

AHO DESIGN GUIDELINES NSW

Prepared for
Aboriginal Housing Office
January 2020



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About

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About

AHO Design Guidelines NSW

1. Acknowledgment



A.1 Acknowledgment

We acknowledge the traditional owners and custodians of the land on which we work and pay our respects to the Elders; past, present and emerging. We recognise their continuing connection to country - the land, resources, places, values, stories and culture.

We also acknowledge the Gadigal people of the Eora Nation, the traditional owners and custodians of country where this document was researched and developed.

Warning: Aboriginal readers should be aware that this document may contain images of people who have since passed away.

A.2 Introduction

The AHO Design Guidelines NSW were prepared by Tzannes, in collaboration with the Aboriginal Housing Office (AHO) in 2019. This document is a result of an extensive collaborative process which included a thorough analysis of AHO and relevant government guidelines, as well as consultative input from expert cultural advisors.

The fundamental purpose of this document is to create a benchmark for design excellence, sustainability and whole of life analysis for low and medium density housing projects throughout New South Wales, including remote, regional and inner city locations.

This Design Guideline addresses the immediate need for delivery of good quality housing. It begins to address cultural sustainability, however further consultation may be required to expand the guidelines to incorporate culturally appropriate principles to suit the broader needs of Aboriginal people across different communities.

It is also relevant to note that due to the diverse and evolving nature of Aboriginal culture, guidelines and protocols may change according to a particular clan or community. These guidelines provide general principles and a reference point, however specific consultation needs to take place on a case-by-case basis to ensure needs are met.

This Design Guideline is an evolving document and an ongoing process is proposed to ensure it maintains cultural and market relevance.

A.3 Scope of Document

This document is intended to be used by AHO staff for guidance when reviewing tenders at all stages of the design and construction process. It is also a resource for tenderers and builders to provide a clear understanding of AHO requirements. Finally, it is a resource for architects and designers working on specific development applications.

The AHO Design Guidelines are intended to fulfill a number of functions.

- The first and foremost role is to provide a concise document that captures all current AHO requirements in relation to design and construction.
- To provide a consistent regional benchmark for housing that ensures high quality and sustainable design.
- To provide a basis for classification that accounts for varying geographical and climatic conditions across the New South Wales region. This document intends to group and classify design and construction requirements based on their relevance to the site's climate and remoteness with an aim to deliver better performing, high quality housing stock that is region and climate appropriate.
- To provide dwelling design guidance to tenderers by way of typical floor plans for example housing typologies, as well as an accompanying set of design principles.

Please note that this document is intended as a guide for new construction only, and should not be utilised for alterations and additions to new acquisitions or existing AHO properties.

Landscaping requirements are currently excluded from the scope of the document, however should be incorporated to suit the needs of the Principal Project Requirements and or any authority requirements.

This document should be read in conjunction with the accompanying Principal Project Requirements, the contract, the technical specification as well as other documentation and compliance conditions.

The Design Guidelines do not replace the need to comply with the relevant statutory codes, standards and guidelines. Data and information provided within this document is current as at the revision date and may require updating should new data or requirements become available.

A.4 Document Structure and Legend

- o This document is structured to provide guidance on the key principles in relation to siting, cultural, sustainability, envelope and internal design principles.
- o Legends are provided graphically to alert the reader to whether the principles are relevant to one or all climate or remoteness zones.
- o Certain elements are marked as ‘mandatory’, noting this must be achieved to ensure compliance with AHO requirements. The remainder are considered ‘best practice’ and are encouraged to be incorporated to ensure quality design and construction outcomes.

Document legend

Climate Zones

New South Wales contains five of the eight climate zones relevant to Australia. Therefore, the relevance and application of the guidelines outlined in this document have been classified in terms of their suitability to each of the five climate zones. This is represented graphically through the use of a zone key in each section’s heading.

A heading with a key that displays all of the five climate zone icons signifies that the information in that section is relevant to all climate zones.

EXAMPLE 1 - Information in this section is relevant to all zones >>> 

When the information is only relevant to some climate zones, only the relevant zone icons are displayed.

EXAMPLE 2 - Information in this section is only relevant to zones 2 and 4 

Climate data is based on the classification of the Australian Building Codes Board (ABCB) in the National Construction Code (NCC) 2019.



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Location and Climate

B.1 Climate Zones

B.2 Designing for Climate

B.3 Remoteness Zones

B.4 Designing for Remoteness

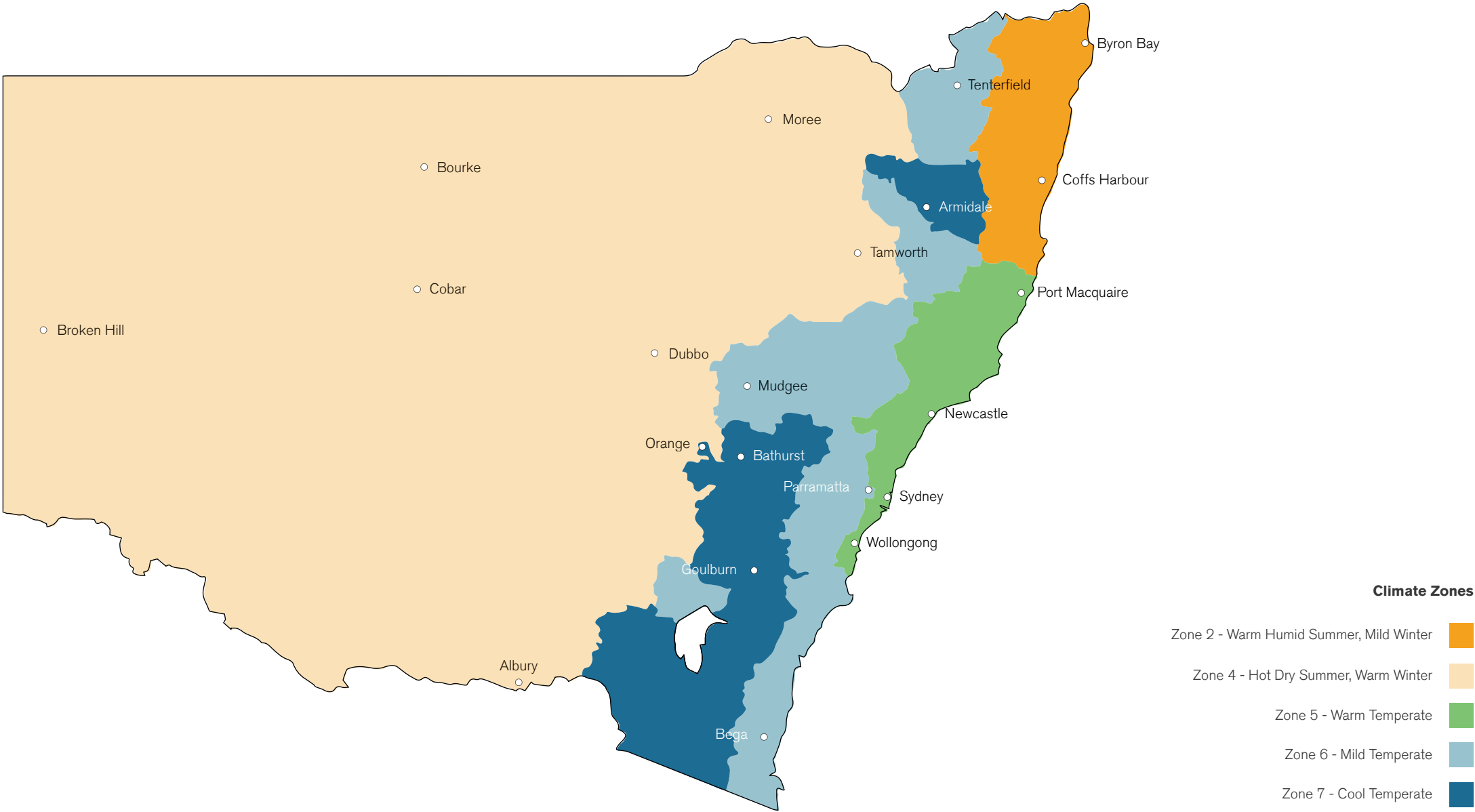
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B.

Location and Climate

AHO Design Guidelines NSW

1. Climate Zones



The following guideline classifies the NSW landscape into 'climate zones' to capture unique climate characteristics, which is used to identify appropriate design strategies and considerations for each zone.

The five climate zones used in this guideline are defined by the Australian Building Codes Board (ABCB) in the National Construction Code (NCC). Within each climate zone are many regional sub-zones determined by local geographical features, including wind patterns and height above sea level. Each climate zone has a distinct set of design and construction guidelines.

For the purpose of these Design Guidelines, the five climate zones are:

-  **Zone 2** - Warm humid summer, mild winter
-  **Zone 4** - Hot dry summer, cool winter
-  **Zone 5** - Warm temperate
-  **Zone 6** - Mild temperate
-  **Zone 7** - Cool temperate

Notes:

Climate change is likely to alter the characteristics of each zone during the life span of homes currently being built.

The climate zone boundaries are also aligned with local government areas and are therefore subject to change from time to time.

Zone

02

Warm Humid Summer, Mild Winter
NatHERS - Min 5 Star

North-eastern New South Wales, encompassing Kempsey, Coffs Harbour and Byron Bay.



Main Characteristics



High humidity with a definite 'dry season'



Hot to very hot summers with mild winters



Distinct summer/winter seasons



Moderate to low diurnal (day-night) temperature range, which can vary significantly between regions (e.g. inland to coastal)

Key Design Objectives

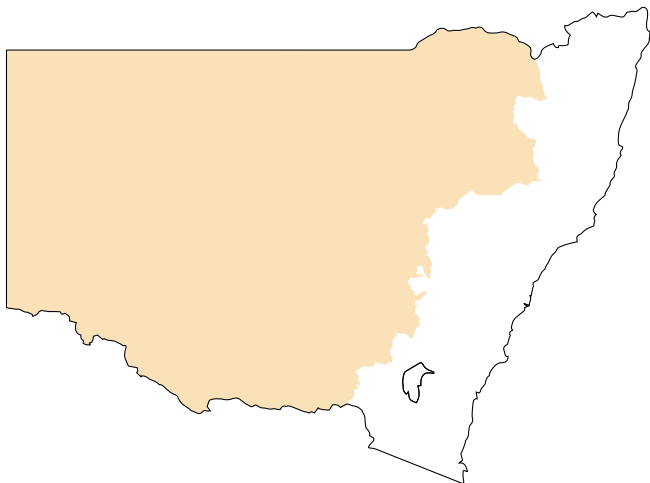
- Incorporate appropriate passive design principles; eliminate auxiliary heating and reduce auxiliary cooling where possible.

Zone

04

Hot Dry Summer, Cool Winter
NatHERS - Min 6 Star

Covering most of New South Wales, capturing towns such as Broken Hill, Bourke, Cobar, Dubbo, Albury, Moree and Tamworth.



Main Characteristics



Distinct seasons with low humidity all year round



Cool winters with cold dry winds



Very hot summers common with hot, dry winds



High diurnal (day-night) temperature range



Low rainfall

Key Design Objectives

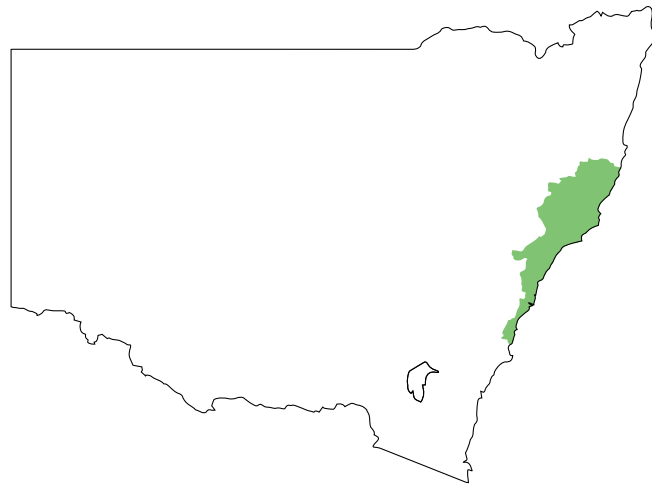
- Incorporate passive solar heating and cooling, as well as other sound passive design principles, which can be adopted to achieve cost effective 8 star or better thermal performance.
- Utilise high thermal mass solutions
- Maximise the benefit of sunny winters in this climate zone to provide energy for active solar heating systems
- Active solar cooling systems provide flexible thermal solutions for hot summer nights

B. Location and Climate

AHO Design Guidelines NSW

2. Designing for Climate

Zone 05



Warm Temperate NatHERS - Min 5 Star

Central east coast of New South Wales, including Wollongong, Sydney, Parramatta, Newcastle and Port Macquarie.

Main Characteristics



Mild winters with low humidity



Hot to very hot summers with low to moderate humidity



Variable solar access and cooling breeze directions and patterns



Moderate diurnal (day-night) temperature range near coast to high diurnal range inland

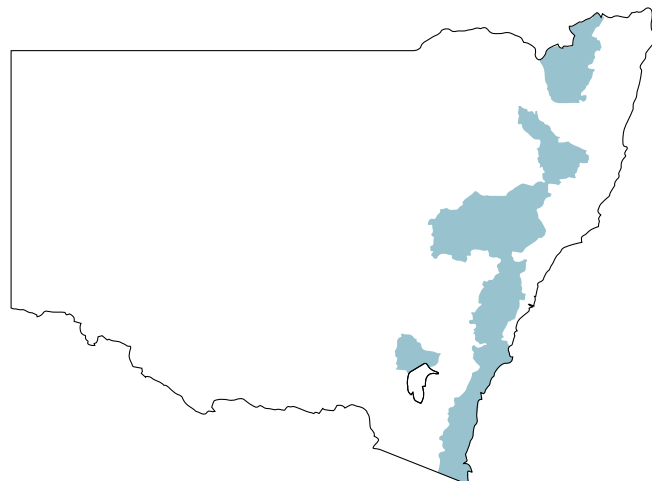


Four distinct seasons: summer and winter can exceed human comfort range; spring and autumn are ideal for human comfort

Key Design Objectives

- Most diverse climate zone, when it comes to climatic conditions.
- Diversity is particularly evident during the hours of sunlight and with the direction and reliability of cool breezes. For example, waterfront properties in Sydney have unique thermal mass requirements due to oceanic temperature stabilisation, diurnal ranges and reliability of cool breezes. Newcastle has very different cool breeze patterns and seasonal humidity variations.

Zone 06



Mild Temperate NatHERS - Min 5 Star

Eastern New South Wales, including Bega, Nowra, Ulladulla, Blue Mountains region, Mudgee and Tenterfield.

Main Characteristics



Mild to cool winters with low humidity



Hot to very hot summers, moderate humidity



Low day-night temperature range near coast, high range inland



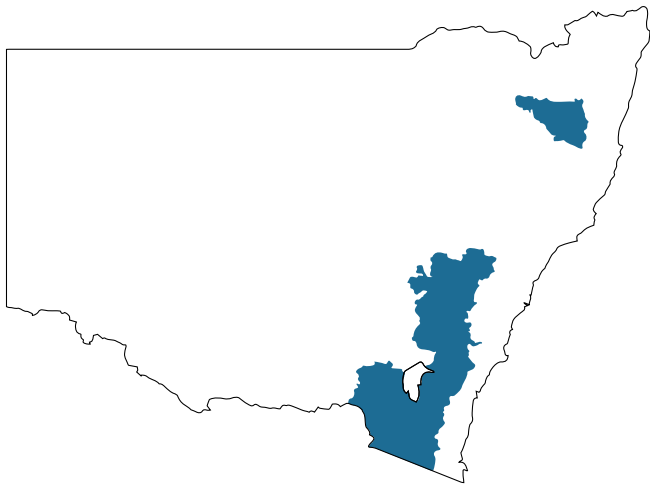
Four distinct seasons: summer and winter exceed human comfort range; spring and autumn are ideal for human comfort

Key Design Objectives

- Take advantage of cost effective, and simple design adjustments to achieve carbon zero outcomes.
- The primary design objective should be to minimise energy for heating and cooling.

Zone

07



Cool Temperate

NatHERS - Min 6 Star

Eastern New South Wales, capturing towns such as Armidale, Orange, Bathurst, Goulburn, and Cooma.

Main Characteristics



Low humidity



Hot dry summers (increasing with climate change)



Cold to very cold winters with majority of rainfall (decreasing with climate change)



High diurnal (day-night) temperature range

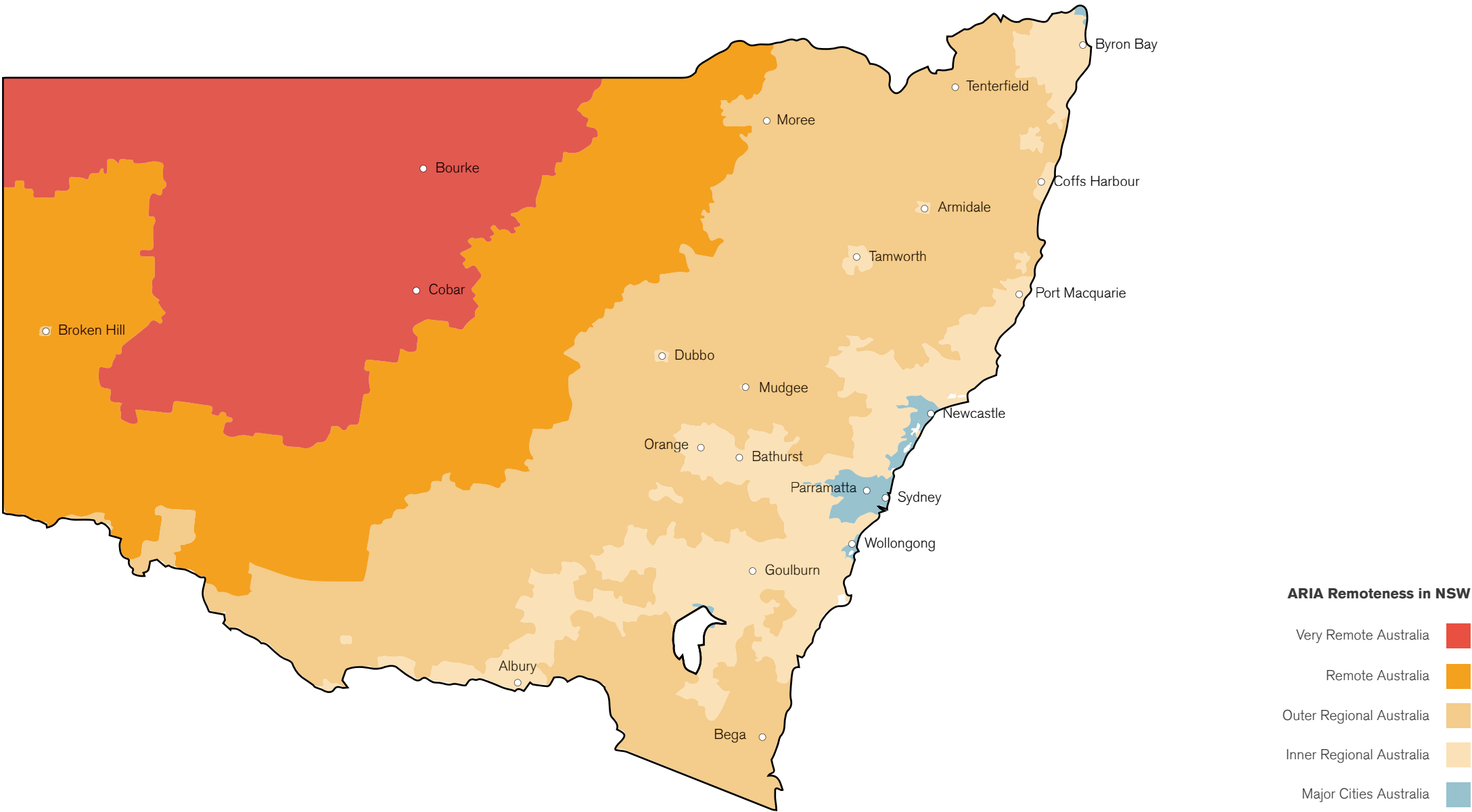


Four distinct seasons: summer and winter exceed human comfort range; highly variable spring and autumn conditions (range increasing with climate change)

Key Design Objectives

- Due to the cooler temperatures substantially more energy is required to maintain thermal comfort in this zone compared to more benign climates.
- Double glazing is recommended in this climate because on each winter's day there are 19-20 hours of heat loss through glass with a maximum of 4-5 hours of heat gain.
- Consider glass to mass ratio; exceeding these ratios can lower thermal mass performance and increase initial and operational costs

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The following guideline classifies the NSW landscape into 'remoteness zones' to capture unique site considerations, which is used to identify appropriate design and construction strategies for each zone.

The Accessibility/Remoteness Index of Australia (ARIA) is a geographical approach to defining remoteness and takes into account a locality's relative access to services. Part of the calculation considers the travel distance from a locality to five Service Centre categories.

Components:

Locality: Mapped places, across Australia, where people travel from.

Service Centres: Towns and localities that people travel to, in order to obtain services such as health, education, public transport, financial/postal.

Five Categories of Service centres:

- A | 250,000 persons or more
- B | 48,000 - 249,999 persons
- C | 18,000 - 47,999 persons
- D | 5,000 - 17,999 persons
- E | 1,000 - 4,999 Persons

The remoteness map on the left has been produced using the 2016 ABS census data - which assigns a remoteness value to each NSW location. These may need to be reviewed with future updates to census data.

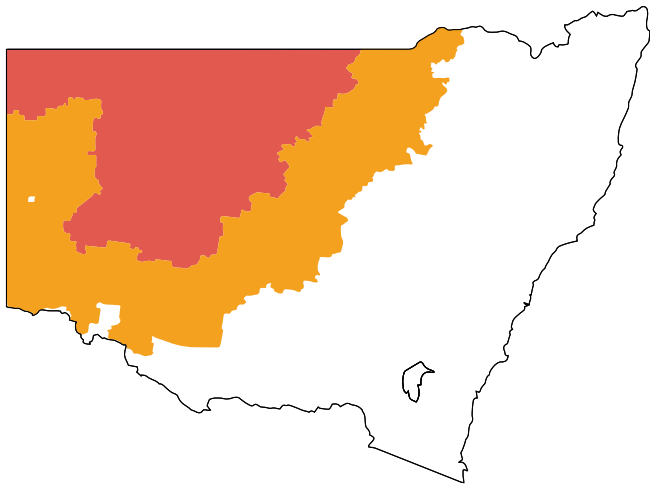
For the purpose of these Design Guidelines, the five ARIA remoteness zones are:

-  **Zone VR** - Very Remote Australia
-  **Zone R** - Remote Australia
-  **Zone OR** - Outer Regional Australia
-  **Zone IR** - Inner Regional Australia
-  **Zone MC** - Major Cities of Australia

The requirements for Very Remote (VR) and Remote (R) in terms of AHO's provision of housing is similar and has been combined in the diagrams that follow.

Zone

VR / R



Very Remote / Remote Australia



Locations such as:

Bourke, Cobar, Ivanhoe (VR)

Broken Hill, Walgett, Coonamble, Hillston,
Hay (R)

Main Characteristics

Locationally disadvantaged, with very little accessibility to goods, services and opportunities for social interaction.

Generally a scarcity of labour and materials, increased costs for transportation and security concerns on site.

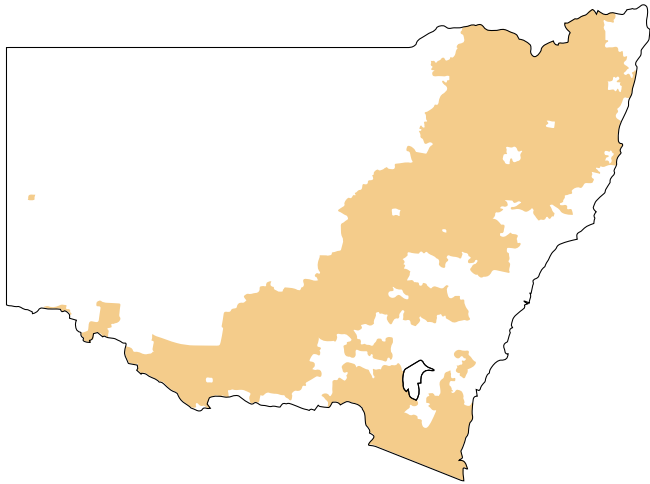
Largely unskilled, or semi-skilled and highly mobile labour markets.

Key Design Objectives

- o Ample planning and preparation is required in remote communities. Have the ability to be flexible to changing time frames and highly mobile labour markets.
- o Consider the availability of labour and materials, the distance from source or supply and high materials transport cost. Promote local employment opportunities and consider mentoring, where a community organisation enters into a joint venture with a mainstream builder. Consider alternative construction methodologies to allow construction of components off site. Assess distances and transportation modes required for components and systems.
- o Consider community perceptions and use local materials where possible. Use of high mass systems contributes to thermal performance in climate zone 4, however careful cost-benefit analysis is required where local materials are scarce and transportation needs are significant. Consider the availability of suppliers and future maintenance services when specifying utilities, fittings, fixtures and equipment.
- o Consider a multi-purpose space to allow occupants a number of flexible living arrangements.

Zone

OR



Outer Regional Australia



Locations such as:

Moree, Wee Waa

Main Characteristics

Significantly restricted accessibility to goods, services and opportunities for social interaction.

Generally a scarcity of labour and materials and increased costs for transportation.

Largely skilled, or semi-skilled labour markets.

Key Design Objectives

- o Engage in a meaningful way with indigenous people through participation as well as consultation.
- o Consider the availability of labour and materials, the distance from source or supply and high materials transport cost. Promote local employment opportunities and consider mentoring, where a community organisation enters into a joint venture with a mainstream builder. Consider alternative construction methodologies to allow construction of components off site. Assess distances and transportation modes required for components and systems.
- o Consider community perceptions and use local materials where possible. Assess whether high mass or lightweight systems are appropriate for the climate and the cost-benefit analysis where local materials are scarce and transportation needs are significant. Consider the availability of suppliers and future maintenance services when specifying utilities, fittings, fixtures and equipment.
- o Consider a multi-purpose space that could be adapted to accommodate visitors, particularly for those who travel distances for sorry business, or kin who require short term accommodation.

Zone

IR

Inner Regional Australia



Locations such as:

Dubbo, Tamworth, Armidale, Wagga Wagga, Lismore, Coffs Harbour, Goulburn Port Macquarie, Bathurst, Orange, Grafton

Main Characteristics

Some restrictions to accessibility to some goods, services and opportunities for social interaction

Generally good availability of labour and materials.

Largely skilled, or semi-skilled labour markets.

Key Design Objectives

- o Engage in a meaningful way with indigenous people through participation as well as consultation.
- o Promote local employment opportunities and consider mentoring, where a community organisation enters into a joint venture with a mainstream builder. Consider alternative construction methodologies to allow construction of components off site. Assess distances and transportation modes required for components and systems.
- o Consider community perceptions and use local materials where possible. Assess whether high mass or lightweight systems are appropriate for the climate and the cost-benefit analysis where local materials are scarce and transportation needs are significant. Consider the availability of suppliers and future maintenance services when specifying utilities, fittings, fixtures and equipment.
- o Consider a multi-purpose space that could be adapted to accommodate visitors, particularly for those who travel distances for sorry business, or kin who require short term accommodation.

Zone

MC

Major Cities of Australia



Locations such as:

Sydney, Newcastle, Gosford, Wollongong, Wyong, Parramatta

Main Characteristics

Relatively unrestricted accessibility to a wide range of goods, services and opportunities for social interaction.

Very good availability of labour and materials.

Largely skilled labour markets and a variety of builders available.

Key Design Objectives

- o Engage in a meaningful way with indigenous people through participation as well as consultation.
- o Consider a multi-purpose space that could be adapted to accommodate visitors, particularly for those who travel distances for sorry business, or kin who require short term accommodation.



Cultural Sustainability Principles

C.1 What is Cultural Sustainability?

C.2 What is Country?

