Issue no. 01 — 2021

Draft Apartment Design Guide

Creating great apartments
Draft for discussion 2021

NSW GOVERNMENT

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Acknowledgement of Country

The Department of Planning, Industry and Environment acknowledges the Traditional Custodians of the land and pays respect to Elders past, present, and future. We honour Australian Aboriginal and Torres Strait Islander peoples' primary cultural and spiritual relationships to place, and their rich contribution to our society. To that end, all our work seeks to uphold the idea that if we care for Country, it will care for us.

ADG structure comparison

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Sydney Park wetlands

Minister's foreword

It is exciting to see our State coming back to life after long and difficult lo downs. The NSW Government is committed to making it simpler, faster and cheaper for businesses to get back on their feet, and, while we get back to business, we are also making sure that safer, healthier and more inclusive places are at the heart of our communities, helping us to achieve a more sustainable and prosperous future.

The *State Environmental Planning Policy (Design and Place) 2021* (DP SEPP) aims to do just that, by ensuring that great places and great design are in the focus of our planning process.

The people of NSW deserve to live in homes that are affordable and meet the needs of our diverse and growing communities.

For the *Apartment Design Guide* (ADG) to be successful, it must result in homes that people want to live in. A landmark survey of the NSW community undertaken in September 2021, clearly showed how important private open space, air flow, sunlight, storage, green space and energy efficiency are to people across all our communities.

This review of the ADG builds on its greatest qualities, while also responding to lessons learnt since 2015, particularly in light of the pandemic. It promotes greater housing diversity and choice by including provisions for family apartments, spaces to work or study, more storage and usable balconies. It also seeks to promote walking, cycling and public transport use by introducing greater bike parking requirements, and reducing minimum car parking requirements in suitable locations.

We've also looked at some of the pinch points experienced by councils and industry, great design can't always be quantified and written down in a series of tables. This revised ADG seeks to ensure that innovation and creativity isn't stifled by providing a clear framework for alternate design solutions where it benefits the community.

In response to this important feedback, as well as research and testing, we have made series of changes to support these needs, and we have done so while ensuring they are feasible and affordable.

The DP SEPP together with the guides will ensure we have the policy, so the people of NSW will be able enjoy the benefits that good design can deliver – design that will make our cities and towns vibrant, productive and sustainable, while supporting the needs of people and the quality of places.

With a collective effort now, and an investment in more sustainable ways of planning, designing and delivering our homes and urban environments, we will all reap the future dividends – better health, better connected communities, more comfortable and efficient apartments for living, and a more resilient built environment.

Government Architect's foreword

Our places and buildings are for the long term. Their impacts are far-ranging, and our joint responsibility to make a positive contribution to these places is more significant than ever before.

We are faced with the urgent need for sustained economic recovery as well as having a clear focus on environmental sustainability. In the wake of the pandemic we have a whole new appreciation for how people want to work and live. We have a growing understanding about how we need to be better connected to the Country on which we reside. In this context, I am committed to ensuring the DP SEPP, together with its supporting guides, will deliver better housing and urban design outcomes for communities across NSW.

Good design plays an important role in improving peoples' mental and physical health, and the community has reinforced this understanding. We are necessarily connected to the places where we live and work, and this policy is directed at creating equitable and high-quality built spaces embedded in liveable and beautiful environments. For our neighbourhoods, workplaces, schools, hospitals and other infrastructure, this is evident in our connection to the natural environment, moments for recreation, and the ways we move around and through places and create connections. For houses and apartments, this means homes that are well-ventilated and insulated and contain ample outdoor space, with great outlook and a positive relationship to the immediate context. We want homes we love to live in – and this is even more important now as our homes are also becoming more multifunctional – they're places of work, they're our home gym, and our places to entertain.

The DP SEPP also seeks to create places that are more responsive to the environment and to our unique Australian culture. When our buildings are designed sustainably, they respond to climate, are cheaper to heat or cool, they last longer and create less waste, and are more enjoyable to inhabit. They connect to parks and walkways, they sit within cool streets that have connected soil networks and tree canopy, where stormwater is well-managed to contribute to the ecosystem rather than cause problems, and where the greater community uptake of electric vehicles is supported with appropriate infrastructure. While this reflects the NSW Government's goal to achieve net zero emissions, it also creates better places to live and work – places that have character and identity and are resilient.

The DP SEPP promotes place-based design. It focuses on the importance of sound decision-making through the use of skilled professionals, through documentation of the design process, and through participation in design review before lodgement of planning applications, fostering the optimal outcome for each site and each community.

I'm grateful for the commitment and energy of our stakeholders and colleagues across industry, government and the community, who have worked alongside us to develop a draft DP SEPP that is flexible and responsive. The policy and supporting guides that are now on exhibition will provide a clear framework to create housing, infrastructure and development that will better fit community needs now and in the future.

I look forward to continuing to work with you to finalise the policy and guides so together we can deliver the homes people want and the places they want to live, in a way that enhances the environment for us all.

Cover image: Wonderland, FJMT Studios. Photographer: Rodrigo Varga.

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DPIE and Government Architect New South Wales (GANSW) images only, unless otherwise captioned.

About this guide

What is the Apartment Design Guide?

This *Apartment Design Guide* is a resource to improve the planning and design of residential apartment development in NSW. It supersedes the 2015 version of the Apartment Design Guide.

The guide is to be used in conjunction with the *Draft State Environmental Planning Policy (Design and Place) 2021* (the DP SEPP) which sets out NSW Government policy for improving the design quality of the built environment, including residential apartment development.

The *Apartment Design Guide* is a companion document to the *Urban Design Guide* (DPIE 2021), which explains how larger scale urban developments can comply with the DP SEPP requirements.

The *Draft Connecting with Country* framework (GANSW 2020) also provides guidance for all planning and design proposals across NSW.

Who is this Apartment Design Guide for?

The guide is for:

- design teams and their clients preparing planning applications for developments with residential apartments
- members of design review panels considering the design quality of development proposals
- design and planning professionals in local and state government assessing development proposals
- members of the community participating in the planning process by viewing and submitting comments on development proposals.

Application of the Apartment Design Guide

The *Apartment Design Guide* applies to residential flat buildings, shop-top housing and the residential component of mixed-use developments where these buildings are 3 or more storeys and have 4 or more dwellings, and where the development consists of the:

- erection of a new building
- substantial redevelopment or refurbishment of an existing building
- conversion of an existing building to a residential flat building.

Aims of the Apartment Design Guide

The guide aims to:

- deliver buildings that respond appropriately to the character of their neighbourhood, landscape setting and surrounding built form
- improve the liveability of apartments through greater amenity; improved layout, apartment depth and ceiling heights; and provisions for solar access, natural light and ventilation, and visual privacy
- improve environmental sustainability by supporting walking and cycling, providing greater building adaptability and robustness, improving energy efficiency, and applying water-sensitive urban design
- improve the relationship between apartments and public space including streets, lanes and open space
- promote the provision of a more diverse mix and choice of housing to suit different-sized households and people of all ages.

The *Apartment Design Guide* has been updated to respond to innovations across a range of social, economic and sustainability factors, and a growing understanding of best practice based on completed developments.

How this guide relates to the NSW planning process

The advice in this guide is framed around a set of objectives for residential apartment development. These objectives have a critical role in the documentation applicants must provide to support a development application, and the process the consent authority must use to assess the development application, as follows:

Apartment development must be consistent with the DP SEPP

The DP SEPP sets a consistent statewide policy framework for the design quality of the built environment, including residential apartment development. It establishes 5 design principles, 10 considerations and a range of key outcomes. Residential apartment development in NSW must be consistent with the DP SEPP principles and considerations.

This requirement applies to design professionals when designing residential apartment development, to design review panels when giving advice on proposals, and to consent authorities when determining a development application.

The *Apartment Design Guide* objectives are derived from the DP SEPP principles and considerations and provide further detailed guidance applicable to the design and assessment of residential apartment development.

As a consequence of its statutory authority, the DP SEPP may take precedence over, or supplement, the provisions of other state environmental planning policies, local environmental plans (LEPs) and development control plans (DCPs).

In addition, the specific matters relating to siting, design and amenity of residential apartment development that are referred to in clause 23 of the DP SEPP prevail over any inconsistent DCP controls.

The DP SEPP sets 3 non-discretionary development standards for apartment development (relating to car parking requirements and minimum apartment sizes and ceiling heights). If complied with, these standards cannot be used as a reason to refuse a development application. These standards are included in the relevant sections of this guide.

Development application requirements

Development application requirements for residential apartment development are set out in the Environmental Planning and Assessment Regulation 2000 (the EP&A Regulation). Residential apartment proposals also need to meet the development application requirements set out in the DP SEPP.

A list of the documents and evidence required to support an application for apartment development can be found on the NSW Planning Portal.

How to use this guide

Residential apartment development in NSW must be consistent with the *Apartment Design Guide* (ADG) objectives.

This guide includes objectives, design criteria and design guidance. The objectives are considered as universal requirements for achieving good urban outcomes in keeping with the 5 principles of the DP SEPP. These are outcomes that will ultimately benefit the health, wellbeing and prosperity of our homes, places and planet.

It is acknowledged that projects will have different responses depending on the site, scale, brief and typology. The objectives are not prescriptive controls, and the guide provides criteria and detailed guidance that describe how they can be met. The design criteria are quantitative benchmarks that if met, will achieve the objective. For some objectives only design guidance applies. The design guidance offers qualitative advice for how objectives can be achieved through appropriate design responses. This guide also includes a framework for developing 'alternative design solutions' that allow designers to find the best solution for their site. Where an alternative is proposed, the development application (and specifically the design verification statement) must demonstrate how this delivers a neutral or beneficial planning outcome when assessed against the objective.

Documentation of the design process, including technical submissions or other evidence to support alternative design responses, particularly options that have been considered, is critical to demonstrate the best planning outcome for the site is achieved.

The criteria and guidance included in this guide is not exhaustive, and each site and project will have a unique response. We can't create great places by writing a rule for everything, however we can begin to define what is important, and use skill, expertise, good processes and sound judgement to help us get there.

Our places and buildings are for the long term. Their impacts are far ranging, and our joint responsibility to make a positive contribution to our places is more significant than ever before.

Design verification statement

The EP&A Regulation requires a qualified designer to prepare a design verification statement which should demonstrate how the proposal provides the best possible design response for the site, and how it meets each of the ADG objectives.

The statement should direct the consent authority to where they can find evidence supporting the design response. (This could be a reference to a drawing, a table or another report, or the evidence can be provided in the design verification statement.)

The DP SEPP requires a consent authority to consider the design verification statement when determining a development application.

Design review

Design review provides independent expert design advice on development proposals. It can help to improve the design quality of developments, and is a requirement for all apartment development proposals in areas where there is a design review panel.

The design verification statement submitted as part of a development application for a residential apartment building requires the applicant to set out how the proposal responds to advice from the design review panel, and to justify any departures from that advice. A template for this response is included in the *Local Government Design Review Panel Manual* (DPIE 2022).

The *Local Government Design Review Panel Manual* provides information on the review of development proposals by independent council-appointed design review panels.

Structure of the guide

Part 1 – Designing for the site

This part explains the benefits of a site and context analysis, and how consideration of place and broader context informs site-specific design decisions. This advice applies to preparation and assessment of development applications. It includes guidance on how an apartment development can contribute to and enhance its context by considering its interface with adjoining properties and public realm.

Part 2 – Building design

This part addresses the design of apartment buildings in more detail. It focuses on building form, layout, functionality, landscape design and residential amenity. This advice applies during the design process and to the preparation and assessment of development applications.

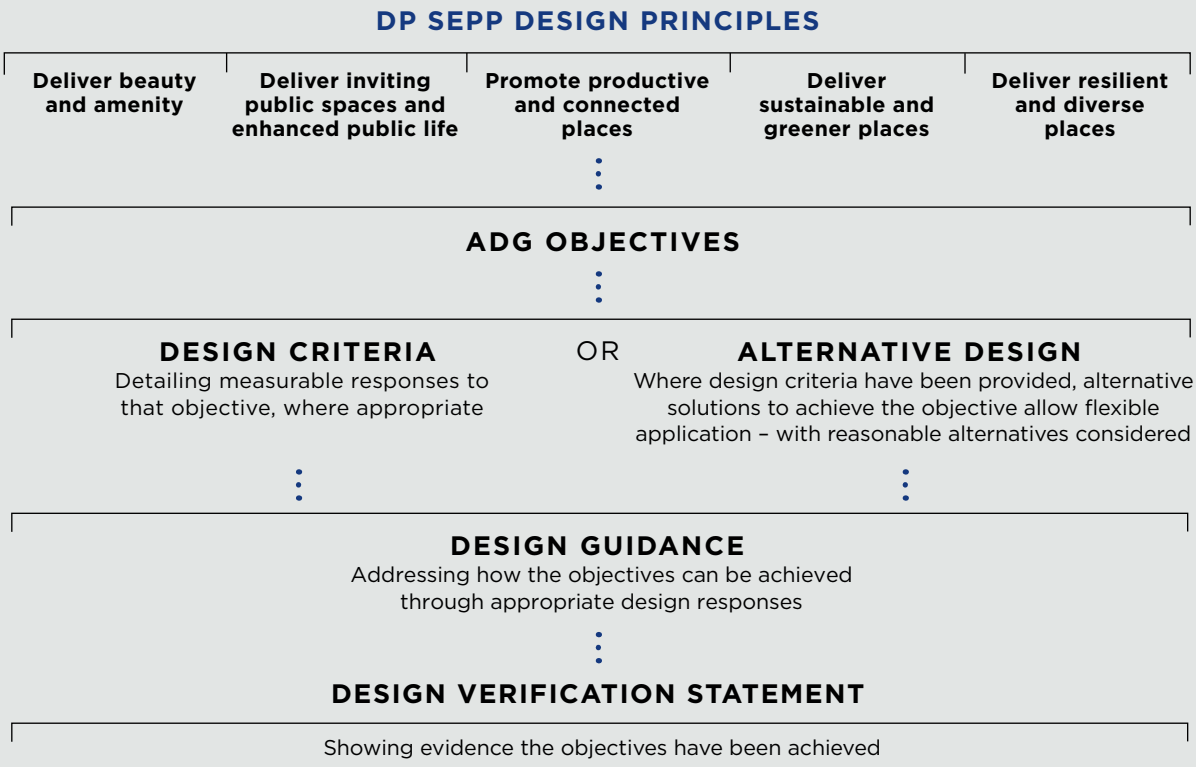
Part 3 – Environmental considerations

This part addresses the environmental performance of both individual apartments and apartment buildings as a whole. It provides guidance on energy and thermal performance, water, waste, and building materials and maintenance.

Appendices

This part addresses documentation of the design process, including technical submissions or evidence to support alternative design responses.

Figure 1: Line of sight from the DP SEPP to the *Apartment Design Guide*



PART ONE

Designing for the site

SOP by Bligh Voller Nield Architecture,
Photo: Murray Fredricks

1.1
Site and context analysis

Good design responds and contributes to its context, including key natural and built features and the influen e of social, cultural, economic and environmental factors.

Analysis of the context and the project site is the critical first step of the design process. Describing the elements of the locality and the conditions affecting the site identifies opportunities and constraints and reveals how new buildings should respond to and enhance the quality and character of the area.

OBJECTIVES

1.1 Base design decisions on comprehensive site analysis, strategic planning priorities and the site's contextual opportunities and constraints.

DESIGN GUIDANCE

Site and context analysis

Undertake a comprehensive site and context analysis. Capture this analysis in the design verification statement, explaining how it has informed design decisions. Typically, this involves 3 steps:

1. **Gather** information about the site's contribution and response to its context, gained from site inspections, primary research and other sources (e.g. consultation, searching online).
2. **Synthesise** the information to understand the site parameters holistically.
3. **Interpret** and distil the information to establish key design considerations for the site which will be addressed through further exploration.

Consider the site and context at 3 scales:

Catchment: an area defined by the walkable distance that encompasses key community amenity, including for example public transport, public open space, a town centre (zoned for commercial uses) or a school.

Neighbourhood: an area which includes adjacent blocks and a minimum of 2 intersections and may be defined by its shared building forms and detail (e.g. in a statement prepared by the local council).

Site: adjoining properties, and properties on the other side of the street.

Technical consultants (e.g. surveyors, landscape architects, contamination specialists, geotechnical engineers and arborists) can contribute greatly to a thorough understanding of the site and the preparation of a detailed site analysis.

See **Appendix 2.1** and **2.2** of this guide for a more detailed explanation of site analysis, a checklist, and how the process should be recorded in the design verification statement. The *Urban Design Guide* also provides guidance on place-based design and site analysis.

'Place-based design': responding to context and character

Analysing the context informs how new buildings should respond to and enhance the quality and identity of a particular place and contribute to creating the desired future character. The desired character can range from retaining the existing look and feel of an area to establishing a completely new character based on different uses, street patterns, subdivision, densities and typologies.

Typically, the desired character of an area is described within local planning controls and strategies, such as development control plans and local housing strategies. These establish expectations about the environmental, social, cultural and economic elements of a place that should be maintained, enhanced or changed.

The site as part of an urban system

Each site, and the elements within a site, are part of a network or system. For example: an existing tree is not only related to the site on which it is located, but is connected to a broader network of green infrastructure, providing shared amenity to neighbouring properties; supporting soil health, local ecosystems and biodiversity; and reducing urban heat.

Informed by analysing the elements of urban systems, such as green and blue infrastructure, and experiencing a place through site visits (before and during the design process and at different times of the day and year), the design response is more likely to create an outcome that is successfully embedded in its environment and community.

Cultural context – response to Country

A critical first step in analysing the cultural context of a site is gaining an understanding of Country, with respect to the site, as defined by local Traditional Custodians and knowledge-holders.

The meaningful associations we make with a place, the things which happen on or in that place, and the physical characteristics of a place, together allow us to understand a 'place-based' way to design. A well-rounded and holistic understanding of place sustains and respects culture.

All Aboriginal communities are responsible for nurturing narratives and sustaining memories that shape and maintain landscapes for future generations. Understanding a place is a subtle and complex combination of strong physical and emotional interconnection to the meaning, activity and physical form of Country. All NSW communities can learn from this understanding, and through this lens bring cultural awareness to the way we consider the design of the built and natural environment and the preservation of natural surroundings.

The *Draft Connecting with Country* framework (GANSW 2020) provides more information supporting this approach, including engagement with Traditional Custodians and knowledge-holders. Connecting with Country recognises that places have both Aboriginal and non-Aboriginal histories that need to be shared and acknowledged. The framework advocates a shift towards a Country-centred approach which views all natural systems including people, animals, resources, and plants, as equally important parts of a connected ecosystem. As the Traditional Custodians of the land and waters, Aboriginal people have a deep and ongoing connection to these elements through their experience of Country. Country includes tangible and intangible aspects including knowledge and cultural practices, belonging and identity, wellbeing, and relationships. Aboriginal people maintain a strong belief that if we care for Country, it will care for us.

At the scale of an individual site, particularly a site within an established area, the design team are encouraged to research the local story of Country as it applies to the site, starting with accessing local government resources and advisory committees. The site analysis checklist in **Appendix 2.2** highlights some required information.

Should early investigation into Country identify a significant finding relating to the site or area, then actions may be required to comply with the *National Parks and Wildlife Act 1974*, administered through Heritage NSW.

Refer to case study projects included in the *Draft Connecting with Country* framework**.**

NAIDOC week event at Hyde Park, Sydney.
Photo: City of Sydney Council

1.2
Built form and siting

Well-designed built form and appropriate siting of apartment buildings is fundamental to enhancing amenity and maximising the enjoyment and experience of place.

By shaping and framing the surrounding space, built form can:

- contribute to establishing future desired character
- safeguard green infrastructure
- ensure residential amenity through access to fresh air, sunlight and daylight, outlook and visual privacy, while being protected from noise, pollution and urban heat.

The built form and siting of apartment development should be designed to respond to and respect its context, including the topography, urban grain, scale, setbacks, proportions, materials and visual and social relationships, as understood through the site analysis process.

OBJECTIVES

1.2.1 The built form responds to the historic, cultural, and planning context, streetscape and open spaces with appropriate building height, bulk, setbacks, and separation.

1.2.2 Minimise built form impact on neighbouring sites and properties, limit overshadowing in winter, and protect the privacy of adjacent properties.

DESIGN CRITERIA

Separation between windows and balconies ensures visual privacy. Minimum required separation distances from buildings to the side and rear boundaries are listed in **Table 1.2.1**.

Table 1.2.1:
Best practice minimum building separation distances

BUILDING HEIGHT	BETWEEN NON-HABITABLE ROOMS	BETWEEN HABITABLE AND NON-HABITABLE ROOMS	BETWEEN HABITABLE ROOMS (INCLUDING BALCONIES)
Up to 4 storeys	6 m	9 m	12 m
5-8 storeys	9 m	12 m	18 m
9+ storeys	12 m	18 m	24 m

DESIGN GUIDANCE

Siting

Locate, orientate and configure building forms in response to the site analysis.

Articulate the skyline using a variety of building heights and stagger built form in relation to street walls, with adequate tower separation to protect access to sunlight and sky view for the surrounding public realm and neighbouring properties. (See **Figure 1.2.1**.)

Test the desired built form and siting outcome to ensure it supports the objectives and design guidance set out in this guide. In particular:

— building separation

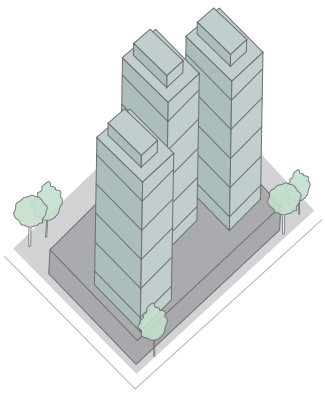
— open spaces

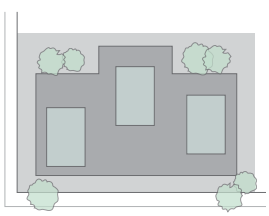
— apartment layouts and amenities such as adequate access to sunlight and daylight, shade, natural ventilation, and visual and acoustic privacy.

To determine the site planning, including entry levels, carefully consider natural systems like ground and surface water management including flooding.

Figure 1.2.1
Staggering built form and including adequate tower separation protects access to sunlight and sky view for the surrounding public realm and neighbouring properties, and improves privacy and daylight within tall buildings.

Adequate minimum separation distance between buildings promotes privacy, daylighting and at-grade access to sunlight and sky view





Variation in tower stepbacks and orientation increase perceived and actual separation distance

Building separation and setbacks

Align building separation and setbacks with building use. For example, in town centres zero street and side setbacks may be appropriate to define a street wall.

When measuring building separation:

— share separation equally between adjacent sites, so each building is located no closer than half the required separation distance from the property boundary

— treat gallery access circulation areas as habitable space, with separation measured from the exterior edge of the circulation space.

For residential buildings next to commercial buildings, to measure separation distances:

— for retail, office spaces and commercial balconies use the habitable room distances

— for service and plant areas use the non-habitable room distances.

Define built form through building separation and setbacks relative to the desired streetscape, development pattern and local landscape features (refer **Figure 1.2.3**).

Reinforce a street edge or define a future streetscape with the front building line.

Match the rhythm, spacing, form and street aspect ratios of existing development that achieves the desired future character of the area.

Frame views, and step back from special buildings and landscape features including heritage items or other elements with local significance.

Retain significant trees and landscaping and consolidate deep soil zones between properties and within the public realm.

Consider the articulation of balconies and landscaping within the street setback.

Consider secondary upper-level building setbacks and separation to reinforce the desired streetscape, scale of buildings at the street level, and at other frontages to open spaces.

Minimise overshadowing of the surrounding areas, streets and other buildings.

For some site conditions, building separation and setbacks may need to be increased beyond the minimums noted in **Table 1.2.1**:

— to achieve adequate solar access and open space on the site, and avoid overshadowing of public space and overlooking of neighbours e.g. on sloping sites

— to respond appropriately to the scale of neighbouring sites

— for future street or footpath widening.

Alternative design responses – building separation and setbacks

Where building separation distances cannot be met (e.g. in the adaptive re-use of existing structures), maximise the visual amenity of apartments using other design strategies. See **Figure 1.2.6**, and **Part 2.9: Visual amenity**.

Demonstrate adequate daylight and ventilation is achieved: see **Parts 2.6** and **2.7**.

Building floorplates, depth and articulation

The building 'envelope' includes allowable gross floor area as well as building components that do not count as floor space but contribute to building design and articulation, such as balconies, lifts, stairs and open circulation space.

For apartment tower floorplates (any part of a building 10 storeys and above), ensure the overall size provides maximum amenity for apartments (e.g. solar access, cross ventilation, common circulation) and minimises impact on surrounding public space and surrounding buildings (e.g. overshadowing, impact on sky views from public space and visual bulk).

The overall building depth should provide for optimal cross-ventilation (see **Part 2.7: Natural ventilation**), daylight access (**Part 2.6: Sunlight, daylight, shade and thermal comfort**), building separation, landscaping, sky views and sunlight access to neighbouring buildings and open space.

For mixed-use buildings, align building depth with likely uses. For example, transition deeper commercial or retail podium levels to a narrower residential floorplate above.

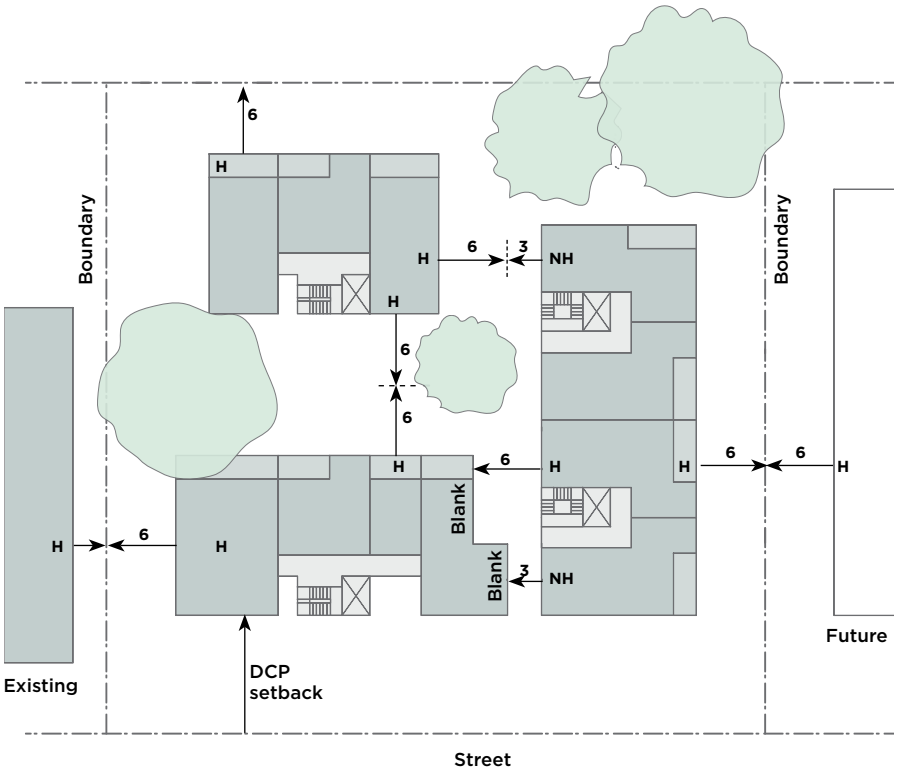


Figure 1.2.2
Any one development will need to accommodate appropriate setbacks and building separation for a variety of site conditions. The separation distances shown in this diagram are based on a development of up to 4 storeys.

H: habitable room
NH: non-habitable room

Consider varying building depth relative to orientation and height. Buildings facing east–west capture sun from both aspects and may support dual-aspect apartments of greater depth (see **Part 2.7**), while buildings facing north–south should be shallower to reduce the number of south-facing apartments that have limited or no direct sunlight access (see **Part 2.6**).

Shape, stagger and offset built form within the site and in relation to adjacent development to achieve optimal amenity for public and communal space and individual apartments. See **Figures 1.2.2 to 1.2.6**.

Use building articulation to break down the visual bulk of the building and provide visual interest.

— Consider the pattern of neighbouring built form and desired character of the street (**Figure 1.2.3**)

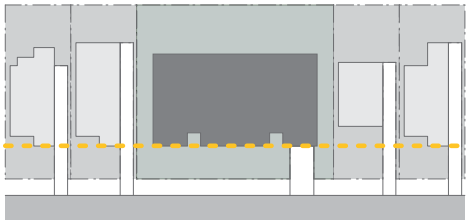
— Use design solutions such as facade recesses, narrower widths or bays and material variation to create separation.

— Where any building length exceeds 40 m, division into separate elements will help reduce the overall bulk of the building.

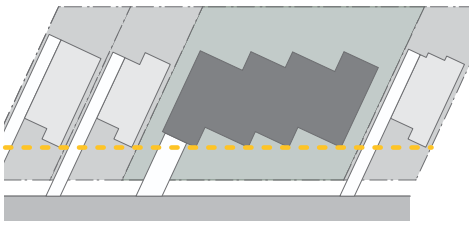
Where building depths exceed those suggested to achieve adequate daylight access (**Part 2.6: Sunlight, daylight, shade and thermal comfort**) and natural ventilation (**Part 2.7: Natural ventilation**), demonstrate the alternative design can achieve the objective of acceptable amenity for apartments. This may require additional building articulation and higher ceiling heights.

Figure 1.2.3
Building separation, and side and street setbacks, should relate to the immediate context, and to desired future character, as defined by planning strategies.

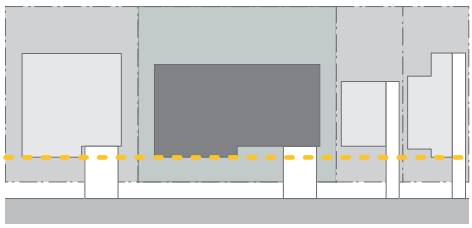
1. Predominant setback



2. Variation for angled subdivision



3. Setback range



4. Building line

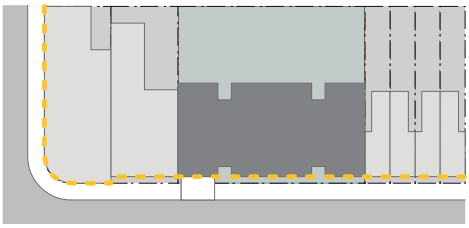


Figure 1.2.4
New development adjacent to existing buildings should provide adequate separation distances to the boundary in accordance with the design criteria.

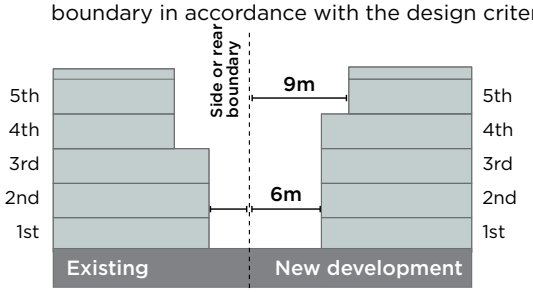


Figure 1.2.5
Within the same site, minimum separation should be shared equitably between buildings. On sloping sites, appropriate separation distances ensure visual privacy for apartments on different levels.

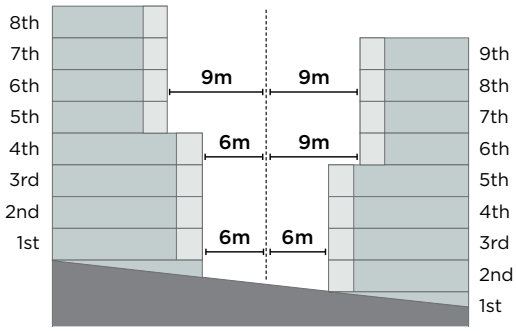
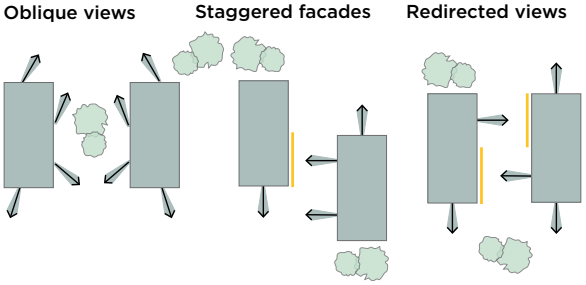


Figure 1.2.6
Shaping, staggering and realigning built form achieves better amenity for public and communal space as well as visual amenity for individual apartments. For further guidance see **Part 2.9: Visual amenity**.



Building height

Appropriate building height ensures adequate daylight and sunlight access, as well as sky view, is available for apartments, communal open space, adjoining properties and public space.

See **Part 2.4: Apartment configuration** for minimum residential ceiling heights.

Where flooding conditions require the ground level to be raised, minimum ceiling heights in **Table 2.4.2** of **Part 2.4** still apply.

Accommodate the following within the permissible building height:

— rooftop communal open space including lift and stair access and shade structures

— articulated roofs designed to enhance design quality.

Relate the height of buildings and other built form elements to context-specific features such as natural landforms, heritage items or other buildings that are unlikely to change (such as strata subdivided buildings).

Define an overall height, street wall or podium height in relation to existing datum lines, such as eaves, parapets or cornices.

Align floor-to-floor heights of new development with existing built form.

For buildings without podiums, or for built form above a podium, adopt a single setback that is equal to or greater than the separation distance required for the overall building (see **Figure 1.2.7**).

In locations such as main streets and centres where buildings incorporate blank party walls and a continuous street wall is desirable, no building separation is necessary.

For generating the height of buildings in mixed-use development, **Table 1.2.2** provides recommended floor-to-floor heights to maximise future flexibility of use.

Table 1.2.2
Recommended floor-to-floor height for future proofing (to promote future flexibility of uses) in mixed-use development.

AREA	RECOMMENDED FLOOR-TO-FLOOR HEIGHT (MIN.) FOR MIXED-USE DEVELOPMENT
Ground floor non-residential uses	4.2 m
Ground floor residential uses	3.6 m
First floor residential uses	3.6 m

Figure 1.2.7
Setbacks and minimum building separation distances should increase proportionally to the building height. Minimise multiple steps.

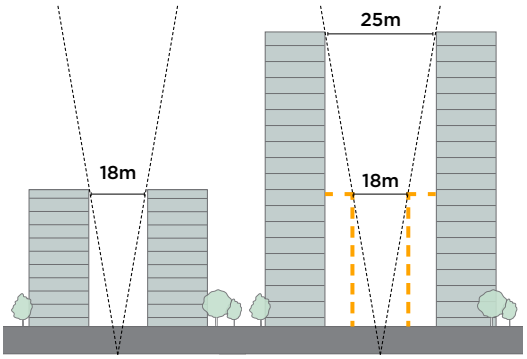
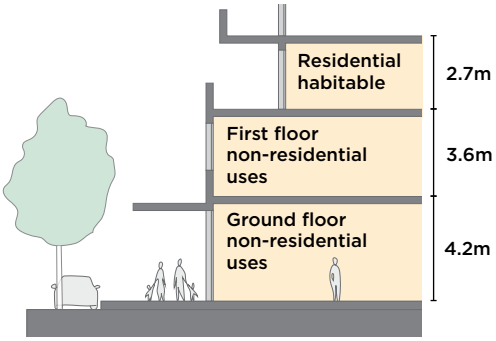


Figure 1.2.8
Higher floor-to-floor heights are encouraged for retail and commercial floors of mixed-use developments, to promote flexibility of use and allow larger ceiling spaces for additional services.



Pedestrian through-site links need to be direct with clear sightlines to each end. Windows and balconies should overlook through-site connections to provide passive surveillance. Landscape buffers create visual amenity and provide shade. Refer to **Objective 1.3.1.** Central Park by Ateliers Jean Nouvel and PTW, Photo: Brett Boardman

1.3
Site access and address

Clear and connected pedestrian networks provide amenity for local communities, support walkability, enable active and safe streets, and reduce reliance on car travel. Reinforcing pedestrian and cycling networks within larger sites can amplify existing connections and improve public space by increasing permeability and access.

Clear entry points to developments, direct entries to ground floor apartments and visible non-residential uses (where appropriate), contribute to the life and legibility of the street, add to the identity of the building and the character of the streetscape.

Well-designed building entries also enable efficient servicing of the development and delivery of goods to residents.

