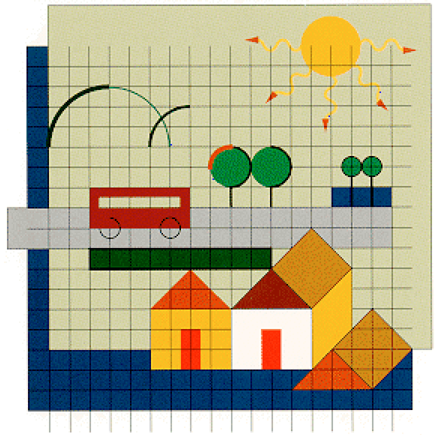
# AMCORD

A national resource document for residential development



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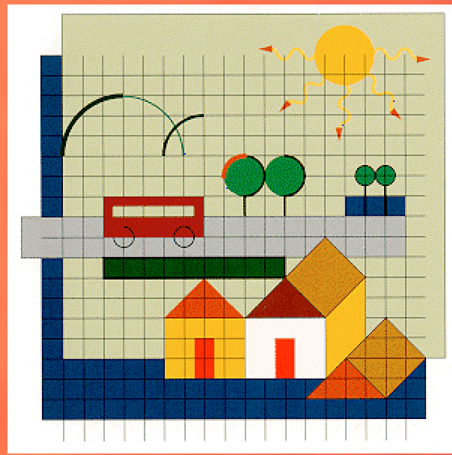

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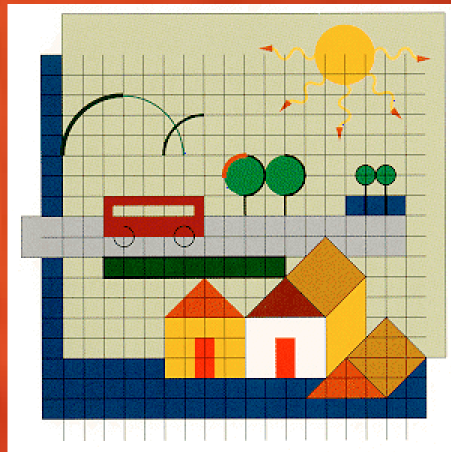
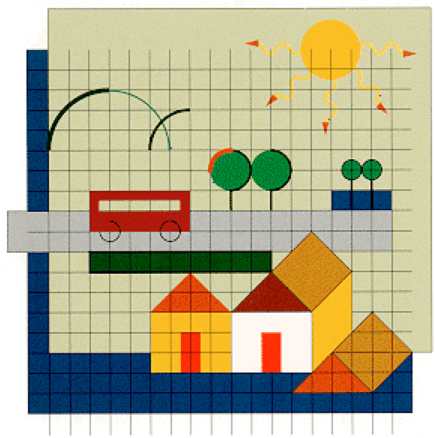


# Preface

Following the publication of AMCORD Editions 1 and 2, and AMCORD URBAN, the Commonwealth Government has maintained its commitment to producing national guidelines for housing development. The result, AMCORD—A National Resource Document for Residential Development, is a comprehensive document that can be adapted and adopted by State/Territory and local governments. AMCORD is applicable to all forms of housing other than high-rise development, and builds on, reviews and integrates the earlier documents.

Throughout the 1990s, the housing and development industry has been responding to the needs of changing housing markets and to growing community demand for more sustainable residential environments. Concurrently, various Commonwealth, State/Territory and local government initiatives have led to significant improvements in the planning and development of our urban areas.

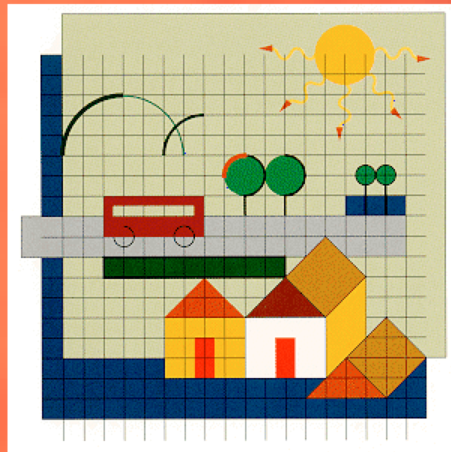
AMCORD has therefore been able to draw upon the considerable practical experience gained through hundreds of demonstration projects across Australia, as well as important advances in integrated planning and development at the local level.



Apart from a major review of the strategic or upfront planning framework as outlined in Part 1, AMCORD simplifies and clarifies the performance-based approach applicable to the design process. It also includes new Design Elements relating to neighbourhood planning and stormwater management, and a number of other important site planning and design considerations.

In response to requests for AMCORD to provide more specific information based on 'best' practice, Practice Notes have been developed containing case studies and additional material considered relevant to practitioners/designers.

# Overview



**A Planning Blueprint**
**The Urban Management Framework**
**AMCORD For Different Users**
**Implementation by State/Territory and Local Governments**

# A Planning Blueprint

## Purpose

AMCORD—A National Resource Document for Residential Development (known as AMCORD) has been produced to advance the planning, design, assessment and implementation of residential development other than high-rise housing (ie housing requiring lifts). It is for use by designers, builders, developers and government officers responsible for housing development. The guidelines provided by AMCORD can be adapted (where necessary) to produce local codes, policies and regulations, thus meeting the needs of State and Territory Governments, local authorities and the housing and development industry.

Importantly, AMCORD provides:

- a process to achieve more efficient, effective, responsive and environmentally sustainable approaches to housing and residential development at the local level;
- a means of improving the quality and choice in housing and residential environments, and ensuring a high level of integration of housing with other elements within the urban environment;
- a framework, principles and processes for a more consistent regulatory environment for those seeking approval for residential projects.

As a national resource document AMCORD aims to achieve national objectives of sustainable development, social justice, micro-economic reform and efficiency in land use. It proposes innovative approaches to design and regulation, and encourages more integration of planning and control processes. Importantly, it provides the vehicle for disseminating nationally the results of current housing research as well as information on 'best' practice throughout Australia.

## Stakeholders

The major stakeholders in urban development - residents, State/Territory Governments, local authorities, and the housing and development industry - have a diversity of needs and interests, which include:

- sustainable environments;
- affordable housing for a changing population;
- making better use of existing infrastructure through more compact towns and cities;
- better access to public transport;
- preserving the quality of the urban environment;
- protecting existing lifestyles;
- greater development control to protect privacy and amenity;
- less development control to reduce costs;
- faster processing of applications;
- greater consistency in regulation of development across local and State boundaries;
- more consultation with the community potentially affected by development;
- developer contributions to cover public costs of development;
- flexibility to innovate.

To come some way towards meeting such needs and interests, there often have to be trade-offs and compromises. For example, cost-effective methods cannot be guaranteed if controls are too rigid or standards too high. AMCORD provides a basis for making these judgements through the promotion of a performance-based approach to design and development.

## Updating the Documents

AMCORD is the Australian Model Code For Residential Development.

It replaces both AMCORD Edition 2 (1990) and AMCORD URBAN: Guidelines for Urban Housing (1992). AMCORD Edition 2 had an emphasis on subdivision for single-lot housing where the lot area per dwelling was greater than 300 m². AMCORD URBAN was produced as a provisional document, and began where the conventional detached house on a typical suburban lot ended. It covered a wide variety of urban housing—terraces, town houses, units, flats, apartments, and housing on lots with an area of 300m² or less.

AMCORD, based on additional research and review, and on the comments received to both AMCORD URBAN and a draft version (released as AMCORD 95), updates the information in both documents, removes ambiguities, and combines both documents in a common format.

## Structure

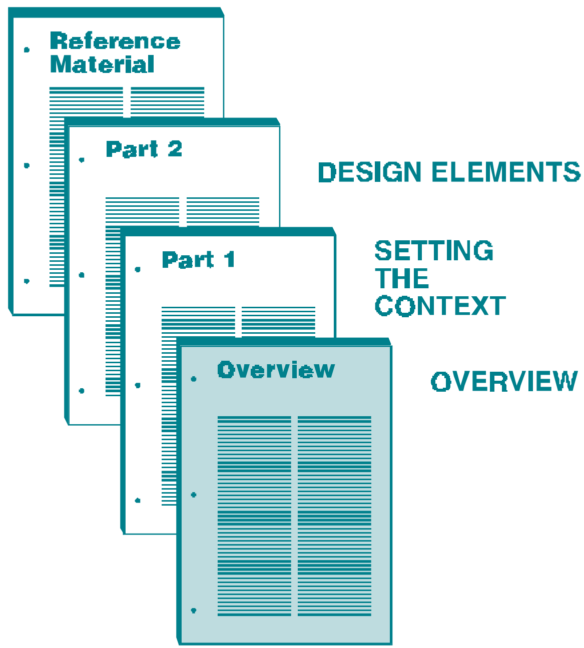
AMCORD comprises two documents, each in its own ring binder. The first and main document has the following components:

Overview

Part 1: Setting the Context

Part 2: Design Elements

Reference Material.



## Setting the Context

Part 1 is intended to serve a wide audience, including Commonwealth, State and Territory Governments and local planning and servicing authorities, as well as the community. Its focus is on a planning process designed to reconcile the diverse interests in residential development.

Experience shows that the implementation of innovative ideas outlined in codes is often stifled because of outdated or poorly structured planning processes. Codes must be supported by up-to-date and relevant approaches to strategic and development planning.

Part 1 outlines a recommended approach to facilitating residential development. A central feature is the proposal to clarify the scope for development through upfront planning. There are four sections:

*Integrated residential planning*: highlights the importance of integrating residential planning and development within the broader context of community development, and involving the community in strategic and local planning processes.

*Adapting Part 1 to local conditions*: identifies the need for, matters to be addressed in, and a model process for the adaptation of Part 1 to meet local (ie State/Territory or local authority) conditions and requirements.

*Strategic planning*: considers sustainability and housing, housing needs, urban form and density, transport, employment and accessibility, infrastructure and other strategic planning issues.

*Development planning*: outlines the preparation of development plans and addresses community dynamics, urban character and design, transport and the local environment, environmental care, development standards and funding, and approval processes.

## Design Elements

Part 2 is for designers, developers and State and local planning authority assessors. It covers design issues related to residential development, and provides the basis for design and regulation in the form of a series of Design Elements which are to be used to develop local or State codes.

*Neighbourhood Planning and Infrastructure*

Neighbourhood Planning and Movement Networks (Elements 1.1–1.6): considers neighbourhood design, integrated movement networks, street networks, pedestrian and cyclist facilities, public transport and public open space.

Physical Infrastructure (Elements 2.1–2.3): addresses street design and on-street carparking, street construction, and utilities.

Stormwater and Integrated Catchment Management (Elements 3.1–3.3): considers storm drainage, water quality management and stormwater harvesting.

*Streetscape, Site Planning and Design*

Streetscape and Neighbourhood Character (Elements 4.1–4.3): addresses streetscape and landscape, building appearance and neighbourhood character, and fences and walls.

Site Planning and Building Design (Elements 5.1–5.14): considers site planning, lot layout, street setbacks, building envelope, privacy, on-site carparking and access, private open space, communal open space and landscaping, safety and security, design for climate, dwelling interior, site facilities, housing on traffic routes and bushfire protection.

## Reference Material

Reference Material includes the Acknowledgements, Glossary, and Selected References.

## Practice Notes

The second document contains a set of Practice Notes for use by all those involved in residential development. It is envisaged that these will be expanded and modified as required and as experience is gained.

## The Performance-Based System of Control

AMCORD is directed towards the planning, design and control of residential development. However, regulation will not be effective unless there is:

- recognition of the changes in housing demand;
- understanding of the need for the associated infrastructure;
- clarity about the context, ie what is to be designed and how it is to be controlled;
- flexibility for innovation;
- a process to avoid conflict and uncertainty;
- information on how regulation should be implemented and administered.

AMCORD promotes a *performance-based system of control* as an alternative approach to regulation. Instead of specifying prescriptive standards, it focuses on matters to be addressed (called Performance Criteria) in order to achieve a desired outcome.

Such a performance-based system is centred on objectives and desired outcomes, offers an opportunity for diversity and choice, and provides flexibility to respond to market needs and preferences, and changes in approaches and technology.

Performance-based regulation also requires some examples of ways in which the desired result can be achieved. AMCORD provides Acceptable Solutions as examples of what is considered acceptable, while not precluding other options.

Examples and illustrations of principles of ‘best’ practice are provided to reduce the potential for misinterpretation, with Practice Notes providing further information.

# The Urban Management Framework

The Commonwealth Government is a key player in developing Australia’s urban environment. In partnership with the States, Territories, local government and the housing and development industry, it is involved in formulating and implementing a range of programs to improve the nation’s regions, cities and housing.


Major initiatives have been the Better Cities Program which is demonstrating the feasibility of an integrated approach to planning and development, and the Australian Urban Regional Development Review, instigated to improve the way in which the Commonwealth manages its responsibilities for, and its impacts on, the development of Australian cities.

Additionally, the quality of urban design was the subject of a recent review by the Prime Minister’s Urban Design Task Force. Recommendations from the review are currently being implemented through various Commonwealth programs.

Under the Regional Development Program, the Commonwealth is facilitating social and environmental reforms identified in regional strategic plans. Initiatives focusing on economic growth, employment and export opportunities are also being promoted under this program.

The Coastal Strategic Planning Program involves the three tiers of government, community groups and the private sector in encouraging ‘best’ practice in regional and integrated coastal management strategies.

The Community Housing Initiative is a program specifically tailored to the development of a viable community housing sector. An increase in community and local government involvement in the provision and management of long-term rental housing for low and moderate income earners underpins the program's success.

The Commonwealth State Housing Agreement (CSHA) is a financial arrangement between the Commonwealth Government and each State/ Territory under which the Commonwealth makes annual housing assistance grants to the States and Territories. These include assistance for low income private renters, public rental housing and private home ownership.

These programs are linked to the Local Government Development Program (LGDP) which aims to promote a partnership approach to local government development to advance systemic change and reform. The delivery of national priorities such as micro-economic reform, urban reform, regional economic development, environmental management and social justice are primary objectives of the program. The development and implementation of AMCORD at the national, State and local level are LGDP priorities.

Under LGDP, the Commonwealth is accelerating the pace of reform of development and building

approvals processes at State and local level as an essential complement to the AMCORD approach.

This has the support of all levels of government and will benefit industry, consumers and the general community by reducing delays and providing a more efficient service.

AMCORD is a contribution to broader reform initiatives including:

- Regulatory reform activities initiated under the National Competition Policy which is a commitment to national market reform;

- Agreement by the Commonwealth and local government to pursue an Accord, crucial to strengthening relations between the Commonwealth and local government in areas of urban planning, urban design and regulatory reform.

National objectives for housing and urban development, established by the Council of Australian Governments (COAG), provide a framework within which policy directions of the Commonwealth and States are promoted. These include to:

- improve coordination in urban development within and between all jurisdictions through a strategic planning arrangement linked to budgetary processes;

- promote efficient and equitable patterns of urban settlement through pricing policies which take into account, as far as practicable, the environmental, social and economic costs and benefits;
- contain the cost of housing and urban development and promote efficient expression of housing and locational choice through regulations and building codes which are performance based rather than prescriptive, and through streamlined approval processes;
- review taxation systems to consider the impact of taxation on efficient use of land and the effective expression of housing and locational choice;
- achieve housing and urban development processes which consider housing affordability, particularly for low income households;
- increase the range of housing options available to Australians appropriate to their needs and preferences throughout their life cycles;
- promote equity of access to employment and other services and facilitate more coordinated development of housing and urban physical and social infrastructure;
- facilitate improved information and education for housing developers and consumers on a range of

housing options which may offer better environmental, social and financial housing alternatives.

A pattern of urban management is evolving which is leading to better integrated planning and implementation techniques at all levels of government, within a coherent national framework. AMCORD is a pivotal component in this process.

# AMCORD for Different Users

## Local Authorities

Because Part 1 addresses the process of dealing with urban expansion and change, it is of particular value to local and State authorities. It is proposed that local authorities undertake sufficient planning to clarify the scope for different forms of housing, and provide developers with the information they need to prepare proposals. However, it is not intended that consideration of applications for housing be deferred until such upfront planning has been completed.

Part 2 provides an alternative basis for the design and assessment of residential development and housing. State and local authorities can use the information to construct their own code, provided the principles and integrity of the document (such as the performance approach) are retained.

## State and Territory Authorities

State and Territory authorities will share local authorities' interest in AMCORD although their role in housing varies from State-to-State. Their interests will be in:

- identifying regional priorities and requirements for residential development;
- formulating regional strategies or plans;
- identifying special locations for urban housing;
- developing general policies where residential development and housing assist in the development of metropolitan structure or in utilising under-used infrastructure;
- considering how the Design Elements relate to existing State planning policies or regulatory codes (where applicable).

## Developers and Designers

Developers and designers of small housing projects need to consider only the Design Elements. Large developments, however, may raise issues that are dealt with in Part 1: Setting the Context, including proposals for rezoning or removal of restrictions on housing.

Developers and designers need to be aware of the options provided by the Performance Criteria and Acceptable Solutions. By taking advantage of the flexibility provided by the Performance Criteria, they can be innovative and try new approaches without being held back by restrictive regulations. For those who prefer the traditional methods, there is an opportunity for a quicker, more certain response by using the Acceptable Solutions as an alternative to existing regulatory practices.

The Practice Notes are of particular value to designers, who are expected to respond effectively to the more flexible performance approach.

## Relationship to Statutory Controls

AMCORD is not a statutory document with legal force until it is adopted as a statutory instrument by State or local government. Developers and designers therefore need to verify council's planning and development requirements before preparing an application for residential development.

# Putting AMCORD Into Practice

Implementation of AMCORD is not a simple decision because it affects the diverse legislative policy frameworks, planning instruments and regulations of State, Territory and local Governments. The implementation process therefore requires reviewing areas of inconsistency between AMCORD and the existing legislative and policy frameworks.

## The Role of the Commonwealth

Implementation of AMCORD will be the subject of discussions between the Commonwealth, States

and local governments. These discussions will cover the degree of consistency between the States and Territories and the extent to which the States and Territories make AMCORD (or some adaptation) mandatory for local government.

## The Role of State/Territory Governments

Some States and Territories have already prepared a design code or codes, and some are undertaking reviews. In other States/Territories such decisions have not yet been made or it is being left to local authorities to decide whether they want to proceed directly with adaptation.

The exact process for adaptation at the State/ Territory level, therefore, will vary and depend on existing legislative frameworks and administrative practices.

Implementation of AMCORD at the State level is likely to focus on the planning framework, process and principles. In some States, technical requirements and performance standards may be determined centrally. In other States these may be left to local authorities or, alternatively only some requirements and criteria may be determined centrally.

AMCORD therefore, provides a resource to review and/or prepare (using a range of implementation options), residential planning and design policies, controls and guidelines. Given State/Territory governments' focus on strategic planning, it would be extremely useful to have a policy document to assist local government in these tasks. Such a process would ensure that the research and development undertaken as part of the finalisation of AMCORD can be passed on to local governments throughout Australia.

## The Role of Local Authorities

Local government's role will depend on the manner in which AMCORD is adopted at the State/Territory level. In States/Territories where an AMCORD equivalent document is introduced in a statutory format, local government would only need to adapt/adopt relevant sections not covered by the State document.

Alternatively, in States where an equivalent AMCORD document is produced as an advisory document, local government will be able to adopt their own local AMCORD equivalent.

## Process for Adoption

The AMCORD approach involves a cultural change within government and industry relative to previous prescriptive approaches. It therefore requires:

- commitment by State and Local Government to the planning and design principles embodied in the AMCORD document;
- an agreed and inclusive process involving all stakeholder groups;
- allocation of sufficient quality resources and time to the facilitation process and to the training and education of staff, so that the performance-based approval system can be introduced and operated successfully.

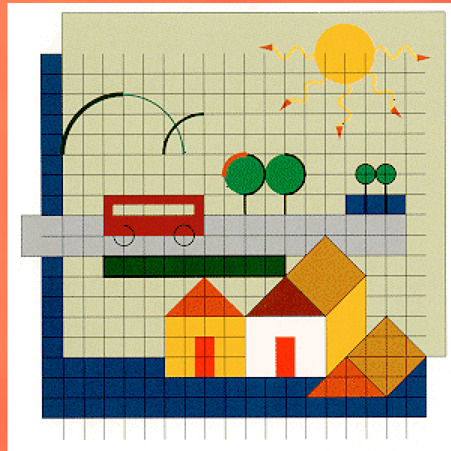
As a national resource document AMCORD has responded to the Commonwealth Government's urban reform agenda relating to housing policy and development. Adaptations of the document should respond to both Commonwealth and relevant State/Territory objectives.

## Retaining AMCORD's Integrity

The development of AMCORD has involved extensive research, review and development over a number of years, and has taken into account specific regional factors from around Australia (in particular climatic variations). Therefore, the integrity of the document should be maintained to the greatest extent possible in the adaptation process, with any variations to the Performance Criteria and Acceptable Solutions in the Design Elements justified by way of specific explanations as to why local variation is required.

In this way, desired outcomes and a level of consistency between local government areas and between States/Territories can be achieved.

# Part 1: Setting the Context



# 1.0 Introduction

## Setting the Context

### Purpose

Upfront and integrated planning is the key to resolving the wide-ranging issues associated with housing and residential development within the broader community context. AMCORD Part 1 addresses the interests of developers and designers, the community, and local government planning and servicing authorities, and helps clarify in advance the scope for the location, type and form of housing development.

Specifically, clarification:

- reduces uncertainty and hence the potential for delay and conflict;
- raises awareness of any regional planning requirements and hence consideration of any proposed development in a broader context;
- provides support for developing and interpreting the performance approach in the Design Elements (Part 2);
- gives local authorities the means to determine a range of Acceptable Solutions before applications are made;
- provides an opportunity for addressing community concerns about development before applications are made;
- defines roles and responsibilities;
- provides opportunities for establishing clear procedures for particular requirements, such as information to be supplied and the contribution required towards infrastructure provision.

### Sections

Section 1.1 outlines the increasing commitment of local, State and Commonwealth Governments to more integrated planning approaches, and explains how this commitment is reflected in AMCORD.

AMCORD is a resource document. It presents information, ideas and processes, but is not a code which can simply be adopted in entirety. Section 1.2 establishes how AMCORD can be adapted to local conditions.

In identifying the relevant aspects of upfront planning at the strategic and development levels (Sections 1.3 and 1.4), Part 1 links with the Design Elements of Part 2. The performance approach underpinning the Design Elements requires a clear understanding of performance criteria in a local context—a focus of Part 1.

A series of Practice Notes (PNP 1–11), contained in a separate document, provides further information on the range of topics covered in Part 1.

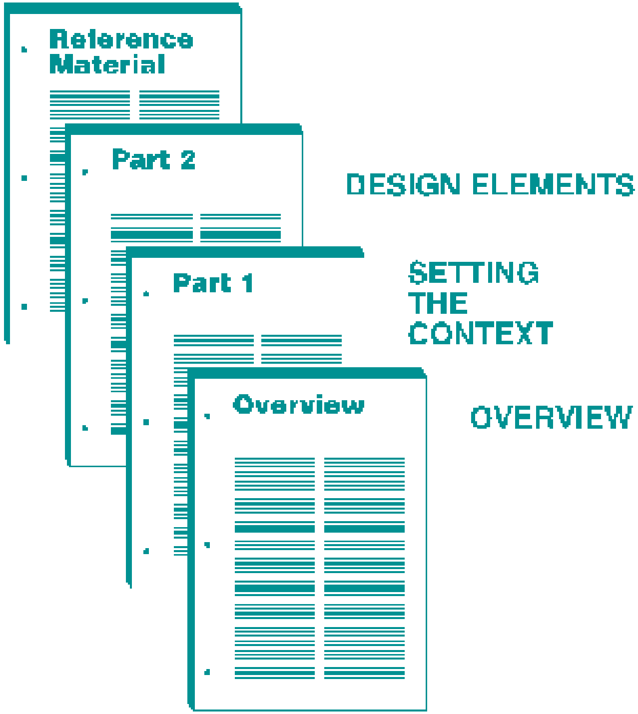



**Figure 1: Structure of AMCORD**

# 1.1 Integrated Residential Planning

## The Importance of Integrated Planning

Integrated planning focuses on the planning and design of residential development within the broader setting of community development. Such an approach was a key feature of both AMCORD and AMCORD URBAN. Since this initial work, the Local Government Association of Australia and the Commonwealth Government jointly undertook and completed the Integrated Local Area Planning (ILAP) program. ILAP has significantly advanced this integrated approach by emphasising the need for:

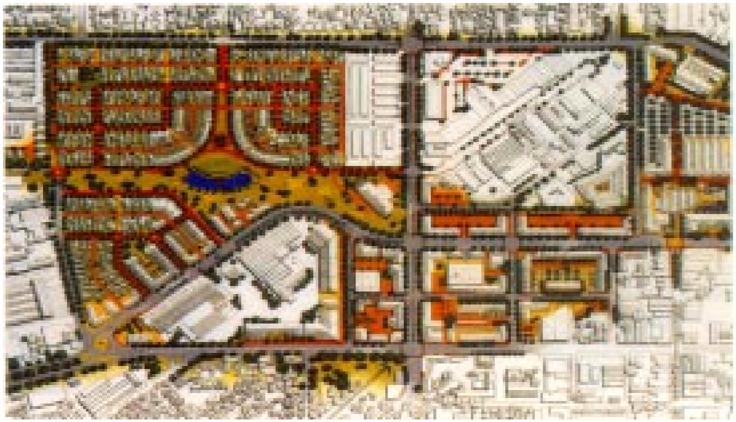


**Figure 2: Integrated residential and mixed-use development at Subiaco, Perth.**
Source: Draft Subiaco Redevelopment Scheme and Policy, 1995, Subiaco Redevelopment Authority.

- partnership between the three spheres of government, local communities and the private sector to work towards enhancing local well-being;
- the public sector to enhance local well-being through effective integration of its activities;
- local government to be a leader in bringing about more effective local or regional strategic planning and integration.

ILAP suggests a generalised model (Figure 3) to achieve a shared commitment and partnership, ongoing arrangements for cooperation and review, and a link into council corporate planning and management (see PNP 1). The process is comprehensive and can be used for all kinds of planning issues, including integrated residential development.

## Levels of Planning

The model is relevant in the context of Part 1 of AMCORD, which, like ILAP, recognises the different steps or levels in the residential planning and development process. It starts with defining objectives and finishes when desired outcomes are achieved. The terms *strategic planning* and *development planning* have been carried through from earlier versions of AMCORD because they reflect different layers of residential planning. However, this approach is not inconsistent with the ILAP model. The relationship between the ILAP model and AMCORD is illustrated in Figures 3 and 4.

The *strategic planning* activity aims to determine longer-term strategic directions, set priorities based on needs and resources, and identify action areas for shorter-term investigation and/or development. Some of the aspects to be addressed in a residential context are changes in demographic, economic, social, cultural and environmental characteristics; sustainable residential development; land use and transport; density; major infrastructure; and housing strategies. An important result of the process is the identification of action areas or development areas where there is potential for further residential development and housing, and a need for detailed planning. Development areas are either growth areas on the urban fringe or infill housing in established suburbs.

The next level, *development planning*, aims to identify the form of development and systems for implementing it. The development areas are investigated in detail, the requirements for development are determined (including those of the public and private sectors) and procedures are established so that implementation is coordinated. Matters to be addressed include performance-based land-use zoning; precinct urban design guidelines; environmental management criteria; a traffic calming plan; social and physical infrastructure plans; development standards and funding ; and programming. With such a focus on the integrated management of residential development, desired outcomes can be achieved within available resources.

AMCORD, like ILAP, recognises that both strategic planning and development planning are required. Sections 1.3 and 1.4 outline the approach that can be followed as part of an integrated residential planning process. The two forms of planning are complementary; however, they have different inputs and outputs, and require different professional skills and forms of consultation.

