



Building a Sustainable *Home*

SIX
HOUSE
DESIGNS

HANDY
CHECKLISTS





Logan Howlett



Simon Anderson

Sustainability is the Heart of Cockburn

The City of Cockburn, in partnership with the University of Western Australia and Solar Dwellings, is leading the way to a sustainable future through the introduction of six innovative and inspirational house designs.

These designs are intended to help you create the home of your dreams. A home that is climate sensitive and site responsive. A home that will keep you warm in winter and cool in summer, while minimising the impact you have on the environment and saving you money.

The City's commitment to good governance extends beyond the needs of our current generation and into the future - to the legacy we will leave for our children.

We welcome your feedback on this unique initiative.

Logan Howlett
Mayor – JP
City of Cockburn

The Future of Sustainable Design

The Faculty of Architecture, Landscape & Visual Arts at the University of Western Australia through its Architecture programme is both delighted and proud to have been a partner with the City of Cockburn and Solar Dwellings in the production of six designs for sustainable homes suitable to the various precincts of Cockburn.

Each design shows that good design can deliver attractive and affordable homes that simultaneously have low environmental impacts, flexible living opportunities and significant lifestyle benefits.

I commend the City of Cockburn for its initiative and vision in leading this project that has made available to Cockburn residents this suite of unique and sustainable homes. Projects such as these are vital as sustainability is now rightfully the key concept in all we do as creators of the future built and social environment that our children will inherit.

Professor Simon Anderson LFRAIA
Dean
Faculty of Architecture, Landscape & Visual Arts
The University of Western Australia

Checklist



Using good design principles can save energy, water and money, while creating a more enjoyable and comfortable home.

These practical checklists can help you design a more sustainable home for Perth's climate, with lower running costs and improved environmental performance.



Why build a sustainable home?

- ✓ Save energy and water
- ✓ Low running costs
- ✓ More comfortable
- ✓ Higher resale value

Building a Home - The 3 most important decisions

1. Location, Location, Location

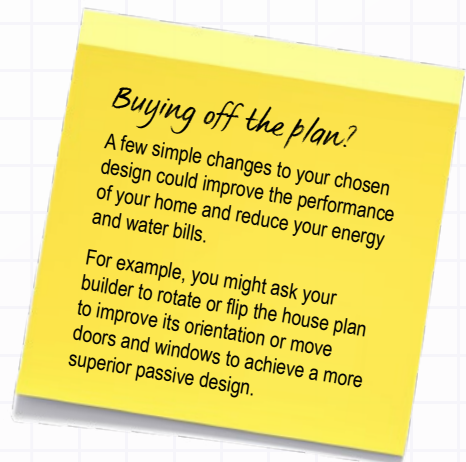
A home that is close to everything you need will save on transport and fuel costs. Consider the walking and cycling distance to public transport, shops, parks and schools.

2. Size

Bigger isn't always better. If you really want a sustainable home, choose a smaller size. Larger homes require more heating, air conditioning and lighting and also take up valuable garden space.

3. Orientation

Look for a block with good orientation that allows for the placement of living and entertaining areas in the north and minimal windows on east and west.



Buying off the plan?

A few simple changes to your chosen design could improve the performance of your home and reduce your energy and water bills.

For example, you might ask your builder to rotate or flip the house plan to improve its orientation or move doors and windows to achieve a more superior passive design.

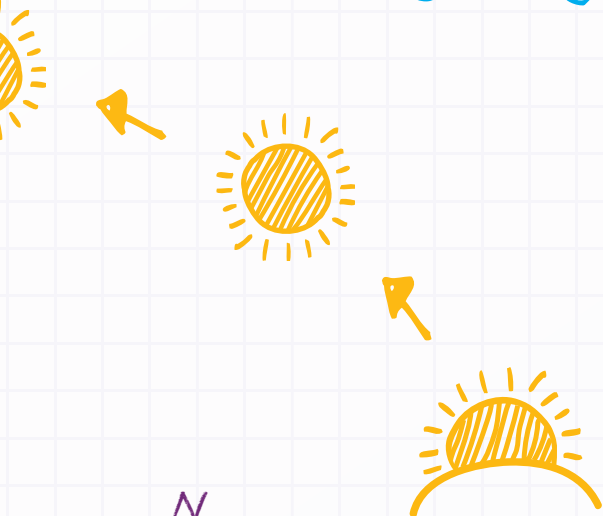
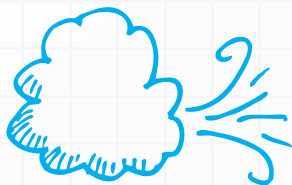


Little or no extra cost

These principles can be applied to most homes to improve thermal comfort and reduce heating and cooling expenses. Many builders will make these changes at little or no extra cost.

Design Basics

- Living areas and windows in the North.**
Provides natural lighting all year round. Allows winter sunlight to enter the home during the colder months. Easy to shade from the harsh summer sun with eaves.
- Light coloured roof**
Reflects solar radiation and keeps the interior cooler during summer.
- Natural ventilation**
Make the most of the cooling south west breeze. Allow for cross ventilation by aligning windows and doors opposite each other to enable natural air flow.
- Universally accessible home**
Plan ahead by creating a liveable home that is easy to move around in. Check your design has wide doors (minimum 820mm), hallways (minimum 1000m), flush entry doors, hobless showers and an easy access toilet with strong walls. For a full checklist visit www.liveablehomes.net.au
- Minimise windows in the East and West elevations**
Avoid exposure to the morning and afternoon sun by moving, deleting or reducing the size of windows on the east and west.
- Thermal mass**
Use of materials with high thermal mass can make your home more comfortable in summer and winter. For example dark tiles or exposed concrete in north facing rooms (that are exposed to winter sun) helps to stabilise internal temperatures both during the day and at night.





Additional costs

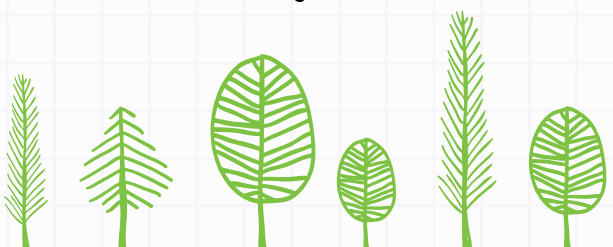
For an additional cost these features can deliver big savings in the long term. Many will pay for themselves with a few years energy savings.

An accredited house energy rating assessor may help to further optimise the performance of your design.

Additional Considerations

- Solar hot water**
Solar hot water or heat pump systems are cheaper to run and use less energy. By locating your hot water system near the bathrooms, laundry and kitchen you can reduce the amount of cold water that needs to be run while waiting for hot water to arrive at taps and shower heads.
- Extra insulation**
A well-insulated home will provide year-round comfort reducing the need for artificial heating and cooling. Consider increasing the insulation levels in walls, ceiling and lining the roof to keep the heat out in summer and retain warmth in winter.
- Shading**
Use verandas, eaves, trees and shrubs to shade walls and windows on the east and west. A pergola with tilted slats, removable sail shades or deciduous vines on the north side will allow winter sun in, while shading the harsh summer sun. Window treatments, such as well fitted curtains and pelmets will further reduce unwanted heat gain.