C.3 General Principles

C

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Image supplied by AHO

C.1 What is Cultural Sustainability?



Providing a link between past, present and future Aboriginal cultural heritage consists of places and items that are of significance to local Aboriginal people.

This may relate to traditions, observances, lore, customs, beliefs and local history and provide a connection and sense of belonging that people have with country, nature and with each other.

AHO will conduct consultation with regional AHO staff, Elders, local community and other key stakeholders to ensure the project scope considers the needs of our clients.

From time to time designers, planners and builders may be invited to participate in engagement activities prior to commencement and during the life of AHO projects. Key principles to consider are outlined below for reference.

General principles are contained within this document for reference and awareness of cultural sustainability and how it relates to the design and construction of dwellings for AHO properties. Specific information is also included within the remaining sections D, E, F and G. References are contained within Section I for further information on these aspects.

Please refer to the Principal Project Requirements (PPR) document for site specific information regarding Aboriginal cultural heritage and sustainability for the project for which you are engaged.



Image supplied by AHO

C.2 What is 'Country'?



The meaning of 'Country' is integral to the cultural heritage of Aboriginal people. It means a place of origin; literally, culturally and spiritually. It is more than a geographical area: it is values, places, resources, stories and cultural obligations associated with that geographical area.

Each Aboriginal person is a custodian for the land in which they live. Three important aspects of country are below.

- Connecting with country (walking on country, singing songlines, mental mapping)
- Designing for country (having a wholistic understanding of people, nature and design)
- Caring for country (ensuring the built solution is complementary to country)



Image supplied by AHO



Image supplied by AHO

C.3 General Principles



- General principles provided here are based on research and guidance from Aboriginal people and protocol documents. Refer to *1. References* for acknowledgment of applicable documents or for further reading.
- Different communities have different cultural principles, values, lores/laws and protocols which vary and the approach taken will depend on the location, remoteness zone and specific community.
- **AHO will engage with** relevant Aboriginal Land Council, Elders and members of the **community to communicate the project at various stages**
- Be aware that during events of celebration or cultural significance, including 'sorry business' the community will focus on the event and other consultation or engagement may be postponed.

Respect

- Respect relates to the view of oneself, others, all living creatures and the land to ensure everything works in harmony.
- Ensure the rights of Aboriginal people are maintained to own and control their cultural heritage
- Respect the communal nature of social structures, kinship systems and decision making processes when scheduling consultation with Aboriginal people.

Community Specific

- Ensure respect is given for the diversity of Aboriginal culture by following community specific cultural protocols and traditions.
- Protocols differ between communities and are highly influenced by a community's location and climate. For detailed information on climate and remoteness zones in NSW refer to Section B of this document.
- Always consider the impact of designs so that they are respectful to Aboriginal culture.
- Refer to the Principal Project Requirements (PPR). for site specific information, including if there are important Aboriginal sites near or on the land you are working.



Image supplied by AHO

Interpretation and Integrity

- Representing Aboriginal cultures should be reflective of their cultural values and respectful of their customary lores /laws.
- Ensure Aboriginal culture is not exploited or disadvantaged by the commercial representation of their culture.
- Employ Aboriginal staff and consultants where possible.

Deep Listening and Observation

- Listening is more important than speaking. True engagement with country starts with deep listening.
- Ensure respectful and culturally specific engagement when communicating and consulting with the community.
- Collaborate with Elders and the community to share the wealth of knowledge Aboriginal people hold about country, the land and the environment.
- Listen with an open mind and engage all the senses, not just sight. Patience is important to open up important skills of observation.
- Country communicates with all life forms and sends signals. This may be more evident in remote or regional areas where there is less sensory interference, however it is important to also engage with country in cities.

Consultation

- Aboriginal people should be consulted and involved in all decisions affecting their cultural heritage, especially the provision of housing to suit their needs and the needs of the community.
- Engage with local Aboriginal people in the location you are working from the very beginning of a project and continuously through the process. Do not simply seek approval at the end.
- Provide opportunities for meaningful and active participation of community members. Acknowledge and, where appropriate, remunerate people for their contribution.
- Consider the scheduling of consultation around cultural obligations, travel commitments (especially in remote locations), and consider appropriate timeframes for respectful consideration by the community.
- Be aware that Aboriginal kinship systems are complex and will impact on how you can interact with members of a community.



Sustainability

- Consider carefully the siting of dwellings to suit the local culture and climate, including within the context of the larger landscape of Aboriginal narratives.
- Practice passive and sustainable design strategies. For detailed information, refer to Section E of this document.
- Utilise sustainable materials where possible, including the use of locally produced, low embodied energy, renewable materials that can be recycled.
- Utilise appropriate water, energy and waste management systems.



Image supplied by AHO

Site Responsive

- The design of dwellings should be firmly grounded and responsive to place and country.
- Ensure designs are responsive to climate, remoteness, siting, orientation and local culture.
- Explore opportunities to work with locally informed vernacular materials, craftsmanship and construction methods.



Responsibility

- We have a professional and social responsibility to establish, maintain and promote ethical standards and principles in relation to Aboriginal culture.
- We are all responsible for caring for country and for family.
- We can all ensure nothing is wasted and promote sustainable practices in our lives and in the construction of dwellings.



Siting Principles

D.1 Siting and Orientation

D.2 Ground Conditions

D.3 Access and Movement

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D.1.1 Walking on Country



An important aspect of the site analysis process is ‘Walking on Country’. Where possible, spend time and connect with country. Always seek permission from AHO before visiting a site. AHO will liaise with the relevant Land Council, Local Council, Elders and community to ensure specific protocols are followed.

Key aspects include:

- Sensing and feeling the place you are in
- Observing with all the senses
- Patiently waiting for the signals the country sends
- Focused access and engagement with Elders, community and custodians (Note: AHO leads all consultation and engagement)
- Mentally mapping the natural landscape and features, including paths, edges, districts, nodes, landmarks
- Connect with the unique place you are working

D.1.2 Cultural Principles and Key Features of the Land

2 4 5 6 7



Where possible work with the natural features of country. There is a value hierarchy regarding key features of the land. The most important hierarchy is rivers, then mountains. Where possible, do not build too close to ridge tops and waterways to respect the cultural principles and practicality of sites, eg floodplains.



Mountains

- Hold spiritual and practical significance, including an important place for teaching, viewing points and gathering of resources.
- Where possible, mountains should be generally left unbuilt upon to show respect to culture.



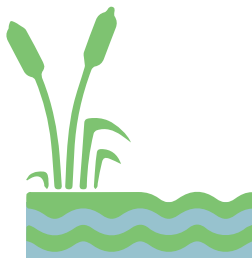
Rainforest

- A place to gather rich resources of food
- Provides a cool environment and cover for people and animals.



Open woodlands, grass areas and grass pathways

- Important hunting grounds which are kept clear for people and animals .



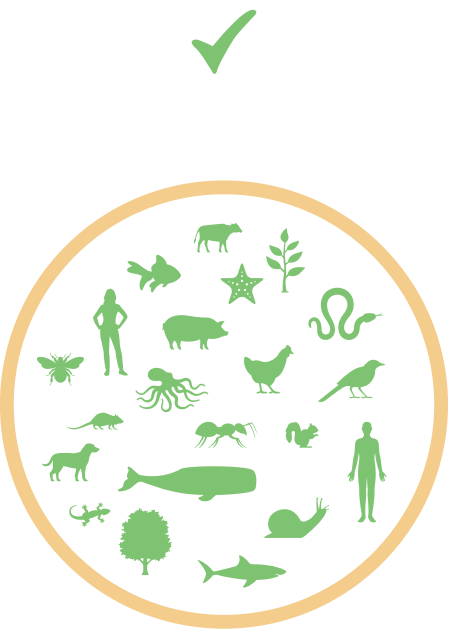
Wetlands

- Important resource areas, providing for abundant life

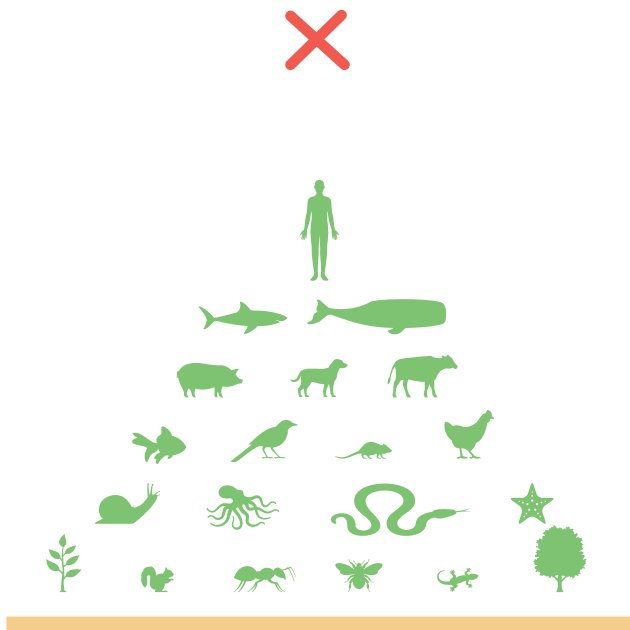


Beaches, rivers and waterways

- Holds spiritual and practical significance, expresses the life giving properties of water



Eco (to be equal and care for country)



Ego (to rule over country)

D.1.3 Protecting the Natural Environment



Protection of the environment is an important aspect of building design and central to the cultural heritage of Aboriginal people. We are all responsible for caring for country.

Key aspects include:

- Respecting one self, others, all living creatures and the land in order to live in harmony
- Managing resources through time and through generations, only take what you need
- Protecting and contributing to maintain the environment
- Practice efficient treatment of vital resources, eg water
- Have regard for the seasonal exploitation of particular resources, eg management according to ecological events
- Promote biodiversity and retain or rebuild a diverse range of nature
- Country can heal, consider giving back through landscaping of the property and where possible the surrounding land.
- Country will give feedback, where possible let country be what it wants to be, eg floodplains

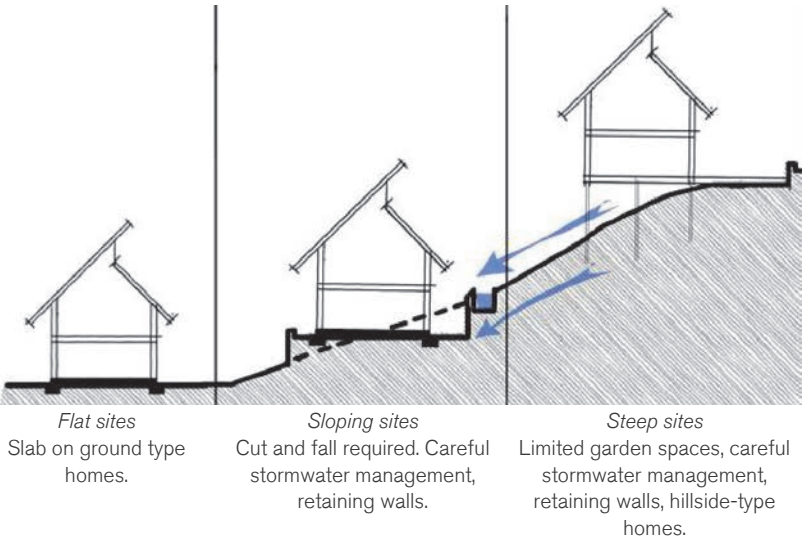
Built form can change the nature of a site. Sounds choices can enhance and repair , whereas poor siting choices can be destructive.

- Retain local flora and fauna and encourage it to flourish
- Protect waterways from pollution
- Reduce the threat of bushfire
- Maintain or improve the soil condition, prevent soil erosion
- Protect natural features of the site
- Preserve culturally significant features

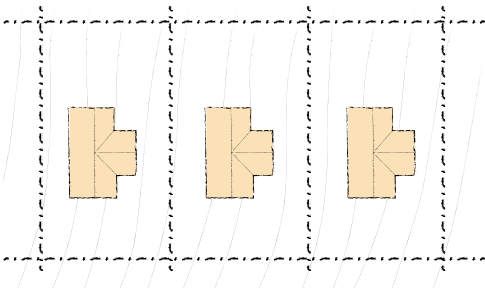
D.1.4 Topography



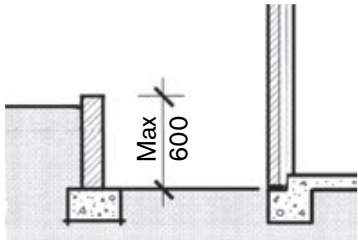
Site topography is an important aspect of building design. Challenging land forms can impose stringent constraints resulting in higher environmental impacts and additional costs. On the other hand, they are often conducive to good passive design and, with innovative solutions, they provide for exciting living environments and sustainable homes.



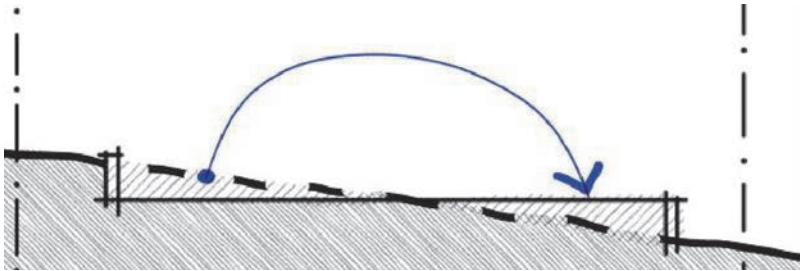
- Consider the impact of the site slope: slab-on-ground house types are good for flat sites; hillside houses (such as pole framed houses) are better suited to steep sloping sites.
- Steep sites with a gradient exceeding 30° may require extensive cut and fill and may be unstable - construction on these sites can be significantly more expensive.
- Consider the spiritual and practical significance of mountains, culturally they are seen as teaching points and view points which are best left unbuilt upon.



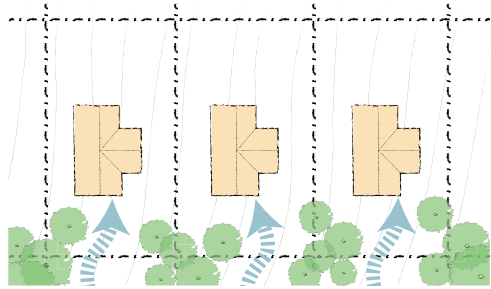
- Consider building along contour lines, not across them. Site topography may also be irregular with some parts steeper than others, and the fall may lie diagonally across the site; these sites require very site-specific building designs.



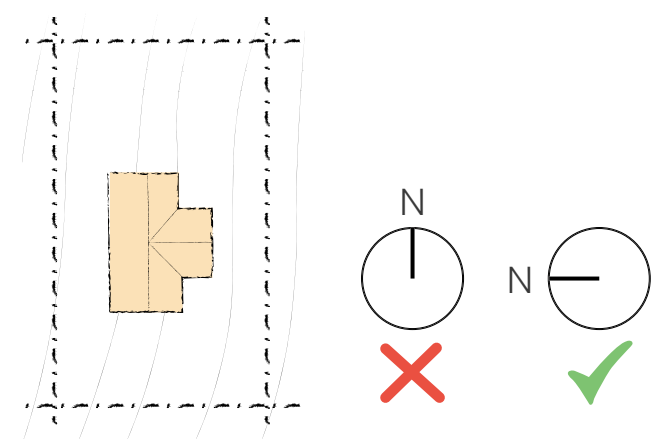
- Avoid retaining walls higher than 600mm where possible.



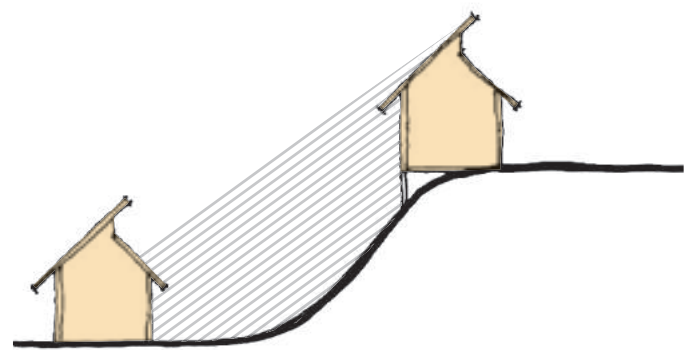
- Balance cut and fill to reduce the amount of soil that needs to be removed from site.
- Consider the site topography in terms of stormwater run-off. Steeply sloping sites increase stormwater runoff above and below the surface.
- Consider the impact of overshadowing through topography. A south-facing slope increases the potential for overshadowing, whereas north-facing slopes increase the potential for solar access



- Use topography to channel cooling breezes



Minimise westerly exposure



Consider the impact of overshadowing on neighbouring properties

Warm Humid and Hot Dry Climates

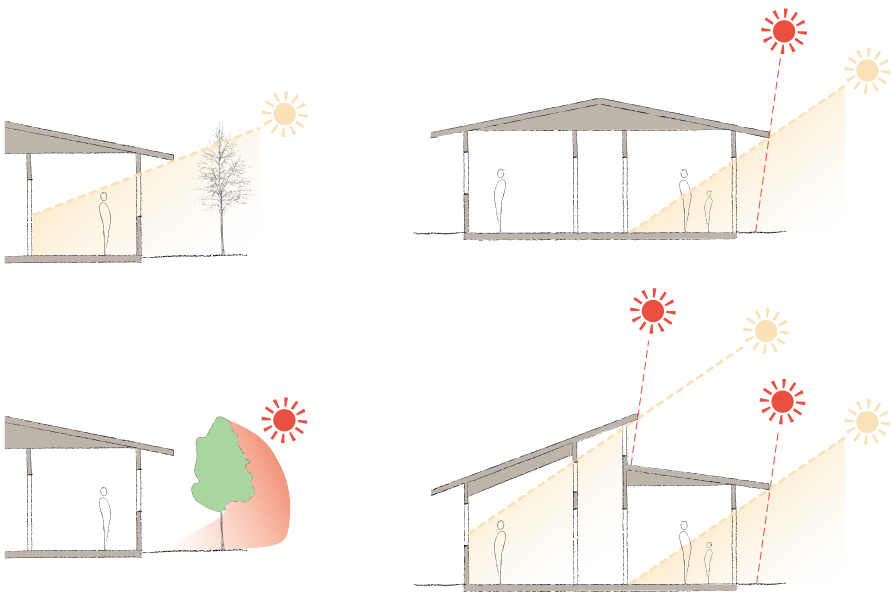


- Consider selecting sites with topographies that will minimise heat load on the walls and enable the capture of prevailing breezes
- North-facing buildings are still desirable as they are easy to shade through eaves and overhangs.
- Try to work with the site topography to avoid west-facing daytime living areas that flow to outdoor spaces with similar orientation
- Consider the impact of overshadowing neighbouring dwellings due to slope orientation.

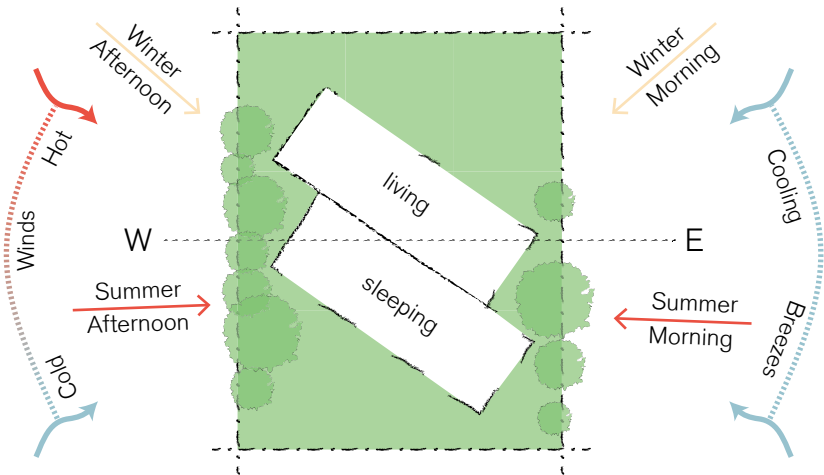
Warm, Mild and Cool Temperate Climates



- A north-facing slope increases the potential for access to northern sun and is ideal for higher housing densities.
- Where possible, choose a site with a topography that can accommodate north-facing daytime living areas that flow to outdoor spaces with similar orientation.
- Consider the impact of overshadowing on neighbouring dwellings due to slope orientation. This is to be minimised to maximise solar heat gain.



Screen with deciduous vegetation and design appropriate eaves.



Orientated up to 30° east of solar north for cool temperate climates: *Your Home, 5th edition*.

D.1.5 Solar Orientation



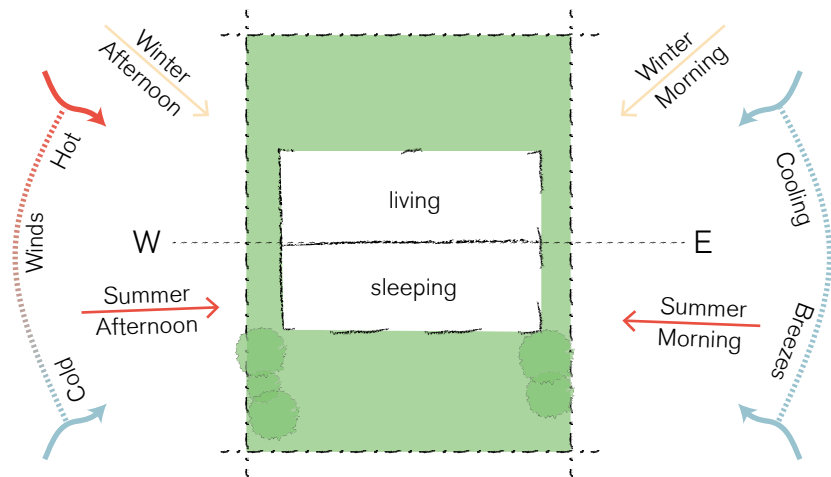
When orientating the position of a house and planning the internal layout, it is important to first access the sun's path and its seasonal variations. Solar orientation refers to the sun's varying position in relation to a building's fixed position. A well orientated building facilitates energy efficient passive heating and cooling design, and has the potential to create a more comfortable place to live whilst reducing energy costs.

- Consider shading west facing windows and walls
- Buildings should be orientated to capture cool breezes and other forms of natural cooling.
- Maximise north-facing daytime living areas where passive solar access is available. Avoid placing obstructions such as carports or sheds to the north,
- Avoid west-facing bedrooms to maintain sleeping comfort.
- Locate utility areas (laundries, bathrooms and garages) on the south or west where possible.
- Prune vegetation that blocks winter sun; alternatively plant deciduous vegetation that allows winter sun in but provides summer shade.

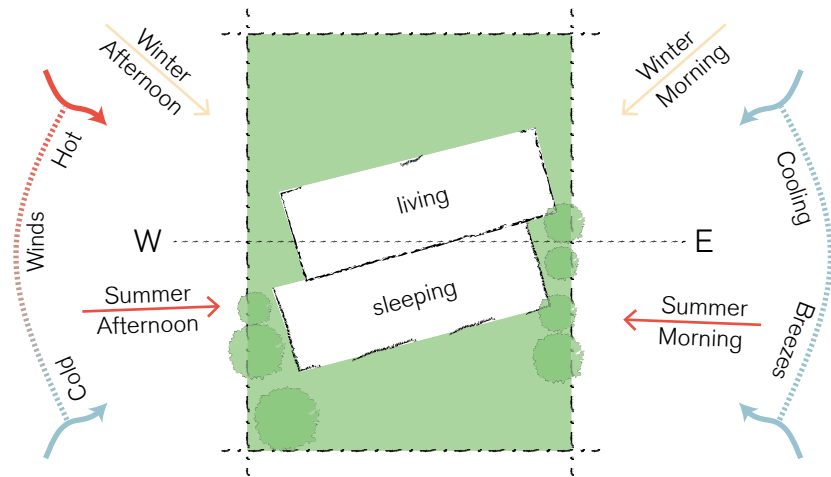
Mixed climates - cooling dominated



- This configuration maximises exposure to cooling breezes but reduces passive solar heat gains. It requires shade plantings to the west to eliminate solar gains through south-facing windows in summer and protect the house from westerly winds.
- In warmer climates,
 - Shade plantings on the east are also required but should not block breezes.
 - Clerestory windows along the spine can increase solar and breeze access to sleeping areas.
 - Provide shaded outdoor living areas
- Ensure that landscape and adjacent buildings funnel rather than block beneficial breezes and provide shade to walls.
- Existing topography and site conditions can provide opportunities for shade.
- Uninterrupted solar access to roof areas is highly desirable for solar collectors.
- Configure rooms to capture and encourage the flow-through of cooling breezes, and position door and window openings to improve cross-ventilation paths.
- Minimise the size of east and west-facing walls and avoid windows in these walls unless fully shaded.



Orientated to solar north for temperate climates. *Your Home, 5th edition.*



Orientated up to 15° west of solar north for cool temperate climates: *Your Home, 5th edition.*

Temperate climate orientation

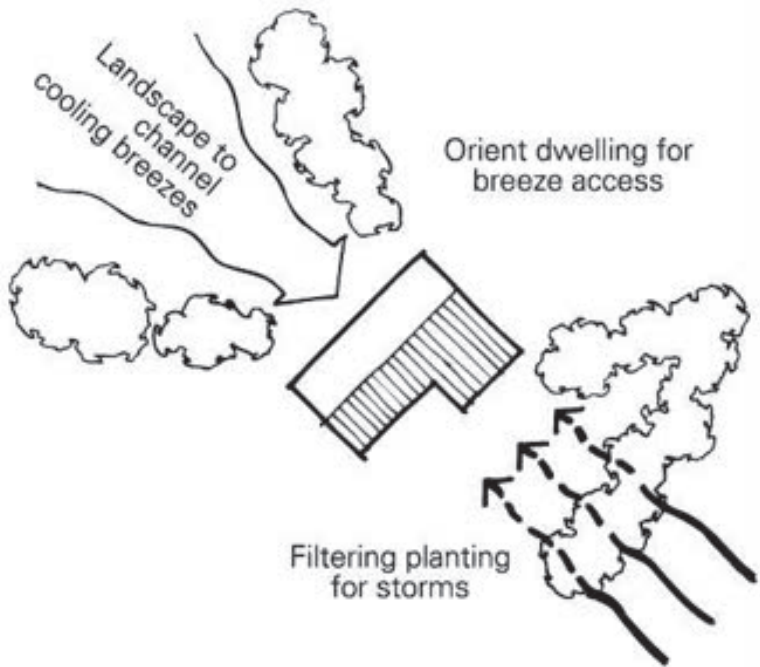


- This orientation allows for passive heating of living areas during the day and cooler, southerly sleeping areas.
- In cooler climates, a thermal mass wall separating these zones would transfer warmth to sleeping areas.
- In warmer regions, passively shaded clerestory windows along the spine would allow hot air to escape from bedrooms in summer while allowing in a small amount of winter sun.