The extent to which local authorities apply the principles set out in Sections 1.3 and 1.4 depends on local conditions. Some local authorities may want to prepare a more broadly-based strategic plan, while others may want to formulate a housing strategy or review their existing residential code. Similarly, there will be different needs for

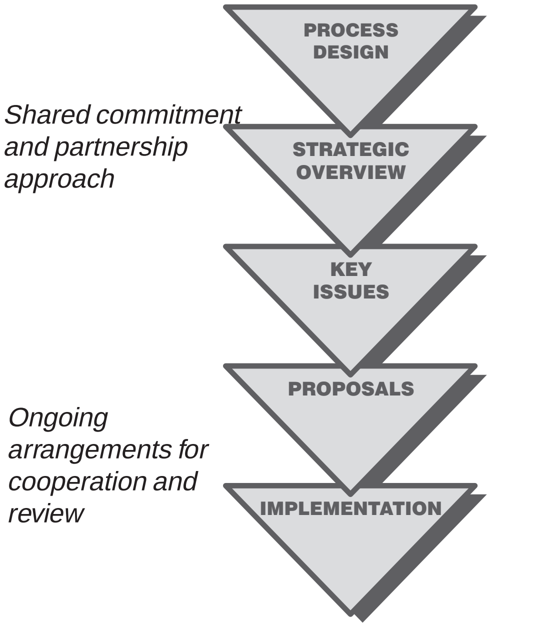



**Figure 3: Integrated local area planning model**

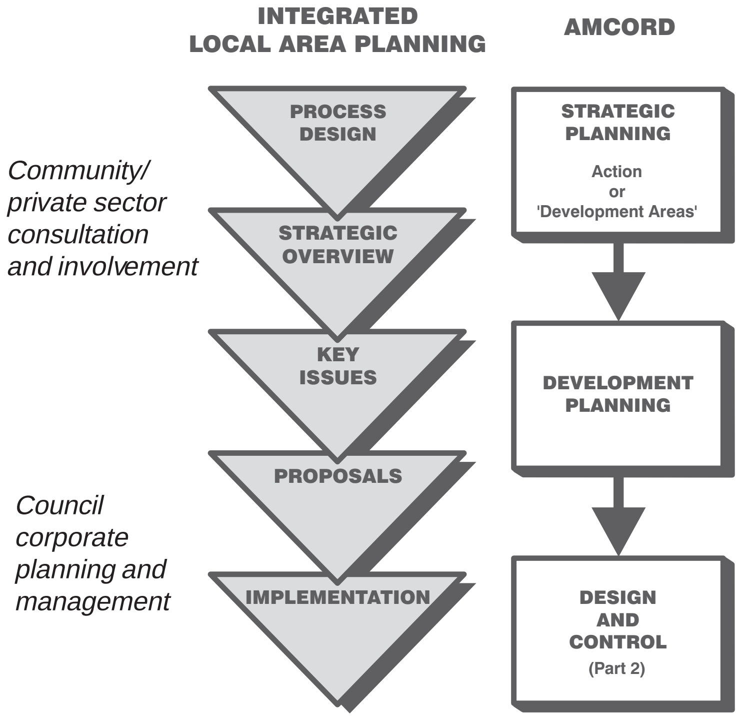



**Figure 4: Relationship between ILAP and AMCORD**

development planning. This range of approaches is reflected in the two sections.

## Support Mechanisms

ILAP identifies four mechanisms to support integrated planning. These are:

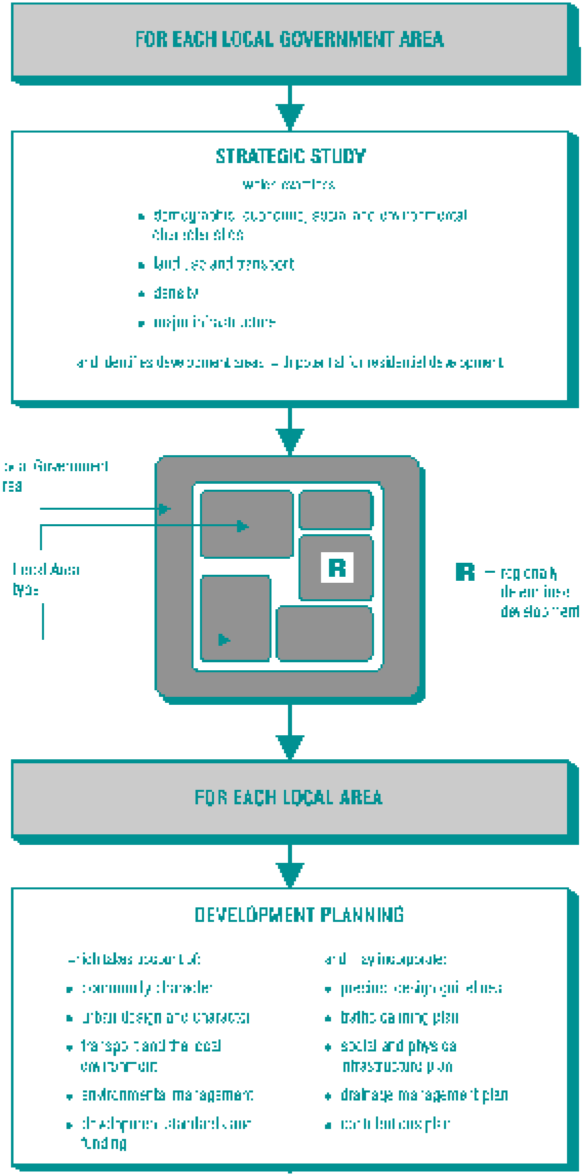
- shared commitment and partnership among key stakeholders;
- adequate opportunities for community consultation and involvement, including the private sector;
- effective corporate planning and management within the responsible council;
- ongoing arrangements for inter-agency cooperation and review of outcomes.

All these mechanisms are relevant to AMCORD, but community consultation particularly needs to be highlighted.

## Community Consultation

Adequate community consultation is important in residential planning, especially in established areas where proposals for development are often seen as a threat to existing values. There are advantages in adopting a systematic approach to consultation and in choosing the most relevant consultative technique. In developing such a systematic approach, the following principles may be relevant:

- people/groups with an interest in the outcome should be consulted;
- consultation should start as early as possible, before entrenched positions have been taken by any party;
- the approach should be based on the needs of the particular community;
- the costs of prolonged consultation may increase the cost of planning and/or the housing product;
- the process should be solution-oriented rather than problem-oriented;
- adequate resources (eg. time, money, staff, information) should be made available;
- the consultation program should be flexible;
- solutions devised by experts are not necessarily the best from a community's viewpoint;
- there should be clear demonstration of how community views have been incorporated.



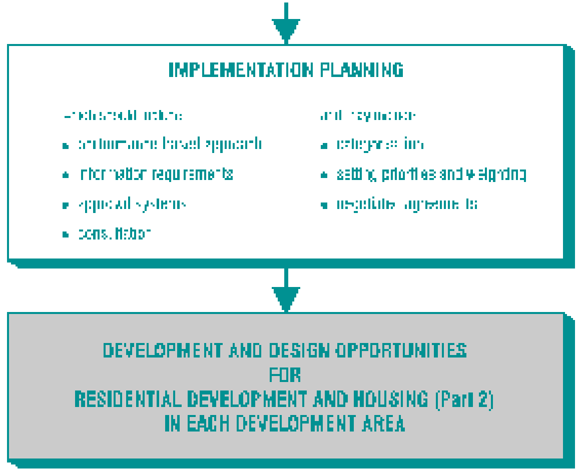




**Figure 5:** **An integrated process for identifying the scope for residential development and housing through upfront planning.**

There are various techniques, based on these principles, to involve and consult with the community concerning strategic planning, development planning and development applications and issues (refer to PNP 2).

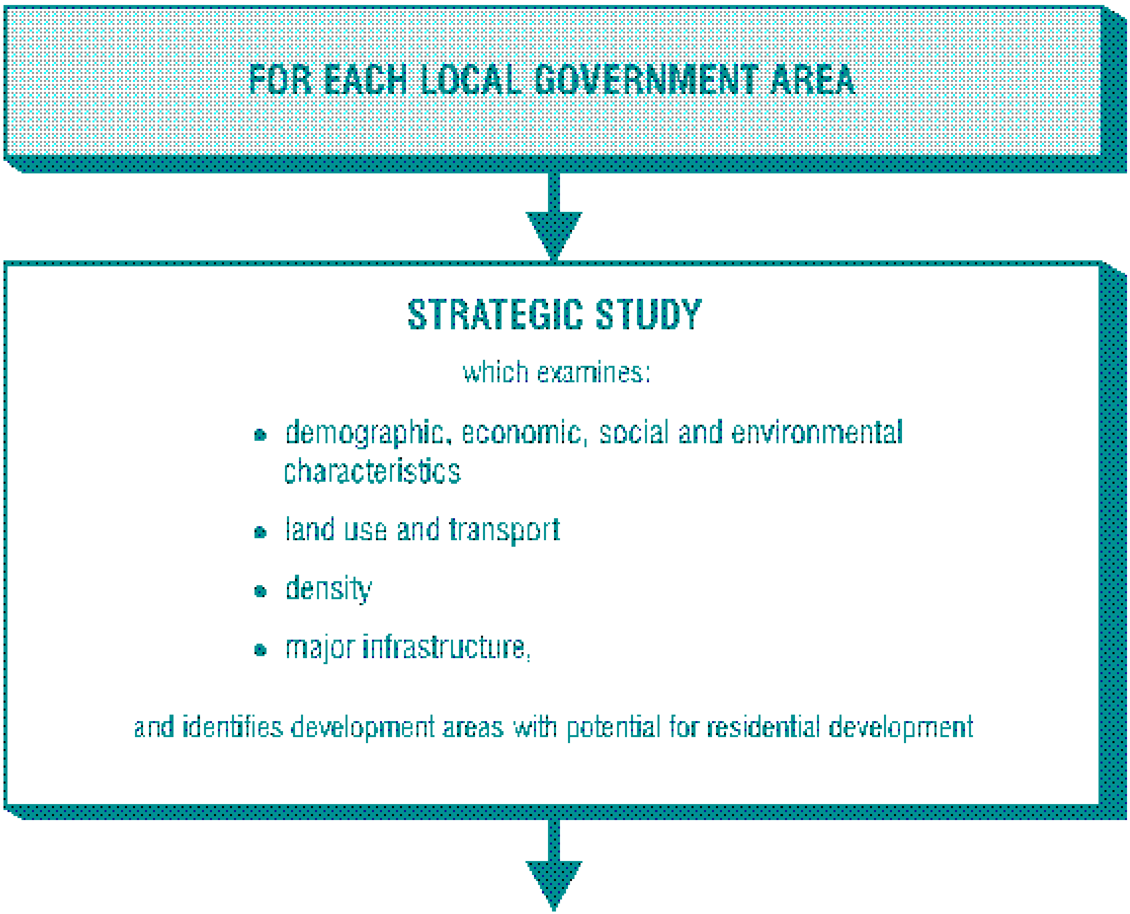
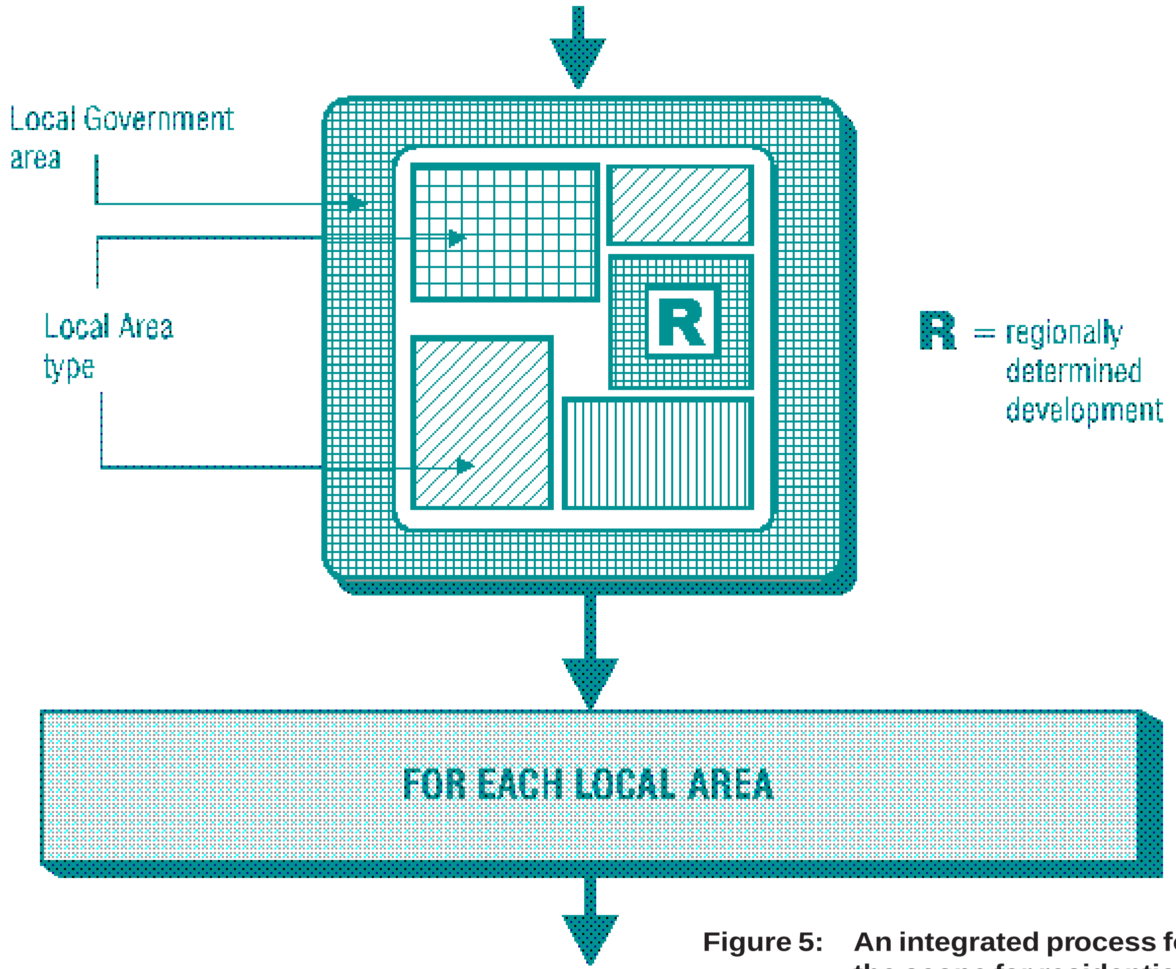



**Figure 5: An integrated process for identifying the scope for residential development and housing through upfront planning.**

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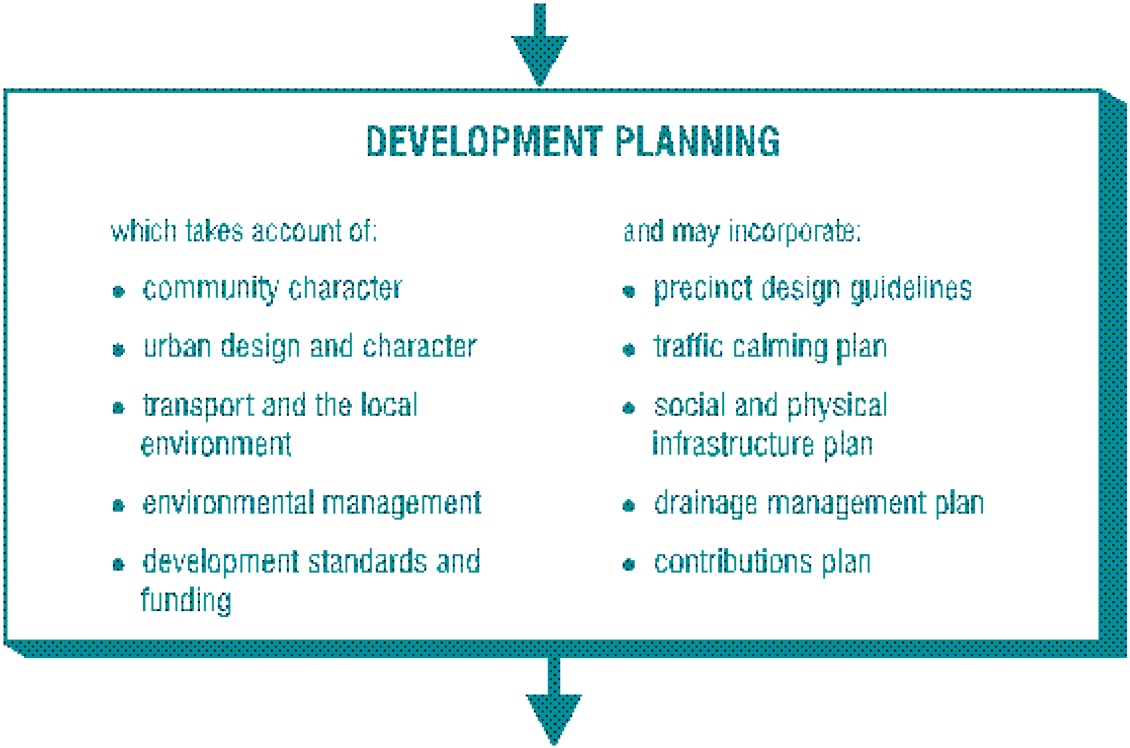



**Figure 5: An integrated process for identifying the scope for residential development and housing through upfront planning.**

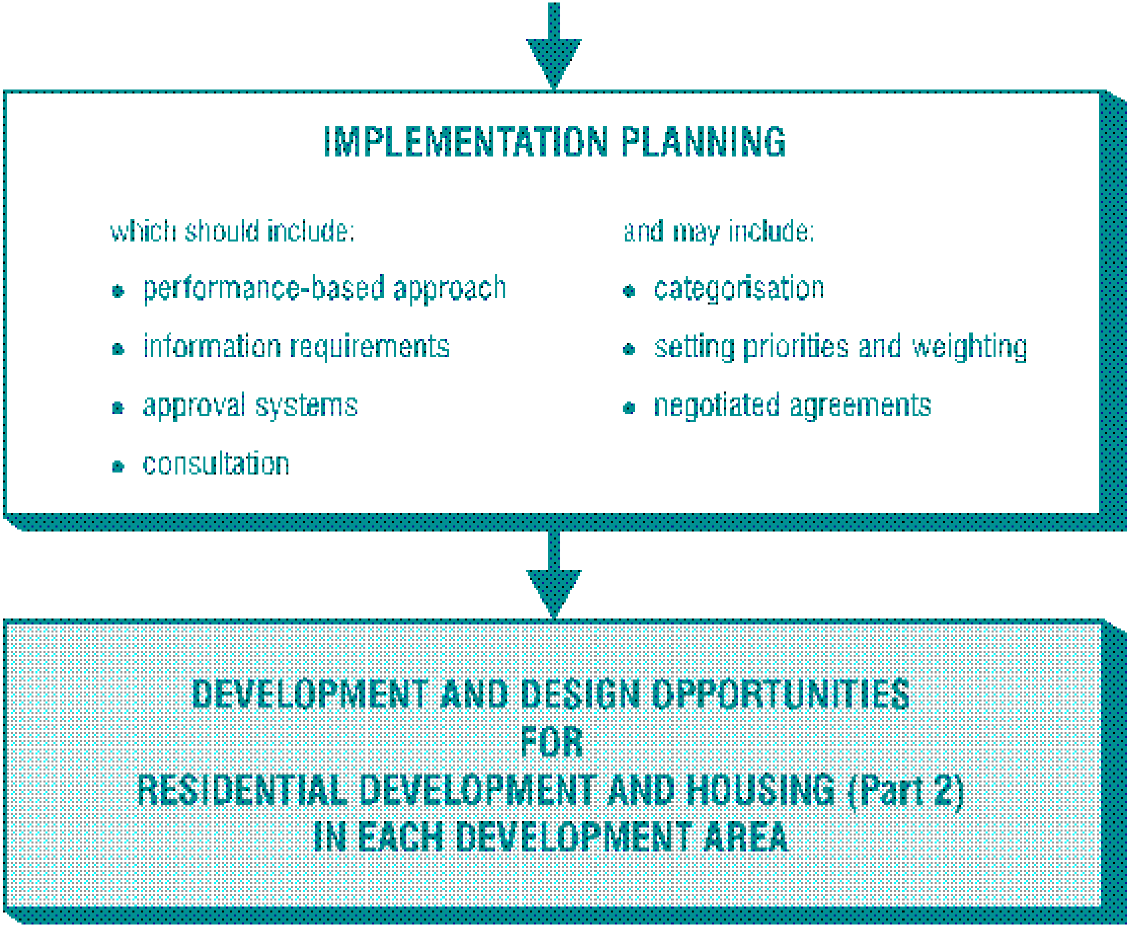



**Figure 5: An integrated process for identifying the scope for residential development and housing through upfront planning.**

# 1.2 Adapting Part 1 to Local Conditions

## Approach

### The need for adaptation

AMCORD's focus is national. Before it can be used at the local level it must accommodate the laws and policies of States/Territories, within the context of their planning instruments and regulations. Adaptation of Part 1 is needed in order to:

- develop a local planning system that will assist in the implementation of more efficient, effective and responsive residential development. The principal concern here is the process of residential development;

- improve the quality and choice in housing and residential environments and ensure a high level of integration of housing with other elements of the urban environment. This reflects a concern with the quality of the urban environment in general and with residential development in particular. AMCORD aims to achieve national objectives of sustainable development, social justice, micro-economic reform, efficiency in land use and quality urban design.

Adapting Part 1 of AMCORD can bring to the local level the advantages of a nationally produced resource document that incorporates the results of current housing research and information on 'best' practice.

## Matters that should be addressed

Consideration of AMCORD at the local level should lead to:

- recognition of the changes in housing demand;

- opportunity for responding to such changes, reflecting Commonwealth and State/Territory strategic, development and implementation objectives;

- understanding of the need for the associated physical and social infrastructure;

- agreement on the intended character and environmental conditions of an area and how they are to be achieved;

- a process to reduce conflict and uncertainty;

- opportunity for innovation through use of the performance approach to regulation;

- information on how such regulation should be interpreted and administered;

- effective integration with other programs such as Local Approvals Review Program (LARP), ILAP and the Better Cities Program.

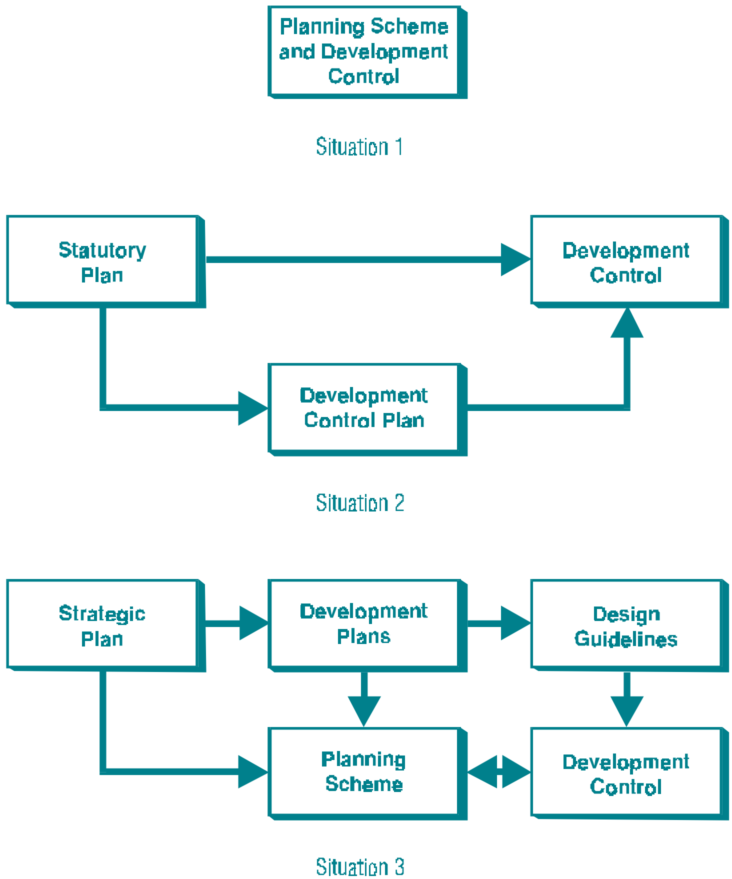



**Figure 6: Illustration of a range of planning and regulatory systems**

**The importance of local conditions**
There are significant variations in State legislation and local planning instruments and this influences the process of adaptation (refer Figure 6).

Some local authorities exercise planning control through a single planning instrument. The instrument may prescribe, for different land uses, the conditions which any development proposal has to meet. This specification may be incorporated in the planning instrument or be set out in a local code or regulations.

Local authorities in some States may also have development control plans for special areas where there are additional or different requirements. These development control plans may or may not be part of the planning instrument, but contain matters which must be taken into account when a proposal is prepared and assessed.

In some States, local authorities are encouraged to prepare a planning instrument setting the objectives and broad planning intentions as the basis for more detailed development control plans. Another variation is where local authorities are required to prepare strategic plans linked with corporate plans in addition to a local statutory planning instrument.

There are also wide variations in scope for strategic and development planning. In rapidly urbanising or re-urbanising areas, strategic planning and development planning are essential. In relatively stable communities (both in country towns and major urban areas) strategic planning may be confined to setting a few simple policy directions and the focus of development planning may be confined to urban improvement schemes.

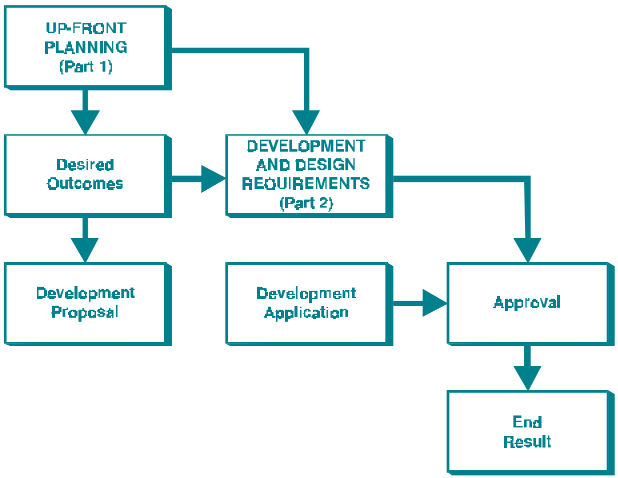



Figure 7: An integrated planning system, linking desired outcomes, established by up-front planning, with design controls.

Many local authorities already have undertaken strategic studies and may simply want to review their residential codes. Others prefer to undertake strategic and development planning in a comprehensive manner, not limited to residential planning.

While there are obvious advantages in a more consistent approach to assist those dealing with more than one local authority, AMCORD does not assume any particular method. However, in all situations, there is a need to reinforce the link between the desired outcomes (determined through up-front planning) and the means of achieving them through development and design controls (refer Figure 7).

## Adaptation process

There are various ways in which Part 1 of AMCORD can be adapted to local conditions, but as a general guide, adaptation can proceed in ten steps (described below).Consultation with, and involvement of, the key stakeholders is essential throughout the process.

**Step 1: Establish a 'project'**
The process of adaptation should be given some status. This can be done by appointing a project manager and by setting appropriate objectives,

timelines and administrative arrangements. A project team could be established which may include a consultant. It is also an advantage to form a steering committee comprising elected representatives, officials and key potential users.

**Step 2: Clarify State and regional needs**
This step may arise where a State version of AMCORD exists or is being prepared, or where there are specific requirements and policies at State government (or regional) level that are relevant at the local level.

**Step 3: Review strategic planning issues**
Existing strategic plans may not fully cover strategic requirements for housing development in the area (eg sustainable development, housing needs, densities, accessibility, major infrastructure).

**Step 4: Identify Development Areas**
In areas of substantial growth or change (such as in new neighbourhoods or major infill areas), there will be a need to identify development areas. Such a need may also arise in areas where there is likely to be small scale incremental development or redevelopment coupled with a general need for urban improvement.

Once development areas have been identified, the context for their future development should be clearly established. This should indicate both the constraints and opportunities for development, and the relationship of housing to other aspects of the urban environment.

Where a local authority simply wants to review its residential design code without identifying separate development areas, the whole or part of the Council area can be regarded as a development area.

**Step 5: Establish a link with the Design Elements**
The strategic objectives, policies or principles should be reflected in the Design Elements to be used. There is a need to determine which aspects of development regulation require the use of particular Design Elements, which Performance Criteria are relevant and what constitutes an Acceptable Solution in a particular development area. For instance, there may be a local need to specify Performance Criteria for stormwater quality, access to public transport or streetscape character.

This establishes a clear link between what is to be designed for (ie the ‘up-front’ planning context) and how a development is to be designed and assessed.

In practice, the administration of development regulation is often treated as an activity separate from strategic and development planning. There is a risk of a communication breakdown, especially where the performance approach—which is an integral part of AMCORD's system of development regulation—may be misunderstood.