- Health and wellbeing**
Avoid toxic carpets, flooring and paints which can release chemical emissions into your home for years. Choose zero or low Volatile Organic Compound (VOC) paints and materials.
- Energy and water wise appliances**
Choose appliances and fittings with the highest energy efficiency star rating and Water Efficiency Labelling (WELS) to reduce your bills and improve the environmental performance of your home.
- Energy efficient and natural lighting**
Energy efficient lights (e.g. LED) and the use of natural lighting with skylights and north facing windows can significantly reduce your electricity bills.
- Heating and Cooling**
A well designed home minimises the requirement for artificial heating and cooling. Ceiling fans are a good alternative to air conditioners as they use less energy.
- Solar Photovoltaic Panels**
Onsite renewable energy generation (ideally on your north facing roof) will help to reduce your carbon emissions and can lower your bills.



Passive Design

The importance of passive design cannot be overstated.

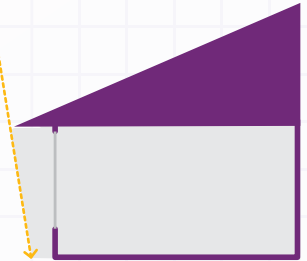
Passive design principles make use of the local climate including the sun's energy and local breezes to make a building warm in winter and cool in summer. Good passive design is achieved by appropriately orientating your building.

In Perth, the summer sun travels high across the sky on an approximate angle of 82° at noon. In winter its path is lower in the sky on an approximate angle of 34° at noon.

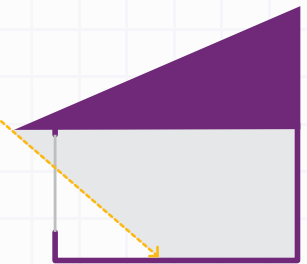
Ideally a passive designed house in Perth would have larger (but appropriately shaded) windows on the northern side of the building to allow access of the low winter sun, with minimal windows on the east and west to restrict heat gain from the rising and setting sun in summer. Windows, doors and hallways would be aligned to capture the cooling sea breeze from the south west.

Shading, thermal mass, insulation and skylights also make a contribution to energy efficiency and comfort.

Summer



Winter

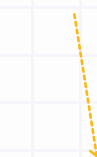


Landscaping tips

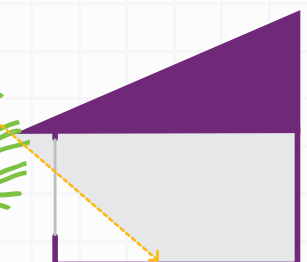
Trees and gardens can add value to property, offer privacy, provide shading and reduce the amount of heat reflected into a building. Trees also filter air pollution, reduce traffic noise, and create habitat for wildlife.

- North side— plant trees that lose their leaves in winter, to allow the sun into your garden and house, whilst providing shade in summer.
- East and west Side— plant water wise shrubs, vines and trees to shade the walls and windows of your house from the morning and afternoon summer sun.
- Set aside a sunny area for your washing line to reduce the need to use a dryer. Use a waterwise irrigation system and mulch your gardens to save on water bills
- You may be eligible for local council incentives including native plant subsidy schemes, street trees, free garden workshops and more.

Summer

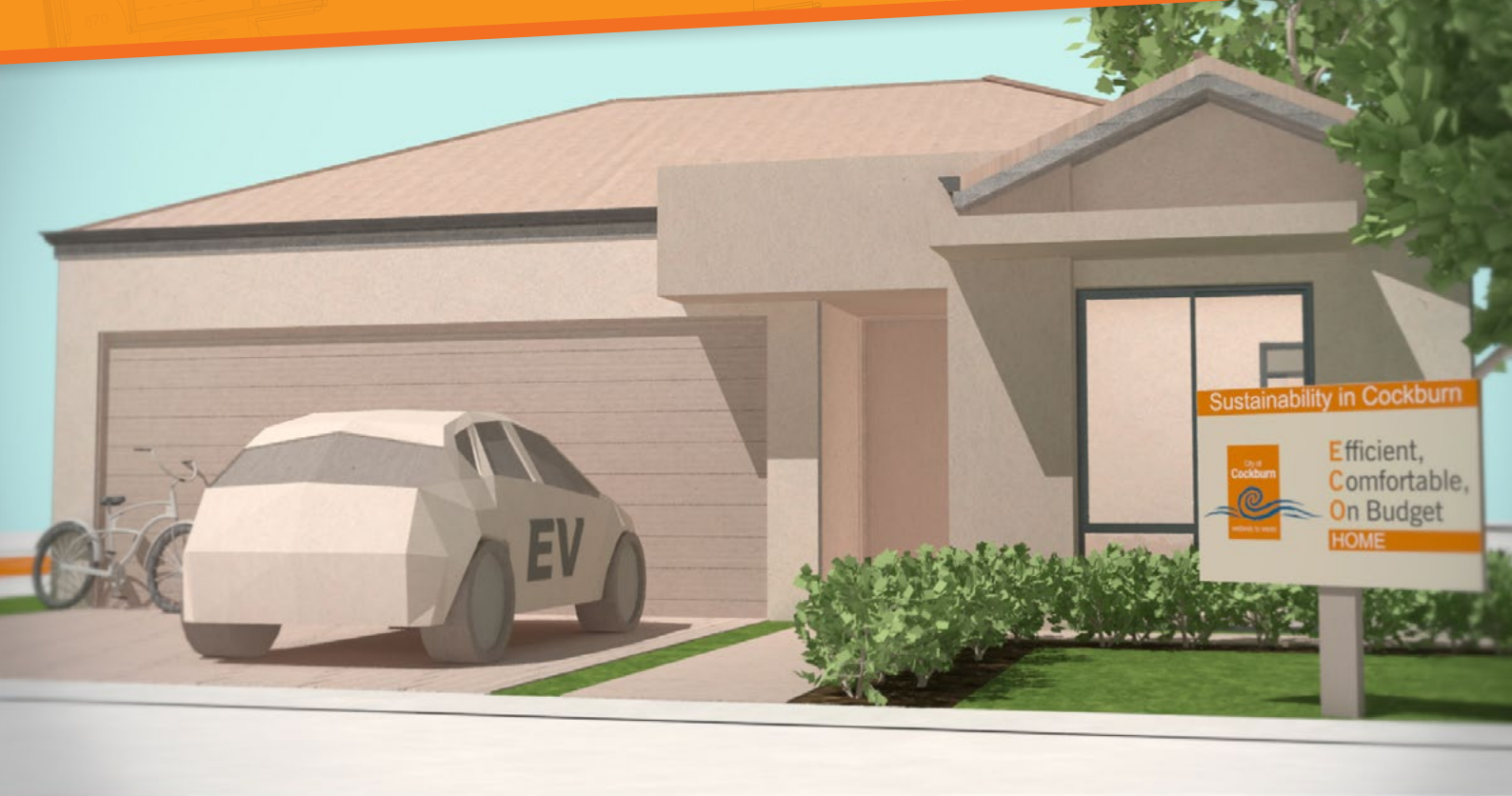


Winter



Design 1: Suitable for North elevation block

The Gallery



The Gallery

Concept designed by Julian Luca

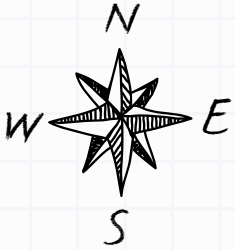
The Gallery is a contemporary styled home with sleek street appeal, designed for those challenging narrow sites in Perth where north faces towards the street.

This family friendly home features abundant outdoor living spaces framed as discrete courtyards thanks to the Gallery's clever planning and layout. Both outdoor spaces are protected by a solar pergola that blocks the harsh summer sun while allowing the warmth of the winter sun to enter into the home.