OBJECTIVES

1.3.1	Any pedestrian link should prioritise walking and cycling and provide access to streets and connection to local destinations.
1.3.2	Entries are clear, visible, safe, and accessible, and contribute to the life and activity of the street.

DESIGN GUIDANCE

Through-site links

Through-site links reduce the impact of large building mass on its surroundings and promote fine-grain connectivity and permeability, and improve walkability in the immediate street network.

Where a site is sufficiently sized to support the inclusion of through-site links, and for all sites with internal pathways, consider the design and location of links.

Facilitate direct connections along desire lines between attractors within the development (communal spaces, non-residential uses) and the wider context (public open space, main streets, centres and public transport).

— Use types of links appropriate to the local context and their primary use, e.g. shared zones, laneways, paths or arcades.

— Make links direct and accessible from public space.

Provide clear sightlines for safety and good lighting. Consider minimum lighting and lux levels as set out in *AS 1428.2-1992 Design for access and mobility Part 2.*

Provide through-site links in locations that are overlooked by habitable rooms and private open spaces of apartments and adjacent development for passive surveillance.

Provide active uses where appropriate.

Integrate with and extend the green infrastructure network, tree canopy and landscape buffers to soften built-form interfaces.

Provide integrated facilities to support cycling (for more detail see **Part 1.6: Parking**).

Site access

Relate access and entries to the surrounding pedestrian and street network.

Consider the rhythm and grain of the surrounding context in the design of access and entrances.

Make entries easy to identify and directly accessible from the surrounding streets and public space.

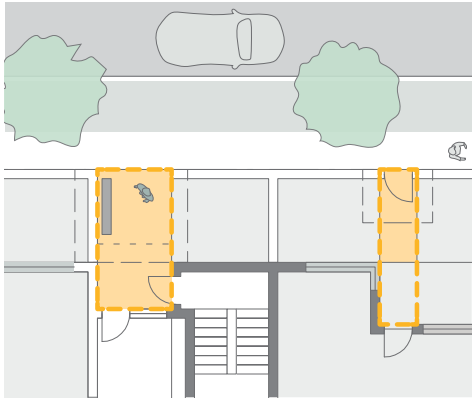
Maximise the number of entries that face the street to improve accessibility, passive surveillance, and opportunities for activation.

Make lift lobbies, stairwells and hallways clearly visible from communal open spaces and public space.

Provide direct access to ground floor apartments where they address a street, public open space or a proposed through-site link. These connections, via a private terrace, balcony or courtyard, are opportunities for activation and passive surveillance.

In developments with multiple street frontages, buildings or entries, differentiate the entries to improve legibility using architectural detailing, landscaping, changes in colour and materials, or public art. Ensure clear sightlines and pathways are available to secondary building entries where they do not have a street address. For larger developments, provide wayfinding and signage.

Figure 1.3.1
Successful building entries define public and private space, are clearly identifiable and activate the street.



Accessibility and serviceability

Integrate steps and ramps into the overall building and landscape design.

Minimise steps and level changes along pathways and, where not conflicting with flood planning, at transitions between public space and entries, ground floors and car parks.

Consider larger than minimum widths of common pathways to allow people with prams, wheelchairs and mobility aids to pass each other easily.

Prioritise access by equitable and sustainable modes of transport, especially walking and cycling, by providing:

— appropriately designed ramps and facilities for bicycles, mobility scooters and prams connected to common circulation spaces

— clearly identified access to resident bicycle parking.

Minimise conflicts between pedestrians, vehicle access and movement routes adjoining the site.

Provide clear sightlines where vehicles cross pedestrian pathways.

Separate and distinguish pedestrian and vehicle access. Techniques include changes in surface materials or levels, or separation with landscaping

Locate mailboxes in a secure area and in close proximity to the main building entry, or integrated into individual apartment street entries where possible. For best practice regarding the location and alignment of mailboxes, see Australia Post guidelines.

Consider access for deliveries, especially for bulky items, and where parcels may be left without contact with the addressee.

Alternative design responses – street entries

Where direct street access to ground floor apartments is difficult to achieve, provide primary access from common circulation. This applies:

— where there may be a significant level change across the site

— where the existing or proposed street setback is greater than 3 m

— to retain mature planting and existing landscape features

— on noisy or high-traffic roads

— for apartments designed for or able to be adapted for universal access, where apartment amenity can be improved by raising the ground floor level above the street.

For further guidance on ground floor apartments see **Part 1.4 Relationship to the street**, and for internal circulation see **Part 2.1 Common circulation**.

Design ground floor apartments to address public space and be accessed directly from the street. OneA by Breakspear Architects, Photo: Tom Ferguson

Breaks between buildings, colour and landscaping can be combined to help identify building entries. The Burcham, by Allan Jack + Cottier, Photo: Tom Ferguson

Features such as awnings, blade walls and signage contribute to building entries that are clearly identifiable from the street. Refer to **Objective 1.4.3.** Verve, Hill Thalis with CKDS, Photo: Brett Boardman

1.4 Relationship to the street

The way in which an apartment building meets the ground plane and public space significantl influen es the quality, character and life of a neighbourhood.

Non-residential interfaces in mixed-use development increase the activity and vitality of residential areas and local centres, accommodate local businesses, and support the local economy. This contributes to walkable neighbourhoods where local services and jobs can be accessed easily.

Residential interfaces such as ground floor apartments, building entries, private open space, communal and circulation spaces can relate to the human scale of the street and contribute to the activity and safety of the ground plane. Where street activation is not provided through non-residential use, direct access to ground floor apartments facing a street can improve street activation and passive surveillance.

OBJECTIVES

1.4.1 Provide building and landscape interfaces with the street that deliver safe, secure, and high-amenity building entries and ground floor apartments

1.4.2 Maximise street activation and passive surveillance of public realm through appropriate active street frontages or ground floo apartments.

1.4.3 Integrate awnings and signage into the built form to provide orientation and wayfinding

DESIGN GUIDANCE

Transition between public and private space

Built form and landscape interfaces with public space can support safety by encouraging passive surveillance and activating the street. Interfaces at the ground plane are particularly important.

Arrange uses, entries, private open space, common spaces and internal circulation so they view the street and open space.

Limit the length of blank and solid walls, particularly along street frontages.

Consider the principles of crime prevention through environmental design (CPTED).

Use soft landscaping to soften the street edges of any raised terraces, such as the edges of private open space and basement car parking. Use layered planting to provide privacy rather than solid fences.

Design ground floor levels and entry points to respond to adjoining public space levels, minimising the extent of ramps or stairs required for building access.

Avoid ground floor levels located below the footpath level, or more than 1 m above it. Where this can't be avoided, use well-designed landscape setbacks to achieve the objectives.

Residential interfaces

Design frontages between private space and public or communal space to balance activation and openness with privacy and safety. Design solutions include:

— raising the floor level of ground floor private open spaces and terraces (maximum 1 m above the street level)

— using window, glazing and balcony configurations that minimise sightlines into apartments while providing passive surveillance of the ground plane

— maximising sunlight and daylight access for ground floor apartments by using:

  — high ceilings and tall windows

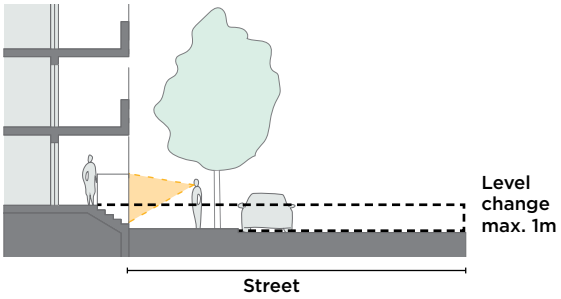
  — trees and shrubs that allow sunlight access in winter and provide shade in summer

  — creating flexibility in the design of the ground floor component of double-storey apartments to accommodate uses such as a home office.

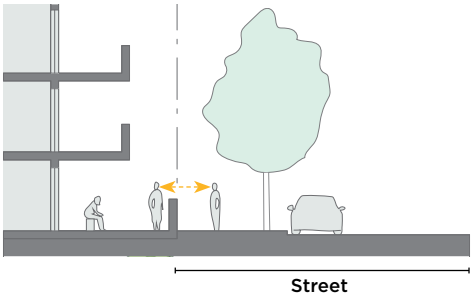
Consider opportunities for residents' casual interaction with public space, such as providing seating at building entries, in common circulation areas, near front boundaries, or in private courtyards next to streets.

Figure 1.4.1 Public realm interface scenarios

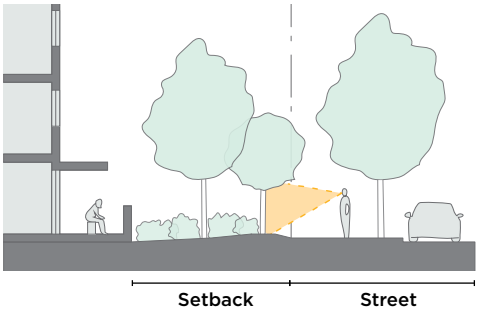
A change in level from the footpath to a ground floor apartment y up to 1m enhances privacy while allowing surveillance of the public realm.



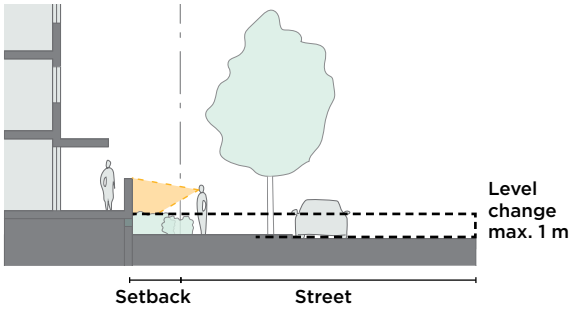
Ground floor erraces at street level can help promote activity along a street and contribute to the safety of the public realm.



Gardens with a variety of plantings including trees and shrubs can enhance the quality of the public realm, while providing privacy and amenity benefits o apartment residents.



Where ground floor apartments a e elevated above the footpath, landscaping should be considered to soften the building edge and improve the relationship with the public realm.



Mixed-use and non-residential interfaces

Consider incorporating non-residential uses by providing commercial, retail, community or public spaces, informed by local needs and planning policies. Proximity to foot traffic, public transport and town centres is also an important consideration.

Design solutions include providing:

- spaces that are adaptable, accommodating diverse uses and activities that can change over time (see **Part 1.2** for floor-to-floor heights which support flexible use)
- direct street access and address
- a variety of ground floor tenancy spaces that offer greater street activation than a single large tenancy, or where a larger tenancy is planned, additional facade articulation including multiple entry points
- outdoor dining, where local planning controls allow, and the design can accommodate:
  - weather protection including shade
  - sufficient space for pedestrians to pass seating areas comfortably
  - deeper setbacks or recesses to the ground floor facades where streets have narrow footpaths.

Consider these options early in the design process, to ensure non-residential spaces are well-proportioned and fit for purpose.

Where non-residential uses are located beside noisy roads or hostile environments, consider including landscaping or courtyards to provide protected outdoor areas adjacent to active uses.

Locate non-residential uses on lower levels of buildings in areas where residential use may not be appropriate or desirable, such as along main roads or railway lines.

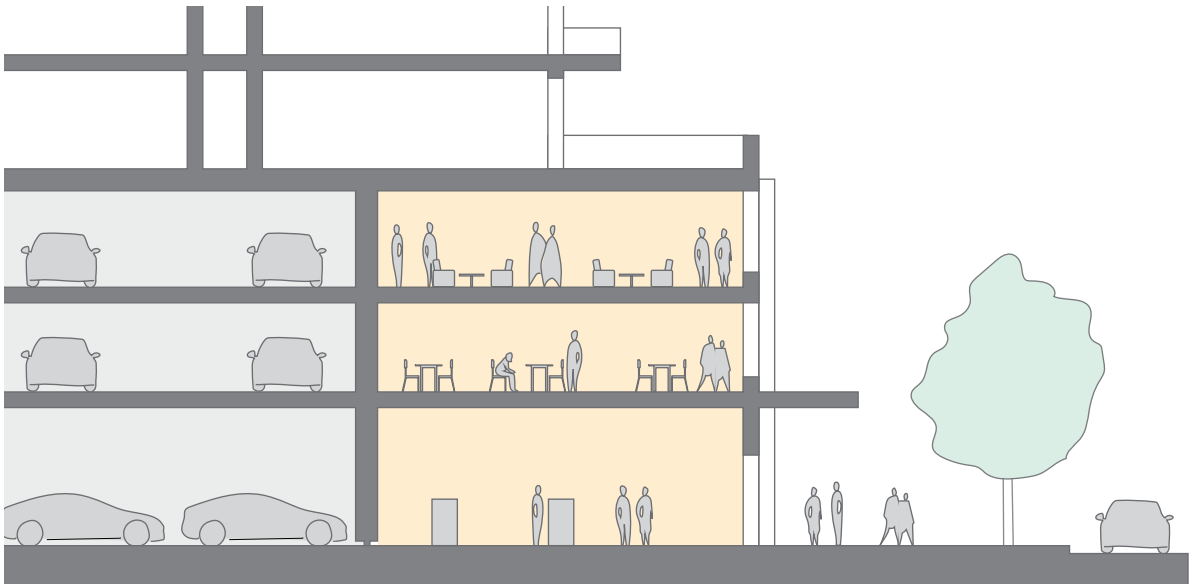
Commercial floors can be a useful buffer at first floor level between residential apartments on upper floors and busy active ground floor uses such as food and beverage premises.

Where non-residential uses are unachievable or inappropriate, consider other ways of promoting greater street activity, such as:

- live–work apartments or home office spaces at ground floor level
- ground floor apartment layouts supporting small-office-home-office (SOHO) use, that provide opportunities for future conversion into commercial or retail use (see **Part 1.2: Built form and siting** for recommended floor-to-floor heights to support adaptability)
- 2- to 3-storey terrace or townhouse apartments.

Active uses can be used to ‘sleeve’ above-grade parking and activate the street, as shown in **Figure 1.4.2**.

Figure 1.4.2
Active uses can be used to ‘sleeve’ above-grade parking to activate the street.



Utilities and building services

Reduce the visual impact of utilities and building services on public space by locating them in basement car parks wherever possible, including substations, pump rooms, water tanks and waste storage areas.

Where building services are required to be located at or above ground level, including waste facilities, loading areas, car parking vents, rainwater goods, and infrastructure for electrical, fire, hydraulic or mechanical services, ensure they are:

— visually and physically recessive

— integrated with the development's built form and landscape

— not in front of the primary building frontage

— screened with planting or other design elements.

Awnings and signage

Design awnings and signage to contribute positively to prevailing streetscape, built form and amenity, and character.

Provide awnings along streets with high pedestrian activity and active frontages, and at all building entries, to define entry points and provide weather protection.

Design awnings to:

— provide continuity along the street and align with existing awnings and street patterns, including wrapping around corners

— integrate and conceal building services including gutters, downpipes and cabling for signage and lighting

— integrate appropriate artificial lighting for pedestrian safety

— avoid impact on or conflict with street trees and other green infrastructure and consider their growth over time.

Integrate signage and wayfinding elements into the building design so they respond to the scale, proportion, materials and detailing of the development, and are consistent, legible, discrete and well-designed.

A diversity of uses improves access to services and promotes walking, social interaction and safety. Newmarket by Bates Smart, Photo: Felix Mooneerem.

Setbacks can be used to retain existing trees which increase the quality of the development and the surrounding public space. The facade of this project was significantly inset to retain a mature fig tree in the street frontage. SOP by Bligh Voller Nield Architecture, Photo: Murray Fredricks.

1.5 Green infrastructure

Green infrastructure is the network of green spaces, natural systems, and semi-natural systems that support sustainable communities.

Successful landscape design, best undertaken by a qualified landscape architect and considered early in the design process, responds to place and optimises the existing natural and cultural features of a site. It considers the connectivity between elements on a site and the broader network of urban green infrastructure.

The primary landscape design elements that contribute to green infrastructure in apartment development include deep soil zones, green cover including tree canopy, and planting on structures.

Green infrastructure provides neighbourhood and residential amenity, reduces urban heat and improves air quality. By supporting biodiversity and habitat, it contributes to ecological resilience and assists stormwater infiltration and flood mitigation. Green infrastructure supports community health and wellbeing and contributes to sustainable urban development by offering opportunities for public space and active transport corridors.

Landscape design responds to the underlying natural environment, existing site conditions, and significant features such as trees and rock outcrops. It creates green spaces for respite, recreation and places to garden and grow food. Landscape design also enhances environmental performance and microclimate by incorporating diverse and appropriate planting and biofiltration. It can provide connections across urban habitat to support native plants and animals.

OBJECTIVES

1.5 Provide and retain sustainable landscaping, planting and trees, including planting on structures and in deep, connected soil.

DESIGN CRITERIA

Deep soil

Table 1.5.1: Deep soil and tree canopy area targets

SITE AREA	MINIMUM DIMENSION	DEEP SOIL ZONE % OF SITE AREA	MINIMUM CANOPY TARGET (%) OF SITE AREA
<1500 m²	3 m	10%	15%
1500 m² +	3 m, with a wider contiguous portion that is a minimum 6 m wide and at least 25% of the minimum deep soil area	15%	20%

Note: **Table 1.5.1** deep soil targets are a minimum recommendation. Local controls reflect variations in character and local context, and take precedence where their requirements are greater than these. Tree canopy spread is calculated at maturity (refer **Table 1.5.2**) and includes newly planted as well as retained trees on site.

For sites where it is not possible to provide sufficient deep soil, e.g. mixed use developments where the basement or building envelope fills the site, use alternative options for green cover, such as planting on structures, including for landscaped communal open space offering amenity and outlook for residents.

DESIGN GUIDANCE

Deep soil

Soils are important for sustaining a healthy ecosystem. Healthy and connected deep soil networks allow trees to thrive and provide maximum environmental benefit. There is no equivalent to deep soil, and its provision should always be prioritised as a key design consideration. To meet the green infrastructure objective, **Table 1.5.1** provides targets for deep soil zones.

Prioritise deep soil zone locations to:

— retain and protect natural soil profiles to support existing vegetation, especially during the construction process

— maximise the area of undisturbed deep soil and minimise cut and fill

— retain existing trees in front and rear setbacks

— maximise contiguous areas of deep soil by co-locating with deep soil areas on adjacent sites and in the public realm. See **Figure 1.5.1 and 1.5.2**.

Coordinate the building and landscape design with services engineering disciplines to ensure service locations do not compromise deep soil.

Consolidate basement car parking beneath building footprints to allow for maximum deep soil.

Where deep soil and communal open space is co-located in areas relied on for minimum deep soil area, if a communal facility is provided it should be a 'minor structure' only, as defined in the glossary.

Figure 1.5.1
Where possible, co-locate deep soil areas across lot boundaries to support canopies of large trees.

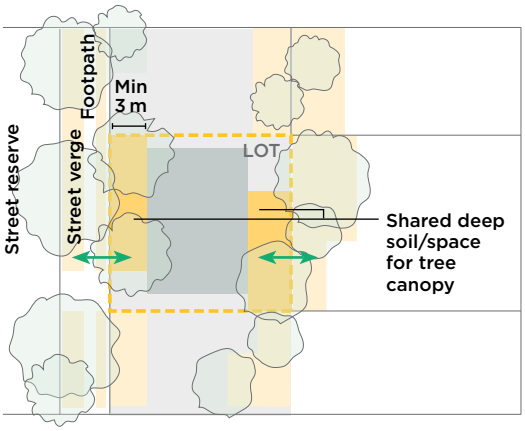


Figure 1.5.2
Setbacks provide opportunities for shared deep soil across boundaries to allow for the growth of large canopy trees, which provide privacy and outlook for apartments.

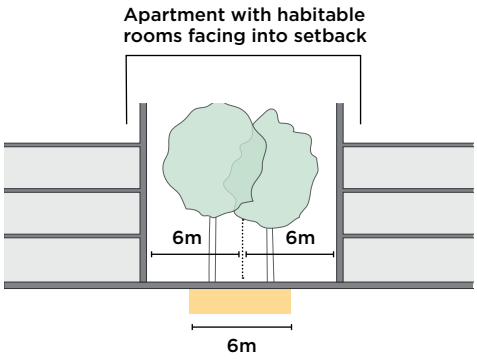


Figure 1.5.3
Opportunities for deep soil zones are increased when parking levels are contained within the building footprint.

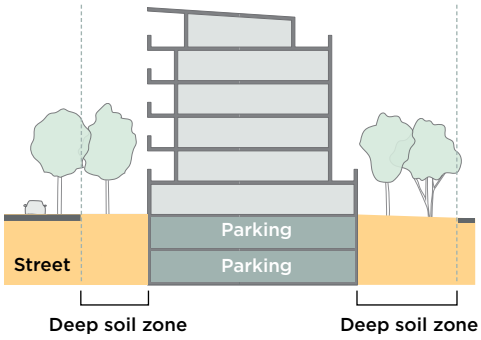
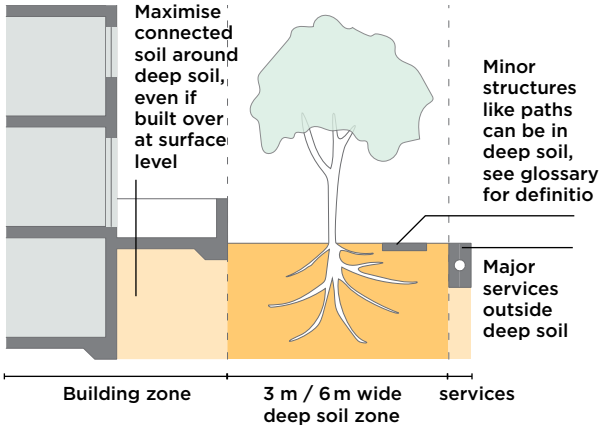


Figure 1.5.4
Consolidate deep soil areas and minimise intrusion of built elements and services to allow for growth of large canopy.



Tree canopy

Tree canopies support sustainable, liveable and cool neighbourhoods with more shade and cleaner air, providing more beautiful places to live.

Domestic use of air conditioning in NSW is projected to increase by 90 per cent by 2050. Trees can reduce household energy costs by providing an alternative, non-mechanical mechanism for cooling, and direct tree shade is shown to reduce household cooling kilowatt hours by 30 per cent.

Table 1.5.2 provides tree canopy sizes at maturity, which can be used to calculate the percentage of tree canopy required for the site area in **Table 1.5.1**.

Table 1.5.2: Tree size and mature canopy spread

TREE TYPE	MATURE CANOPY SPREAD
Small	Minimum 6 m diameter
Medium	Minimum 8 m diameter
Large	Minimum 12 m diameter

It is best practice to:

— replenish canopy through sufficient new tree planting of a suitable mature size

— allow sufficient deep soil for the development of healthy root systems, providing anchorage and stability for mature trees.

Table 1.5.3: Tree planting rates

SITE AREA	TREE PLANTING RATE
<650 m^2	For every 350 m^2 of site area, or part thereof, at least one small tree is to be planted in the deep soil area
650 to – 1,500 m^2	For every 350 m^2 of site area, or part thereof, at least one medium tree is to be planted in the deep soil area
1,500 m^2 +	For every 575 m^2 of site area, or part thereof, at least one large tree or 2 medium trees are to be planted in the deep soil area

Retaining trees

Mature trees provide the best and most immediate form of canopy and contribution to habitat. Retain and protect existing trees, including those on adjoining sites.

Locate building envelopes, basements and driveways in order to maximise the number of trees able to be retained on site.

Have existing trees assessed by an arborist to ascertain safe usual life expectancy (SULE), structural root zones (SRZ) and tree protection zones (TPZ).

Protect trees in accordance with *AS 4970–2009 Protection of trees on development sites,* and arborist recommendations.

Categorise retained trees by canopy size and include them in the tree canopy calculation.

Show trees for retention and removal on site plans and other relevant drawings; include the TPZ of retained trees.

Protect significant trees and landscape features using appropriate signage and fencing during construction.

Deep soil zones promote the growth of larger trees which improve amenity and local microclimate. The Burcham by Allan Jack +Cottier, Photo: Tom Ferguson

Tree and plant species selection

Select trees and other types of planting that are suited to site conditions, and document this as part of the landscape design. Consider:

— drought and wind tolerance

— seasonal changes in sunlight access

— modified substrate depths for a diverse range of plants

— plant longevity

— size at maturity and capacity for healthy root growth

— water availability and irrigation

— soil type

— local ecology and suitable endemic species.

Where a landscape maintenance plan is being provided, see the additional guidance in **Part 3.4: Materials and maintenance**, and **Appendix 7.2: Landscape maintenance.**

Planting on structures

Table 1.5.4:
Minimum requirements for planting on structures

PLANT TYPE	SOIL VOLUME	SOIL DEPTH	SOIL AREA
Turf		200 mm	
Ground covers		300–450 mm	
Shrubs		500–600 mm	
Small trees	10 m^3	800 mm	3.5 m x 3.5 m or equivalent
Medium trees	36 m^3	1,000 mm	6 m x 6 m or equivalent
Large trees	120 m^3	1,200 mm	10 m x10 m or equivalent

Note: dimensions in **Table 1.5.4** have been calculated assuming irrigation. Any subsurface drainage requirements are in addition to these minimum soil depths.

Provide suitable locations on site and adequate soil, drainage and irrigation to ensure the ongoing health of planting.

Reinforce structures for additional saturated soil weight.

Provide soil volume appropriate for plant growth. Consider:

— modifying depths and widths according to the planting mix and irrigation frequency

— free draining and long soil life span

— tree anchorage.

Design irrigation and drainage to respond to:

— changing site conditions

— soil profile and planting regime

— whether rainwater, stormwater or recycled grey water will be used.

Design solutions include:

— green roofs, including on top of podiums, particularly where roofs are visible from the public realm

— edge planters and planter boxes to communal and private open spaces.

Green cover

In addition to deep soil areas, green cover can include planting on structures (rooftops, podiums, planters) and landscaped areas such as lawns or gardens in communal open space.

For sites where it is not possible to provide sufficient deep soil, e.g. mixed-use developments where the basement or building envelope fills the site, use alternative options for green cover, such as planting on structures, including for landscaped communal open space offering amenity and outlook for residents.

Green roofs

Green roofs can be extensive or intensive. Depending on the depth of substrate used and the level of maintenance required:

— intensive green roofs are generally greater than 300 mm deep and include accessible landscape spaces with pathways and other features

— extensive green roofs are generally less than 300 mm deep and not trafficable.

Green walls

Green walls may be desirable in certain circumstances and where ongoing maintenance can be assured. To accommodate green walls, integrate planting structures into a building facade.

Methods for planting on structures include raised planters and a mix of shallow and deep-profile garden beds, useful in situations like roof gardens. Eve by DKO, Photo: Brett Boardman.

Texture and colour in rooftop planting with appropriate soil volumes and integrated seating contributes to vibrant communal space for residents. New Life Darling Harbour by Architectus, Photo: Brett Boardman.

Planters integrated into a facade can give the impression of a green wall and provide additional amenity for apartments. Infinity by Koichi Takada, Photo: Tom Ferguson.

1.6 Parking

Integrating car parking within apartment buildings has a significant impact on site planning, streetscape, landscape and building facade design.

The location, form and organisation of car parking is usually a balance of development feasibility, site constraints, local context, apartment types and regulatory car parking requirements. Vehicle access must be integrated with site planning from an early stage to balance any potential conflicts between traffic patterns, streetscape elements and safe pedestrian access.

Car parking requirements are broadly based on proximity to alternative transport, and may be reduced in certain areas by the preparation of a green travel plan that details the alternative sustainable transport options that will be available. Where car dependency can be reduced by residents walking, cycling and using public transport instead, it may be possible to reduce the number of car parking spaces.

Designs should also consider and respond to developments in technology, and make provision for electric vehicles (EVs).

OBJECTIVES

1.6.1 Minimise car parking and provide access to alternative transport facilities such as car sharing and cycling, where appropriate.

1.6.2 Support cycling for transport with bicycle parking.

1.6.3 Support sustainable vehicle use by providing 'EV-ready' car parking.

1.6.4 Minimise conflicts bet een pedestrians and vehicle access to the site and create high quality streetscapes.

NON-DISCRETIONARY DEVELOPMENT STANDARD

Car parking

Car parking requirements for residents and visitors are either set out in the *Guide to Traffic Generating Developments (RTA 2002)*, or as prescribed by the local council. Whichever is the lower requirement is the minimum required for development in the following locations:

- on sites that are within 800 m of a railway station or light rail stop in the Sydney metropolitan area
- on land zoned, and sites within 400 m of land zoned B3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre (see glossary).

In all other locations, car parking requirements are as prescribed by the local council.

DESIGN GUIDANCE

Car parking

Provide the car parking needs for a development off-street.

Design above-ground parking within a building to allow for future adaptive re-use, for either residential, retail or commercial use, as appropriate for the area, with floor-to-floor heights suitable for achieving minimum ceiling heights (see **Part 2.4: Apartment configuration**).

Make provision for 'EV-ready' connections for all residential car parking spaces as outlined in **Part 3.1: Energy efficiency**.

Provide a shared EV connection to 10 per cent of spaces allocated for visitors, or one space if fewer than 10 spaces are allocated for visitors (see **Part 3.1**).

Prioritise and provide convenient access and parking for sustainable modes of transport.

Consider deep soil zones, stormwater management and the retention of trees during initial design stages, as these can affect the size and shape of a car park footprint.

Locate basements predominantly below the building footprint. Avoid the front, rear and side setbacks where possible, to allow for consolidated and connected deep soil zones between properties and within the public realm.

Separate parking and facilities for residential and non-residential uses to improve security.

Minimise the visual and environmental impacts of car parking through:

— using efficient layouts and ramp design

— limiting protrusions of car parking structures to a maximum of 1 m above ground level (measured from the top of the structure)

— using landscaping and screening to reduce visibility from public space

— avoiding lighting or noise impacts affecting public space or private dwellings.

Ensure safe movement within car parks by:

— providing direct, clearly visible and well-lit pedestrian access to common circulation areas

— establishing a clearly defined and visible lobby or waiting area to lifts and stairs

— providing pedestrian pathways separate to vehicular access where possible, to minimise use of vehicular ramps by pedestrians

— marking pedestrian crossing zones over vehicle circulation and using bollards where appropriate to protect pedestrian movement.

Vehicle entries

Balance the visual impact of vehicle entries so they are clearly visible but also recessive to the overall building form and streetscape.

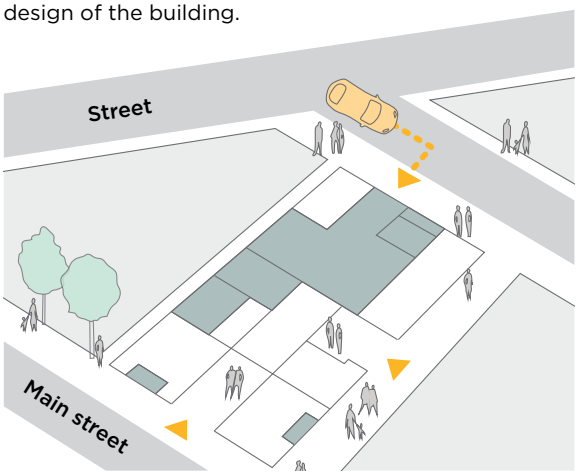
Locate car park and vehicle entries behind the building line.

Design and locate vehicle access points to achieve safety, minimise conflicts between pedestrians and vehicles, and create high-quality streetscapes. Where possible locate vehicle access to the site for servicing and car parking on secondary streets, to minimise the impact on public space.

Minimise the width and number of vehicle access points, ramp length and visual impact.

Integrate ventilation grilles or screening devices for car parking openings into the facade and landscape design.

Figure 1.6.1
Minimise the impact of car parking and vehicular access points on the streetscape by accessing onsite car parking from secondary streets where possible, and integrate the vehicle access into the design of the building.



Bicycle parking

Provide minimum bicycle parking rates as set out in **Table 1.6.1**, or according to local DCP requirements, whichever is greater.

Provide bicycle parking for residents which is:

— undercover and located at ground, first floor or basement level 1

— secure and easily accessible from the public realm and common circulation areas

— clear of obstructions, clearly marked, and via routes which avoid conflict between cyclists, vehicles and pedestrians.

Provide visitor bicycle parking:

— in close proximity to building entries

— integrated into the design of the ground floor interface when provided externally

— preferably undercover.

Consider providing a portion of Class A *(AS 2890.3)* bicycle parking spaces untethered to apartments and available for rent from the body corporate.

Class A bicycle parking spaces on individual apartment titles can contribute to the calculation of storage volumes (outside apartments) required by **Part 2.10: Storage.**

Make bicycle parking easily accessible from street level, on grade, by lift or using ramps of a maximum gradient of 1:15.

If the development includes a major retail destination, provide proximate public bicycle parking close to and integrated with the public space and street design.

For clusters of bicycle stands in public space, avoid more than 8 spaces to allow for ease of access and minimise visual impact.

Consider providing an area 2 m x 2 m as a dedicated bicycle maintenance zone, equipped with a bike stand, and adjacent to bicycle parking. Access to electricity for battery charging is useful for e-bikes and cargo e-bikes.

Table 1.6.1 Minimum rates for bicycle parking

TYPE	RATE	BICYCLE PARKING CLASS *(AS 2890.3)*
Residential use	1 space per 1 dwelling	Class A or B
Commercial use	1 space per 200 m^2 of floor space	Class B
Visitor	1 space per 10 dwellings	Class C

Bicycle parking class as set out in *AS 2890.3–2015: Parking facilities,* Part 3: Bicycle parking

Alternative design responses

Consider providing parking for alternative forms of transport such as car share vehicles, motorcycles and bicycles, and opportunities to reduce the overall provision of car parking, where:

— an option to include a site-specific response through a green travel plan is possible

— multiple car share services and multiple transport modes with frequent services are available within 400 m walking distance of the primary building entry

— adapting an existing structure for re-use means the requirements for car parking cannot be met.

Lumina, by DKO, Photo: Ben Guthrie

PART TWO

Building design

Blackwattle by Turner, Photo: Brett Boardman

2.1 Common circulation

The design of common circulation can positively influen e the amenity of apartments, by increasing opportunities for dual-aspect apartments, as well as contributing to built form, articulation and the building's relationship to the street.

Successful design of lobbies, internal corridors, external galleries and vertical circulation such as lifts and stairs provides residents with a sense of belonging and opportunities for casual social exchanges that foster a sense of community.

Common circulation spaces within a building are shared by residents and their visitors, not only to access the apartments, but importantly, to access communal spaces and facilities critical to daily life and social needs, such as open space, communal facilities, waste rooms, additional storage and parking.

Important design considerations include universal access, safety, amenity and durability.

OBJECTIVES

2.1 **Maximise the amenity of common circulation areas and provide services for maximum building occupancy to create socially inclusive, secure, and safe circulation spaces.**

DESIGN CRITERIA

The maximum number of apartments accessed from a circulation core on a single level is 8.

Lift handling capacity and anticipated waiting times, demonstrated in a vertical transportation report prepared by a suitably qualified person, comply with the minimum standards in *ISO 8100-32:2020 Lifts for the transportation of persons and goods – Part 32*:

— average waiting time: 60 seconds or less

—handling capacity: 7 per cent or more.

DESIGN GUIDANCE

Configuration and layout

Design common circulation spaces to maximise opportunities for dual-aspect apartments, including multiple-core apartment buildings and cross-over apartments.

Articulate corridors greater than 12 m long. Design solutions include:

— a series of foyer areas with windows and spaces for seating

— wider areas at apartment entry doors and varied ceiling heights.

Consider providing greater than minimum requirements for corridor widths to allow for comfortable movement, universal access, and doormats, particularly in entry lobbies, outside lifts and at apartment entry doors.

Ensure visual and acoustic privacy between common circulation spaces and apartment interiors. Avoid habitable room windows opening directly onto common circulation spaces even if unenclosed.

Alternative design responses

Where a development is unable to achieve 8 or fewer apartments accessed from a circulation core on a single level, provide a high level of amenity for apartments, common lobbies and corridors, including:

— sunlight and natural cross-ventilation in apartments

— access to ample daylight and natural ventilation in common circulation spaces

— common areas for seating and gathering

— generous corridors with greater than minimum widths and ceiling heights

— other innovative design solutions that provide high levels of amenity.

Although 8 apartments is preferable, where this is not possible consider 12 apartments as the maximum number accessed from a circulation core on a single level.