To reduce this risk there are advantages in providing a set of explanations. These show (if necessary, for each development area) the context in which the Performance Criteria in the Design Elements should be interpreted.

It is important, therefore, to document the development intentions for each development area with a set of Explanations. This documentation is valuable not only for development controllers but also for developers preparing a development application.

**Step 6: Resolve implementation procedures**
One of the aims of AMCORD is to help achieve quality residential development. It is appropriate, therefore, to review the adequacy of the implementation process. Such a review may include the desirability of introducing policies and procedures regarding categorisation, setting priorities and weighting for different design aspects, improving approval systems and consultation. If the review shows there is a need for such policies and procedures, the adaptation process is a useful opportunity for determining them.

**Step 7: Complete the integrated residential planning system**
The outcomes of the previous steps can be assembled into an integrated residential planning system which is consistent with the ILAP model. In addition, such an upfront planning system provides a proper context for development regulation and a clear basis for any adaptation of the Design Elements.

The format of the documentation is important taking into account such matters as clarity in communication, simplicity in use, and flexibility for revision and up-dating.

**Step 8: Exhibition and comment**
The document should be exhibited for public comment on completion of Step 7.

**Step 9: Finalise**
After public exhibition and any revision arising from public comments, the final version of the integrated residential planning document is produced, exhibited and implemented.

**Step 10: Monitoring, evaluation and review**
An ongoing process of monitoring and evaluation is

important. It may highlight any unintended consequences and a need to review the application of particular Design Elements or the range of Acceptable Solutions.

**IMPORTANT THINGS IN THE ADAPTION OF PART 1**

- Do not comprise the basic objectives
- Do not lose the performance approach
- Integrate different programs (eg ILAP, LARP)
- Clarify responsibiities
- Involve the stakeholders
- Consider opportiunities for categorising different types of development
- Consider information requirements
- Determine priorities in the application of Design Elements
- Revisit the approval process
- Establish a framework for consultation

# 1.3 Strategic Planning

## Purpose and Scope

The purpose of strategic planning is to guide development within a longer-term framework. The major elements determining the form, structure, development and management of an area are considered together and viewed in a long-term and broad perspective. It is on-going, as needs and perceptions about the future will change.

The outputs of the process are strategic plans and policies, supported by diagrams, structure plans or concept plans. These are not inflexible blueprints but directions to pursue, and should be reviewed at regular intervals. Strategic plans usually identify topics or areas which should be given priority for detailed planning or implementation.

The purpose of strategic planning at the State, regional or local level is to:

- anticipate change;
- develop a vision of how change could be accommodated;
- set longer-term objectives, such as creating a more sustainable environment or increasing choices in modes of travel and housing;
- establish a long-term framework for integrating these objectives (eg a structure plan or concept plan) and showing how such issues as environmental protection, the cumulative effect of development on the natural and social environment, the development of the land-use and transport structure, residential density, and infrastructure and resource management are related to each other;
- provide a context for addressing specific issues (eg review of residential codes or development of a housing strategy);
- identify action areas for subsequent, more detailed planning (eg the preparation of development plans for specified areas);
- identify resources required to service growth and change, identify their sources and establish priorities for action;
- identify and involve the various organisations, councils and departments within and outside the council area with a stake in the strategic planning process and its outcome:
- coordinate the activities of councils and other spheres of government;

- serve as a channel for communication with the community, other public authorities and the housing development industry.

Strategic plans are needed at both the regional (or metropolitan) and local level and should be coordinated so that they reinforce each other. These plans are needed for greenfield areas

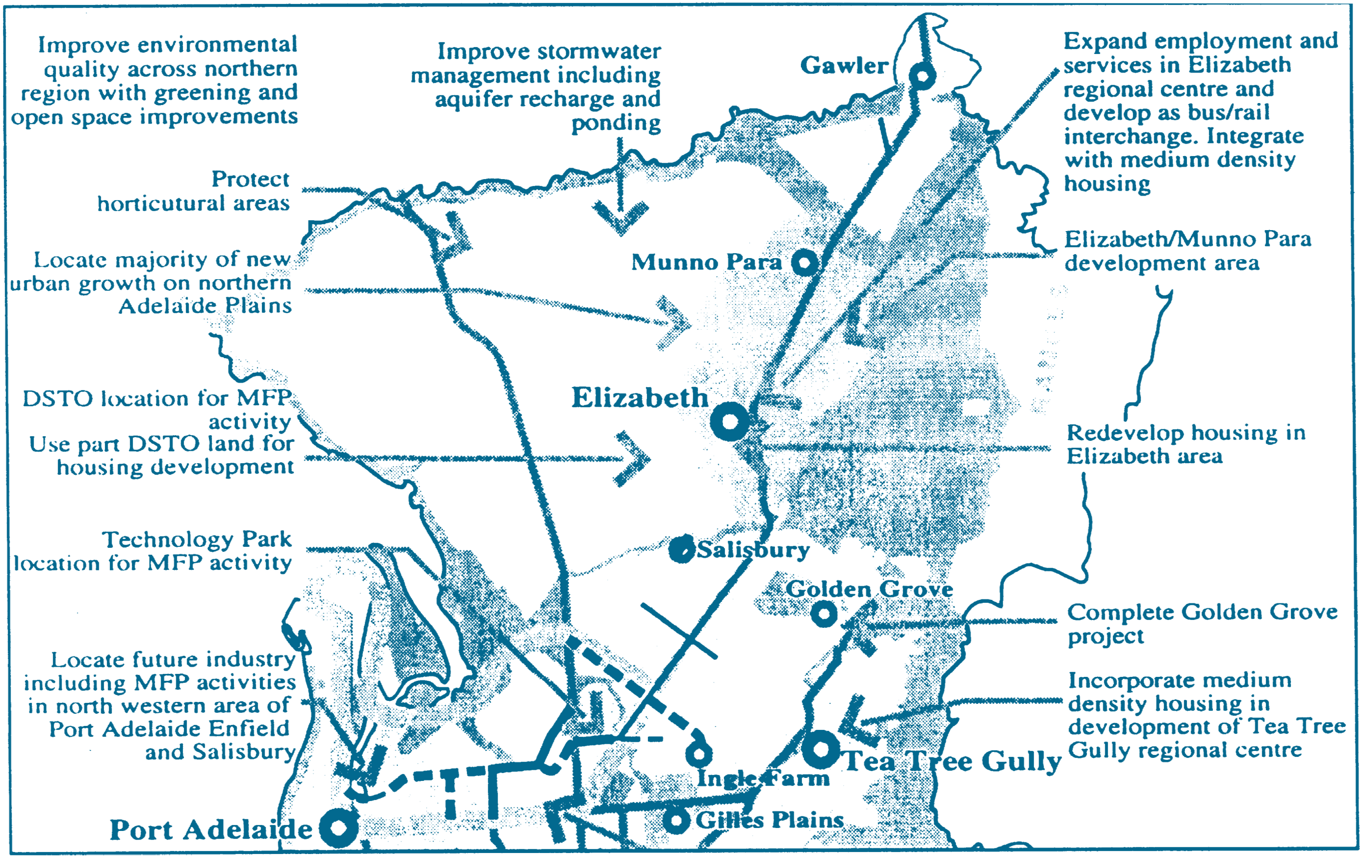



**Figure 8: Illustration of strategic planning output.**
Source: 2020 Vision, Planning Strategy for Metropolitan Adelaide, 1992.

before development takes place, and for developed areas where changes may occur and guidance is required on how such changes should be accommodated.

## Strategic Planning in the Context of AMCORD

The above descriptions are valid for most strategic planning activity, but their application in the context of AMCORD depends entirely on local need and circumstances. Some of the options are to undertake:

- a review of residential development codes. This may arise when a local authority already has a strategic plan;
- a strategic overview of housing and associated needs and requirements for residential development. This can occur when there is a perceived need to formulate an integrated housing strategy;
- a broadly-based strategic study without an initial focus on residential development. Some local authorities may prefer, or may be required by legislation, to prepare strategic management plans encompassing the full range of activities.

Local issues, perceptions and resources will determine the most appropriate strategic planning approach. However, there are fundamental issues, outlined in the next sub-sections, which deserve to be considered in all strategic planning and subsequent implementation of AMCORD.

For local authorities who seek to introduce AMCORD and have not undertaken a strategic review, there may be merit in starting from a broader strategic perspective. This is because, in the planning for integrated residential development, a wide range of other urban activities must be taken into account.

## The Strategic Planning Process

The strategic planning process will usually include the following steps (Figure 9):

- making a decision to undertake a strategic planning study: purpose, scope, resources, methodology;
- determining the policy issues that need consideration, with public involvement important here;
- compiling inventories—the natural environment,

existing land use, employment, services and facilities, transport networks, other infrastructure, and the condition of the urban environment—as well as identifying significant problem areas.

- making forecasts: identifying growth and change dynamics, including social and economic change within the area, housing and community needs, likely development pressures and cumulative effects of population growth on the natural environment.

- defining alternative and/or preferred futures: visions that reflect different community goals, attitudes and perceptions about desirable directions (eg a future where the area adapts to changing housing needs without an overall increase in population). These projections should be developed with the participation of stakeholders (ie community groups, industry and professional groups and others with an interest or stake in the future development);

- defining criteria for assessment of options (again, in association with the stakeholders);

- assessing strategies or plans and implementation processes, including the resources, responsibilities and timelines that might be required. This is a technical activity;

- establishing priorities for action within available resources;

- evaluating alternative plans and priorities in association with the stakeholders;

- preparing a strategy or a plan that incorporates those components on which there is consensus, and presents alternatives (where there are differences) for political decision;

- establishing mechanisms for coordinated implementation;

- disseminating the strategy or plan in terms that are easily understood;

- implementing, monitoring, evaluating and reviewing the strategy or plan.

There is considerable scope for strategic planning in both developing and established urban areas. Local authorities can use the outcomes of the strategic planning process for developing corporate plans (ACT City Services Corporate Plan, 1992; ILAP 1993), combine a strategic plan with a corporate management plan (North Sydney Strategic Plan, 1995), or use a community based corporate plan to drive the strategic plan (Cockwell Shire Council, 1995).

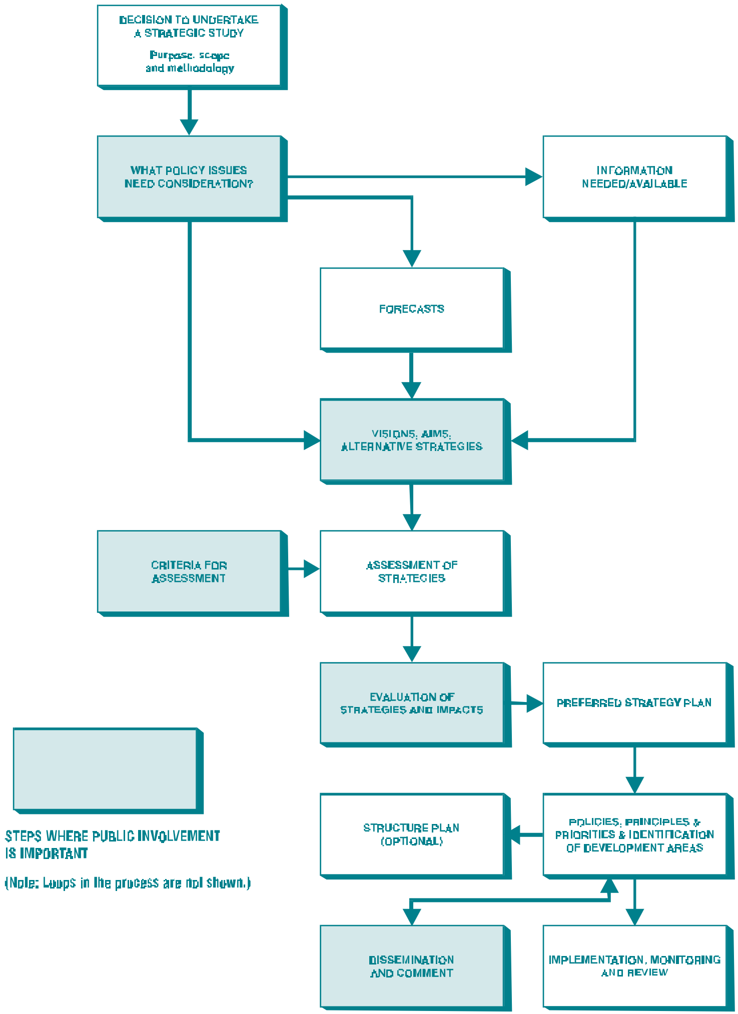



**Figure 9: Indicative model of a strategic planning process.**

In predominantly rural areas, the set of policies or principles may be related to preferred dominant land-uses, reserves, major transport networks, urban areas and villages, and major infrastructure. In established urban areas and developing areas, the policies or principles may relate to housing and employment location, living areas and neighbourhood densities, major centres, open spaces, transport corridors and infrastructure.

In most cases, there is merit in an integrated approach towards strategic planning. The overall structure of a strategic plan may then consists of the following components (refer to Figure 10):

- a vision statement, supported by strategic aims and objectives;
- a set of policies or principles derived from the objectives, to be used for planning and managing development;
- an indicative structure plan and/or a broad zoning plan;
- identification of policy action areas (which can include development areas and housing strategies);

- a statement on resources and the priorities for planning and development using available resources;
- a statement on coordinated implementation;
- mechanisms for monitoring and review.

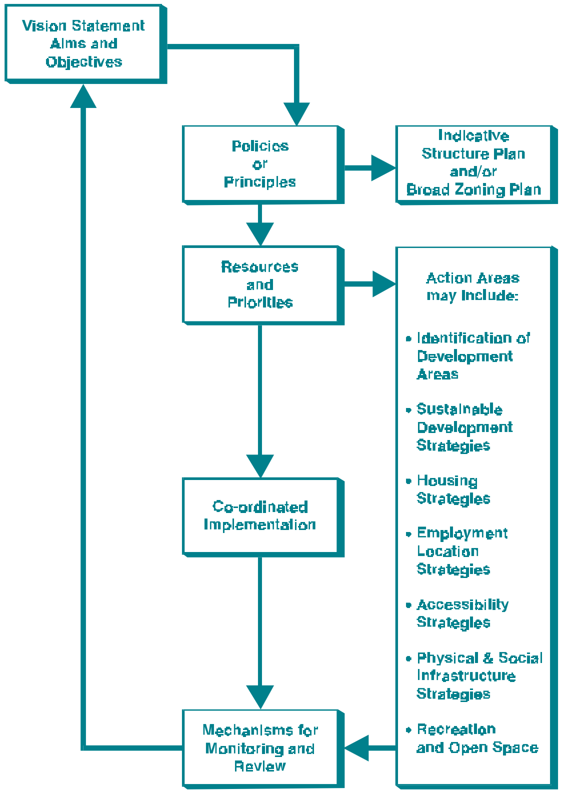



**Figure 10: Possible output of a strategic planning process.**

Progress towards implementing a strategic planning process will depend on resources and priorities. It is not intended nor implied that short-term decisions on development applications for housing should be deferred until such strategies and plans are in place.

The commitment of the principal stakeholders must be stressed. Collective learning and selective decision-making are key features of a successful planning process and there are several stages in the planning process where community involvement is essential. These stages are highlighted in Figure 9, and various techniques are available (see PNP 2).

Identifying and securing resources over the longer term are important for implementation. Strategic planning can be a resource-intensive activity, and must be justified by practical and achievable outcomes.

It is important to monitor, evaluate and review the strategic plan at regular intervals. It is generally not necessary to repeat the process unless there are significant changes in demographic and other conditions, or different views about objectives and desirable outcomes.

## Some Possible Applications of a Strategic Plan

A strategic plan sets the context for development planning, design and development control, and provides a broad explanation for the kind of development local authorities seek to achieve. Four examples show how it can be used for the purposes of AMCORD.

### Defining living area zones

The strategic plan can be used to identify the development opportunities and constraints that apply to the area or parts of it. If the plan is used as a zoning plan or if a zoning plan is derived from it, broad zoning with an emphasis on environmental performance is preferred to prescriptive categorisation of land use and housing. In this way, choice and flexibility are increased while amenity and environmental quality can be assured.

### Identifying development areas

The strategic plan identifies the location of future development areas, establishes priorities for their development and provides an input into the preparation of development plans (or development control plans).

### Developing a housing strategy

A housing strategy can be used to identify deficiencies and opportunities for alternative housing forms in a local area. The strategy will generally identify matters including demographic change, household structure, housing type, choice and location.

Developing a housing strategy can assist a council develop planning policies and controls which:

- are responsive to changing economic and demographic trends;
- encourage the provision of housing for identified special needs groups;
- provide for greater variety and flexibility in dwelling types in the local area;
- result in improved access to a range of existing services and facilities;
- enable local residents to remain in their local community;
- provide a greater degree of certainty for developers and the community in the redevelopment of new and existing neighbourhoods;

- provide clear standards and guidelines about the preferred locations for alternative forms of housing;
- provide local area design control and guidance;
- ensure an up-to-date legislative framework within which development applications are prepared and assessed.

**Establishing policies or principles of development performance**

The strategic plan sets policies on a wide range of matters (eg water quality, heritage, accessibility), providing councils with a basis for determining:

- what performance conditions should be applied to particular zones or development areas;
- what Performance Criteria should be included in the Design Elements of AMCORD (Part 2) when councils adapt them to their needs;
- how such Performance Criteria should be interpreted when development applications using the performance approach are being prepared and assessed.

## Important Considerations in Preparing Strategic Plans

There are important aspects in preparing strategic plans or overviews in the context of AMCORD.

They are:

1. Sustainability and residential development
2. Housing needs
3. Urban form and density
4. Transport, employment and accessibility
5. Major infrastructure

and are explained on the following pages.

# 1 Sustainability and Residential Development

There is a growing awareness of the need to create a sustainable urban environment, ie one in which there is a balance between what the community needs, and what it can afford and can sustain, and the long-term preservation of the environment.

Housing is a major component of the urban environment. Its location, type, density, design and the infrastructure it needs interact with the urban environment as a whole. Principle issues include:

- how to combine the need for sustainable urban environments with the need to satisfy a diverse and changing housing market;
- how to balance the need to provide affordable housing with the often increased upfront development costs associated with environmentally sustainable initiatives and technologies.

## Relevant Considerations in Preparing Strategic Plans

### Minimise the use of resources

There should be recognition of the relationships between urban form, housing density and type, transport systems and street design, the use of non-renewable resources and energy, and subsequent greenhouse impacts.

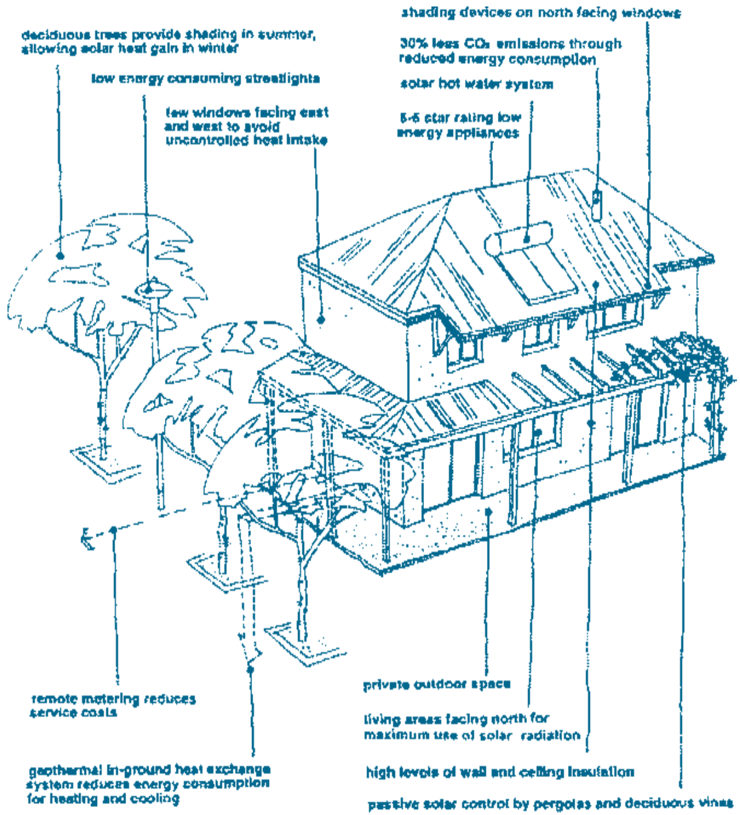



**Figure 11: Application of principles of sustainable housing, New Haven Village, Osborne, South Australia. Source: South Australian Housing Trust / MFP Australia**

**Minimise the negative impacts of development**
The location, type and scale of development should be considered in terms of its appropriateness to the environment. Pollution should be minimised through the design and technology of sewage, wastewater, drainage, noise reduction, traffic and other systems.

**Further information on sustainability and housing is provided in PNP 3.**

**Protect sensitive natural systems and habitats from urban expansion**
This includes the need to recognise bioregions based on natural systems (water, soil, air, flora and fauna), to protect these systems from encroachment where some environmental values still remain, and to seek longer-term strategies to withdraw from sensitive areas.

**Environmental performance should replace rigid zoning**
Rigid zoning based on land-use categories is no guarantee that sustainable environments will result. Objectives, Performance Criteria (ie requirements for environmental impact and management) and Acceptable Solutions (indicating examples of appropriate outcomes) provide a better safeguard and offer greater scope for more flexible and innovative planning and design.

# 2 Housing Needs

Housing preferences have helped to shape Australian cities and will continue to do so. However, housing demand is not static.

There are significant changes in the demographics of the population which have implications for housing. Household size is declining so that most households are now composed of only one or two people. The number of households has increased at a faster rate than population growth, and by 2006 almost half of all income units will consist of single persons or childless couples aged over 35 (National Housing Strategy, 1992).

The changing demand is not only a matter of type and quantity, but also of location. There is a growing need for housing which is well located in relation to employment and community services. Many people, as they grow older, want less space and more care, but wish to stay in their local area because of their networks of friends and relatives and the familiarity of the local environment.

Demand for well-designed and well-located housing greatly exceeds supply in most major urban communities and this creates pressure on housing price. There is a particular need to develop strategies that will bring well located housing within the financial reach of people who need it.

Housing affordability has become a critical issue for a growing proportion of the population. Home ownership continues to be highly valued in Australian society, but the increasing cost of traditional housing and a diminishing ability to pay have forced the housing development industry to find more cost-effective solutions. The needs of different socio-cultural groups should also be understood.

These changes indicate a need for increased choice and diversity in housing type, location and price, and should be considered in a strategic plan.

## Relevant Considerations in Preparing Strategic Plans

### Develop housing strategies

Changes in housing demand are likely to occur in all communities. The implications may be more profound in larger cities than in smaller communities because of the costs of affordable housing in desired locations. However, in all communities there is a need to address these implications and formulate housing strategies (PNP 4).

**Consider location, affordability and choice**
In housing options are needed to help make existing low-density suburban areas more sustainable by increasing diversity and density. Affordable housing must support the needs of changing populations in some locations while recognising the desires of established communities to retain existing attractive urban character.

**Further information on housing needs is provided in PNP 4.**

**Figure 12: Small lot housing whcih responds to changing housing needs (Queanbeyan)**

# 3 Urban Form and Density

The location, density and type of housing is strongly correlated with urban form. Options are needed to help make existing low-density suburban areas more sustainable and to offer affordable housing in locations that support the needs of a changing population. No single urban form can achieve all environmental, social justice, economic and lifestyle requirements. The most acceptable approaches are: selectively making cities more compact; protecting productive agricultural land; increasing housing variety, access and affordability in the inner, middle and outer parts of existing cities; and developing district centres in favoured locations to make employment opportunities more widely available (as well as reducing pressures on central business areas).

Compact urban forms can be created through a variety of planning provisions that can be applied generally or to specific areas. Selective increases in density can offer more varied forms of housing than are currently available and may reduce development costs, particularly public sector costs. While the demands for improved air quality and energy conservation through reduced reliance on private transport suggest more compact cities, there are other environmental factors that may offset some of the savings in land. These factors include the need to improve water quality, reduce compact residential stormwater run-off, protect dwellings from traffic noise and provide additional open space. In

**Figure 13: Net residential density.**

addition, residential land represents only about 40-50% of total urban land, thus limiting the degree to which compact residential areas can contribute to more compact cities.

## Relevant Considerations in Preparing Strategic Plans

Planning authorities are encouraged to adopt the following definitions of density:

- site density

Site density represents the ratio of dwellings to the area of the site they occupy. Site density is the preferred definition for density comparisons between projects.

- net residential density

Net residential density represents the ratio of the number of dwellings to the area of land they occupy (including internal streets plus half the width of adjoining access roads that provide vehicular access to dwellings , but excluding public open space and non-residential land areas) — see Figure 13.

- neighbourhood density

Neighbourhood density represents the ratio of the number of dwellings to the area of land (including associated neighbourhood or local facilities) they occupy. The area includes internal public streets, all areas of public open space, local or neighbourhood shops, primary and secondary schools, local community services, local employment areas, and half the width of adjoining arterial roads.

- urban centre dwelling density

Urban centre dwelling density represents the ratio of total dwellings in an urban centre to the area occupied by the urban centre.

**Determine neighbourhood density levels**
There can be different levels of density for different development areas. Maximum and minimum density levels can be defined and related to existing or proposed infrastructure capacity and desired planning outcomes. AMCORD does not stipulate maximum or minimum density provisions as this must be done at State and local government levels. Site or net residential densities should be determined during the development planning stage to provide a practical guide to developers, residents, real estate agents and municipal representatives of what can be achieved on particular sites.

**Encourage opportunities for diversity in dwelling type, location and price**

The scope for diversity in dwelling type, location and price must not be limited. Indirect measures of density may unduly constrain such diversity. The use of performance-based zoning can help to reduce this risk.

**Further information on urban form and density is provided in PNP 5 and Pnp 6.**

# 4 Transport, Employment and Accessibility

In order to create more sustainable communities, the use of non-renewable resources should be reduced and the environmental, social and financial impacts of development minimised. There are two major implications for the planning of residential development that relate to transport: the link between land use and dependence on the motor car, and the impact of traffic on the residential environment.

The car is used for 75 per cent of urban trips in Australia. There are strong environmental, social and economic arguments for reducing dependence.

Car travel is greatly influenced by the distribution of land-use activities and their relationship to public transport. Accessibility and density are key, linked aspects. Accessibility should be a matter of choice of using public transport, pedestrian and cycle routes, or the motor car. The choice is constrained when public transport routes cannot be economically provided because densities are low, the origin and destination of trips are dispersed, and no thought is given to the provision of safe and convenient pedestrian and cycle routes.

A closer fit between housing, employment and transport modes is required. Increased housing densities alone may not be sufficient to encourage greater use of public transport. Employment and other major destinations should also be concentrated around public transport stops and stations.

Many dwellings are exposed to high levels of traffic, affecting the safety, health and amenity of their residents. Residential planning and dwelling design must recognise the impacts of traffic, and the most effective way of achieving this is at the strategic planning stage.

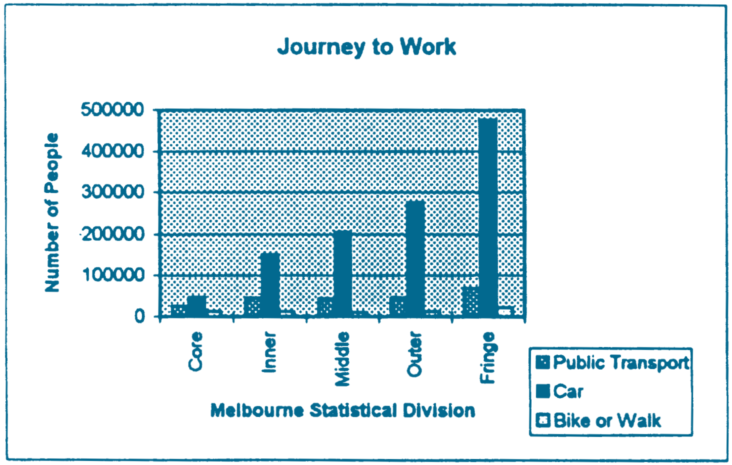



**Figure 14: Modal split for work trips by zone, Melbourne 1991. Source: ABS 1991 and Victorian Department of Planning and Development**

## Relevant Considerations in Preparing Strategic Plans

**Relate employment nodes and housing to public transport infrastructure**
The location and type of housing and the location of employment areas should be related to public transport routes. Locations near railway stations, tram and bus stops should be given priority for higher density housing and/or employment nodes.