The Gallery also features a home theatre and spacious study at the front, ideal for the self-employed or work at home business. All bedrooms and living areas feature ceiling fans to provide inexpensive summer cooling, while high performance windows help to maintain comfortable internal temperatures throughout the year.

How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a North elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.



Windows

Minimise windows on the East and West to reduce unwanted heat from the rising and setting sun.

Living rooms and windows facing North will allow the warm winter sun to enter the home during the colder months.

Heavy curtains with pelmets and/or double glazing help to regulate internal temperatures without spoiling the view.

Insulation

Insulate the ceiling and roof as well as the external walls.

Shading + Landscaping

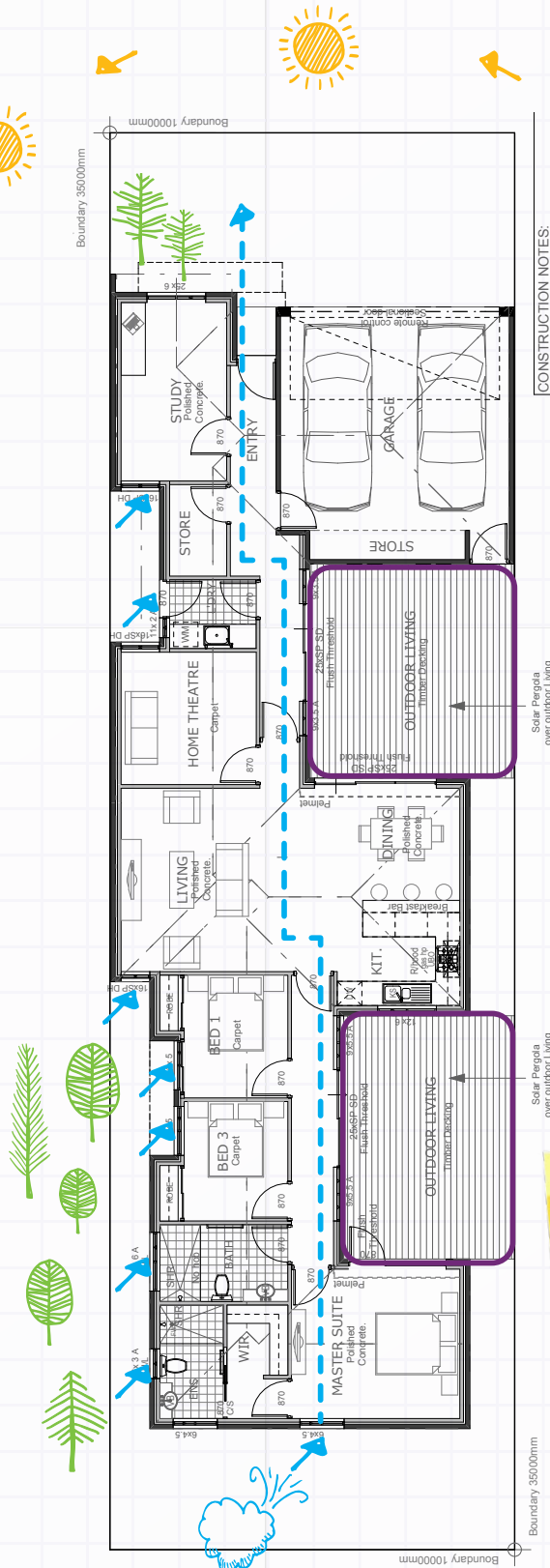
Shading and landscaping on the east and west to reduce unwanted heat gain from the rising and setting sun.

Deciduous trees in the North will let the winter sun into your house, whilst providing shade in summer.

Eaves help the shade the windows and walls from the summer sun.

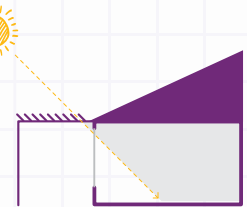
Southwest Sea Breeze

Strategic placement of windows and hallways allows the sea breeze to cool your home for free.



8 Star Energy Rating

-  3 Beds
-  2 Baths
-  2 Cars
-  202 sq.m



Solar Pergolas

A solar pergola or removable shade sails will allow the winter sun into the house whilst providing shade in summer.

Think Ahead!

Using good design principles can save energy, water and money, while creating a more enjoyable and comfortable home.

Light Coloured Roof

Reflect unwanted light and heat, save money on cooling costs.

Design for universal accessibility

Minimum door width 820mm, Hallways 1000mm, plus an easy access toilet.

Exposed concrete or tiled floors

Help regulate internal temperatures by providing thermal mass, keeping the home cooler in summer and warmer in winter.

Design 2: Suitable for South elevation block

The Hanger

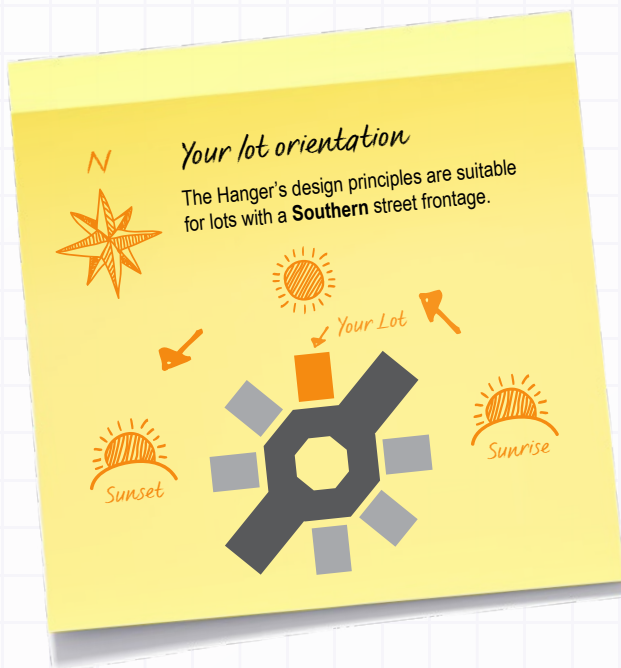


The Hanger

Concept designed by Jeandre Beukes

The Hanger is an attractive 2-storey residence designed to suit lots where north is orientated towards the rear of the site. It presents a unique visual appeal to the street with a receding stepped-wall façade and skillion roof. Strategically placed windows and wing walls help to direct south-westerly breezes into the home for natural cooling.

The main living areas are situated towards the north, where winter sunlight and warmth can enter the home through full height windows and wide sliding doors that open to the garden.



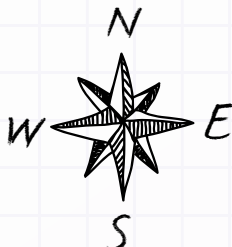
How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a South elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.

