategies, and the benefits	
	Quantify outcomes where possible (eg. HERS rating, BASIX score etc)	
	Involve clients in decisions about how to best achieve the sustainability outcomes	

Cost planning

	Goal: develop cost plans that support sustainability outcomes	
	On projects, allocate a separate budget especially to support sustainability outcomes	
	To assist marketing, calculate longer-term savings to customers resulting from sustainability initiatives	
	Investigate rebates/ financial incentives for sustainability initiatives and factor into budgets	

Contracting

Goal: ensure subcontractors deliver the sustainability outcomes

	When engaging subcontractors, ask about their demonstrable sustainability credentials	
	Use the checklists to indicate the actions with which your subcontractors must comply	
	Ensure drawings and specifications include all of the desired sustainability outcomes	
	In contracts, link payment to the delivery of the specified sustainability outcomes	

Procurement

Goal: create links with suppliers of green products and services

	Develop an ongoing database/ library of sustainability products and suppliers	
	Allocate a budget for research time while you build up the database	
	Identify products you are likely to use most often and negotiate with suppliers	

Project management

Goal: ensure the sustainability outcomes are implemented on-site

	Use the checklists at all stages of the project to certify compliance with the goals/ targets	
	Conduct inductions with subcontractors on expectations and contractual responsibilities	
	Provide subcontractors with copies of the relevant checklists	

Post-project support

Goal: ensure your clients get the most out of their homes' sustainability features

	Develop a simple standard client induction manual and customise for each project	
	Include an on-site induction meeting and a follow up meeting as part of your service	

Marketing

Goal: advertise your commitment to sustainability

	Advertise your sustainability policy	
	Describe how your business is taking action regarding environmental issues of concern (link to strategies)	
	Outline the benefits of sustainability to the customer (eg. lower bills, health, comfort, 'future proofing')	
	Document your project successes (outcomes achieved, awards, client testimonials)	

Goal: market the sustainability outcomes you deliver as part of your standard service

	List outcomes you provide as standard practice (quantify them where possible eg. HERS rating)	
	Use the checklist to help you- focus on the 'deadset winners' and include some of the 'good practice' actions	
	Explain the benefits to the customer of the outcomes you deliver	

Goal: market selected cutting-edge sustainability outcomes you can deliver as an extra package

	Include several of the 'best practice' and 'cutting edge' actions to test market interest and differentiate your business	
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Staffing and training

Goal: build-up and maintain company knowledge and skills

	When engaging new staff, ask about their demonstrated sustainability credentials	
	Allocate a budget for staff to attend ongoing sustainability training, trade events etc.	
	Include achievement of sustainability targets as a consideration in staff performance evaluation	