Figure 2.1.1
Limit the total number of apartments accessed from one circulation core to 8 or fewer, to minimise single-aspect units, support a sense of community and limit overcrowding.

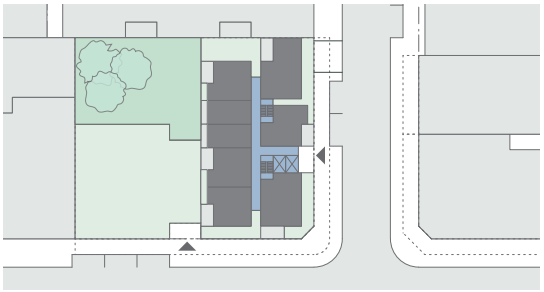


Figure 2.1.2
Multiple cores improve natural cross-ventilation and provide more entries along the street, increasing activity and passive surveillance.

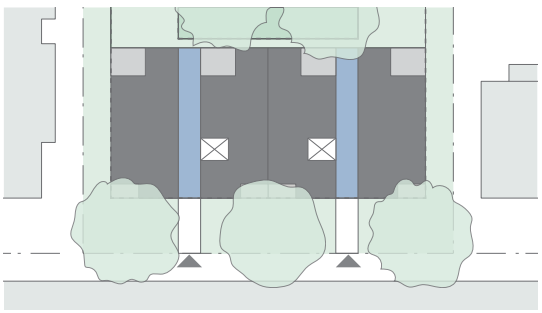


Figure 2.1.3
External gallery access can be used to maximise a desirable aspect for apartments or as a buffer to a noise source.

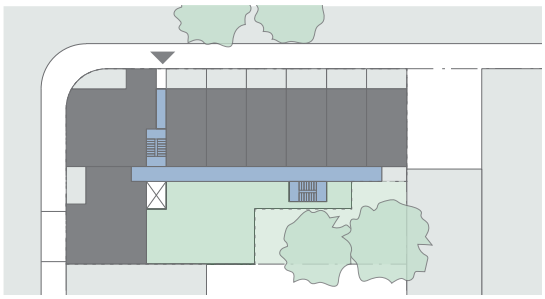
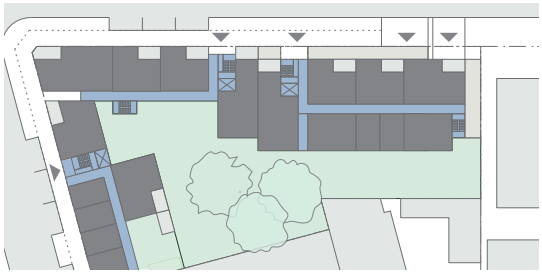


Figure 2.1.4
Mixed-use buildings may have a range of circulation spaces including multiple cores, gallery access and double-loaded corridors with cross-over apartments.



Lifts

In the vertical transportation report, include the percentage of the population waiting beyond the average waiting time.

Provide suitable clearance in front of lifts to allow for people passing, for medical emergency access, and for movement of furniture.

Consider lift redundancy (access to an alternative lift in case one lift is out of service).

To determine the location, number, size and capacity of lifts, consider:

— functional uses, including allowing for prams, mobility equipment, bicycles and shopping, and movement of goods, waste and furniture

— access to parking levels including bicycle parking and mobility equipment.

Equitable access

Consider the thoughtful integration of universal access to all common areas and apartments early in the design process. Design access to cater for households and visitors of all ages and abilities, including families with young children, the elderly, and people with impaired mobility, and to accommodate residents and visitors using prams, mobility scooters and larger electric wheelchairs.

Common stairs

Particularly for the lower floors of buildings, locate and design common stairs (including fire stairs) for ease of movement and with adequate amenity for daily use, including natural light and ventilation. This reduces reliance on lifts and provides opportunities for residents to be active and interact with other residents.

Daylight and natural ventilation

Daylight and natural ventilation in common circulation spaces that are above ground will improve amenity, thermal comfort and reduce operational costs. For daylight and natural ventilation, provide:

— a minimum glazed area of 10 per cent of the common circulation floor area served

— a minimum equivalent open area (EOA) of 2 per cent of the common circulation floor area served

— 2 or more sources of natural ventilation and daylight, where the floorplate has 7 or more apartments per floorplate, with the distance between openings maximised to encourage air movement

— high-level and low-level windows for natural ventilation where openings are located on a single aspect

— where glazing is connected to a slot or indent in the facade, the slot should have a width-to-length ratio of 1:3 or wider and be open to the sky.

Where apartment windows are adjacent to circulation areas, locate them to maximise visual and acoustic privacy.

For further detail on natural ventilation and calculation of EOA, refer to **Part 2.7: Natural ventilation** and **Appendix 4: Alternative design responses for natural ventilation and natural cross-ventilation**.

Safety and social interaction

Ensure access is direct and legible, with short, straight and clear sightlines between vertical circulation points, apartment entries and communal spaces. Minimise corridor and gallery lengths and avoid tight corners and spaces.

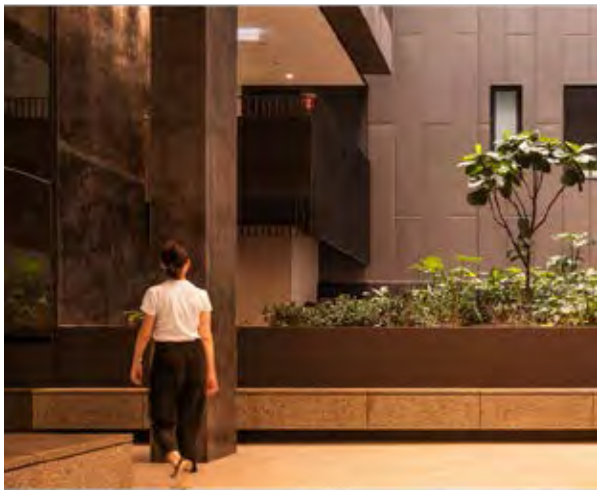
Provide legible signage for apartment numbers, common areas and general wayfinding, to help residents and visitors.

For safety and equitable access, ensure circulation spaces are well-lit. Consider minimum lighting and lux levels as set out in *AS 1428.2–1992 Design for access and mobility, Part 2.*

External galleries benefit from a greater number of openings and fewer closed-off sections along their length and above the balustrade.

Provide incidental spaces for social interaction and rest, such as space for seating in a corridor, at a stair landing or near a window. Consider integration and robust design of furniture in lobbies and communal areas to minimise potential theft and vandalism.

Integrated seating in entry lobbies and common circulation spaces promotes opportunities for social interaction and convenience for waiting, without risk of theft. Hensley Apartments, by Woods Bagot, Photo: Trevor Mein.



Natural light and ventilation in common circulation areas, and encouraging residents to use stairs for general circulation in addition to lifts, increases amenity and provides opportunities for residents' social interaction. The Fern by Steele Associates, Photo: Oliver Steele.

Natural light and ventilation in common circulation areas, and encouraging residents to use stairs for general circulation in addition to lifts, increases amenity and provides opportunities for residents' social interaction. George & Allen by Turner Studio, Photo: Brett Boardman.

2.2 Communal spaces

With a growing number of NSW households living and working in apartment buildings, shared spaces are an increasingly important design consideration.

Communal spaces benefit residents through economies of scale (the ability to share resources and save costs), and by providing opportunities to meet fellow residents and build a sense of community.

Communal spaces can be outdoor or indoor. Their size, location and design should respond to the apartment mix, expected household types and occupancy, site context and scale of development.

Communal open space supports a broad range of activities related to the domestic and social life of households that are unable to be accommodated within individual apartments or in publicly accessible open space.

Communal indoor space is also an important resource for residents, providing space to meet (in particular for strata management), entertain, socialise, play and exercise.

OBJECTIVES

2.2.1 Provide suitably sized and thoughtfully located communal open spaces that provide opportunities for plentiful landscaping and enhanced amenity.

2.2.2 Provide safe and resilient communal spaces that support a range of activities and contribute to the wellbeing of residents.

DESIGN CRITERIA

The quantity of communal open space provided is 8 m^2 per dwelling, up to 25 per cent of the site area.

At any time between 9 am and 3 pm in midwinter (21 June), ensure at least half the communal open space area receives 2 hours solar access.

DESIGN GUIDANCE

Communal open space

Where the communal open space area calculation exceeds 25 per cent of the site area, the additional part is optional, and can be provided flexibly as more communal open space or as communal indoor space.

Communal open space may be provided on podiums or rooftops; it is not required to be co-located with deep soil.

At midsummer (21 December), achieve a minimum 30 per cent direct shade to communal open space for a minimum of 2 hours between 9 am and 3 pm, using planting and landscape structures.

Provide communal open space with a minimum dimension of 6 m. For sites under 650 m^2 a minimum dimension of 4 m is acceptable.

Provide a range of spaces offering a variety of opportunities for both group and individual recreation and activities, aligned to the expected demographics of the building residents, including children, young people, pet owners, people working, and aged and older residents. Ensure capacity is adequate for multiple groups to use communal open space and for different uses to occur simultaneously.

Provide for activities which cannot be accommodated within apartments, like nature play, informal ball games, noisy activities, exercise, gardening, and social gatherings both indoors and outdoors.

Communal outdoor spaces can include:

— seating for individuals and groups

— barbecue areas and outdoor sinks or washing equipment

— play equipment and play areas for children of different ages

— 'playful' integrated elements such as custom seating, stepping stones through garden beds and interactive sculptures

— swimming pools, gym equipment and tennis courts

— communal gardens for residents to grow their own food and enjoy gardening

— storage for equipment for a variety of different activities, such as gardening tools, children's play items

— shared clothes lines and drying courts.

Design spaces to be:

— clearly and directly accessible from common circulation areas, supported with signage, and if possible, close to accessible toilet facilities

— safe and well-lit with opportunities for passive surveillance

— suitable for daily use, with robust materials and details that enable ongoing maintenance.

Roof gardens can provide verdant and abundant reprieve from an urban environment. They can be a useful alternative in highly built-up areas where ground floor communal open space is limited. Cleveland & Co. by SJB Architects, Photo: Brett Boardman

Communal open spaces can be located on a podium or roof, and can provide opportunities for social interaction among residents, with outdoor kitchens, communal gardens, and other opportunities for recreation and relaxation. Rochford by Studio Johnston, Photo: Brett Boardman.

Establish clear definition and boundaries between private, communal and public spaces. Locate communal open space so it doesn't impact neighbouring buildings or other residents, including with noise, solar access or overshadowing.

For developments with multiple buildings, provide communal open space and communal spaces for each building, i.e. within each building or on each rooftop, in addition to spaces shared by the whole development.

Consider microclimate, urban habitat, green cover and links to green infrastructure networks to enhance amenity.

Where communal open space is located on a rooftop:

— provide protection from sun, wind, noise and pollution

— manage overlooking to and from adjacent buildings

— set trafficable areas back from the building edge, preferably behind planters or landscaped areas

— ensure there are no climbable elements, including mobile furniture.

Internal communal space can provide essential amenities for residents, including recreation, music practice, or multi-purpose spaces that can be used for meetings and social events. Infinity by Koichi Takada, Photo: Tom Ferguson.

Communal indoor spaces

Ensure communal indoor space has a high level of amenity, including good ventilation and natural light.

Enhance the amenity and usability of communal indoor spaces by connecting them to communal outdoor spaces.

Distribute the location of communal indoor space across multiple levels and locations to enable easy access for all apartments, particularly for tall buildings and towers.

Communal indoor spaces can provide a range of facilities, such as:

— multi-purpose rooms for strata meetings, social activities, birthday parties, co-parenting and rainy-day play for children, sharing domestic equipment and children's toys

— sound-insulated music rooms

— gyms, pools and exercise rooms

— shared kitchens, pantries and laundries

— libraries, reading rooms, shared studies or work from home spaces

— dedicated spaces for children and young teenagers

— communal workshop space with shared tools for home, furniture and bicycle maintenance and hobbies

— storage space.

Ground floor community rooms may have potential to contribute space for neighbourhood events, activities, meetings and classes. In this case, provision of adjacent accessible toilet facilities is particularly beneficial.

SOP by Bligh Voller Nield Architecture, Photo: Murray Fredericks.

Open space which is publicly accessible

When providing publicly accessible open space in addition to the requirement for communal open space, consider the following principles:

— Design the public open space in response to the existing pattern and uses of the neighbourhood. Create links to the space using sightlines, pedestrian desire paths and the wider street grid.

— Ensure the space is well-connected, with a public street along at least one edge.

— Provide active frontages that positively contribute to adjacent public open space.

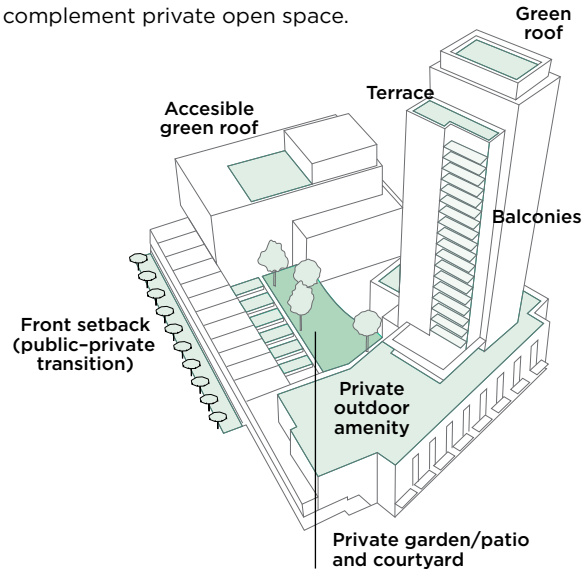
— Clearly define the boundaries between the public open space and private space.

— Connect the space to nearby parks and other public landscape elements where possible.

— Provide year-round sunlight access and protection from strong winds.

— Provide opportunities for a range of recreational activities for people of all ages.

Figure 2.2.1
Apartment development can provide a broad range of communal spaces in different locations to support the needs and lifestyles of different residents and households and complement private open space.



Recreation areas allow residents to relax and connect with the natural environment. Tandara (common area) by Aspect Studios, Photo: Simon Wood.

Locate and design open space to respond to microclimate and site conditions. The Finery (common area) by Aspect Studios, Photo: Nelson Cortez.

2.3 Apartment mix and diversity

Apartment mix can provide a diversity of housing choices and support equitable access to housing.

By accommodating a variety of household types and incorporating flexibility and high degrees of amenity, apartment development can meet the needs of current and future populations and create an appealing alternative to standalone dwelling houses.

Factors that contribute to mix and diversity include number of bedrooms, bedroom-to-bathroom ratios, work-from-home arrangements, accessibility, size, quality, affordability, and universal and family-friendly design. These are considerations in the early stages of design, in response to local housing needs and strategies.

Flexible configurations and adaptable and universal design can ensure new buildings will be able to accommodate a diverse range of needs and household structures across the building lifetime without difficult and costly retrofitting.

Universally designed apartments are safer and easier to enter, move around and live in. They benefit all members of the community, from young families to older people, their visitors, and those with permanent or temporary disabilities.

OBJECTIVES

2.3 Provide a range of apartment types, sizes and configu ations to promote fl xible housing that caters for current and projected housing needs of the community.

DESIGN GUIDANCE

Apartment mix

Refer to local housing strategies, targets and planning controls to ensure the development responds to local housing needs and provides a range of apartment types, sizes and configurations that can support different household types and stages of life.

Unless otherwise outlined in a local planning policy, use the following to determine housing mix and diversity:

For the purposes of dwelling mix, consider studio apartments and 1-bedroom apartments as a single apartment type, and all apartments over 3-bedroom as a single apartment type.

For a development with more than 20 dwellings, provide a minimum of 3 different dwelling types.

Provide a mix of the types so that:

— no less than 10 per cent of the total number of dwellings are one type

— no more than 50 per cent of the total number of dwellings are studio or 1-bedroom units (combined).

Provide of minimum of 20 per cent of apartments that incorporate the Livable Housing Australia (LHA) *Livable Housing Design Guidelines* Silver Level universal design features. Provide universal access apartments across a range of types and locations within a development.

Provide adaptable housing according to the relevant council policy, designed according to the requirements of *AS 4299–1995 Adaptable housing*.

When determining the apartment mix consider:

— current market demands

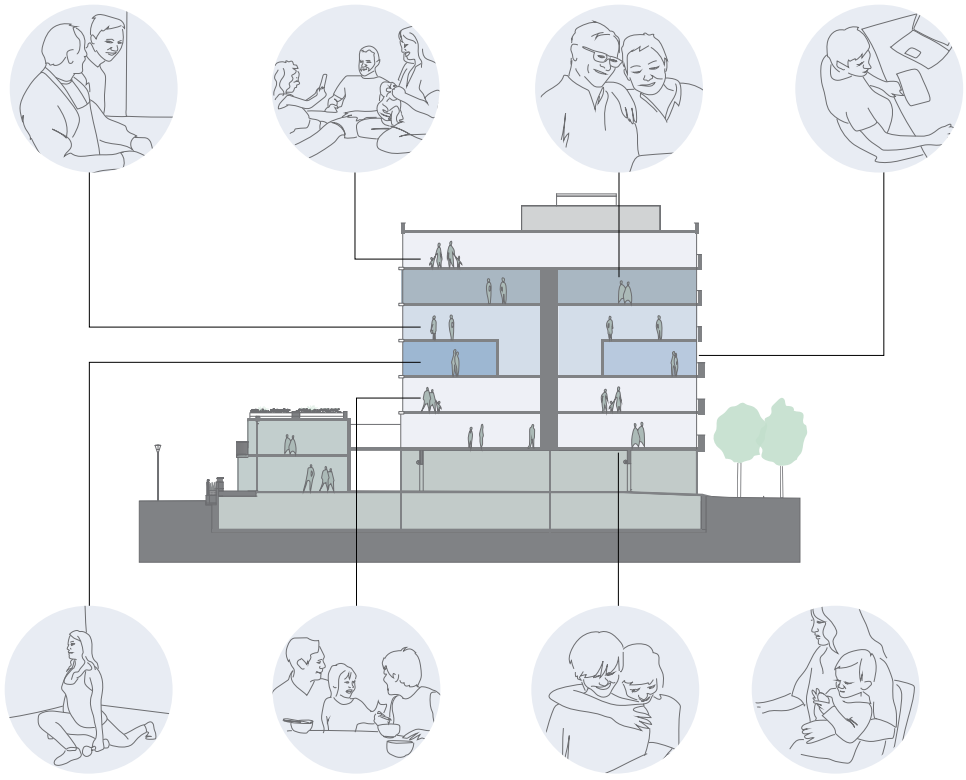
— the demand for social and affordable housing

— the distance to public transport, employment opportunities, education facilities and health services

— the needs of different cultural and socio-economic groups.

Appendix 6 provides indicative apartment layouts.

Figure 2.3.1
The mix of apartments provided in a development should respond to the housing needs of the local area.



Flexibility

Design apartment layouts to provide flexibility over time and opportunities for future reconfiguration. Lightweight non-structural partitioning between internal rooms without services facilitates future modification. See **Figure 2.3.2** for an example floor plan arrangement showing flexible options.

Consider diverse household types and stages of life including single-person households, families, multigenerational families and group households. Design solutions include:

— sizing and proportioning rooms to enable a variety of uses, activities, and furniture configurations – rectangular spaces 2:3 are more easily furnished than square spaces 1:1.

— rooms and spaces with different levels of privacy and acoustic separation

— dual key apartments (see glossary)

— greater than minimum apartment areas

— generous private open spaces.

Family-friendly apartments

Provide 20 per cent of 2-, 3- and 4-bedroom apartments as family-friendly apartments to accommodate the needs of families with children. Design solutions include:

— greater than minimum apartment sizes

— location in lower levels of the development to allow easy access to open space and reduce dependency on corridors and lifts

— multiple living rooms or main bedrooms

— wider than minimum hallways and entry zones to allow for manoeuvring of prams and other bulky children's equipment

— larger than minimum areas for living rooms and private open spaces, including areas for play that are visible from the kitchen

  — consider co-locating family friendly apartments and attached private open space with communal open space on ground level or podiums to allow intervisibility from kitchen to common play space

  — for private open space consider the safety of children, e.g. use integrated planters that eliminate climbing hazards

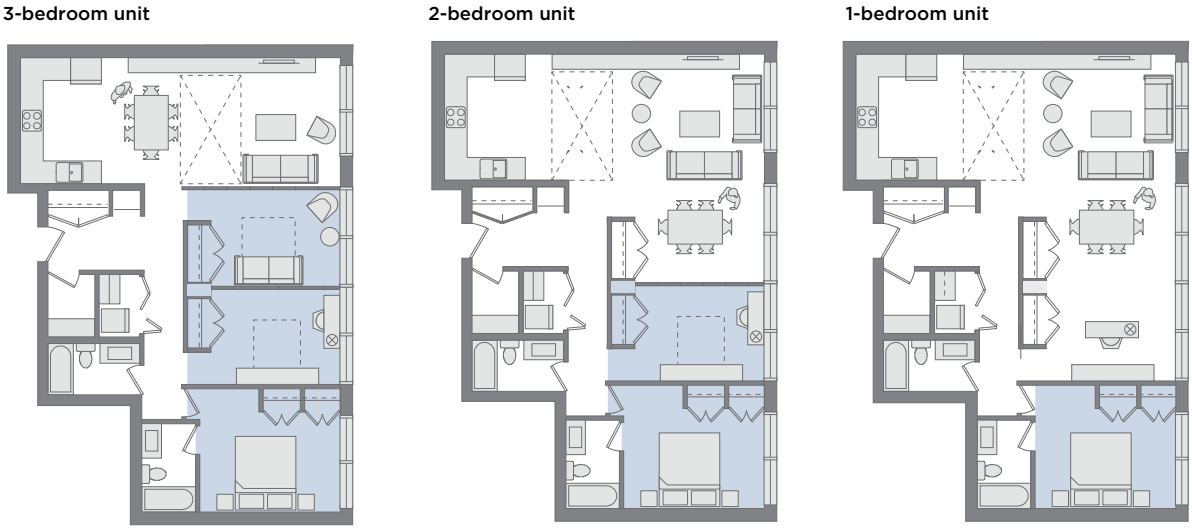
— at least one bedroom with sufficient size to provide space for furniture like study desks and cribs (see **Figure 2.3.4**)

— bedroom sizes and layouts that suit various configurations of children's furniture including 2 single beds, bunk beds, space for play, and space for desks

— bathroom sizes and layouts that accommodate a parent and child using a bathroom together, and at least one bathroom with a bathtub

— greater acoustic separation between apartments and communal spaces, as well as between bedrooms and living areas.

Figure 2.3.2
Lightweight internal walls without services or structure allow for future flexibility and modification.



Study rooms

To support greater apartment mix and diversity, and facilitate working and studying from home, consider providing a study room as a separate habitable room.

Minimum-sized study rooms are capped at one per apartment. Design considerations include:

— a minimum size of 7 m^2 and minimum dimension of 2.4 m clear

— access to daylight and natural ventilation

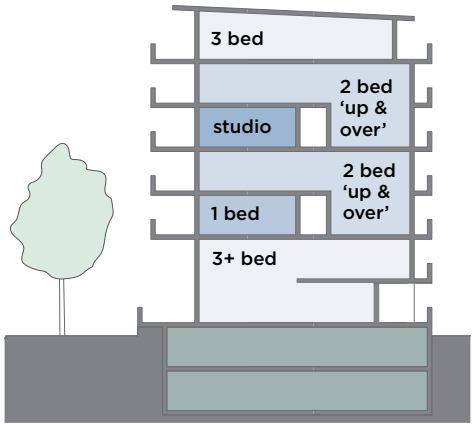
— a higher level of acoustic privacy than a typical bedroom.

Alternative design responses

Development that includes social housing, or is delivered by a community housing provider, may incorporate an alternative approach to apartment mix, aligned with relevant housing strategies.

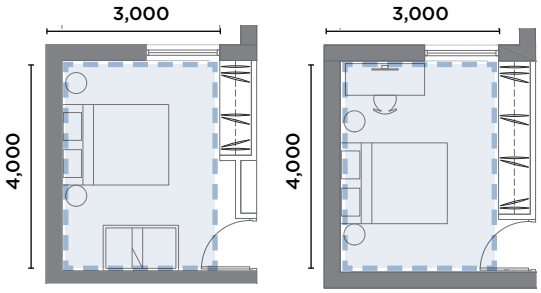
Where proposals are considered under *State Environmental Planning Policy (Affordable Rental Housing) 2009,* the consent authority may be flexible in applying the design guidance for the provision of apartment mix and configuration, and consider the design guidance in **Part 2.4: Apartment configu ation – alternative design responses**.

Figure 2.3.3
Large apartments located on the ground floor or roof level can provide opportunities for increased private open space that benefits families with children and shared households. Internal common circulation (e.g. corridors) can be reduced by adding cross-over ('up and over') apartments to the mix.



Communal space on podiums or roofs can provide great amenity for families, and an opportunity for co-location of private open space attached to family-friendly apartments. St. George Community Housing, by Aspect Studios.

Figure 2.3.4
Bedrooms of 12 m^2 (instead of minimum 9 m^2) can accommodate furniture including desks or cribs, or a variety of other uses alongside sleeping.



Family-friendly apartments, with multiple large bedrooms or separated living spaces, provide opportunities for multi-generational families, families with children and co-tenants to use the apartment differently at the same time. North Rocks by Candalepas Associates, Photo: Brett Boardman.

2.4 Apartment configuration

The configu ation of an apartment establishes the way rooms and spaces of different sizes, height and function are arranged, located and accessed from each other.

It determines the amenity of the apartment – how an apartment will receive sunlight, daylight and fresh air, has outlook and prospect without loss of privacy, and avoids unwanted noise and overlooking others.

Successful apartment design and efficient and well-planned spaces can create homes that are a pleasure to live in for many years – not simply a step on the way to a standalone house.

OBJECTIVES

2.4 **Design apartments that are functional and flexible over the life of the building, with generous internal dimensions and proportions, a high level of internal amenity, natural ventilation, and daylight access.**

NON-DISCRETIONARY DEVELOPMENT STANDARDS

Apartment size

Provide the following minimum internal areas for apartments.

Table 2.4.1: Minimum internal areas for apartments

DWELLING TYPE	MINIMUM INTERNAL AREA (INCLUDES ONE BATHROOM)
Studio	35 m^2
1 bedroom	50 m^2
2 bedrooms	70 m^2
3+ bedroom	90 m^2

Ceiling height

Table 2.4.2: Minimum ceiling heights (measured from finished floor level to finished ceiling level) for apartment buildings and mixed-use buildings

AREA	FLOOR-TO-CEILING HEIGHT (MINIMUM)
Habitable rooms	2.7 m
Non-habitable rooms and kitchens	2.4 m
2-storey apartments	2.7 m for main living room floor area 2.4 m for second floor, where the area doesn't exceed 50% of the apartment area
Attic spaces	1.8 m at the edge of the room with a 30-degree minimum ceiling slope
Ground floor non-residential uses	3.3 m

The minimum ceiling heights do not preclude higher ceilings.

DESIGN CRITERIA

Depth of habitable rooms is limited to a maximum of 2.5 times the ceiling height or primary window-head height, whichever is lower.

Where living and dining rooms are combined, habitable room depth is limited to a maximum of 3 times the ceiling height or primary window-head height, whichever is lower. This excludes depth occupied by storage space or a kitchen benchtop on the room's farthest wall.

Every habitable room has a window in an external wall with a total minimum glass area of not less than 10 per cent of the room's floor area. Daylight and air is not borrowed from other rooms.

Bedrooms have a minimum dimension of 3 m (excluding wardrobe space).

Main bedrooms have a minimum area of 10 m^2 and other bedrooms 9 m^2 (excluding wardrobe space).

Additional bathrooms increase the minimum internal area by 5 m^2 each.

A fourth bedroom and further additional bedrooms increase the minimum internal area by 12 m^2 each.

For living rooms and combined living and dining rooms, the minimum room width is:

— 3.6 m for studio and 1-bedroom apartments

— 4 m for 2- and 3+ bedroom apartments and cross-through apartments.

DESIGN GUIDANCE

Living areas

Provide a minimum area of 24 m^2 for combined living and dining rooms in 2- and 3+ bedroom apartments.

In apartments larger than a studio apartment, avoid locating the kitchen as part of the main circulation space (such as in a hallway or minimum-width entry space).

Separate access to bedrooms, bathrooms and laundries from living areas, to minimise direct openings between living and service areas.

Windows

Ensure a window is visible from any point in a habitable room.

Locate all living areas and bedrooms on the external face of the building to achieve the design guidance for natural ventilation (see **Part 2.7: Natural ventilation**).

Where possible:

— provide an external openable window for bathrooms and laundries

— orientate main living spaces towards the primary outlook and aspect, and away from noise sources.

A double-height space near windows can ensure natural light and ventilation reach deep into the floor plan. This can be especially helpful for ground floor apartments which are more likely to be shadowed by landscaping. Neue by SJB Architects, Photo: Brett Boardman

Ceiling height

Design appropriate ceiling heights to ensure apartments have adequate daylight and sunlight access.

Where flooding conditions require the ground level to be raised, the minimum ceiling heights in **Table 2.4.2** still apply.

Consider greater than minimum ceiling heights in lower-level apartments to enable better daylight access, and in shallower single-aspect apartments to enable better natural ventilation.

Wherever possible, avoid bulkheads compromising ceiling heights. Consider stacking service rooms and wet areas from floor to floor, and coordinating bulkhead locations above kitchens and non-habitable rooms. Do not extend kitchen bulkheads into the dining area (e.g. in eat-in kitchens).

Alternative design responses

Where minimum apartment sizes and room dimensions are not achieved, demonstrate:

— apartment planning is efficient, usable and functional, as indicated by realistically scaled furniture layouts and circulation areas (see **Appendix 5: Furniture schedule**)

— apartments satisfy the design guidance set out in:
  — **Part 2.6: Sunlight, daylight, shade and thermal comfort**
  — **Part 2.7: Natural ventilation**
  — **Part 2.10: Storage**

Offset less than minimum apartment sizes with:

— increased private open space provision

— high-quality communal spaces that exceed the minimum criteria set out in **Part 2.2: Communal spaces**.

Figure 2.4.1
The depth of a single aspect apartment relative to the ceiling height directly influences the quality of natural ventilation and daylight access.

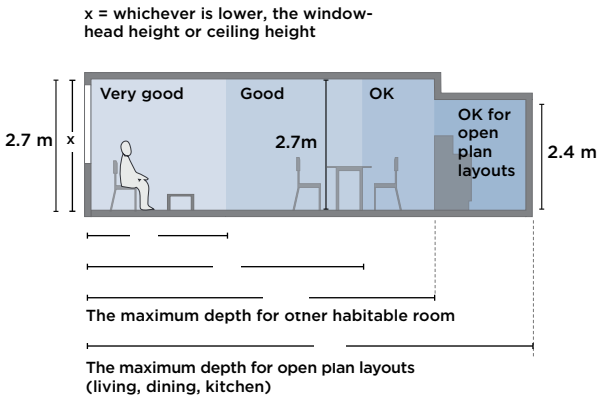


Figure 2.4.2
Design service bulkheads to be wholly contained within non-habitable rooms or kitchens, and not intrude into habitable spaces.

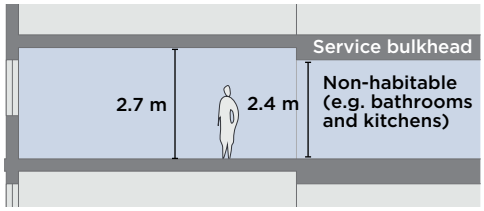
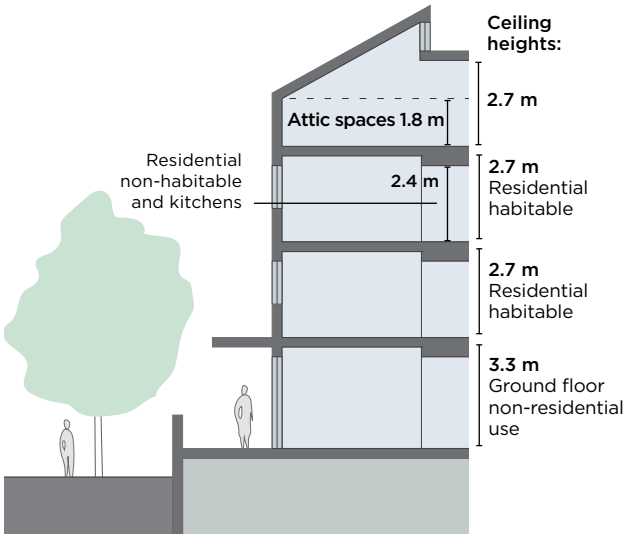


Figure 2.4.3
Ceiling heights of minimum 2.7 m can help to achieve good daylight access and natural ventilation for apartments.



A generous flow of space in an apartment, incorporating external private open space as an extension to the living room, provides great amenity and functionality. Rochford by Studio Johnston, Photo: Ben Hosking.

2.5 Private open space and balconies

Private open spaces include balconies, courtyards and terraces. These can enhance amenity, taking advantage of our temperate NSW climate to extend living areas, provide space for outdoor activities, and give privacy to interior spaces from the street.

Balconies that are safe and appropriately designed can provide space for children to play outdoors. They can also offer residents opportunities such as owning a pet or growing food.

Private open spaces are also important architectural elements, contributing to the form and articulation of the building with depth and shadow, as well as fences, balustrades and screens.

OBJECTIVES

2.5.1 Locate appropriately sized private open space to optimise internal amenity, outlook, and privacy, and provides opportunities for gardening, clothes drying, outdoor entertaining and passive surveillance of common and public areas.

2.5.2 Design and detail private open space and balconies that contribute to the overall architectural form and detail of the building.

DESIGN CRITERIA

All apartments have a primary balcony sized as follows:

Table 2.5.1: Primary balcony minimum dimensions

DWELLING TYPE	MINIMUM BALCONY AREA	MINIMUM BALCONY DIMENSIONS
Studio apartments	4 m^2	1 m depth
1-bed apartments	8 m^2	2 m depth
2-bed apartments	10 m^2	2.4 m depth
3+ bed apartments	12 m^2	
The minimum balcony depth counted as contributing to the balcony area is 1 m.		
For apartments at ground level or on a podium or similar structure, where a private open space is provided instead of a balcony, the minimum area is 15 m^2, with a minimum depth of 3 m.		

DESIGN GUIDANCE

Private open spaces and balconies

Enhance liveability for residents by:

— locating private open spaces adjacent to the living room, dining room or kitchen to extend the living space

— facing the longer side outwards, or having the private open space open to the sky to optimise daylight access into adjacent rooms

— integrating operable screens, shutters, hoods and pergolas to control sunlight, wind and noise

— providing level transitions between interior and exterior spaces, to enhance universal access and flexibility

— using external finishes for walls, floor and ceilings and connection to drainage, to distinguish these spaces from habitable rooms and ensure appropriate weather proofing

Provide balconies with minimum dimensions as shown in **Figure 2.5.2** to ensure suitability for furniture. The remainder of the minimum balcony area over and above these minimum dimensions can be provided flexibly with a minimum depth of 1 m.

To maximise protection from adverse winds, design single-aspect balconies that do not project beyond the facade.

For corner balconies in exposed locations, mitigate high wind speeds using devices such as full-height impermeable screens on the most exposed aspect.

Locate sources of heat rejection, such as those from air conditioning units, in a location away from private open space, and to avoid degrading the amenity of private open space.

— The roof can be used to locate split-system condensers for up to 8 storeys immediately below, i.e. within the limits of the condensate pipework length and height difference.

— For buildings with more than 8 residential storeys, and where a rooftop location is not practical, centralise heat rejection in dedicated on-floor plant rooms (condenser decks) that are sufficiently sized to provide efficient heat rejection, and suitably screened to reduce visual and acoustic impacts.

Figure 2.5.1
Maximise balcony use by allowing access from the main living area and a bedroom. Secondary balconies provide further amenity to apartment living and are best accessed off kitchens and laundries.