Ground Floor

☆☆☆☆☆☆☆☆☆
8.5 Star Energy Rating

-  3 Beds
-  2 Baths
-  2 Cars
-  300 sq.m

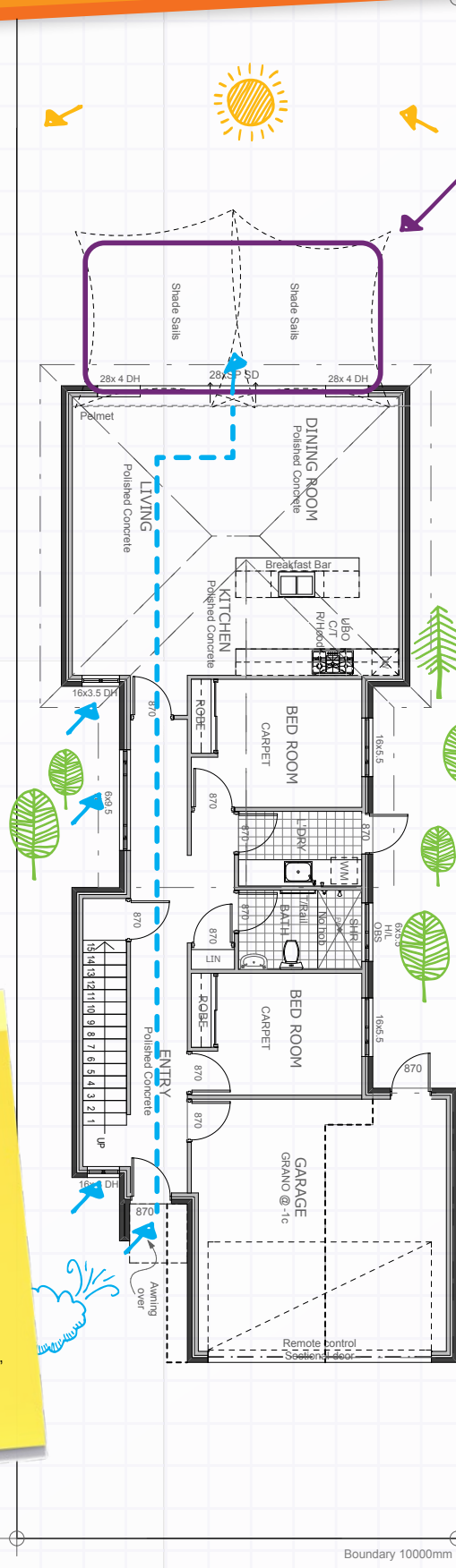


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Light Coloured Roof
Reflect unwanted light and heat, save money on cooling costs.

Design for universal accessibility
Minimum door width 820mm, Hallways 1000mm, plus an easy access toilet.

Exposed concrete or tiled floors
Help regulate internal temperatures by providing thermal mass, keeping the home cooler in summer and warmer in winter.



Shade Sails

A solar pergola or removable shade sails will allow the winter sun into the house whilst providing shade in summer.

Windows

Minimise windows on the East and West to reduce unwanted heat from the rising and setting sun.

Living rooms and windows facing North will allow the warm winter sun to enter the home during the colder months.

Heavy curtains with pelmets and/or double glazing help to regulate internal temperatures without spoiling the view.

Insulation

Insulate the ceiling and roof as well as the external walls.

Shading + Landscaping

Shading and landscaping on the east and west to reduce unwanted heat gain from the rising and setting sun.

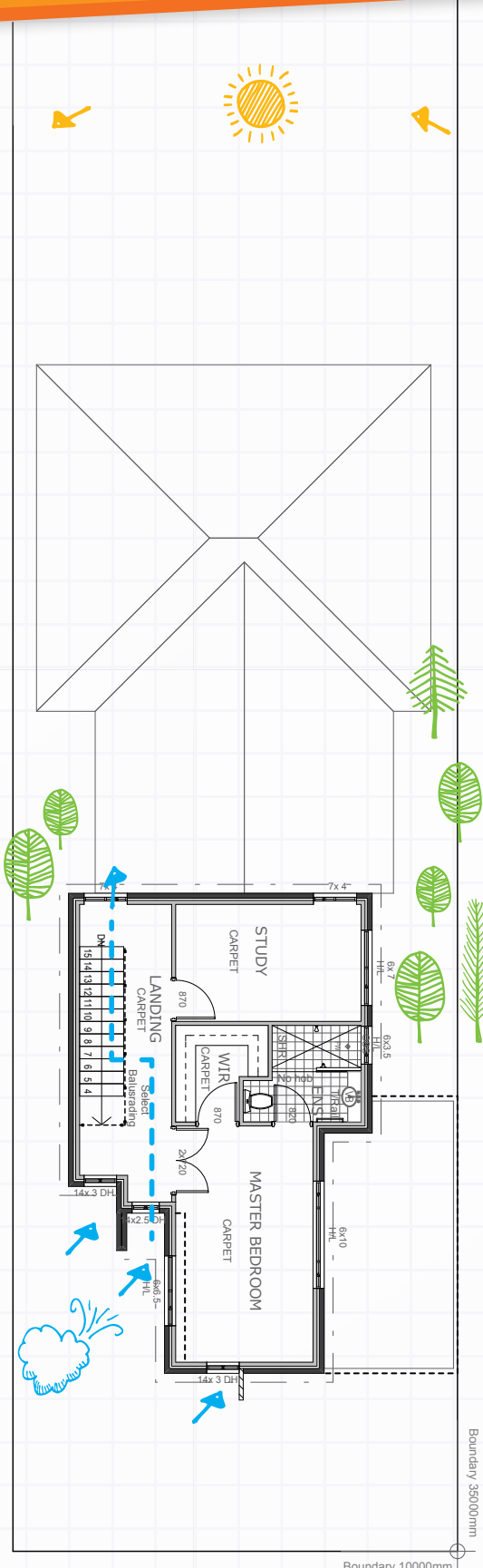
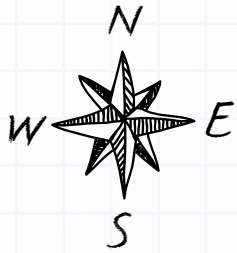
Deciduous trees in the North will let the winter sun into your house, whilst providing shade in summer.

Eaves help the shade the windows and walls from the summer sun.

Southwest Sea Breeze

The wing wall helps to direct breezes into the hallway for natural cooling in summer.

First Floor



Boundary 10000mm

Design 3: Suitable for South elevation block

The Intellect



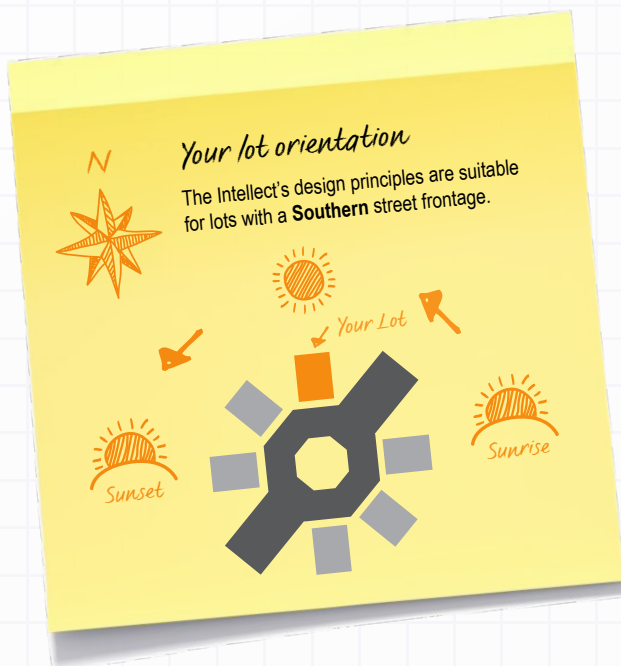
The Intellect

Concept designed by Ming Ho Wong

This barn style home features 4 bedrooms with built-in robes, a ground floor powder room and upstairs bathroom. The open-plan layout of the ground floor makes for great entertaining, connected to an expansive outdoor area.

The main living areas on the northern side make best use of the winter sun, while a solar pergola blocks the harsh summer sun. Smaller windows facing west help to minimise the impact of the afternoon sun while still allowing for natural cooling throughout the house.