**Set densities at a level where public transport can be effective**
Neighbourhood residential densities should be set at a level where a good quality and cost-effective public transport service can be provided.

**Link transit-based housing to transit-based employment**
A closer fit between housing, employment and transport modes is required in order to maximise the benefits of the transit system.

**Provide for pedestrians and cyclists in residential development projects**
Planning for facilities for pedestrians and cyclists is central to an integrated housing strategy, and not a subsidiary to planning requirements for the motor vehicle.

**Link housing and local land use**
When housing is linked closely to the services and activities people need, there is an opportunity to reduce the need for long-distance travel, and the use of the motor car can potentially be reduced. Mixed-use zoning, multiple-use sites and close proximity of housing to activity centres should be considered as part of such a housing location strategy.

**Protect residential areas from vehicle traffic**
An important part of a housing strategy is the protection of the local residential environment from transport-related impacts, such as traffic noise, air pollution and reduced safety. This can be done by creating precincts, traffic calming and built-in protection of housing along transport corridors.

**Provide adequate accessibility for vehicles**
Car travel and delivery of goods will continue to be of major importance in all communities. Adequate accessibility must be provided without compromising safety and amenity.

**Further information on transport, accessibility and the local environment is provided in PNP 7.**

# 5 Major Infrastructure

The infrastructure is the framework that supports economic and social activity. There are two categories of infrastructure that relate to residential development:

- physical infrastructure (eg utility, drainage and transport systems);
- social infrastructure (eg schools, hospitals and community facilities).

This subsection refers only to those infrastructure components relevant in a strategic context. The provision of local infrastructure and funding aspects are considered as Part of Development Planning (Section 1.4).

The approach to the relationship between housing and infrastructure differs for new urban areas and established areas. In new urban areas, the primary focus is on cost-effective, timely and environmentally sustainable provision. In established areas, infrastructure already exists. The issues to be considered are the extent to which the infrastructure can sustain new development; what is needed to maintain it; and how any augmentation or modification can be funded.

As a general principle, new residential development should be provided with all the infrastructure necessary to a functioning community.

Consideration of regional open space at the strategic planning level is important for promoting more coherent vegetation and habitat management strategies. It is also important to ensure that open space strategies are developed in conjunction with stormwater infrastructure strategies to allow for multiple-use drainage approaches.

Coordination in the provision of infrastructure is important as many stakeholders and agencies are involved in the process. The key tool is the urban land release system, which aims to maximise cost-effectiveness of urban growth and to ensure timely delivery of services to new communities. Land ownership and land assembly are important aspects in the design and implementation of any urban release program.

In established areas, there is a nexus between the scope for infill housing and redevelopment and the existing urban infrastructure. Urban consolidation may help to offset declining populations, thus using existing infrastructure systems more efficiently and making the replacement of ageing infrastructure more cost-effective. However, it may also accelerate the need for replacement, involving an opportunity cost.

## Relevant Considerations in Preparing Strategic Plans

### An integrated approach is needed

An integrated approach towards residential development in both fringe and infill locations and infrastructure management is needed to increase the opportunity for more sustainable urban environments.

### Urban release programs should be the basis for urban expansion

New development on the fringes should be based on urban release programs and cover all aspects of the infrastructure needed for the new population.

### Infrastructure data bases should be established

The public cost of adapting or expanding the existing infrastructure associated with providing housing must be assessed. Asset management requires an accurate and comprehensive data base. Such a data base should be established and maintained.

**Futher information on infrastructure is provided in PNP 8.**

### Provide Infrastructure that the community needs and can afford

The provision of housing cannot be divorced from the provision of physical and social infrastructure (PNP 8). The issues of needs, costs and cost recovery are fundamental questions that must be addressed (PNP 9).

### Housing location should take account of infrastructure capacity

Thresholds in the provision of capital-intensive infrastructure (such as headworks and trunk mains) should be established and the implications for residential expansion, infill and redevelopment should be assessed. In established areas, priority should be given to the development of sites for housing where the costs of infrastructure adaptation are relatively small.

### The link between densities and infrastructure should be clearly defined

Neighbourhood densities should be set at levels that take account of the overall costs of housing and infrastructure (ie the private and social costs).

### Provide for open space

Provision for open space should be made, taking account of vegetation and habitat management strategies and multiple use drainage approaches.

## Application: A Greenfields Illustration

In greenfield situations, some of the critical issues—which may be expressed as strategies or policies—include:

- principles for housing for particular categories of consumers or housing choice;
- the provision of local employment;
- sustainable forms of transport, health, safety and energy consumption;
- protection from noise, flooding, bushfires, and contamination of water, soil and air;
- provision for community development.

**Land suitability and availability**
Opportunities, constraints and available resources, including the scope for sustainable development.

**Land use, transport and infrastructure**
The general location of areas to be developed, their urban form, neighbourhood residential density, population and employment capacity, accessibility, physical and social infrastructure, and relationship to areas that are developed, areas that are not to be developed and areas that may be developed later. This information can be expressed in diagrammatic form in a structure plan.

**Development sequence**
The staging of development, including the timing for provision of major infrastructure.

**Action areas**
Identification of development areas and the strategic intentions for each area.

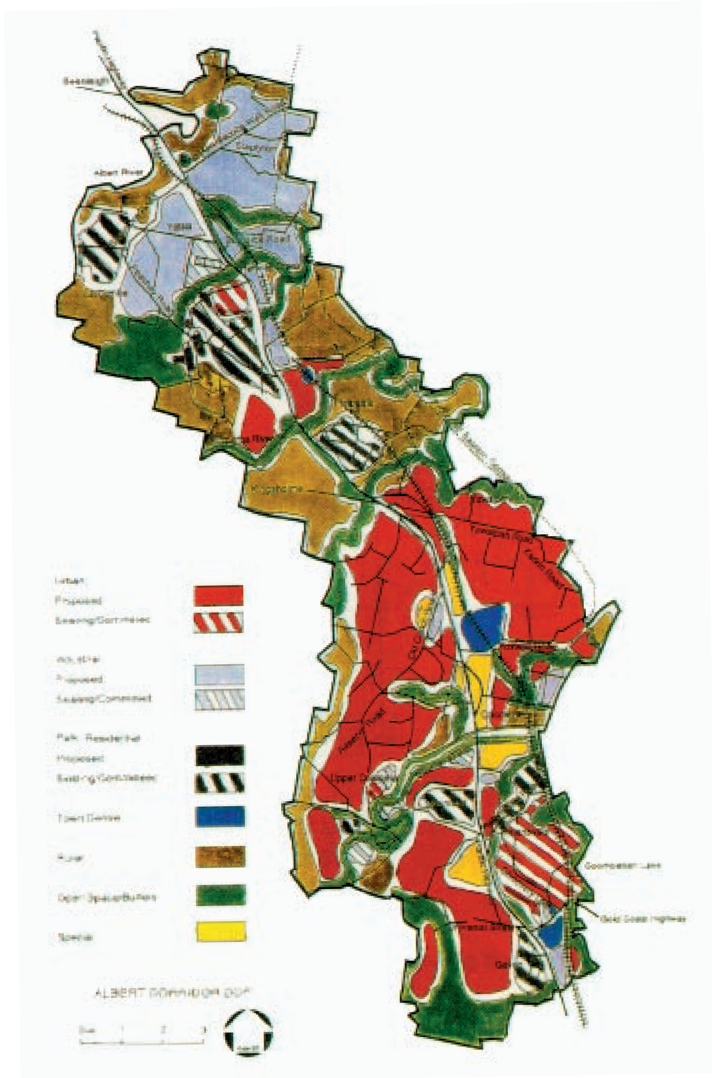
**Responsibilities**
The respective responsibilities of the public and private sectors, including the preparation of detailed plans, land assembly, infrastructure funding, the provision of services and facilities, and development coordination.

**Consultation**
Participation of the public sector agencies and the development and housing industry during the preparation of the strategy is essential. Community involvement is also essential. The form and degree of community consultation is dependent on the local situation.

## Presentation

At the conclusion, publication of the intentions in easily understood form with an invitation to comment.

**Figure 15: Albert Corridor: An example of Strategic Planning in a new development area.
Source: Queensland Department of Housing, Local Government and Planning.**



# Application: An Established Area Situation

Although the strategic planning process for established areas is similar to that in greenfield situations, there are some significant differences. There is an existing community, an existing built form with its own character, an environmental context, existing infrastructure, a pattern of roads and streets with traffic and its associated problems, and issues of privacy, property values and community expectations.

The eight figures below illustrate a strategic planning process for the development of housing strategies and the preparation of development area plans. The steps that are outlined are presented in diagrammatic and greatly simplified form.

**Population and employment scenarios (Figure 16)**

It is possible, for instance, to assume that there will be further population and employment growth, but it is also possible that population and employment levels may be maintained or reduced. There may have been a loss in population due to ageing of the population or a loss in local employment due to changes in the industrial base, and a local authority may wish to redress any imbalance.

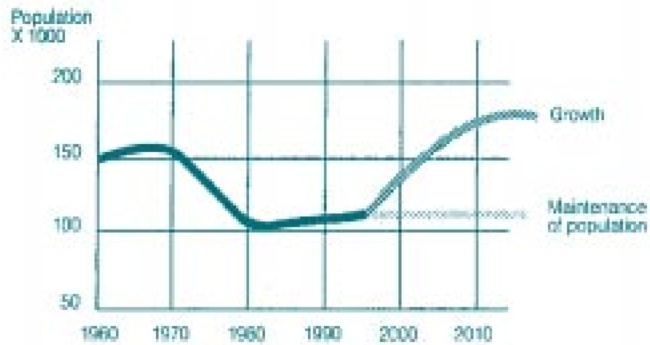



**Figure 16: Population growth scenarios**

**Housing Implications (Figure 17)**
The impact of such population assumptions on the provision of housing can be assessed. Even if existing population levels were maintained, there may still be a need to construct new dwellings, not only to replace older dwellings but also to provide for changes in household composition.

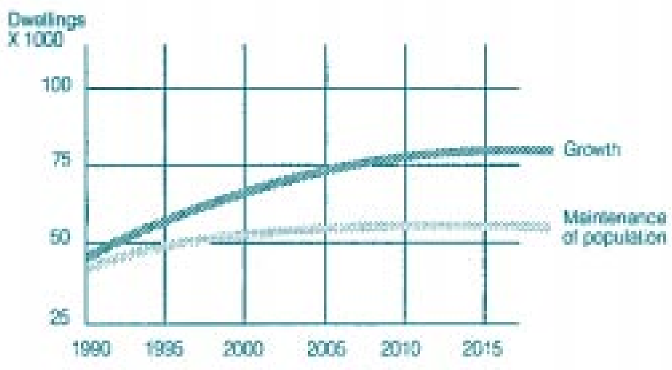



**Figure 17: Housing Scenarios.**

**Infrastructure assessment (Figure 18)**
There may be areas where there is spare capacity or a need for augmentation or replacement. For reasons of simplicity, transport and utility infrastructure are combined. In practice, several overlays would be needed to give an accurate description of infrastructure capacity.

Figure 18 only indicates physical infrastructure; social infrastructure is equally important.

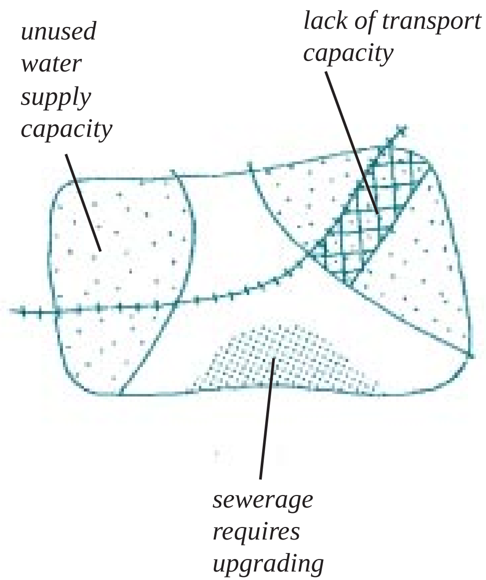



**Figure 18: Infrastructure capacity.**

**Environmental assessment (Figure 19)**
Areas where there may be significant environmental problems that can be resolved only in a longer-term context need to be identified. Excessive exposure to traffic noise, the penetration of through traffic into local streets, and impacts from adjacent or former industrial uses are examples of such problems.

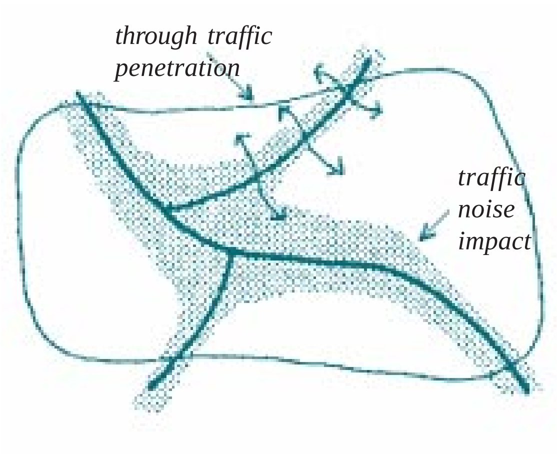



**Figure 19: Quality of the existing environment**

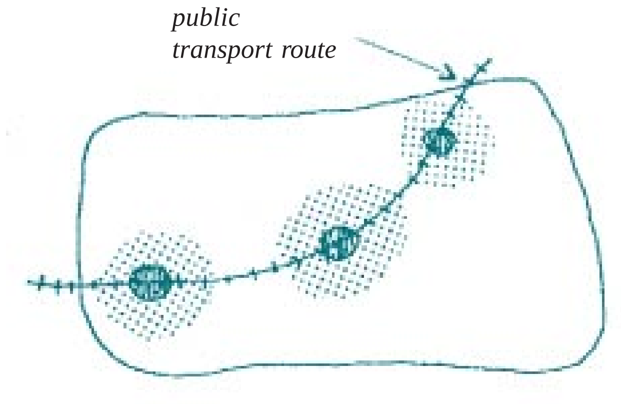



**Figure 20: Accessibility to public transport.**

**Public transport accessibility (Figure 20)**
Areas within close proximity to railway stations, tram stops and other public transport are primary candidates for higher density urban development. Accessibility to jobs, facilities and services should also be considered at this stage (see PNP 7).

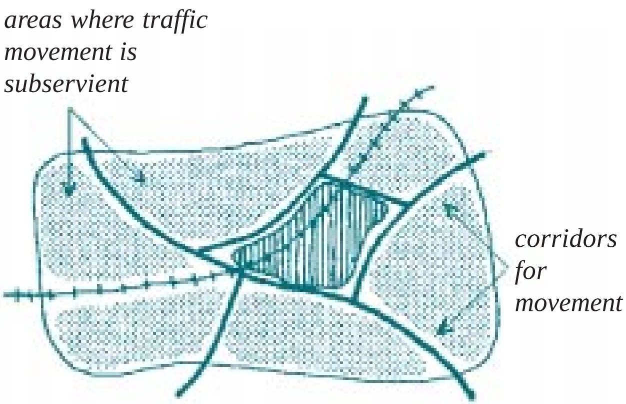



**Figure 21: One aspect of environmental protection: precincts and corridors**

## Environmental protection (Figure 21)

Environmental protection is a key factor. Figure 21 addresses only one of these factors: the protection of existing areas from through traffic (by creating precincts) and improving the performance of major traffic routes (by creating corridors). The principle of precincts in which the environment is dominant and traffic becomes subservient is well established and used extensively in the planning of new urban areas. The principle of creating corridors allows for forms of residential development in which the impact of traffic is reduced. Another significant factor is the management of urban run-off.

## Structure plan (Figure 22)

Some of the components of a structure plan are shown in Figure 22: eg land use, density, transport, precincts and corridors. The structure plan can form the basis for defining development areas (ie areas for which detailed development plans are prepared). The planning of development areas is considered in Section 1.4.

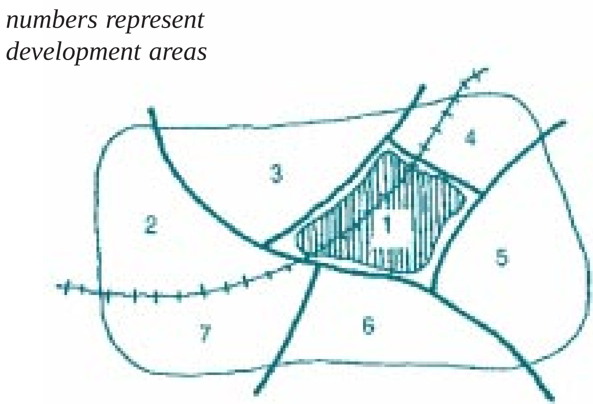



**Figure 22: Structure plan**

**Housing targets (Figure 23)**
Figure 23 presents indicative housing targets for each of the local areas. Depending on housing projections, infrastructure conditions, accessibility and environmental protection requirements, different targets may be set.

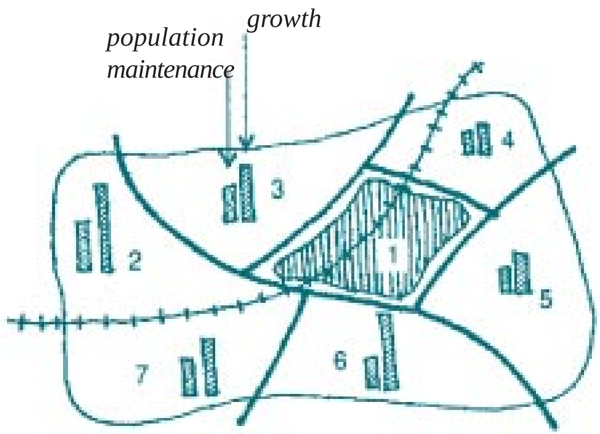



**Figure 23: Indicative housing targets by development areas.**

## Conclusion

It must be stressed that there are many other factors in the strategic planning process that have not been illustrated. In addition, there are loops in the process where it is necessary to return to an earlier step.

In the examples above, an approach towards the development of local housing strategies was illustrated. Regional housing strategies are also needed. A regional strategy can set housing targets for the region as a whole or in specific locations where this is in the long-term public interest for the region.

# 1.4 Development Planning

## Purpose and Scope

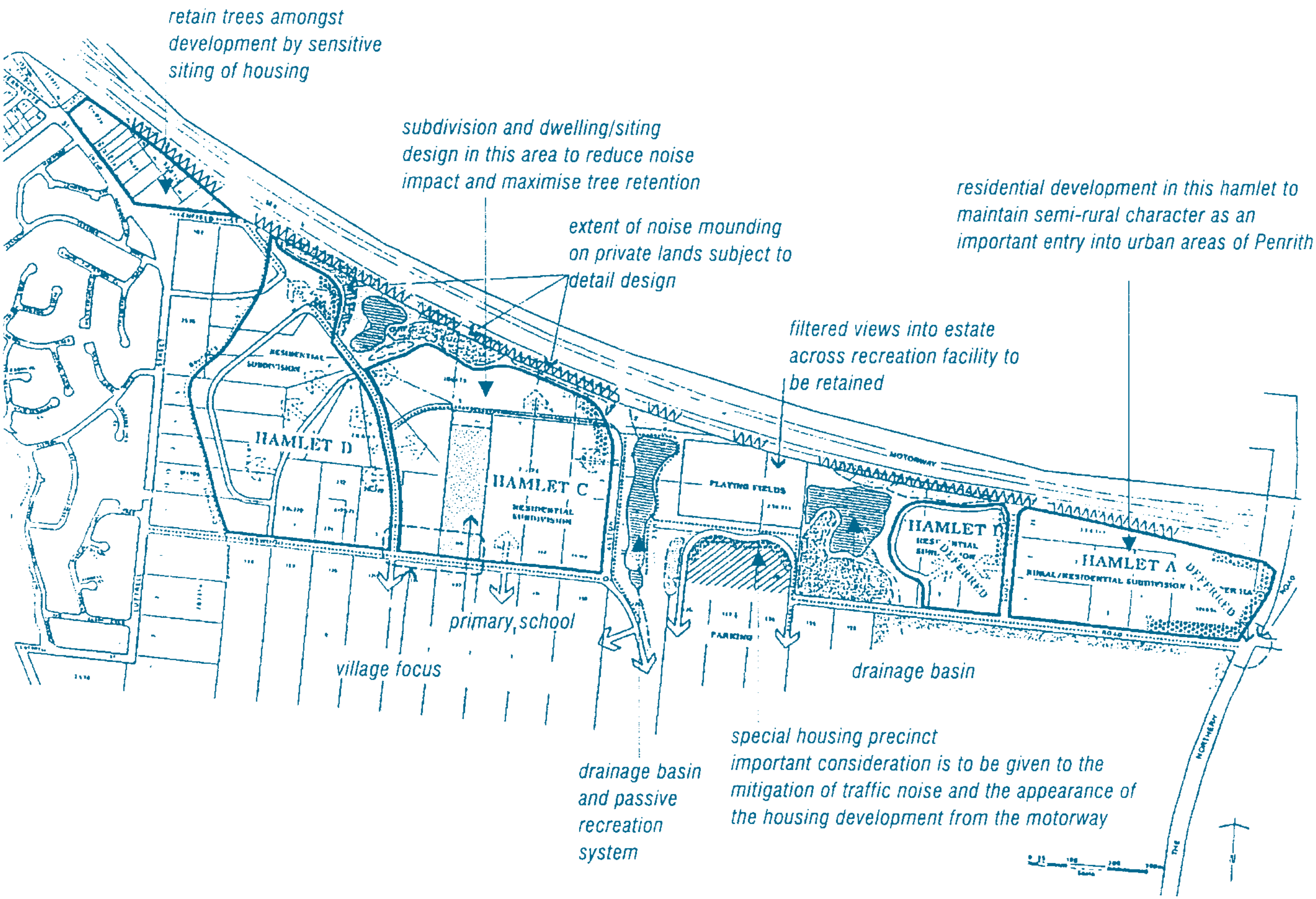
Development planning is the process where the elements determining the built form for a defined development area are considered together and viewed in a shorter-term and detailed perspective. In the context of AMCORD, a development area may be defined as containing one or several neighbourhoods or precincts. A development area may be a local area in the context of ILAP, an action area in the context of a local strategic plan, or an area covered by a development control plan as is common in some States.

Zoning alone does not provide the conditions necessary to guide the development of new urban areas or the improvement of established areas. Development planning can provide more specific guidance. It is the means by which the policies and principles determined through strategic planning form the basis of integrated development or redevelopment of specific local areas.

The output of the process is a clear statement of planning intentions that can be used for preparing and assessing development proposals and for undertaking public improvement programs.

The scope of development planning can encompass the following functions:

- giving effect to strategic plans and policies;
- indicating intentions for all aspects of the future development of the area, including the performance conditions that apply;
- determining appropriate Performance Criteria for inclusion in the council's version of the Design Elements of AMCORD (Part 2);
- providing information on how such Performance Criteria should be interpreted when development applications using the performance approach are being prepared and assessed;
- providing guidance on the kind of information to be included when submitting proposals;
- justifying resources required, establishing priorities and clarifying responsibilities of the public and private sectors;




GLENMORE PARK
NORTHERN HAMLETS DEVELOPMENT CONTROL PLAN
PENTHRITH CITY COUNCIL AUGUST 1995

**Figure 24:** An example of a **development plan** in a greenfield context

- coordinating the improvement programs of public authorities and integrating them with private and public developments;

- serving as a communication channel with the community, other public authorities and the housing development industry.

Development planning is needed for all local areas where significant changes are likely to occur (such as in new housing areas) or where there is a need to improve the performance and quality of an area. But even in areas where significant changes are unlikely (such as in some country towns or established suburbs), there may still be an advantage in moving towards a more performance -based zoning approach.

## Development Planning in the Context of AMCORD

The above descriptions of development planning functions are valid for many development planning activities. Although their application in the context of AMCORD depends entirely on local needs and conditions, there are also common features. These include, for example, shifting from rigid land-use zoning to performance-based environmental planning and recognising significant factors such as sustainable development.

In the past, development plans were often prepared to provide the basis for detailed land-use control. Additional aspects, such as urban design character, are now often included and performance outcomes (such as the appearance of a street) are being specified in some plans. This shift towards environmental quality and performance outcomes is important, but requires attention to the character and form of development to be achieved.

Development plans should not be confined to land use, but should also include such matters as community and cultural development, community services, urban design, transport and the local environment, local infrastructure, environmental management, and the provision and funding of infrastructure improvements. Development plans prepared in this way help to clarify what is to be achieved, and provide a sound basis for preparing and assessing development proposals.

Development planning can also provide the link with the Design Elements in Part 2. The objectives and development intentions for a

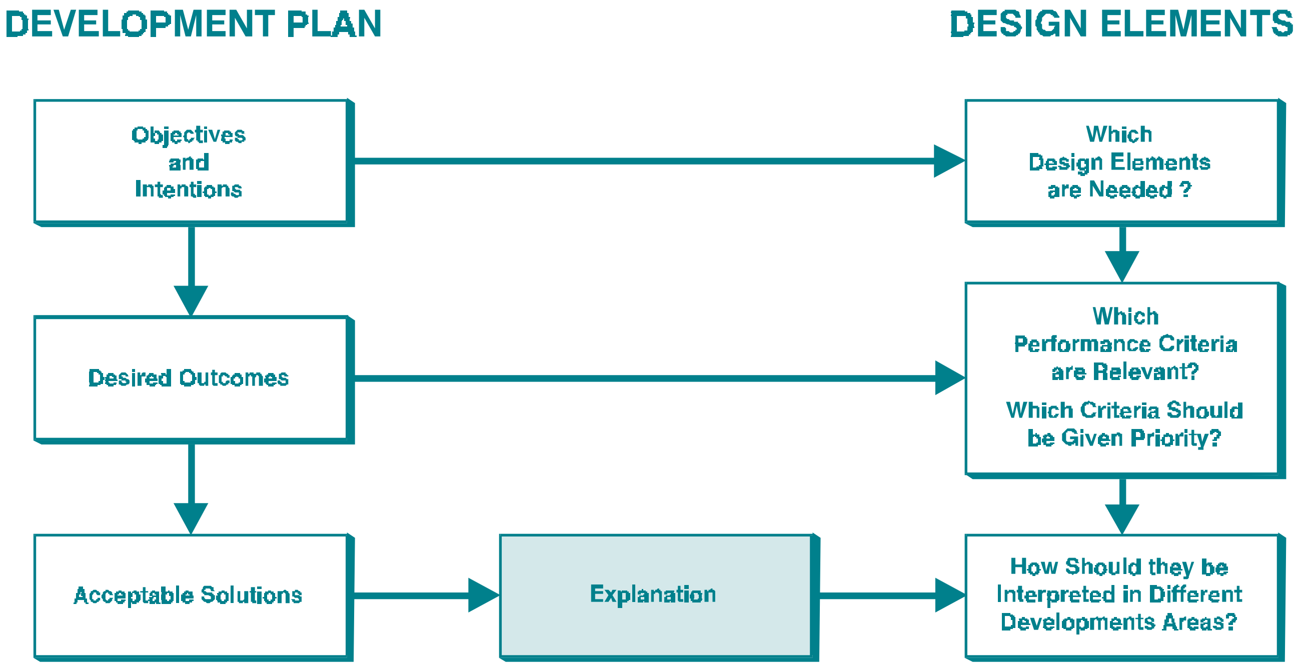



**Figure 25: Justification for design control derived from a development plan.**

particular area may differ from those for another area, even within the same council area. Further, some Design Elements may apply in one but not another area. The desired outcomes for a particular development area will determine which Performance Criteria are relevant (ie which matters should be taken into account) and what are considered Acceptable Solutions for that development area (ie how they should be interpreted)—Figure 25.

For example, Performance Criteria for stormwater quality may need to be specified for a particular area. Some or all of the Performance Criteria in Design Element 3.2 then become relevant. The desired outcome may be a standard of water quality prescribed by State clean waters regulations or a requirement that any development upstream does not diminish the existing quality of any receiving waters at the point of reception.

There are many other examples where the Performance Criteria and Acceptable Solutions may differ from one area to another, eg on-site and on-street parking, open space, building height, and street setbacks.

When desired outcomes for each development area are clarified, there is a clear basis for determining what Performance Criteria should be included in the Design Elements and how they should be interpreted.

In other words, the justification for particular Performance Criteria, and the explanation of what they mean for designing and assessing a proposal in a given area, are found in the details of the relevant development plan.