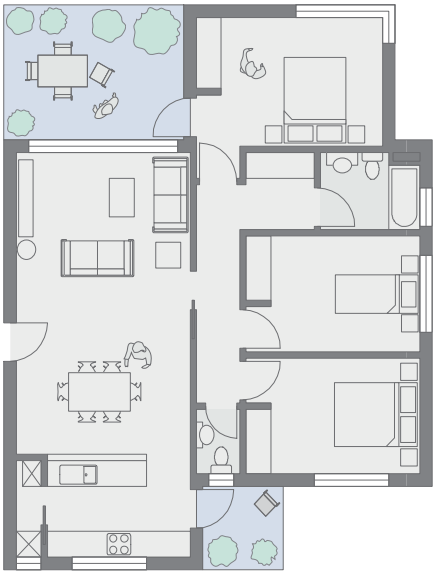
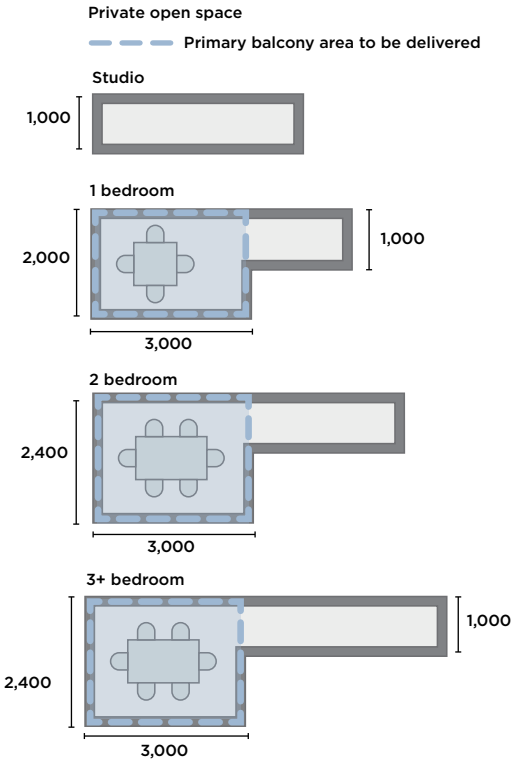


Figure 2.5.2
Minimum balcony areas and depths ensure the balcony area is usable and can be easily accessed and furnished with appropriate furniture (see **Appendix 5: Furniture schedule**).



Integrate the following elements into the building's overall architectural form and facade detailing, and in alignment with the street character:

— private open space and balconies

— services including downpipes and balcony drainage

— projecting balconies and soffits.

Consider the visibility of soffits from the street.

Where clothes drying or storage areas are located on balconies:

— count these areas in addition to the minimum balcony size

— provide screening and integrate them into the building design.

Insulate the ceilings of apartments below balconies and roof terraces to avoid heat loss.

Provide water and electricity for primary balconies and private open spaces wherever possible. Ensure locations do not assist climbability.

Balance privacy, activity, surveillance and safety for residents and the public by:

— designing spaces to allow views and passive surveillance of the street while maintaining visual privacy and allowing for a range of uses on the balcony or within the open space

— selecting materials and treatments that responds to the location

— preferencing solid or partially solid balustrades over full-width glass balustrades, particularly at lower levels of the building

— setting back balustrades where overlooking or safety is an issue

— designing out opportunities for climbing or falls.

Incorporate shading into the design of protected balconies where appropriate. (See **Part 2.6: Sunlight, daylight, shade and thermal comfort**.)

Find opportunities to incorporate operable elements on balconies to enable residents to manage the level of enclosure, wind, noise and sun protection provided.

A combination of solid and transparent materials balances the need for privacy with surveillance of the public realm. Viewed from the inside, screening increases privacy and allows for storage and external clothes drying. Llandaff St by Hill Thalis Architecture, Photo: Ben Guthrie.

Level threshold transitions support universal and adaptable design, eliminate trip hazards and allow for easy movement of furniture from inside to outside, expanding the usability of internal rooms and private open space.Short lane by Woods Bagot, Photo: Trevor Mein.

Alternative design responses – private open space and balconies

Balcony use and amenity may be limited by:

— environmental conditions including high winds or proximity to road, rail, aircraft and other sources of noise and air pollution

— heritage and adaptive re-use of existing buildings

— housing type, where alternative solutions are being considered under an applicable SEPP.

Where alternative solutions are being considered under an applicable SEPP, such as policies for affordable rental housing or build-to-rent apartments, the consent authority may be flexible in considering how a proposal complies with guidance for private open space. Design solutions include:

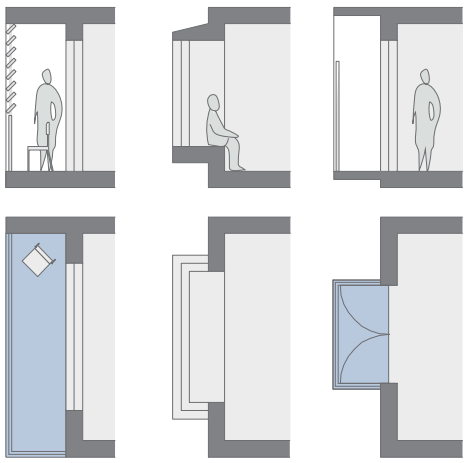
— where the number or size of balconies is reduced, an increase in communal area supporting a variety of functions can provide residents with an alternative onsite area for external activities and larger social gatherings

— alternatives including Juliet balconies, operable walls, partially enclosed wintergardens or bay windows may be appropriate, see **Figure 2.5.3**

— protected balconies can be designed as an external space with external materials, finishes and drainage

— protected balconies can include at least one enclosed side.

Figure 2.5.3
Design solutions for protected balconies. Noisy locations may require different solutions such as enclosed wintergardens, balconies with operable walls, or Juliet balconies.



Wintergardens and protected balconies

Design wintergardens to temper noise and harsh conditions but not limit natural ventilation or natural cross-ventilation within the apartment.

To allow adequate natural ventilation of the balcony and the apartment, provide the wintergarden with permanent openings at the top of the enclosure, and running the full length of the wintergarden facade. Make the size of the openings at least the greater of:

— 25 per cent of the external face of the balcony on its longest aspect

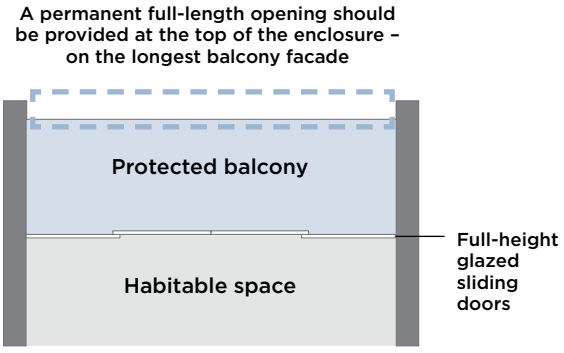
— twice the EOA required for openings from the apartment onto the wintergarden to support natural ventilation or natural cross-ventilation.

For wintergardens on a corner, provide the permanent openings to the balcony along the side alternative to the elevation being relied upon for natural cross-ventilation, and:

— where the balcony is rectangular, provide a full-height impermeable screen to the full length of the shorter facade

— for square balconies on a corner the impermeable screen can be on either aspect to suit cross-ventilation.

Figure 2.5.4
Wintergardens can improve liveability of the balcony and adjoining habitable rooms.



2.6 Sunlight, daylight, shade and thermal comfort

Sunlight and daylight access are important to ensure indoor light quality and residential amenity. They can also improve energy efficie y by reducing reliance on artificial lighting and he ting.

Building orientation directly affects residential amenity including sunlight access and natural ventilation. Designing the site layout to maximise northern orientation is an important consideration and needs to be balanced with other siting and built form considerations.

By adopting passive design strategies, such as providing solar shading for glass to avoid unshaded, highly glazed facades, and choosing materials with low thermal transmittance, the thermal comfort of an apartment can be improved and the need for glare control can be reduced. Passive design strategies can also help buildings to meet the thermal performance requirements of the Building Sustainability Index (BASIX).

OBJECTIVES

2.6.1 Maximise the number of apartments that receive sunlight to living rooms and private open spaces, and have high-quality daylight access, especially where sunlight is limited.

2.6.2 Use passive environmental design strategies to optimise heat storage in winter and reduce heat transfer in summer, using low thermal transmittance construction, shading devices, and balconies.

DESIGN CRITERIA

In the Sydney Metropolitan Area, and Newcastle, Gosford, and Wollongong LGAs, the living rooms and private open spaces in at least 70 per cent of the apartments in a building receive a minimum of 2 hours direct sunlight between 9 am and 3 pm at midwinter (21 June).

In all other LGAs, the living rooms and private open spaces in at least 70 per cent of the apartments in a building receive a minimum of 3 hours direct sunlight between 9 am and 3 pm at midwinter.

No more than 15 per cent of the apartments in a building receive no direct sunlight between 9 am and 3 pm at midwinter.

Where glazing is greater than 30 per cent of the apartment facade on any individual apartment aspect (when measured on the internal face of the wall), provide external sun shading to a maximum of 30 per cent of the exposed glazing in a wall to block 30 per cent of summer sun.

DESIGN GUIDANCE

Solar access

Maximise the number of apartments with a northern aspect and minimise the number of single-aspect apartments facing south.

— Living areas are best located to the north and service areas to the south and west of apartments.

For living rooms and private open spaces, 'receiving direct sunlight' includes the following surfaces receiving direct sunlight for at least 15 minutes:

— the floor of a private open space, or the face of its surrounding walls

— the glazed opening to a living space.

To provide daylight to habitable rooms, use skylights, high-level windows (sill height of 1,500 mm or greater), courtyards or light wells as secondary sources only.

Where courtyards or light wells are used:

— make them fully open to the sky

— restrict their use to kitchens, bathrooms and service areas

— consider noise and privacy (see **Part 1.2: Built form and siting**, **Part 2.8: Acoustic privacy, noise and pollution**, and **Part 2.9: Visual amenity**)

— treat them as part of the building's visible external facade, including appropriate selection and detailing of materials and building services

— provide access for cleaning and maintenance from a communal area.

Alternative design responses – solar access

Where the local street grid or subdivision pattern limits potential sunlight access to a building, the minimum 2 hours or 3 hours of direct sunlight in midwinter can be received between 8 am and 3 pm (i.e. the time interval extended one hour earlier). However, consider the potential impact on satisfying **Objective 1.2.2** for any future residential development on adjacent sites.

Providing sunlight access may not be possible on some sites. This includes:

— where greater residential amenity can be achieved along a busy road or railway line by orientating the living rooms away from the noise source

— on south-facing sloping sites

— where significant views are oriented away from the desired aspect for direct sunlight

— adaptive re-use of existing buildings or heritage items.

Where this is the case, demonstrate how the site constraints and orientated preclude meeting the design guidance, and how the development meets the objectives in other ways.

Orientation

Minimise overshadowing to public open space and neighbouring residential properties to ensure living areas, private open spaces and communal spaces in the affected properties continue to receive the sunlight access described in the design criteria.

If neighbouring properties are already not receiving the recommended minimum number of hours, ensure their sunlight access is not reduced by more than 20 per cent as a result of the proposed design.

Ensure solar collectors on neighbouring buildings retain a minimum of 4 hours sunlight access a day.

If the proposal significantly reduces the neighbours' sunlight access, mitigate the impact of shading by increasing the building separation beyond the minimums set out in **Part 1.2: Built form and siting**.

Where necessary, increase upper-level setbacks to minimise overshadowing, especially to the south or downhill.

Shading control

Where the solid material on an apartment facade in an individual aspect is 70 per cent or more, no additional shading is required for glazing on that aspect.

Where a covered balcony with a minimum depth of 1 m extends across the length of a glazed facade or opening, this is considered to provide the shading necessary for all facade orientations apart from +/- 30° of west. A building facade located behind a covered balcony can therefore been excluded from the apartment facade calculation.

For all balconies oriented +/- 30° of west, incorporate operable shading to protect glazing.

If a balcony has an orientation to the north and west, only the western orientation will require additional shading.

The amount of shading required depends on the amount of glazing on that aspect. Increase or decrease shading in proportion to the glass-to-wall ratio.

Reduce direct summer sun on a glazed apartment facade through a combination of:

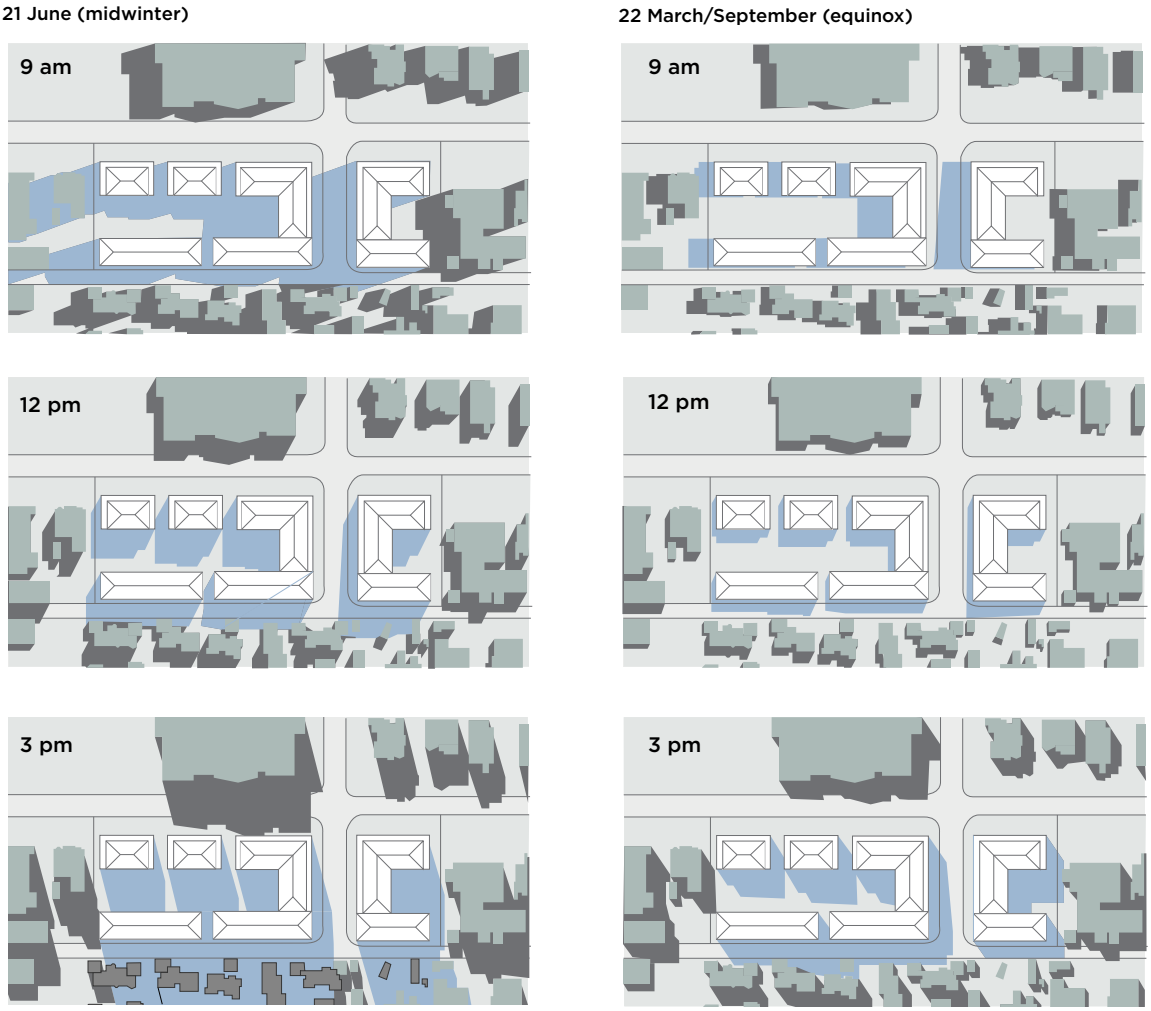
— solid materials and projections

— shading of the glazed facade.

Design shading so it does not limit the sunlight access recommended for midwinter. Operable and movable shading devices are best for this situation.

High-performance solar control glazing is not suitable as a substitute for shading. Clear double-glazing and appropriately designed shading devices provide the best balance between summer sun protection and winter solar access for NSW climates.

Figure 2.6.1
Shadow diagrams demonstrate the impact of overshadowing within and beyond the site.



Consider facades on an individual aspect and per apartment basis, and measure along the internal face of the external wall. For facade calculations, exclude:

— any walls or glazing located behind a covered balcony of 1 m or greater depth except where the elevation is within 30° of west

— facades facing between south-west, south, and south-east

— the area of window or door reveals

— the area between the finished ceiling height and finished floor area above

— the edge of party walls.

Elements which can be considered as providing shade for glazed areas include opaque building elements on the site or on neighbouring sites, including:

— vertical screens

— horizontal projections

— opaque balcony balustrades

— other buildings within the site.

The following elements cannot be considered as providing shade to glazed areas:

— translucent built elements including glass balustrades

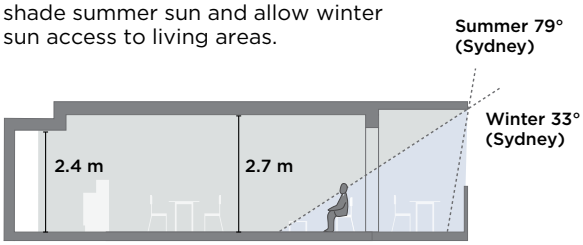
— opaque built elements outside the site yet to be delivered

— trees within or outside the site.

Alternative design responses – shading control

In areas of genuine constraint, good solar shading for a development can be demonstrated using seasonal testing or with a single-hour test. See **Appendix 3.2: Demonstrating good solar shading**.

Figure 2.6.2
Shading devices on balconies should shade summer sun and allow winter sun access to living areas.



Horizontal louvres are most effective on north-facing facades and can be angled to achieve summer shade and winter sunlight access. The Sanctuary, Turner Studio, Photo: Tom Ferguson.

Vertical louvres are ideal for east- and west-facing facades, particularly when operable. Newmarket by Bates Smart, Photo: Robert Walsh.

2.7 Natural ventilation

Access to outdoor air is a fundamental requirement in residential buildings. Natural ventilation supports residents' amenity, comfort, health and wellbeing by providing good access to outdoor air, and can safeguard occupants from illness due to lack of fresh air.

To achieve adequate natural ventilation, apartment design should consider the orientation of the building, the configuration of apartments, and the external building envelope. Sustainable design practice incorporates natural ventilation and natural cross-ventilation by responding to the local climate and reducing the need for mechanical ventilation and air conditioning, enabling energy savings and creating resilience.

Natural cross-ventilation is a wind-driven form of natural ventilation that provides significantly higher air change rates and should be maximised to allow occupants to create a comfortable indoor environment.

Apartments that are naturally cross-ventilated can offer 7 to 9 times more air change rates per hour compared to single-aspect ventilation. This increased air velocity improves thermal comfort by removing heat from the room, purging warm air in 5 to 10 minutes (whereas a naturally ventilated room would be purged in 35 to 70 minutes). This allows apartments to remain within the realms of passive design, even in the hottest temperatures, for the majority of the year.

Passive design strategies can aid natural and cross-ventilation, which can also help buildings to meet the BASIX thermal performance requirements.

OBJECTIVES

2.7 **Provide natural ventilation to all habitable rooms and maximise apartments with natural cross-ventilation to optimise indoor air quality and thermal comfort and reduce reliance on mechanical ventilation.**

DESIGN CRITERIA

Natural cross-ventilation (using exposure to wind and appropriate sizing and distribution of openings) is provided for at least 60 per cent of the apartments in the first 9 storeys of a building.

Apartments at 10 storeys or greater are deemed to be cross-ventilated only if any enclosure of the balconies at these levels allows adequate natural ventilation and balconies cannot be fully enclosed.

The overall depth of a cross-over or cross-through apartment does not exceed 18 m, measured from glass line to glass line.

DESIGN GUIDANCE

Natural ventilation

Provide an equivalent open area (EOA) of ventilation openings equal to at least 5 per cent of the floor area served.

For EOA calculations, include an allowance for flyscreens, regardless of whether they are provided, and opening restrictors, if required for fall prevention.

For courtyards or building indentations, provide a width-to-depth ratio of less than 2:1 to ensure effective air circulation and avoid trapping pollutants.

To improve natural ventilation to non-cross-ventilated apartments:

— provide high-level and low-level window openings or use full-height louvres

— maximise the distance on plan between windows to harness wind pressure differences across the facade.

Use ceiling fans to improve air circulation within standard-height habitable rooms.

Avoid light wells as the primary air source for habitable rooms.

Where possible, use windows to provide natural ventilation for bathrooms and kitchens to reduce moisture build-up, disperse smells, and provide ventilation if an exhaust fan breaks down.

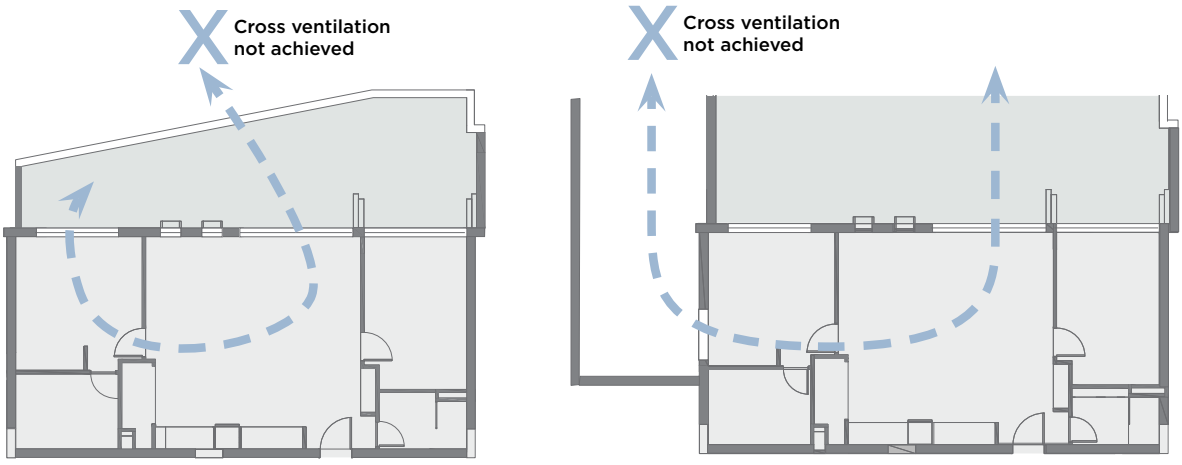
Window opening restrictors for fall protection and flyscreens severely limit available airflow.

— When calculating the amount of ventilation available, it must be based on the geometric open area (GOA) of the window, which takes the restrictor into account.

— In addition, the reduction shown in **Table A4.1 (see Appendix 4)** must be applied to the geometric open area to calculate the EOA, allowing for loss of airflow due to flyscreens.

— Even if flyscreens are not installed from the outset, the calculations must allow for future installation of flyscreens. (See **Appendix 4** for calculation of EOA.)

Figure 2.7.1
Treatments to a single facade aspect, including slots and recesses, do not provide adequate wind exposure to create a pressure differential and generate natural cross-ventilation.



Natural cross-ventilation

Acceptable solutions for providing natural cross-ventilation include:

— cross-through, corner and roof-window apartments consistent with wind exposure achieved through minimum separation

— limited obstruction to wind from the building

— appropriate sizing and distribution of openings (see **Appendix 4.2: Natural cross-ventilation** decision tree)

Where facade exposure is inconsistent with acceptable apartment types, achieve exposure to wind by:

Providing unobstructed access to 225° of wind exposure to openings, measured from the centre of the openings (see **Figure A4.2.2** in **Appendix 4**)

and:

Maintaining adequate separation distances between buildings:

— 9 m minimum separation between buildings if space between buildings is open at both ends and has unobstructed airflow

— 6 m minimum separation between buildings if space between buildings is open at both ends and has unobstructed airflow, and the adjacent building facade is the same length or shorter

— minimum habitable–non-habitable separation distance if the apartment opens to a courtyard

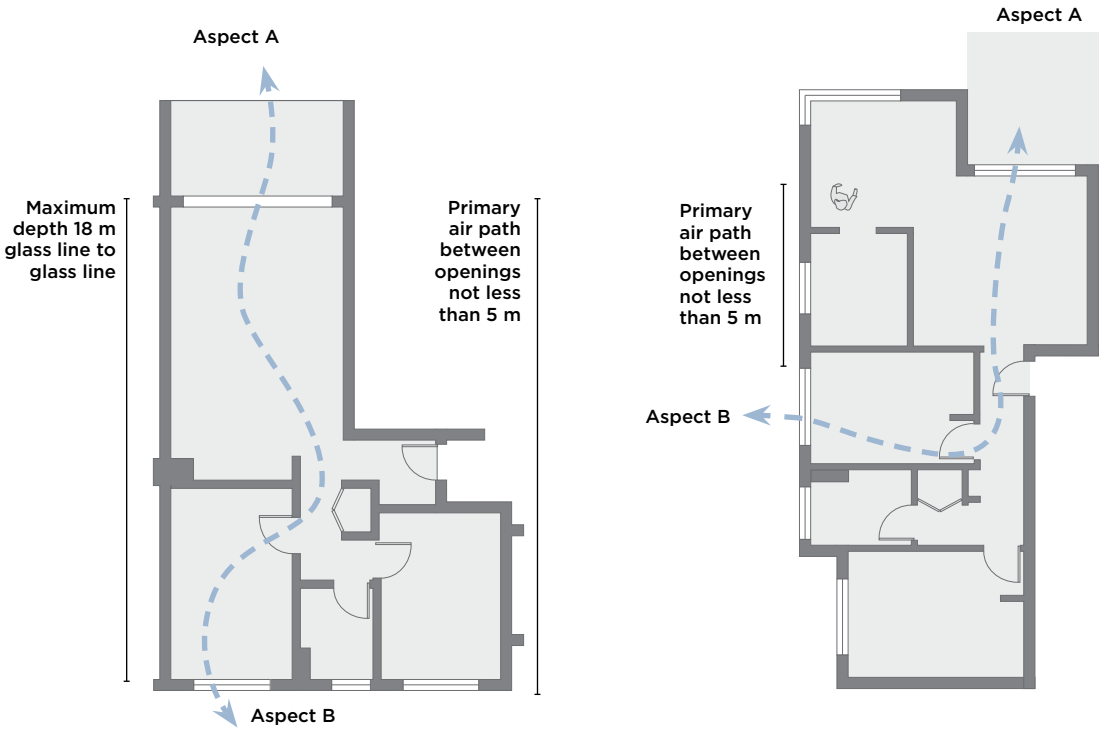
— in all other cases, assume building separation distances between habitable rooms as set out in **Part 1.2: Built form and siting** (see **Figure 1.2.1**).

Achieve appropriate sizing and distribution of the natural ventilation openings by:

— providing openings with a total EOA of not less than 5 per cent of the total habitable floor space of the apartment

— balancing the openings between facades, with no facade having openings with an EOA of less than 2 per cent of the total habitable floor space if the apartment has dual aspects, or 1.5 per cent of the apartment has three aspects

Figure 2.7.2
Accepted cross-through and corner apartments consistent with the window orientation and wind exposure achieved.



Making the primary air path between the openings:

— not less than 5 m

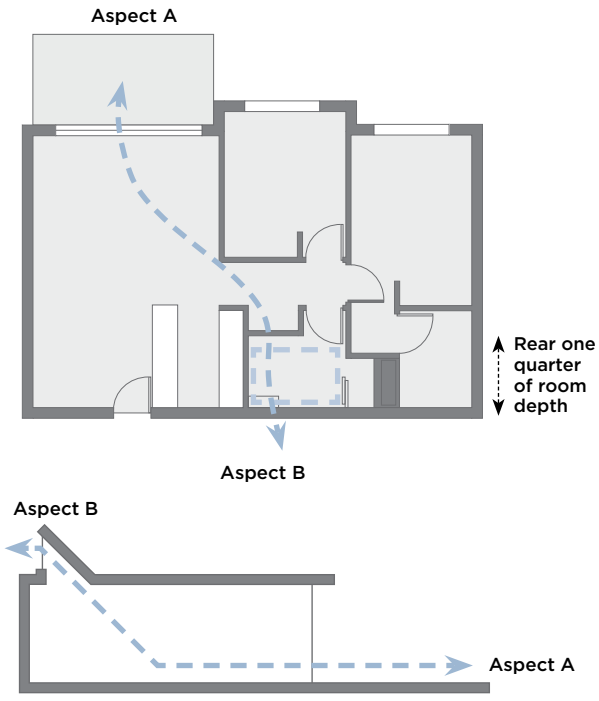
— pass through the primary living space and n-1 bedrooms (where n is the number of bedrooms) and pass through no more than one single doorway

— not pass through any common circulation or communal area other than gallery access.

Indentations, slots and other similar facade treatments do not provide adequate exposure to different wind direction and natural cross-ventilation.

For the purposes of calculating natural cross-ventilation and 225° of wind exposure to the openings, elements projecting less than 600 mm from the facade of the apartment, for example for solar shading, are considered not to be creating an obstruction.

Figure 2.7.3
Accepted clerestory roof-window apartment consistent with the window orientation and wind achieved.



Alternative design responses – natural ventilation and natural cross-ventilation

Where apartment developments are unable to achieve this design guidance due to ambient noise and pollution, consider alternative solutions for:

— sunlight and daylight access

— private open space and balconies

— natural cross-ventilation.

An alternative natural ventilation pathway can be applied which allows a smaller area of opening to be acoustically attenuated, with the balance of the 5 per cent EOA to be provided via unattenuated openings. See **Appendix 4.1: Natural ventilation**.

An alternative design response for natural cross-ventilation requires confirming the performance through testing using the verification methods described in **Appendix 4**.

To comply with guidance on designing apartments that will be affected by rail corridors and busy roads see **Part 2.8: Acoustic privacy, noise and pollution**.

Responding to the local climate reduces the need for mechanical ventilation and air conditioning and improves the liveability of an apartment. Operable louvres provide the maximum required effective open areas for natural ventilation in the smallest frame size. Llandaff St by Hill Thalis Architecture, Photo: Ben Guthrie.

2.8 Acoustic privacy, noise and pollution

Acoustic amenity provides residents with a comfortable and healthy environment and helps people to work and study from home. Acoustic amenity and privacy depends on the site context, surrounding uses, building separation, the location of public and private open spaces, and the arrangement of internal spaces in a building.

Properties located near major roads, railway lines and beneath flight paths can be subject to noise and poor air quality. Hostile and noisy environments such as industrial areas, substations or sports stadiums can also affect residential amenity. Careful design solutions can help to improve the quality of life in affected apartments by minimising the impacts of noise and pollution.

Development near rail corridors and busy roads

For guidance on designing apartments that will be affected by rail corridors and busy roads see *Development near Rail Corridors and Busy Roads – Interim Guideline* (DoP 2008). This is cited by *State Environmental Planning Policy (Infrastructure) 2007*.

OBJECTIVES

2.8 **Minimise the impact of noise and pollution on residential amenity by careful site and apartment planning, using appropriate noise shielding or attenuation in design detailing, material selection and construction quality.**

DESIGN GUIDANCE

External noise and pollution

Use appropriate siting to separate the development from noise sources, minimise propagation of noise through the site, and minimise noise reaching habitable rooms and private open spaces. See **Part 1.2: Built form and siting**.

In mixed-use developments, minimise noise transfer from commercial operations into apartments through planning, acoustic mitigation measures, and suitable noise controls such as business operating hours.

Locate noisy activities such as gyms and loading docks away from apartment habitable rooms.

Locate non-residential buildings so they provide an acoustic buffer between noise sources and residential buildings or communal open spaces.

Design window and door openings in habitable rooms so they are oriented perpendicular to a noise source, and shielded by other structures where possible.

Use landscaping to act as a filter for air pollution from traffic where residential uses are adjacent to a busy road.

Use external acoustic treatments such as reducing the extent of flat reflective surfaces, increasing building articulation, or designing vertical projections, balcony soffits and wintergardens to minimise the need for alternative natural ventilation.

For developments near a busy road, obtain a site-specific acoustic and air quality assessment to determine the existing noise and air quality environment and inform potential mitigation strategies.

Where necessary, embed acoustic treatments and controls on structure-borne noise in the building or in caveats for operators of non-residential uses.

Figure 2.8.1
Although barrier buildings can be effective in shielding residential uses from noise sources, take care to avoid reflections and reverberation between buildings.

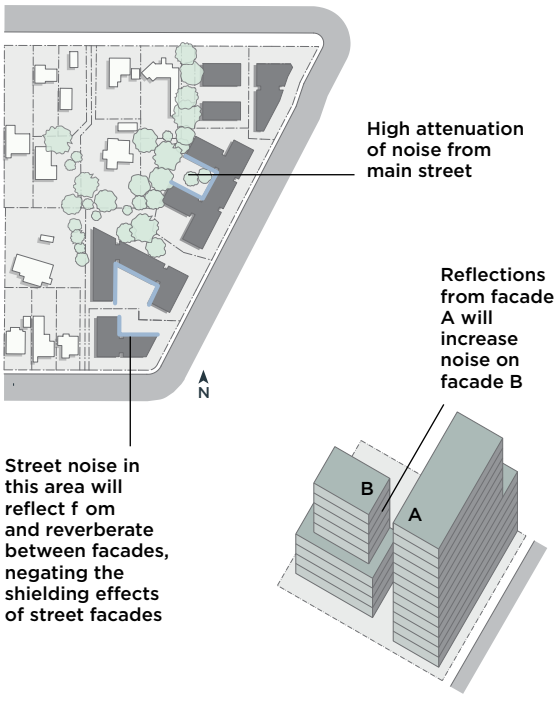
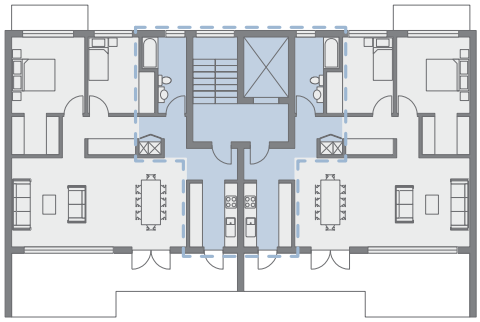


Figure 2.8.2
Configure the building layout to ensure amenity impacts from noise are reduced to both living areas and bedrooms. The plan here locates living spaces away from noisy common circulation.



Internal acoustic separation

Minimise noise impacts from the floors of apartments below, above or next door.

Locate noise sources such as garage doors, driveways, service areas, plant rooms, mechanical equipment, communal open space and circulation areas at least 3 m away from bedrooms.

For all habitable rooms, including where an alternative solution for natural ventilation is necessary, refer to the noise level criteria with windows closed in *Development near Rail Corridors and Busy Roads – Interim Guideline.*

Alternative design responses

For noisy environments where planning is constrained, or other design guidance may need to be compromised to provide acoustic amenity, consider alternative solutions for:

— sunlight access

— natural cross-ventilation.

Apartments that require an alternative natural ventilation solution to meet acoustic amenity requirements may be removed from the total count of apartments used to calculate provision of natural cross-ventilation and sunlight access.

Figure 2.8.3
To achieve consistent acoustic attenuation over floor levels, setbacks are required at each level. Greater setback will result in greater noise reduction.