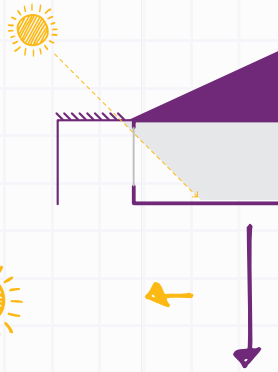
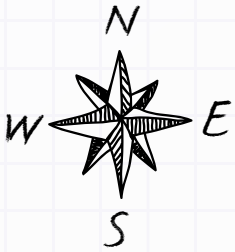
Another clever design feature is the placement of the wet areas, such as the kitchen, laundry, powder room and upstairs bathroom which are grouped together to minimise plumbing and hot water running costs.



How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a South elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.

Ground Floor



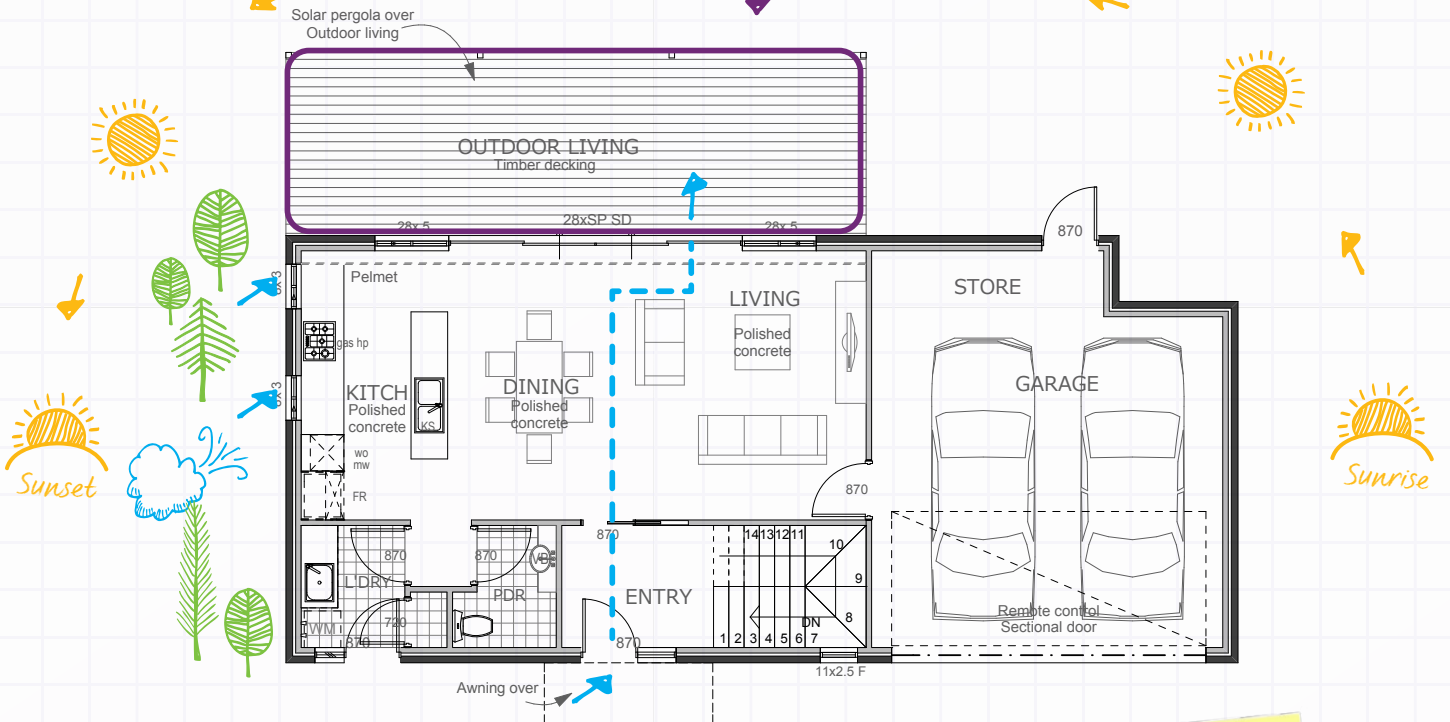
Solar Pergolas

A solar pergola or removable shade sails will allow the winter sun into the house whilst providing shade in summer.



8.5 Star Energy Rating

-  3 Beds
-  2 Baths
-  2 Cars
-  300 sq.m



Windows

Minimise windows on the East and West to reduce unwanted heat from the rising and setting sun.

Living rooms and windows facing North will allow the warm winter sun to enter the home during the colder months.

Heavy curtains with pelmets and/or double glazing help to regulate internal temperatures without spoiling the view.

Insulation

Insulate the ceiling and roof as well as the external walls.

Shading + Landscaping

Shading and landscaping on the east and west to reduce unwanted heat gain from the rising and setting sun.

Deciduous trees in the North will let the winter sun into your house, whilst providing shade in summer.

Eaves help to shade the windows and walls from the summer sun.

Southwest Sea Breeze

Strategic placement of windows and hallways allows the sea breeze to cool your home for free.

Think Ahead!

Using good design principles can save energy, water and money, while creating a more enjoyable and comfortable home.

Light Coloured Roof

Reflect unwanted light and heat, save money on cooling costs.

Design for universal accessibility

Minimum door width 820mm, Hallways 1000mm, plus an easy access toilet.

Exposed concrete or tiled floors

Help regulate internal temperatures by providing thermal mass, keeping the home cooler in summer and warmer in winter.

How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a South elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.

First Floor



The Sunshower



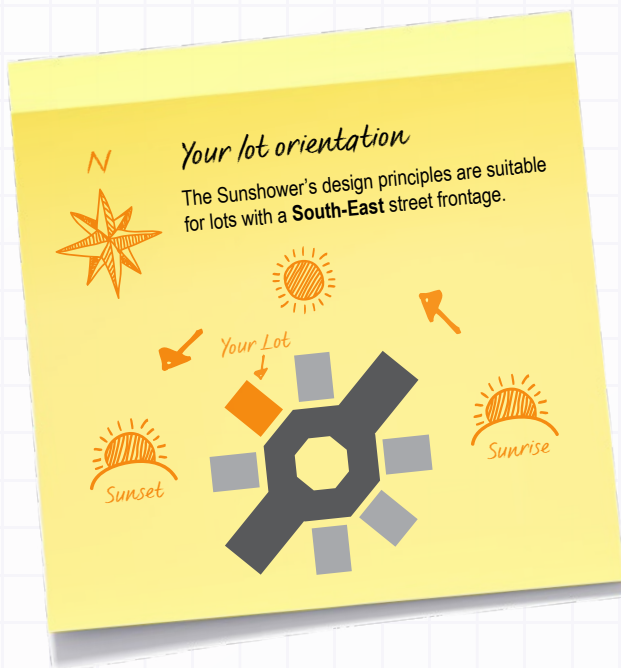
The Sunshower

Concept designed by Yuxi Cheng

The Sunshower is an elegant home designed around a central north-facing courtyard that offers comfortable living all year round through passive solar design.