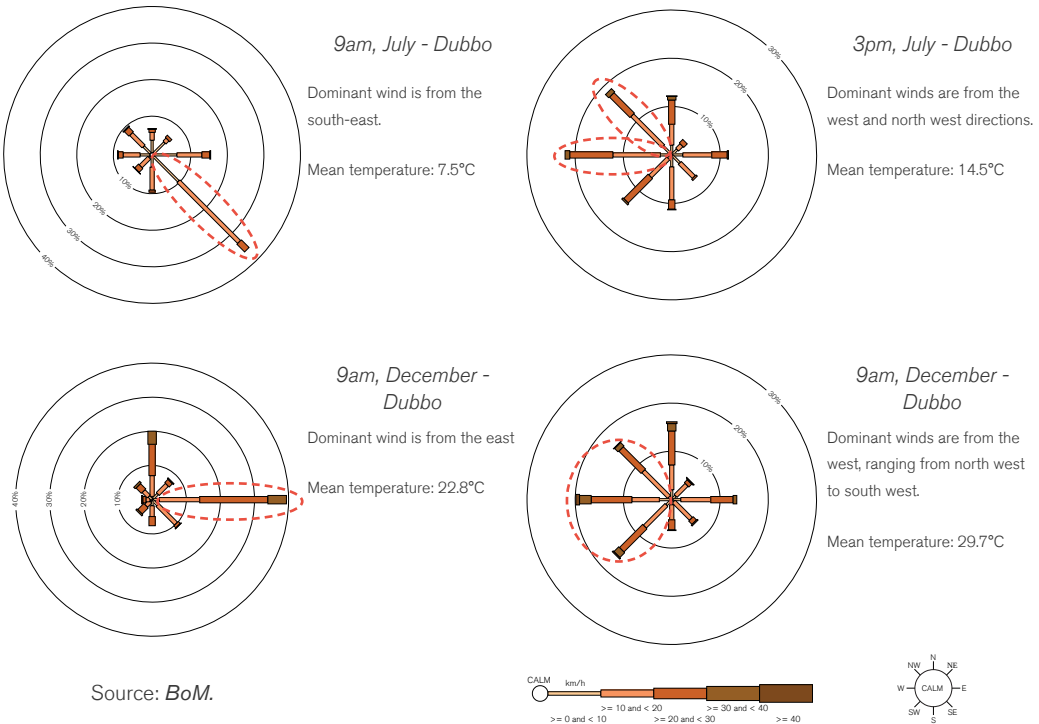
Cool temperate climate - heating dominated



- The above orientation maximises late afternoon solar gains and allows morning sun in winter. It excludes summer sun from west and south-facing windows and minimises exposure to westerly winds while allowing reasonable breeze access.
- Dense planting to the west shades walls from summer sun and protects them from cold winters.
- This configuration is also useful in warmer climates where cooling breezes are from the south-east.
- Utilise the sun as a source of free home heating by letting winter sun in and keeping unwanted summer sun out.
- Variations in orientation towards east and west can have advantages in some climates and for some activities. For example, in cold climates, orientations west of north increase solar gains in the afternoon when they are most desirable for evening comfort, but east of north can warm the house more in the mornings, improving daytime comfort for those who are at home then.
- Where possible, choose a site that can accommodate north-facing daytime living areas that flow to outdoor spaces with similar orientation.



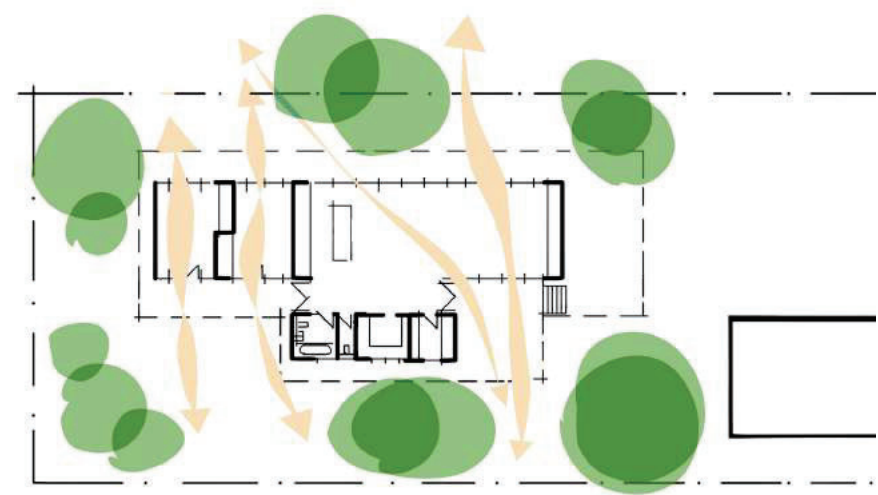
Source: *Your Home*, 5th edition.



D.1.6 Wind Orientation



- Where the climate provides cooling breezes, maximise their flow through a home when cooling is required, especially to living areas.
- Unlike cool night air, these breezes tend to occur in the late afternoon or early evening when cooling requirements usually peak.
- Coastal breezes are usually from an onshore direction.
- In mountainous or hilly areas, cool breezes often flow down slopes and valleys in late evening and early morning, as heat radiating to clear night skies cools the land mass and creates cool air currents.
- Thermal currents are common in flatter, inland areas, created by daily heating and cooling. They are often of short duration in early morning and evening but with good design can yield worthwhile cooling benefits.
- Wind doesn't blow through a building — it is sucked towards areas of lower air pressure. To draw the breeze through, use larger openings on the leeward (low pressure or downwind) side of the house and smaller openings on the breeze or windward (high pressure or upwind) side.
- Position windows (vertically and horizontally) to direct airflow to the area where occupants spend most time (e.g. dining table, lounge or bed).
- Wind roses can be obtained from the Bureau of Meteorology, which can be sorted by month or season, as well as time intervals (see above).
- Further site specific studies may need to be carried out for warmer climates, in order to ascertain the direction of night-time cooling breezes in summer.



Maximise cooling breezes through dwelling. *Your Home, 5th edition.*

Warm Humid and Hot Dry Climates

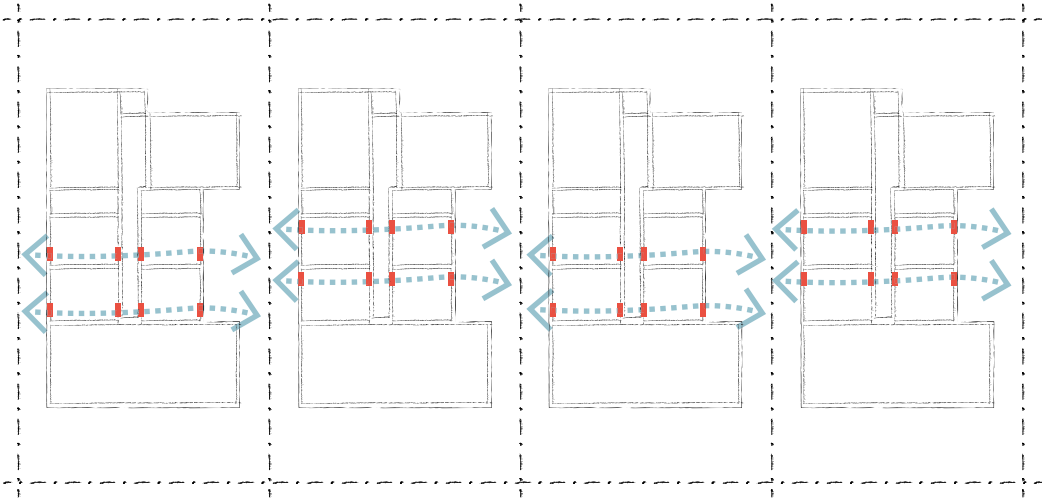


- o Orientate the building to take full advantage of cooling breezes, and position landscaping and outbuildings to funnel breezes over, under and through the building.
- o Attempt to prioritise design for night-time sleeping comfort. Consider sleep-out spaces.
- o Consider installing ceiling fans
- o Maximise external wall areas (plans with one room depth are ideal) to encourage cross ventilation and, if possible, elevate the building to permit air flow beneath floors.
- o Design to maximise beneficial cooling breezes by providing multiple flow paths and minimising potential barriers.

Warm, Mild and Cool Temperate Climates



- o Orientate the building to avoid exposure to prevailing cold winds that affect heat losses and produce uncomfortable draughts.
- o Consider adopting artificial obstructions to block out wind, using materials with low air permeability.
- o Consider the use of vegetation to reduce the negative impact of cold wind in winter.
- o In temperate climates that require winter heating, look to design to maximise beneficial cooling breezes in summer, whilst providing a degree of protection from harsh winter winds.



Offset window openings from building to building to maintain privacy.

D.1.7 Building Separation



- Careful consideration needs to be given to setbacks - clearances between the site boundary and building walls required by planning rules.
- Setbacks constrain the height and location of the building from the ground and have a profound influence on building volume and spatial configuration.
- Offset window alignment between houses to increase privacy
- Maintain window alignment within the dwelling to promote cross ventilation
- Reduced separation due to setbacks will affect the size and orientation of windows, flexibility to locate the private open areas and covered outdoor terraces.
- Building separation on sites with non-rectangular geometries on a block can be further exacerbated by inflexible setbacks and planning controls.
- A 'tight site' has little flexibility. The shape of the block, planning constraints and the design brief can lead to only minimum building separation.
- Where building separation is compromised or minimised, design solutions such as reducing the physical building footprint, increasing the number of building levels or consolidating blocks may be necessary.
- Dense urban environments can lead to no separation at all – attached dwellings. In such locations, good design that works from first principles can still achieve very high residential amenity and good passive performance.
- The degree of separation can impact on privacy. Design openings to allow for privacy
- Have consideration for the design of multiple dwelling lots or the existing adjacent lots, and adjust the envelope window locations and separation to suit.

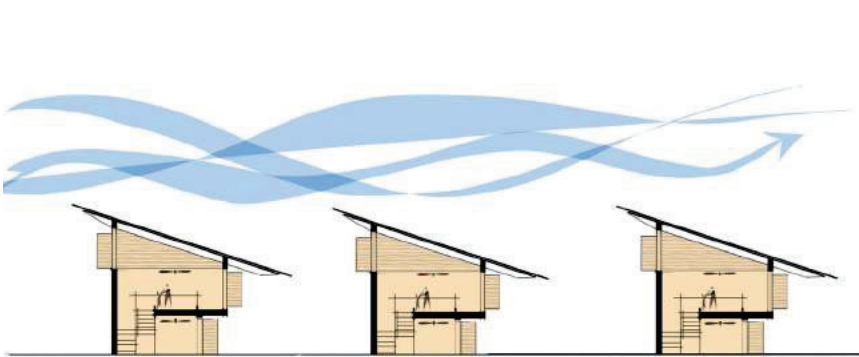


Allow adequate separation for cooling breezes to be drawn into dwelling

Warm Humid and Hot Dry Climates



- Ensure adequate separation is maintained between adjacent dwellings to allow for cooling breezes to be drawn into living spaces. Avoid “wind shadow” where possible
- The distance between the buildings should allow for landscaping and outbuildings to funnel breezes over, under and through the houses and provide shade on the ground and on the building walls.
- In detached dwellings ensure that building separation is maintained to avoid the transfer of radiant heat between them.
- Wall sharing in semi-detached buildings can lead to higher performance, as one wall is not exposed to the elements.
- Building separation and block sizes must be sufficient to prevent the occurrence of boxy and enclosed floor plans and allow for covered verandahs and open plan layouts



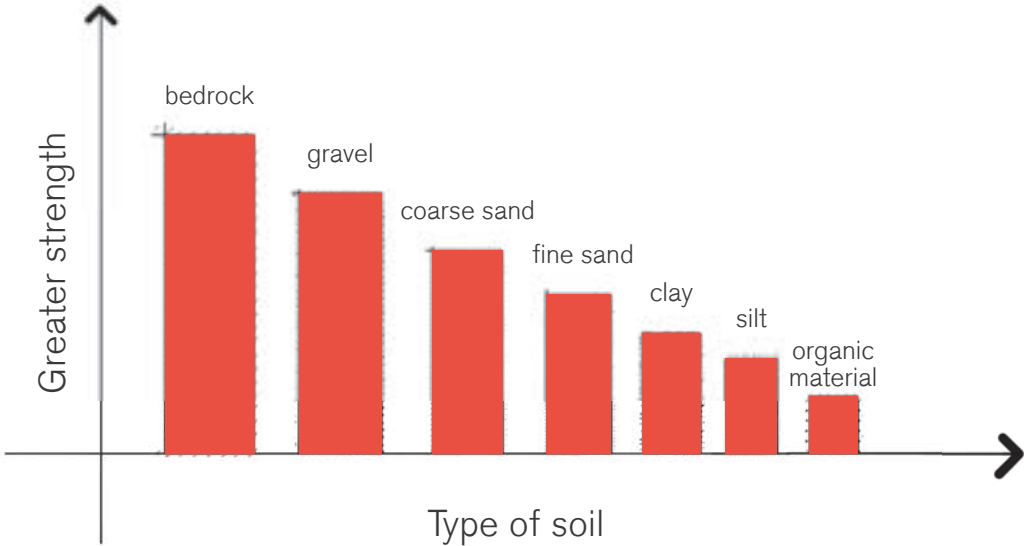
Avoid ‘wind shadow’

Warm, Mild and Cool Temperate Climates



- Ensure adequate separation is maintained between adjacent dwellings to allow for solar access and cross ventilation (indoor air quality) where possible
- Where possible, ensure that the distance between the dwellings allows for landscaping with deciduous trees that provide shade in the summer while allowing solar gains in winter
- In colder climates shared walls (semi-detached houses) could help reduce heat losses and achieve more spacious outdoor areas in small lots

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D.2.1 Soil Classification



- Consider the existing ground condition, such as rock, sand, clay or wetlands. Different soil conditions affect the type of foundations and cost of construction. Soil must have the strength or bearing capacity to carry the building load with minimum movement. Seasonal wet or dry weather and other site conditions causes sudden extreme volume changes and movement in soil.
- Reactive soil is the way that a particular soil reacts to changing moisture content. Reactive soils absorb water and change in volume which can cause footings to buckle or sink.
 - Seasonal weather and site conditions can cause excessive water and erosion of some soils which may result in subsidence of foundations and building damage.
 - Generally rocky terrain and sandy sites are not usually prone to expansion and contraction.
 - Generally avoid clay and wetlands due to their inherent instability.
 - Refer to the soil classification according to Australian Standards 2870 and ensure structural engineering is designed to achieve the required strength and stiffness to counter ground movement.
 - Generally the higher the soil reactivity, the stronger and stiffer the footing and slab system will need to be.

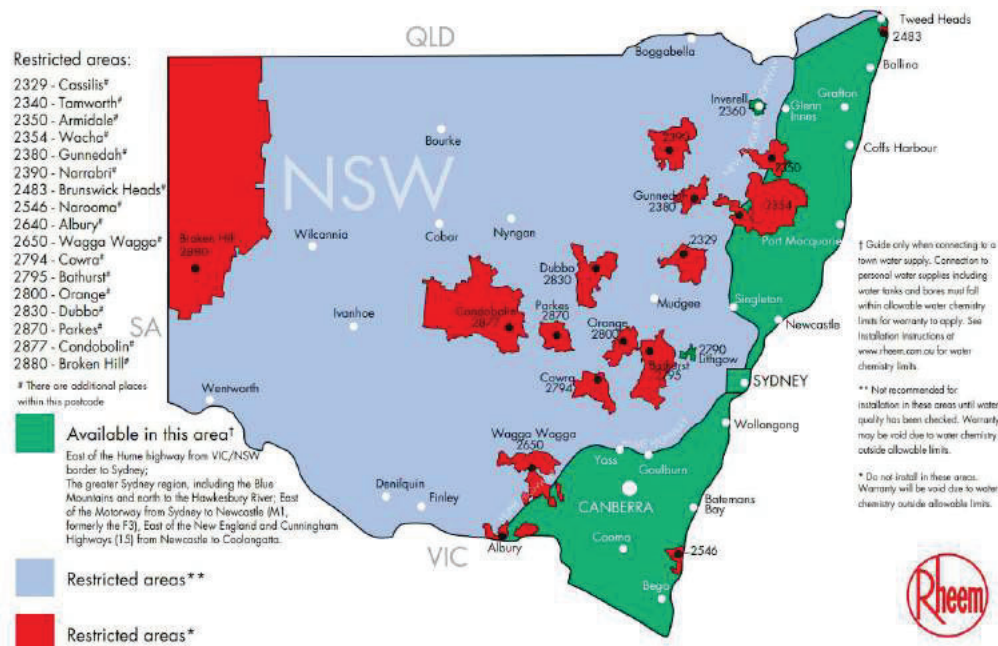
Class	Foundation
A	Most sand and rock sites with little or no ground movement from moisture changes
S	Slightly reactive clay sites with only slight ground movement from moisture changes
M	Moderately reactive clay sites which can experience moderate ground movement from moisture changes
H1*	Highly reactive clay sites which can experience high ground movement from moisture changes
H2*	Highly reactive clay sites which can experience very high ground movement from moisture changes
E*	Extremely reactive clay sites which can experience extreme ground movement from moisture changes
A to P*	Filled sites - see AS 2870
P*	Problematic sites which include soft soils, such as soft clay or silt or loose sands; landslip; mine subsidence; collapsing soils; soils subject to erosion; reactive sites subject to abnormal moisture conditions or sites which cannot be classified otherwise

* Structural system requires AHO approval

NCC, Volume 2, Part 3.2.4 (p. 119) and AS 2870 - 2011, Part 2.1 (p. 17).

General Considerations

- Ensure good drainage away from the edges of buildings
- Manage stormwater drainage appropriately throughout the construction phase
- Avoid positioning trees and landscaping beds in the immediate vicinity of dwellings
- Building design should avoid excessive cut and fill
- Engage or consult engineers with appropriate local knowledge of soil conditions and footing systems
- Structural design and appropriateness of structural system for local conditions requires approval by AHO for sites classified as H1 and below.



Source: Rheem

D.2.2 Water Classification



Water hardness is a measurement of mineral content within water, either acidic or alkaline. Water that is too hard (highly alkaline) can deposit minerals that cause accumulation of scale. Water that is too soft (highly acidic) can be aggressive, increasing the risk of corrosion, eroding some metals in plumbing systems. Consider the pH, chlorine level, saturation index and total dissolved solids in determining water quality. Both hard and soft water can impact efficiency, longevity and life cycle on appliances and services.

Confirm with the relevant manufacturer the type of installation recommended in your location.

An example map is shown above for reference of areas where installation is not recommended until quality of water has been checked or not possible due to water chemistry being outside allowable limits. Warranties in these areas may be void.

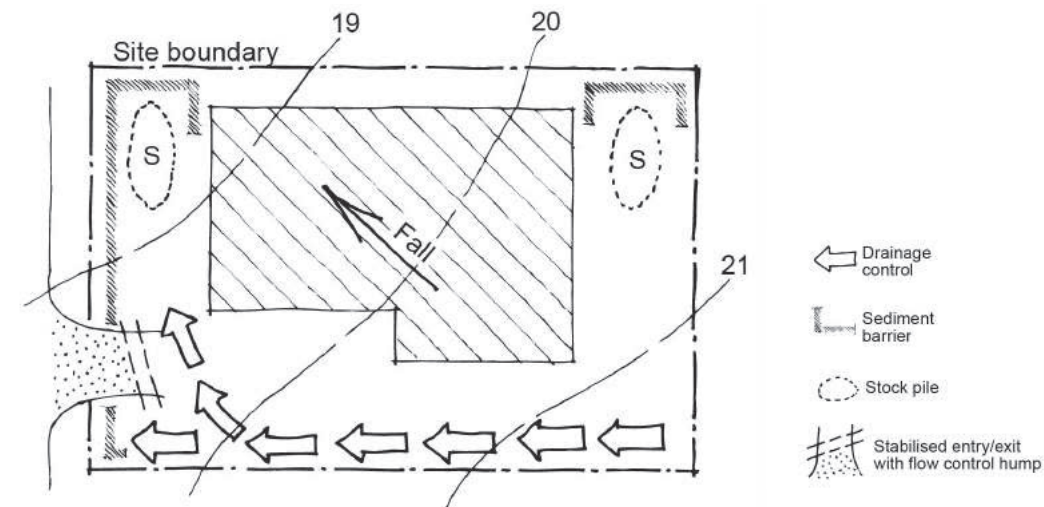
General Considerations

- Liaise with the relevant manufacturers for water chemistry limits and to set design parameters and maintenance requirements to mitigate scale accumulation and corrosion in hard and soft waters, respectively.
- Confirm if a warranty is available based on the dissolved solids measurement in the water supply at the proposed location. Confirm water hardness with the local water supply authority.
- Generally, connection to personal water supplies including rain water tanks and bores must fall within allowable water chemistry limits for warranty to apply.
- Liaise with relevant hot water system manufacturer to ensure the correct colour anode is chosen to suit the water chemistry in the available water supply.
- Consider mitigation measures such as reducing water tank temperature, choosing a noncorroding tank material and maintenance inspections of anodes.
- Ensure cost effectiveness and life cycle costing are taken into consideration when choosing appropriate appliances and servicing systems.
- Systems with mechanical pumps should be avoided in restricted areas as per the adjacent map, or as recommended by the manufacturer.

D. Siting Principles

AHO Design Guidelines NSW

2. Ground Conditions



Source: *Your Home*, 5th edition.

D.2.3 Sediment Control

2 4 5 6 7

- o Consider designing to avoid excessive cut and fill and unnecessary clearing of vegetation
- o Attempt to maintain existing site drainage patterns during construction
- o Avoid carrying out site activities that disturb soil during periods of expected heavy or lengthy rainfall - wet seasons wherever possible
- o Divert uncontaminated stormwater away from the work area using flow diversion devices wherever possible
- o Use sediment control devices such as the woven sediment fences, vegetated filter strips, inlet traps so as to minimise contaminated water runoff from the site wherever possible
- o Protect stockpiles and materials that may erode with waterproof coverings. Divert stormwater runoff away from these and protect with sediment barriers



The driveway at this AHO property allows for a car to be parked outside the garage, within the property boundary.

D.3.1 Pedestrian and Vehicle Access



- Where possible provide separate access for pedestrians adjacent to the vehicle driveway
- Where the parking area forms part of the dwelling access the space should be designed as follows.
 - provide a minimum dimension of 3.2 x 5.4m
 - be constructed as an even, firm and slip-resistant surface
 - be built to a maximum gradient of 1:40, or 1:33 on bitumen
- Driveway cross-overs to be clear from street trees by a minimum of 1.5m.
- Minimum width of the driveway must enable safe access to the garage.
- Minimum length of the driveway must accommodate one car parked on the driveway within the block

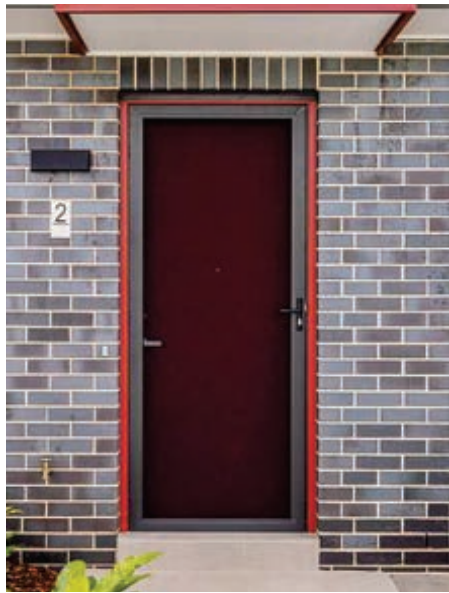


Landscaping and transparent fences allow passive surveillance at this AHO property.

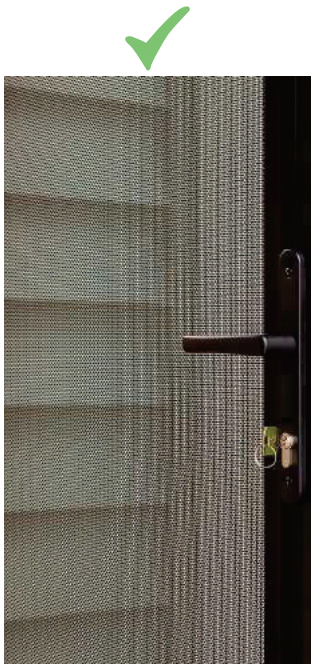
D.3.2 Streetscape



- Ensure dwellings on corner lots address both streets
- Consider locating habitable rooms to address the street
- Consider the location of street bins, water tanks and utilities in relation to street visibility
- Front porches and verandahs, as well as landscaped gardens at the front of the dwelling improve the building's relationship with the street and surrounding buildings
- Consider avoiding high fences and hedges along the front boundary to improve connection with the street



Use of an integrated security screen in front of the entry door at a typical AHO property



Crimsafe screen door



Diamond pattern grilles

D.3.3 Safety and Security



- Security screens are to be provided to all ground floor and upper level hinged and sliding doors.
 - All openable windows must be capable of being locked in a partial open (safe ventilation) and closed position, and keyed alike.
 - Security screens are not required to openable windows, (provide insect screens) **unless directed by AHO.**
 - Provide heavy duty screen doors to front and rear entry doors. Crimsafe or equivalent security screens are preferred.
- All external and internal doors are to be solid core doors.
 - A solid core door must be installed when there is internal access to the garage.
 - Provide clear sightlines to the front gate and entry with strong fences around yards.
 - Focus on emotional security and a feeling of general safety at home.
 - Provide security view to entry door.
- Provide adequate external lighting to allow safe access and circulation within individual dwellings, for example to the front and rear entry, external doorways, laundry, patio, balcony, garage/carport.
 - Manual override switches are required for any sensor lights.



Building Envelope Principles

E.1 General Design Principles

E.2 Daylight Control

E.3 Ventilation

E.4 Thermal Performance

E.5 Construction

E

E.1.1 Facade Design

2 4 5 6 7



The building facade should be of simple design and sit comfortably within the surrounding streetscape. This architectural language is characterised by the following design strategies:

- The idea that “form follows function”, meaning that the result of design should derive directly from its purpose. Every design decision must have a functional benefit, if it is purely aesthetic, it fails.
- In practice, single story houses, for example, should be designed to look like single storey homes of its time, climate and place.

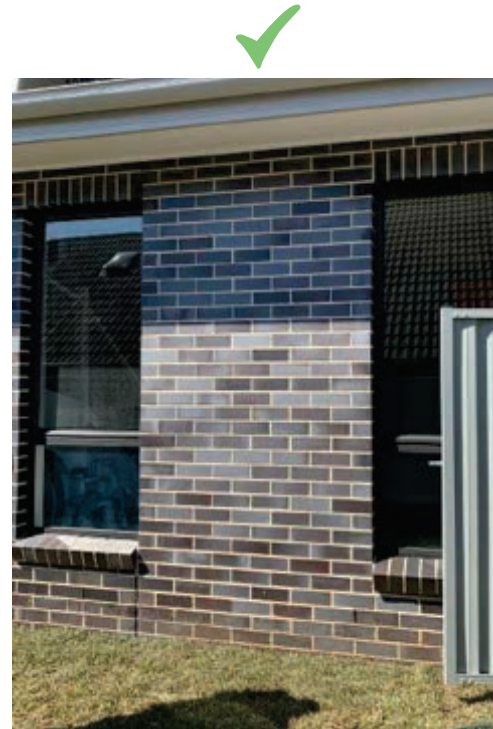
- Building forms should be simple, directly detailed, true to the materials used and without any complex detailing or junctions which have no aim other than to be ornamental.
- Avoid unnecessary steps in plan that create complex detailing
- Use conventional roof forms and avoid unnecessary valleys in rooves.

- Avoid multiple changes of materials within the facade.
- It is preferable to continue the facade material around the corner and “wrap the volume” rather than to change materials on each face. Avoid cladding individual faces.
- Material changes for no purpose other than ornamentation or interest should be avoided.
- Use glazing to bring in light and have regard to the orientation and extent to ensure it is functional.