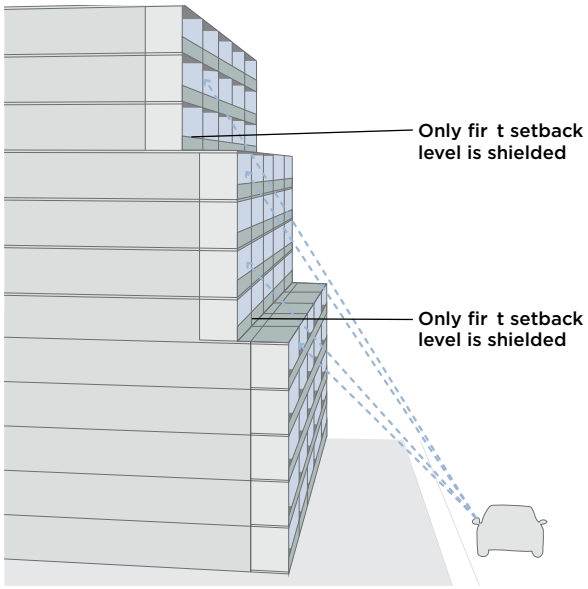
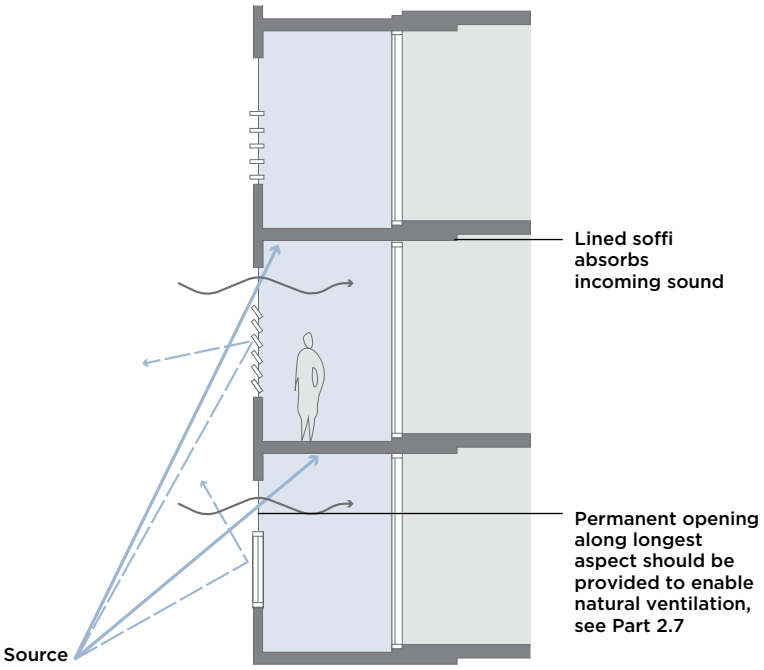


Figure 2.8.4
Enclosing balconies to function as wintergardens is an effective means of reducing road and rail noise.



Wintergardens and other types of protected balconies can be an excellent way to mitigate unpleasant noise and environmental exposure. Central Park by Ateliers Jean Nouvel and PTW, Photo: Brett Boardman.

2.9
Visual amenity

Visual amenity supports residents' quality of life and wellbeing. It balances the important need for outlook with the need for privacy and environmental comfort, including ventilation, sunlight and daylight access.

Visual amenity needs to be considered for both current and future residents, and for occupants of surrounding properties.

A high-quality outlook includes long-distance, middle-distance and shorter distance views of the sky and surrounding environment.

OBJECTIVES

2.9 **Provide privacy to apartments without compromising outlook, access to daylight and natural ventilation, or visual connections to surrounding public realm.**

DESIGN GUIDANCE

Outlook and views

Optimise the quality of outlook for each apartment by thoroughly considering its orientation, configuration and floor-to-ceiling heights to ensure:

— apartments have a view of the outside environment including sky, open space, landscape and elements within or beyond the site

— openness and appropriate outlook is balanced with protection from overlooking, noise, sun and wind.

Soften the visual impact of built form interfaces and use green infrastructure including tree canopy and landscaping to provide a high-quality outlook.

Refer back to the site and context analysis and if public viewpoints were identified as siting considerations, consider them in the detailed building design too.

Building configuration

Locate, orientate and configure buildings to carefully balance the need for outlook with the need for visual privacy between buildings on the site and for neighbouring buildings. See **Part 1.2: Built form and siting**. Design solutions include:

— using site layout and building orientation – such as staggering and angling built form, or increasing setbacks and building separation – to minimise privacy impacts and enable view sharing

— using the general arrangement of the built form to maximise visual separation and increase apartments with different outlook and views

— offsetting and orientating windows and balconies away from the windows and balconies of adjacent buildings and apartments to avoid direct lines of sight

— using recessed balconies or vertical fins between adjacent balconies and private open spaces to provide separation and privacy.

Landscape design within ad equate building separation distances can provide a quality outlook and enable trees to contribute to visual amenity and privacy. 906 Bourke St by Bligh Voller Nield Architecture, Photo: John Gollings

Achieving privacy through design

Maximise the visual amenity that can be achieved by scaling and configuring the development and apartment layouts in response to the adjacent context, topography and activities in spaces where overlooking may occur.

Mediate visual and privacy impacts without compromising the design quality and safety of communal and public spaces by relying on blank walls, high-level windows or fixed screens.

Separate private open space and windows to apartments, particularly the primary windows to habitable rooms, from common circulation areas, communal spaces and public spaces. Design solutions include:

— providing solid or partially solid balustrades to balconies and private open spaces

— raising apartments or private open space above the public space or communal open space, keeping distance above to 1 m or less

— using landscape design including trees and vegetation to separate spaces, and planter boxes incorporated into walls and balustrades to increase visual separation.

— providing operable or fixed screening devices and louvres

— providing bay windows or pop-out windows to provide privacy in one direction and outlook in another

— using pergolas or shading devices to limit overlooking of lower apartments or private open space.

Alternative design responses – visual amenity

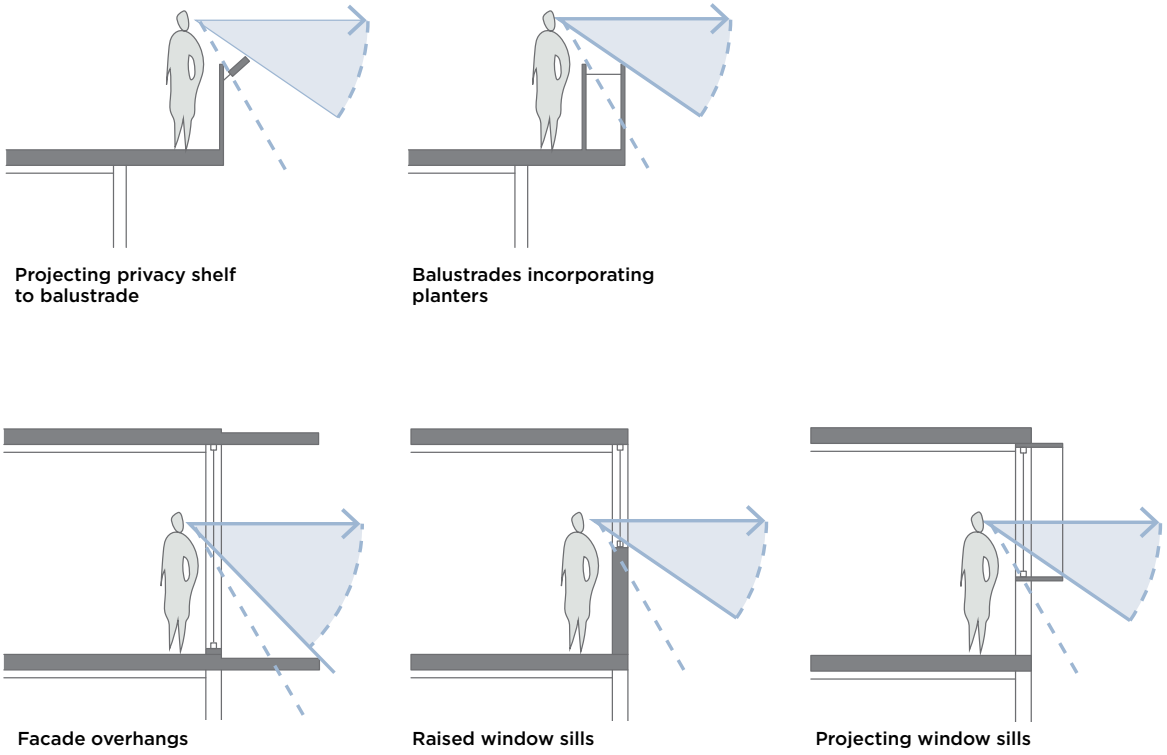
On constrained sites where it can be demonstrated that building layout opportunities are limited, provide fixed louvres or screens to windows or balconies where required to provide privacy. Balance this with the amenity of habitable rooms in apartments, including their:

— sunlight and daylight levels

— natural cross-ventilation

— outlook (where possible), including long-distance and middle-distance views of the sky, surrounding context, communal open space, public space and landscaping.

Figure 2.9.1
Examples of design solutions to control outlook and achieve visual privacy.



Good visual amenity for an apartment combines adequate privacy with a pleasant outlook that includes sky views, middle-distance and shorter distance views. Wellington by Studio Johnston, Photo: Brett Boardman.

2.10 Storage

Adequate storage is an important component of apartment design. It provides residents with suitable spaces to store everyday household items that need to be readily accessible, as well as larger or less frequently used items that households acquire over the longer term and which need to be accessed less frequently.

Storage needs to be provided in proportion to the size of the apartment. Well-located and designed storage means apartment developments can support a diversity of households and their whole-of-life residential needs including families with children, the elderly, and the mobility impaired.

OBJECTIVES

2.10 Provide conveniently located and accessible storage, both within and external to an apartment, to support the whole-of-life needs of the residents.

DESIGN CRITERIA

In addition to storage in kitchens, bathrooms and bedrooms, apartments have the following volume of storage. Any storage in addition to minimum storage volume within apartments can be provided within or external to the apartment.

Table 2.10.1
Minimum storage volumes for apartments in addition to storage in kitchens, bathrooms and bedrooms

DWELLING TYPE	MINIMUM STORAGE VOLUME WITHIN APARTMENTS	TOTAL
Studio apartments	2 m^3	6 m^3
1-bed apartments	3 m^3	8 m^3
2-bed apartments	4 m^3	10 m^3
3+ bed apartments	5 m^3	12 m^3

DESIGN GUIDANCE

Storage schedule

To demonstrate adequate storage has been provided:

— prepare drawings that highlight, dimension and label the volume allocated for internal and external storage for each typical apartment layout

— include a summary table outlining the volume and location of the storage provided for each apartment, as a schedule to a drawing, or as part of the design verification statement.

Storage within apartments

Provide one storage space with the following minimum dimensions:

Table 2.10.2
Minimum dimensions for one internal storage space within each apartment

DWELLING TYPE	MINIMUM VOLUME
Studio apartments	0.6 m deep x 0.9 m wide x 2.4 m high
1-bed apartments	
2-bed apartments	0.6 m deep x 1.2 m wide x 2.4 m high
3+ bed apartments	

Provide a main bedroom wardrobe 0.6 m deep x 1.8 m wide at a minimum. Provide all other bedroom wardrobes at least 0.6 m deep x 1.5 m wide.

Provide storage cupboards and wardrobes that are no less than 2.4 m high and extended to the ceiling or underside of bulkheads where possible.

Make storage accessible from either circulation or living areas.

Where storage is provided on a balcony or other private open space, the volume:

— does not count towards the storage volume provided within an apartment

— is in addition to the minimum size of the balcony or private open space

— is integrated into the building design, screened from view from the street and weatherproof.

Use left-over space such as under stairs for storage, provided is it functional and easily accessible.

For adaptable apartments, consider flexible provision for storage or circulation to accommodate mobility devices including mobility scooters or electric wheelchairs. Provide a charging point for mobility devices.

Storage outside apartments

External to apartments, provide storage that is:

— a minimum height of 2.1 m

— a functional shape and size to suit various needs

— suitable for larger and less frequently used items

— weatherproof, easily and safely accessible, secure and clearly allocated to specific apartments.

Consider providing storage:

— in common areas with lockers or cages

— at the rear or side of car spaces, with the allocated car parking remaining accessible. Only car spaces on the same title as the storage can be traversed to obtain access.

If communal storage rooms are provided, make them accessible from the building's common circulation areas, integrated into the overall building design, and not visible from public space.

Avoid locating storage behind columns or in areas with limited visibility to increase security and safety.

Class A bicycle parking spaces (see **Part 1.6: Parking**) can contribute to minimum storage volumes external to apartments if they are on the title of an individual apartment.

External storage provides space for sporting goods, unused furniture or bicycles, avoiding the need to bring them through common internal circulation to the apartment, and releasing internal area for living space. WBTC by Turner Studio, Photo: Tom Ferguson

Alternative design responses – storage

Where alternative design solutions are being considered under an applicable SEPP, such as policies for affordable rental housing or build-to-rent apartments, the consent authority may be flexible in applying the design guidance for internal storage, and instead consider whether provisions for storage outside apartments (as set out above) will meet the needs of the residents.

Minimum provision for internal storage meets resident needs and makes apartments more liveable. One30 Hyde Park by Bates Smart, Photo: Anson Smart.

2.11
Building articulation

The design of facades contributes greatly to both the visual interest of a building and the character of the local area.

Facades facing the street contribute to the experience of public space, while side and rear facades often influence the amenity of neighbouring buildings and communal and private open spaces. The composition and detailing of a facade is important to the appearance of a building, including its perceived scale.

A well-designed roof provides a positive addition to the character of an area and can form an important part of the skyline. Roofs can also provide opportunities for communal and landscaped space where appropriate, and can add to the sustainability performance of a building (see **Part 3.1: Energy efficie y**).

OBJECTIVES

2.11 Design articulated apartments with services and design features integrated into the overall development.

DESIGN GUIDANCE

Facades

Design the building form, facades and roof holistically, so they are cohesive and well-resolved.

Respond to human scale and proportion as well as the streetscape.

Consider the desired character of the area.

Integrate building services and maintenance infrastructure.

Integrate sustainability features including clerestory windows, ventilation systems, skylights and controls for sunlight access and shade.

Use building articulation, texture, materials, detail, colour and shadow to provide visual interest and reduce the visual bulk of development.

Express building functions to support wayfinding and passive surveillance:

— Clearly define building entries

— Express apartment layout externally.

Select materials which are robust and durable, graffiti-resistant, easy to clean, and appropriate for the environmental conditions and use.

Avoid large areas of painted surfaces such as painted render or concrete, as these can detract from the building's appearance over time.

Consider the potential impact of glare from glazing on adjacent properties.

Detail the building to age well and provide protection from weathering. Design solutions include:

— roof overhangs to protect walls

— hoods over windows and doors to protect openings

— detailing horizontal edges with driplines to avoid surfaces becoming stained

— methods to eliminate or reduce planter box leaching

— appropriate design and material selection for hostile locations.

Roof design

Relate the building facades and roof form to the key datum lines of adjacent buildings by using upper-level setbacks, parapets, cornices, awnings or colonnade heights.

Maximise opportunities for habitable roof spaces for private or communal use, subject to visual, acoustic, comfort, privacy, safety and security considerations.

For apartments located on the top floor or in habitable roof space, consider incorporating operable skylights, or dormer or clerestory windows, to maximise access to daylight, natural ventilation and natural cross-ventilation.

Building articulation such as balconies and deeper window reveals contribute visual interest to a facade. Bourke St Apartments by McGregor Westlake Architecture, Photo: Brett Boardman.

Consider how rooflines will be viewed against the sky and integrate into the overall built form detailing. Newmarket by Smart Design Studio Photo: Martin Siegner.

Integrate roof treatments with the building design:

— design the roof in relation to the overall building size, scale and form

— use roof materials that complement the building

— integrate service elements.

Adaptive re-use

Retaining existing buildings has many benefits, including sustainability, aesthetics, character and valuing their social and cultural significance. Adaptation of an existing building for a new residential use provides for its repurposing and should be approached in a way that acknowledges the past and respects its sense of place.

Non-residential buildings often have dimensions, layouts and orientations that were not designed for residential use. Adapting them requires achieving a balance between the benefits of retaining an existing building and the quality of the residential amenity that can be achieved.

For new additions to existing buildings:

— complement the existing character, siting, scale, proportion, pattern, form and detailing of the existing building

— enhance the sense of place

— be contemporary

— allow for the interpretation and future evolution of the building.

Make additions to heritage items clearly identifiable from the original building, and reversable where appropriate. Provide residential amenity without precluding future adaptive re-use.

Seek opportunities to re-use materials from demolished buildings on site in the proposed new development.

Alternative design responses – adaptive re-use

Some proposals that adapt existing buildings may not be able to achieve all of the design objectives. Consider alternative solutions for the following situations:

— where there are existing higher ceilings, increasing depths of habitable rooms by demonstrating adequate access to natural ventilation, cross-ventilation (when applicable), and sunlight and daylight (see **Sections 2.6: Sunlight, daylight, shade and thermal comfort**, and **2.7: Natural ventilation**)

— providing deep soil where less than the minimum requirement is currently available on the site

— providing building and visual separation by demonstrating alternative design approaches to achieving privacy

— common circulation

— car parking

— private open space and balconies.

Well-designed building facades have an appropriate scale, rhythm and proportion relative to the streetscape. 81 Foveaux by SJB Architects, Photo: Brett Boardman.

Distinguish new building elements from the original. Flour Mill of Summer Hill by Hassell, Photo: Mark Syke.

Well-considered adaptive re-use respects the original building fabric and facade rhythm. Newcastle by Durbach Block Jaggers, Photo: Tom Roe

PART THREE

Environmental considerations

3.1
Energy efficiency

Energy efficie y is a primary factor in making buildings ready for net zero emissions. Net zero readiness requires buildings to have the best possible energy performance, including providing infrastructure to support foreseeable future needs, and avoiding locking in future environmental impacts.

Providing alternative sources of energy, such as solar hot water, photovoltaics for energy generation and batteries for storage, will reduce overall energy consumption.

The guidance in this section supplements the BASIX sustainability requirements applying to the building's thermal performance, potable water use and greenhouse emissions. It also provides further guidance, not covered by BASIX, such as provisions for EV charging, all-electric buildings, and use of other rating systems to promote better design practice.

Design guidance on passive environmental and energy-efficient design for managing thermal comfort is provided in **Sections 2.4: Apartment configu ation**, **2.6: Sunlight, daylight, shade and thermal comfort**, and **2.7: Natural ventilation.**

OBJECTIVES

3.1.1 Use low-carbon, low-emission systems, construction processes and materials to deliver energy-efficient apartment developments, where possible.

3.1.2 Maximise environmentally sustainable energy consumption and facilitate energy production, where practical.

DESIGN GUIDANCE

Low-carbon low-emission materials and processes

Select sustainable materials, landscaping, building systems and construction methods to minimise embodied greenhouse gas emissions, construction waste, and maintenance costs.

Preference use of local, robust, durable and easy-to-maintain materials with low embodied energy and low environmental impact over their life cycle.

All-electric building

Preference electricity as the power source for all energy requirements associated with normal operations.

Consider induction cooktops to reduce overheating of apartments, cooling loads and air pollutants.

Locate heat pumps in a central location to reduce urban heat-island effects.

Rooftop solar

Provide maximum solar energy generation on roof space that is not allocated to common open space or roof gardens, to reduce ongoing energy costs for residents and the body corporate.

On low-rise, large-footprint buildings, rooftop solar panels should be provided for each apartment, directly connected to provide power behind the meter.

In all other buildings, rooftop solar collection should be connected to the distribution board that supplies common services and be sized to maximise energy contribution to common services while avoiding the need for export.

Integration of green roofs with solar panels has been demonstrated to increase the efficiency of power generation by reducing roof temperatures.

For guidance on roof design see **Part 2.2: Communal spaces** and **Part 2.11: Building articulation.**

Electric vehicles

Planning for residential buildings to allow future overnight charging of EVs will accommodate anticipated market growth in this area and can also leverage the diversity of load in apartment buildings, eliminating the need to augment onsite electricity infrastructure.

Make provision for EV-ready connection for each car parking space allocated to residents.

Provide EV distribution boards of sufficient size and quantity in each storey of the car park to allow connection for EVs, complete with a charging control system and connection to the main switchboard.

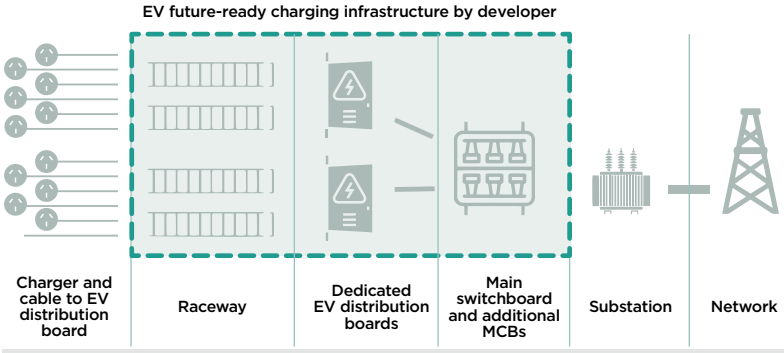
Make provision for cable trays to support the future installation of 32A single-phase final subcircuits for each EV car parking space and allow space for this when designing for other services.

Locate EV distribution boards so any future EV charger will require a cable of no more than 50 m from the parking bay to the EV-ready connection.

Provide a shared EV connection for all car share spaces.

Where EV-ready provision is made for visitor parking, a minimum of 7 kW AC EV chargers should be installed (see **Part 1.6: Parking**).

Figure 3.1.1
Essential EV charging infrastructure for a net zero ready building.



Power requirement for a residential EV charger through to the electricity network

Integrating rooftop solar collection with a green roof significantly improves performance.

3.2
Water

Continued water security for a growing population and a changing climate requires an integrated approach to urban water management. A fit- or-purpose approach to water use in new residential developments can provide a valuable non-infrastructure contribution to water security.

Best practice considers water measures at all stages of the project and maximises the collection, retention and re-use of water available on the site. Rainwater collected from the roof is suitable for non-human-contact uses in apartments, common areas and building services. Stormwater collected on the site is best suited to landscape and infiltration. Stormwater flows off the site can be reduced through passive detention and maximising deep soil areas.

Water-sensitive urban design is the integrated management of water in urban areas. It takes into account all of the elements of the urban water cycle including potable (drinking-quality) water, rainwater, wastewater, stormwater and groundwater.

BASIX ensures all new dwellings are designed to minimise potable water use and reduce greenhouse gas emissions. To support the BASIX requirements, a number of planning and design considerations are relevant to apartment developments.

OBJECTIVES

3.2.1 Minimise use of potable water and use alternative water sources for non-potable uses, where possible.

3.2.2 Incorporate sustainable water management systems for water storage, retention, and stormwater to minimise impacts on receiving waters.

3.2.3 Integrate flood managemen systems and water-sensitive urban design into site design.

Water-sensitive features effectively filter and re-use stormwater on site, and can be attractive landscape elements. Marrickville by Tonkin Zulaikha Greer, Photo: Murray Fredericks.

DESIGN GUIDANCE

Rainwater re-use

Maximise recovery and re-use of rainwater by collecting, storing and re-using rainwater on site.

Connect rainwater to all non-human-contact uses (third pipe or purple pipe), including toilets and washing machines. Laundry tubs should be connected to potable water.

Size rainwater tanks to intercept a 10 per cent annual exceedance probability (AEP) 6-hour storm and to allow full use of all rainwater collected in this event.

Provide for top-up of rainwater storage from the water mains.

In metropolitan areas, enable the top-up of rainwater to be switched to recycled water infrastructure with minimum cost and disruption.

Stormwater discharge

Minimise stormwater discharge from the site.

Use passive onsite retention to maximise recharge of soil and groundwater wherever soils are suitable.

Employ water-sensitive urban design systems including rain gardens designed by suitably qualified professionals.

Size passive retention to intercept a 10 per cent AEP 6-hour storm.

Maximise use of porous and open paving materials on the ground, particularly with minor pathways over deep soil.

Locate detention tanks under paved areas, driveways or in basement car parks.

Design open spaces to provide temporary onsite detention basins.

Consider grey or black water treatment to generate additional water suitable for non-human-contact uses; this is particularly suited to larger and mixed-use development.

Figure 3.2.1
Onsite water management using fit-for-purpose principles.

1. Down pipes
2. Rainwater tank
3. Laundry/toilet flushing
4. First flush diversion valve
5. First flush roof water (15 mm)
6. Pavement run-off
7. Biosink/wetland filter system irrigation
8. Overflow from courtyard detention
9. Infiltration to water table
10. Detention tank
11. Water table
12. Municipal stormwater system
13. Future connection to the municipal water recycling for rainwater tank top-up

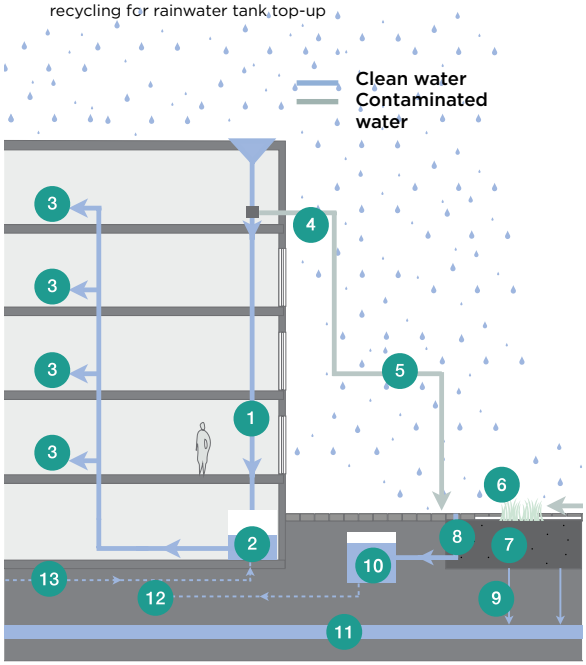
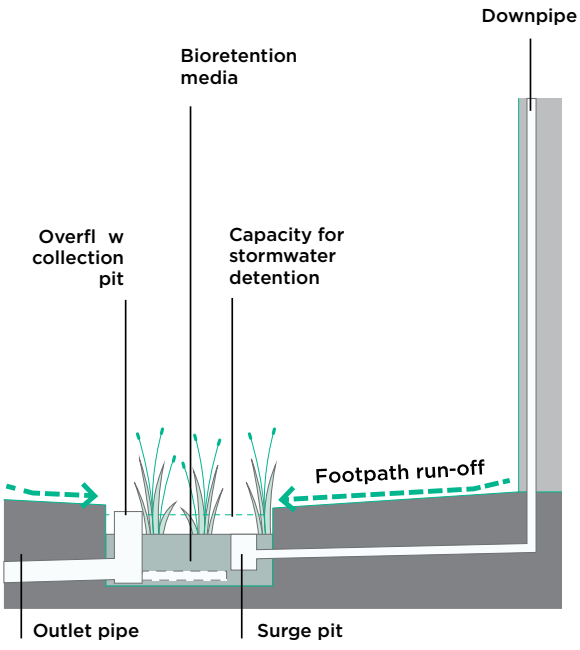


Figure 3.2.2
A rain garden improves water quality by using plants to treat roof and surface water run-off.



3.3 Waste

Effectively managing the collection, storage and removal of waste is an important function in an apartment development.

Waste management is relevant throughout the life cycle of a development, and is best considered early in the design process. Integrating waste management infrastructure into a development, and effectively managing apartments' domestic waste, contributes to residents' and neighbours' visual and physical amenity and limits potentially harmful environmental impacts.

Well-designed infrastructure for safe and convenient collection and storage can help to minimise waste by promoting best practice management, including separation of waste streams for recycling.

The *Better practice guide for resource recovery in residential developments* (NSW EPA 2019) provides good practice guidelines for waste management.

OBJECTIVES

3.3.1 Minimise waste storage impacts on the streetscape, building entries and amenity of residents.

3.3.2 Minimise occupants' waste to landfill by providing safe and convenient onsite organic and inorganic waste and recycling facilities.

Well-designed, easily accessed waste and recycling rooms improve the collection and management of household waste.

DESIGN GUIDANCE

Waste collection

Encourage waste separation at the source, ideally in the kitchen, by providing a dedicated waste storage area within each apartment to accommodate 2 days' worth of waste, recycling and organics.

Integrate waste management infrastructure to facilitate separation of waste, recycling and organics at the point of disposal – for large buildings, on each residential level.

Prepare an operational waste management plan for residents (and other occupants in mixed-use developments) addressing waste collection, separation and storage, including locations of collection points, bin cart routes and equipment such as chutes.

For safety, limit direct resident access to any areas that house chute systems and compactors.

Integrate all waste management facilities and collection infrastructure within the built form of the development to improve amenity for residents and the neighbourhood.

Waste storage

In mixed-use developments, separate residential waste infrastructure from commercial waste infrastructure to facilitate secure management.

Allocate communal space for residents to temporarily store unwanted bulky items such as furniture, appliances and mattresses awaiting disposal through council's clean-up service, or to be available for re-use by other residents.

Locate communal waste and recycling storage rooms in convenient and accessible locations for each vertical circulation core.

For onsite waste storage facilities, provide:

— hot and cold water

— drainage connected to the sewer

— self-closing, sealed and outward-opening dual doors

— automated lighting

— mechanical ventilation

— waterproofing.

Where applicable, allow for vehicle access (as required by Australian Standards) on site for local council or contracted waste collection service vehicles.

Locate collection infrastructure for council waste collection services wholly within the development's basement and within close proximity to the onsite loading dock to permit unobstructed access for collection contractors.

Figure 3.3.1
Waste chutes for separate waste streams can offer spatial efficiencies in larger apartment buildings and provide for convenient collection and disposal of waste and recycling. Diverter systems offer further efficiencies and can be arranged with multiple compaction systems within the waste collection room. Providing a dedicated waste room on each floor can help to minimise impact on the amenity of adjacent apartments. Ensure universal access is considered.

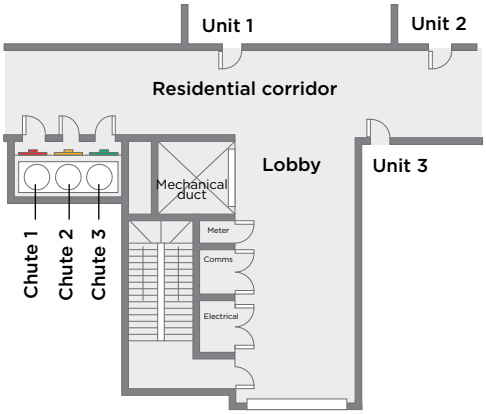
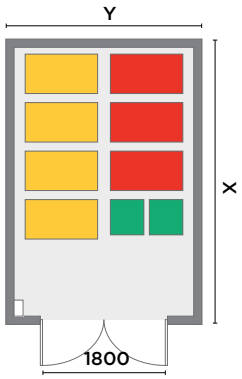


Figure 3.3.2
Integrated waste rooms for separated steams offer considerable space savings compared to manual bin storage.

Figure 3.3.3
Waste collection room bin infrastructure for each waste stream: residual, recycling, organics.



3.4 Materials and maintenance

Careful design and sustainable use and selection of materials can minimise carbon footprint and operational emissions and reduce the long-term maintenance obligations of apartment development.

In addition, effective ongoing maintenance can ensure the longevity and viability of buildings and green infrastructure, sustaining the value of the property and reducing the life-cycle cost to owners.

The BASIX Materials Index requires applicants to specify materials to be used in a building's construction and calculate embodied emissions.

OBJECTIVES

3.4.1 Incorporate protection from weathering and ease of access for maintenance in the detail design of the building.

3.4.2 Select materials that reduce ongoing running and maintenance cost as well as environmental impacts of construction, maintenance, and operation.

Roof overhangs, hoods and drip lines protect walls from the elements (rain, sun and wind) reducing maintenance costs. Illume Little Bay by MAKO, Photo: Brett Boardman.

Preference materials that are long-lasting and will weather well over time, such as brickwork, tiles and glass, in preference to materials with applied finishes like paint that will require ongoing maintenance. Short Lane by Woods Bagot, Photo: Trevor Mein.

DESIGN GUIDANCE

Building maintenance

Integrate service and maintenance access for all building elements and landscaped areas into the design of the building, for aesthetic reasons and ease of ongoing maintenance.

Provide for centralised maintenance, services and storage for communal open spaces.

Detail and construct building and landscape components to protect from weathering and daily wear (see **Part 2.11: Building articulation**).

Preference manually operated systems over mechanical systems for fittings and fixtures such as blinds, sunshades and curtains.

Where possible, enable windows and glass balustrades to be cleaned from the inside of the building.

Avoid needing external scaffolding for maintenance access. Consider permanent mountings for access systems where they are required for regular maintenance, particularly at roof level and for planting on structures, to minimise safety risks.

Provide wall-mounted rather than soffit-mounted lighting on balconies to facilitate safe servicing by residents.

See **Appendix 7: Maintenance schedules**.

Design building layouts to provide easy access for maintenance and inspection of services and plant equipment. Surry by Candalepas Associates, Photo: Brett Boardman.

Landscape maintenance

Use planting schemes that consider long-term viability and ongoing maintenance.

Identify areas highly vulnerable to water loss, and nominate measures to address survival of planting through periods of drought.

Consider species' life span and their replacement schedule.

Consider plants at mature size and potential future maintenance requirements, e.g. pruning.

Provide irrigation appropriate for the site conditions and seasons to ensure the ongoing health of planting.

See **Appendix 7: Maintenance schedules**.

Environmental performance of materials

Choose colours that are light-fast and suitable for exterior use.

Preference light-coloured materials to reduce heat absorption. Consider reflectivity and whether this needs to be mitigated to reduce impact on surroundings.

To improve environmental performance, consider using:

— engineered wood products in place of concrete or steel

— industrial waste products or geopolymer cement in place of Portland cement

— structural steel with a high recycled content.

Maximise the retention of existing buildings, structures, materials and landscaping where possible.

Where possible reduce construction waste by:

— using prefabricated components and designing for offsite construction

— using standardised systems and components.

APPENDIX 1

APPLICATION REQUIREMENTS

Design verification statement — template

This template can be used as a guide to help design teams prepare a design verification statement. Under the Environmental Planning and Assessment Regulation 2000, this statement is required to be submitted to the consent authority as part of a development application for a residential apartment building.

DEVELOPMENT PROJECT:	
Project address:	
Applicant's name and contact details:	
Architect's name and contact details:	
Registration no.	

I confirm that I was responsible for designing the development, and that the development is consistent with the relevant principles of *State Environmental Planning Policy (Design and Place) 2021* (DP SEPP) and the objectives of the *Apartment Design Guide* (ADG).

Signature of architect

Non-discretionary development standards: design consistency

Following is a summary of the 3 non-discretionary development standards in the DP SEPP that apply to the development.

The table below describes how the proposed development meets the non-discretionary development standards or, where they are not met, how the proposed development balances this with other design objectives and provides the best possible design response.

Evidence is either provided in this table, or a reference is provided to explain where the evidence can be found. The evidence could be an image, drawing, table or report.

CAR PARKING — DRAFT ADG PART 1.6

NON-DISCRETIONARY DEVELOPMENT STANDARD	DESIGN RESPONSE
For apartments in the following locations: — on sites that are within 800 m of a railway station or light rail stop in the Sydney Metropolitan Area, or — on land zoned, and sites within 400 m of land zoned B3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre* the minimum car parking requirement for residents and visitors is set out in the *Guide to Traffic Generating Developments*, or the car parking requirement prescribed by the relevant local council, whichever is lower.	*The nominated regional centres are Albury, Ballina, Batemans Bay, Bathurst, Bega, Bowral, Cessnock, Charlestown, Coffs Harbour, Dapto, Dubbo, Glendale–Cardiff, Gosford, Goulburn, Grafton, Lismore, Maitland, Morisset, Newcastle, Nowra, Orange, Port Macquarie, Queanbeyan, Raymond Terrace, Shellharbour, Tamworth, Taree, Tuggerah–Wyong, Tweed Heads, Wagga Wagga, Warrawong and Wollongong.

APARTMENT SIZE — DRAFT ADG REFER PART 2.4

NON-DISCRETIONARY DEVELOPMENT STANDARD	DESIGN RESPONSE
The internal area for each apartment is equal to, or greater than, the following minimum internal areas:	

MINIMUM INTERNAL AREA (INCLUDES ONE BATHROOM)	
Studio	35 m^2
1 bedroom	50 m^2
2 bedroom	70 m^2
3+ bedroom	90 m^2

CEILING HEIGHTS — DRAFT ADG PART 2.4

NON-DISCRETIONARY DEVELOPMENT STANDARD	DESIGN RESPONSE
The ceiling heights for the building must be equal to, or greater than the following:	

MINIMUM CEILING HEIGHTS FOR APARTMENTS AND MIXED-USE BUILDINGS	
Habitable rooms	2.7 m
Non-habitable rooms and kitchens	2.4 m
2-storey apartments	2.7 m for floor containing main living area 2.4 m for second floor, where its area does not exceed 50% of the apartment area
Attic spaces	1.8 m at edge of room with a 30° minimum ceiling slope
Ground floor non-residential uses	3.3 m

Apartment Design Guide objectives: design responses

The table below describes how the proposed development satisfies the ADG objectives – by following the ADG design guidance or by using alternative solutions – and how the proposed development balances all the ADG objectives to provide the best possible design response.

Evidence is either provided in this table, or a reference is provided to explain where the evidence can be found. The evidence could be an image, drawing, table or report.