## The Development Planning Process

There are different ways in which a development plan can be prepared. A simplified model of the sequential steps involved in preparing one such plan is set out in Figure 26.

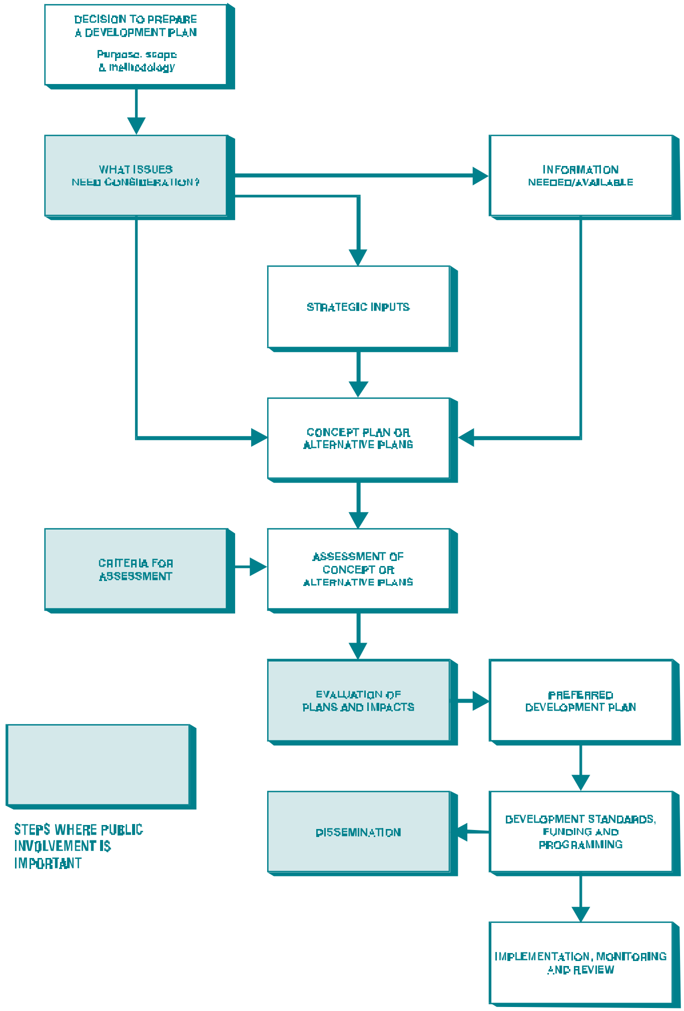



**Figure 26:Indicative model of a development planning process.**

**In greenfield areas**
In a greenfield situation the steps could be:

- Examine and assess the implications of regional and local strategic plans and any environmental and housing strategies that apply to the development area.
- Make a thorough inventory of the physical and environmental characteristics of the area.
- Establish the suitability of the natural environment as a whole (eg air, water, land, vegetation/habitat) for particular types of development.
- Record existing land use and property/ ownership.
- Compile the characteristics of the likely population and local employment.
- Determine the land requirements for categories of land use, based on assumptions about neighbourhood density.
- Consider physical and social infrastructure needs and the sequencing of development.
- Forecast the likely environmental impacts of the planned development to determine whether environmental Performance Criteria and Acceptable Solutions are likely to be achieved.
- Determine the urban design character.
- Define categories of development appropriate for the area.
- Establish performance standards or conditions in relation to environmental management and other factors.
- Develop a concept plan that satisfies criteria of sustainability, accessibility, equity, flexibility, staging and cost-effectiveness.
- Assess the concept plan, consult stakeholders and modify as appropriate.
- Determine how the development or improvements are to be staged and funded, including the kind and level of development contributions (if any) associated with particular categories and locations of development.
- Prepare a consolidated development plan, together with a program for submission to, and decision by, elected representatives.
- Disseminate the plan in terms that can be easily understood.

**In established areas**

The preparation of a development plan for established areas follows a similar sequence, but more information is required and public involvement during the process is essential.

More information is required on the existing community, the built form of development with its character and heritage, transport and its impact on the local environment and existing infrastructure, facilities and services. Urban change often is a matter of concern to local communities and issues such as privacy, property values, community expectations and the impact of traffic cannot be ignored. Public participation in the preparation of the plan can help to identify issues of concern, address them and lead to an understanding and support that may not otherwise be achieved.

These differences are reflected in the following variations to the greenfields model:

- Compile the characteristics of population and socio-economic change; prepare an inventory of existing land use, housing stock, transport networks and other infrastructure; determine the condition of the local environment; and identify the needs/issues/problems of the area.
- Make forecasts of changes in population and housing stock.
- Assess opportunities for, and constraints on, the provision of additional housing; identify issues of conservation and change associated with environmental capacity, physical and social infrastructure, and heritage (these issues should be explored with the involvement of stakeholders).
- Define criteria for assessing alternative plans (again, in association with the stakeholders).
- Develop and assess alternative plans, including the kind, level and sources of resources and programs.
- Evaluate plans in association with the stakeholders.

The content of development plans can vary widely and there is scope for a diversity of techniques.

Inability to undertake development planning should not be an argument for maintaining the status quo and deferring or refusing consideration of rezoning proposals for housing and residential development.

There are intermediate steps that can be undertaken to ensure that there is a reasonable

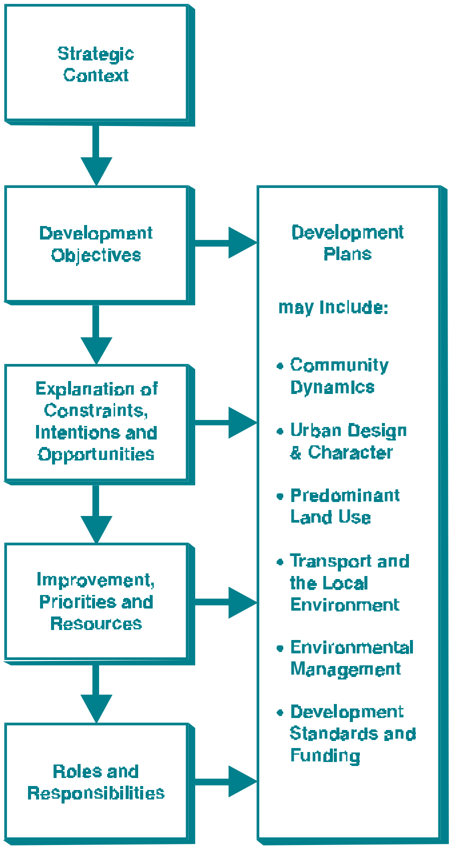



**Figure 27: Possible elements of a development plan.**

basis for conceiving and assessing infill housing projects within the context of infrastructure availability.

For local authorities who seek to introduce AMCORD and do not have development plans or want to review them, the following elements of a development plan may be useful (refer to Figure 27):

- a statement on relevant strategic policies and principles, and information on how they have been applied in the formulation of the plan;
- a statement on general development objectives for the area;
- issues addressed in the development plan and the relationship between them;
- development constraints;
- intentions and opportunities, supported by information on the Performance Criteria and Acceptable Solutions;
- a statement on roles, responsibilities and requirements for developer contributions towards infrastructure development;
- a statement on urban improvement (where appropriate), resources and management;
- information on coordinated implementation, including intentions for monitoring, evaluation and review.

# Important Considerations in Preparing Development Plans

There is considerable scope for development planning in both developing and established communities. However, there are several important aspects in preparing development plans for the purpose of implementing AMCORD. They are:

1. Community dynamics

2. Urban character and design

3. Transport and the local environment

4. Environmental management

5. Development standards and funding

6. Approval processes

and are explained on the following pages.

# 1 Community Dynamics

A central activity in any development planning is to determine what kind of community is to be accommodated in the area.

In new urban areas, questions arise about population, housing and associated services and facilities, net residential density, urban character and design, employment, provision for transport, environmental management, and funding and coordination of the infrastructure. In established areas, questions arise about the need and scope for new development or for improvements in order to cope with changing social, environmental and economic conditions.

Many aspects are technical in nature and some of them will be described in the following pages. However, there are also important issues of character and identity that are matters of value. Community involvement can be of considerable benefit here, especially in established areas.

Community involvement is a critical factor in shaping the quality, equity and efficiency of the built environment. The most effective form of consultation is that which clarifies upfront the character of the built environment and the scope for housing development. In this way, there is a sense of ownership in the shaping of the environment and both the community and the housing development industry know what to expect.

Conflicting views within a residential community are inevitable. Local communities tend to resist change, often in the face of policies that have the greater community interest at heart. Consultation, therefore, does not necessarily produce solutions acceptable to all parties.

However, if conducted in a way where its purpose is explicit and appropriate techniques are used, consultation should increase informed discussion and the possibility of a strategy, plan or proposal being accepted.

**Figure 28: Community input at the precinct level.**

## Relevant Considerations in Preparing Development Plans

### Establish a data base

There is a need to understand the physical and socio-economic characteristics of the area. This should include land use and property holdings, population and households, and other aspects that determine the characteristics of the existing community. Similarly, a data base of infrastructure assets should be prepared.

### Identify likely change

The strategic plan should identify any likely longer-term changes in population and housing characteristics and other aspects of the area's development. However,
shorter-term factors will also influence the future development of the local community.

### Understand constraints and opportunities

Understanding the constraints and opportunities in the future development of the area is essential, but constraints should not necessarily be accepted at face value. This is particularly where there are entrenched 'not in my backyard' attitudes. It is often possible to overcome constraints provided other measures are taken to protect essential qualities.

### Consider options and impacts

There is generally merit in exploring alternatives by making different assumptions and assessing likely impacts. This can be a powerful learning activity and should include the local community.

### Evaluate with the community

Evaluation of the options and impacts should, wherever possible, be undertaken with the local community. There should be a clear demonstration of how community views have been incorporated in the development plan.

**Further information on social impact assessment is provided in PNP 9.**

# 2 Urban Character and Design

Urban design involves understanding how places are made, how people experience them, and how the making of places may impact in other ways, eg environmentally, socially and economically. This understanding must then be translated into three-dimensional form, and involves shaping or influencing the physical form of places to achieve quality environments. While there is emphasis on physical design and appearance, urban design must also deal with the workings and the social use of places, and aim to satisfy the full range of human needs.

All forms of development have urban design implications that need careful consideration at the upfront planning stage. The development plan(s) should address the urban design consequences, including the relationship of these special areas to the wider context.

After the desired future character and qualities of local distinctiveness have been identified, urban design plans and policies can be prepared that take into account the local context and other planning needs.

Local precinct design guidelines can be developed to help clarify the Performance Criteria included in the council's version of the Design Elements of AMCORD (Part 2). They may include land form, landscape, streetscape, site layout, built form and heritage.

## Relevant Considerations in Preparing Development Plans

**Recognise the role of the natural environment**
The natural environment plays an important role in shaping the character and identity of communities and places, and this should be recognised from the start.

**Identify existing character and heritage**
Urban character is defined by many factors. Together, they affect our perception and understanding of a place. Within a municipality there are usually several local areas with distinctly different urban characters, some of high quality and others in need of significant improvement.

**Enhance sense of place**
Local communities value their distinctiveness. Where the local identity is strong, it is often referred to as that area's sense of place. Creating or maintaining and enhancing a strong sense of place should be a key aim, whether in an established area or a greenfields situation.

## Define future urban character

There is a need to identify how densities can be increased (if required), and what sort of urban character is appropriate, while maintaining or improving the essential qualities of an area. Community involvement is important in established areas to achieve community acceptance and ownership of a changing urban environment.

## Identify scope for new housing

When ways of achieving housing and population targets are being identified, some opportunities usually arise for housing in alternative forms and special locations (such as 'shop-top' housing, or other forms of development, and other mixed-use developments).

## Determine policies for public spaces

A useful approach is to develop policies for the improvement of public spaces. This enables the community to see how the overall vision for the area will be translated into physical changes, while demonstrating an integrated approach. It also suggests a partnership with the private sector in which each has a role and obligations in caring for the urban environment.

**Figure 29: New urban housing, designed to respond to the existing character while increasing site density.**

**Further information on urban character and design is provided in PND 9.**

# 3 Transport and the Local Environment

In the planning of residential areas there must be a careful balance between transport needs and protection of the environment. There should be accessibility, choice in mode of transport (private vehicle transport, public transport, walking and cycling), cost-effective provision, operational efficiency and environmental protection.

Residential areas should not be exposed to traffic noise and should be safe for all street users. It should be possible for pedestrians and cyclists to cross residential streets safely and without significant delay. Residential areas should be connected to public transport stops, schools, shops, local employment and playing areas by safe and direct pedestrian and cycle routes. They should not be severed from adjoining areas by major transport barriers.

In order to satisfy these principles, transport and the environment must be managed in an integrated manner at the development planning stage. The concept of environmental traffic capacity can be a useful tool.

Environmental traffic capacity can be defined as the maximum number of vehicles that should be permitted to pass through a given environmental situation over time and under prevailing environmental conditions. Major factors are exposure of residents to traffic noise and volumes, and exposure of pedestrians and cyclists to dangers from excessive vehicle speed.

In the planning of new residential areas, there are opportunities for establishing safe and quiet precincts and corridors for movement from the beginning. Performance conditions can then be defined which, as development proceeds, can achieve an acceptable balance between accessibility and environmental protection. In established areas, traffic calming plans can be prepared and implemented with similar results.

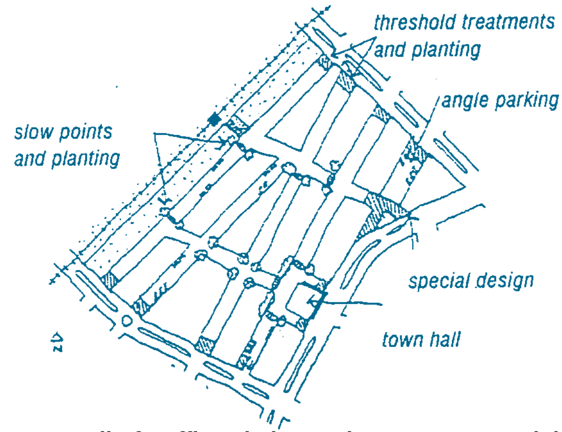



**Figure 30: Detail of traffic calming and streetscape work in the Town Hall Precinct, Port Melbourne.**
**Source:City of Port Phillip, Vic.**

## Relevant Considerations in Preparing Development Plans

**Increase choice in transport modes**
Sustainable development requires that primary attention be given to providing modes of transport other than the private car.

**Housing location and net residential density should be related to transport**
Accessibility is the key factor. Unless there are special reasons for departing from this principle, areas with a high level of accessibility should be developed at higher densities than those with a low level of accessibility.

**Traffic calming should be part of development plans for all areas**
Housing should preferably be located in environments or precincts protected from high traffic volumes, vehicle speeds and traffic noise.

**Housing along traffic routes needs protection**
Where housing is provided along traffic routes, environmental performance standards (eg relating to the design of exposure to traffic noise) should ensure that such housing provides adequate protection of the residents.

**Opportunities for integrated development should be maximised**
There may be opportunities for ‘transit-oriented development’ and ‘urban villages’ in new areas and on large infill sites. In such areas, pedestrian accessibility to public transport stops and stations, land use and housing layout should be designed and developed together.

**The needs of mobility impaired people should be recognised**
These needs are reflected in housing location, safety and design of transport facilities. All housing environments should be capable of adaptation for use by mobility impaired people.

**Further information on transport, accessibility and the local environment is provided in PNP 7.**

# 4 Environmental Management

Environmental management is needed to create more sustainable residential environments. It involves:

- protecting and responsibly using natural resources, such as land form, landscape, climate, water and energy resources;
- protecting residential areas and housing developments from traffic noise, air, water and soil pollution, flooding and bushfires, and natural or industrial hazards;
- ensuring that new residential development does not create environmental problems, such as polluted urban run-off and the disposal of domestic waste.

The following topics are important in this context:

- biodiversity, land form, and landscape;
- soil contamination;
- climate and energy efficiency;
- noise, air, and water pollution;
- household waste;
- flooding, bushfire, and other natural or industrial hazards.

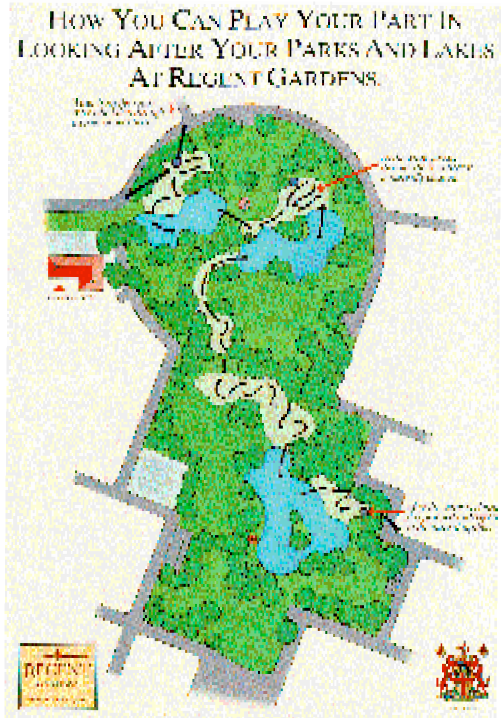



**Figure 31: Community education regarding stormwater quality at Regent Gardens, Oakden, SA.**

**Further information on environmental management is provided in PNP 10.**

# Relevant Considerations in Preparing Development Plans

**Relate development to land**
The biodiversity, slope and orientation of land, and the existence of any foundation difficulties such as rock outcrops, reactive clays, landslip-prone areas and drainage areas, should influence the form and type of residential development.

**Identify contaminated sites**
There are many sites that have a residue of harmful chemical substances. Special conditions apply where they are to be restored and made available for residential purposes.

**Design for climate**
Design for climate includes use of the sun, shade and cooling breezes and reducing exposure to wind to ensure a level of comfort in the dwelling.

**Design for energy efficiency**
Solar access to north-facing living area windows offers the greatest energy benefits in temperate and cooler climates. In hot climates, shade and ventilation are more important.

**Provide protection from noise**
Traffic noise exposure can be reduced by planning street networks where traffic volumes do not exceed 3000 vehicles per day (vpd), by dwelling setbacks, mounds and barriers and by building design.

**Consider air quality**
Air pollution has regional and local dimensions. At the local level the principal concern is with carbon monoxide (CO), nitrogen oxide (NO) and lead levels.

**Protect the quality of the local streams**
Urban development can lead to an increase in the export of pollutants, but with pollution traps, detention basins, artificial wetlands and tertiary treatment, high standards of water quality can be achieved. However, this requires upfront planning and careful location of sites for treatment.

**Protect local areas from natural hazards**
Major and minor drainage systems must both be considered at the development planning stage. The most flood-prone areas and areas subject to coastal erosion should be avoided for residential development.

**Protect development from bushfires**
Protection of dwellings from bushfires is of major public concern and affects the location and form of development and surrounding land uses.

**Consider domestic waste disposal**
Waste management policies may influence the design of multi-unit housing, access to sites and street design, and housing density in areas without sewerage.

**Further information on environment management is provided in PNP 10.**

# 5 Development Standards and Funding

There is a strong link between development standards and the ability to pay for them. Most local authorities determine infrastructure development standards as part of a development plan (or its equivalent), but standards range widely and are still evolving. There are also different mechanisms for cost recovery, although some common principles have been established.

Development standards are commonly used as the basis for determining needs, but questions arise about how they were derived, whether they have general applicability and whether there is flexibility to adapt to changing circumstances. Standards are reflections of values and the interpretation of need depends on the particular point in time. In addition, the characteristics of communities vary and the spatial patterns of communities differ considerably. Accordingly, standards should not be seen as fixed and inflexible.

A distinction is often made between physical and social infrastructure. Physical infrastructure includes water, sewerage, drainage, utility and transport systems, and social infrastructure includes open space, schools, hospitals and community facilities.

The costs of providing infrastructure represent a considerable proportion of the house and land package. The higher the development standards and the performance expected, the greater the costs and the potential benefits. However, funds have to be generated to pay for them and the responsibility for payment has to be defined. The best time to resolve these issues is when a development plan is being prepared.

It is important to realise that the dynamics of urban change require a flexible approach, particularly towards the provision of social infrastructure. For example, an ageing population has different needs from an area with a large proportion of young households.

## Relevant Considerations in Preparing Development Plans

**Develop a facilities and services plan**
The plan should cover both the physical and social infrastructure.

**Consider standards of provision**
Needs should be based on standards that may be applied to similar areas, modified to take

account of any deficiencies or special needs, and opportunities for funding them. In short, development standards for each development area should be based on what is considered reasonable and appropriate for the local area.

**Consider local needs**
For the social infrastructure the following process may be useful:

Step 1 Identify the existing community

Step 2 Identify existing community facilities and services

Step 3 Identify the new community

Step 4 Identify facility and services needs in the new community and appropriate sequencing for their provision

Step 5 Finalise facilities and services plan.

**Determine responsibility for provision**
If development contributions are to be charged, sufficient planning must be undertaken to establish the baseline from which the nature, level and timing of contributions can be determined.

**Identify funding and management structures**
How much will they cost? How will they be funded for both capital and recurrent costs? How will their provision be managed?

**Prepare a program for public infrastructure improvement**
Development of new residential areas and the adaptation of established urban communities are generally shared between the public and private sectors. Each depends on the other. A development plan provides a useful tool for urban management and it is desirable to include a program for public infrastructure improvement.

**Further information on development standards and funding is provided in PNP 11.**

# 6 Approval Processes

Ultimately the use of a code based on AMCORD will occur through a fully integrated approvals system, as advocated by LARP. Such a system should cover all land and building development matters including rezoning, planning consent, subdivision, environmental impact, heritage implications, building, health issues, plumbing connections, and operational licences.

During examination of existing approval processes, dissatisfaction often emerges about approval times and the complexity of requirements for development approval. The LARP publication, Better Approval Practices Manual, provides a tool for councils to assess their approvals system, identify difficulties and develop improvements. A review of existing development controls can be facilitated if it forms part of an integrated development planning process so that the requirements are clarified upfront. Matters of particular importance in the context of AMCORD include:

- implications of the existing appeals system;
- the need to ensure reasonable development approval times;
- the option of introducing a simplified process of packaging Acceptable Solutions for different categories or types of development.


**Figure 32:** LARP advocates a fully integrated approvals system.

## Relevant Considerations in Preparing Development Plans

**Consider appeal rights**
The extent to which appeals against a decision for development approval can delay a project is important. With improved upfront planning and consultation, there may be an opportunity to reconsider the need for third-party appeal rights associated with some categories of residential development.

**Establish reasonable approval times**
The length of time required to obtain a development approval is also important. There are benefits in encouraging designers, developers and regulators to work together as the design proceeds, but this partnership approach can fall down if it significantly lengthens the approvals time beyond a reasonable limit. Approval times may be reduced by:

- allowing a staged approach to approvals;
- providing for different primary and supporting information requirements related to the scale and location of development;
- introducing a system of certification by professionally qualified people for particular categories and scales of development;
- establishing mechanisms for dispute mediation including an urban design panel to mediate or arbitrate on matters related to design.

**Weighting and categorisation**
The packaging of a group of Acceptable Solutions for particular categories of development can be used to take account of the weighting, trade-offs and compromises that occur in the design and provision of housing. By putting together groups of Acceptable Solutions, approval of certain types of housing can be facilitated. There could be different combinations for some or all development areas. The scope for, and application of, such packaging are explained in Part 2 (Section 2.1).

**Consider development agreements**
Another form of partnership is the development agreement where roles and responsibilities are negotiated and/or spelt out in advance. These agreements are legally binding contracts (usually between a developer and State and/or local authorities), and can include a wide range of detailed planning, design and implementation issues that are often not contained within statutory planning documents.

## Some Possible Applications of a Development Plan

A development plan can be used for a wide range of purposes, and can provide the link between broad council strategies and detailed development control.

**Integrated development and improvement**
It can show the relationship between housing, local employment, open space, facilities and services and transport, and how staged development can proceed in an integrated fashion. It can also be used for identifying and implementing urban improvement proposals, such as housing for an ageing population, community facilities and services, and traffic calming, or a major improvement/ redevelopment of public housing estates (refer to Figure 33).

**Provide for, and explain the application of, Performance Criteria**
The development plan can play an important role in establishing which Performance Criteria should be included in the Design Elements and how they should be interpreted. For instance, local precinct urban design guidelines can be drawn up for the preparation and assessment of private development proposals.

**Establish implementation policies**
Implementation policies and techniques, such as categorisation of housing types, setting priorities for different Design Elements and integrated housing, will be addressed in Part 2. The plan can be used as a basis for determining such policies.

**Allow opportunity to vary development plans**
Developers should be able to submit integrated development proposals to vary the scope for housing, but procedures should be in place to deal with such situations. Development plans should be capable of being revised in any event, but not without supporting evidence.

# HILLCREST LOCAL IMPROVEMENT PLAN

Primary objective

To develop a quality community environment

Primary Action Statement

Prepare an overall plan for the urban improvements area identifying opportunities and constraints.

Principles to guide the implementation of objective

Enhance the built physical environment

Create a safe living environment

Promote community participation and community development

Enhance the natural environment

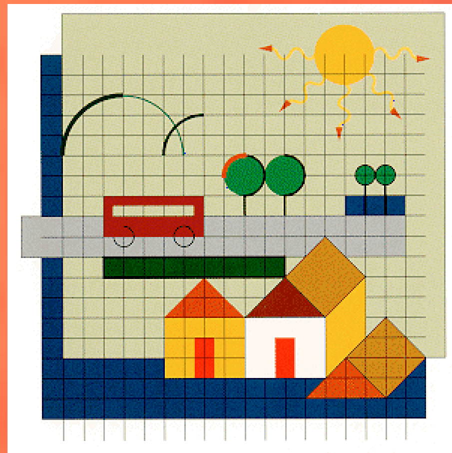
| STRATEGY | ACTION |
|---|---|
| Housing | Housing |
| S1 Provide appropriate housing for a range of needs | A1 Identify the housing needs of the area and how these change over time |
| S2 Enhance existing public housing stock | A2 Prepare a range of infill, upgrading and/or redevelopment programs that initially focuses on [precinct A] |
| S3 Provide opportunities to increase the level of private ownership of housing | A3 Prepare and implement a sales program for public housing |
| S4 Promote innovative, energy-efficient and diverse housing forms for all, including special needs | A4 Prepare urban design guidelines covering housing and site management e.g. stormwater disposal, soil related issues |
| S4 Formulate innovative ways to encourage private owners to upgrade their dwellings and gardens | A5 Investigate financial, local employment programs and self-help methods |
| Traffic Management | Traffic Management |
| S5 Establish an efficient network for pedestrians, cyclists and vehicles | A6 Prepare a traffic management plan to minimise through vehicular traffic, create a low speed environment, provide accessibility to all facilities and accessible public transport |
| Open Space Reserves and Streetscape | Open Space Reserves and Streetscape |
| S6 Establish useable open space | A8 Identify community recreation needs |
| | A9 Prepare an open space plan and program to provide accessible and attractive open spaces linked to services and facilities and with an adequate range of recreation uses |
| | A10 Promote local tree growing by local groups on reserves and street verges |
| S9 Establish attractive streetscapes | A11 Prepare a streetscape plan and program |

| STRATEGY | ACTION |
|---|---|
| **Community Facilities** | **Community Facilities** |
| S10 Upgrade and enhance community services and facilities to meet the needs of existing and new residents | A13 Consult with key human service agencies to ensure co-ordination of redevelopment proposals |
| **Commercial Facilities and Services** | **Commercial Facilities and Services** |
| S11 Promote an adequate range and standard of facilities and services | A14 Identify needs and investigate opportunities for the upgrading and redevelopment of local retail centres |
| **Community Development** | **Community Development** |
| S12 Identify community needs and aspirations | A16 Consult with the residents and community groups |
| S13 Promote community development and positive community image | A18 Prepare a program for community development with a focus on developing community networks and resources, and promoting community involvement in improvement projects |
| | A19 Ensure the provision of information to the community |
| | A20 Identify opportunities for local employment and skills training within urban improvement projects, including home-based employment |
| | A21 Support local events and activities that promote a positive community image |

**Figure 33: An extract from the Hillcrest Urban Impan, prepared by the Enfield City Council, SA Housing Trust and the SA Urban Land Trust (1992).**

(Figure continued from previous screen)

# Part 2: Design Elements



**Part 2:**
**Design Elements**



**Elements**



More contents

*Neighbourhood Planning and Infrastructure*



More contents

*Streetscape, Site Planning and Design*

# 2.0 Introduction

## Purpose

Primarily for designers, builders, developers and State and local planning and servicing authorities, Part 2: Design Elements focuses on the design and control of residential development and housing. Its purpose is to provide State, Territory and local Governments with source material for the development of State and local residential codes.