E. Building Envelope Principles

AHO Design Guidelines NSW

1. General Design Principles

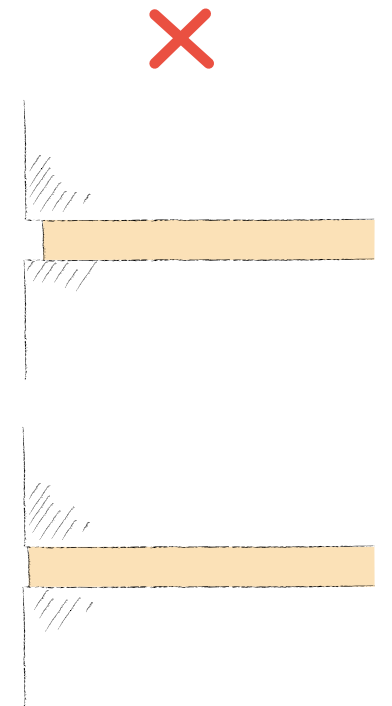
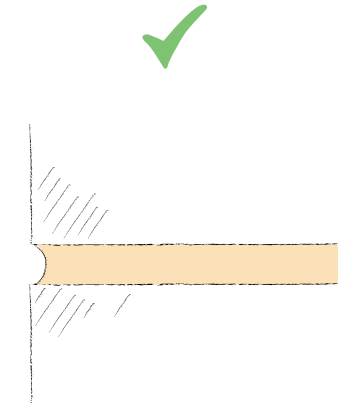
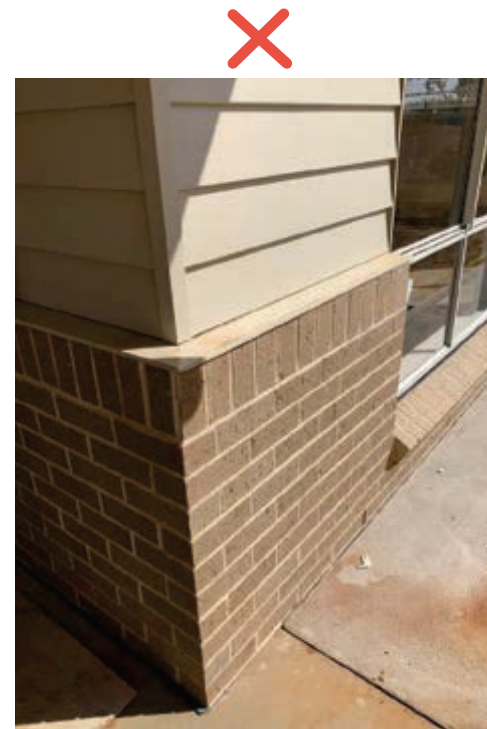


- Building architecture should seek to express “truth to materials”, meaning that the true nature or natural appearance of a material ought to be seen rather than concealed or altered to represent something else
- Visual emphasis is on horizontal and vertical lines, not on diagonals
- Use of materials should be functional and rational, with honest and direct detailing, and with an openness to structural innovation and the elimination of ornament.
- The use of pre-finished materials, such as brick and pre-finished metal are preferred over post-finished cladding such as render and paint due to ongoing maintenance costs.
- The entry to the dwelling should be visible from the street
- Bathroom or laundry windows should not be on the street facade
- The garage entry line should be recessed from the main facade
- At least one window from a habitable room should face the street to provide passive surveillance

E. Building Envelope Principles

AHO Design Guidelines NSW

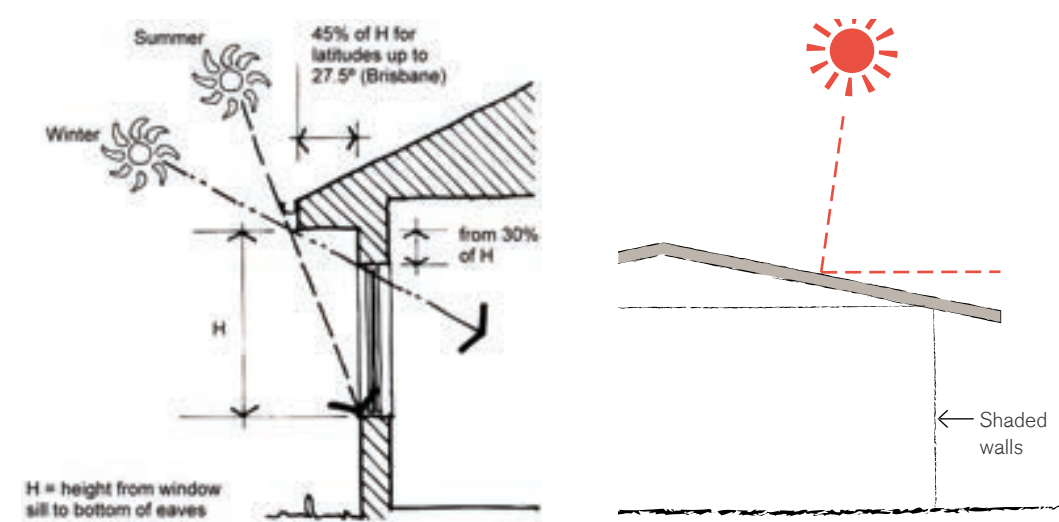
1. General Design Principles



Preferred masonry joints

- Building datums should be set at logical positions, for example between the lower and upper floors, (rather than within a single storey), or at an internal corner.
- Consider where and how the material changes and the articulation of detailing.
- Generally detail over flashing or flush facade transitions rather than ledges where water can pond and cause maintenance concerns.

- Brick joints should offer the best moisture resistance, value for money and quality appearance.
- Generally use ironed/rounded joints rather than raked or flush joints.



Source: *Your Home*, 5th edition.

E.1.2 Roof Form and Awning Design



- Flat, skillion or pitched roofs are permissible, valleys should be minimised
- Thick and insulated roofs with wide eaves should be designed to provide adequate shading as well as protection from solar heat.
- Increasing roof insulation over and above NCC requirements is an effective strategy to reduce heat transfer in all climates.
- In NSW, eave depth should be a minimum of 45% of the height from the window sill to the bottom of the eaves.
- All roof penetrations are to be flashed and sealed to prevent roof leaks.
- Any external features such as sunshades, screens or pergolas must be robust in construction and designed to withstand potential vandalism and inappropriate usage or climbing.
- Metal rooves are preferred due to their low maintenance qualities. Roof drainage and downpipes must be designed to prevent water ingress into the building fabric.
- Box gutters are not permitted.

Hot Dry, Warm Humid and Warm/Mild Temperate Climates

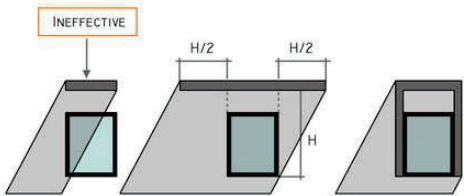


- Use deep overhangs to protect walls and openings. Deep overhangs, however, are only partially useful in east-west facades. Combine with vertical screens, or louvers, for effective shading to openings.
- Dark roofing materials should be avoided to lessen the impact of heat loading
- Roof spaces should be ventilated

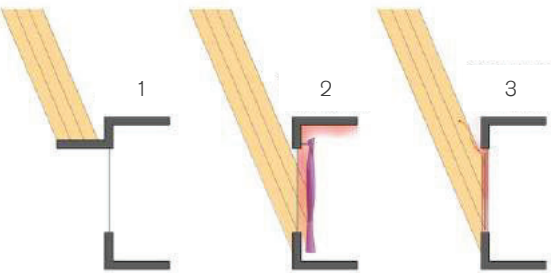
Cool Temperate Climates



- Use deep overhangs to protect walls and openings. Deep overhangs, however, are only partially useful in east-west facades. Combine with vertical screens, or louvers, for effective shading to openings.
- Ventilate roof spaces in summer and seal them in winter (use automated fans or closeable roof ventilators).



Elevation of shading device configurations for north facing facades.



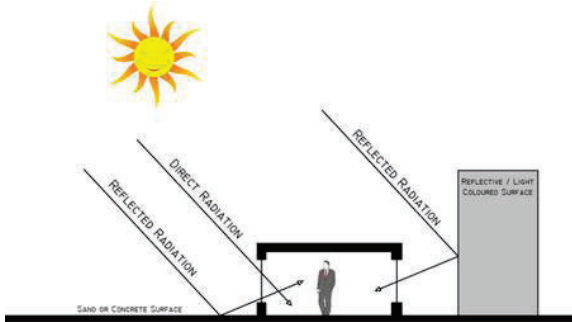
1. Overhang / no direct sun enters the space.
2. Internal shade / sunlight enters the space, heat builds up between curtain and window.
3. Blind and double glazing / heat builds up in the window itself and is exhausted to the outside.

Source: Carbon Neutral Design Project, Terri Meyer Boake.

E.2.1 Shading



- By shading a building and its outdoor spaces, summer temperatures can be reduced, comfort improved and energy saved.
- Internal shading does not prevent heat gain unless it is reflective.
- Fixed shading devices (eaves, awnings, pergolas and louvres) can regulate solar access on northern elevations throughout the year, without requiring any user effort.
- Protect all roof glazing and skylights with external shading.
- North-facing openings receive higher angle sun in summer, and therefore require narrower overhead shading devices than east or west-facing openings.
- Where possible, keep the area of glazing on the east and west orientations to a minimum.
- East- and west-facing openings receive lower angle sun (early morning and late afternoon), therefore making fixed vertical shading structures an important feature to integrate. Vertical structures include screens, climber covered lattice and vertical awnings.
- Deep verandahs or pergolas can be used to shade east-west glazing, but may still admit very low angle summer sun.
- Adjustable shading is especially useful for eastern and western elevations, giving greater control while enabling daylight levels and views to be manipulated as the angle of the sun changes. Adjustable systems include sliding screens, louvre screens, shutters, retractable awnings and adjustable external blinds.



Source: Carbon Neutral Design Project, Terri Meyer Boake.



Hot Dry Climates

- Provide passive solar shading to north-facing openings in regions where winter heating is required.
- Avoid shading any portion of the glass in winter when winter heating is required - use upward raked eaves to allow full winter solar access, or increase the distance between the window head and the underside of the eaves.
- Use adjustable shade screens or deep overhangs (or a combination of both) to the east and west. Deep covered balconies or verandahs shade and cool incoming air and provide pleasant outdoor living spaces.
- Place a shaded courtyard next to the main living areas to act as a cool air well. Tall, narrow, generously planted courtyards are most effective when positioned so that they are shaded by the house.
- Use plantings instead of paving to reduce ground temperature and the amount of reflected heat.

Warm humid and warm/mild temperate climates

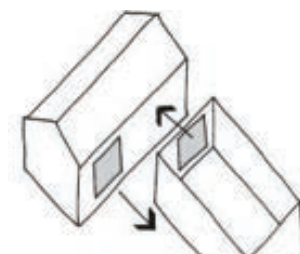


- Provide passive solar shading to all north-facing openings, using shade structures or correctly sized eaves.
- Use adjustable shade screens or deep overhangs to the east and west. Adjustable shade screens exclude low angle sun the most effectively.

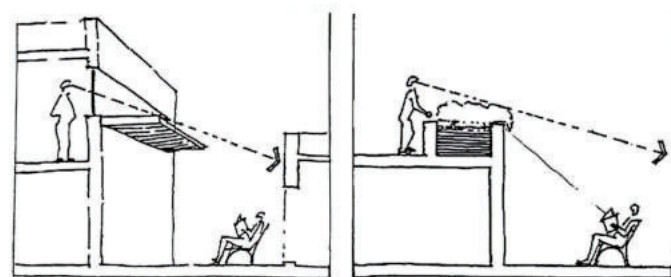
Cool temperate climates



- Do not place deep covered balconies to the north as they obstruct winter sun. Balconies to the east or west can also obstruct winter sun to a lesser extent.
- Avoid shading any portion of the north-facing glass in winter - use upward raked eaves to allow full winter solar access, or increase the distance between the window head and the underside of the eaves.
- Use deciduous planting to the east and west. Avoid plantings to the north that would obstruct solar access.



Source: *Your Home*, 5th edition.

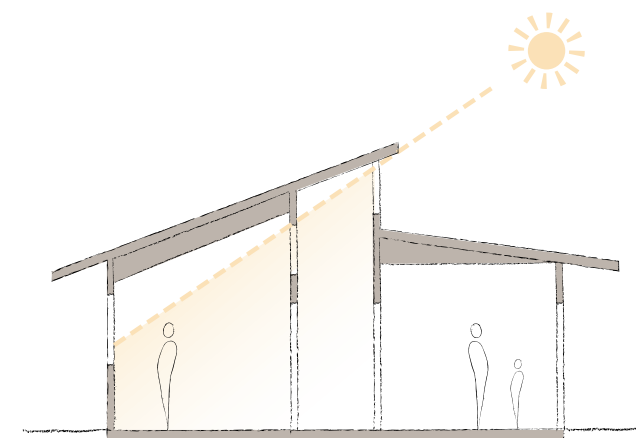


Source: *Your Home*, 5th edition.

E.2.2 Privacy



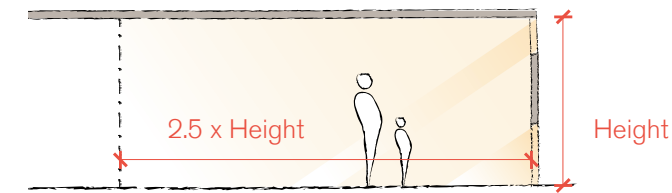
- Landscaping can provide screening between dwellings, with varying levels of transparency.
- In addition, windows should be offset between dwellings to prevent overlooking into main living areas (both internal and external).
- Acoustic and visual privacy should be considered and preserved by carefully considering internal room planning.
- Outdoor living should not be open to the street.



E.2.3 Solar and Daylight Access



- North-facing windows introduce sunlight and daylight into the home, particularly in winter when the sun angle is lower. This contributes to the lighting and heating of the house.
- South-facing windows predominantly introduce daylight without any heat gains from sunlight. This makes them suited to houses in warmer climates where cooling is imperative.
- Good daylighting in an interior space can be achieved using the following rule of thumb: effective daylighting can only cover a space that is 2.5 times the height of the wall with the opening.
- Clerestories or roof monitors can help light deep interiors when oriented and shaded correctly
- Aim to keep direct sunlight away from 'task areas' such as kitchens or desks due to the potential for glare and occupant discomfort.
- Use direct sunlight sparingly in non-critical task areas

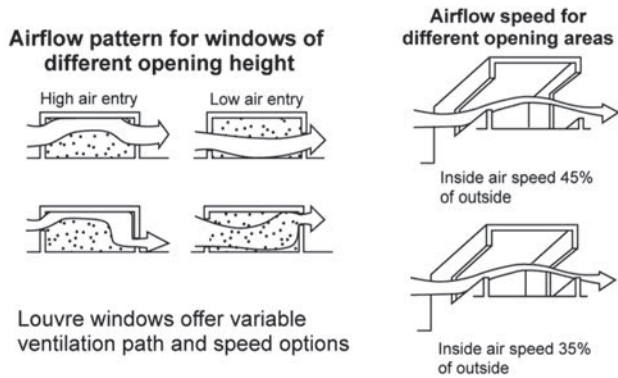


- Skylights and solar tubes can light an interior with little heat gains if shaded and, in cold climates, use high performance glass.
- Light-coloured interior surfaces reflect more light and reduce the need for artificial light.

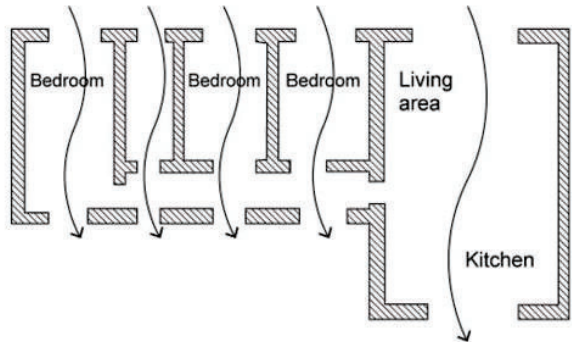
E.2.4 Artificial Lighting



- Look to design artificial lighting to compliment natural lighting
- Use energy efficient appliances and fittings, including light emitting diodes (LEDs) and compact fluorescent lamps (CFLs) where practical
- Avoid down lights when possible as their installation often compromises the thermal resistance of the envelope (perforation of insulation layer).
- Use centralised switchers where possible
- Consider using task lighting to reduce overall energy consumption.



Source: *Your Home*, 5th edition.

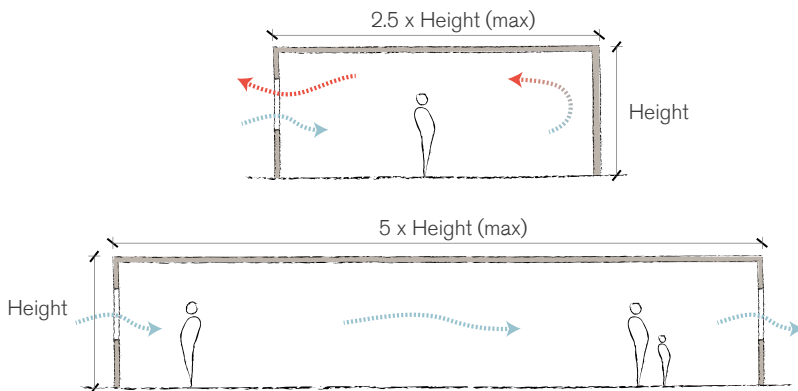


Source: *Your Home*, 5th edition.

E.3.1 Natural Ventilation



- The size, type and position of openings are all crucial considerations when designing for passive cooling. Air exchange through openings in a room can improve internal air quality and allows a space to be cooled if cooling breezes are captured.



- The length of a room with ventilation on one face only should not exceed 2.5 x that of its height.
- The length of a room with openings at each end should not exceed 5 x that of its height.
- Landscaping, fences and outbuildings can be located to direct breezes into and through the building, as well as disperse stronger winds that may have adverse effects on the building and internal temperature (such as extreme hot and cold winds).
- Single depth rooms are ideal in warmer climates.
- Cooling breezes are best directed to where occupants spend most of their time (such as tables, desks, lounges, etc), and openings should be designed to achieve this.

Warm humid climates



- Design and orientate to capture cooling breezes where possible
- Maximise cross ventilation, with unobstructed pathways.
- Provide shading to outdoor living area.

Hot arid climates with cool winter



- Minimise surface area of building by using compact forms, and maximise the building depth.
- Closeable stack ventilation in stairwells, and thermal separation between floors in two storey homes
- Shaded internal courtyards with evaporative cooling features in a single story home.
- Use smaller window and door openings designed for night-time cooling and cool thermal currents where available.

Temperate climates

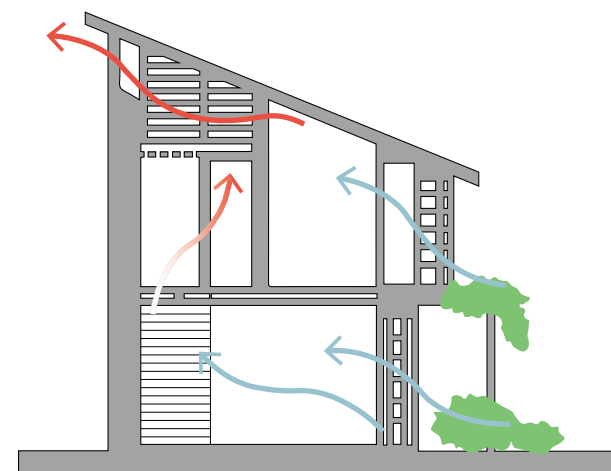


- The position of a window, and the style of its opening, should be carefully considered to ensure good cross-ventilation.
- Prevailing cooling breezes should be assessed, and openings placed according to these breezes.

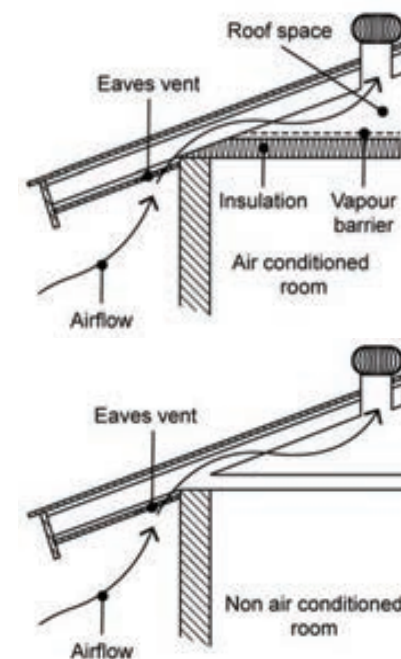
Cool and cold climates where heating dominates



- Cross-ventilation for night cooling in the warmer seasons.



Source: *Your Home*, 5th edition.



Source: coolMOB, *Your Home*, 5th edition.



Different types of roof openings that can be used for stack ventilation

E.3.2 Stack Ventilation



- Stack ventilation, or convective air movement, occurs when warm air rises and cool air falls. Cool air is drawn into the house as warm air rises to escape the house.
- Convective air movement improves cross-ventilation, and allows heat to leave a building even when there is no breeze. It is capable of cooling a building but usually has insufficient air speed to cool people.
- Clerestory (high level) windows can be used to capture winter sun and create stack ventilation in summer. Clerestory windows should not be used in cold climates unless carefully designed, as daytime heat gains rarely offset night-time heat losses and cold draughts are unavoidable.
- Openings at the top and bottom should be roughly the same size to encourage even air flow through the vertical space.
- Roof exhausts, fans and ventilators can all be used to achieve stack effect ventilation.

- Towers and chimneys can be useful to carry air up and out, or skylights or clerestories in more modest buildings. For these strategies to work, air must be able to flow between levels.

E3.3 Roof Ventilation



- Consider using ventilators to cool roof spaces, and to allow built up moisture to escape.
- Locate roof ventilators where they are not easily visible from the street.
- Air gaps along the ridgeline or between tiles often provide sufficient ventilation. Gable or eave vents may also be used.

Warm humid climates

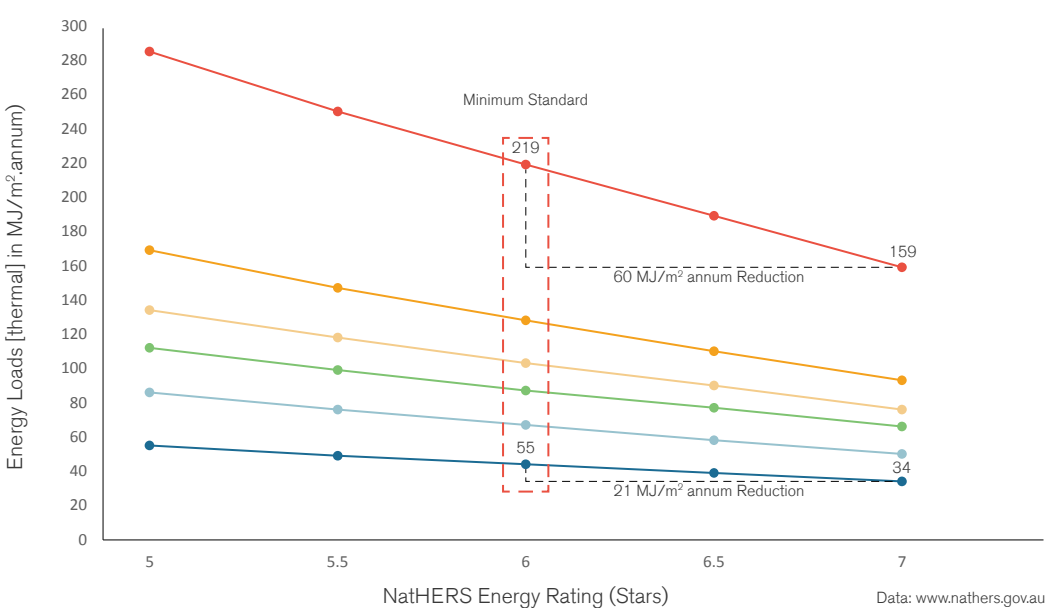
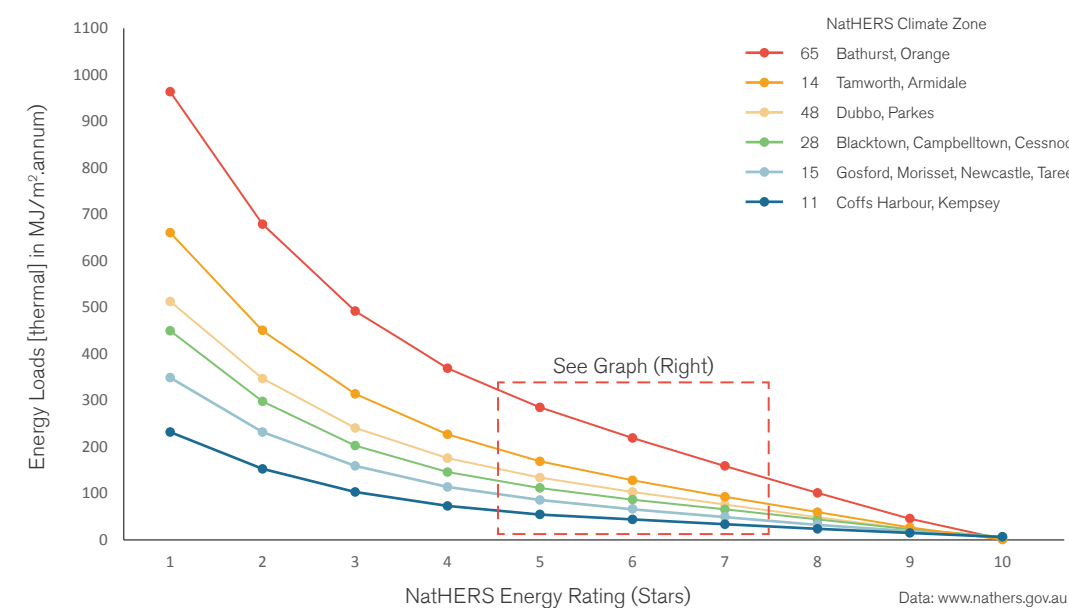


- Whirlybirds alone are not sufficient to cool the roof space. Consider using power ventilators, light coloured roofs and under roof insulation

E.3.4 Roof Openings



- Roof openings promote stack effect (air flow from the bottom to top of a building) and bring light in deep plans.
- Look to limit roof openings in cold climates, and seal internal spaces well to avoid heat loss.
- Roof openings are effective in hot climates as they can exhaust hot, high level air. However, the openings need to be effectively shaded to avoid overheating.
- Consider maintenance requirements to openable elements.



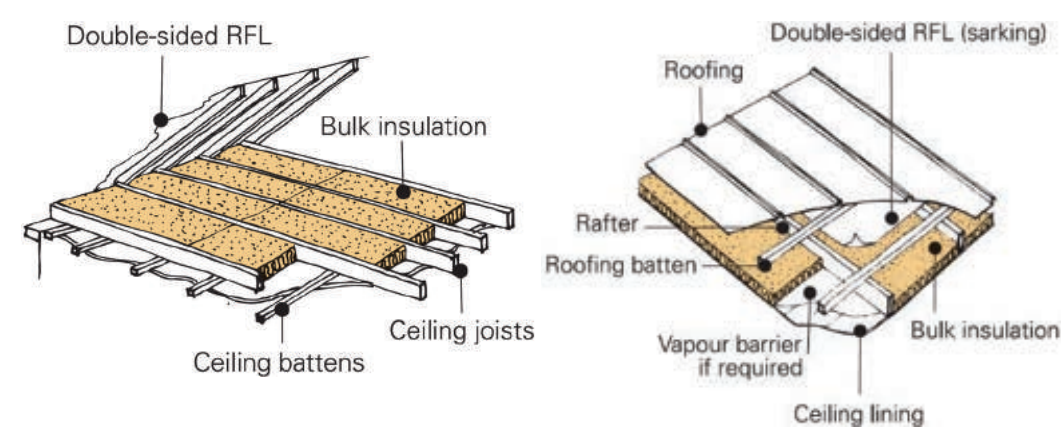
E.4.1 Performance Guidelines and Ratings



The Nationwide House Energy Rating Scheme (NatHERS) is a star rating system (out of 10) that rates the energy efficiency of a home based on its design and thermal performance.

- Rating depends on how well these factors suit the local climate:
 - Layout of the home and orientation
 - Roof, walls, windows and floor construction methods and materials
 - Shading to the sun's path and how well your home takes advantage of local breezes
- NSW consists of 18 different NatHERS climate zones, which are different to the NCC climates zones included in section B this guideline.
- Use the NatHERS website to access your project's NatHERS climate zone.
- The graph above shows the exponential reduction in energy consumption with increasing stars.
- The minimum NatHERS rating required by AHO is dictated by the climate zone (CL). CL 2 - 5 stars, CL 4 - 6 stars, CL 5 - 5 stars, CL 6 - 5 stars, CL 7 - 6 stars.