DP SEPP PRINCIPLE 1:

Deliver beauty and amenity to create a sense of belonging for people

Considerations:
— Overall design quality
— Comfortable, inclusive and healthy places

ADG OBJECTIVES	
2.1 COMMON CIRCULATION	**DESIGN RESPONSE**
2.1 Maximise the amenity of common circulation areas and provide services for maximum building occupancy to create socially inclusive, secure, and safe circulation spaces.	
2.2 COMMUNAL SPACES	**DESIGN RESPONSE**
2.2.1 Provide suitably sized and thoughtfully located communal open spaces that provide opportunities for plentiful landscaping and enhanced amenity.	
2.3 APARTMENT MIX AND CONFIGURATION	**DESIGN RESPONSE**
2.3 Provide a range of apartment types, sizes, mix and configuration to promote flexible housing that caters for current and projected housing needs of the community.	
2.5 PRIVATE OUTDOOR SPACE AND BALCONIES	**DESIGN RESPONSE**
2.5.1 Locate appropriately sized private open space to optimise internal amenity, outlook, and privacy, and providing opportunities for gardening, clothes drying, outdoor entertaining and passive surveillance of common and public areas. . 2.5.2 Design and detail private open space and balconies that contribute to the overall architectural form and detail of the building.	
2.8 NOISE AND ACOUSTIC PRIVACY	**DESIGN RESPONSE**
2.8 Minimise the impact of noise and pollution on residential amenity by careful site and apartment planning, using appropriate noise shielding or attenuation in design detailing, material selection and construction quality.	
2.11 BUILDING ARTICULATION	**DESIGN RESPONSE**
2.11 Design articulated apartments with services and design features integrated into the overall development.	

DP SEPP PRINCIPLE 2:

Deliver inviting public spaces and enhanced public life to create engaged communities

Considerations:
— Culture, character and heritage
— Public space for public life

ADG OBJECTIVES	
1.1 SITE AND CONTEXT ANALYSIS	**DESIGN RESPONSE**
1.1 Base design decisions on comprehensive site analysis, strategic planning priorities and the site's contextual opportunities and constraints.	
1.2 BUILT FORM AND SITING	**DESIGN RESPONSE**
1.2.1 The built form responds to the historic, cultural, and planning context, streetscape and open spaces with appropriate building height, bulk, setbacks, and separation. 1.2.2 Minimise built form impact on neighbouring sites and properties, limit overshadowing in winter, and protect the privacy of adjacent properties.	
1.3 SITE ACCESS AND ADDRESS	**DESIGN RESPONSE**
1.3.2 Entries are clear, visible, safe, and accessible, and contribute to the life and activity of the street. .	
1.4 RELATIONSHIP TO THE STREET	**DESIGN RESPONSE**
1.4.1 Provide building and landscape interfaces with the street that deliver safe, secure, and high amenity building entries and ground floor apartments. 1.4.3 Integrate awnings and signage into the built form to provide orientation and wayfinding.	
2.9 VISUAL AMENITY	**DESIGN RESPONSE**
2.9 Provide privacy to apartments without compromising outlook, access to daylight and natural ventilation, or visual connections to surrounding public realm.	

DP SEPP PRINCIPLE 3:

Promote productive and connected places to enable communities to thrive

Considerations:
— Vibrant and affordable neighbourhoods
— Sustainable transport and walkability

ADG OBJECTIVES	
1.3 SITE ACCESS AND ADDRESS	**DESIGN RESPONSE**
1.3.1 Any pedestrian link should prioritise walking and cycling and provide access to streets and connection to local destinations.	
1.4 RELATIONSHIP TO THE STREET	**DESIGN RESPONSE**
1.4.2 Maximise street activation and passive surveillance of the public realm through appropriate active street frontages or ground floor apartments.	
1.6 PARKING	**DESIGN RESPONSE**
1.6.1 Minimise car parking and provide access to alternative transport facilities such as car sharing and cycling, where appropriate. 1.6.2 Support cycling for transport with bicycle parking. 1.6.4 Minimise conflicts between pedestrians and vehicle access to the site and create high-quality streetscapes.	
2.2 COMMUNAL SPACES	**DESIGN RESPONSE**
2.2.2 Provide safe and resilient communal spaces that support a range of activities and contribute to the wellbeing of residents.	
2.3 APARTMENT MIX AND CONFIGURATION	**DESIGN RESPONSE**
2.3. Provide a range of apartment types, sizes, mix and configuration to promote flexible housing that caters for current and projected housing needs of the community.	

DP SEPP PRINCIPLE 4:

Deliver sustainable and greener places to ensure the wellbeing of people and the environment

Considerations:
— Green infrastructure
— Resource efficiency and emissions reduction

ADG OBJECTIVES	
1.5 GREEN INFRASTRUCTURE	**DESIGN RESPONSE**
1.5 Provide and retain sustainable landscaping, planting, and trees, including planting on structures and in deep, connected soil.	
3.1 ENERGY EFFICIENCY	**DESIGN RESPONSE**
3.1.1 Use low-carbon, low-emission systems, construction processes and materials to deliver energy-efficient apartment developments, where possible.	
3.1.2 Maximise environmentally sustainable energy consumption and facilitate energy production, where practical.	
3.3 WASTE	**DESIGN RESPONSE**
3.3.1 Minimise waste storage impacts on the streetscape, building entries and amenity of residents. 3.3.2 Minimise occupants' waste to landfill by providing safe and convenient onsite organic and inorganic waste and recycling facilities.	

DP SEPP PRINCIPLE 5:

Deliver resilient, diverse places for enduring communities.

Considerations:
— Resilience and adaptation to change
— Optimised and diverse land use.

ADG OBJECTIVES	
2.6 SUNLIGHT, DAYLIGHT, SHADE AND THERMAL COMFORT	**DESIGN RESPONSE**
2.6.1 Maximise the number of apartments that receive sunlight to living rooms and private open spaces, and have high-quality daylight access, especially where sunlight is limited. 2.6.2 Use passive environmental design strategies to optimise heat storage in winter and reduce heat transfer in summer, utilising low thermal transmittance construction, shading devices, and balconies.	
2.7 NATURAL VENTILATION	**DESIGN RESPONSE**
2.7 Provide natural ventilation to all habitable rooms and maximise apartments with natural cross-ventilation to optimise indoor air quality and thermal comfort and reduce reliance on mechanical ventilation.	
2.10 STORAGE	**DESIGN RESPONSE**
2.10 Provide conveniently located and accessible storage, both within and external to an apartment, to support the whole-of-life needs of the residents.	
3.2 WATER	**DESIGN RESPONSE**
3.2.1 Minimise use of potable water and use alternative water sources for non-potable uses, where possible. 3.2.2 Incorporate sustainable water management systems for water storage, retention, and stormwater to minimise impacts on receiving waters. 3.2.3 Integrate flood management systems and water-sensitive urban design into site design.	
3.4 MATERIALS AND MAINTENANCE	**DESIGN RESPONSE**
3.4.1 Incorporate protection from weathering and ease of access for maintenance in the detail design of the building. 3.4.2 Select materials that reduce ongoing running and maintenance cost as well as environmental impacts of construction, maintenance, and operation.	

APPENDIX 2

SITE AND CONTEXT ANALYSIS

A2.1
Site and context analysis

Site and context analysis

Outlined below is a 3-step site and context analysis process, relevant to a specific site.

Step 1: Gather

To gain an understanding of place, including what makes it unique, special, or suitable for change, carefully consider the approach to gathering, layering and interpreting relevant site and contextual information.

The best way to capture the site and context information to inform the design process is to spatialise the data across 3 scales: catchment, neighbourhood and site.

Figure A2.1.1 Examples of site analysis diagrams

Site analysis - Catchment

Site analysis - Neighbourhood

Site analysis - Site

Step 2: Synthesise

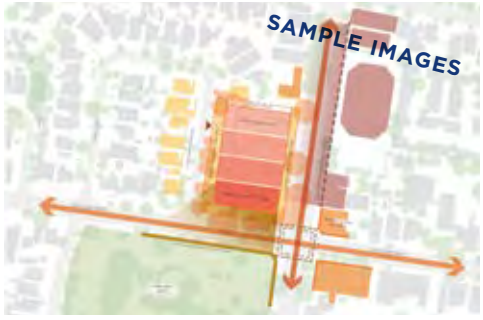
Gaining a holistic understanding of a place involves a process of synthesising information. It extends beyond compiling a description of physical elements and site conditions to focus on identifying the opportunities and constraints that will shape a place-specific design response.

Depending on the complexity and sensitivity of the site and its context, the process of analysis and synthesis will benefit from collaboration with a range of technical consultants to flesh out the key design strategies that will fundamentally influence the project. At a minimum, a qualified landscape architect should be a core member of the design team from the outset. Other key consultants might include environmental and contamination specialists, hydrologists, geotechnical engineers, planners or heritage and interpretation experts.

The findings of the synthesis phase should be unique to the site and reflect the nature and scale of development being proposed, but not so specific that alternative approaches are ruled out too early. The potential of the site and its setting should remain fluid for as long as possible, providing scope for the design testing phase (see below).

Figure A2.1.2
Examples of opportunities and constraints diagrams

Site analysis – Constraints



Site analysis – Opportunities

Step 3: Interpret

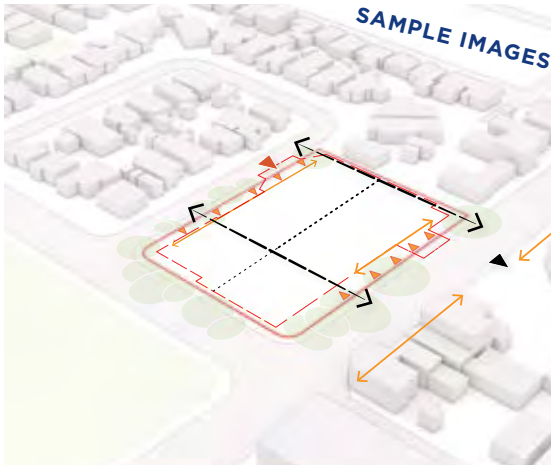
Once a site's unique characteristics and place qualities have been identified and spatially represented, the next step is interpretation of the data to identify the key design strategies that will lead to an optimal outcome.

The design strategies are the bridge between the analysis of the site data and the proposed design. The process of interpretation balances understanding of the place with the needs of the development, including considering proposed land uses, service requirements, active frontages, internal amenity and needs of future residents.

Figure A2.1.3 Examples of design drivers or strategies

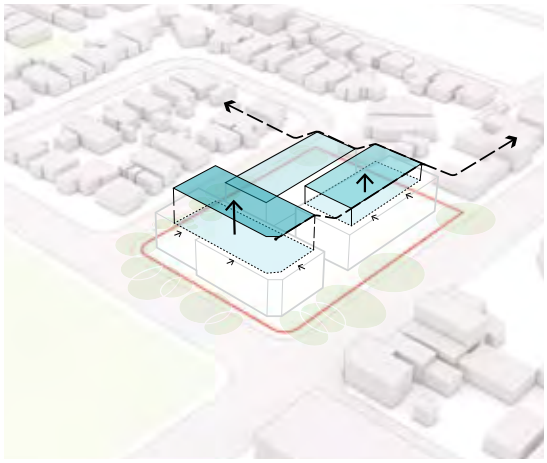
Driver 1 – retain trees and provide additional setbacks

Driver 2 – limit vehicular access and prioritise pedestrian movement



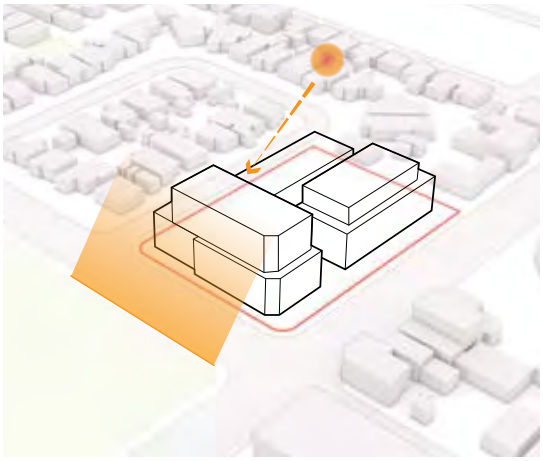
Driver 3 – scale of built form responds to local context, use, grain and setbacks

Driver 4 – focus height to south and transition to the north and west



Driver 5 – provide additional landscaping and internal amenity

Driver 6 – preserve solar access to the public space in all cases



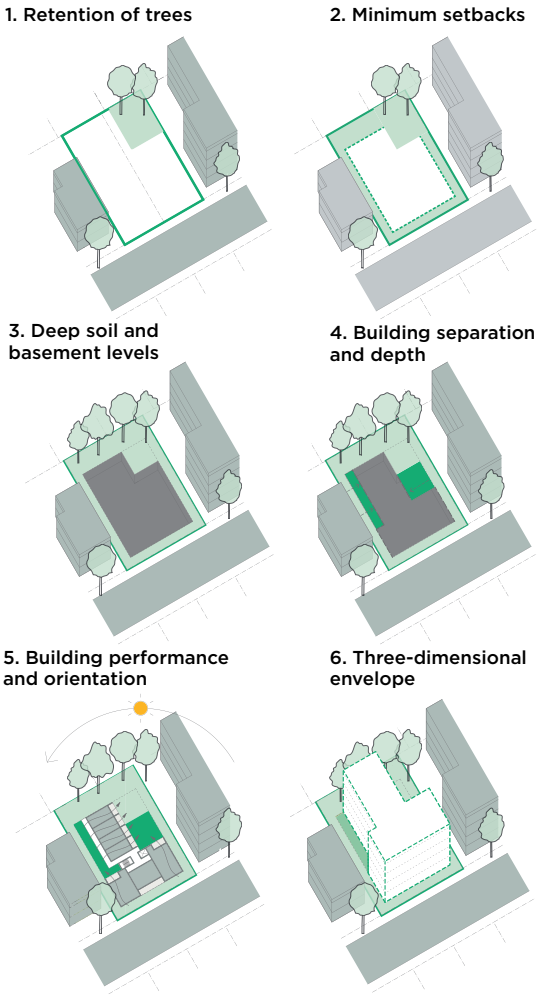
Design testing

Once the key design strategies have been identified through the process of site analysis, undertake a process of design testing, in which various options are interrogated against findings from the site analysis.

The design solutions which emanate from the design strategies may be further developed from a detailed understanding of strategic planning documents and by exploring the application of particular typologies (see **Appendix 8** for examples). The goal is to select a building type that marries a response to the unique qualities of the place with the client's objectives. The choice of building type may yield similar development outcomes but result in very different impacts and contributions.

The design team can continue to test the suitability of the design response by understanding the extent to which it makes a positive contribution to the place, both within and external to the site. This testing and exploration is critical to arriving at an optimal solution, and to illustrate the rationale for a specific design approach.

Figure A2.1.4
Key considerations when testing development controls and establishing a three-dimensional building envelope



Documenting the design process

Capture the design process – the process of progressing the project from the site analysis, to design solutions, through design testing and refinement, to the selection of a preferred approach – in the design verification statement. The statement is a required deliverable as part of the design documentation for an apartment building planning application under the Environmental Planning and Assessment Regulation 2000. It is critical to inform understanding of the rationale and decision-making process behind a proposed design outcome.

The statement should include diagrams, photos, sketches and written content explaining how the design of the proposed development has been generated from the site and context analysis, and is therefore responding to place. Without duplicating other required reports:

- include any key advice from technical consultants that has shaped the response
- include the various design responses considered
- illustrate how the selected design solution maximises the opportunities of the site and contributes positively to the site's context.

The design verification statement should clearly and concisely summarise the process in a way that allows the assessor and stakeholders to track how the site and place-specific considerations are reflected in the design. The statement becomes a useful tool to communicate the design process, either as part of a design review process, or in a formal discussion with council before submitting a development application.

A2.2
Site and context analysis checklist

DOCUMENTATION	REQUIRED INFORMATION	PROVIDED	
		YES (✓)	NO (✗)
COUNTRY The approach to connecting with Country, as appropriate for the scale and significance of the project. For a smaller scale project this might involve recognition of the Traditional Custodians, and for larger projects this might expand to engagement with Traditional Custodians, knowledge-holders, local Aboriginal land councils (LALCs), or other representative organisations nominated by the community.	What were the site attributes before 1788?		
	Who are the Traditional Custodians of the land where the site is located?		
	What is the Aboriginal history within the area of the site?		
	How will you acknowledge the past and living cultural heritage of the place?		
SITE LOCATION AND WIDER LOCAL CONTEXT Broad map or aerial photograph showing the development site location in relation to its wider surrounding context, including centres, shops, community facilities and transport. Plans and sections showing the site in relation to existing features of the wider context, including adjoining properties and the other side of the street, and including retail and commercial areas, community facilities and transport services. This includes but is not limited to:	Pattern of buildings, proposed building envelopes, setbacks, and subdivision pattern		
	Land use and building typologies of adjacent and opposite buildings in the street		
	Movement and access for vehicles, servicing, pedestrians and cyclists		
	Topography, landscape, open space and vegetation		
	Significant views to and from the site		
	Significant noise sources in the vicinity of the site, particularly vehicular traffic, train, aircraft and industrial noise		
SITE SURVEYS AND PLANS, INCLUDING ADJOINING CONTEXT Plans, sections, and written material as appropriate, showing existing site features and including properties that are adjoining and on the other side of the street. Information may include but is not limited to:	Boundaries, site dimensions, site area, north point		
	Topography, showing relative levels and contours at 0.5-m intervals for the site, and across site boundaries where level changes exist, and including any unique natural features such as rock outcrops or watercourses, existing cut or fill, and adjacent streets and sites		
	For major trees on the site, as well as street trees and adjacent property trees close to the shared boundaries, identify species, location, height, diameter and relative levels (RLs) at base of trunk		
	Location and use of existing buildings or built features on the site		
	Location and important characteristics of adjacent public space, communal space and private open space		
	Location and height of existing windows, balconies, walls and fences on adjacent properties facing the site, as well as parapet and ridge lines		
	Pedestrian and vehicular access points, driveways, and features such as service poles, bus stops, fire hydrants etc.		
	Location of utility services, including easements and drainage		
	Location of any other relevant features		
SITE AND CONTEXT ANALYSIS:			
BUILT FORM AND LAND USE Plans, photographs and other relevant material that synthesises and interprets information about the site and its context, documenting opportunities and constraints that generate design parameters, in relation to the following:	Overall height (storeys, metres) of existing built form, planned future heights, important parapet and other datum lines, awnings, colonnades and other building elements – for existing buildings on the site and adjacent buildings		
	Pattern of buildings, proposed building envelopes, setbacks and subdivision pattern – including era of development		
	Relationship to and interface with adjacent properties		
	Land use and building typologies of adjacent and opposite buildings		
	Location and use of existing buildings or built features on the site		
	Location and height of existing windows, balconies, walls, parapets, roof lines and fences on adjacent properties facing the site		
	Patterns of building frontages including street setbacks and side setbacks, presentation to the street, active street frontages		
	Public space interfaces and connections, permeability, safety		
	Proposed building entries		
	Proposed building footprint location		
	Proposed car park footprint and depth		
	Proposed communal open space and public open space		

DOCUMENTATION	REQUIRED INFORMATION	PROVIDED	
		YES (✓)	NO (✕)
MICROCLIMATE	Orientation and aspect		
	Wind tunnels and downdraft (especially in areas with multiple towers)		
	Overshadowing of the site and adjoining properties by neighbouring structures (excluding vegetation), showing the winter sun path between 9 am and 3 pm on 21 June		
	Contribution of shading elements, and impacts arising from their removal (e.g. mature trees)		
	Spaces (internal and external) relying on existing direct sunlight (e.g. living rooms, primary outdoor spaces, swimming pools), including seasonal variations		
	Prevailing winds		
	Average maximum and minimum temperatures, and urban heat mapping		
	Other microclimate indicators such as natural ventilation for the site and immediate neighbours		
LANDSCAPE, TREES AND PLANTING	Landform and topography, including natural features		
	Landscape, vegetation and open space		
	Landscape character, including significant views to and from the site		
	Geotechnical characteristics of the site and suitability for the proposed development		
	Topography, showing relative levels and contours at 0-5 m intervals for the site, and across site boundaries where level changes exist, including any unique features such as rock outcrops, watercourses, and existing cut or fill		
	Soil zones		
	Details of trees on the site and adjacent properties, including street trees. Include species, species type (e.g. endemic) location, maturity, size, height, canopy coverage, health, including an arborist report on the health of significant trees		
	Bushfire risk and asset protection zones – ideally sourced via a centralised point		
	Erosion zones		
WATER	Catchment area		
	Overland flow, stormwater, drainage infrastructure		
	Waterway health		
	Flood risk		
	Coastal erosion		
BIODIVERSITY	Endemic and threatened species of native plants and animals in the area		
	Biodiversity surveys and mapping (sourced from local council GIS resources)		
	Existing and potential habitat zones and corridors		
OPEN SPACE AND GREEN INFRASTRUCTURE	Location, quantity and important characteristics of adjacent public, communal, and private open space		
	Proximity and access to local, district and regional open space		
	Quality, diversity and usability		
	Local streetscape quality and characteristics, including verges, setbacks and landscape		
	Green infrastructure networks and connections, and active transport networks		
HISTORY, CULTURE AND HERITAGE	Significant social and cultural attributes, assets and places		
	Heritage items		
	Conservation areas		
	Transition zones (curtilage around heritage items)		
	Character and materiality		
OTHER	Technical advice from specialists involved in the development process including community engagement consultants, urban planners and designers, transport planners, landscape architects, arborists, air quality specialists, geotechnical engineers, contamination specialists where applicable		

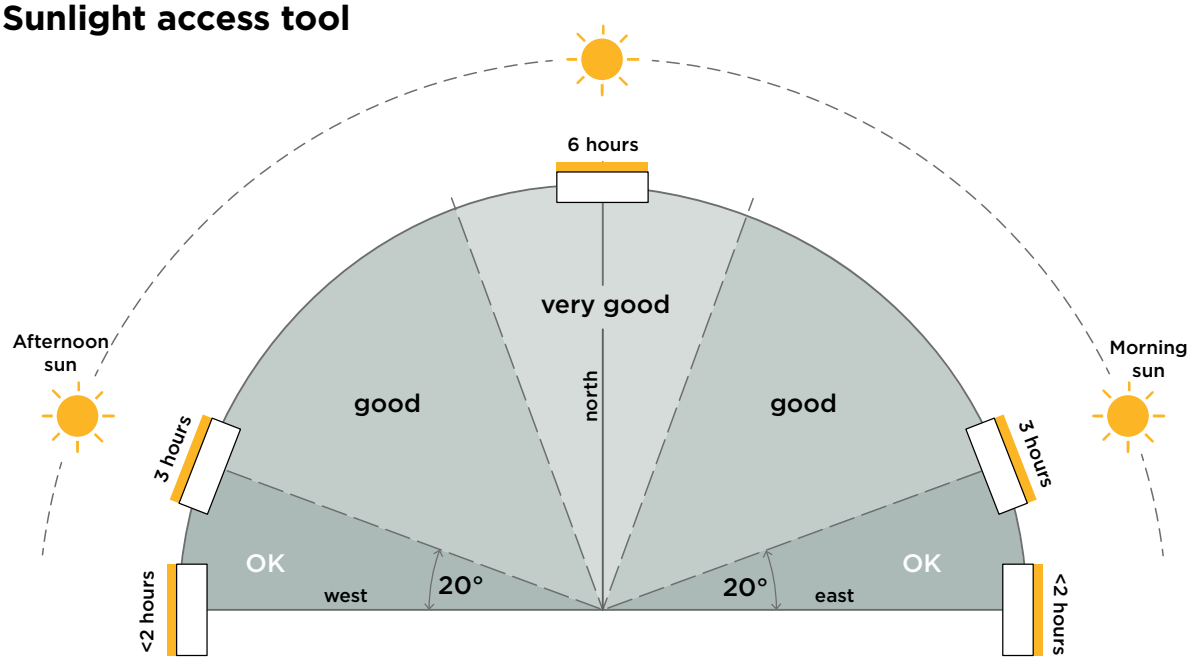
APPENDIX 3

SUNLIGHT ACCESS ANALYSIS TOOL

Appendix 3.1 Solar access analysis tool

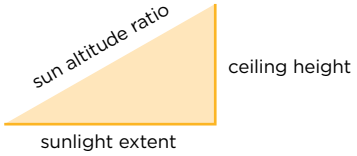
To achieve 2 hours of direct sunlight in midwinter, a good test is to check whether the sun can 'see' the living room window and private open space between 11 am and 1 pm in plan view.

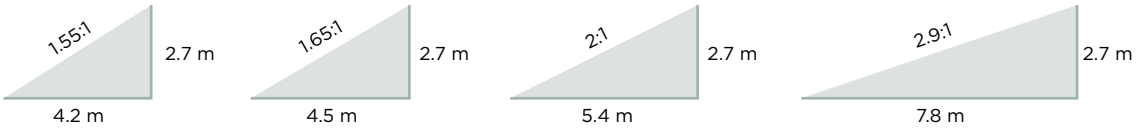
Sunlight access tool



Sun altitude ratios

The ratios below can be used to determine how far sunlight extends into apartments at a given time of day, accoring to the ratios indicated on the sunlight access tool above.





Appendix 3.2 Demonstrating good solar shading

Seasonal performance of shading

A project can demonstrate seasonal shading performance by testing each hour that the sun would reach an otherwise unshaded facade for the entire summer period.

For fully glazed facades, this involves demonstrating that external solar shading will block more than 70 per cent of direct sun that would otherwise reach the glazing over the summer period.

The percentage of direct sun required to be blocked by shading can be reduced proportionally from 70 per cent for a fully glazed facade to 0 per cent for a facade with only 30 per cent glazing.

The percentage shading required can be derived from the graph (**Figure A 3.2.1**) or determined by the formula (glazed percentage minus 30 per cent). For example, a facade with 50 per cent glazing will require 20 per cent of that glazing to be shaded: 50% (glazed percentage) – 30% = 20%.

Figure A3.2.1:
Seasonal shading requirement

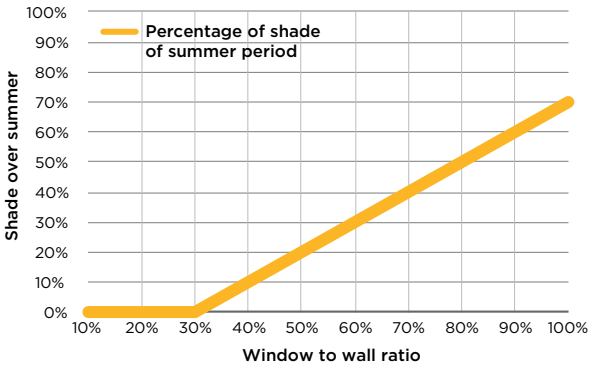
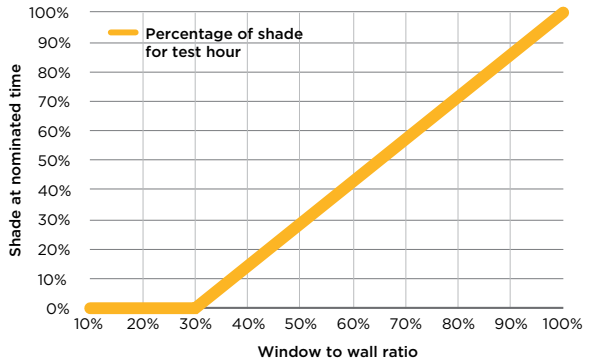


Figure A3.2.2:
Single-hour shading requirement



Single-hour test

A project can demonstrate shading with a single-hour test using shadows cast onto an elevation or from a sun's eye view at the nominated time.

The percentage of shading required at the nominated test hour can be reduced proportionally from 70 per cent for a fully glazed facade to 0 per cent for a facade with only 30 per cent glazing.

The percentage shading required at the test hour can be derived from the graph (**Figure A 3.2.2**) or determined by the formula (glazed percentage minus 30 x 1.42). For example, a facade with 50 per cent glazing will require 28.4 per cent of that glazing to be shaded: 50% (glazed percentage) – 30% x 1.42 = 28.4%.

Figure A3.2.3:
Times of year for single-hour shadow test

ORIENTATION OF GLAZING	DAY	HOUR
N	Jan 24	1:15 pm
NNW	Jan 14	4:45 pm
NW	Dec 10	4:20 pm
WNW	Dec 22	6:00 pm
W	Dec 22	6:00 pm
WSW	Feb 25	4:45 pm
SW	Jan 22	4:45 pm
SSW	—	—
S	—	—
SSE	—	—
SE	Jan 22	9:30 am
ESE	Feb 25	9:35 am
E	Dec 22	7:45 am
ENE	Dec 22	7:45 am
NE	Dec 10	9:15 am
NNE	Jan 14	9:25 am

Submission requirements – sunlight access

Provide a plan indicating which apartments achieve the required hours of direct sunlight access, along with a schedule showing overall percentages, and one of the following:

— view from sun diagrams at midwinter between 9 am and 3 pm with apartment numbers shown on the building facade, or

— elevations with shadows at midwinter between 9 am and 3 pm with apartment numbers shown on the building facade.

Provide shadow diagrams (midwinter, equinox and midsummer) to demonstrate the potential impact of development on neighbouring properties.

Detailed analysis of the proposed overshadowing impact on neighbouring properties may need to be demonstrated. Where requested by the consent authority, prepare one of the following sets of diagrams to demonstrate compliance with the design criteria:

— sunlight hour diagrams which illustrate the hours of direct solar access achieved between 9 am and 3 pm at midwinter on the impacted facade of a neighbouring building

— view from sun diagrams between 9 am and 3 pm in midwinter with a supporting table outlining the hours of direct sunlight access achieved by apartments within the affected neighbouring property under the existing and proposed settings.

APPENDIX 4

ALTERNATIVE DESIGN RESPONSES

FOR NATURAL VENTILATION AND CROSS-VENTILATION

Appendix 4.1
Natural ventilation

Minimum performance requirements

Provide a system of natural ventilation for each apartment that delivers an average hourly volume flow rate equivalent to the greater of the following criteria:

— 10 litres/second/person (where the number of persons is equal to the number of bedrooms in the apartment +1), or
— 0.3 litres/second/m^2 of floor area of the apartment

for:

— 85 per cent of all hours in the year for cross-through and cross-over apartments, or
— 90 per cent of all hours in the year for all other apartments.

For this calculation, the definitions of cross-through and cross-over apartments are consistent with the definitions set out in the ADG glossary. Applying the definitions is limited to apartments where the total area of openings proposed for natural ventilation is evenly distributed across at least 2 opposite facades with differences in orientation of 180° ± 35°.

Provide effective natural ventilation for each habitable room and ensure the distribution of ventilation between different rooms is proportional to reasonable expectations about the use and occupation of each room.

For apartments affected by noise: providing additional unattenuated openings

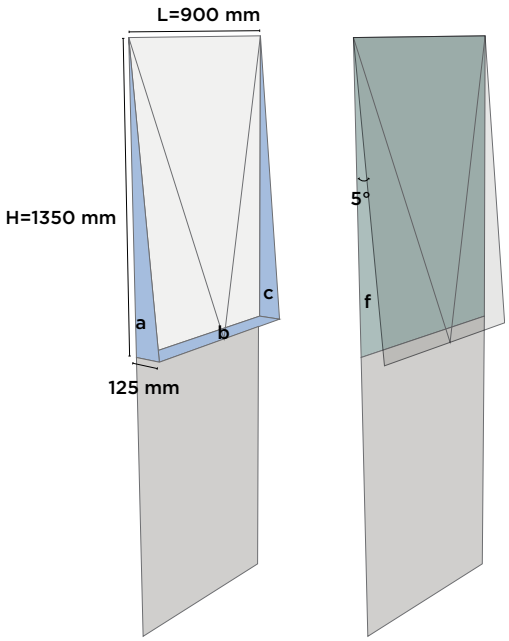
To comply with guidance on designing apartments that will be affected by rail corridors and busy roads (see **Part 2.8: Acoustic privacy, noise and pollution**), an alternative natural ventilation pathway can be applied which allows a smaller area of opening to be acoustically attenuated, with the balance of the 5 per cent EOA to be provided via unattenuated openings.

Provide additional unattenuated openings for each habitable room by determining the difference between the size of the attenuated natural ventilation system proposed and the EOA corresponding to 5 per cent of the floor area, as set out in **Part 2.7: Natural ventilation**.

The alternative pathway provides for natural ventilation. It does not offer an alternative means of providing natural cross-ventilation.

Calculation of window EOA

Figure A4.1.1:
Glazing example demonstrating losses for fly screens for windows with restricted openings



1. Geometric open area (GOA) = a + b + c
2. Loss due to resistance to airflow (f) = Table A4.1
3. Equivalent openable area (EOA) = GOA – (f*GOA)

Example for EOA calculation:
GOA = 0.084 + 0.112 + 0.084 = 0.28 m^2
f = 17%
EOA = 0.28 – (0.28*0.17) = 0.232 m^2

Table A4.1:

WINDOW OPENING ANGLE	LOSS DUE TO RESISTANCE TO AIRFLOW (F)		
	L/H<0.5	0.5<L/H<1	L/H>1
<7.5°	30%	17%	5%
7.5° – < 12.5°	45%	20%	15%
12.5° – < 20°	50%	52%	35%
20° – < 45°	55%	55%	40%
45°+	55%	55%	55%
Sliding doors or windows		50%	

Alternative natural ventilation pathway – assessment requirements

To satisfy the minimum performance requirements, testing and reporting needs to demonstrate hourly natural ventilation over a full year. Dynamic thermal simulation is suitable for hourly natural ventilation modelling and is required where the alternative proposal includes single-aspect apartments or buoyancy-driven natural ventilation.

Where the alternative proposal does not include single-aspect apartments, thermal chimneys or other devices relying on stack effect, wind tunnel testing may be used as an alternative to demonstrate the minimum performance requirements have been met.

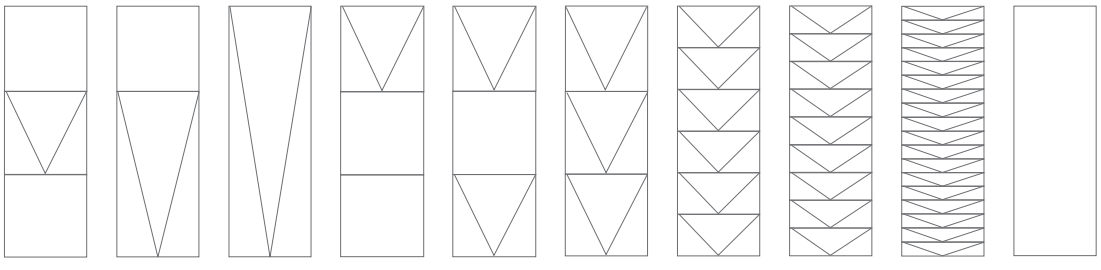
Requirements for natural ventilation modelling

- Each unique apartment design is discretely tested, and testing demonstrates each habitable room meets the minimum performance requirements.
- Apartment buildings with a similar plan but a difference in height of more than 6 storeys are considered unique. Where multiple floors are represented by a similar plan, the lowest floor apartment is used in the modelling.
- Arrangement and features of apartments modelled or tested are consistent with the architectural drawings.
- The calculations must factor in the loss in 'equivalent open area' and aerodynamic performance characteristics of any attenuated ventilation device's air path, including louvres, grilles, control dampers, insect screens and similar components.
- Performance is calculated by predicting average hourly airflow rates each hour of the year, i.e. 24 hours x 365 days.