Section 2.1 explains the format of the performance-based approach to development control, which is critical to the achievement of AMCORD's objectives. Additional guidance, including information requirements for housing applications and the options of weighting and categorisation, is provided.

As with Part 1, it is intended that States and Territories and local authorities adapt Part 2 to State and local conditions. This process is outlined in Section 2.2.

Section 2.3 promotes the benefits of integrated housing and development, and outlines the wide variety of approaches currently adopted throughout Australia. It also provides advice on methods of effectively implementing such projects.

The need to understand the development context of a housing project and to undertake a site analysis to identify key influences on the design is discussed in Section 2.4. This is a most important aspect which can lead to higher-quality urban design outcomes and greater acceptance of new housing projects in established areas.

Section 2.5 contains 29 Design Elements divided into two main categories:

*Neighbourhood Planning and Infrastructure* focuses on broad-scale planning and development issues related to the design and development of larger-scale housing projects.

**Element categories include:**

1: Neighbourhood Planning and Movement Networks

2: Physical Infrastructure

3: Stormwater and Integrated Catchment Management.

*Streetscape, Site Planning and Design* focuses on a wide range of planning and design issues relevant to smaller or infill housing projects. Element categories include:

4: Streetscape and Neighbourhood Character

5: Site Planning and Building Design.

The Elements have been arranged in this manner to help larger-scale housing/land developers, and smaller individual housing project builders/ developers. However, the use of all relevant Elements is recommended.

**The key features of the Design Elements are:**

- an emphasis on objectives (the design Intent);
- the description of Performance Criteria to achieve the Intent;
- the provision of Acceptable Solutions illustrating one way that the Performance Criteria can be met.

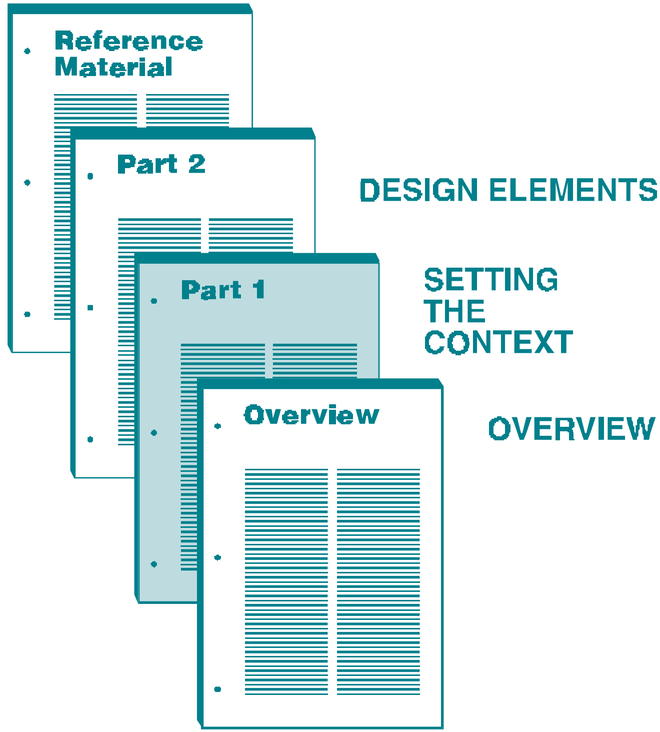



**Figure 1: Structure of AMCORD**

# 2.1 Using the Performance Approach

## Design Element Format

Each Element has a consistent format (refer to Figure 2). The two left-page columns contain an Explanation and Illustrations **(1)**. The Explanation assists in the interpretation of the Design Elements. It provides background information and explanatory evidence for the requirements of each Element, together with examples and illustrations to clarify principles and demonstrate 'best' practice.

The right-hand page contains the model performance-based design code for each Element. A concise statement of the Intent of the Element is at the top of the page **(2)**. The left column sets out Performance Criteria **(3)** and the right column Acceptable Solutions **(4)** related to the relevant Performance Criteria. Additional Explanation material is included where required.

### 1 Explanation

The Explanation is included for information rather than statutory purposes and, as such, supports the resource role of the document.

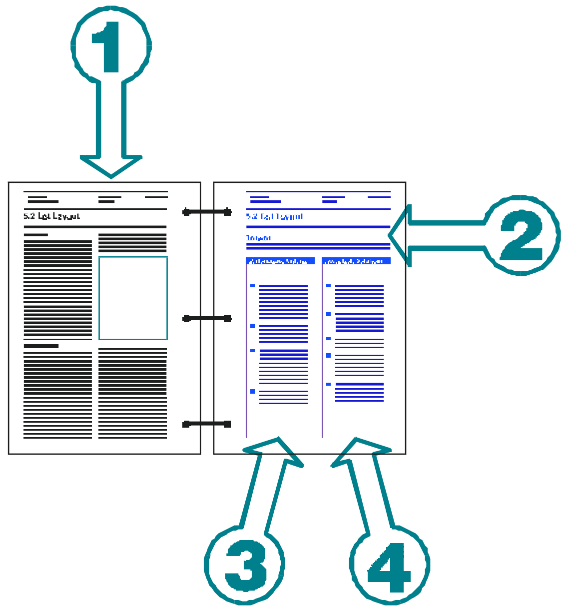



**Figure 2: The layout of a typical double page for an Element.**

### 2 Intent

The Intent outlines the aim of the Design Element and reflects identified planning and policy requirements.

In complying with the Intent, an applicant must conform with all relevant Performance Criteria. Where Acceptable Solutions have been documented to cover specific Performance Criteria, designers can use these in lieu of the Performance Criteria.

**3 Performance Criteria**
Performance Criteria are genera! statements of the means of achieving the Intent. They are not meant to be overly limiting in nature. Instead, they provide designers and developers with an opportunity to develop a variety of design responses.

Not all Performance Criteria will be applicable to every development. In submitting a proposal for approval, the designer and developer must indicate those criteria not relevant to their particular development.

**4 Acceptable Solutions**
Acceptable Solutions are provided as examples of what may enable the achievement of the Performance Criteria. They should not be interpreted as an alternative prescriptive form of regulation nor should they preclude other solutions.

## Prescriptive Approaches

Most development control systems are based on relatively fixed standards prescribing conditions under which a development is likely to be approved. Arguments in favour of this approach are:

- It offers a measure of certainty and predictability to applicants, councils and the community.
- It simplifies the assessment of development applications, as areas where a judgement has to be made are relatively few.
- Standards are usually set at 'safe' levels, which means that no matter where they are applied, a reasonable result can be expected.

Arguments against prescriptive standards are:

- The original purpose of and justification for the standards are often obscure.
- Standards are inclined to become overly rigid, leaving little flexibility.
- They restrict choice, are unable to respond to changing demands and stifle innovation.
- They protect outmoded practices and inhibit cost-effectiveness.
- They are often viewed as a single entity—not to be varied for fear of creating a precedent.

**PND 1 provides additional information on how to adapt and use the performance approach.**

## The Performance-Based System of Control

Instead of specifying prescriptive standards, a performance-based system of control focuses on matters to be addressed called Performance Criteria. The desired outcome is determined by identifying objectives, policies, principles and other considerations upfront without specifying in detail how they are to be achieved.

For example, a desired outcome may be to maintain or achieve a specified level of stormwater quality. The Performance Criteria would indicate matters to be taken into account such as rainfall, soil conditions, site coverage and detention basins, but would leave it to the designer to determine how a residential estate achieves the desired outcome.

A desired outcome may also be to provide private open space for all one or two-storey dwellings. The Performance Criteria might refer to matters such as overlooking, solar access, usefulness and relationships to internal living space, but the amount and dimensions of private open space would not be specified.

Arguments in favour of a performance-based system of control are that it:

- focuses on objectives and desired outcomes;
- offers an opportunity for diversity and choice;
- provides flexibility to respond to market needs and preferences.

There are also the following arguments against such a system:

- It could involve too great a discretionary judgement, which could create uncertainty and misunderstanding.
- If the objectives and policies are too general, they may be open to too wide a range of interpretation, and lead to approval of some inferior work.
- There is a potential for delay because additional work will be required to demonstrate that the Performance Criteria have been addressed and the objectives met.
- Assessors may not have the time and expertise in administering a performance-based system.

However, many of these problems can be overcome by clearly determining at the outset the objectives and desired outcomes (see Part 1). It will then also be possible to provide an explanation of why the Performance Criteria are included and how they should be interpreted. Such explanations are of benefit not only to designers and developers, but also assessors.

## Applying Performance Criteria

The performance approach starts with a general statement of the overall Intent of applying the Design Element. The Intent reflects a need which has been identified through a strategic plan, a development plan, or State or regional policies. The left page of an Element summarises the justification of this need which, in practice, should be derived from local conditions.

For example, the Intent for Element 5.5: Privacy, is: 'To site and design buildings to meet projected user requirements for visual and acoustic privacy, and to protect the visual and acoustic privacy of nearby residents in their dwellings and private open space'. The rationale for this Intent, with the Explanation and illustrations, is set out on the left-hand pages.

The Intent is then further clarified by Performance Criteria which indicate the means of achieving compliance with the Design Element.

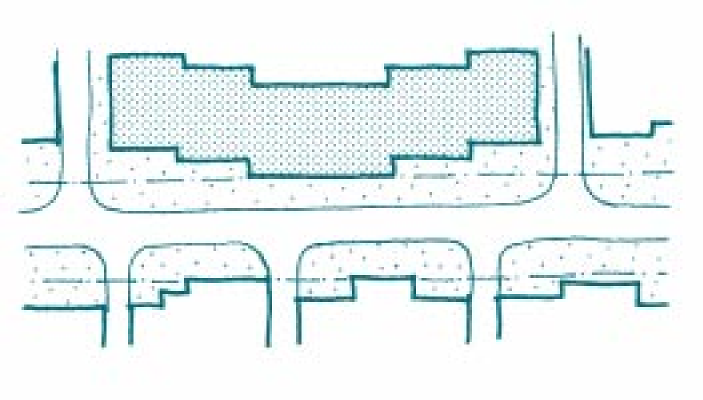
In our example of privacy, Performance Criterion P2 states; 'Direct overlooking of main internal living areas and private open spaces of other dwellings is minimised by building layout, location and design of windows and balconies, screening devices and landscape, or remoteness'. The matters to be considered are listed and the designer has to demonstrate how they are reflected in the design; however, there is no prescription as to what 'minimise' means as this depends on the particular situation.

Figure 3 shows a comparison between the application of the performance and prescriptive approaches to street setback. The performance approach offers an opportunity for a more sensitive response in certain circumstances.

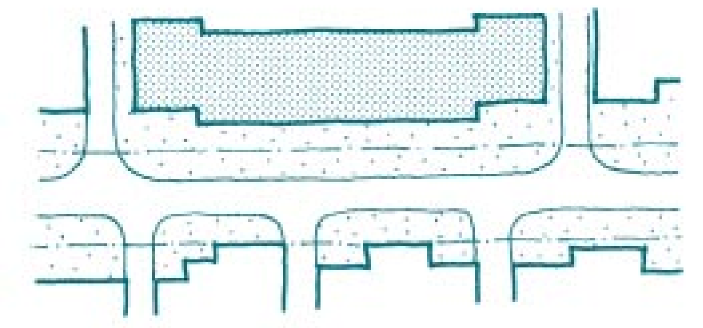
## Interpreting Performance Criteria

The opportunity for interpretation of the performance approach can be a double-edged sword. A designer may interpret the criteria to suit his/her particular problem, while an assessor may interpret them differently.

For example, Performance Criterion P1 for Street Setbacks (Element 5.3) states: 'The setback of buildings contributes to existing or proposed streetscape character, assists the integration of



*Using the Performance Criteria, the street setback is reduced to nil for part of the development (in response to existing nit setbacks of dwellings opposite) without detracting from streetscape character.*



*Using the Acceptable Solutions, street setback is governed by that of adjacent buildings.*

**Figure 3: Using Performance Criteria and Acceptable Solutions**

new development into the public streetscape, makes efficient use of the site and provides amenity for residents'.

In order to reduce uncertainty in interpretation and develop a common understanding, the designer and assessing officer may need to discuss a reasonable response to such a Performance Criterion.

Alternatively, and preferably, an explanation derived from a strategic or development plan is provided upfront. The Performance Criteria, therefore, serve as a checklist, but may need to be supported by further information linking the objectives with the desired outcome.

For example, in the case of the setback criterion, a streetscape policy or plan may have been prepared for the area where the proposal is located. If such a policy or plan is prepared in consultation with the community, the probability of misinterpretation is reduced. The same approach can be used in other Performance Criteria eg pedestrian and cycleways, public open space, verges, and major drainage.

Checklists in themselves can be limiting and should be avoided. There will be applications where a particular set of Performance Criteria does not apply. Categorising development (such as for two-storey attached or dual occupancy housing) will simplify the procedure. The designer and developer, when submitting a proposal for approval which does not fall within a predetermined category, will need to indicate the criteria thought not to be relevant to their particular development.

There will also be situations where not all Performance Criteria can be satisfied, but where development is appropriate in the circumstances. In these situations, weighting may be necessary or there may be trade-offs—a fairly common feature, particularly in infill and redevelopment.

In order to reduce the potential for uncertainty and conflict, there is a need for transparency in trade-off policies.

## Acceptable Solutions

**Interpretation**
Performance-based regulation requires not only a description of desired performance but also some examples of ways in which this performance can be achieved.

Agencies using AMCORD to develop their own regulatory controls may wish to add other solutions which have been found satisfactory in the local area. Some developers wanting to 'fast-track' approval may then opt for one of these proven solutions, while others may want to be more innovative.

This approach towards performance-based regulation is a development of the dual system of control proposed in AMCORD Ed2 and AMCORD URBAN. Both documents offered a prescriptive model in the form of 'deemed-to-comply' conditions (AMCORD Ed2) and 'measures' representing one way of satisfying the Performance Criteria (AMCORD URBAN). AMCORD offers more choice by replacing prescriptive measures with examples of Acceptable Solutions.

For example, Element 5.6: On-site Carparking and Access, has a Performance Criterion addressing parking provision (P1). It does not specify the number of spaces to be provided per dwelling unit, but provides information on matters to be taken into account. In contrast, the Acceptable Solutions specify (in A1.1 and A1.2) the number of spaces to be provided for different situations as one way of meeting Performance Criterion P1.

## Format Issues

Acceptable Solutions have not been provided for all Performance Criteria in the Design Elements. This is because of difficulties in defining solutions applicable throughout Australia or throughout different geographic/climatic areas, or because it is considered a task more appropriate for local authorities so that solutions meet local expectations/conditions. In these situations there is no Acceptable Solution identified for the equivalent numerical Performance Criteria. For example:

| | |
|---|---|
| P1 ____________<br>____________<br>____________ | A1 ____________<br>____________<br>____________ |
| P2 ____________<br>____________<br>____________ | |
| P3 ____________<br>____________<br>____________ | A3 ____________<br>____________<br>____________ |

Where an Acceptable Solution satisfies all of the aspects of a Performance Criterion, it is given the same number. In these cases designers have the choice of satisfying the Performance Criterion using an alternative, more appropriate solution OR conforming to the Acceptable Solution. For example:

| | |
|---|---|
| P1 ____________<br>____________<br>____________ | A1 ____________<br>____________<br>____________ |

Where an Acceptable Solution only partially satisfies all of the aspects of a Performance Criterion, the format is as follows:

| | |
|---|---|
| | *(in partial satisfaction of P1)* |
| P1 ____________<br>____________<br>____________ | A1 ____________<br>____________<br>____________ |

Acceptable Solutions that relate to more than one Performance Criterion are identified as follows:

| | |
|---|---|
| | *(in relation to P1-P3)* |
| P1 ____________<br>____________<br>____________ | A1 ____________<br>____________<br>____________ |
| P2 ____________<br>____________<br>____________ | |
| P3 ____________<br>____________<br>____________ | |

Where more than one Acceptable Solution combine to satisfy a particular Performance Criterion, the following format is used:

P1 ______________ A1.1 ______________

AND

A1.2 ______________

Where there is more than one Acceptable Solution that satisfies a particular Performance Criteria, the following format is used:

P2 ______________ A2.1 ______________

OR

A2.2 ______________

## From Prescriptive to Performance Based Regulation

It is not envisaged that the prescriptive approach will disappear. It is simple, predictable, practical and appropriate for routine applications, most of which are small in scale. However, it is expected



that there will be an increasing need for more flexible and responsive approaches.

Using AMCORD, designers, developers and builders are able to choose whether they want to design to the Performance Criteria or to the Acceptable Solutions. Indeed, they may prefer to design to Performance Criteria for some Elements and Acceptable Solutions for others.

There is a need, however, to build confidence and develop expertise in such a system. This can be achieved by clarifying interpretation, documenting experience, and training.

**Clarity in interpretation**
The interpretation of Performance Criteria will vary from locality to locality depending on the context. Hence, it is not simply a matter of using precedence; what is an appropriate interpretation in one area may be inappropriate elsewhere.

The performance approach will work best where there are upfront plans and policies, and where objectives and desired outcomes are defined and communicated in the form of local explanations, derived from local planning studies, plans and policies.

### Documenting experience

Documenting and sharing experience is also important in developing confidence in the performance system.

Notwithstanding different interpretations, it is useful for designers and assessors to be aware of a range of situations addressed and of their solutions. Over time, it is expected that responsible authorities and the development industry will work together to publish, in the form of practice notes, guidelines, or other suitable mediums, examples of how Performance Criteria have been met.

### Training

Confidence and expertise in making judgements about meeting Performance Criteria will increase with training and experience. Many professionals will respond well to the performance approach, welcoming the flexibility. Others may feel uncomfortable and will benefit from having access to technical training. Local authorities should create opportunities for the training of assessors and encourage the development of expertise.

As with all new systems, ease of use will improve as experience is gained and the body of knowledge expanded. It should be noted that there is a need for collaboration and cooperation between all parties—performance approaches require teamwork.

## Priorities and Weighting

### The need to set priorities

In recent decades, residential development has been evolving to meet the ever-increasing range of housing and lifestyle choices. Achieving a wide range of planning and design objectives, including marketability, is clearly a complex task. It is apparent that relatively few recent housing projects in Australia have been designed to meet the range of Performance Criteria outlined in the Design Elements.

Residential projects must be undertaken within a localised culture, economy and housing market. This will likely result in the need to apply weighting to some of the Performance Criteria and/or Acceptable Solutions because of the difficulties and/or inappropriateness of achieving them all. It would obviously be counter-productive to penalise a developer who met most of the requirements, but not all, yet had proposed an innovative and high-quality project which was exemplary in the local area and, importantly, met current and future housing needs.

Having attempted unsuccessfully to meet a particular Performance Criterion, a designer or developer will be able to communicate the process when lodging plans and negotiating planning approval.

Improving the design and development of housing projects may also have some limitations determined by the need for developers, builders and governments to produce affordable housing.

Undoubtedly the design of complex projects, such as residential environments, involves design and development trade-offs. For example locating private open space and living rooms with a northerly orientation may have to be traded-off against the need to protect such areas from noise on an adjacent arterial road. Similarly, the protection of a large, significant tree, or orientating living rooms to views, may result in certain Performance Criteria/ Acceptable Solutions not being met. It is therefore important for AMCORD, and State and local government's adaptation and adoption of it, to recognise the importance of design trade-offs and/or setting priorities.

While all of the Design Elements included in Part 2 are considered important, planning authorities may prefer to weight some of them, in particular identifying those that might be given less weight in development assessment processes. For certain types of development (eg small infill projects of 2-4 dwellings) certain Elements might not be seen as being relevant.

**A process**

This weighting process should be determined following community consultation, and should be reviewed regularly to take account of changes in technology and community expectations. For instance, examples of total stormwater management are now successfully in operation whereas only a few years ago they were seen to be 'futuristic' and 'too difficult'.

Alternatively some Elements might be given advisory status for a predetermined period to give housing providers time to prepare for a more desirable future outcome.

Codes have never been particularly good at guaranteeing excellent housing outcomes. Therefore AMCORD has been drafted as a performance-based approach which requires interpretation, interaction, collaboration and cooperation in keeping with the prime underlying objectives—providing safer, and more affordable, diverse, socially interactive and environmentally sustainable residential environments.

## Categorisation

Categorisation is a process where 'bundles' of Design Elements can be related to commonly used categories of development, such as dual occupancy and two-storey attached housing. It can assist the development industry by:

- clarifying matters to be considered in assessing an application;
- indicating the appropriate consultation/appeal process;
- developing 'packages' of Acceptable Solutions for particular categories or types of development.

Categorisation is already widely used (eg by dwelling type, density, height, form and scale), but care is required so as not to inhibit innovative solutions.

Many existing codes use dwelling types as the basis for categorisation. There are disadvantages in such a categorisation, because it:

- does not distinguish between the scale of development and the context within which it occurs;
- requires acceptance of commonly used definitions of dwelling type (whereas there are variations of these between the States);
- can lead to housing types being selected by planners instead of being determined by the market;
- may encourage stereotyped and negative attitudes towards some forms of housing (and its occupants), while idealising an established range of housing forms and the lifestyle associated with them.

A categorisation of development by building height was proposed in the Higher Density Codes of New South Wales prepared in 1990. The Residential Development Code in Western Australia uses density as a categorisation of development. There are advantages in both approaches, provided consideration is also given to how the height or density of a proposed development relates to the existing dwelling density and character, the streetscape and other aspects affecting the quality of the environment.

Development categories should be defined to clarify and improve the development process, but not to the extent, where there is no flexibility and choice offered.

## Information Requirements

Information requirements and procedures for each category of development should be clearly established upfront. In this way delays, which can add considerably to costs, can be avoided.

There may be a need for different types of information, depending on the category of development or the particular development area. For some forms of development or some locations, there may be a need for a site analysis plan, site concept plan (refer Section 2.4), streetscape plan, a model, a staging plan, evidence of consultation, or a statement on how any concerns have been addressed. For other forms of development, the information requirements may be confined to a simple siting plan and details of the relationship to adjoining buildings.

In ensuring an acceptable development, the requirements for more information may be justified in some cases. However, unless there is a reasonable expectation of approval, the additional costs involved may be seen by developers as an imposition. To assist applicants in the lodging of applications and speed up the approval process, it is suggested that local councils prepare a policy as part of their codes specifying the information requirements for various categories of development.

**PND 2 provides further material on requirements for development applications.**

# 2.2 Adapting Part 2 to Local Conditions

## Overview

Reference should be made to the Overview and Section 1.2 of Part 1 for a more complete outline of the adaptation/ adoption process. Most of the material in these sections is relevant to determining appropriate implementation procedures for Part 2.

The AMCORD Design Elements have been the subject of significant research, comment and review. They attempt to take account of local conditions, especially climatic differences. There are advantages in adopting the Design Elements as drafted in order to facilitate consistency in the use of codes by those doing business in more than one area.

## State/Territory Governments

In preparing a State version of AMCORD and adapting/adopting Part 2, a State/Territory Government should appoint a project team (which might include a consultant) to undertake a technical review. The project team should seek the advice of a technical steering committee, comprising representatives from State and local Government, the housing industry and relevant professional groups.

Elements should be reviewed relative to individual State/Territory requirements, with departures from AMCORD justified so as to retain the integrity of the document. Any changes must also be cross-referenced to avoid conflict between Elements.

In particular, climatic, geographic and cultural characteristics should influence the review, and photographs and figures can be tailored to each particular State/Territory. For example, each local government area in Australia is located within a particular climatic zone, and therefore councils will need to adapt Element 5.10: Design for Climate, to local conditions.

States may wish to include Performance Criteria and all or some Acceptable Solutions within their documents, (leaving other Acceptable Solutions to be reviewed by local government).

Another option is for State and Territory Governments to identify key Design Elements for inclusion in a State-based code, concentrating on those Elements that have greatest impact in terms of State and regional planning policies and microeconomic reform. Local government can then build on this range of Design Elements in developing local codes.

For States/Territories not preparing a State version of AMCORD, there is considerable scope to promote the document through activities such as promotions to the housing industry, relevant professional groups, local government and the general community. Additionally, AMCORD and its objectives can be applied to their own residential land and housing development and release strategies.

## Local Government

Depending on the manner in which a State/ Territory adopts AMCORD, opportunities may exist for local planning authorities to adapt and adopt Part 2: Design Elements.

## Successful Adaptation

The main criteria for the successful adaptation of AMCORD are:

- involvement of a multi-disciplinary team of suitably qualified professionals (staff and/or consultants);
- consultation with key stakeholder groups;
- modification of the document only if the changes can better meet local requirements and if the Intent and Performance Criteria of each Element are not compromised;
- maintenance of the performance approach with its Intent and Performance Criteria for each Element;
- use of local examples of ‘best’ practice;
- consideration of opportunities for categorisation;
- weighting of Elements if appropriate;
- development of a trade-off policy;
- adaptation of Practice Notes to better include local knowledge and views;
- upholding of the general format and key definitions and/or terminology to help maintain a level of consistency within the industry, between States/ Territories and across urban areas;
- development of a procedure for trial and evaluation of the adopted document.

## Streamlining the Processes

As part of the process of adapting Part 2 to local conditions, it will be possible to categorise development and assemble ‘bundles’ of Design Elements appropriate to each category. In this way not all of the Elements will need to be applied to particular forms of development.

For example, it would be possible to produce a design code consisting of Design Elements relevant to land subdivision and development, as well as other codes for different types of residential development, ranging from large-scale redevelopment to small infill housing projects.

The categorisation of development and the simplification of the design code by way of a reduction of Design Elements would be of significant benefit to designers and assessors (refer to PND 1).

# 2.3 Integrated Housing and Development

## Integrated Housing and Development Defined

Integrated housing and development projects in Australia are being developed in urban fringe growth areas and within established areas in the middle and inner suburbs.

Integrated housing is a form of development where:

- housing and associated facilities are planned, designed and built by the same developer or through a developer-builder combination;
- a developer undertakes the site planning and development as well as establishing detailed requirements for building designs without actually constructing the dwellings.

Integrated development differs from integrated housing in that the housing is not constructed or detailed requirements for building design are not incorporated (ie all elements of physical infrastructure are designed and developed in an integrated manner, leaving land buyers free to build houses in accordance with council requirements only).

## Applications

The development scenarios that have prompted an increase in the use of integrated housing and development approaches include:

**Environmentally sensitive land**
Where there is significant vegetation and/or sloping land, dwellings and driveways should be positioned before designing the subdivision layout. This to maximises site opportunities and minimise environmental disturbance.

**Figure 4: Integrated housing project, Camerons Landing, Balmain, NSW.**

**Figure 5: Integrated public housing project, Enoggera, Brisbane**

### Housing on small lots
Increasing demand for this form of housing calls for greater attention to issues such as relationship between buildings, creation of private open space, protection of privacy, and positioning of driveways in order to provide adequate on-street visitor parking. Road designs and carparking layouts should therefore be provided at the planning stage, together with detailed requirements for building design (eg building envelopes and site specific guidelines).

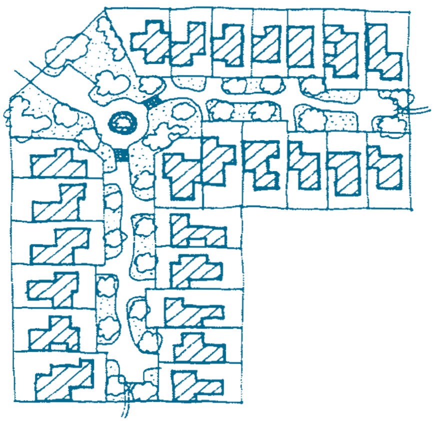
### Multi-unit dwelling projects
This form of integrated housing, which includes housing for the aged and cooperative housing has occurred for many years. It requires integrated planning, design and construction of housing and associated facilities.

### Housing in areas of special character
Housing in some locations (eg coastal and historic conservation areas and areas with high scenic amenity) can benefit from an integrated housing approach which incorporates site or area-specific design controls which enhance the special character or environmental attributes.