- Houses with comparable star ratings perform very differently depending on location. In general, houses in more extreme climates with high heating or cooling requirements have a much higher thermal energy load of a comparable house of the same star rating in a mild climate.
- For example, a 6-star NatHERS rated house in Orange (219 MJ/m².annum) will have an energy consumption of up to 4 times the consumption of a 6-star rated house in Coffs Harbour (55 MJ/m² annum) due to the cooling load.
- Dwellings in very mild climates, such as Coffs Harbour and Wollongong (NatHERS climate zones 11 & 56), have a very low thermal load in a 6-star NatHERS rated house
- Houses in moderate to very hot/cold climates, such as Dubbo and Orange (NatHERS climate zones 48 & 65), have better energy reductions with increasing stars beyond 6-stars.
- Where possible, consider increasing the star rating and performance of dwellings to reduce overall energy consumption, especially of those located within Zones 4, 6 and 7.
- For example, the graph above shows increasing the star rating from 6 to 7 will have a reduction in energy consumption up to 4 times higher in Orange (60 MJ/m².annum) than in Coffs Harbour (21 MJ/m² annum)



Roof insulation. Pitched roof with flat ceiling (left). Concealed rafters (right). *Your Home, 5th edition.*

E.4.2 Insulation and Thermal Bridging



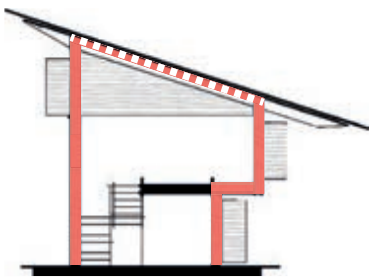
Insulation

- Where possible, avoid compressing insulation, or to prevent water entry. Plan construction details to make space for insulation.
- Use the correct type of membrane (vapour barriers and breathable linings) and terminology:
 - Sarking: a layer beneath the roof for thermal insulation, or to prevent water entry.
 - Vapour barrier: restricts the transmission of water vapour. Always place them on the warm (vapour entry) side of the structure.
 - Vapour permeable (breathable) membranes: allows vapour to pass through. Should be placed on the cold side of insulation to allow vapour to escape before encountering a dew-point.
 - Smart membranes with vapour permeability: vary with temperature and humidity. Can be highly effective where cold and warm sides are interchangeable.
 - Air barrier: no air passes through.
- Bulk insulation is not air tight. To work well, bulk insulation needs an air barrier, best placed on the outside for hot climates, and inside for cold climates.

- Generally, locate a vapour barrier on the warm side of construction. This means the outside for hot climates, and inside for cold climates.
- Consider utilising a vapour barrier to garage walls to address moisture buildup.
- Vapour barriers, when used incorrectly, can cause condensation and mold. The best method is to build an air-tight, vapour permeable construction; this allows for the controlled escape of vapour from within the building, whilst repelling the ingress of water from the outside. This is characterised by the following strategies:
 - Use a vapour permeable air-tight membrane
 - Use water-based (naturally vapour permeable) paints
 - Use no vapour barriers.
- Air tightness is essential to insulation, as air infiltration into the dwelling will reduce its effectiveness.

Thermal Bridging

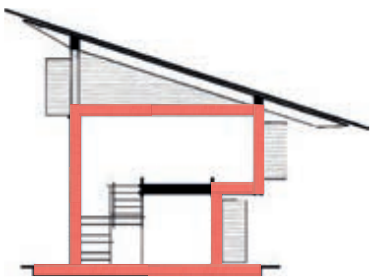
- Gaps in insulation and thermal bridging are a substantial source of heat loss and can cause both draughts and condensation.
- Consider using additional layers of insulation fixed to frames to reduce thermal bridging
- The building frame can act as a thermal bridge, particularly in cold climates, conducting heat and allowing it to bypass otherwise effective insulation.
- Metal framing is a particular problem because of its high conductivity. The presence of the frame reduces the overall insulation value, as the frame can constitute up to 15% of the wall, ceiling or floor surface.
- Consider installing polystyrene isolating strips between the metal frame and cladding, which must be at least 12mm thick with an R-value of 0.2. Fix bulk insulation, such as polystyrene boards, over the external or internal surface of the frame.
- Fixing insulation to the outside of the studs helps reduce thermal bridging in cold climates. Placing the insulation on the outside gives a higher total R-value than placing the insulation between the studs.
- Steel is an excellent conductor and is by far the greatest source of thermal bridging. While timber is a natural insulator and a poorer thermal bridge, it still typically has a lower R value than insulation materials.
- Insulation design and detailing should avoid thermal bridging by ensuring continuous insulation between the internal and external skins in all external walls.



Warm humid summer, mild winter



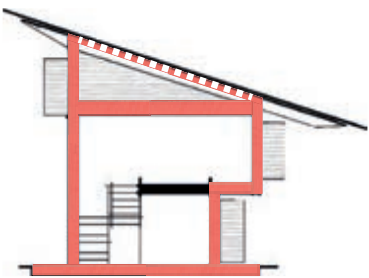
- In areas where no winter heating is required, use multiple layers of reflective foil in ceiling/roof to create a one-way valve effect.
- Insulate internal wall surfaces from any external thermal mass.
- Use highly breathable reflective vapour barriers in walls and add bulk insulation to rooms that are air conditioned.
- Line open ventilated spaces with reflective foil insulation and design to remove condensation.
- Avoid installing bulk insulation in ceilings and walls unless winter heating is used.



Hot dry summer, cool winter, and warm/
mild temperate climates



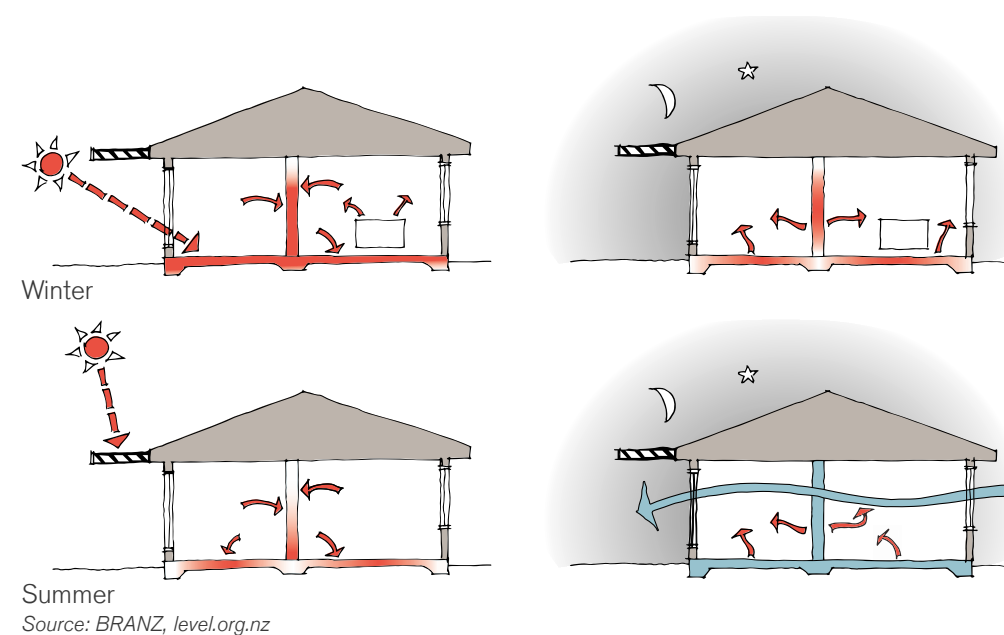
- Use bulk and reflective insulation in ceilings, and bulk or reflective insulation in walls.
- Provide external insulation to all thermal mass
- Insulate under concrete slabs if using in-slab heating.
- Insulate elevated floors (concrete or lightweight)
- Ensure all spaces are effectively air sealed.
- Seal thoroughly against draughts and use entry airlocks (zone 6).



Cool temperate climates



- Use bulk insulation in walls, ceilings and exposed floors.
- Use heavy drapes with sealed pelmets to insulate glass in winter.
- For walls, use bulk insulation with highly breathable sarking or multiple layers of reflective foil insulation, with detailed design to ensure condensation discharge.
- Insulate all thermal mass externally (including rammed earth and mud brick).
- Use high levels of bulk insulation in ceilings and line underside of roofing material with down-facing reflective foil.



E.4.3 Thermal Mass



- o Thermal mass acts as a thermal battery. It is most beneficial where there is a big difference between day and night outdoor temperatures.
- o Thermal mass is not a substitute for insulation. Thermal mass stores and re-releases heat; insulation stops heat flowing into or out of the building.
- o During summer it absorbs heat during the day and releases it by night to cooling breezes or clear night skies, keeping the house comfortable.
- o During winter the same thermal mass can store heat from the sun or heaters to release it at night, helping the home stay warm.
- o Where winter heating is the primary source of energy consumption, locate thermal mass in areas that receive direct sunlight or radiant heat from heaters.
- o Where summer cooling is the primary source of energy consumption, protect thermal mass from summer sun with shading and insulation if required. Allow cool night breezes and air currents to pass over the thermal mass, drawing out all the stored energy.
- o Where winter heating and summer cooling are both a primary source of energy consumption, locate thermal mass inside the building on the ground floor for ideal summer and winter efficiency. The floor is usually the most economical place to locate heavy materials, and earth coupling gives additional thermal stabilisation in both summer and winter in these climates.

- o Earth-coupling (uninsulated) should be avoided where groundwater action or temperatures can draw heat from slabs.

Warm humid summer, mild winter



- o Where summer ground temperatures exceed 19°C at 3m depth, use elevated lightweight floors.
- o Consider using earth coupled slabs (uninsulated) in all areas where deep ground temperatures are less than 19°C in summer.
- o Use lightweight wall construction where day-night temperature ranges are low and add thermal mass as these ranges exceed 6°C.

Hot dry summer, cool winter



- o High thermal mass construction is preferred
- o Use earth coupled slabs (uninsulated) to stabilise internal air temperatures

Warm temperate



- o Composite thermal mass construction is ideal
- o Earth coupled slabs (uninsulated) are highly beneficial

Mild temperate



- o Earth coupled slabs (uninsulated) are highly beneficial
- o High thermal mass walls can be used if within glass to mass ratios

Cool temperate



- o Earth coupled slabs (uninsulated) are beneficial except where 3m earth temperatures are below 16°C in winter. Insulate under the slab or use insulated, lightweight floors.
- o Use low thermal mass walls on sites with no solar access
- o Use lightweight wall construction where diurnal temperature ranges are low and increase thermal mass and solar exposed glass as they increase above 6°C

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E. Building Envelope Principles

AHO Design Guidelines NSW

5. Construction



E.5.1 External Materials



- As a general rule, limit the number of material changes to the facade
- Limit material junctions, unnecessary steps in plans and changes in roof form that often arise from over complicated designs
- Understand when repetition and simplicity can work
- If changing materials on the facade, look to establish consistent datums, generally utilise one material on single storey dwellings and a change of material for the upper level on two storey dwellings.
- Utilise materials to articulate volumes, not just covering a surface. Apply a material to the entire volume, not a single side.
- Maximise the use of pre-finished materials wherever possible, for example face brickwork, bare masonry and metal cladding to minimise maintenance costs. These material choices are preferred over render or paint.
- Minimise painted or rendered finishes and limit to the ground level only, where no scaffolding would be required to maintain it.



E.5.2 Glazing



- Maximise the benefit of glazing to serve a function, not simply to articulate the facade.
- Locate and size windows and shading to let sunshine in when the temperature is cold and exclude it when it's hot.
- As a general rule, locate most glazing to the north, with moderate overhangs to protect from harsh summer sun where possible.
- Optimisation of glazing based on orientation is likely to yield at least half a star more (NatHERS rating).
- Use glazing in conjunction with thermal mass to store heat produced by the sun, which can then be used to provide warmth at night in cold climates.
- Coordinate window and door openings to take advantage of cooling breezes.
- See WERS (Window Energy Rating Scheme) website for authoritative data on window performance. Window performance can be specified with a WERS rating.
- There are many different types of glazing, each with differing cost and performance qualities. Starting from the highest performance/cost: low-e double glazing, standard double glazing, low-e single glazing and single glazing.

The following information comes from The Australian Glass and Window Association (AGWA), WERS and Your Home:

Warm humid summer, mild winter.



- Keep solar radiation out of the home and retain coolness of air-conditioned air
- Avoid overuse of glazing
- Use low Solar Heat Gain Coefficient (SHGC) glazing in all cases and low U-value glazing in regions with cooler winter or hotter summers.

Hot dry summer, cool winter & warm temperate zones



- Balance the benefits of solar heat gain in winter against keeping cool in summer. Use mid-range solar control
- Reduce heat flowing through glazing (in & out) over course of the year.
- Avoid overuse of glazing
- Use different glazing types for each facade; low U-value glazing is essential in all cases. (in zone 4)
- For north-facing windows select high SHGC glazing and passive shading (in zone 4).
- For east and west facades, select low U-value and high visible light transmittance (in zone 4).

Mild & cool temperate zones



- Maximise opportunity to exploit desirable solar heat gain for majority of year
- Reduce heat flowing through glazing (in both directions) over course of year
- Avoid overuse of glazing
- Minimise east and west-facing glazing
- Sites with solar access require north-facing living areas with majority of glazing.
- Use high SHGC and low U-value glazing (and double glazing for zone 7).
- Consider double glazing in regions with higher heating needs (zone 6).
- Where passive solar access is unavailable, minimise all glass areas (zone 7)



E.5.3 Windows and Doors



- Well-insulated buildings use a thermal insulation layer that carefully encloses the whole building without any missed area, which means no “holes” or “thermal bridges” in the insulation. If there are holes or gaps heat will transfer significantly through these, greatly reducing the whole system of insulation.
- Consider window and door frames with minimal thermal bridging where possible. This means that the metal framing of the glazing system will not be in direct contact with external walls which have high thermal mass.
- Where possible, align doors and windows to promote cross ventilation
- All rooms to have an openable window
- Skylights should be avoided

Warm humid summer, mild winter.



- Utilise windows with high operable areas to maximise opportunity for air movement for natural cooling
- Consider louvers or openable highlights above doors to allow for cross ventilation
- Shade all east and west-facing glazed surfaces year round.
- Use appropriate levels of passive shaded north-facing glass as heating requirements increase in more southerly and inland regions.

Hot dry summer, cool winter & warm temperate zones



- Consider ‘season specific’ physical shading of windows
- Provide windows with adequate openable area for ventilation
- Consider thermally improved or insulated frames, especially in air conditioned dwellings.

Mild & cool temperate zones



- Consider ‘season specific’ physical shading of windows
- Use tight fitting window coverings with pelmets where possible
- It is recommended to seal thoroughly against draughts and use entry airlocks
- Where possible, specify thermally improved or insulated frames. High performance doors and windows should be used in colder climates
- If high performance doors and windows are not used, look to design and detail for high levels of window condensation
- It is recommended to provide airlocks to entries and seal all interior spaces

E. Building Envelope Principles

AHO Design Guidelines NSW

5. Construction



E.5.4 Alternative Construction Methodologies



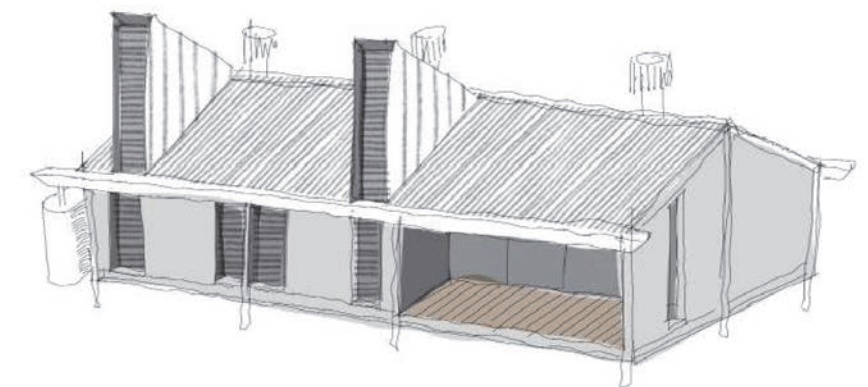
- Consider the integration of modular or prefabricated construction technologies, such as off and on site fabrication of either building components or the entire dwelling assembly.
- Propose innovative solutions where they can offer economies of scale, time savings, reduction in costs, reduction in maintenance and improvement in design consistency and construction quality.
- Sizes of modules and assemblies should take into account the maximum transportable size and weight.



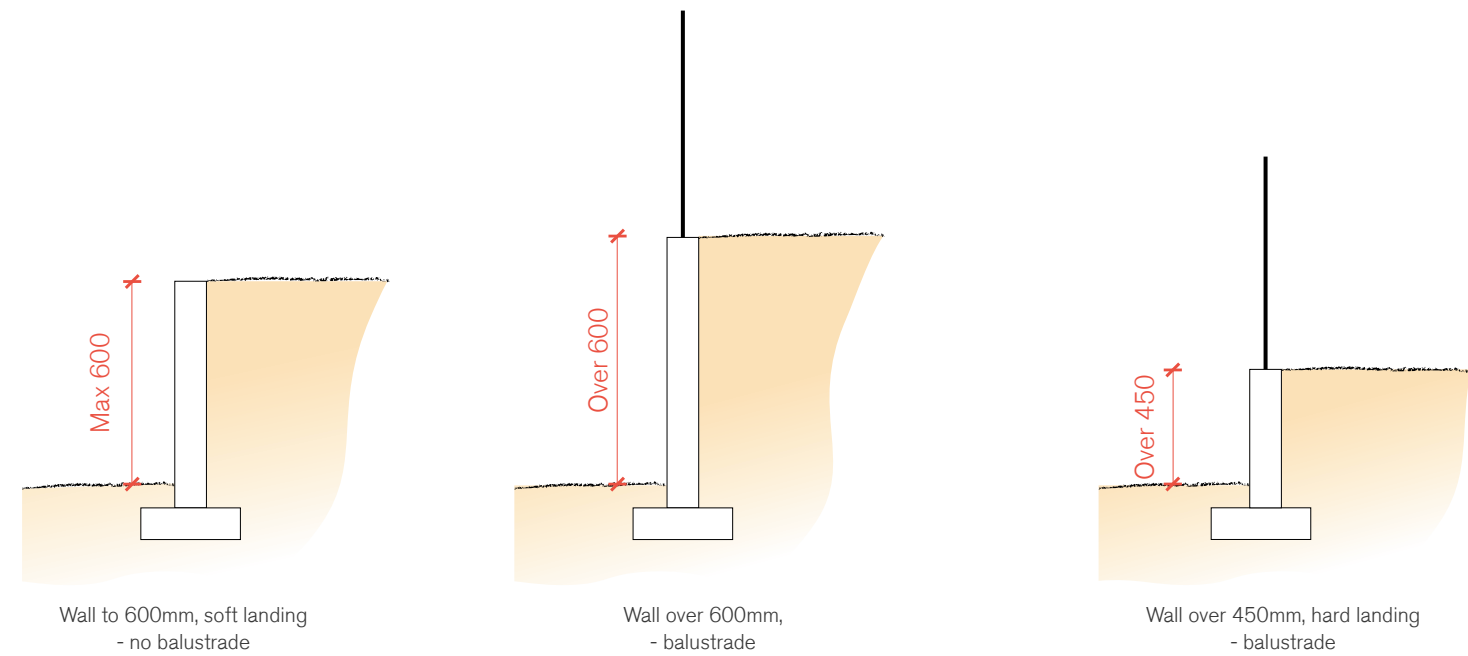
Possible typical 2 bed assembly

Possible typical 4 bed assembly compact

Possible typical 4 bed assembly linear



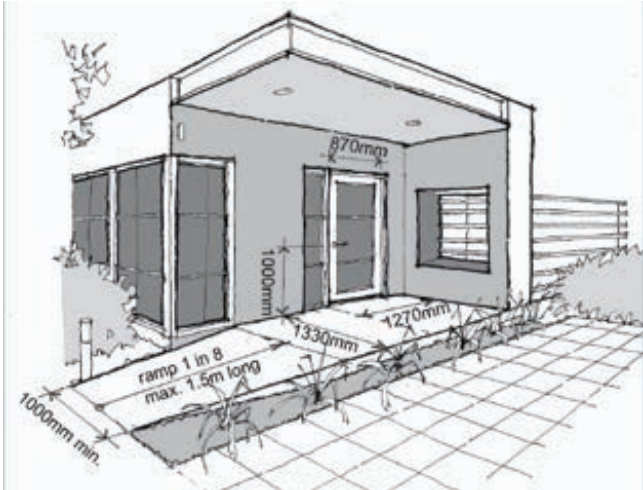
Possible building form and articulation



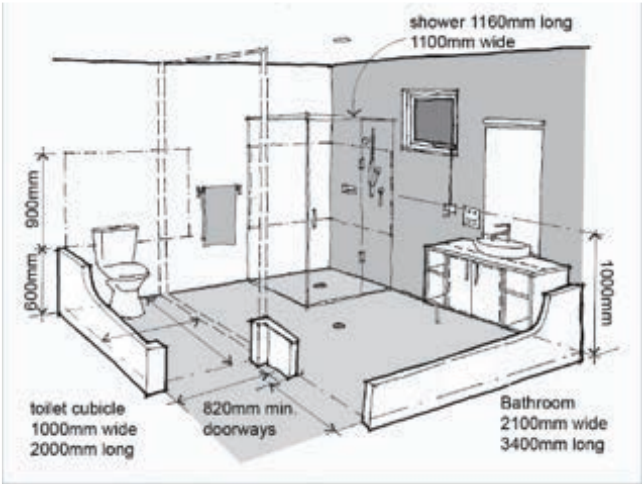
E.5.5 Safety in Design



- o All projects are to be assessed with a Safety in Design review to ensure design and construction issues are adequately addressed.
- o Balustrades are required for changes in floor level over 600mm.
- o Balustrades are required to meet NCC and DDA requirements (if applicable)
- o Balustrades are required for changes in floor level over 450mm if there is a path of travel adjacent.
- o Balustrades are to be constructed of durable low maintenance and cost effective materials
- o Utilities, service equipment, lighting fixtures etc are to be located where safe access can be provided to maintain.
- o Avoid trip hazards and finish off joinery, staircases and the like to avoid trips and falls.



Entry Clearances. *Your Home, 5th edition.*



Bedroom Clearances. *Your Home, 5th edition.*

E.5.6 Designing for Seniors and Adaptability



- o

Consider amendments to the design of dwellings to suit the following groups:

▪ Families with young children

▪ People with temporary injuries

▪ People with a disability

▪ Seniors

o

Enhancements to the design allow for these groups of people to easily enter, navigate and move around dwellings.

o

Consider these general principles when providing suitable dwellings.

▪ Design dwellings for aging in place and consider the curation of tenants carefully to promote suitable communities for the elderly.

▪ Consider smaller landscaped front and rear yards and consider sitting areas at the front yard to increase passive surveillance

▪ Ensure graded landscaping and ramps to provide step free access to the entry

▪ Consider additional external pathway lighting requirements

▪ Ensure letterboxes are in a central location with a continuous accessible path of travel.

▪ Provide a minimum corridor clearance of 1200mm

▪ Provide clearances all around the bed; 1200mm wide at the foot of the bed and 1000mm wide beside the bed and between it and the wall, wardrobe or any other obstruction.

▪ At least one bedroom and bathroom should be located on the ground floor.

▪ Provide generous circulation spaces in the living room, dining room, kitchen, laundry, etc. Refer to specific requirements in AS 1428.1 and AS 4299 if wheelchair access is required.

▪ Provide large switches to lighting controls and two way light switching at door entry and at the bed head (1000mm off the floor).

▪ Ensure door hardware is easy to use and uncomplicated to operate.

▪ Provide a power operated garage door.

o

Where adaptable dwellings are required, provide compliant elements to AS1428.1 and AS4299.



External Design Principles

F.1 Front Yard

F.2 Rear Yard

F.3 Utilities

F.4 Boundary Conditions

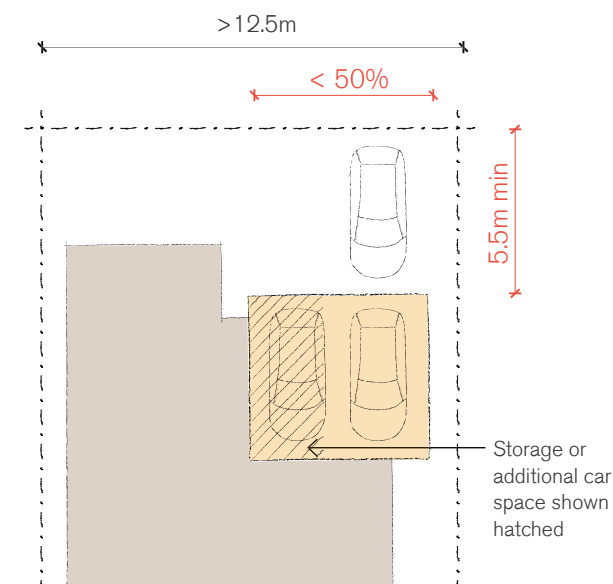
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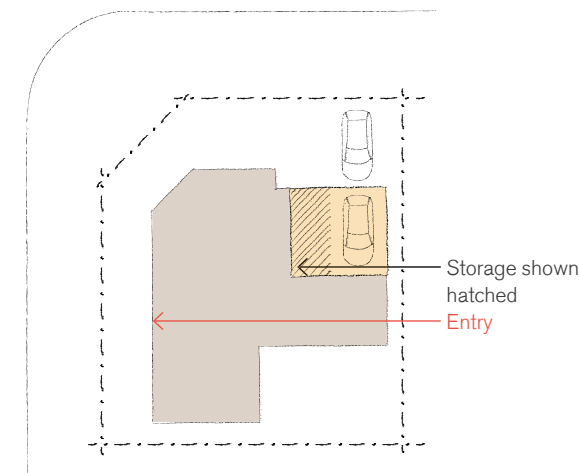
F. External Design Principles

AHO Design Guidelines NSW

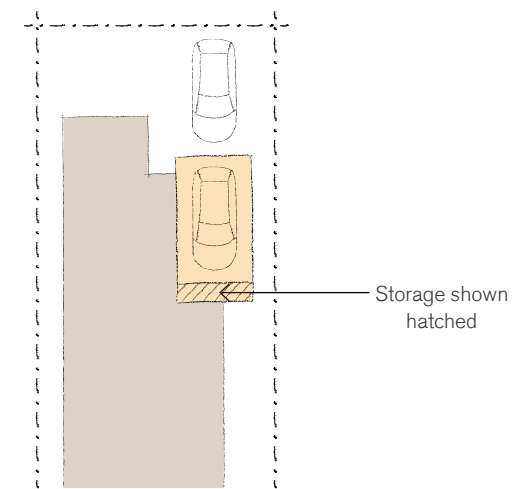
1. Front Yard



Typical double garage layout



Corner lot arrangement



Single car park with storage

F.1.1 Car Parking - Garages and Carports



- o The minimum provision is a single lock up garage or carport. Where lot size permits allow for a double garage or carport.
- o Width of the garage door is limited to 50% of the front facade or developer's/council covenant if applicable.
- o Minimum garage clear width 3200mm wide x 5400mm deep, with 2500mm vertical clearance.
- o Garage door or carport should be simple and plain-coloured, and should be in keeping or recessive to the facade palette.
- o The garage or carport portion of the dwelling should be set back from the building line.
- o The garage is to be set back a minimum of 5.5m from the boundary to allow sufficient space for a car to park on the driveway.

Lots > 12.5m wide

- o Double car garages are generally suitable in lots of 12.5m or wider.
- o Double car garages are to include storage provisions as per section F 3.3.
- o For a double car garage, additional storage or space for a second car is permissible.