Figure A4.2: Glazing examples demonstrating EOA losses due to fly screens for windows with restricted openings

	AWNING 1	AWNING 2	AWNING 3	AWNING 4	AWNING 5	AWNING 6	AWNING 7	AWNING 8	OPERABLE LOUVRES	DOOR TO BALCONY
Window assembly	1 x restricted 900 mm sash	1 x restricted 1800 mm sash	1 x restricted 2700 mm sash	1 x unrestricted 900 mm sash	1 x restricted 900mm sash + 1 x unrestricted 900 mm sash	2 x restricted 900mm sash + 1 x unrestricted 900 mm sash	6 x restricted 450 mm sash	9 x restricted 300 mm sash	18 x restricted 150 mm louvres	1 x unrestricted 900 mm opening
Total geometric open area (m^2)	0.225	0.337	0.450	0.540	0.765	0.99	1.014	1.350	1.944	2.43
Area of flyscreen (m^2)	0.81	1.62	0.2.43	0.81	1.62	2.43	2.43	2.43	2.43	2.43
Loss from flyscreen	19%	24%	24%	47%	39%	34%	24%	34%	45%	50%
Equivalent openable area (m^2)	**0.183**	**0.257**	**0.344**	**0.285**	**0.468**	**0.651**	**0.768**	**0.891**	**1.069**	**1.215**
Size of room that window + flyscreen can provide natural ventilation (m^2)	**3.66**	**5.14**	**6.88**	**5.7**	**9.36**	**13.02**	**15.36**	**17.82**	**21.384**	**24.3**

Notes
Restricted openings are limited to 125 mm.
Unrestricted openings are assumed to 300 mm openings. Larger opening distances will be more effective.
Flyscreens are estimated with 50% loss over area of flatscreen.



Awning 1 | Awning 2 | Awning 3 | Awning 4 | Awning 5 | Awning 6 | Awning 7 | Awning 8 | Operable louvres | Door to balcony

— All neighbouring buildings are assumed to be the full height and massing allowed by the planning controls, even if currently built at less than that full potential.
— Additional point-of-time testing is required using either computational fluid dynamic (CFD) or wind tunnel testing where alternative natural ventilation systems proposed incorporate a device to enhance performance that is not able to be supported with manufacturer performance data relevant to a natural ventilation context.
— Natural ventilation openings that comprise the alternative proposal are assumed to be open at all times and all other openings are assumed closed.

For dynamic thermal simulation

— Multi-zone airflow modelling using dynamic thermal simulation software is used to verify the performance of the alternative proposal.
— Annual weather data suitable to the location and with typical wind conditions is used.
— Wind is modelled using city terrain type for velocity profile modification.
— Local shelter for openings is nominated in accordance with the proposed planning and proximity of neighbouring buildings.
— Specific facade pressure coefficients may be determined using wind tunnel or CFD testing which more accurately accounts for the surrounding features (buildings, streets, topography).

For wind tunnel testing

— Quantitative testing is performed in a boundary layer wind tunnel capable of simulating the atmospheric boundary layer and appropriate profiles.
— Physical modelling of the proposed development is done at an adequate scale, and appropriate levels of the surrounding natural and built environment for at least a 300-m radius around the proposed development site are taken into account.
— Measurements are taken at each unique apartment in locations representative of the alternative proposal's openings.
— Measurements are taken for at least 16 wind directions.
— 10 years of reliable continuous wind climate data from Sydney Airport (corrected for the local terrain conditions at the airport anemometer and corrected again for the local site conditions) is required.

Where CFD modelling is used to supplement dynamic thermal simulation or wind tunnel testing

— Solver and meshing are appropriate to the scale of testing.
— Measurements are taken at each unique apartment in locations representative of the alternative proposal's openings.
— Measurements are taken for at least 16 wind directions.
— Extent of modelled domain includes all relevant context.

Minimum level of reporting

For reports submitted using the alternative natural ventilation pathway to support an application, show the percentage of annual hours that are predicted to meet or exceed the minimum performance requirements. Also show the annual distribution of predicted average hourly ventilation rates to demonstrate the full year has been tested.

Commission a suitably qualified or experienced person to prepare the report, and include in the report a full list of assumptions that affect the prediction of performance, including but not limited to:

— modelling methods used including any details of any simulation tools used
— schedule of compliance with the relevant assessment requirements listed above
— all inputs, assumptions and outputs used in the testing that are relevant to predicted results
— manufacturers' published performance criteria relied upon for any equipment selection.

Also include in the report:

— consistent naming of openings, plenums, chimneys or stacks and other system constituents between drawings and reports
— a summary schedule of EOA requirements for each component of the alternative proposal
— design of plenums, chimneys, stacks and other system constituents, detailed to a sufficient level that confirms they are:
  — adequately sized
  — coordinated with the planning
  — providing all necessary allowances for components and parts
  — providing adequate access for cleaning and maintenance.

Appendix 4.2 Natural cross-ventilation

Alternative solutions for providing natural cross-ventilation can be considered to provide adequate natural cross-ventilation if they are tested and shown to provide a level of natural cross-ventilation equivalent to that prescribed by the design guidance.

Minimum performance requirements

Acceptable alternative apartment layouts providing natural cross-ventilation provide ventilation rates at least 7 times greater than a single-aspect apartment in the same location, due to 2 or more openings on separate facade aspects being exposed to a wide range of wind directions.

The improvement in ventilation rates is measured over a year and is demonstrated by testing the first quartile of average air changes through the apartment per hour over a typical year for alternative and reference apartments.

Reference single-aspect apartment

Test a reference single-aspect apartment for each alternative apartment layout to provide a context-relevant baseline of ventilation performance.

Use a reference single-aspect apartment orientated with the same facade aspect as the longest facade of the proposed alternative apartment layout, and in the same location as the alternative apartment on plan and in section.

The reference single-aspect apartment must have natural ventilation that meets the natural ventilation design guidance.

Verification requirements

To demonstrate the minimum performance requirements have been met, test and report on hourly natural ventilation rates over a full year.

Calculate wind and resulting facade pressure coefficients for the full range of wind directions. Requirements for calculating facade pressure coefficients are as follows:

For wind tunnel testing

- Quantitative testing is performed in a boundary layer wind tunnel capable of simulating the atmospheric boundary layer and appropriate profiles.
- Measurements are taken for each alternative apartment type in locations representative of the alternative apartment's ventilation openings.
- Measurements are taken for at least 16 wind directions.

For CFD modelling

- Solver and meshing are appropriate to the scale of testing.
- Measurements are taken for at least 16 wind directions.
- Extent of modelled domain includes the entire building and sufficient domain external to the building to ensure the wind flow is adequately developed.

Requirements for calculating resulting ventilation rates

- A typical wind year is used that has increments no larger than 1 hour and is representative of the annual distribution of coincident average hourly wind speed and direction.
- No thermal effects are considered in the calculation of natural cross-ventilation.
- Wind-driven ventilation is calculated as average ventilation rate through the apartment assuming windows are open to the full extent proposed.

Minimum level of reporting

In reports submitted using verification requirements to support an application, show the comparative wind-driven ventilation performance of the alternative apartment and the reference single-aspect apartment for the first quartile of average hourly ventilation over the year. Also include a comparison of the annual distribution of predicted average hourly ventilation.

Commission a suitably qualified or experienced person to prepare the report, and include a full list of assumptions that affect the prediction of performance, including but not limited to:

- modelling methods used including any details of any simulation tools used
- a schedule of compliance with the relevant assessment requirements listed above
- all inputs, assumptions and outputs used in the testing that are relevant to predicted results.

Also include in the report a summary schedule of EOA requirements for each opening in the alternative proposal.

Figure A4.2.1: Decision tree

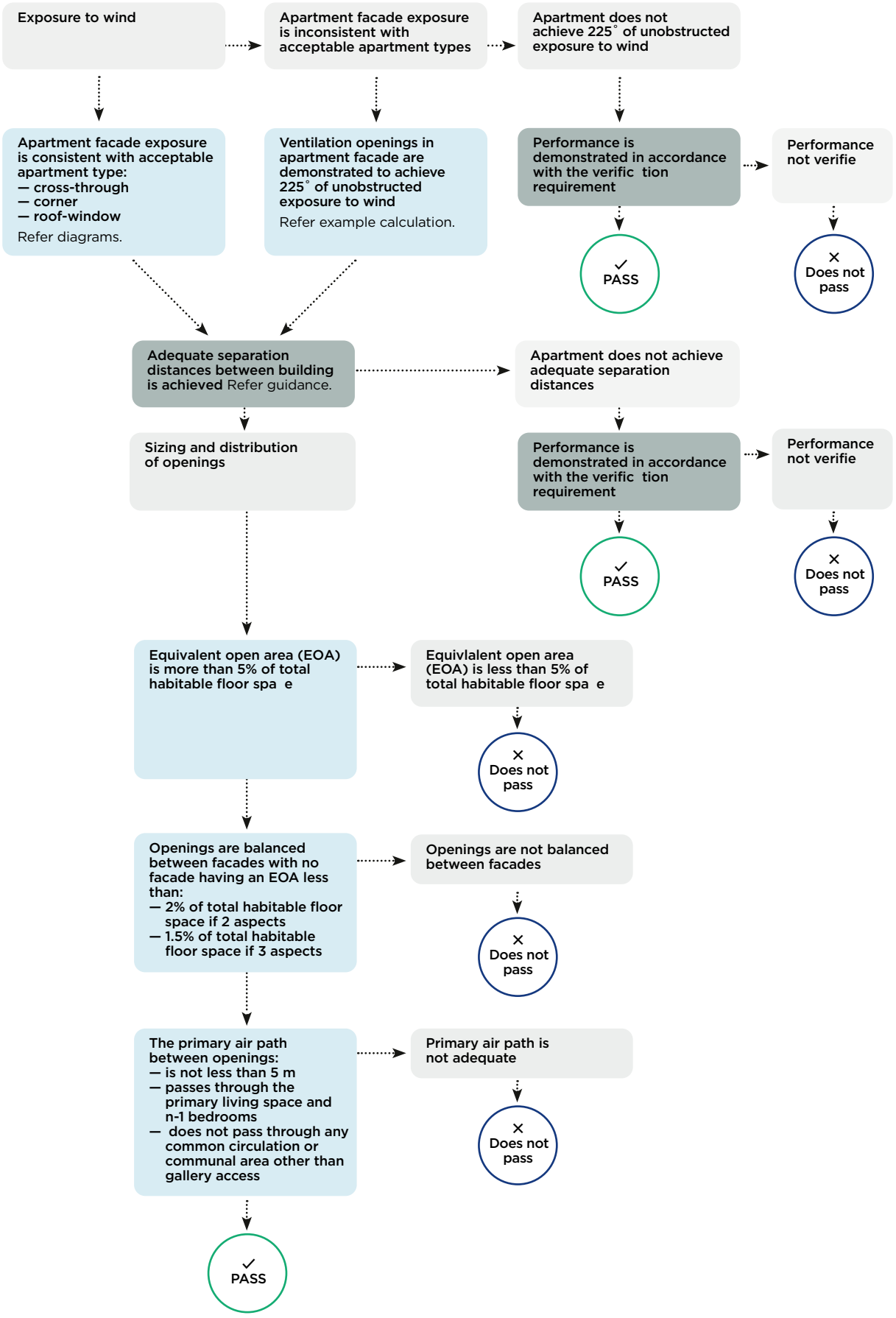
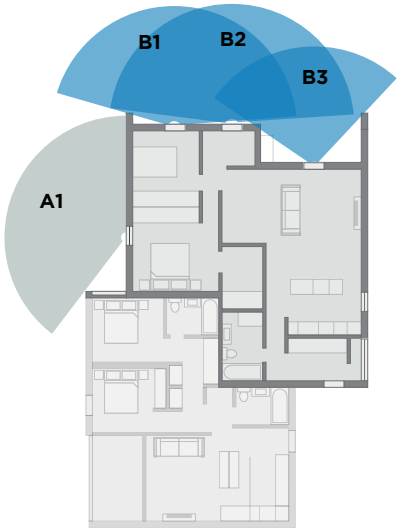
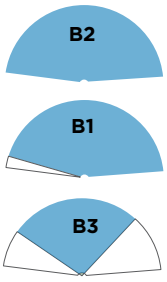


Figure A4.2.2: 225 degrees of unobstructed exposure to wind – how to use this tool

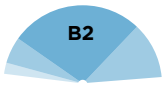
1.
Evaluate angle between obstructions for all windows on the facade aspects providing natural cross-ventilation



1b.
Columns, shading elements less than 600mm deep and similar can be ignored

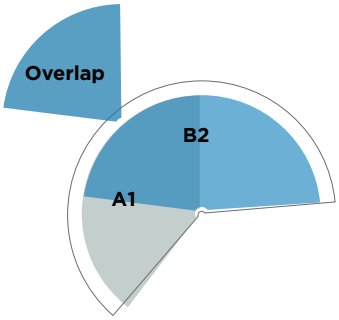


1c.
Consider total exposure for each contributing aspect by overlaying the angles



B1 and B3 provide no additional exposure to wind than B2 on this aspect of the apartment and are therefore excluded

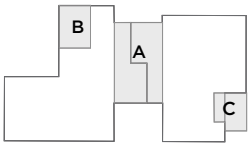
2.
Add the angles that are unique to each window or facade and deduct any overlap



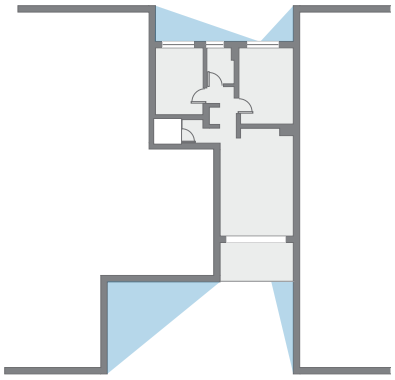
Total unobstructed wind exposure A1 + B2 - overlap = 225 degrees or greater

Figure A4.2.3 Examples of when to apply the 225-degree unobstructed wind exposure tests

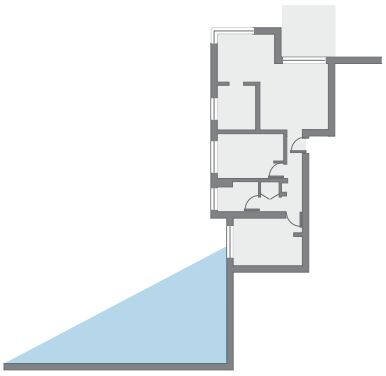
Plan – Scenario A, B, C



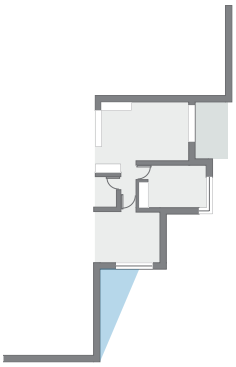
A
Dual aspect apartment is deeply set back and has limited line of sight exposure to wind



B
Corner apartment where line of sight to wind is blocked by deep return in building plan



C
Dual-aspect apartment is not on the outermost corner so the line of sight to wind is blocked by immediate stepping of form

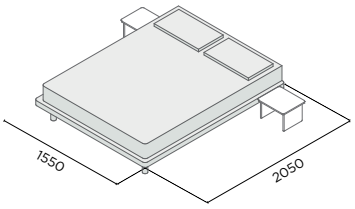


APPENDIX 5

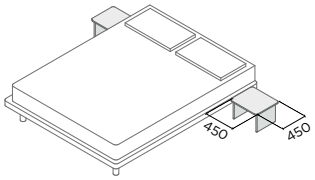
FURNITURE SCHEDULE

Appendix 5.1 General furniture schedule

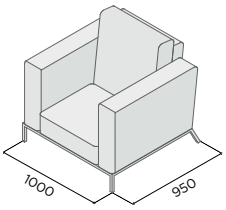
ROOM TYPE	APARTMENT TYPE	MINIMUM FURNITURE	DEPTH (M)	WIDTH (M)	HEIGHT (M)
Main bedroom	All dwellings	Queen-size bed	2.05	1.55	n/a
		Wardrobe	0.60	1.80	2.4
		2 x bedside tables	0.45	0.45	n/a
Second bedrooms	All dwellings	Queen-size bed	2.05	1.55	n/a
		Wardrobe	0.60	1.50	2.4
		2 x bedside tables	0.45	0.45	n/a
Living room	Studio	2-seater lounge	0.95	1.80	
		Coffee table	0.50	0.90	
		Coffee table round	0.60		
	1 bedroom	2-seater lounge	0.95	1.80	
		Coffee table	0.50	0.90	
		Coffee table round	0.60		
		Armchair	0.95	1.00	
		Entertainment unit	0.45	1.20	
	2 bedrooms	3-seater lounge	0.95	2.40	
		Coffee table	0.50	0.90	
		Coffee table round	0.60		
		Armchair	0.95	1.00	
		Entertainment unit	0.45	1.20	
	3 bedrooms	3-seater lounge	0.95	2.40	
		Coffee table	0.50	0.90	
		Coffee table round	0.60		
		2 x armchair	0.95	1.00	
		Entertainment unit	0.45	1.20	
	4+ bedrooms	3-seater lounge	0.95	2.40	
		2-seater lounge	0.95	1.80	
		Coffee table	0.5	0.90	
		Coffee table round	0.60		
		Armchair	0.95	1.00	
		Entertainment unit	0.45	1.20	



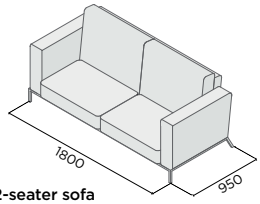
Queen-size bed



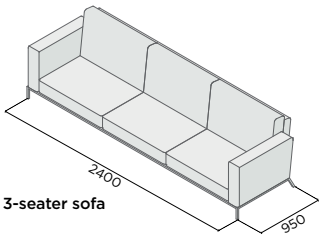
2 bedside tables



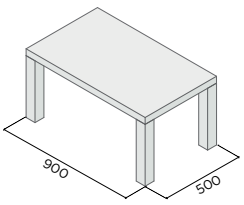
Arm chair



2-seater sofa



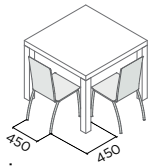
3-seater sofa



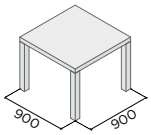
Coffee table

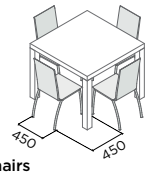
Entertainment unit

ROOM TYPE	APARTMENT TYPE	MINIMUM FURNITURE	DEPTH (M)	WIDTH (M)	HEIGHT (M)
Dining	Studio	Dining table square	0.75	0.75	
		Dining table round	0.80		
		2 chairs			
	1 bedroom	Dining table	0.90	0.90	
		Dining table round	0.90		
		4 chairs			
	2 bedrooms	Dining table	0.90	1.20	
		Dining table round	1.30		
		6 chairs			
	3 bedrooms	Dining table	0.90	1.80	
		Dining table round	1.50		
		8 chairs			
	4+ bedrooms	Dining table	0.90	1.80	
		Dining table round	1.50		
		8 chairs			
Study	All dwellings	Desk	0.70	1.20	0.72
		Desk chair	0.45	0.45	

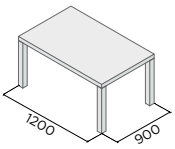


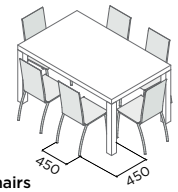
2 chairs



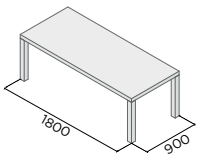


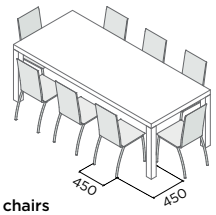
4 chairs



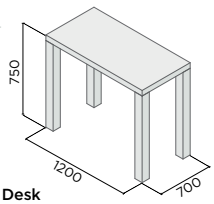


6 chairs

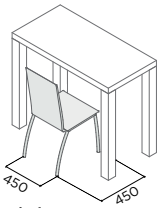




8 chairs



Desk



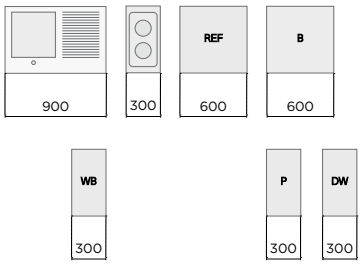
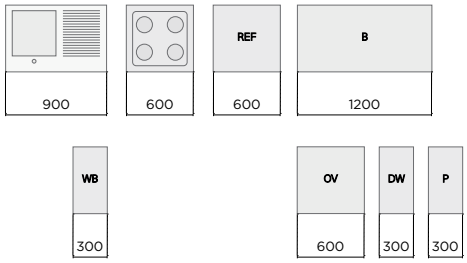
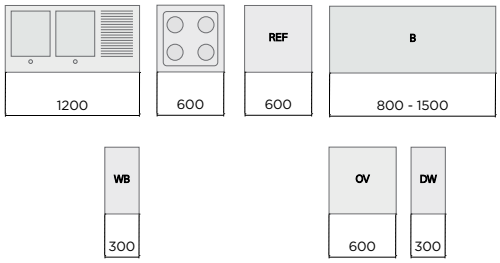
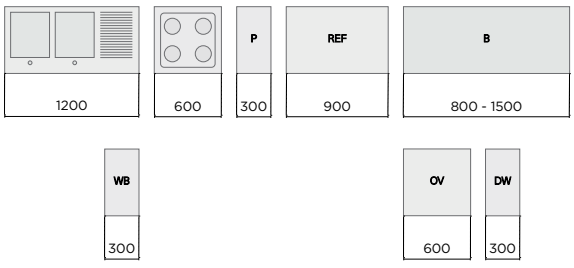
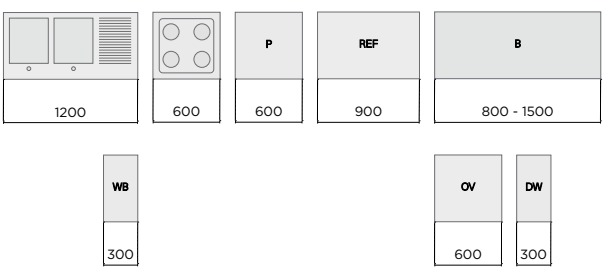
Desk chair

Appendix 5.2 Kitchen furniture schedule

KEY

DW	Dishwasher
P	Pantry
REF	Fridge
B	Benchtop
OV	Oven (optional)
WB	Waste bin
DWR	Drawer
⋯⋯	Below bench

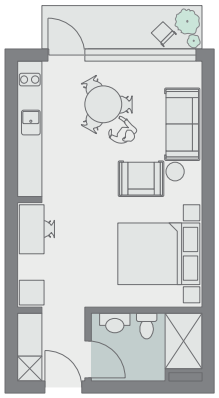
Note:
Dimensions above are spatial allowances, not specific fixture sizes
Minimum total length assumes dishwashers, drawers and the waste bin are located under bench
Pantries in studios and 1 bedroom apartment types can be provided under bench
Pantries are assumed to be full height in 2+ bedroom apartment types
Additional bench space can be provided in lieu of a sink drainer
Ovens should be provided as needed

APARTMENT TYPE	MINIMUM KITCHEN FURNITURE	DEPTH (M)	WIDTH (M)	INDICATIVE COMPONENTS
Studio	Minimum total length (excl. benchtop)		2.70	
	Sink + drainer	0.60	0.90	
	2-burner cooktop	0.60	0.30	
	Fridge	0.60	0.60	
	Pantry	0.60	0.30	
	Waste bin	0.60	0.30	
	Recycling bin	0.60	0.30	
	Drawers	0.60	0.30	
	Bench space	0.60	0.60	
1 bedroom	Minimum total length (excl. benchtop)		3.30	
	Sink + drainer	0.60	0.90	
	Dishwasher	0.60	0.60	
	Cooktop	0.60	0.60	
	Fridge	0.60	0.60	
	Pantry	0.60	0.30	
	Waste bin	0.60	0.30	
	Bench space	0.60	0.30	
	Bench space	0.60	1.20	
2 bedrooms	Minimum total length		3.95	
	Sink (1.5) + drainer	0.60	1.05	
	Dishwasher	0.60	0.60	
	Cooktop	0.60	0.80	
	Fridge	0.60	0.60	
	Pantry	0.60	0.30	
	Waste bin	0.60	0.30	
	Drawers	0.60	0.30	
	Bench space	0.60	1.00	
	Optional Island bench	0.80	1.20	
3 bedrooms	Minimum total length		4.10	
	Double sink + drainer	0.60	1.20	
	Dishwasher	0.60	0.60	
	Cooktop	0.60	0.60	
	Fridge	0.60	0.80	
	Pantry	0.60	0.30	
	Waste bin	0.60	0.30	
	Drawers	0.60	0.30	
	Bench space	0.60	1.00	
4 bedrooms	Minimum total length		4.40	
	Double sink + drainer	0.60	1.20	
	Dishwasher	0.60	0.60	
	Cooktop	0.60	0.60	
	Fridge	0.60	0.80	
	Pantry	0.60	0.60	
	Waste bin	0.60	0.30	
	Drawers	0.60	0.30	
	Bench space	0.60	1.20	

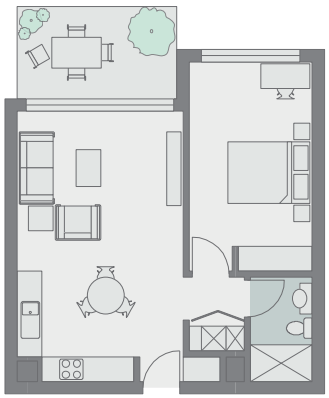
APPENDIX 6

INDICATIVE APARTMENT LAYOUTS

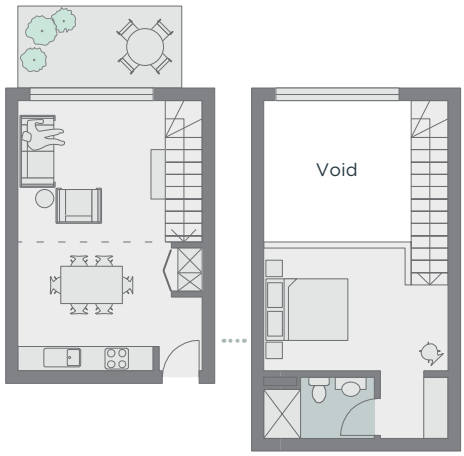
Studio apartment indicative layout



1 bedroom apartment indicative layout

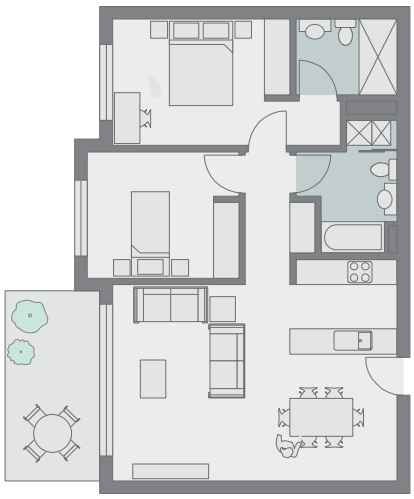


1 bedroom single aspect

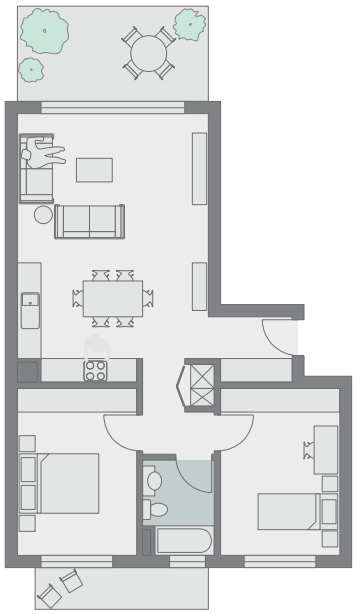


1 bedroom single aspect mezzanine

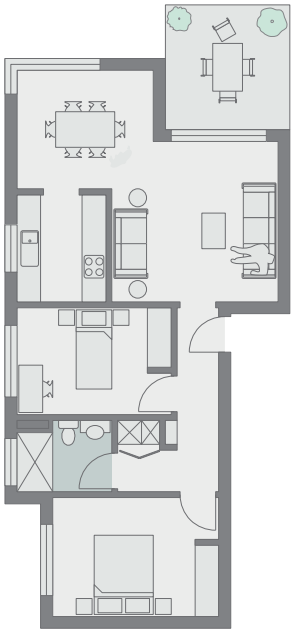
2 bedroom apartment indicative layout



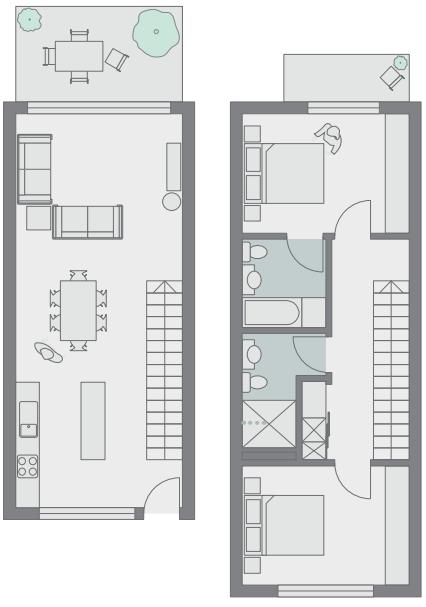
2 bedroom mid-floor plate single aspect



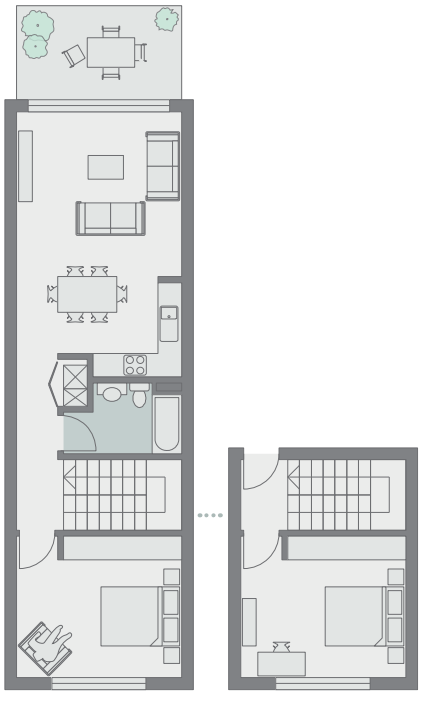
2 bedroom 'L' dual aspect-apartment



2 bedroom corner apartment



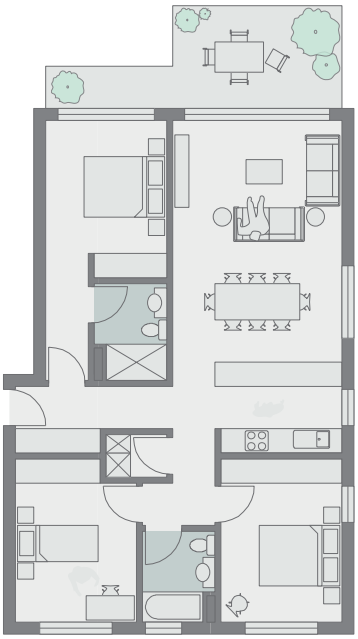
2 bedroom mid-floor plate 2 storey gallery access



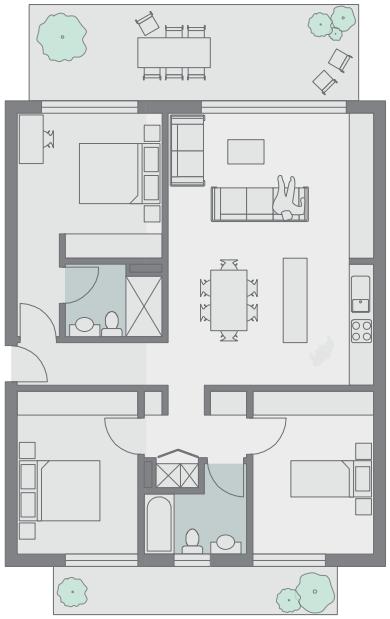
2 bedroom mid-floor plate cross-over

3 bedroom apartment indicative layout

Flexible dual key apartments allow for a variety of configurations, including use of the smaller apartment as a home office or to accommodate extended family in an intergenerational family household.
Note: these do not represent the only solutions.



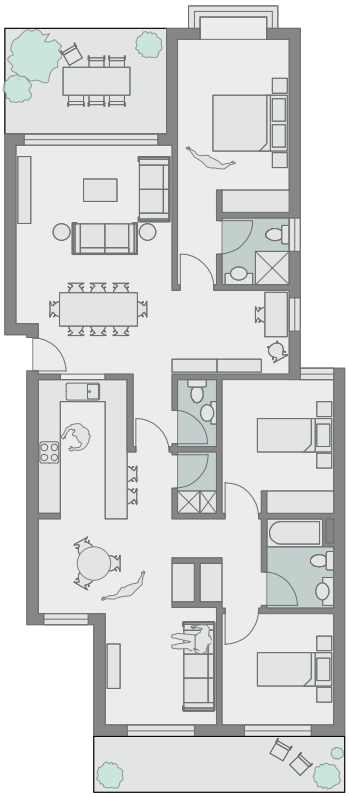
3 bedroom corner apartment

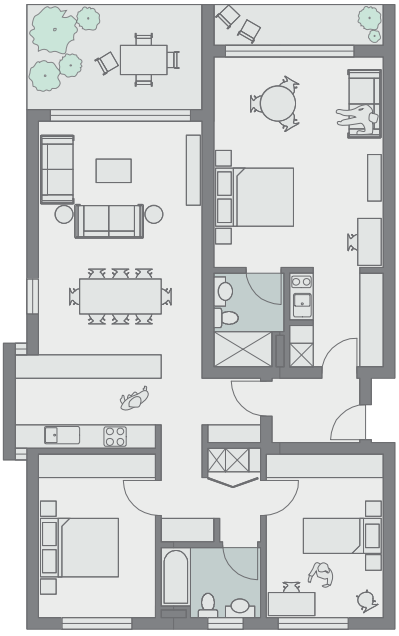


3 bedroom mid-floor plate cross-through apartment

Note: dual key apartments which are separate but on the same title are regarded as two sole occupancy units for the purposes of the BCA and for calculating dwelling mix.

'Family-friendly' apartment indicative layout





APPENDIX 7

MAINTENANCE SCHEDULE

Appendix 7.1 Building maintenance

Provide a maintenance plan showing maintenance paths and entry points to access the building facade, roof, landscaped areas and outdoor communal spaces. Include a description of any maintenance equipment that will need to move through these spaces, including vehicles where required.

Appendix 7.2 Landscape maintenance

Landscape maintenance tasks include:
- —weeding lawns, garden beds and pavements
- —fertilising and topping up mulch for lawns, garden beds, planters and pots
- — pruning, trimming and tree surgery
- —adjusting tree stakes and ties
- —providing pest and disease control for plants and lawns
- —mowing and edge-trimming lawn areas, including collecting and removing clippings
- —diagnosing the cause of failed or dead plants and recommending corrective actions
- —replacing failed or dead plants and lawns
- —maintaining irrigation systems
- —removing rubbish and debris from garden areas
- —removing leaves, mulch and organic debris from pavements and drains.

Additional maintenance tasks may be required depending on the landscape design.

Detail the maintenance requirements for green walls or roofs including:
- —a maintenance plan
- —soil or growing media specification
- —appropriate species selection
- —plant replacement strategy
- —irrigation including back-up in the event of a power failure or drought
- —fertilising procedure
- —access for maintenance
- —service life.