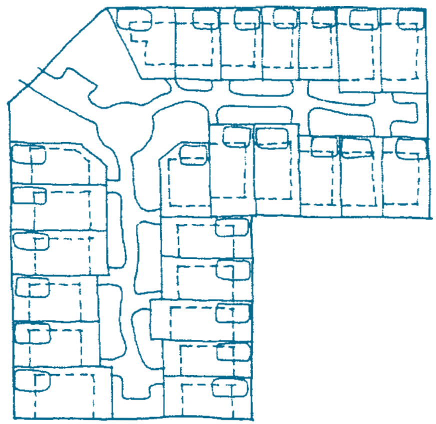
### Inadequate statutory provisions
Where existing council provisions are too broad and unspecific for proposed housing developments, and/or where introducing specific council controls is not appropriate or would take too long, site specific guidelines can be prepared for particular development projects to create an integrated housing scheme.

## Implementation

Integrated housing projects designed and constructed by a single developer/builder will still be an important component of the housing market. However, most new purchasers will continue buy a lot and choose a builder, thus allowing the subdivision of land well before the construction of houses. This facilitates early sales, significantly reducing holding costs normally associated with other forms of medium density housing. Additionally, construction by 'volume' builders of housing specifically designed for these small lots, enhances both housing affordability and choice.



Site layout plan



Building envelope plan

Typical streetscape

**Figure 6: Typical integrated housing project components**

Integrated housing projects typically involve formal agreements (eg encumbrances and land management agreements) between developer and allotment purchaser to ensure that the purchaser constructs the dwelling in accordance with site specific guidelines. These guidelines vary in complexity, but commonly include a building envelope or site development plan which may, for example, designate locations for building on boundaries, for private courtyards and for garages/ driveways.

In many cases the formal agreements are managed by the developer during the project's life with responsibility transferred afterwards to the relevant council. In other cases the design guidelines and agreements are prepared by the developer with the council assuming responsibility for implementation from the project's start.

Where there are large integrated housing projects, especially in new urban areas or in the redevelopment of larger sites in established areas, there should be opportunities for the developer/ designer to review relevant aspects of any development plan, and, supported with appropriate documentation, negotiate changes.

Housing affordability can be significantly improved when developments incorporate small lots, although the increased design requirements can also add to housing costs. Integrated housing projects therefore must balance the design and development of housing affordable to the target market, with the need for acceptance of the project by both the market and the local community.

Further information on integrated housing is provided in PND 11 and PND 12.

# 2.4 Development Context and Site Analysis

## Need

One of the most effective ways of improving the quality of housing projects is to establish its development context before the site planning and design phase. Too often development projects are submitted to planning authorities without a detailed analysis of how the new development relates to its context. As a result, neighbouring property owners are often unnecessarily adversely affected.

The development context involves four aspects:

- planning and development intentions for the site;
- the relationship of the site to the local community;
- the relationship of the site to adjoining properties;
- physical characteristics of the site.

### Planning Intentions

AMCORD encourages local authorities to clarify the strategic planning and development intentions upfront so that the development context and hence appropriate housing is developed. Part 1: Setting the Context provides information on matters to be addressed.

### Local community

Upfront planning should also provide information relevant to the local community. Issues include the locality's identity and character, the streetscape, and the relationship of that site to local movement and social networks.

### Neighbouring properties

The relationship of the proposed development to its neighbours is of critical importance. When housing is to be built among existing dwellings, the design must take into account factors extending beyond the site.

### Site characteristics

The arrangement of buildings and spaces on a site is also part of the development context and will influence the quality of the residential environment. Issues include the building 'footprint', private open space, semi-public open space (setting for the dwellings), setbacks for amenity, street appearance, access and parking, and services and facilities.

## Site Analysis

The site analysis establishes the development context, identifying and explaining graphically:

- the key influences on the design;

- how the proposed dwellings will relate to each other and to the immediate surroundings.

It shows the uses of neighbouring sites, and potential constraints relating to overlooking, overshadowing, view retention, building bulk, landscaping and screening between the development and adjoining sites.

An analysis of the street character may also be necessary. It can provide clues for successful integration, and may influence site layout, landscape, alignment of buildings and the design of the proposed development in relation to the streetscape.

A separate Site Analysis Plan is recommended as part of the approval process for larger developments. For smaller projects, the site analysis information can form part of the Site Development Plan.

It is worth noting that a Site Analysis Plan is not a document where unimportant detail should override its purpose, that is, to explain the relationship of proposed dwellings with each other and with the environment.

A site analysis must be to scale and should identify development opportunities and constraints. It should influence the design to minimise negative impacts on the amenity of adjoining developments and to complement neighbourhood character.

A site analysis should not be a standard exercise, and a responsible authority should exercise its judgement about the extent of information required. At its most exhaustive, a site analysis would document the site in terms of:

- contours;
- existing vegetation;
- buildings (including any that could be retained);
- views to and from the site;
- access and connection points;
- drainage and services;
- orientation, microclimate and noise sources;
- where relevant, any contaminated soils and filled areas;
- fences, boundaries and easements;
- any other notable features;

and the surrounds in terms of:

- the location and use of adjacent and opposite buildings and out-buildings;
- abutting private open spaces and habitable room windows which have outlooks towards the site, particularly those within 9 m of the site;
- views and solar access enjoyed by adjacent residents;
- major trees on adjacent properties, particularly those within 9 m of the site;
- location and height of walls built to the site's boundary;
- characteristics of any adjacent public open space;
- street-frontage features such as services poles, street trees, kerb crossovers, bus stops, services;
- the built form and character of adjacent and nearby development, including characteristic fencing and garden styles;
- direction and distances to local shops, schools, public transport, parks and community facilities;
- the difference in levels between the site and adjacent properties.

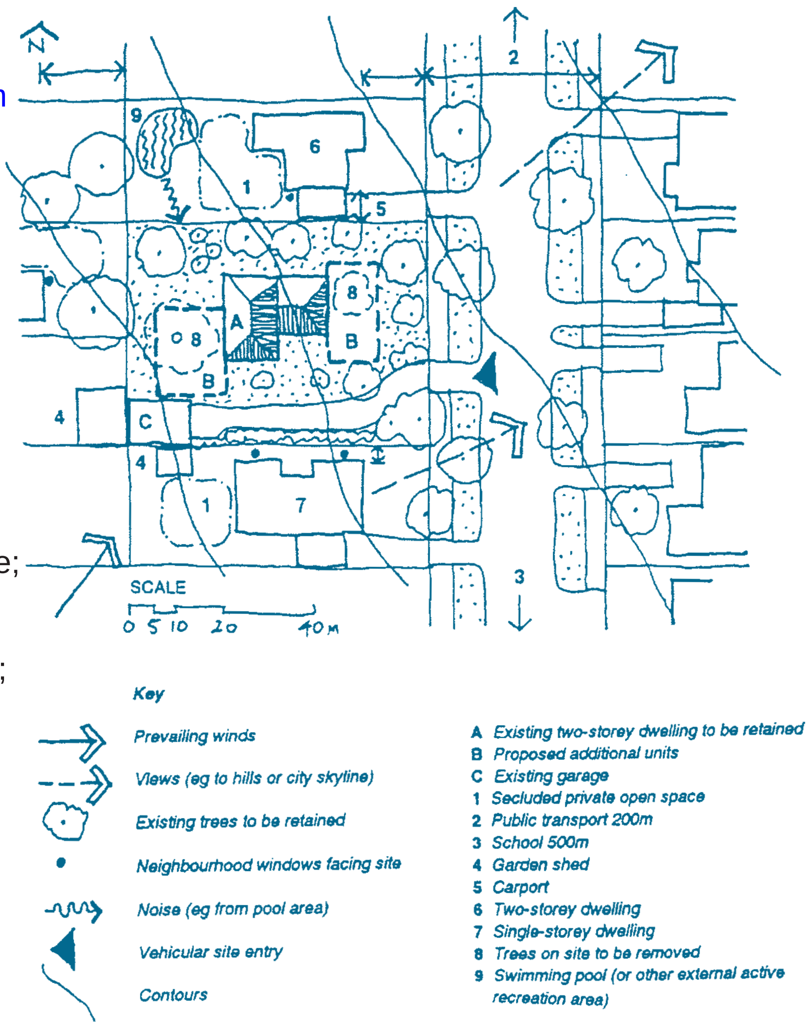
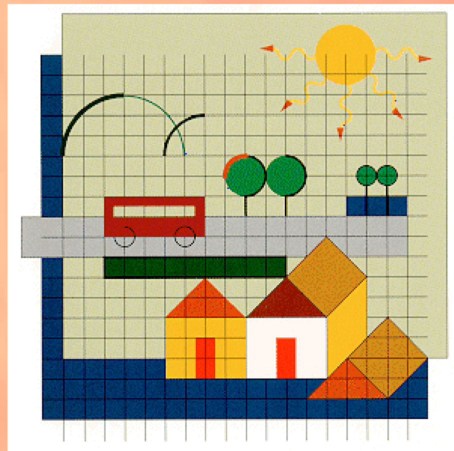



**Figure 7: Typical Site Analysis Plan for an infill housing project.**

## Explanatory Statement

It is clearly not sufficient to prepare a Site Analysis Plan and then ignore it during the design process. It is therefore recommended that a written statement be prepared by applicants of housing development projects explaining how the design has responded to the Site Analysis Plan. Such a statement, to form part of the material required for an application, would greatly assist the design and assessment processes, and is likely to result in a significant improvement in the quality of infill housing. Such an approach is likely to reduce the number of complaints arising from neighbours following lodgement of applications for proposed infill housing projects, and should also reduce associated delays in the approval process.

# Elements



## 2.5 Design Elements

***Neighbourhood Planning and Infrastructure***

1. **Neigbourhood Planning and Movement Networks**
2. **Physical Infrastructure**
3. **Stormwater and Integrated Catchment Management**

***Streetscape, Site Planning and Design***

4. **Streetscape and Neighbourhood Character**
5. **Site Planning and Building Design**

*Neighbourhood Planning and Infrastructure*



More contents

*Streetscape, Site Planning and Design*

# 1. Neigbourhood Planning and Movement Networks

## Introduction

There is a range of issues relevant to planning at the neighbourhood level. In covering them, this Element category relates specifically to neighbourhood planning in greenfields development sites, in growth areas and in large urban infill development sites. It also considers broader strategic issues which affect urban form, including demographic trends; environmental management; integrated movement networks (including street networks, public transport, cyclist and pedestrian networks); and the primary recreational and environmental roles of public open space.

The Elements contained within this category are:

1.1 Neighbourhood Design

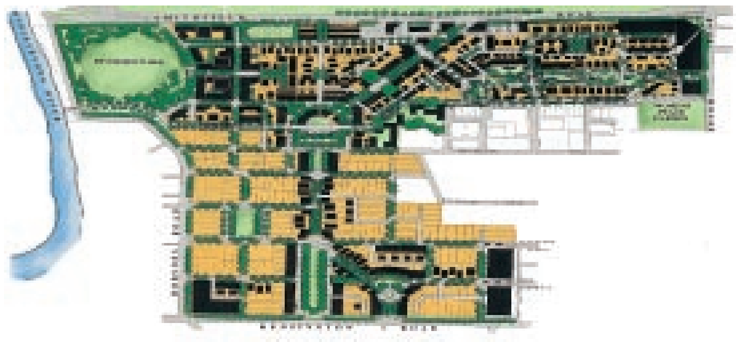
1.2 Integrated Movement Networks

1.3 Street Networks

1.4 Pedestrian and Cyclist Facilities

1.5 Public Transport

1.6 Public Open Space.



**KENSINGTON BANKS**

# Element 1.1
Neighbourhood Design

## Need

As a focus for social interaction, leisure, personal expression and fulfilment, neighbourhoods can have a major influence on quality of life.

The Neighbourhood Design Element is an important part of AMCORD. It sets the context for the Elements that follow and, in considering a diversity of strategic planning issues, helps to ensure an integrated approach to the design and layout of neighbourhoods.

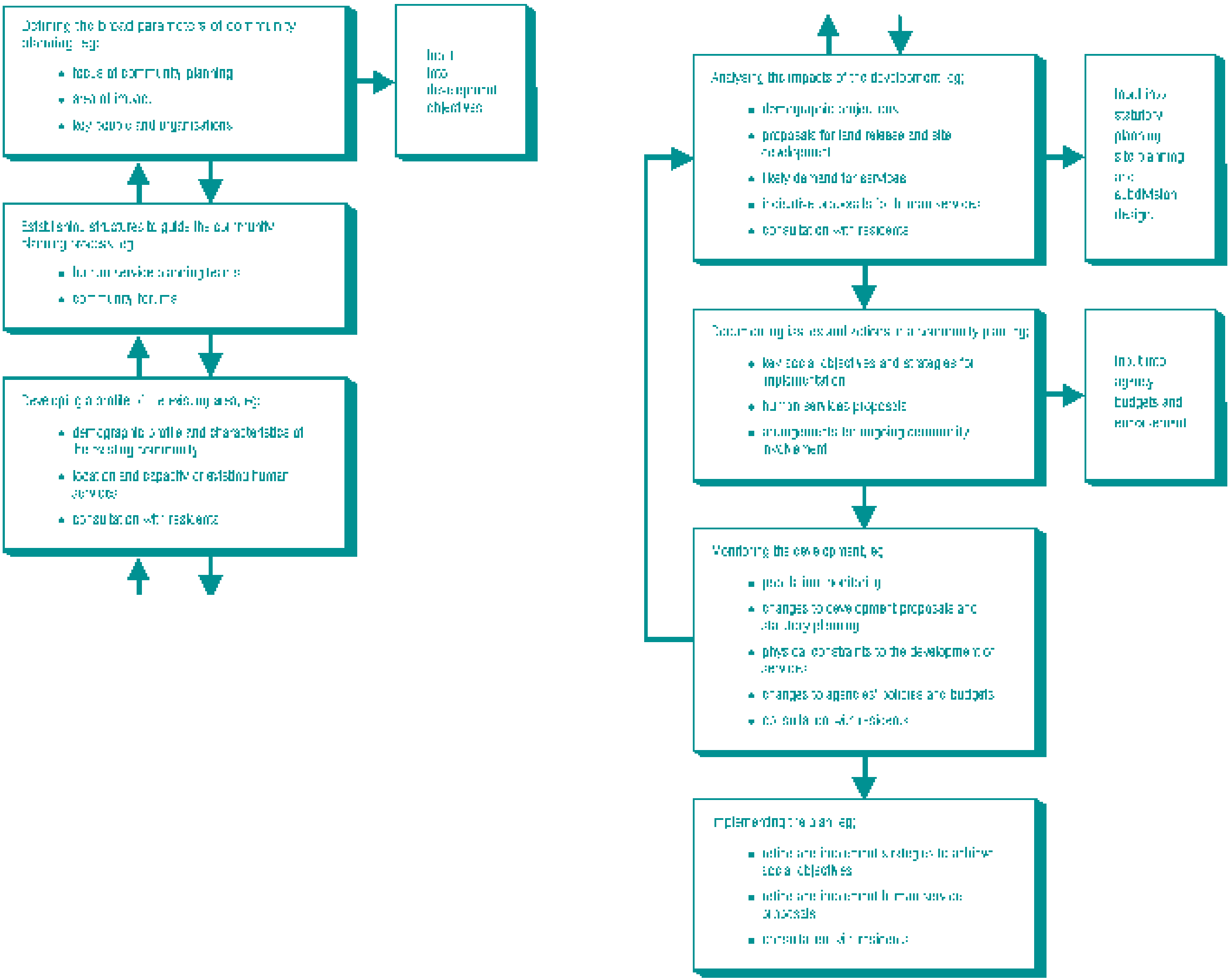
Reference should be made to Part 1: Setting the Context (and in particular Part 1.4: Development Planning), PND 3: Neighbourhood Design, PND 4: Responsive Urban Design, PND 5: Social Planning Considerations, and PND 6: Mixed-use Development for further information on the neighbourhood design process.

## Community Planning

Successful neighbourhoods require the creation of attractive living environments that promote social interaction, participation and a sense of community identity for all residents. Therefore, in addition to housing, the neighbourhoods should include a mix of compatible and complementary facilities for living, education, working and recreation. A high level of safety for residents and visitors, which can be partly addressed through the design process, is a critical component.

The need to incorporate human services planning within overall planning and design, and the effective programming of physical and social infrastructure, are now widely recognised as important elements. A model of the community planning process adopted for various development projects involving the South Australian State Government is shown in Figure 1. Planning for human services is a dynamic process which must recognise possible future demographic changes, building in flexibility wherever possible.

This process allows for the timely and coordinated provision of community facilities and services. It also ensures that other key social issues associated with a particular development, including those relating to cultural development, can be identified and formulated. The community planning process also places emphasis on involving the community.


focus of community planning
key people and organisations
Input into development objectives
community forums
consultation with residents
demographic projections
proposals for land release and site development
likely demand for services
Input into statutory planning site planning and subdivision design.
human services proposals
changes to development proposals and statutory planning
changes to agencies' policies and budgets

## Environmental Management

The National Greenhouse Response Strategy recognises the important influence that urban form and systems can have on reducing greenhouse gas emissions. Factors such as residential density, housing and allotment design and layout, land-use mix, local employment opportunities, street layout, mode and use of transport, and urban infrastructure all have implications for energy consumption and production of greenhouse emissions, and are important considerations in the neighbourhood design process (refer to PNP 3, PNP 5, PNP 7 and PNP 10). There is also a need to consider and maximise opportunities for integrated stormwater and wastewater management, and provide protection from significant noise and air pollution sources, such as traffic.

## Economic Considerations

Neighbourhood development must also satisfy economic and financial imperatives, which vary with different locations. Obviously, the design response for a particular location must be a financially viable and realistic option. Similarly, there should be concerted efforts to develop affordable housing.

## Neighbourhood Design Approaches

There are many approaches to neighbourhood or community design. During the 1970s and 1980s, neighbourhoods typically comprised low-density housing on individual, large allotments. A curvilinear street layout with a strong street hierarchy and low levels of connectivity (usually culs-de-sac leading off local collector streets) were common elements along with limited land-use mix and employment opportunities. Little regard was given to energy or greenhouse implications or the long-term social implications of these ‘dormitory’ suburbs.

In the 1990s a range of social, economic and environmental objectives are being acknowledged.

Recent neighbourhood design concepts used in western developed economies have been given titles such as Transit Oriented Development (TOD), Traditional Neighbourhood Development (TND), Pedestrian Pockets, Transit Supportive Communities, Greenhouse Neighbourhoods and Urban Villages. In each case the underlying objective is to create liveable neighbourhoods, which reduce dependency on private vehicles and are more energy-efficient.

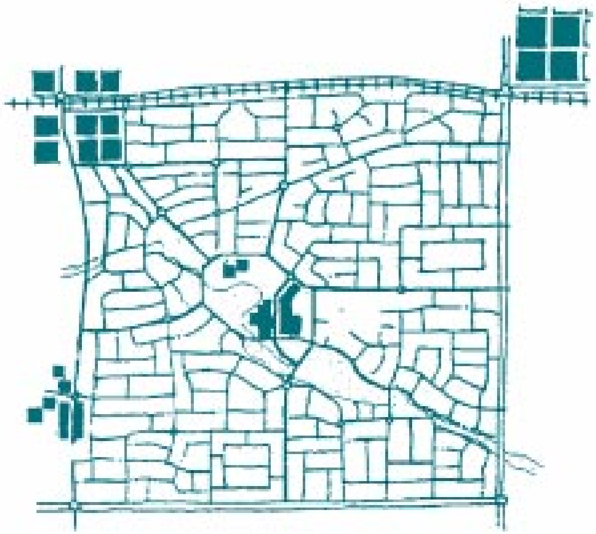


**Figure 2: Convential interconnected neighbourhood land use and street pattern.**

The urban village concept, currently being promoted and developed in various projects in Australia, can be described as a compact, well-defined community featuring the following main design principles:

- higher residential densities;
- increased local self-containment (eg higher levels of local employment and daily activities);
- reduced travel to local employment and activities (eg interconnected street networks and local activity centres within walking distance);
- smooth travel speed and flow;
- dwellings designed to minimise energy use;
- accessible public transport;
- higher levels of public safety.

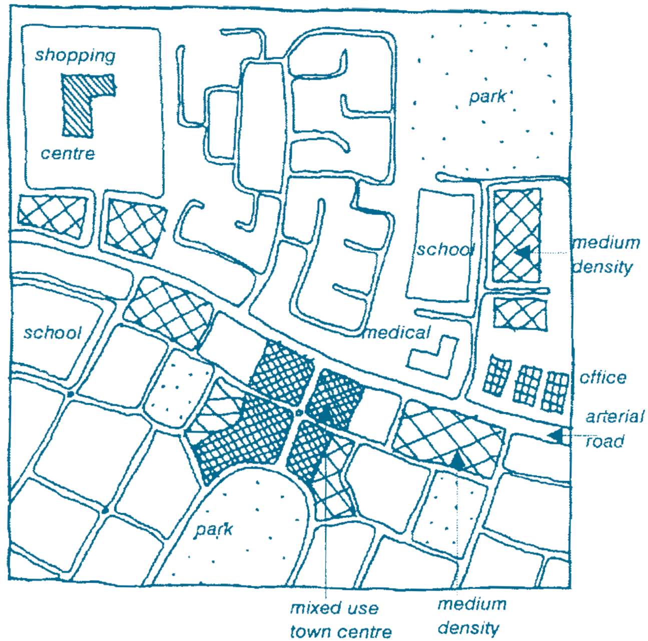



**Figure 3: Contrasting forms —cconventional suburban development compared to traditional neighbourhood development**

Each principle is predicated on achieving increased housing densities, resulting in a higher population to support a range of activities and public transport services close to housing.

## A Neighbourhood Design Process

Neighbourhood design is an interactive process involving a range of stakeholders (eg developers, various design professions, government and non-government service providers, local authorities and the community). It is more than a physical planning solution for a particular site and must incorporate a degree of integration with surrounding urban areas while still creating distinctive, identifiable and relatively self-contained neighbourhoods.

The following process is indicative of the phases and inputs for achieving successful neighbourhoods. While the process is presented as linear, it is in fact layered with the different elements of the design process influencing and shaping each other. The emphasis will vary according to the circumstances and conditions of each site.

### Site context and environmental assessment

- Establish the site context, major site features (eg views, remnant vegetation) and environmental constraints and opportunities (eg slopes, gullies, flood-prone land, bushfire hazard, contaminated soil, prevailing winds, and air and water quality).

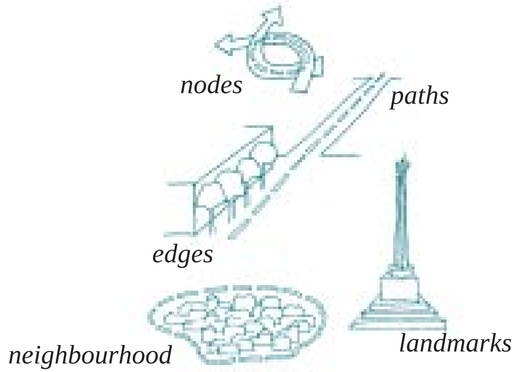



**Figure 4: Urban design principles**

### External influences

- Establish significant external connections to and from the site, such as habitat corridors, air sheds and water catchments.

- Identify external drainage and open space networks, facilities and services (eg schools and community facilities, services and centres) and employment opportunities and their relationship to the site.

- Establish structures and processes to guide the community planning process, including methods for continuing community involvement.

- Identify broad opportunities for integrated catchment management, the provision and multi-use of open space and non-residential facilities.

**Movement and service connections**

- Establish major local movement systems into and out of the site.

- Identify opportunities for bicycle and pedestrian movements through and beyond the site.

- Establish street connections to facilitate local and external movement and identify options for service connections.

**Neighbourhood development, identity and integration**

- Determine the location and nature of proposed and existing features and facilities which will create focus and identity and achieve a relatively self-contained, distinctive neighbourhood with a strong ‘sense of place’.

- Consider alternative development and density scenarios which, in turn, will influence the type, range and location of facilities and services to be provided (eg schools and centres).

- Ensure that some flexibility is built into the various design options.

- Define the preferred form of edge development to provide identity but also encourage integration with existing or future neighbourhoods.

**Safety and security**

- Ensure that safety and security are considered in the design process. They will influence such design elements as street and allotment layout, open space and bicycle and pedestrian networks, dwelling design and orientation, and the design of non-residential facilities.

**Connectivity**

- Establish the basic movement network, linking existing streets where necessary and ensuring good local connectivity, permeability and legibility.

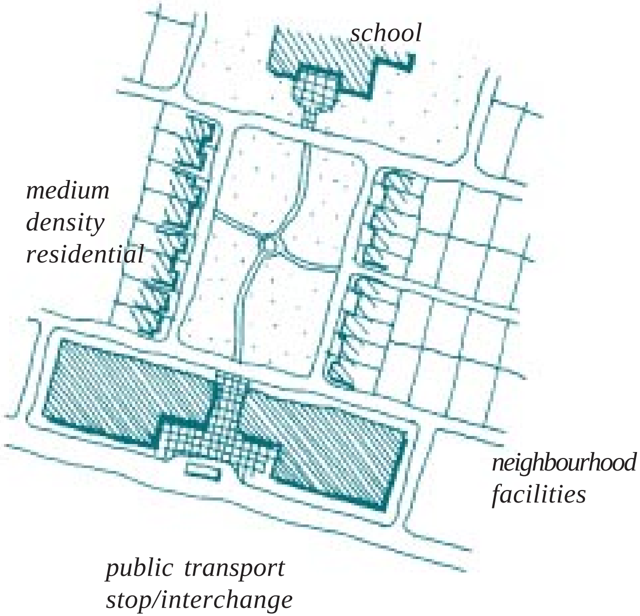
- Ensure that motor vehicle networks do not dominate pedestrian and bicycle movements.

**Street and path layout**

- Convert movement networks to a street and path layout, considering issues such as safety, legibility, environmental capacity, allotment layout and orientation, and climatic factors.

**Lot size and mix**

- Determine broad distribution of lot sizes,



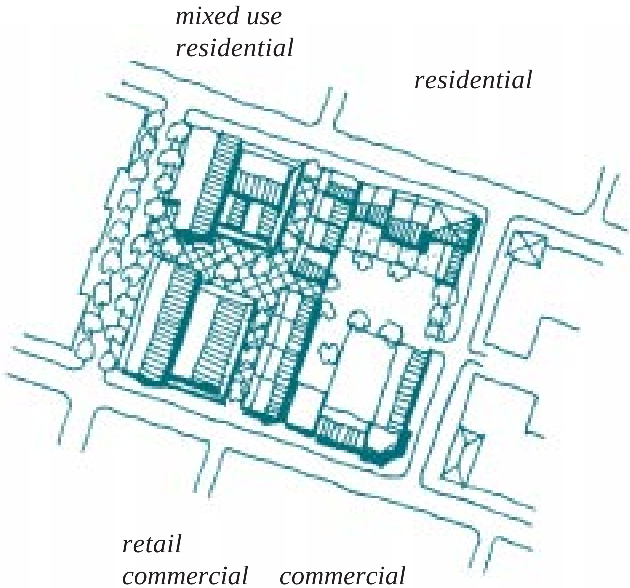




**Figure 5: Mixed-use centres provide for community focus, variety and identity.**

# Element 1.1
# Neighbourhood Design

## Intent

To provide safe, convenient and attrractive neighbourhoods that meet the diverse and changing needs of the community. This encompasses offering a wide choice in good quality housing and associated community and commercial facilities, providing for local employment opportunities, encouraging walking and cycling, minimising energy consumption, and promoting a sense of place through neighbourhood focal points and the creation of a distinctive identity which recognises and, where relevant, preserves the natural environment.

## Performance Criteria

The intent may be achieved where:

**P1** The subdivision layout gives a neighbourhood a strong and positive identity, by responding to site characteristics, setting, landmarks and views and through clearly readable street and open-space networks.

**P2** Neighbourhood identity is reinforced by locating community, retail and commercial facilities at focal points within convenient walking distance for residents.

**P3** The street network provides a high level of internal accessibility and good external connections for local vehicle, pedestrian and cycle movements, with traffic management to restrain vehicle speed, deter through- traffic and create safe conditions for other road users.