Corner lots

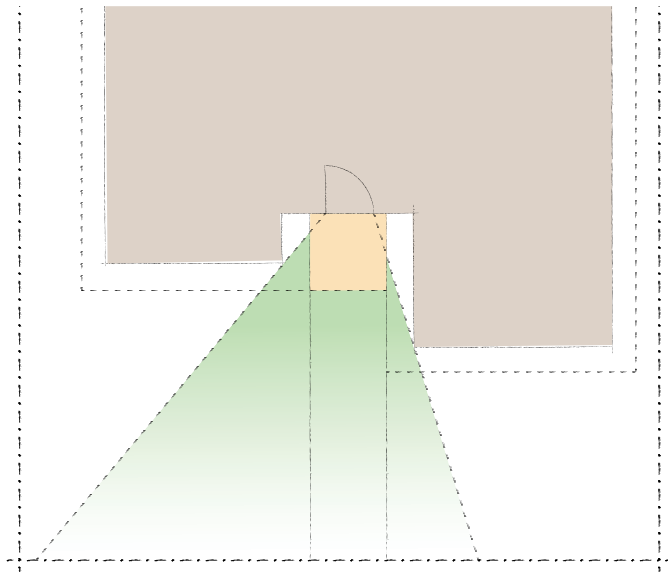
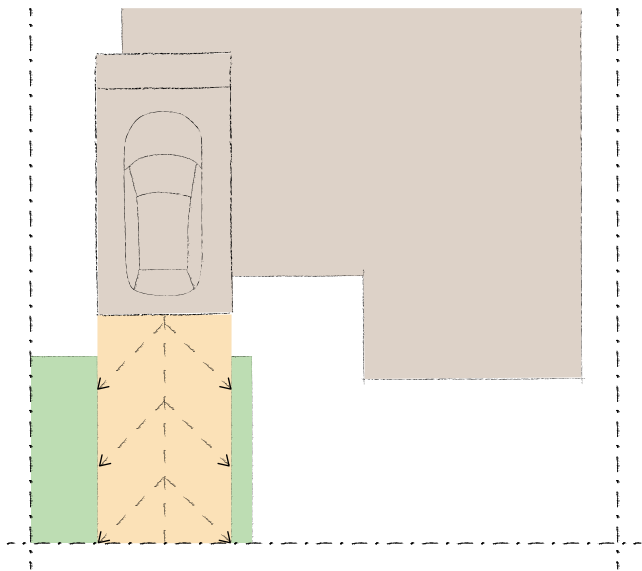
- o For corner lots, the garage is preferred to be accessed on the secondary frontage where applicable, separated from the main pedestrian entry.

Lots < 12.5m wide

- o Single fronted garages should be used in narrower lots
- o Where the garage can be accessed from a shared driveway or service lane, a double car garage is permissible.
- o Single car garages are to include storage provisions as per section F 3.3.

Car ports

- o Where carports are used, additional storage provisions are to be included in the form of a storage shed.
- o Storage sheds should be integrated with the carport, lockable and placed in an accessible but recessive location and materiality in keeping or recessive to the facade palette.



AHO Property, Dubbo

F.1.2 Driveway



Position:

- To be centred on the garage.

Grades:

- To be considered during initial site works to minimise steep grades where possible
- Maximum grade = 1:6, Minimum grade = 1:100
- To be designed to allow surface run off to flow into adjacent soft landscaping for passive irrigation, rather than directly into the street gutter.

Materiality and landscaping:

- Finish to be concrete or unit paver (may be permeable), colour and format to compliment the dwelling character and differentiated from the main entry path finish.
- Garden beds (min width 500mm) to be installed to both sides of driveway where possible - except on narrow lots where the driveway is on the boundary.

F.1.3 Front Entry and Yard Principles

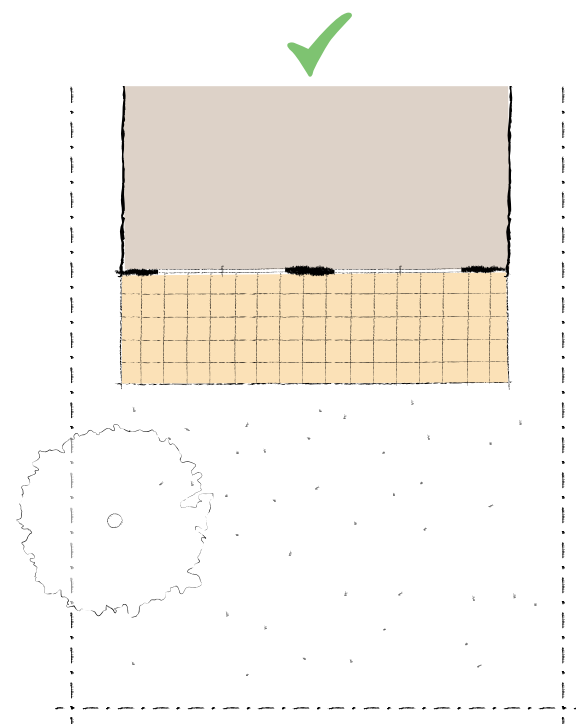


- The front yard should maintain clear sightlines from the street to the main entry.
- To achieve the above, there should be a straight pathway from the property boundary to the front entry door.
- The main entry path is to remain separate from the driveway (by a 500mm width), with a distinct finish and continuous (not stepping) pavers.
- Rubbish bins, hot water systems, water tanks and services should be concealed from public view, preferably located within the side setback and behind the fence.
- Front yards should be open and visually accessible from the street to promote passive surveillance and engagement with the community.
- Consider a front patio where appropriate to further street and community engagement.

F.1.4 Letterbox



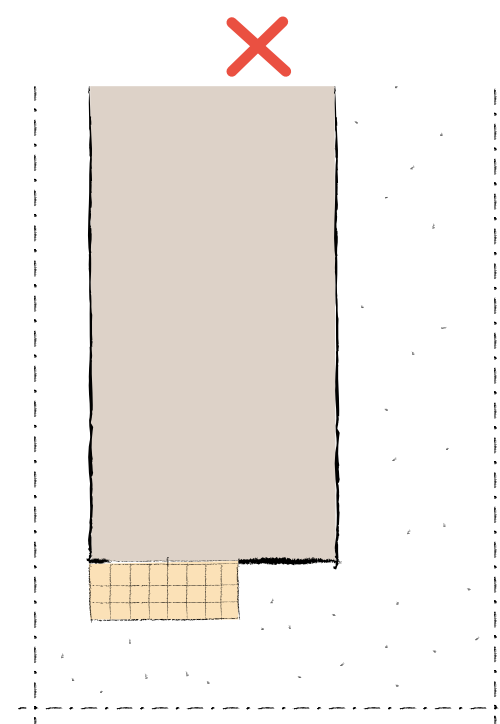
- The letterbox is to be designed adjacent the main entry path at the front boundary.
- Provide a stepping paver or extend the path to allow access to the back of the letterbox.
- Colour and materiality to be consistent and/or compliment the dwelling and/or community identity.
- Consider external lighting to provide safe access from the street and circulation within the front yard.



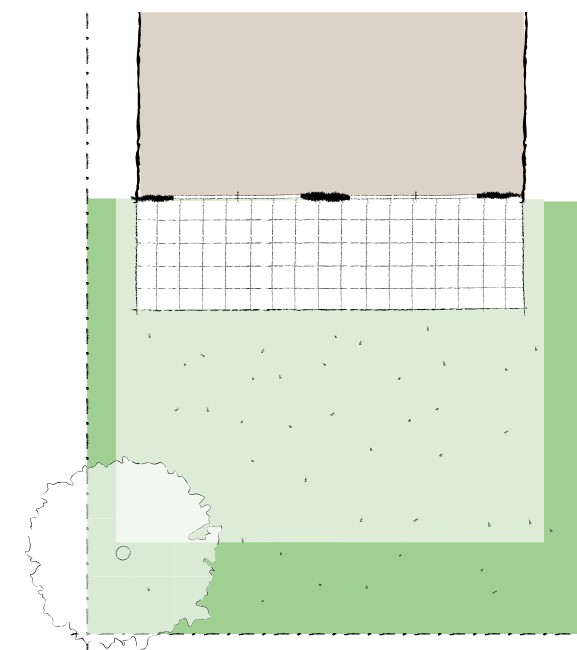
F.2.1 Covered Outdoor Area



- o The covered outdoor area should be directly accessed from the primary internal living area.
- o Covered outdoor area should accommodate a table and chairs as well as space for a BBQ.
- o Cover to outdoor area must be solid and water resistant
- o Floor finish is to be a solid, water resistant surface
- o Consider an external grade fan for large covered outdoor areas, especially in climate zones 2, 4, 5
- o Consider an outdoor food preparation area (bench and sink) to alleviate pressure on indoor facilities where there are increased numbers of occupants.
- o Maximise indoor-outdoor connection through the use of glazed windows and door to increase usability and promote passive surveillance.
- o Where possible align the covered outdoor area with the internal room to increase the sense of space.



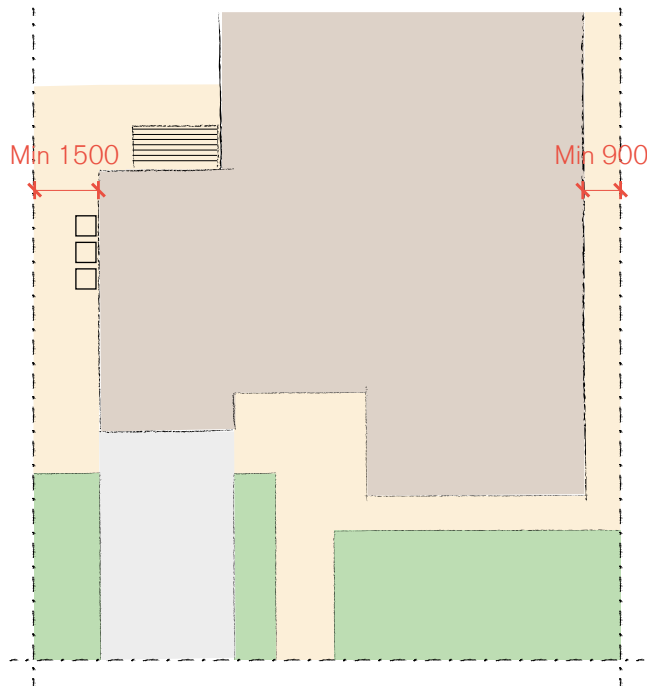
- o Avoid linear primary outdoor space that is disconnected from the living area.
- o Consider wider external corridors, verandah spaces or covered outdoor areas to facilitate additional occupants and sleeping arrangements in hot climates or where occupant numbers are temporarily increased by visitors.



F.2.2 Rear Yard Principles



- o The primary usable space should be clear of planters and obstructions.
- o The rear yard should be directly accessed from the covered outdoor area.
- o Sightlines from indoor living areas to rear yard should be preserved.
- o Semi private screening for privacy between neighbours
- o Consider an outdoor food preparation area where space permits and to suit the local customs.



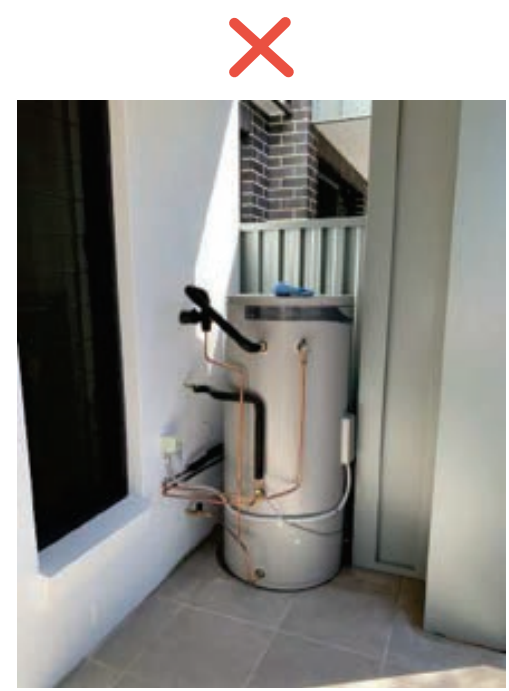
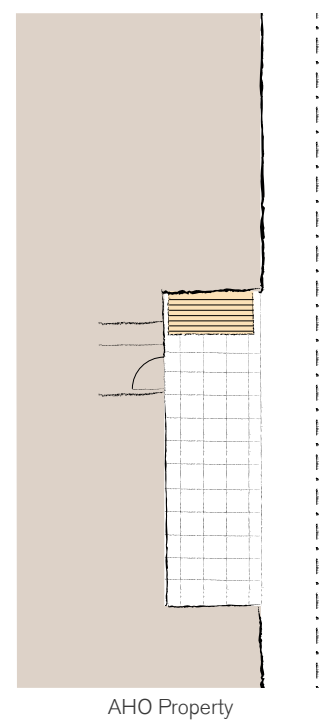
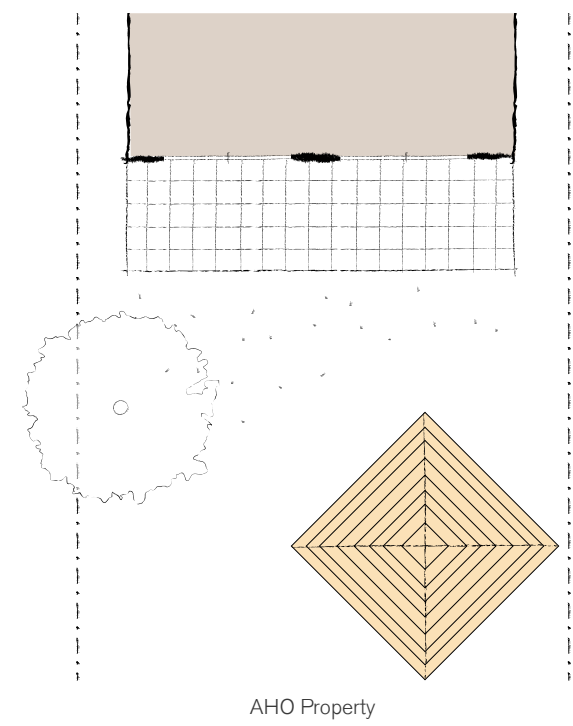
F.2.3 Pavement and Access



- Paths with a minimum width of 900mm and a maximum grade of 1:20 are to be provided
- Landings are to be a minimum of 1200mm long
- Avoid steps unless unavoidable due to site grading conditions
- Paths are to be graded towards adjacent garden beds or lawns for passive irrigation
- Paths are to be a minimum standard of concrete, with slip resistance to meet Australian Standards. Consider improved quality of finish to main entry points, such as exposed aggregate concrete or unit paver to differentiate the primary pathways.
- Gravel or pebble based pavements are **only** acceptable **when used for secondary access or as permeable mulch**
- Provide a continuous path of travel to rubbish bins, utilities ad clotheslines
- Paths should be installed flush with adjacent surfaces to protect from damage and avoid trip hazards. Where ground subsidence is likely to occur, provide a steel edge protection

Design Standards:

- Pave up to boundary where distance to building is less than 1500mm.
- A separate pathway for pedestrian access is to be provided independent of the vehicle access driveway
- Provide a safe and continuous pathway from the street entrance and/or parking area to a dwelling
- All vehicular pavement is to be concrete kerbed



F.3.1 Clotheslines

2 4 5 6 7

- Clotheslines to be sited for minimal visual impact, ideally in side setbacks and directly accessible from the laundry via a paved path (min 900mm wide and step free).
- Avoid locating clothes lines in prominent positions in the front or rear yard where they impact on the usable outdoor amenity.
- Rotary hoist type is preferred where space permits and usable outdoor amenity can be maintained.
- To be sited over a paved surface with sufficient clearance to access. Paved surface to extend a minimum 900mm clear once clotheslines are deployed.
- To be located to allow sufficient solar access and ventilation and 1 m clear of obstructions.

Types :

- Awning:
 - 1-3 bed: min 20 lineal metres | 4-5 bed: min 35 lineal metres
 - Ground or wall mounted, with tensioning mechanism
- Fixed rotary type adjustable (wind-up fixed head hoists)
 - 2-3 bed: min. 39 lineal metres (4 m dia.) | 4-5 bed: min. 48 lineal metres (5 m dia.)

F.3.2 Utilities

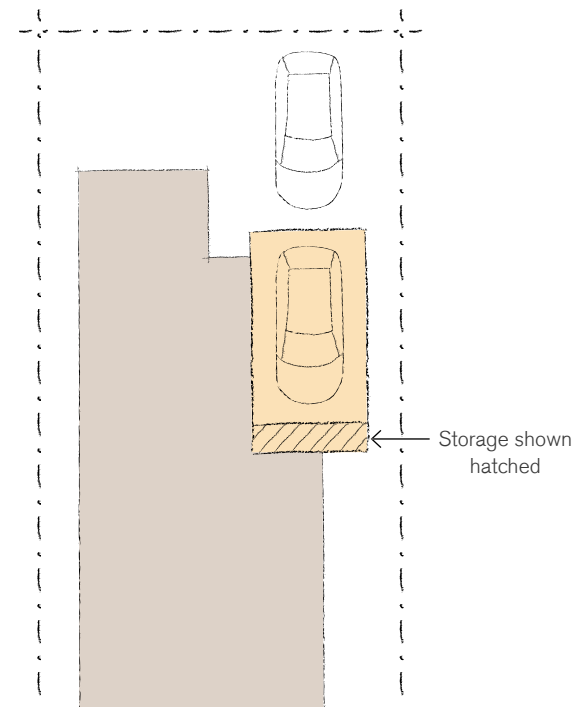
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- Locate hot water units, air conditioning units, and rainwater tanks generally in unobtrusive locations where they will not be visible from windows or covered outdoor areas
- Consider the location of services and utilities so that access around the dwelling, particularly in side setbacks, is not impeded
- Consider screening to services and utilities where they are visible from living spaces or covered outdoor areas
- Consider access space required for the maintenance and servicing of the units.

F. External Design Principles

AHO Design Guidelines NSW

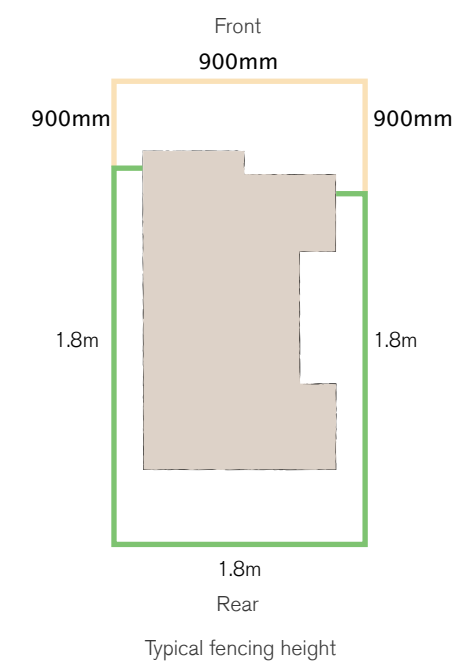
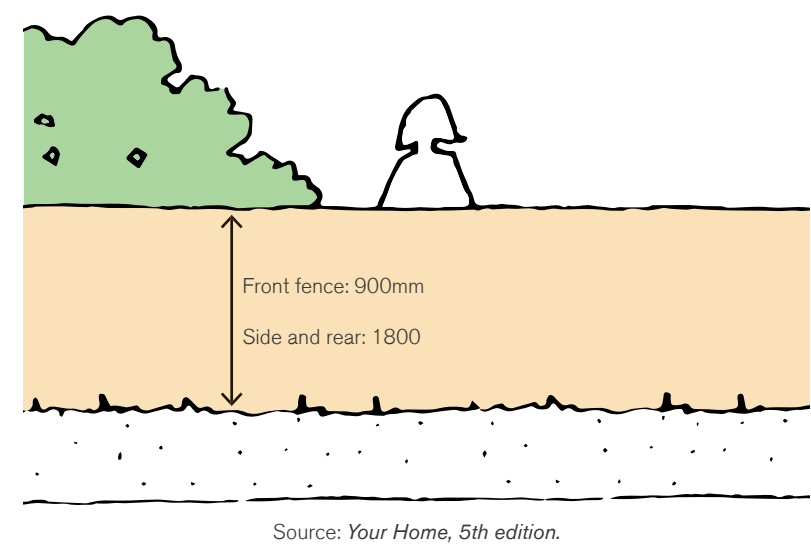
3. Utilities



F.3.3 External Storage

2 4 5 6 7

- o Storage is to be provided preferably through a space dedicated within the garage, or integrated into the carport.
- o An external storage unit is only acceptable when storage cannot be provided in the garage or under the roof line.
- o Allocate enough space within the store for a lawn mower and garden equipment. Locate in an accessible and lockable position to access the rear and front yards.



F.4.1 Fences



- o Ensure that garden and fence layouts do not compromise security by limiting visibility through the site.
- o Use real or perceived barriers to discourage intruders. Real barriers include a picket fence, brick wall or a hedge. Perceived barriers can be created by a flower garden or a change in level or design between the public space of a footpath and private front yard.
- o Use consistent street fencing, which does not isolate the house from the street. Balance privacy requirements with the need for a visual connection with the street and passive surveillance.
- o The maximum height of side and rear fences is to be 1800mm high
- o Where front fences are required, the height is preferred at 900mm and should be consistent with the streetscape and compliant with local council requirements. Use semi-transparent fencing to the street to aid connection
- o Gates are to be provided to side fence returns to provide a secure rear yard.
- o Acceptable fencing materials are metal pre-rolled sheet, lapped timber (hardwood or treated pine), prefabricated palisade. Selection to be made to suit local availability and the colour and type should compliment the character of the dwelling and neighbourhood.

Design Standards:

- o Rear and Side boundary fences: 1800mm high, with rails spaced to prevent a child from climbing
- o Front and side boundary (to cut off) fence: consistent with streetscape and to Council requirements. If no council requirement, fencing is 900mm semi-transparent, with 900mm wide clear pedestrian gate, 2700mm min width vehicle gates.
- o Corner blocks must have 900mm semi-transparent perimeter fencing fronting streets/laneways.
- o Do not use 'spear points' fencing where impaling is possible

Warm humid summer, mild winter



- o Consider the permeability and suitability of fence materials where airflow is desired in warm and humid climates to permit cross breezes.
- o Where porous fence options are used, consider additional privacy to habitable areas via blinds or planting.



F.4.2 Retaining Walls



- Where site grading is required, utilise terraced walls to take up level changes in lieu of fewer higher retaining walls.
- Retaining walls are to be a maximum of 600mm high unless site constraints are unavoidable.
- Structural footings to retaining walls are to be concealed.
- All retaining walls over 600mm high must be designed by a practicing structural engineer and certified as structurally adequate on completion by that engineer.
- Provide a landscaped buffer where possible to avoid retaining walls presenting to the front streetscape.
- Acceptable fencing materials are blockwork, precast concrete sleeper, natural stone, timber sleeper. Selection to be made to suit local availability and the colour and type should compliment the character of the dwelling and neighbourhood.
- Provide adequate drainage and waterproofing to all retaining walls.
- Where balustrades are installed, provide flush on top of the wall or immediately adjacent to prevent a climbable ledge.
- Refer to Safety In Design section for additional considerations for height and incorporation of balustrade.

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Internal Design Principles

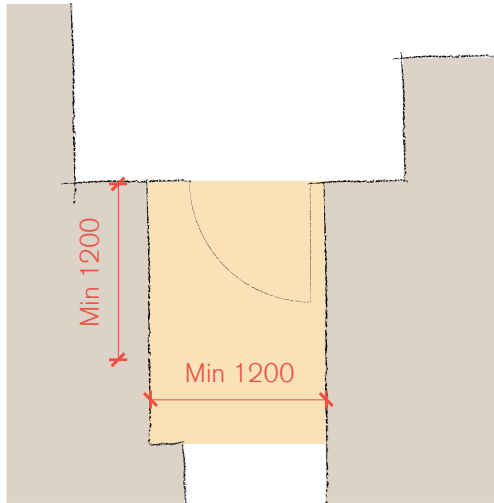
G.1 Functional Spaces

G.2 Circulation and Storage

G.3 Materials and Components

G

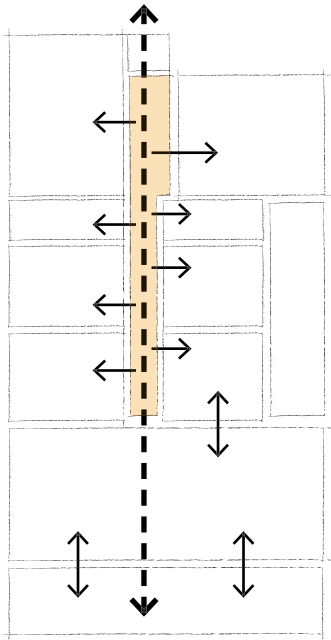
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G.1.1 Entry



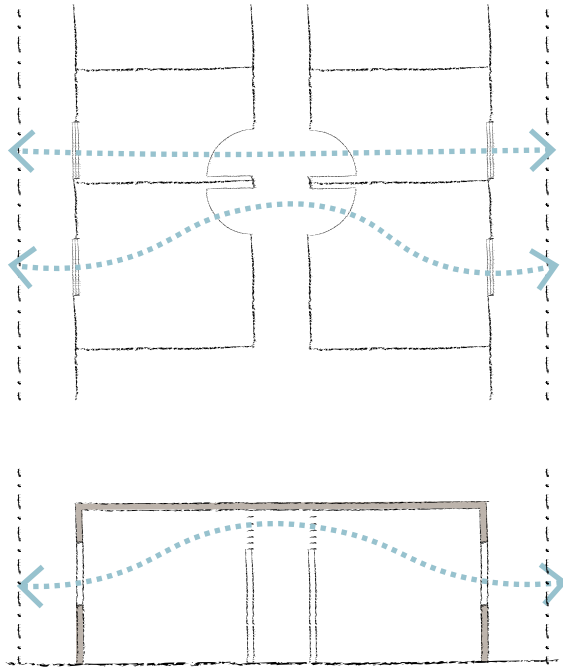
- o Provide a clear entry to a circulation zone where possible
- o Allow for a wider corridor at the entry where possible, consider 1200mm clear in both directions
- o Consider two points of access to dwellings where there may be multiple occupants.
- o Provide a minimum clear door opening width of 850mm
- o Provide a solid core door (40mm thick flush type) and steel frame



G.1.2 Circulation and Corridors



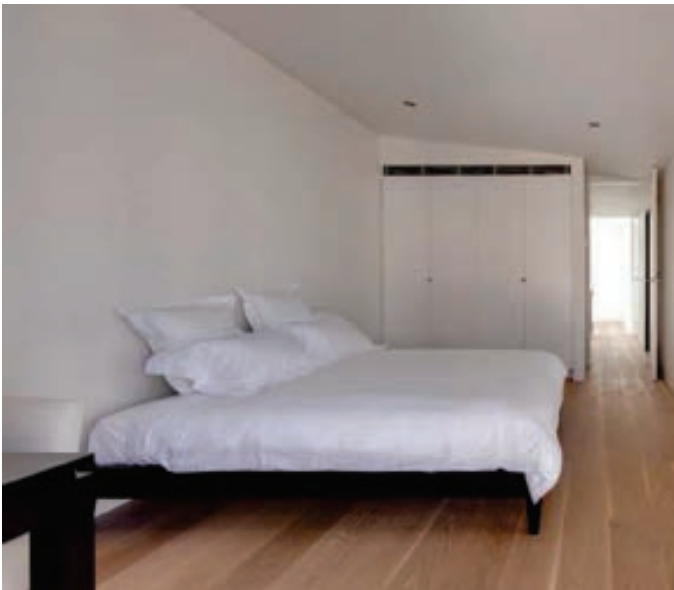
- o Establish clear circulation spines through the house
- o Allow for flexibility for additional circulation and access to suit cultural and social relationships, such as multiple entry and exit points
- o Furniture placement should be considered to allow for clear circulation between spaces
- o Avoid stepped corridors where possible
- o Corridors are to have a min 1000mm wide clear width, increasing to a min 1200mm at the entrance doorway.
- o Corridor lengths should be minimised
- o Consider wider internal corridors to facilitate additional sleeping arrangements where occupant numbers are temporarily increased by visitors.