Landscape maintenance schedule

Monthly schedule sample – source: NATSPEC

ITEM	ACTION
Plant material	Replace failed plants Additional planting Treat disease or pests Tree surgery Fertilising generally Fertilising for specific nutrient deficiencies Thin-out planting Pruning and trimming
Soil	Returfing Seeding Treat disease Topdressing Weeding Mowing and trimming
Mulch	Top-up mulch
Irrigation	Repair system and replace parts Clean out Adjust Clean out subsurface drains
Turf	Returfing Seeding Treat disease Topdressing Weeding Mowing and trimming
Paving and pathways	Repair dips, hollows, irregularities Remove stains and graffiti Replace sections of uplift Clear main pathway drains of debris Weeding
Playground	Make sure all play structures are secure and in working order
Rubbish removal	Generally remove litter including bottles, paper, cigarette butts etc. Remove leaves and litter from pathways and paved areas
Bench/ seat	Repair loose or damaged parts
Lighting	Replace blown lamps and damaged diffusers
Fencing	Repair fencing

Seasonal schedule sample – source: NATSPEC:

SPRING (Sept, Oct, Nov)
Mow and trim lawns
Weed; trim and adjust trees and shrubs
Mow and fertilise lawns; treat plant material for pests and disease
Weed; top dress, condition lawns and oversow bare patches; issue maintenance report
Fertilise all trees and shrubs in garden beds; mow and trim lawns
Weed; inspect mulch for deficiencies in cover; check and adjust irrigation
Reinstate mulch as required; treat plant material for pests and disease; mow lawns
Weed; inspect condition of paving and furniture; issue maintenance report
Mow and trim lawns
Weed; mow lawns
Mow and fertilise lawns; trim and adjust trees and shrubs
Weed; mow lawns; treat plant material for pests and disease
Check and adjust irrigation; mow lawns; issue maintenance report

SUMMER (Dec, Jan, Feb)
Mow lawns; weed
Weed; mow lawns, trim and adjust trees and shrubs
Mow lawns; weed; treat plant material for pests and disease
Weed; mow and trim lawns; issue maintenance report
Mow lawns; weed
Mow lawns; check and adjust irrigation
Mow lawns; weed
Mow and trim lawns; inspect condition of paving and furniture; issue maintenance report
Mow lawns; treat plant material for pests and disease
Mow and top dress lawns
Mow lawns; trim and adjust lawns; weed
Mow, trim and fertilise lawns
Check and adjust irrigation; mow lawns; weed; issue maintenance report

AUTUMN (Mar, Apr, May)
Mow lawns
Weed; mow lawns, trim and adjust trees and shrubs
Mow and trim lawn
Weed; mow lawns; issue maintenance report
Mow lawns
Weed; inspect mulch for deficiencies in cover; check and adjust irrigation
Reinstate mulch as required; mow, trim and fertilise lawns
Weed; inspect condition of paving and furniture; issue maintenance report
Mow lawns
Weed; treat plant material for pests and disease
Mow and trim lawns; trim and adjust trees and shrubs
Weed
Check and adjust irrigation; mow lawns; weed; issue maintenance report

WINTER (Jun, Jul, Aug)
Weed
Mow and trim lawns; trim and adjust trees and shrubs
Weed
Mow lawns; issue maintenance report
Mow lawns
Mow and trim lawns; treat for pests and disease; check and adjust irrigation
Weed
Mow lawns; Inspect condition of paving and furniture; issue maintenance report
Weed
Mow and trim lawns
Prune back trees and shrubs after flowering
Mow lawns; treat plant material for pests and disease
Check and adjust irrigation; weed; issue maintenance report

Wellington by Studio Johnston,
Photo: Brett Boardman

APPENDIX 8

TYPOLOGIES (APARTMENT BUILDING TYPES)

Typologies overview

Apartment development occurs in a variety of arrangements, configurations and types. Apartments can occupy different-sized lots from large redevelopment areas to small infill sites, can consist of a mix of building types or uses, and be situated in suburban, transitional or inner-city locations.

Typical apartment building types include:
—narrow infill apartments
—row apartments
—shop-top apartments
— courtyard apartments
—perimeter block apartments
—tower apartments.

Each type has particular 3-dimensional and organisational characteristics, providing a high-level overview of apartment development. This can be useful during design discussions for selecting suitable building types based on their inherent opportunities while also being aware of their attributes and potential limitations.

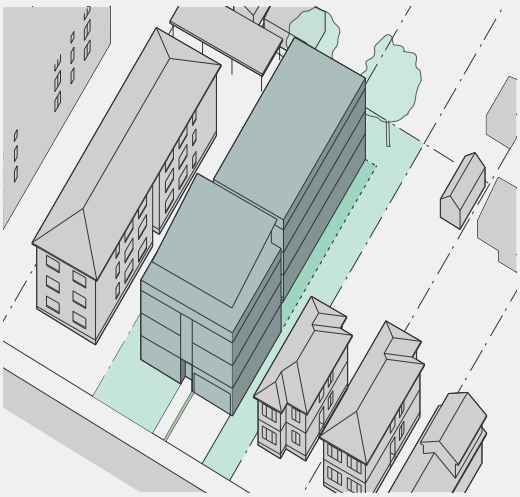
As basic design concepts, these building types can be used during the strategic planning phase to:
—determine the appropriate scale of future built form
—communicate how the development might contribute to the desired character of an area
—test how envelope and development controls will achieve high amenity and environmental performance.

Building types are inherently flexible and can be adapted to fit specific urban contexts. All sites are unique, and apartments buildings should be site-specific, therefore a particular site configuration may be suited to using a mix of types or uses (e.g. a shop-top courtyard building or a tower within a perimeter block).

In larger developments multiple building types may apply, providing more housing choice and design variety. It is appropriate to ‘mix and match’ the desirable forms and qualities of different types to improve built form outcomes.

Some sites require very specific solutions (e.g. sites on busy roads or railway lines). Some may require special technical advice, such as dealing with electricity infrastructure, or smokestacks.

Narrow infill apartments



Characteristics and context

Narrow infill apartments are typically single-core buildings with 3 to 8 levels and a lift. They are often freestanding.

In suburban areas their dimensions respond to traditional narrow and deep residential lot sizes.

They are often surrounded by a combination of detached houses that may also be potential redevelopment sites and strata flat buildings from previous eras.

They are best used:

— when a narrow lot width or frontage results in a building envelope oriented perpendicular to the street frontage

— when amalgamation opportunities of properties in the area are constrained.

Rear portions of buildings can be in varying configurations resulting in 'T', 'L' or 'I'-shaped building plans.

Considerations

Privacy impacts along side and rear boundaries need to be carefully managed to achieve minimum building separation.

A range of side setback solutions can be considered depending on the context and orientation, including:

— a minimum 3 m setback for non-habitable windows

— a minimum 3 m setback where the building form is manipulated to direct habitable room window outlook away from boundaries (e.g. using 'pop-out' or serrated elements)

— a minimum 6-m setback to habitable room windows (or a combination of these) for up to 4 storey buildings; use greater separations for levels 5 to 8.

Consider overshadowing impacts to adjoining properties, particularly when the building is long east–west.

The building height will be influenced by the area's desired future character.

Height is determined by sunlight access requirements for communal and private spaces of the development and neighbouring developments. Change in height can help to address sunlight access.

Provide setbacks for communal open space, deep soil and retention of significant trees.

Use split-level basements with short aisles running laterally to solve sites that are too narrow for double-loaded parking aisles running longitudinally.

Consider visual and acoustic privacy of ground floor units adjacent to the building entry.

Consider the visual impact of vehicle access to the car park, particularly when there is only one street frontage.

Locate circulation to optimise sunlight access to apartments.

Narrow street frontages require careful coordination of services.

Test whether the same built form can be repeated successfully on neighbouring sites without unreasonable impacts to amenity.

Opportunities

The front building faces the street and can help to create a unified streetscape.

The building entry can be prominent, and apartment balconies and windows can enable surveilling the street.

Narrower building depths allow for good natural cross-ventilation.

Row apartments

Characteristics and context

Row apartments are suited to both urban and suburban contexts. They are typically used on sites with wider frontages and shallower depths.

They are characterised by a limited number of units arranged around a core, and best used when it is desirable to:

— use a smaller footprint

— continue the street edge

— reinforce an existing vertical rhythm in the subdivision or building pattern.

Building entries, balconies and windows address the street and provide passive surveillance, while non-habitable rooms face the side boundaries.

They can be single buildings or a series of attached buildings.

Considerations

Longer building facades may require articulation.

Consider orientation for good sunlight access, particularly on north–south sites.

For long frontages to busy roads or railway lines consider solutions for noise.

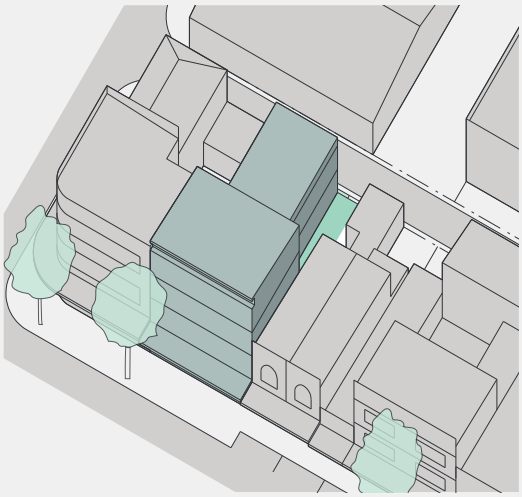
Opportunities

They are highly adaptable and can be used:
— when built form needs to step in response to slope
— to step in height in response to neighbouring buildings
— to accommodate existing trees on the site.

Dual aspect provides good natural cross-ventilation.

Good visual privacy for residents and neighbours can be achieved with balconies facing the street and rear garden.

Shop-top apartments



Characteristics and context

Shop-top apartments are mixed-use residential buildings, usually located in centres, on main streets or close to public transport.

They are are generally an attached urban type, and can be small infill developments or larger redevelopments.

The ground floor is predominantly occupied by retail or commercial uses. Apartments are not included at the ground level.

They usually range between 3 and 8 storeys.

They are best used when:
— increased residential uses are desired in established retail and commercial areas
— the context is a traditional main street
— active frontages such as retail tenancies are desired at street level
— pedestrian activity on the street is desired
— rear lane access or multiple street frontages are available.

Rear portions of buildings can be in varying configurations resulting in 'T', 'L' or 'I'-shaped building plans.

Considerations

A continuous awning can be provided if this is desired or part of the prevailing built form interface with the streetscape.

Consider the location of street trees.

Behind the street edge building, side and rear setbacks can provide amenity benefits including courtyard spaces, privacy between residents and neighbouring dwellings and access to sunlight.

For narrow sites, a range of side setback solutions can be considered:
— zero side setback for the street wall building
— a minimum 3-m setback for non-habitable windows
— a minimum 3-m setback where the building form is manipulated to direct habitable room window outlook away from boundaries (e.g. using 'pop-out' or serrated elements)
— a minimum 6-m setback for habitable room windows (or a combination of these) for up to 4 storey buildings; use greater separations for taller buildings.

Opportunities

Shop-top buildings can be used when zero side boundary walls are possible or desired to provide a continuous street wall.

They can respond to the fine urban grain of main streets, take advantage of sites located near shops and services and integrate community uses.

Apartments overlooking the street and rear lane enhance passive surveillance.

On larger sites:
— where apartments sit over 'big box' retail with high site coverage, significant planting on structures can be provided with the apartments
— there is an opportunity for multiple architects to provide variety in design
— precinct-scale solutions can be used for servicing (e.g. substations and loading docks) and environmental initiatives (e.g. solar collectors and water harvesting).

Height is determined by sunlight access requirements for communal and private spaces of the development and neighbouring developments.

For narrow sites, a change in height can help to address sunlight access.

Separate access for the residential apartments from ground floor retail, to enhance safety.

For narrow sites, use split-level basements with short aisles running laterally to solve sites that are too narrow for double-loaded parking aisles running longitudinally.

Where basements are not contained within building footprints, include planting on top of the basement structure.

Where possible, explore opportunities to create or retain deep soil zones within the side and rear setbacks.

Consider:
— heritage values of adjacent buildings and retention of streetscape character
— how existing or desired street wall height and proportion can be maintained
— interfaces between residential and non-residential uses
— visual and acoustic privacy between properties.

For apartments facing busy roads or railway lines consider solutions for noise.

Carefully coordinate services on narrow street frontages.

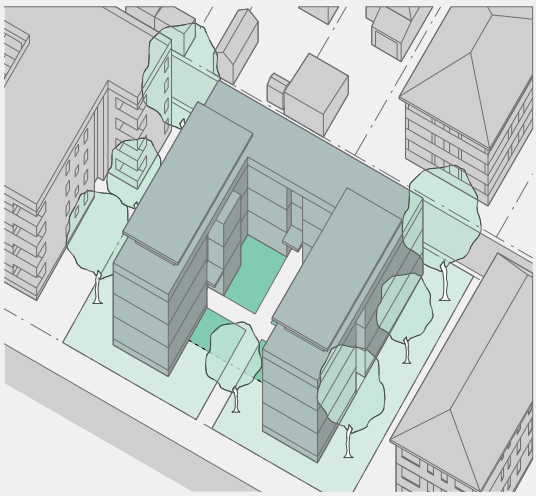
Test whether the same built form can be repeated successfully on neighbouring sites without unreasonable impacts to amenity.

Consider ground floor pedestrian through-site links to increase permeability of block structure and increase walkability.

On larger sites:
— screen podium parking with other uses
— consider the requirements for natural light and cross-ventilation for podium parking
— locate residential cores near the perimeter to provide good residential address and avoid obstructing the non-residential floorplate.

Mitigate potential conflicts between non-residential servicing and residential components.

Courtyard apartments



Characteristics and context

Courtyard apartments provide a centralised open space area defined by buildings on the site, resulting in a 'C', 'U', 'H', 'O' or '=' shape. On corner sites, an 'L'-shape can define the courtyard.

The buildings are generally detached, and on sites large enough to allow for separation between buildings.

They generally range between 3 and 6 storeys and have multiple cores. Taller versions generally require insets or breaks at the corners to achieve good natural ventilation and visual amenity.

Building configuration depends on context and site orientation.

Courtyard buildings are best used when the site has more than one street frontage.

Considerations

Apartments overlooking the street frontages and courtyard can enhance passive surveillance.

Clearly define all access points, and carefully consider the transition from public to private space to provide good address.

Amenity within the site depends on adequate building separation across the courtyard for attractive outlook and good daylight access. Consider the level of solidity of the courtyard facade to increase visual privacy.

Retain significant trees within deep soil courtyards or setbacks.

Carefully manage the relationships of apartments at the corners to maintain visual and acoustic privacy. Consider locating circulation cores at re-entrant corners as a way of breaking the building form.

Carefully manage the relationships of apartments at the corners to maintain visual and acoustic privacy. Consider locating circulation cores at re-entrant corners as a way of breaking the building form.

Carefully design apartments within corners to ensure they have adequate room frontage for outlook and daylight.

Locate vehicle access away from the courtyard.

Limit building height as necessary to maintain sunlight access to the courtyard and to neighbouring properties.

Vary the circulation strategy within different parts of the building based on orientation to maximise sunlight access and natural cross-ventilation.

Consider the interface of ground floor apartments with the courtyard open space.

Opportunities

Courtyard buildings are a highly adaptable building type suitable for many types of site including sloping sites.

They can be used to achieve:
— a landscaped street character by orientating the courtyard to the street
— an urban street character by orienting the courtyard away from the street.

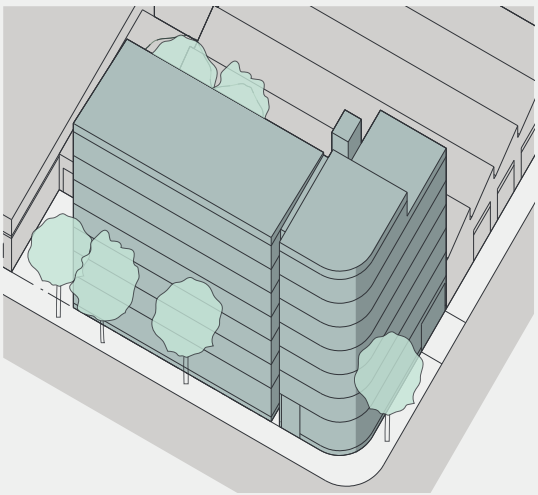
Multiple street frontages can be activated with multiple address points.

Communal courtyards increase opportunities for residents' social interaction.

The courtyard can be orientated to capture views, sunlight and breezes.

High-quality landscaping can increase amenity for all apartments.

Perimeter block apartments



Characteristics and context

Perimeter block buildings are suited to urban areas where it is desirable to integrate the building within an existing or proposed continuous street wall, and to create a protected 'inner' courtyard space. The street wall defines the edge of the building.

Perimeter block apartments typically have long rectangular plans parallel to street frontages.

They are generally built to the desired continuous street wall height for the area, and generally range in height from 4 to 8 storeys.

Apartments face to the front or rear and are typically arranged along a corridor with single or multiple cores depending on building length.

This form is best used when an increase in residential density is desired but taller tower buildings are not.

They are generally built to the side boundaries in anticipation of future development.

They can consolidate green space at the centre of a street block, across sites.

Building separation to the rear provides visual and acoustic privacy and space for a communal courtyard with deep soil zones.

Considerations

Locate vehicle access to minimise safety risks for pedestrians, and contain parking predominantly within the building footprint.

Set back upper levels to create the desired street wall proportion and allow additional sunlight into public space.

Longer facades may require articulation. Consider elements such as entries, balconies, bay windows and parapet lines to provide interest but maintain the street wall.

Consider orientation for good sunlight access, particularly on north–south sites.

For long frontages to busy roads or railway lines consider solutions for noise.

Express entries within the overall street wall to enhance address.

Coordinate with other developments to achieve through-site links and consolidate deep soil.

Consider raising the level of ground floor apartments to increase visual privacy from the footpath.

Consider the level of solidity of facades to increase visual privacy across streets and shared courtyards.

Opportunities

Perimeter blocks are a compact form that achieves high urban densities.

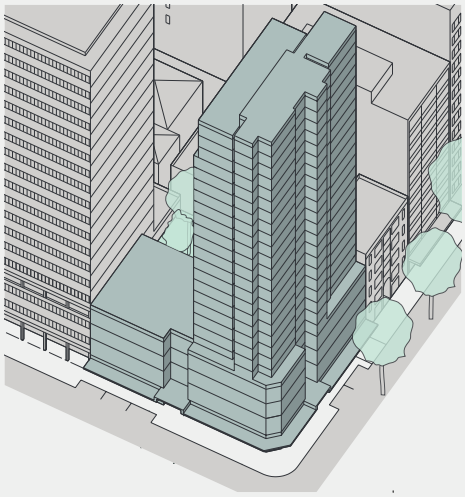
They offer high residential amenity due to shallow building depth and potential for dual-aspect, cross-through and cross-over apartments.

Corner components can be emphasised in the design.

They can:

— support a vibrant neighborhood with street life.
— be staged over time
— be used when built form needs to step in response to slope.

Tower apartments



Characteristics and context

Towers are suited to central business districts, major centres and urban renewal areas.

Towers are typically 9 storeys and over, and are vertically proportioned. In urban areas, towers are often combined with podiums of 4 to 8 storeys.

They can be freestanding in urban renewal areas.

Towers often include a range and mix of non-residential uses suitable to high-density locations.

Generally they require larger sites to allow for adequate building separation.

Considerations

Location and siting need to reflect environmental considerations such as wind, overshadowing and visual impact on surrounding properties and public space.

Make entries directly accessible from the street, appropriately scaled, and distinctly separate from retail and commercial entries.

Generally repetitive floorplates require varied facade articulation to add interest to the building.

Balconies at higher levels may need to be partially enclosed to resolve wind impact (e.g. operable louvres or wintergardens).

In urban situations with non-residential uses at lower floors, the site coverage may be high. Compensating for the lack of deep soil by planting on podiums can benefit the outlook from apartments and provide environmental benefits by improving local microclimate.

Consider the appearance and visual impact of the tower from key locations:

— reduce the visual impact of apparent bulk on open spaces

— minimise loss of views from public space and neighbouring developments, particularly to the sky

— consider how the building profile and roofscape will be viewed.

Consider how the tower form and footprint will maximise views and enable good sunlight access and natural cross-ventilation for all apartments.

Provide separation to neighbouring buildings for towers above the street wall height.

Consider the visual privacy of neighbouring development. Increase building separation as buildings get taller.

In urban renewal areas, provide ground level apartments with direct access from the street or a communal courtyard, and allow for live–work apartments and retail space facing the street.

Provide circulation corridors with access to natural light and ventilation.

Opportunities

Podiums can help to integrate towers with their context at lower levels by building to the street alignment and providing a street wall height that is consistent with the typical range in the area.

Towers provide housing in a centre or CBD, while their ground floor interfaces can encourage activation and a vibrant street life, with varied tenancy sizes allowing flexible uses.

Commercial floors above the ground floor retail can act as a buffer and vertically separate noisier retail uses from upper-level apartments.

Podiums can provide a communal open space area for residents.

Towers can be located to maximise the benefit of adjacent large open spaces, or they can be used as markers to accentuate key features of the urban or natural landscape.

The typically smaller floorplate of towers provides increased amenity to apartments.

GLOSSARY

ACRONYMS

ADG	*Apartment Design Guide*
AEP	annual exceedance probability
BASIX	Building Sustainability Index
BCA	*Building Code of Australia* (part of NCC)
CFD	computational fluid dynamic
CPTED	crime prevention through environmental design
DA	development application
DP SEPP	*State Environmental Planning Policy (Design and Place) 2022*
EOA	equivalent open area
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EV	electric vehicle
GFA	gross floor area
GOA	geometric open area
LEP	local environmental plan
NCC	*National Construction Code*
SEPP	State environmental planning policy
SRZ	structural root zone
SULE	safe usual life expectancy (pertaining to trees)
TPZ	tree protection zone
UDG	*Urban Design Guide*

A

Acoustic privacy	A measure of sound insulation between apartments, between apartments and communal areas, and between external and internal spaces
Adaptable housing	Housing that is designed and built to accommodate future changes to suit occupants with mobility impairment or life-cycle needs, governed by AS 4299 Adaptable Housing, and specifically designed to allow for the future adaptation of a dwelling to accommodate the occupant's needs.
Adaptive re-use	Projects that give new life to an existing place, building or structure through sympathetic alterations, conversions and additions that enable compatible new uses and functions, while maintaining the heritage significance where applicable.
Amenity	The 'liveability', comfort or quality of a place which makes it pleasant and agreeable to be in for individuals and the community. Amenity is important in the public, communal and private domains and includes the enjoyment of sunlight, views, privacy and quiet. It also includes protection from pollution and odours. Expectations of amenity and comfort are contextual and change over time.
Aircraft noise	Aircraft noise is identified as contours on the Australian Noise Exposure Forecast (ANEF) Map. The higher the ANEF contour value, the greater the exposure to aircraft noise.
Articulation zone	An area in front of the building line that may contain porticos, balconies, bay windows, decks, patios, pergolas, terraces, verandahs, window box treatments, window bays, awnings and sun-shading features.
Attached dwelling	As defined in the Standard Instrument - *Principal Local Environmental Plan*.

B

Bay window	A window element which projects a short way past the face of the building. It can have windows on the return walls and sometimes incorporates a seat.
Building line	The predominant line formed by the main external face of a building. Balconies or bay window projections may or may not be included within the building line, depending on the desired streetscape.
Building height	As defined in the Standard Instrument - *Principal Local Environmental Plan*.
Building depth	The overall cross-section dimension of a building envelope. It includes the internal floorplate, external walls, balconies, external circulation and articulation such as recesses and steps in plan and section.
Business zones	Land identified on a land zoning map within a local environmental plan as a B1 Neighbourhood Centre, B2 Local Centre, B3 Commercial Core, B4 Mixed Use, B5 Business Development, B6 Enterprise Corridor, B7 Business Park or B8 Metropolitan Centre zone. *Note: residential apartment development may not be permissible or appropriate in all business zones.*
Busy road or rail line	As defined in *State Environmental Planning Policy (Infrastructure) 2007 and Development Near Rail Corridors and Busy Roads – Interim Guideline.*

C

Cadastre	The current subdivisional pattern of a locality on the ground e.g. boundaries, roads, waterways, parcel identifiers and names.
Clerestory	High-level windows that can be part of a wall above a lower roof.
Communal open space	A consolidated area of external space within common ownership. To be accessible by all residents and designed as the primary area of recreation and social interactions. Communal open space should provide amenity and recreation opportunities for all ages and abilities. Communal open space should be open to the sky, with an allowance for shade structures.

Communal indoor space	A consolidated area of internal space within common ownership to be accessible by all residents and designed as an area of recreation and social interactions. Communal indoor space should provide amenity and opportunities for all ages and abilities. It should have daylight and natural ventilation.
Contiguous deep soil	Deep soil that is connected horizontally through an unbroken sequence.
Core	Vertical circulation (lift or stairs, or both) within a building. A single core may include multiple lifts serving the same floor area.
Corner apartment	A dual-aspect apartment on one level with aspects at least 100° apart. Corner apartments are located on the outermost corners of buildings.
Cornice	A decorative horizontal moulding at the top of a building which 'crowns' or finishes the external facade.
Courtyard	Communal space at ground level or on a structure (podium or roof) that is open to the sky, formed by the building and enclosed on 3 or more sides.
Cross-over apartment	A dual-aspect apartment with 2 opposite aspects and with a change in level between one side of the building and the other.
Cross-through apartment	A dual-aspect apartment on one level with two opposite aspects.
D	
Datum point or datum line	A significant point or line in space established by the existing or desired context, often defined as an Australian Height Datum. For example, the top of significant trees or the cornice of a heritage building.
Daylight	Consists of both sky light (diffuse light from the sky) and sunlight (direct beam radiation from the sun). Daylight changes with the time of day, season and weather conditions.
Deep soil	A landscaped area connected horizontally to the soil system and local groundwater system beyond, and unimpeded by any building or structure above or below ground with the exception of minor structures.
Deep soil zone	An area of soil within a development that is unimpeded by buildings or structures above and below ground and has a minimum dimension of 3 m. Deep soil zones exclude basement car parks, services, swimming pools, tennis courts and impervious surfaces including car parks, driveways and roof areas. Deep soil zones with a minimum dimension of 3 m allow sufficient space for the planting and healthy growth of new trees that will provide canopy cover and assist with urban cooling and infiltration of rainwater to the water table. A deep soil zone also allows for the retention of existing trees.
Dense urban area	An area where the permitted floor space ratio for development under a local environmental plan is 2.5:1 or greater.
Dual-aspect apartment	Apartments which have at least 2 major external walls facing in different directions, including corner, cross-over and cross-through apartments.
Dual key apartment	An apartment with a common internal corridor and lockable doors to sections within the apartment so that it is able to be separated into 2 independent units. Under the BCA, dual key apartments are regarded as 2 sole occupancy units. They are also considered as 2 units when calculating apartment mix.
E	
Equivalent openable area (EOA)	The equivalent open area of a window for natural ventilation and natural cross-ventilation is calculated from the geometric open area (GOA) of the window and the additional resistance to airflow associated with flyscreen and the type of window opening. The allowance for a flyscreen is required irrespective of whether one is to be provided with the development.
Electric vehicle (EV) ready connection	EV ready typically includes a dedicated spare 32A single-phase circuit provided in an EV distribution board to enable easy future installation of cabling from an EV charger to the EV distribution board
Electric vehicle (EV) distribution board	EV distribution board typically includes a charging control system, additional sub main cabling to the main switchboard, outgoing circuit breaker(s) in the main switchboard and metering in the main switchboard as an input to the charging control system. EV chargers, final circuits and cable trays to the EV chargers and metering to support sub-billing at the charger level not included.
F	
Facade	The external face of a building, generally the principal face, facing a public street or space.
Floor space ratio	As defined in the *Standard Instrument - Principal Local Environmental Plan.*
G	
Gallery access	An external corridor, generally single-loaded (i.e. with apartments to one side), which is not less than 50 per cent permanently open to the outside and which provides access to individual apartments along its length. For the purposes of natural cross-ventilation, 50 per cent permanent opening is to be local to any naturally cross-ventilated apartment. Gallery access circulation is required to be treated as habitable space when measuring privacy separation distances between neighbouring properties.

Geometric open area (GOA)	The geometric open area of a sliding or hung sash window can be measured in elevation. Hinged windows such as casement, awning and hopper windows wider than 500 mm may measure the diagonal plane from the sash to the jamb and add the triangles at either end up to a total area of the window opening in the wall. Where the opening is required to be restricted for fall prevention, the restricted dimension must be measured. The reduced opening dimension is measured if a sill, reveal or local boxing obstructs the window opening.
Glass line	The inside face of windows on the external walls of a building.
Green cover	Living organisms growing in soil which have stems, leaves and roots. Green cover is open to the sky and can be located in common areas or within private open space such as balconies or roof tops. Green cover includes deep soil areas, planting on structures (rooftops, podiums, planters) and planting such as lawns and gardens in communal open space.
Green roof	A roof surface that supports the growth of vegetation, comprised of a waterproofing membrane, drainage layer, organic growing medium (soil) and vegetation.
Green travel plan	A plan prepared by a qualified transport planner or traffic engineer that details measures to promote and support the use of sustainable transport options, such as public transport, cycling and walking.
Green wall	A wall with fixtures to facilitate climbing plants. It can also be a cladding structure with growing medium to facilitate plant growth.
Guide to Traffic Generating Developments	*Guide to Traffic Generating Developments*, published by Roads and Maritime Services (formerly RTA) and available on its website.
H	
Habitable room	A room used for normal domestic activities, and includes a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom, family room and sunroom; but excludes a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothesdrying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods, as defined by the BCA.
I	
Integrated waste disposal infrastructure	Receptacles for the collection of separated waste streams on each residential floor. Waste chutes provide efficient collection and separated transport for mid-rise and high-rise buildings.
J	
Juliet balcony	A small projecting balcony, generally ornamental or only large enough for one person standing.
L	
Landscaped area	A part of a site used for growing plants, grasses and trees, but not including any building, structure or hard-paved area. This Includes deep soil, planting on structures, rooftops and rain gardens as defined in the *Standard Instrument – Principal Local Environmental Plan.*
Livable Housing Design Guidelines	*Livable Housing Design Guidelines,* published by Livable Housing Australia (LHA) and available on its website.
M	
Midwinter	Midwinter (middle of winter) is 21 June, the winter solstice, when the sun is lowest in the sky.
Minor structures	For the purpose of calculating deep soil, the following 'minor structures' may be included in the deep soil area where they have at least 1.2 m clear width of deep soil to either side: (a) a path, access ramp or area of paving with a maximum width up to 1.2 m (b) essential services infrastructure (such as stormwater pipes) with a maximum diameter up to 300 mm (c) landscape structures (such as lightweight fences, light poles or seating) requiring a footing with a maximum size of up to 300 mm x 300 mm in cross-section.
Mixed-use development	As defined in the *Standard Instrument – Principal Local Environmental Plan.*
Multi-dwelling housing	As defined in the *Standard Instrument – Principal Local Environmental Plan.*
N	
Natural cross-ventilation	Wind-driven ventilation that provides ventilation rates at least 7 times greater than a single-aspect apartment in the same location, due to 2 or more openings on separate facade aspects being exposed to a wide range of unobstructed wind directions. The improvement in ventilation rates is to be achieved over a year and can be demonstrated following the natural cross-ventilation verification requirements (see Appendix 4.2).

Net zero ready	A 'net zero ready' development has high energy performance, is EV ready, is capable of achieving net zero operational emissions and is either all-electric, or 'all-electric ready', i.e. capable of becoming all-electric and not using onsite fuels. Net zero ready requires sufficient physical space and electrical power to the meter board, and all relevant sections of buildings must be ready for current or future adoption of electric heating, ventilation and air conditioning (HVAC), induction cooking (if relevant), and electric hot water systems.
Non-habitable room	A space of a specialised nature not occupied frequently or for extended periods, including a bathroom, laundry, water closet, pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom or clothesdrying room, as defined by the BCA.
Nominated regional centres	For the purposes of the non-discretionary development standard for car parking (see **Part 1.6**), nominated regional centres include Albury, Ballina, Batemans Bay, Bathurst, Bega, Bowral, Cessnock, Charlestown, Coffs Harbour, Dapto, Dubbo, Glendale–Cardiff, Gosford, Goulburn, Grafton, Lismore, Maitland, Morisset, Newcastle, Nowra, Orange, Port Macquarie, Queanbeyan, Raymond Terrace, Shellharbour, Tamworth, Taree, Tuggerah–Wyong, Tweed Heads, Wagga Wagga, Warrawong and Wollongong.
O	
On-grade	On ground level.
Open plan	Apartment layouts where spaces are not divided into discrete rooms, but are open and connected to allow flexibility of use (typically living, dining, kitchen and study areas).
Operable screening device	Sliding, folding or retractable elements on a building designed to provide shade, privacy, and protection from natural elements.
Operable walls	Walls which can be moved, for example by sliding, folding, or pivoting, to allow for different room configurations or a balcony.
P	
Parapet	A low wall or horizontal barrier at the edge of a balcony or roof. Often taken to refer to the decorative element which establishes the street wall height of heritage buildings (see 'Cornice').
Perimeter block	Development where buildings generally define the street edge and enclose or partially enclose an area in the middle of a block.
Planting	Living organisms growing in soil. This includes deep soil, planting on structures, rooftops and rain gardens.
Planting on structure	A landscaped area that is impeded by, or relies upon, any building or structure. Planting on structure is typically located over basements, on podiums and roof tops, on balconies and terraces, and on walls. Planting on structure is beneficial to supplement any required deep soil planting but should not replace it because it is subject to a range of environmental stresses that can affect the health and vigour of plants.
Plenum	A duct or chamber, usually with grilles, that air passes through. Plenums of small cross-section tend to limit the passage of air and in relation to natural ventilation are not equivalent in performance to standard windows.
Podium	The base of a building upon which taller (tower) elements are positioned.
Potable water	Water which conforms to Australian Standards for drinking quality.
Primary private open space	The principal area of private open space, usually the largest consolidated area.
Private open space	Outdoor space located at ground level (or on a structure) that is within private ownership and provided for the recreational use of the residents of the associated apartment.
Primary windows	Windows to habitable rooms located on the external wall of a building. Primary windows may be supplemented by windows in courtyards, skylights, notches and along galleries.
Public open space	Land that has been reserved for the purpose of recreation and sport, preservation of natural environments and provision of green space. For apartment buildings, this land is vested in or under the control of a public authority.
Public realm	The public realm is the collective, communal part of cities and towns, with shared access for all. It is the space of movement, recreation, gathering, events, contemplation and relaxation. The public realm includes streets, pathways, rights of way, parks, accessible open spaces, plazas and waterways that are physically and visually accessible regardless of ownership.
R	
Residential flat building	As defined in the *Standard Instrument – Principal Local Environmental Plan.*
Roof-window apartments	Roof-window apartments provide natural cross-ventilation through a suitably located opening clerestory window in the roof.

S	
Shared EV connection	Provision of a minimum level 2 40A fast charger and power supply to a car parking space connected to an EV distribution board.
Shop-top housing	As defined in the *Standard Instrument – Principal Local Environmental Plan.*
Silhouette	A building outline viewed against the sky.
Sloping site	A site with a slope of 15% or greater.
Small lots	Sites with an area of less than 650 m^2.
Soffit	The undersurface of a balcony or other projecting building element.
Solar access	The ability of a building to receive direct sunlight without obstruction from other buildings or impediments, not including trees.
Solar collector	A device that converts the energy of the sun into electricity or thermal energy for heating water.
Stack effect ventilation	Air convection resulting from hot air rising up and out of high-level openings and being replaced by cooler, denser air which is drawn in at low-level openings, or the reverse.
Street setback	The space along the street frontage between the property boundary and the building. Refer to building line or setback as defined in the *Standard Instrument – Principal Local Environmental Plan.*
Studio apartment	An apartment consisting of one habitable room combining kitchen, living and sleeping space with a separate bathroom.
Sunlight	Direct beam radiation from the sun.
Sunlight hour diagrams	A diagram showing the number of hours of direct beam sunlight received by a surface or surfaces over a nominated period of time.
Sydney Metropolitan Area	The 34 local government areas of Bayside, Blacktown, Blue Mountains, Burwood, Canada Bay, Camden, Campbelltown, Canterbury Bankstown, Cumberland, Fairfield, Georges River, Hawkesbury, The Hills, Holroyd, Hornsby, Hunters Hill, Inner West, Ku–Ring–Gai, Lane Cove, Liverpool, Mosman, North Sydney, Northern Beaches, Parramatta, Penrith, Randwick, Ryde, Strathfield, Sutherland, City of Sydney, Waverley, Willoughby, Wollondilly and Woollahra.
T	
Terrace	An outdoor area, usually paved and unroofed, that is connected to an apartment and accessible from at least one room. May be on-grade or on a structure (podium or roof).
Tree	A woody plant able to be walked under, with a minimum canopy spread of 6 m.
Tree canopy	The layer of leaves, branches and stems or trunks of trees that cover the ground when viewed from above.
U	
Universal design	The design of homes to meet residents' needs across their lifetime. A universally designed home should be easy to enter, easy to move around and easily and cost-effectively adaptable.
Urban canopy target	A target set to increase tree canopy cover in urban areas.
W	
Wintergarden	A partially enclosed balcony typically glazed and used to minimise noise impacts along busy roads, railway lines and from aircraft noise. Wintergardens provide protected open space and have permanent openings to outside to support natural ventilation and cross-ventilation.

Botany Road Apartments by Candelapas Associates, Photo: Brett Boardman.

7.

CREDITS

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Central Park by Ateliers Jean Nouvel and PTW, Photo: Brett Boardman.

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