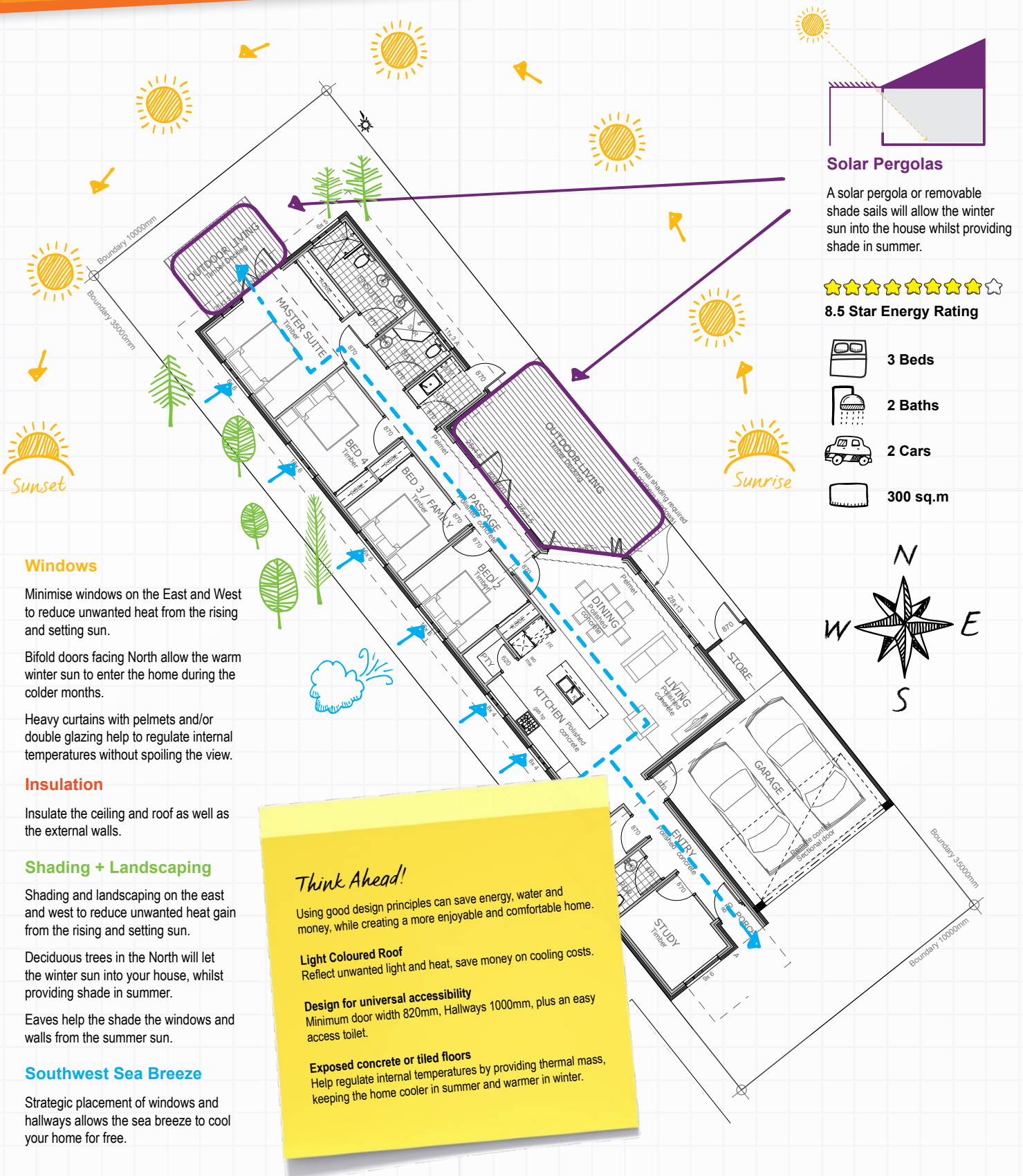
The generous open plan living area, accentuated by the high gabled ceiling, integrates comfortably into the courtyard. Glazed bi-fold doors provide easy access for outdoor entertaining whilst allowing cooling breezes to enter the home.

The Sunshower is surrounded by wide eaves that help to shade the walls and windows in summer. The bedroom windows are strategically positioned to enhance natural cooling from the sea breeze.



How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a South-East elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.



Solar Pergolas
A solar pergola or removable shade sails will allow the winter sun into the house whilst providing shade in summer.

- ★★★★★☆☆☆
- 8.5 Star Energy Rating**
- 3 Beds**
- 2 Baths**
- 2 Cars**
- 300 sq.m**

Windows

Minimise windows on the East and West to reduce unwanted heat from the rising and setting sun.
Bifid doors facing North allow the warm winter sun to enter the home during the colder months.
Heavy curtains with pelmets and/or double glazing help to regulate internal temperatures without spoiling the view.

Insulation

Insulate the ceiling and roof as well as the external walls.

Shading + Landscaping

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Deciduous trees in the North will let the winter sun into your house, whilst providing shade in summer.
Eaves help the shade the windows and walls from the summer sun.

Southwest Sea Breeze

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Exposed concrete or tiled floors
Help regulate internal temperatures by providing thermal mass, keeping the home cooler in summer and warmer in winter.

The Tangent



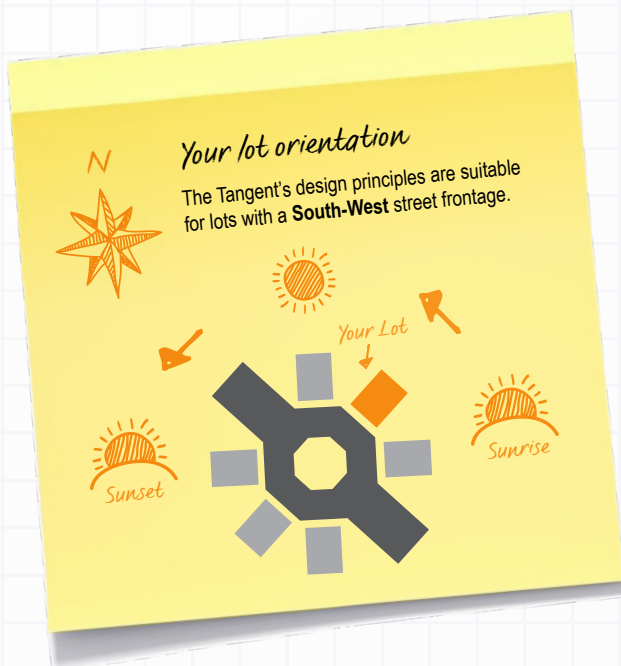
The Tangent

Concept designed by Lyssandra Lumley

The Tangent is a stylish, flexible modern home designed to suit lots where the side boundaries are oriented up to 45 degrees off north.

The kitchen, bathroom and laundry areas have been grouped together to minimise plumbing and water heating costs. Polished concrete floors in the living areas and hallway absorb the winter sunlight from north facing windows. The solar pergola over the alfresco is angled to only permit winter sunlight through, while blocking the harsh summer sun.

An eaves overhang surrounds the entire house, minimising heat gain from the sun in summer.



How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a South-West elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.

Windows

Minimise windows on the East and West to reduce unwanted heat from the rising and setting sun.

Living rooms and windows facing North will allow the warm winter sun to enter the home during the colder months.

Heavy curtains with pelmets and/or double glazing help to regulate internal temperatures without spoiling the view.

Insulation

Insulate the ceiling and roof as well as the external walls.

Shading + Landscaping

Shading and landscaping on the east and west to reduce unwanted heat gain from the rising and setting sun.

Deciduous trees in the North will let the winter sun into your house, whilst providing shade in summer.