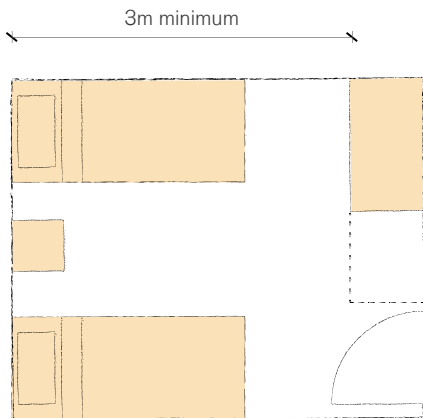
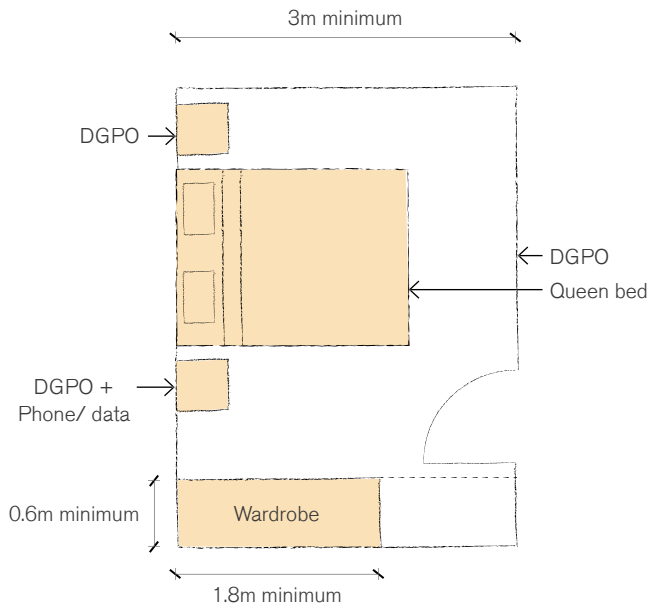
G.1.3 Internal Openings



- o Where possible, align doors and windows to promote cross ventilation.
- o All rooms to have an openable window
- o Skylights are permitted to corridors and bathrooms, however a window is preferred.
- o All internal doorways to have a minimum clear opening width of 820mm and a level threshold.
- o Internal door from the garage gives a minimum clear opening width of 850mm, with level transition threshold
- o Internal doors to at least 1 bedroom, the kitchen/living/dining areas (if any) and to at least one bathroom with a toilet having livable housing features give a minimum clear opening width of 850mm.



Sydney Terrace, *Tzannes*.



G.1.4 Bedrooms



- Provide a minimum dimension of 3m clear of wardrobes to at least 1 bedroom
- Provide the minimum amount of bedrooms to suit the client brief.
- Built in wardrobes with shelving, 4 drawers and hanging space must be provided in all bedrooms
- Provide double GPOs in logical positions for the future provision of furniture and fixtures.
- Consider two way access to some bedrooms where there may be multiple occupants.
- Consider separating bedrooms in wings where there may be older and younger children in a multi-generational home.

Master Bedroom

- Must have sufficient space for a queen size double bed, a wardrobe (min 600 x 1800mm) and 2 x bedside tables (450 x 450mm).
- Provide a minimum of 3m clear of wardrobes in one direction.
- Built in wardrobes with shelving, 8 drawers and hanging space must be provided in master

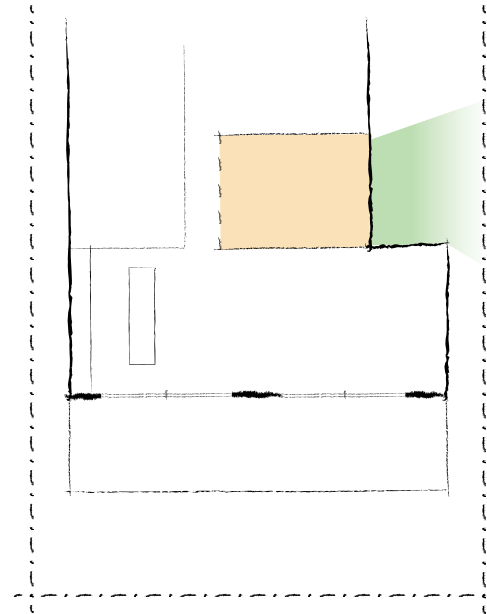
Additional bedrooms

- Must have sufficient space for 2 single beds and a wardrobe (min 600 x 1200mm)

G. Internal Design Principles

AHO Design Guidelines NSW

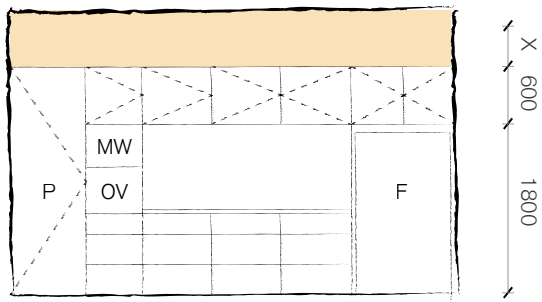
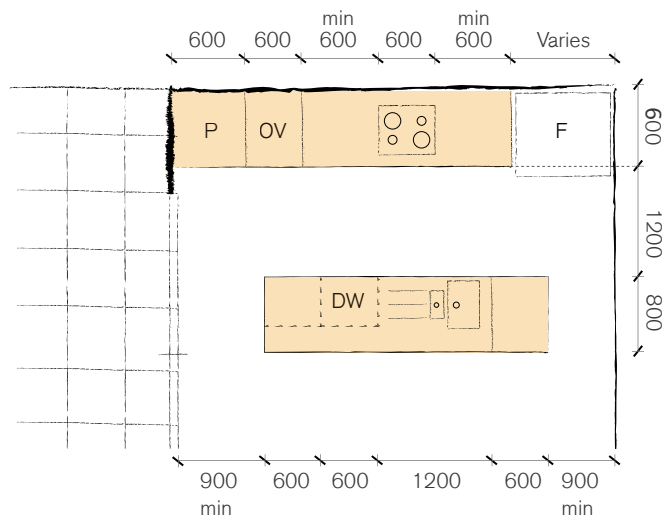
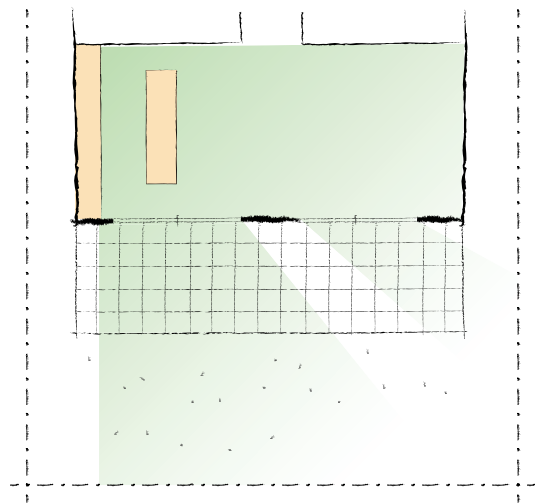
1. Functional Spaces



G.1.5 Multi-use Room

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- o Provide a flexible space that can be used as either an additional living area or space for visitors in dwellings with 3 or more bedrooms.
- o Consider the use of double doors or sliding doors to allow connection or privacy as required and aid efficiency of HVAC systems.
- o Consider acoustic attenuation.
- o Minimum dimension 3m clear and be able to accommodate an entertainment unit, coffee table and lounge seatings for 5 people.
- o Give regard for positions of GPOs - for the potential to use as an additional bedroom.
- o Where possible, the multi-use room should have visual access to a landscaped area.
- o Consider the size of the dwelling and locate the multi purpose room to allow occupants a number of flexible living spaces.



G.1.6 Kitchen



- Where possible, provide a kitchen with a free standing island bench.
- Provide good circulation within the kitchen due to high traffic use.
- 'U' shape kitchens should be avoided (due to inaccessible corners).
- Visual connection to the living spaces and rear outdoor area should be maximised for light, amenity and passive surveillance.
- Window sills/jams are to be a tiled finish.

Design Standards:

- Windows positioned to overlook children's play area if appropriate.
- Floor finishes are slip resistant and level with adjacent surfaces.

Clearances and joinery

- A cavity provision for a dishwasher unit must be included.
- A full height pantry must be provided
- Where possible, the island bench should be free of the wall for improved maintenance
- Sinks should be a minimum of 600mm from side edge of bench.
- Soft close hinges to be installed to cabinets.

Design Standards:

Pantry minimum sizes:

- 600mm wide (minimum), 600mm deep
- Where space permits look to increase pantry width

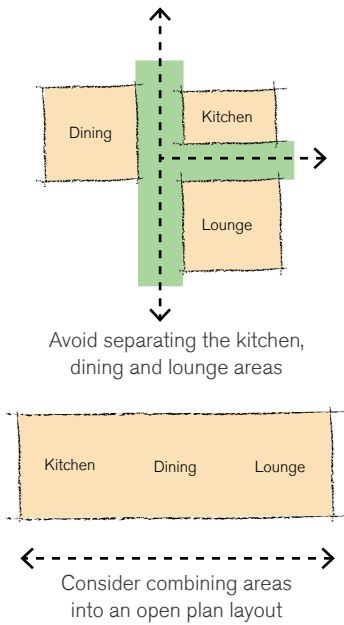
Bench minimum sizes:

- Island Bench tops should be 750 - 900mm deep and include full width end panels to support overhang
- 1 bed: 2200mm lineal metres, 600mm deep
- 2 bed: 2400mm lineal metres, 600mm deep

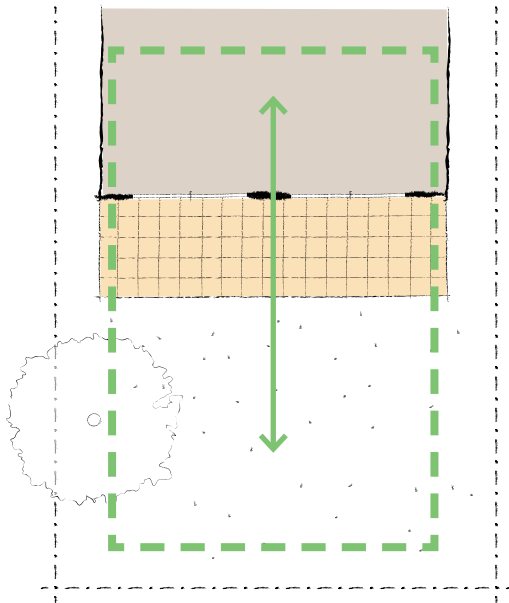
- 3 - 4 bed: 2700mm lineal metres, 600mm deep
- 5 - 6 bed: 3000mm lineal metres, 600mm deep
- Overhead cupboards minimum 300mm deep.
- Fridge space minimum: (allows for air circulation)
- 1-2 bed: 750mm (min) wide
- 3 bed: 850mm (min) wide
- 4 +bed: 950mm (min) wide

Appliances

- Ensure fridge door is able to open without obstruction
- Kitchen exhaust fan must be provided and vented externally.
- Two DGPOs must be provided as a minimum, plus one GPO each for the range hood, cooktop and fridge.
- A GPO must be provided to the island bench. Consider mounting the GPO flush with the joinery.



AHO property, NSW



G.1.7 Dining Area



- Provide sufficient space for a dining table to seat the household occupants plus two visitors.
- Where possible, the dining area should be integrated with the lounge and kitchen in an open plan arrangement.

G.1.8 Living Area



- Provide sufficient space for a living area to accommodate an entertainment unit, coffee table and lounge seating for the household occupants plus two visitors.
- Where possible, the living area should be integrated with the dining area and kitchen in an open plan arrangement.
- Consider furniture placement and DGPOs to allow for circulation and placement of a TV (min 55cm)
- Consider larger living areas or additional breakout spaces to accommodate increased occupants eg study nooks, semi enclosed verandahs, secondary living areas, media rooms.

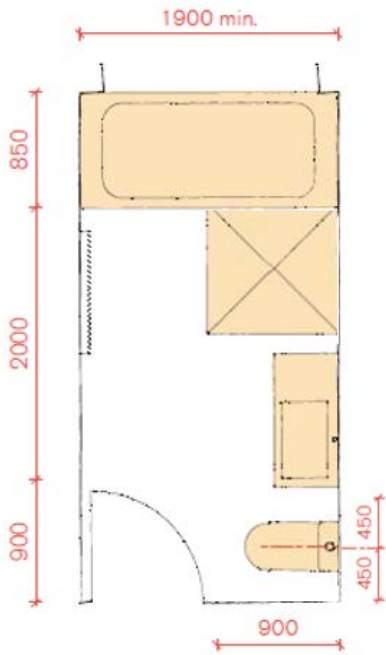
G.1.9 Indoor-Outdoor Connection



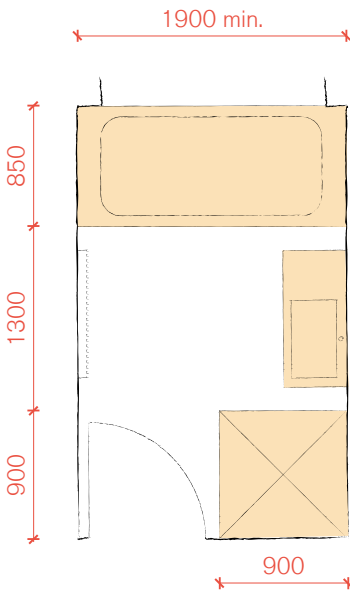
- Primary living areas should open up to the outdoor covered area and rear yard
- Where open plan living is achieved, consider orientating the space so both the dining and lounge have either physical or visual access to the outside.



AHO property, Sydney



Bathroom with WC.



Bathroom without WC.

G.1.10 Bathroom and Ensuite Principles



- Where possible locate plumbing and fixtures on one wall
- Provide hobless shower cubicles. If the shower is to have a glass blade screen, 800mm clear is acceptable. Fix blade on sides.
- Towel rails are to fit a minimum of 2 towels
- For privacy, bathroom windows should have obscured glass
- All bathrooms and ensuites to be mechanically ventilated with extraction fans, vented to the outside
- Where possible incorporate an openable window. Consider a skylight where bathrooms, ensuites and powder rooms are unavoidably without access to a window.
- Window sills/jams are to be a tiled finish
- Allow for setbacks to all wet areas to allow for adequate waterproofing and flush thresholds.

Bathroom

- Baths are to be included in the main bathroom for 3 bedroom houses and larger.
- The bathroom vanity is to have a hand basin and storage cupboards underneath.
- Locate shower cubicles in the corner for future installation of grab rails. Do not place showers over baths.
- For the purposes of future proofing for accessibility, walls around the shower, bath and toilet should be reinforced to provide a fixing surface for installation of grab rails.
- Shower shelves should be wall fixed.
- Tiled walls full height to the ceiling. A square set ceiling with no cornice is preferred.

Shower:

- 800 x 800mm internally (min.) for cubicle showers.

Toilet:

- Centreline is located 450 - 460mm away from the corner.

Vanity Cabinet:

- Do not use wall hung cabinets, provide vanities on stainless steel legs
- Joinery shall not sit directly on the floor to avoid water damage to carcasses.

Mirrored wall cabinet (mounted 300mm above vanity/basin):

- 1 - 2 bed: single door, min. 375mm high, 405mm wide, 115mm deep, min 1 shelf
- 3 + bed: double door, min 415mm high, 700mm wide, 130mm deep, min 2 shelves

Bathroom Vanity:

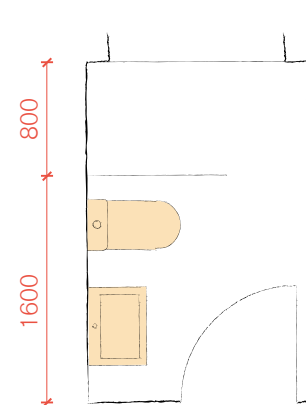
- Carcass: Min 750 wide x 450mm deep

Bath:

- Min 1600 long x 750 wide x 380mm deep

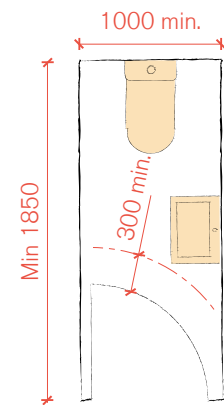
Bathroom fittings:

- Toilet paper holder, towel rail 760mm long, robe hooks
- Do not install combination 3 in 1 fan/light/heat



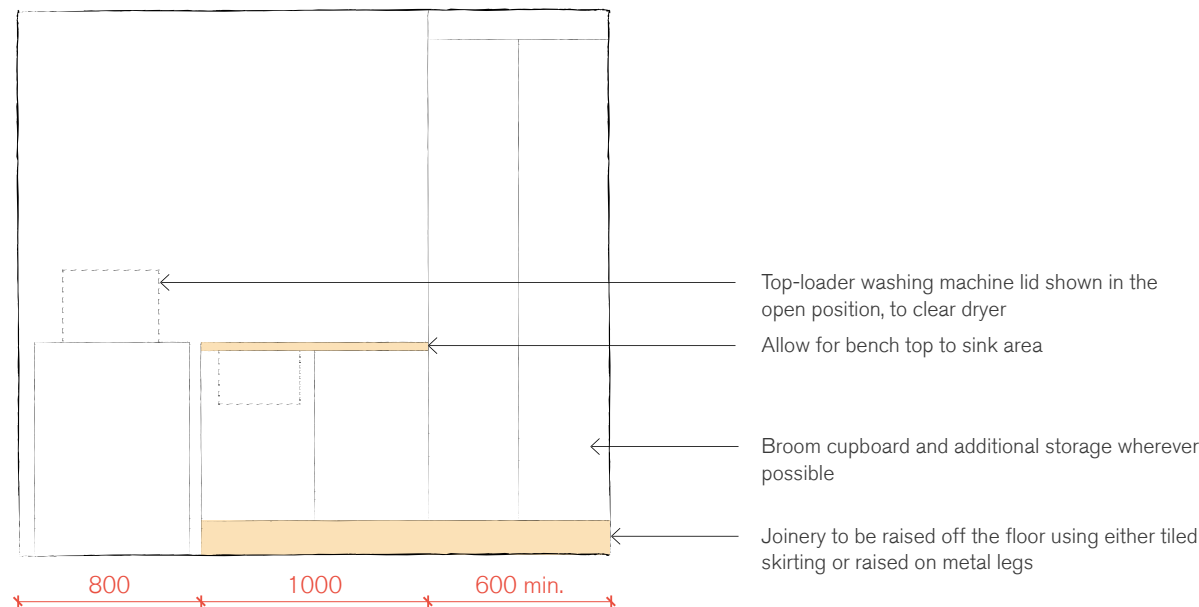
Ensuite

- o Generally provide an ensuite to the master bedroom.
- o Provide a vanity with under bench storage.
- o Provide a minimum 800mm width shower.
- o Baths are not required to ensuites.



Separate Toilet

- o Provide a separate toilet in all dwellings.
- o Where possible provide a handwash basin, if one cannot be provided, ensure adjacent access to a handwash basin in a laundry or bathroom.
- o In two storey dwellings, provide the separate toilet on the ground floor.
- o For the purposes of future proofing for accessibility, walls around the toilet should be reinforced to provide a fixing surface for installation of grab rails.
- o Toilets in a separate laundry must allow the laundry to be used whilst toilet occupied
- o Wall basin to have minimum two rows splashback tiles.
- o Doors are to clear the hand basin by a minimum of 300mm.



G.1.11 Laundry Principles

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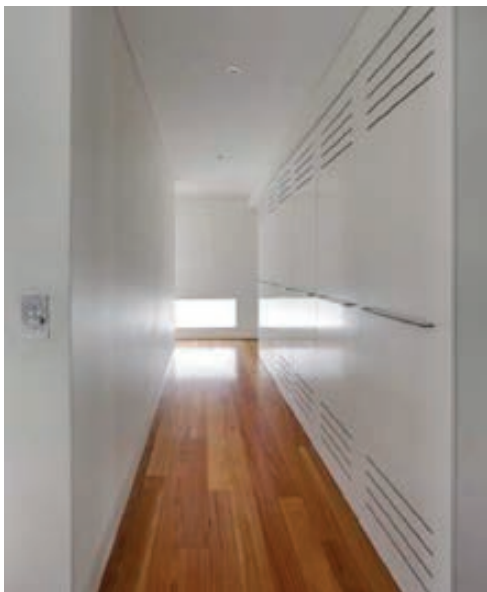
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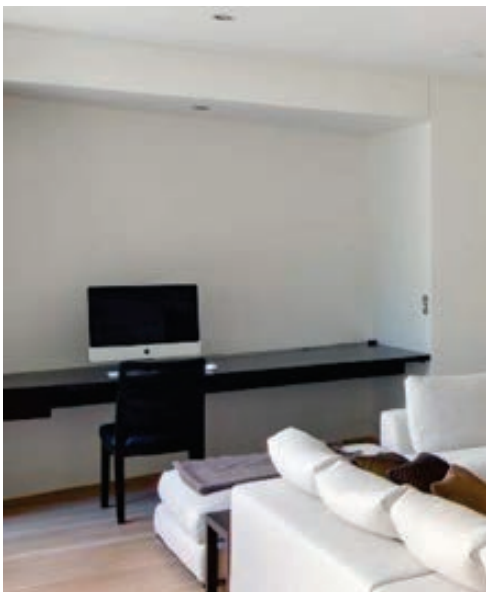
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- o A bench with a sink should be provided
- o The bench is to have a dimension of 600 x 600mm clear of the sink
- o Allow for 800mm clear width for washing machine with no bench over
- o Provide masonry or reinforced walls to support wall mounted dryer and 1 DGPO
- o Where possible the laundry is to have direct access to the outside and drying area
- o Allow for extraction fans, vented directly to the outside
- o Consider using a glass framed door to the laundry to allow natural light from outside and an openable window where possible.
- o A place for the storage of hazardous chemicals and goods must be provided. This must be a secure location that is out of reach for children, such as a high shelf, or a lockable cupboard.

- Design Standards:
- Separate laundry
- o Laundry cupboards have hinged, not bi-fold doors
 - o A min 80mm floor waste
 - o Splashback of two rows of tiles minimum over tub and extend behind washing machine, 1 row skirting tile
 - o Joinery is to be elevated on a tiled plinth or raised on metal legs to avoid water damage to carcasses.



Joinery, AHO.



G.2.1 Internal Storage



- o Provide a linen cupboard. Provision can be provided across multiple cupboards within the dwelling.
- o Consider a place for the storage of additional bedding for when visitors come to stay.
- o Consider utilising the space under internal stairs for additional storage.

Design Standards:

Linen cupboard minimum sizes

- o 0-2 bed: 600 x 450mm deep with min 4 equally spaced shelves
- o 3-6 bed: 900 x 450mm deep with min 4 equally spaced shelves

G.2.2 Joinery



- o Consider building joinery flush into the walls wherever possible
- o Where possible, consider full-height joinery
- o Side edge tracks are to be installed at sliding wardrobe doors to prevent damage to the walls
- o Finger pulls are preferred to handles
- o Soft close drawers are preferred

G.2.3 Study Nook



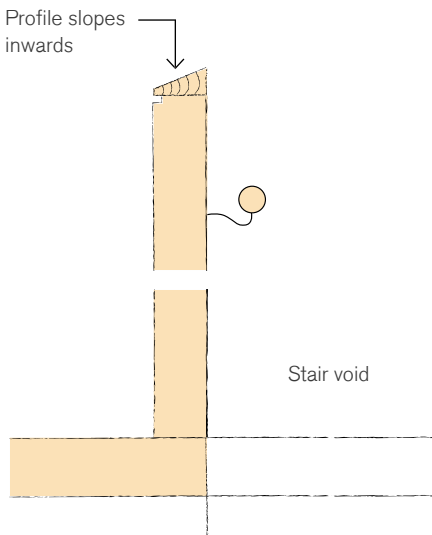
- o Consider additional breakout spaces to accommodate increased occupants eg study nooks
- o Provide a study nook in 2 bed houses where multi-purpose room is not required.
- o Where possible, study nooks should have access to a window
- o Study nooks are to fit a computer desk, a chair and a shelf as a minimum
- o Allow for a minimum 600mm deep x1200mm wide desk with a shelf above
- o Study nooks can be located in a designated area or integrated into the living or multi-use room



G.2.4 Internal Stairway



- o Internal stairways must feature a continuous handrail on one side where there is a rise of more than one metre.
- o Allow sufficient space at the top and bottom of staircases to allow the handrail to finish.
- o Finish stringer correctly to avoid trip hazards.

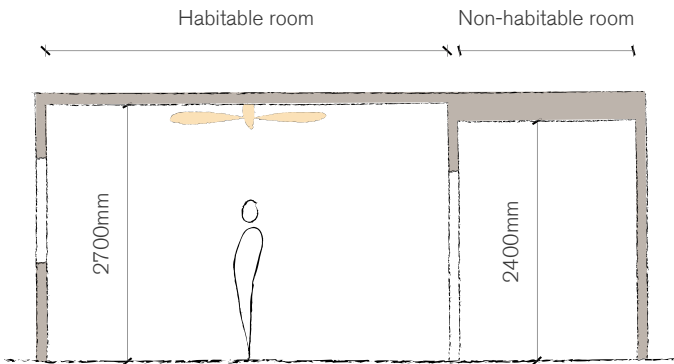
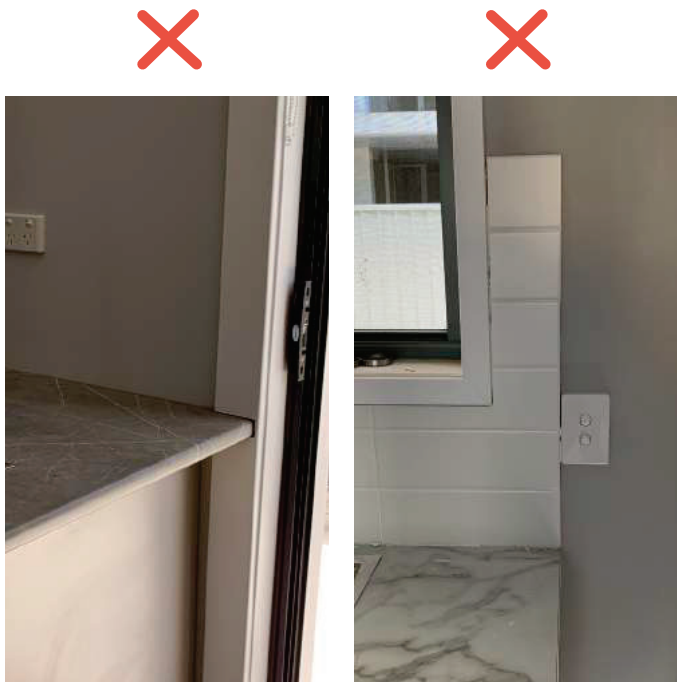


Slope the top of the balustrade inwards

G.2.5 Balustrades



- o Provide a robust solid balustrade
- o Provide a sloped profile at top to discourage the storage of objects which may fall to voids below



Maximum ceiling heights for habitable and non-habitable rooms.

G.3.1 Internal Materials



- Provide low maintenance and durable internal finishes.
- Use locally produced, low embodied energy, renewable building materials that can be recycled wherever possible.
- As a general rule, limit material junctions and avoid steps in plan.
- Consider the layout of joinery and give regard to the alignment of elements surrounding, eg windows, doors, architraves, GPOs.
- Minimise cutting of materials and align spaces and joinery with full tiles for example.
- Preferred flooring for the ground level is vinyl planks/tiles and for the upper levels carpet. Wet areas are preferred as P3 full body porcelain tiles.
- Internal linings are to be impact check as a minimum to all areas and fibre cement sheets to wet areas.

G.3.2 Ceiling Heights and Fans



- Ceilings to habitable areas (bedrooms, living room, lounge room) are preferred to be a minimum of 2700mm from floor level. This height allows for an adequate clearance for ceiling fans.
- Ceilings to non-habitable rooms (bathrooms, ensuites) must be a minimum of 2400mm from floor level.

Fans



Design Standard:

- Install combination light/ceiling fan in living room/living area and all bedrooms

G.3.3 Internal Lighting



- Locate internal lighting where they can be safely and easily maintained.
- Do not place lighting over stairways or voids where maintenance access is difficult.
- Ensure the light selection is robust, cost effective, energy efficient.
- Avoid fixtures which would allow cobwebs to gather.