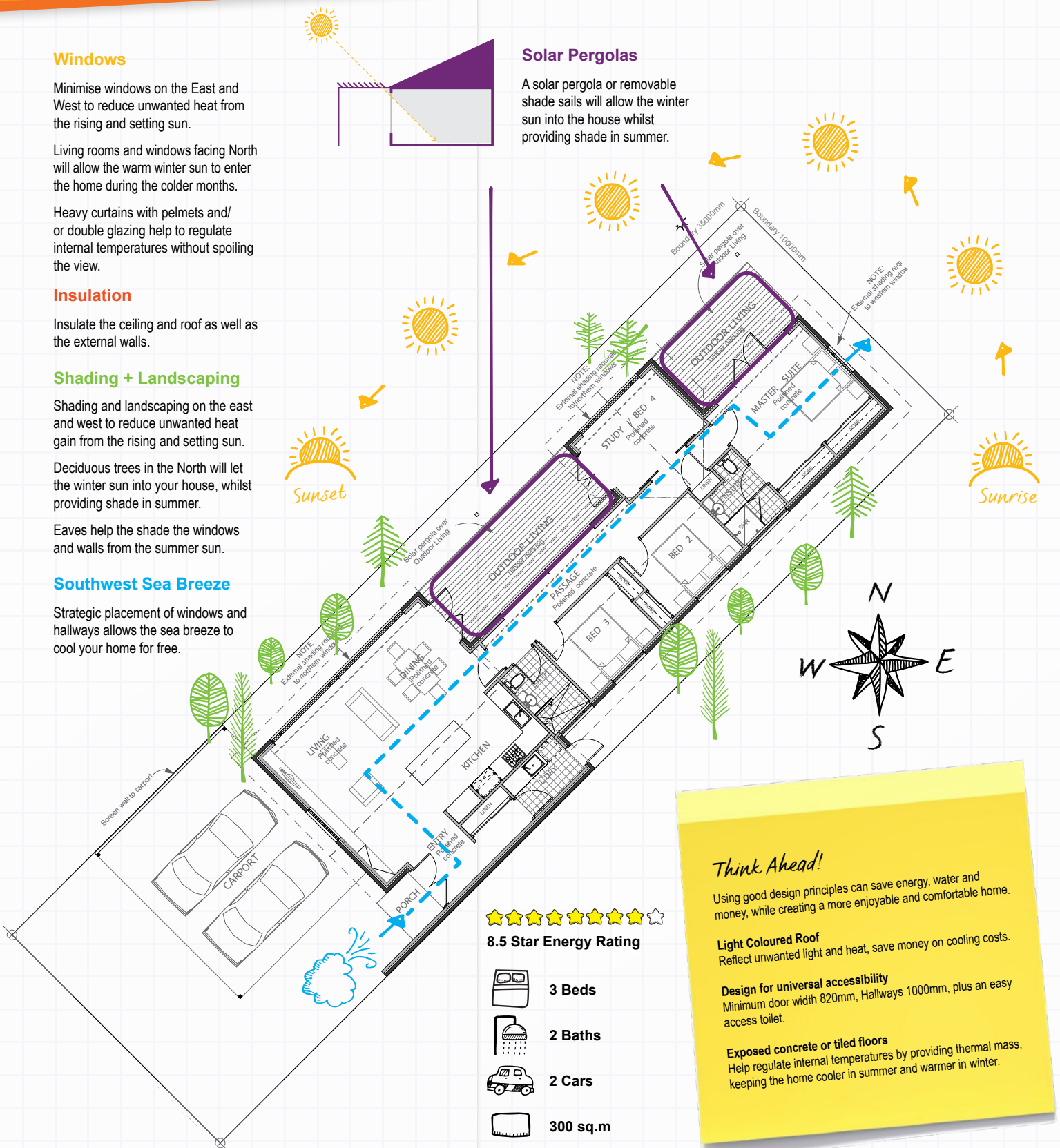
Eaves help the shade the windows and walls from the summer sun.

Southwest Sea Breeze

Strategic placement of windows and hallways allows the sea breeze to cool your home for free.

Solar Pergolas

A solar pergola or removable shade sails will allow the winter sun into the house whilst providing shade in summer.



8.5 Star Energy Rating

-  **3 Beds**
-  **2 Baths**
-  **2 Cars**
-  **300 sq.m**

Think Ahead!

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Light Coloured Roof
Reflect unwanted light and heat, save money on cooling costs.

Design for universal accessibility
Minimum door width 820mm, Hallways 1000mm, plus an easy access toilet.

Exposed concrete or tiled floors
Help regulate internal temperatures by providing thermal mass, keeping the home cooler in summer and warmer in winter.

The Tipti



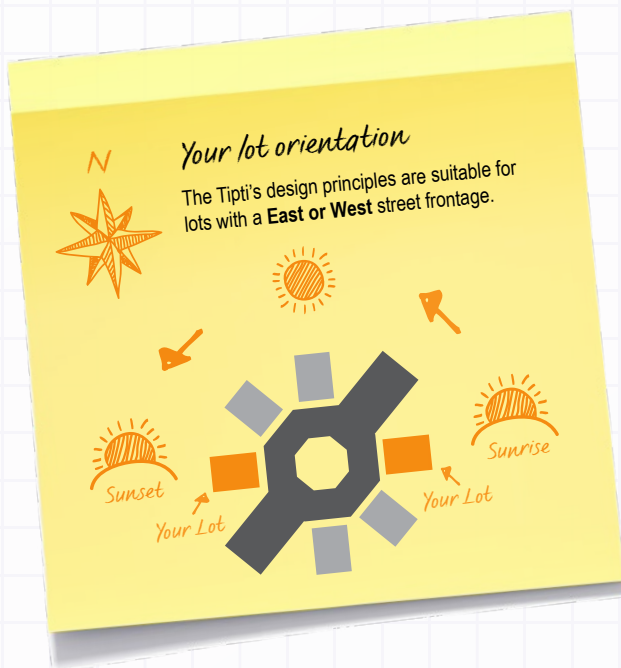
The Tipti

Concept designed by Kevin Cheung

The Tipti is flexible living at its best. This home could possibly be constructed in two stages to affordably accommodate a growing family over time. It can then be converted a third time into two group dwellings to suit retirees, young professionals or students.

The north facing living area features large doors that open directly onto the outdoor living area. The solar pergola provides shade in summer while allowing the warm winter sun to enter the home during the colder months. The Tipti's clever floor plan eliminates the need for excessive hallways while still providing ample privacy to ground floor bedroom areas.

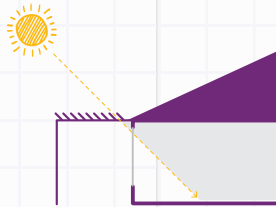
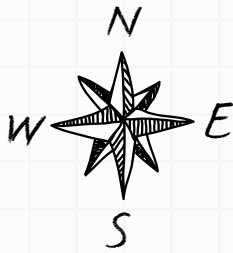
Polished concrete floors, insulated walls and high performance glazing give the Tipti impressive thermal performance, making it naturally cooler in summer and warmer in winter.



How to use this concept design

This plan explains how sustainable design principles can be applied to a lot with a East or West elevation. You and your builder can draw upon this concept as a source of inspiration to design a more sustainable home with lower running costs and improved energy efficiency.

Ground Floor



Solar Pergolas

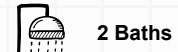
A solar pergola or removable shade sails will allow the winter sun into the house whilst providing shade in summer.