Typical Floor Plans

H.1 Introduction

H.2 Method of Measurement

H.3 Typical House Plans



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The typical floor plans provided here are examples of acceptable solutions that meet the AHO Design Guidelines. A small number of example housing typologies have been shown, which represent the most common types in the current property portfolio.

As each site will have its own unique set of conditions, a series of diagrams are provided which communicate the design intent and explain key principles to show how these designs can be adapted to suit other site conditions or different typologies.

The lot sizes and setbacks are a guide only and floor plans should be adapted to suit the provided lot size and local council requirements, whilst employing the principles set out in the diagrams.

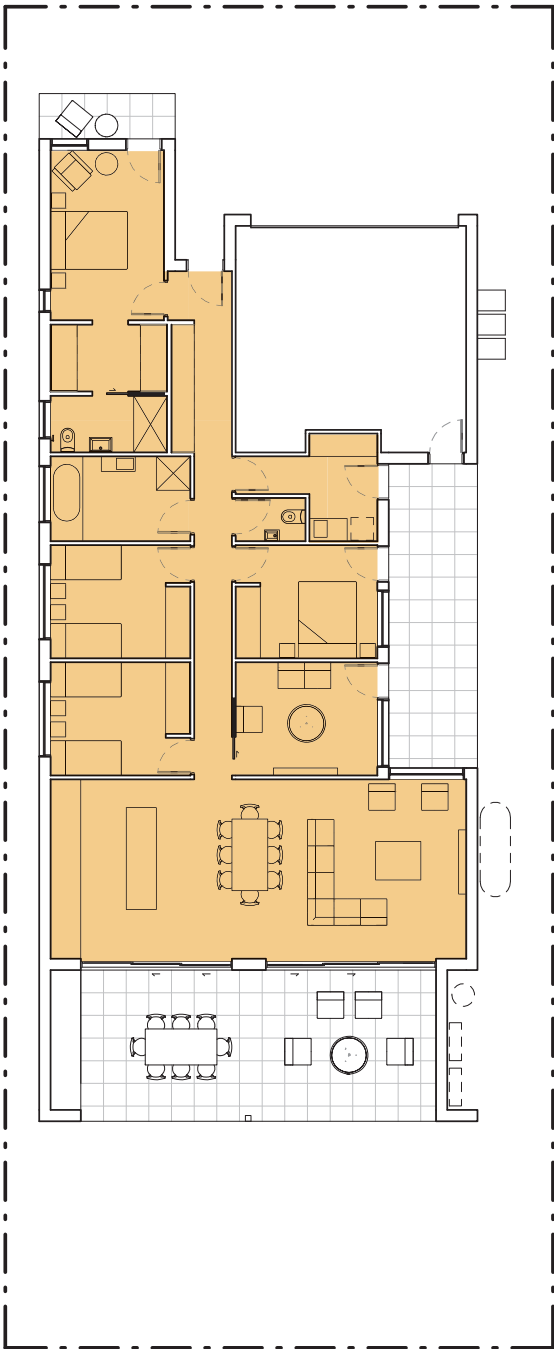
The typical floor plans and diagrams are only intended as a guide and are not compulsory. They offer a best practice example that can be used as reference for AHO staff during the review process, and architects and builders during the design and construction phase.

H.2 Method of Measurement



The dwelling areas provided have been measured using the following key criteria, as per the highlighted area in the adjacent plan:

- Areas are measured to the inside face of the external walls
- Areas include the fully enclosed covered area
- Areas exclude garage structures
- Stairs are counted at the lowest level and stair voids on the levels above are excluded



H.3 Typical Housing Typologies



The housing typologies shown on the following pages are listed below with applicable key data.

	Lot Area (m ²)	Dwelling Area (m ²)	No. of Beds / No. of Baths	Potential number of occupants
Large Family Home	515	160	4 beds 1 en-suite, 1 bath, 1 separate toilet + basin	6 - 8 people
Multigeneration Family Home	560	200	5 beds 2 en-suites, 1 baths, 1 separate toilet + basin	8 - 10 people
Small Family Home	360	118	2 beds 1 bath, 1 separate toilet + basin	1 - 3 people

H.

Typical Floor Plans

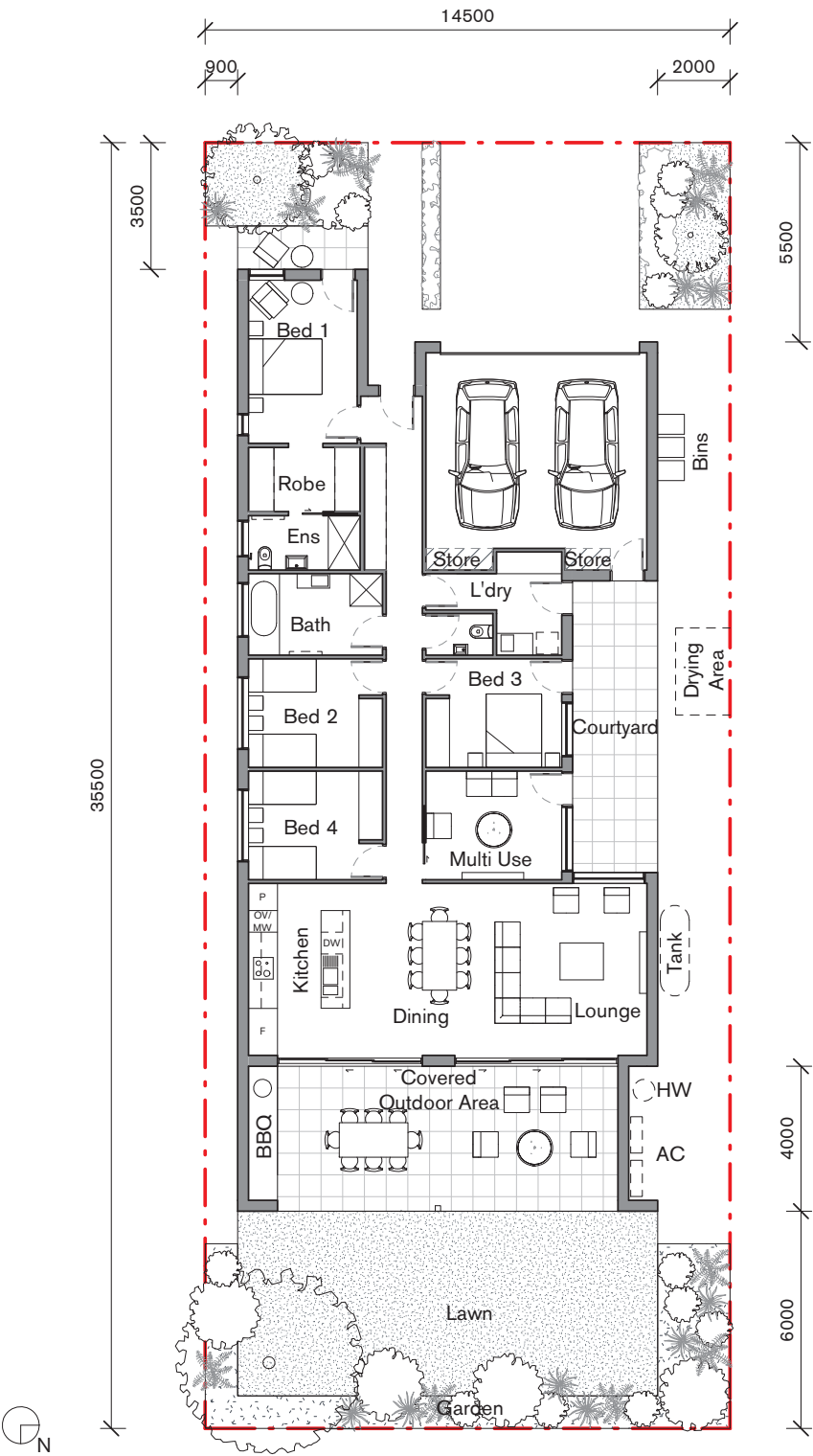
AHO Design Guidelines NSW

3. Typical Housing Typologies



H.3.1 Type 1 - Large Family Home

Lot size = 515 m²
Dwelling size = 160m²
Refer to typical plans introduction for method of measurement.
Scale 1:200 @ A3



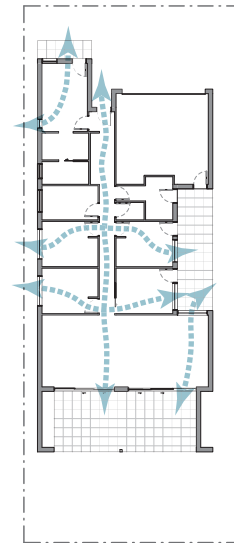
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Typical Floor Plans

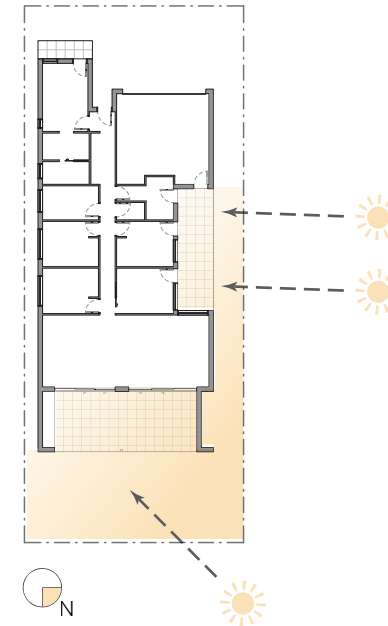
AHO Design Guidelines NSW

3. Key Principles

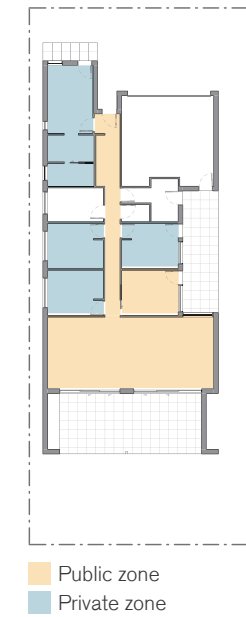
Cross flow



Winter solar access



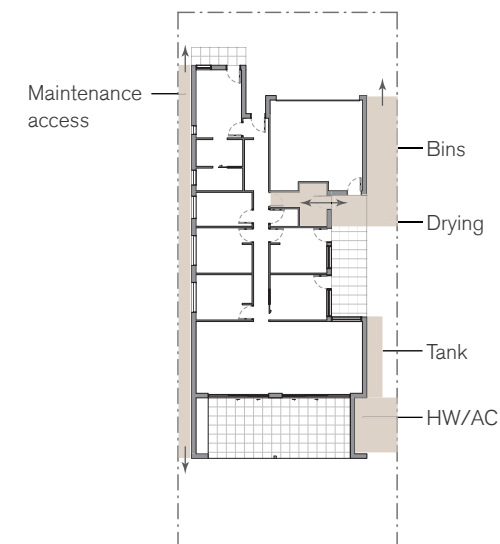
Private/Public zoning



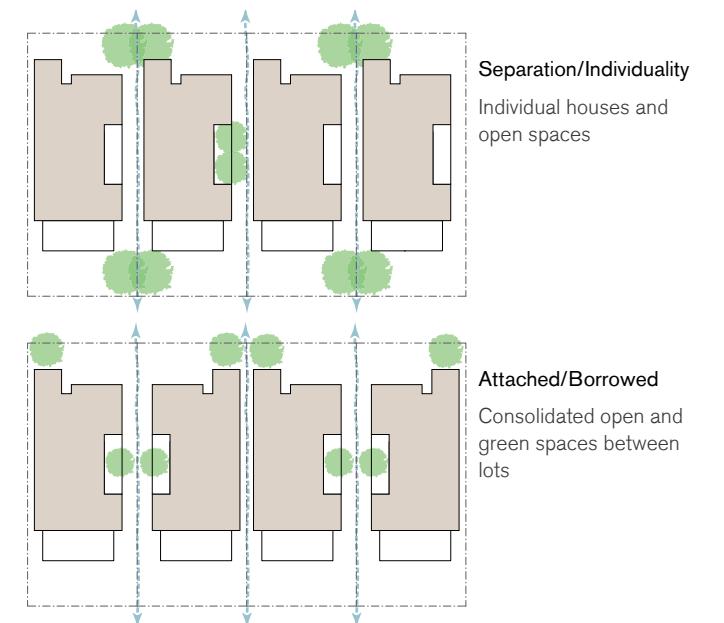
Indoor/Outdoor relationships



Services access



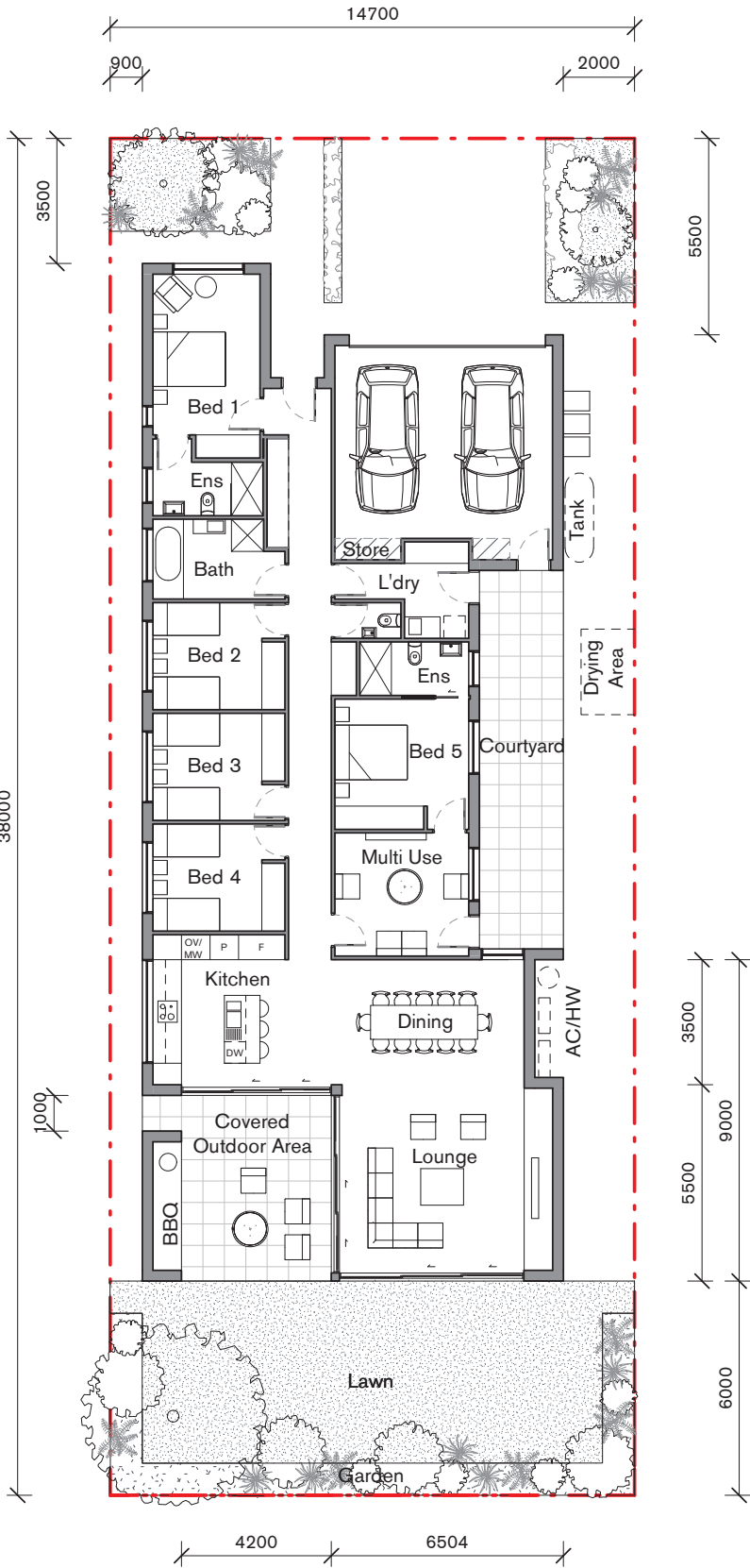
Allotment layout



H.3.2 Type 2 - Multi-Generational Family Home



Lot size = 560 m²
Dwelling size = 200m²
Refer to typical plans introduction for method of measurement.
Scale 1:200 @ A3



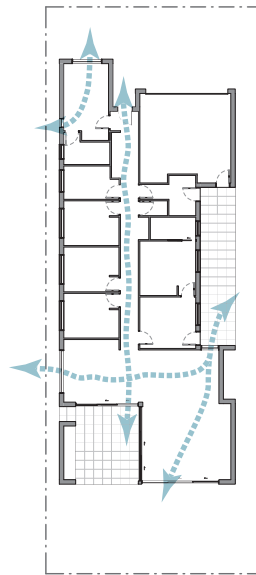
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Typical Floor Plans

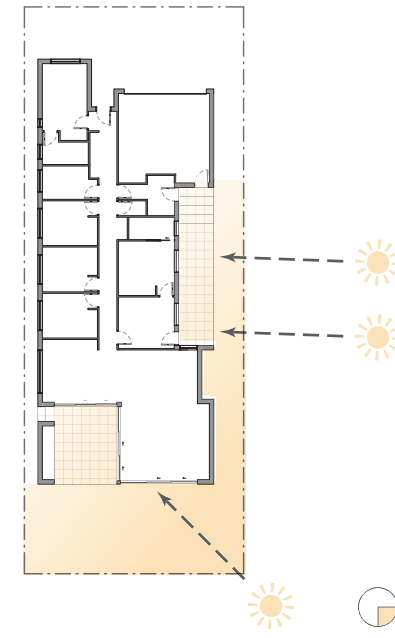
AHO Design Guidelines NSW

3. Key Principles

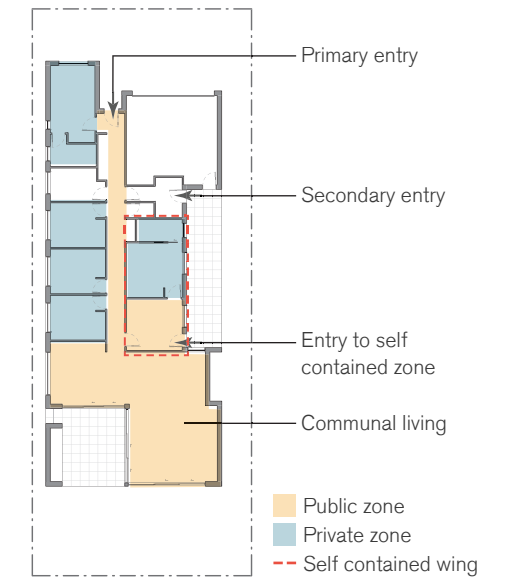
Cross flow



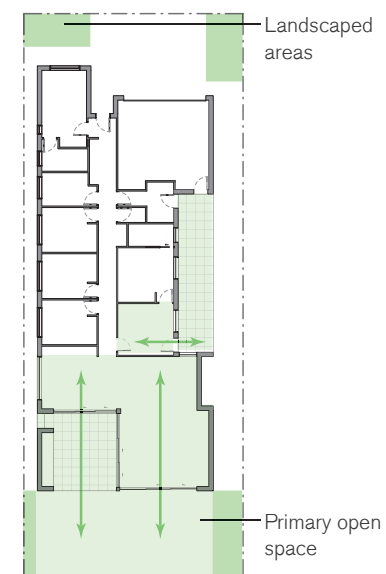
Winter solar access



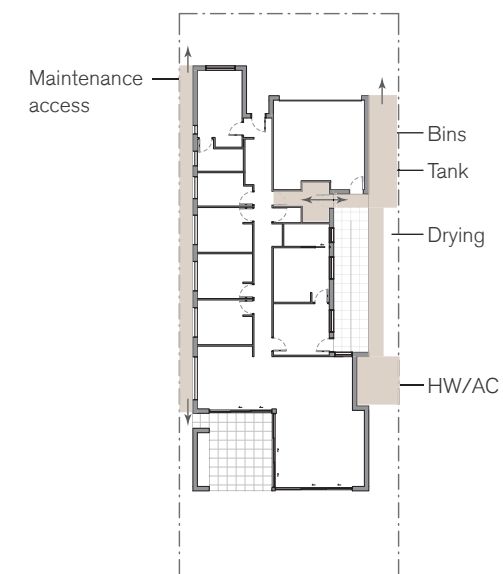
Private/Public zoning



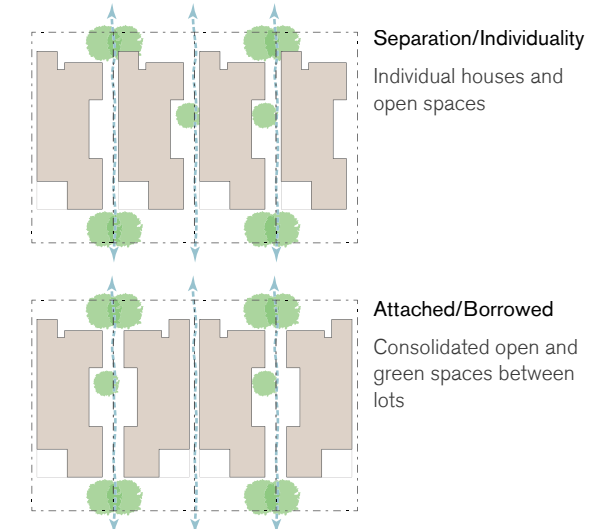
Indoor/Outdoor relationships

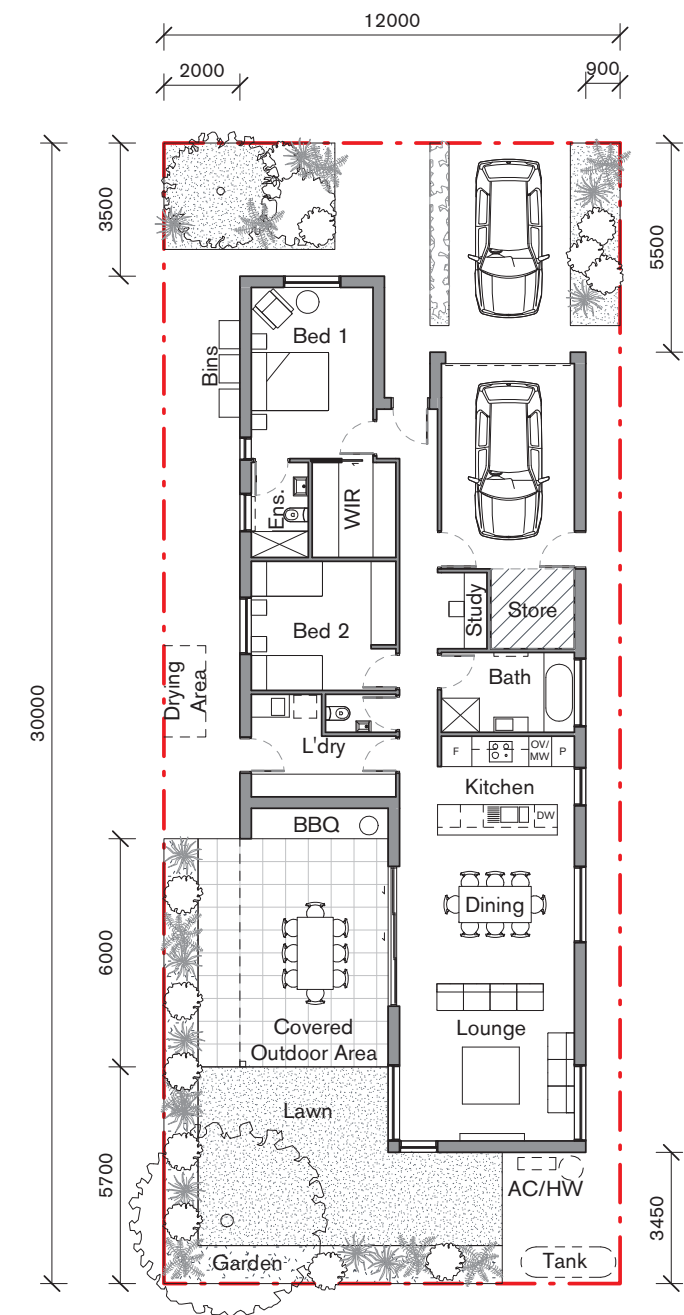


Services access



Allotment layout





H.3.3 Type 3 - Small Family Home



Lot size = 360 m²
Dwelling size = 118 m²
Refer to typical plans introduction for method of measurement.
Scale 1:200 @ A3



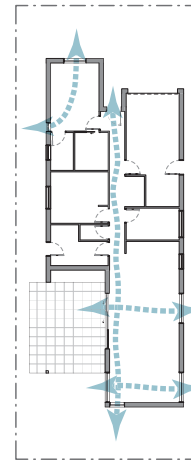
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Typical Floor Plans

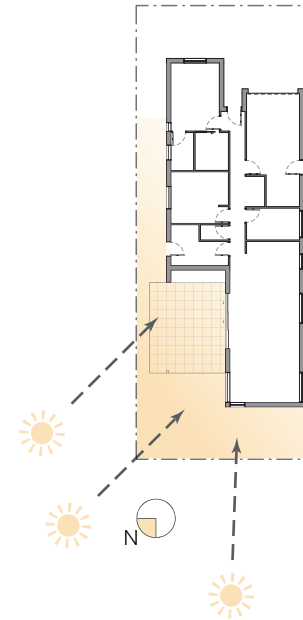
AHO Design Guidelines NSW

3. Key Principles

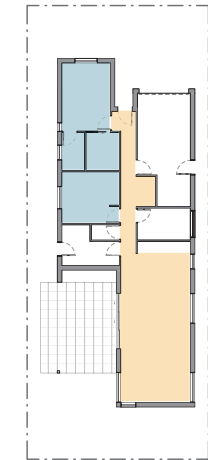
Cross flow



Winter solar access

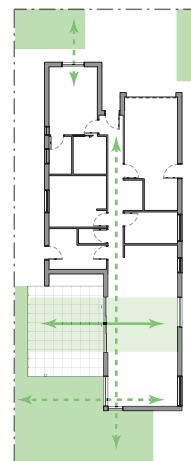


Private/Public zoning

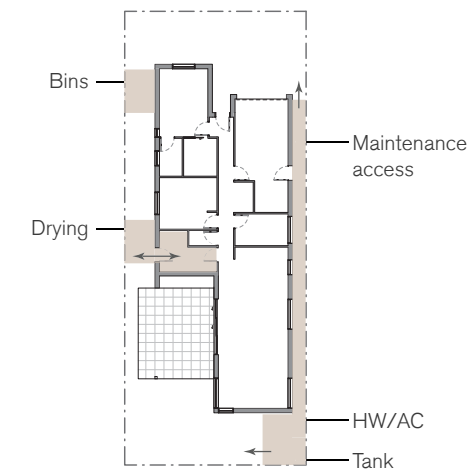


Public zone
Private zone

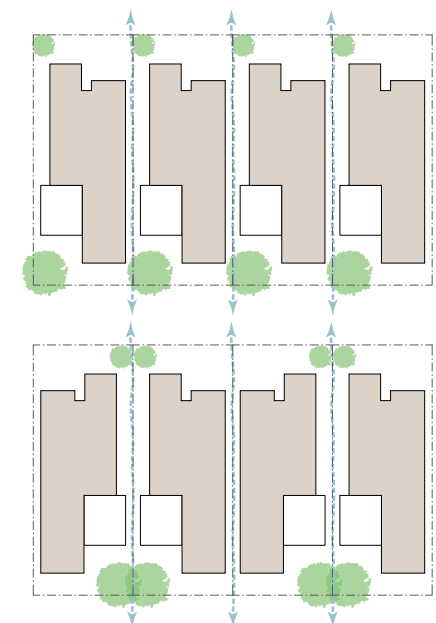
Indoor/Outdoor relationships



Services access



Allotment layout



Separation/Individuality
Individual houses and
open spaces

Attached/Borrowed
Consolidated open and
green spaces between
lots



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