8.5 Star Energy Rating



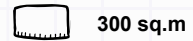
3 Beds



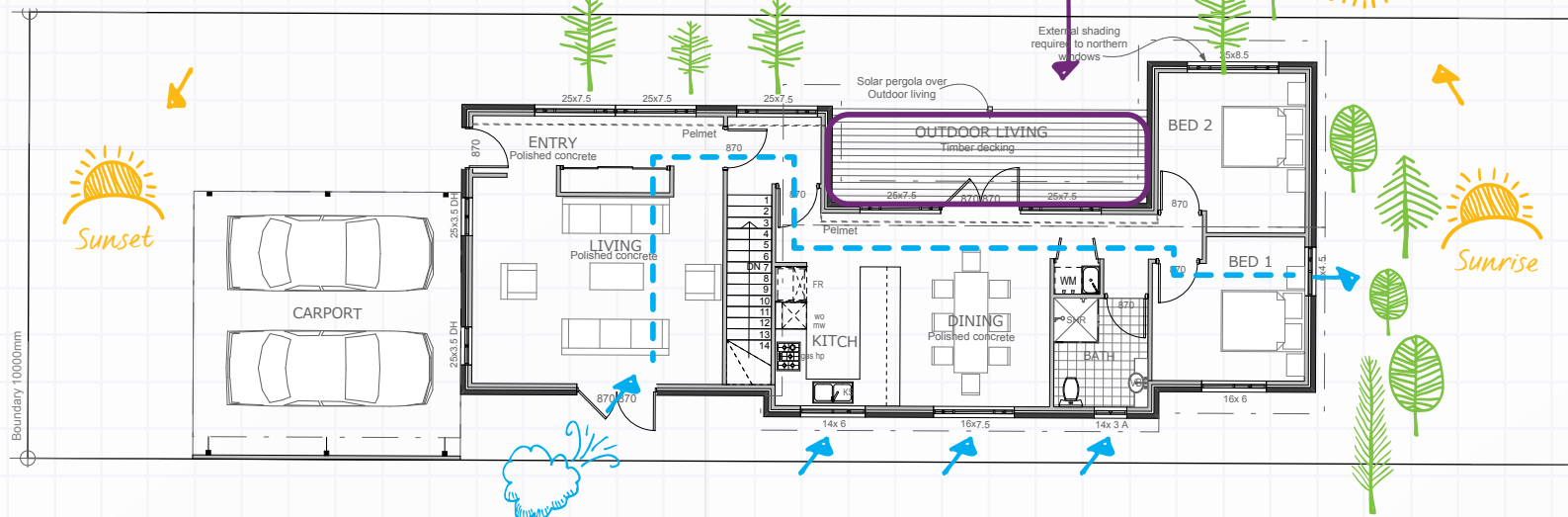
2 Baths



2 Cars



300 sq.m



Windows

Minimise windows on the East and West to reduce unwanted heat from the rising and setting sun.

Living rooms and windows facing North will allow the warm winter sun to enter the home during the colder months.

Heavy curtains with pelmets and/or double glazing help to regulate internal temperatures without spoiling the view.

Insulation

Insulate the ceiling and roof as well as the external walls.

Shading + Landscaping

Shading and landscaping on the east and west to reduce unwanted heat gain from the rising and setting sun.

Deciduous trees in the North will let the winter sun into your house, whilst providing shade in summer.

Eaves help the shade the windows and walls from the summer sun.

Southwest Sea Breeze

Strategic placement of windows and hallways allows the sea breeze to cool your home for free.

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Light Coloured Roof

Reflect unwanted light and heat, save money on cooling costs.

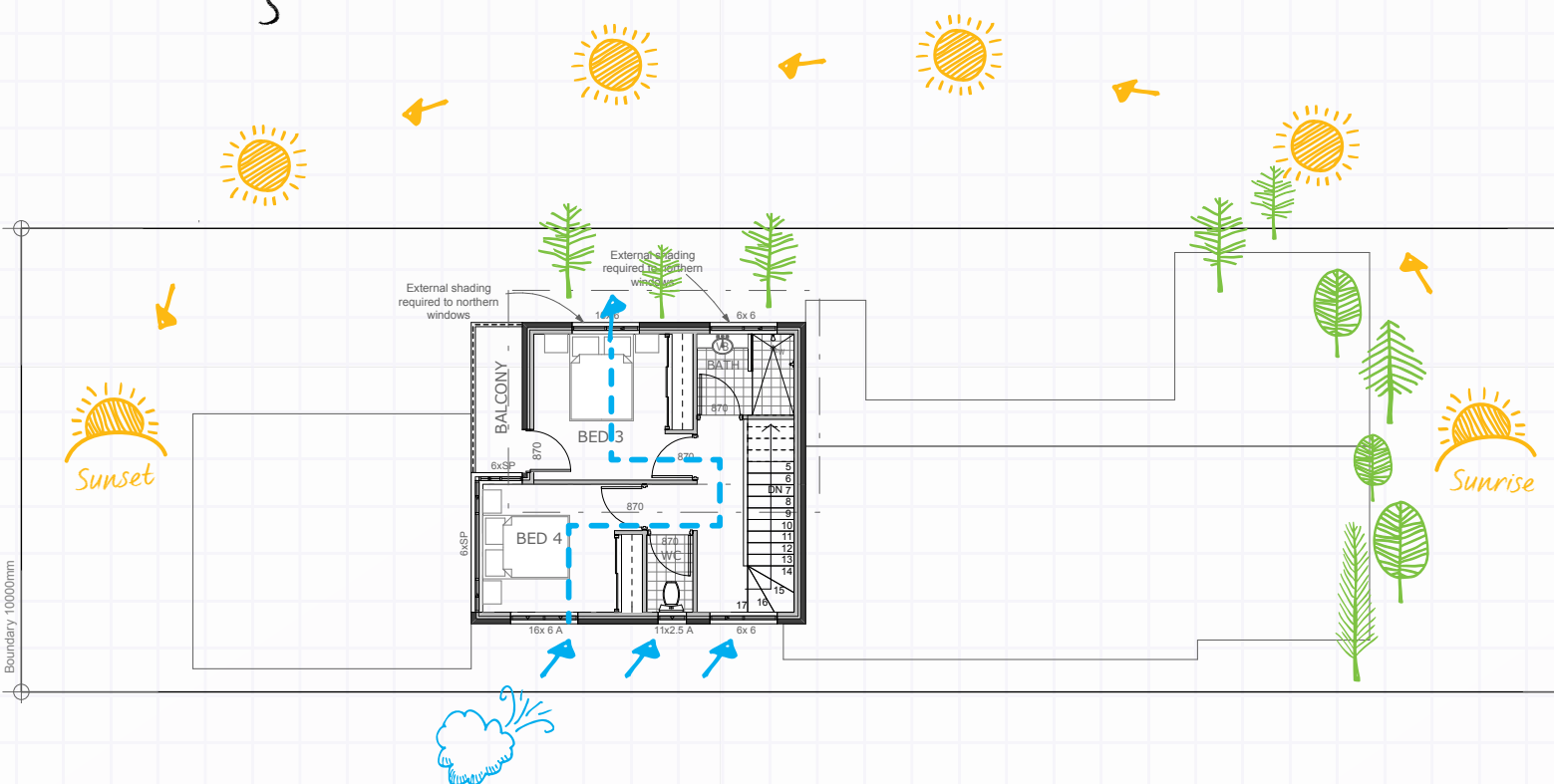
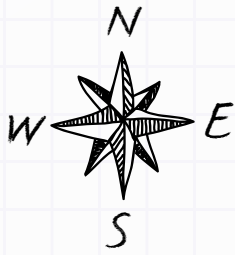
Design for universal accessibility

Minimum door width 820mm, Hallways 1000mm, plus an easy access toilet.

Exposed concrete or tiled floors

Help regulate internal temperatures by providing thermal mass, keeping the home cooler in summer and warmer in winter.

First Floor



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Notes:



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