## Acceptable Solutions

There are no recommended Acceptable Solutions for this Element, as each situation requires an individual approach.

| **Performance Criteria (continued)** | **Acceptable Solutions (continued)** |
|---|---|
| **P4** The vehicle, cyclist and pedestrian networks, land-use mix and lot density minimise fossil fuel use by reducing local vehicle trips, travel distances and speeds, maximising public transport effectiveness, and encouraging walking and cycling to daily activities. | |
| **P5** The distribution and design of land uses minimise infrastructure costs. | |
| **P6** The street and lot orientation and lot dimensions facilitate the siting and design of dwellings which conserve non-renewable energy sources and assist in design appropriate for the climatic conditions (refer to Element 5.10 for more detail). | |
| **P7** The lot design and layout provide a mix of lot sizes and enable a variety of housing types and other compatible land uses. | |
| **P8** The lot design and layout provide for higher densities in areas close to services, public transport and public open space, or areas with high levels of amenity. | |
| **P9** The layout provides well-distributed public open spaces that contribute to the legibility and character of the development, provide for a range of uses and activities, are cost-effective to maintain, and contribute to stormwater management and environmental care. | |

| Performance Criteria (continued) | Acceptable Solutions (continued) |
|---|---|
| **P10** The layout ensures that major linear or regional open spaces are located to define the boundaries of neighbourhoods and, where appropriate, provide community focal points. | |
| **P11** The layout retains significant vegetation and habitat areas, incorporates natural and cultural features, minimises soil erosion and avoids development on flood-prone land. | |
| **P12** The layout is integrated with the surrounding urban environment, complements existing attractive streetscapes and landscapes, and provides for shared use of public facilities by adjoining communities. | |
| **P13** The layout enhances personal safety and perceptions of safety, and minimises potential for crime, vandalism and fear through achievement of surveillance by drivers of passing vehicles and pedestrians. | |
| **P14** The pedestrian network is safe, attractive and efficient, running largely along public spaces (including streets and open spaces) fronted by houses, and avoiding uses that generate major breaks in surveillance on routes to and from public transport or those used at night. | |
| **P15** The layout of residential development abutting areas of high bushfire hazard ensures that streets are designed, located and connected to allow safe and efficient movement of fire emergency vehicles, and lots are configured for the siting and design of houses that incorporate bushfire protection measures (refer to Element 5.14). | |

# Element 1.2
## Integrated Movement Networks

### Need

Street networks must support the movement and provision of facilities for pedestrians and cyclists, public transport and cars and service vehicles.

The street network should be planned as a single integrated system so that the facilities for the various transport modes support each other cost-effectively.

There is also a need to re-examine the relationship between the movement system and the form of residential development. Large-scale, low-density suburban housing and unconnected street networks have locked the community into a car-dominated environment because public transport cannot be provided economically. The subsequent environmental and social consequences of air pollution, traffic noise and accidents, consumption of non-renewable energy, and social isolation are of increasing public concern. The financial resources to provide and operate transport facilities are being stretched (refer to Element 1.1 – Neighbourhood Design).

### Integrated Provision

An integrated approach towards housing and transport is needed. The transport demand generated by housing must be satisfied by roads, streets and cost-effective and convenient public transport. This can be achieved with neighbourhood densities of at least 15—20 dwellings per ha and connected street networks, which should be the aim of land and housing development in urbanising areas.

New higher-density residential areas should be related to existing public transport infrastructure. (Figure 1). This particularly applies to commuter

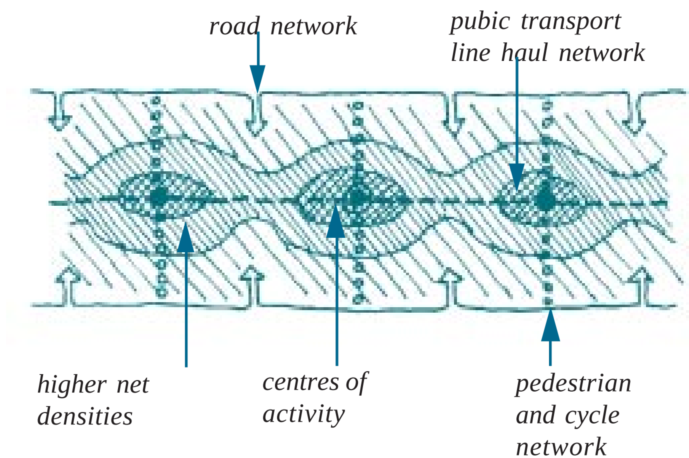



**Figure 1: Networks should support each other and be related to residential density and centres of activity.**

and light railway lines and to busways and high-frequency bus routes. High density urban housing within walking distance of stations and stops reduces the dependence on car travel and increases the viability of public transport.

## Corridors for Roads and Precincts for Streets

Precincts or neighbourhoods (for access to properties and internal circulation) and corridors (which serve as through- traffic routes) are key aspects of transport planning. The local traffic routes in precincts are classified as streets (refer to Table 2 in Element 1: Street Networks for definition); those in corridors are classified as roads (Figure 2).

The distinction is important. For roads (eg. arterial and sub-arterial), the movement function is dominant and the interuption caused by frequent intersections, entrance drives, parked vehicles, and crossing pedestrians and cyclists should be carefully managed. As the regional function of roads becomes more dominant, those should reduce. For streets, access and the quality of the environment are dominant. The streets should be safe for all users and the amenity of the precinct should be protected.

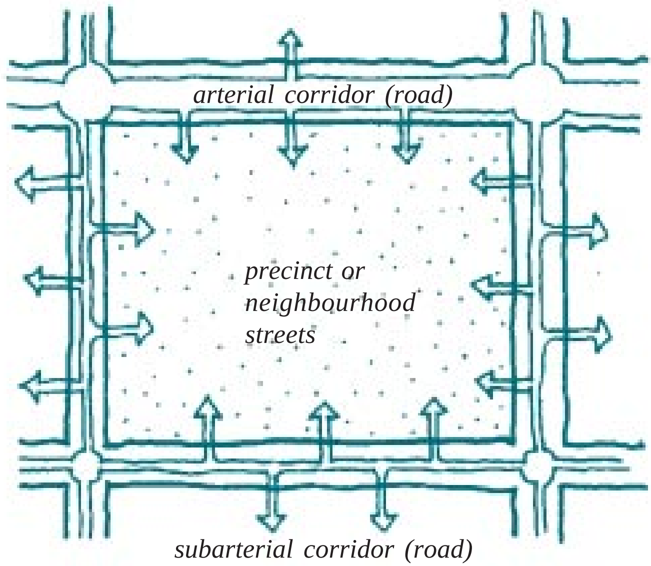



**Figure 2: Corridors for movement and streets within precincts.**

The spacing between corridors depends on regional transport requirements and on the need to create viable residential, commercial or mixed use precincts. A larger precinct or neighbourhood may be more self-contained (with its own school, community and commercial facilities) than a smaller precinct, but dwellings in the large precinct will have less direct access to the external road network than those in the smaller precinct. Traffic volumes on local streets may also increase. With a greater number of smaller precincts, however, there will be more links between them and the external road system. This may reduce the efficiency of the road corridors in carrying through traffic.

## Environmental Protection

Precincts can be protected from traffic by ensuring that development does not exceed the environmental traffic capacity (see PNP 7: Transport and the Local Environment) and that the street design reduces the impact of local traffic on the residential environment.

Providing there is a reasonable balance between corridors and precincts, adherence to the provisions in Elements 1.3: Street Networks and 2.1: Street Design and On-Street Carparking should ensure that these conditions are met. However, there is also a need to protect dwellings near transport corridors from exposure to traffic noise (see Element 5.13: Housing on Traffic Routes).

## Cost-effectiveness

There is a relationship between a residential street network and the surrounding road network which centres around the number and type of access points between the two systems. Arterial roads need adequately spaced intersections in order to operate efficiently. For instance, average spacing of median breaks along regional arterial roads ranges from 500 to 1000 m and along sub-arterial roads from 150 to 300 m.

There is a need for the road system to maintain a high traffic performance while providing for safe connections from the street system and for cross-movements between and within adjoining neighbourhoods (eg buses, pedestrians and cyclists). The role of the collector streets and the number of intersections with the arterials are important. A desirable result is a balanced layout which creates economical traffic management at intersections using minimum total pavement area, and traffic volumes on collector streets which do not exceed environmental capacity.

SPACING OF JUNCTIONS ALONG MAJOR TRAFFIC ROUTES

| Road Type | Typical Average Junction Spacing* (m) | Minimum Spacing of Staggered Junctions | |
|---|---|---|---|
| | | Left/Right Stagger | Right/Left Stagger |
| 2 lane sub-arterial | 100 | 60 | 30 |
| 3 lane sub-arterial | 100 | 100 | 30 |
| Divided sub-arterial | 150 | 150 | 50 |
| Divided arterial | 150 | 150 | 50 |
| Divided major arterial | 200 | 150 | 50 |

** The typical average junction spacing relates to the total number of junctions along both sides of the specified traffic route. Each cross road counts as one junction. A right/left stagger on a three lane sub-arterial or higher order road counts as one junction. Other junctions may form T-junctions or allow only restricted vehicle movements.*

*NOTES*

*# Median breaks or major arterials to be generally 300 m spacing with a minimum of 150 m. A right/left stagger counts as a break.*

*## Left in, left out turns may supplement crossroads and staggered junctions.*

**Table 1: Spacing of junctions along major traffic routes**

# Element 1.2
# Integrated Movement Networks

## Intent

To provide movement networks for vehicles, public transport, pedestrians and cyclists that are integrated, cost-effective and environmentally acceptable, and minimise the impact on traffic on the residential environment.

## Performance Criteria

The intent may be achieved where:

**Integrated provision**

**P1** The street network meets local needs and allows for the provision of public transport, for pedestrians and cyclists, and for expected vehicle traffic.

**P2** Public transport, pedestrian and cycleways, and road and street networks are provided in a manner where they complement each other.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated performance criteria.

**Integrated provision**

*(in relation to P1–P2)*

**A1.1** A development plan exists which provides for public transport, pedestrian and cycleways in accordance with P1 and P2 and development conforms with this plan.

OR

**A1.2** An integrated movement network plan exists with the characteristics specified in Elements 1.3: Street Networks, 1.4: Pedestrian and Cyclist Facilities, and 1.5: Public Transport.

*(in partial satisfaction of P3)*

## Performance Criteria (continued)

**P3** The arterial road network has the capability to accommodate express public transport services and has capacity to safely and efficiently accommodate projected movements.

**P4** The street network connects with external traffic routes (or corridors) to maximise movement efficiency on the traffic routes.

**P5** Corridor traffic routes are more convenient for through traffic than streets within precincts.

## Acceptable Solutions (continued)

**A3** Arterial corridors in developing areas are provided at intervals of not more than 1.5 km.

**A4.1** The street network conforms to a Development Area Plan for the area showing an existing and proposed major road network above the level of major collector street which satisfies projected district and regional travel.

AND

**A4.2** The street network provides for pedestrians and cyclists in accordance with the requirements of sub-element 2.5: Pedestrian and Cyclist Facilities.

AND

*(in relation to P5 tand P6)*

**A5.1** The street network conforms to a development plan for the area, showing an existing and proposed major road network above the level of major collector streets which satisfies projected district and regional travel.

## Performance Criteria (continued)

### Corridors and precincts

**P6** Streets within any neighbourhood do not operate as through traffic routes for externally-generated traffic (other than for pedestrians, cyclists and public transport).

**P7** Safe and efficient connections between transport corridors and residential neighbourhoods are provided.

### Environmental protection

**P8** Safe and convenient links are provided for pedestrians and cyclists across transport corridors.

**P9** Either

- the proposed residential development is not exposed to unacceptable traffic noise

OR

- the design and construction of the development ensures that acceptable living conditions within the dwelling can be created

## Acceptable Solutions (continued)

### Corridors and precincts

**A5.2** Through traffic with the projected traffic volumes exceeding those specified in Table 2 Element 1.3 is excluded from precinct streets.

**A7** Connections between residential streets and arterial roads are in accordance with the requirements of Table 1 (Spacing of Junctions Along Major Traffic Routes).

### Environmental protection

**A8** Safe pedestrian and cyclist crossings of an arterial road adjacent to residential areas are provided at intervals of not less than 500 m in locations related to movement desire lines.

## Performance Criteria (continued)

(refer to Element 5:13: Housing on Traffic Routes).

### Cost-effectiveness

**P10** The spacing of connections between street networks in precincts or neighbourhoods and road networks in corridors protects the performance of the road corridors and preserves the environmental quality of the street networks in the precincts or neighbourhoods.

**P11** Access arrangements for housing along an arterial road do not impede the traffic performance of the road.

## Acceptable Solutions (continued)

### Cost-effectiveness

**A10** Junctions between the external roads and the internal street network are located so as to minimise restriction of movement on the roads, and to avoid traffic volumes in excess of 6000 vpd on major collector streets and 3000 vpd on minor collector streets.

**A11** Proposed housing development along a movement corridor does not have direct vehicle access to an arterial road unless there are no suitable access alternatives, in which case vehicle access on to the corridor must be able to be made in a forward direction (see Element 5.13 for possible means of achieving vehicle access).

# Element 1.3
Street Networks

## Need

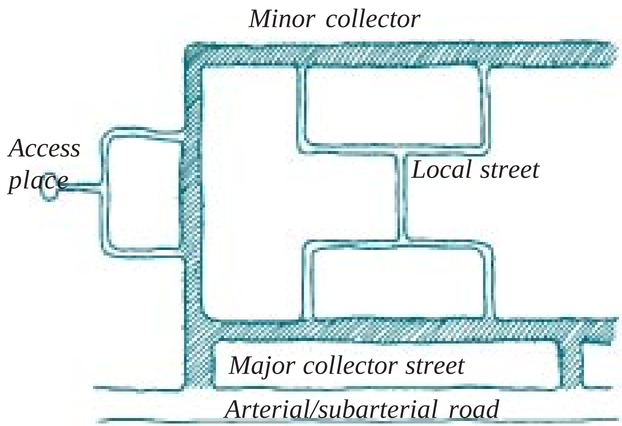
The streets in a network should have clearly identified functions; provide acceptable levels of access, safety and convenience; and create opportunities for choice in mode of transport. Urban design and the street network are linked and this should be recognised. Network planning should further ensure that acceptable levels of amenity are achieved, the negative impacts of traffic are minimised, and cost-effective residential development is facilitated.

## Function and Structure

Streets must provide for access to properties and for local vehicle movement. They should also meet requirements for drainage, utilities, bus routes, pedestrian and cycle systems and streetscape. Some streets must carry more traffic than others because they provide links to the major road network or carry buses. However, the majority of streets should have as little vehicle traffic as possible.

Element 2.1: Street Design and Onstreet Carparking makes a functional distinction between access streets and collector streets.

Within these two levels, there may be further distinctions, depending on traffic volume and



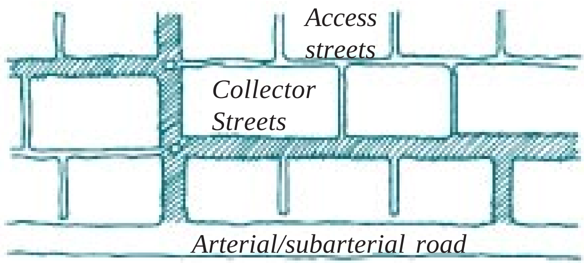




**Figure 1: Street classification**

vehicle speed, and urban design considerations (Figure 1). Streets of different classification should be distinguishable so that drivers learn to recognise street types.

## Safety, Access and Convenience

In the design of residential precincts and neighbourhoods safety and amenity factors must be satisfied ahead of traffic efficiency. Importantly, good street network and residential design involves a balanced judgement between cost-effectiveness, urban design and amenity.

Pedestrian safety is a significant concern, and vehicle speeds should be kept as low as is practicable.

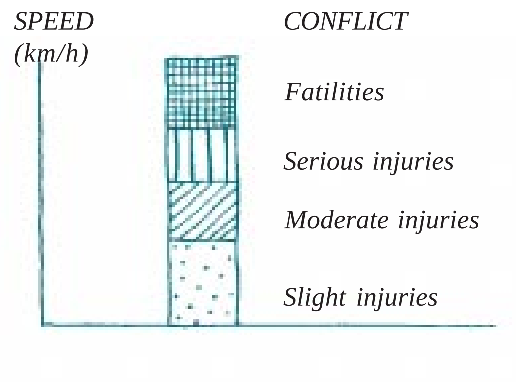



**Figure 2: Pedestrian safety and vehicle speed**

Issues of access, safety and traffic noise arise in streets with high traffic volumes. For example access to property frontage can become a safety issue when traffic volumes exceed about 5000 vpd and vehicle speed exceeds about 60 km/h; concern about traffic noise becomes an issue at even lower traffic volumes (about 3000 vpd), while amenity concerns are recorded with traffic volumes as low as 1500 vpd; and serious injuries and fatalities asociated with car accidents increase as vehicle speeds increase over 40 km/h (Figure 2).

These factors indicate a need for specific design solutions for housing along streets with traffic volumes exceeding 3000 vpd. New networks should be developed and existing ones adapted (through traffic calming) to avoid such streets where possible.

However, these low speed and volume needs must be weighed against driver convenience. The driving distance from any dwelling and the number of turns at intersections or junctions to the most convenient collector street or higher-order road should not be excessive. Table 2 provides information on intersection spacing along residential streets.

## Mode Choice

The street network should provide for bus routes which will give residents reasonable access to the bus service and bus operators a relatively direct route. There should be links with adjoining areas and activity centres without attracting through-traffic.

Bus operations are adversely affected by speed restrictions and require a relatively wide carriageway. Bus routes are typically accommodated on collector streets and occasionally on busier access streets.

All residents should have the opportunity to safely walk or cycle to the nearest community facilities, such as shops and schools, and should be provided with safe and convenient links to similar destinations external to their immediate neighbourhood.

## Urban Design and Character

Street networks should be designed to take account of the topography and vegetation, respect existing or potential site assets, and take advantage of opportunities for views and vistas. The legibility of the street network can be enhanced by sensitive network design.

Consideration should also be given to the streetscape. This may include the option of creating urban, landscaped or a combination of streetscapes. Design principles are set out in Element 4.1: Streetscape and Landscape.

An important factor in the design of a street network is the creation of lots where there is potential for the design of energy efficient dwellings. Solar access affects street orientation and is especially important for small lots in temperate climates. The preferred orientation in these situations ranges between 20o W and 30oE of true north. Preferred orientation of streets varies depending on local climatic characteristics (refer to PND 17, PND 18 and PND 19).

## Environmental Protection

The number of vehicle trips generated by a development must be related to the environmental capacity of the street network. Table 3 provides the kind of information which is required, but local trip generation rates should be used. By using this information, an assessment can be made of the impact of proposed development on the street network Figure 4).

The street network should be designed to restrain traffic speeds and volumes to acceptable levels.

**CLASSIFICATION OF RESIDENTIAL STREETS**

| Residential Street Level/Type and Function | Target maximum speed (km/h) * | Indicative traffic volume (vpd) ** |
|---|---|---|
| ACCESS STREET | | |
| Access place | 15 | 300 |
| The Lowest order of street providing access to sites without any traffic generated by sites in other streets. | | |
| Local street | 40 | <2000 |
| Access streets are generally streets where the residential environment is dominant, traffic is subservient, speed and volume are low and pedestrians and cycle movements are facilitated. | | |
| COLLECTOR STREETS | | |
| Minor collector | 50 | <3000 |
| The collector street collects traffic from access streets and carries higher volumes of traffic. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and vehicle speeds. Vehicle speeds are controlled by street alignment, intersection design and, in some cases, by speed control measures. | | |
| Major collector | 60 | <6000 |
| The major collector is generally short and connects that collector street with the road corridor network. Fronting development should still be encouraged, but with siting conditions which ensure acceptable amenity and safety. | | |

** This is the intended maximum speed at which most drivers will travel given the inbuilt environmental speed controls created by the street layout and design. It is not a design speed for sight distance cornering or other geometric properties of the carriageway.*

*** The indicative maximum traffic volume is a target volume which may be exceeded in a few cases where significant lack of economic or design quality would otherwise result.*

**Table 1: Classification of residential streets. (for further details see Element 2.1)**

**SPACING OF JUNCTIONS ALONG RESIDENTIAL STREETS**

| Street type | Typical av.junction spacing (metres) | Minimum spacing of staggered junctions | |
|---|---|---|---|
| | | Left/right stagger | Right/left stagger |
| Access street | 40 | 20 | 5 |
| Collector (minor) | 40 | 20 | 5 |
| Collector (major) | 80 | 40 | 5 |

** The typical average junction spacing relates to the total number of junctions along both sides of the specified traffic route. Each cross street counts as one junction.*

**Table 2: Spacing of junctions along residential streets.**

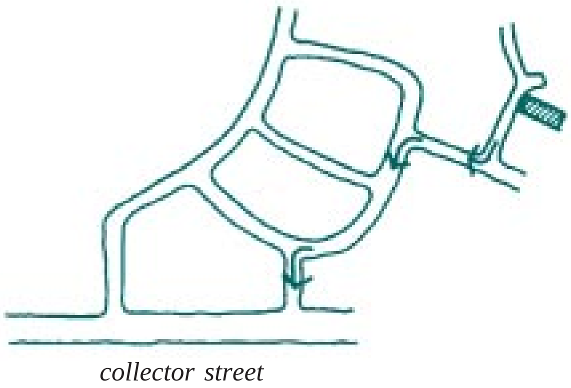



**Figure 3: Maximum of three turning movements from houses to nearest collector street/arterial road.**

| Type (number of cases) | Mean | Range |
|---|---|---|
| Family detached (280) | 0.74 | 0.3–2.3 |
| Apartment (rental) pre 1973 (87) | 0.51 | 0.1–1.0 |
| Apartment (rental) post 1973 (16) | 0.44 | 0.2–0.7 |
| Low rise (26) | 0.47 | 0.3–0.9 |
| Townhouse/condonimium (owner) (54) | 0.44 | 0.2–1.6 |
| High rise (>10 storeys) (17) | 0.30 | 0.2–0.5 |

(Source: Black, 1992)

**Table 3: Trip generation (local rates should be used).**

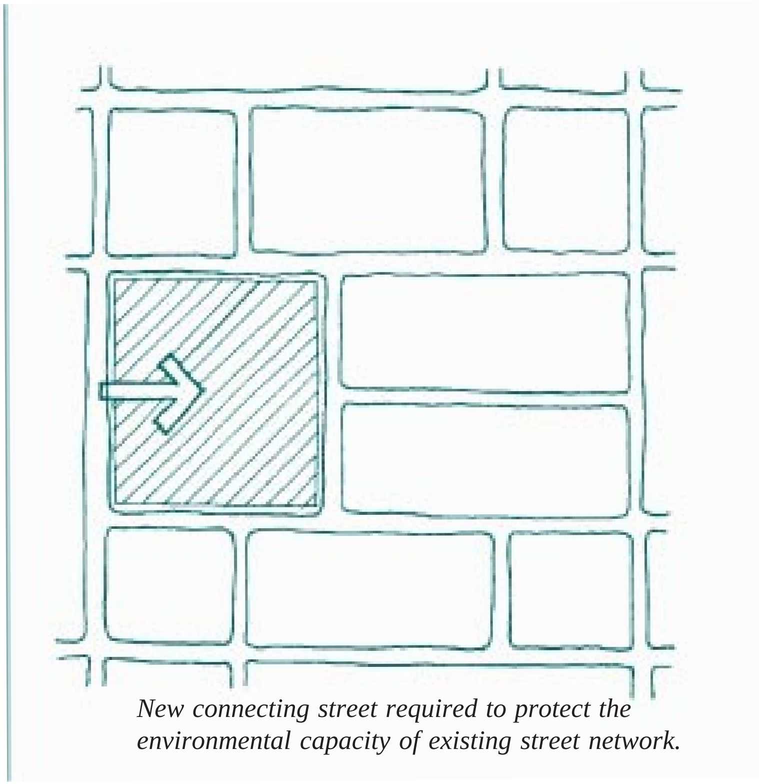



**Figure 4: Impact of development on network.**

# Element 1.3
# Street Networks

## Intent

To create street networks in which the function of each street is clearly identified, providing acceptable levels of access, safety and convenience for all users.

## Performance Criteria

The intent may be achieved where:

**Function and structure**

**P1** The street network has a clear structure and component streets conform to their function in the network.

**P2** The network has clear physical distinctions between each type of street. These distinctions are based on function, legibility, convenience, traffic volumes, vehicle speeds, public safety and amenity.

**P3** The design features of each type of residential street encourage driver behaviour appropriate to the primary function of the street in the network.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**Function and structure**

*(in partial satisfaction of P1)*

**A1** Streets link with other streets that are no more than two levels higher or lower in the hierarchy.

*(in relation to P2 and P3)*

**A2** The street network reflects the characteristics specified in Table 1 (see also Table 1, Element 2.1).

## Performance Criteria (continued)

### Safety, access and convenience

**P4** Junctions along residential streets are spaced to create safe and convenient vehicle movements.

**P5** The street network creates convenient movement for residents between their homes and higher-order roads.

### Mode choice

**P6** There is provision for bus routes which are direct and safely accessible by foot from all dwellings and activity centres, provide links with external areas and are efficient to operate.

**P7** Streets carrying bus routes provide for ease of movement of buses between developments and for links to major activity centres within and external to the development without complicated turning manoeuvres.

## Acceptable Solutions (continued)

### Safety, access and convenience

**A4** Junctions are spaced as set out in Table 2.

**A5.1** The driving distance from any dwelling to the nearest collector (or higher-order) street or road is a maximum of 700 m, and the distance to the nearest road is no more than 1200 m.

AND

**A5.2** No more than three turning movements at intersections or junctions are required in order to travel from any home to the most convenient collector street or higher-order road.

### Mode choice

*(in relation to P6 - P8)*

**A6.1** Public transport routes and stops are provided as set out in Element 1.5.

AND

**A6.2** The streets suitable for bus routes through the development are no more than 30% longer than those available on the road network for at least 5% of all routes.

## Performance Criteria (continued)

**P8** The alignment and geometry of the streets that form the bus route allow for efficient and unimpeded movement of buses without facilitating high traffic speeds.

**P9** The street network facilitates walking and cycling within the neighbourhood and to local activity centres.

**Urban design and character**

**P10** The street network takes account of the topography and vegetation, respects any existing or potential site assets, and takes advantage of opportunities for views and vistas.

**P11** The street network takes account of the streetscapes that may be created or that already exist.

**P12** The street network is orientated, where practical, to promote efficient solar access for dwellings.

**P13** The street network takes account of natural drainage and open space systems.

**Environmental protection**

**P14** Traffic generated by a development is within the acceptable environmental capacity of the roads and streets.

## Acceptable Solutions (continued)

**A9** Streets provide a safe, convenient and legible network for pedestrians and cyclists in accordance with Element 1.4.

**Urban design and character**

**A11** The street network permits the establishment of streetscapes that incorporate the provisions of Element 4.1.

**Environmental protection**

**A14** Traffic generated by a development is within the limits established by the relevant development plan for the type of residential development proposed.

## Performance Criteria (continued)

### Environmental protection (continued)

**P15** Streets do not operate as through-traffic routes for externally-generated traffic, while limiting the length of time local drivers need to spend in a low-speed environment.

**P16** The street network is designed to reduce traffic speeds and volumes to acceptable levels, with most dwellings fronting streets with low volumes.

**P17** The impact of measures intended to restrain traffic speeds and/or volumes take account of the needs of other street users and adjoining dwellings, by avoiding:

- stop-start conditions
- increased vehicle emissions
- unacceptable traffic noise to adjoining dwellings
- devices which reduce convenience or safety levels for cyclists and public transport.

**P18** Streets and lots are located so that dwellings are not subject to unacceptable levels of traffic noise.

## Acceptable Solutions (continued)

### Environmental protection (continued)

*( in partial satisfaction of P16 and P17)*

**A16.1** Intersections within the street network are either roundabouts or other appropriate traffic management treatments to slow and control traffic.

AND

**A16.2** Traffic speeds and volumes are restrained through such measures as:

- limiting street length
- introducing bends
- introducing slow points in accordance with Element 2.1.

**A18** Traffic noise in residential streets does not exceed 55 dB(A) $L_{10}$ at the facade of dwellings.

## Performance Criteria (continued)

### Cost-effectiveness

**P19** Streets and carriageway widths and street lengths optimise the cost-effectiveness of the street network.

**P20** The network provides for the cost effective provision of public utilities.

## Acceptable Solutions (continued)

### Cost-effectiveness

*(in partial satisfaction of P19)*

**A19** Major collectors are less than 150 m long, except where the topography or the location of major traffic routes makes a longer distance unavoidable.

**A20** The network caters for the efficient provision of public utility networks including water, sewerage, electricity, telecommunications and gas.

# Element 1.4
## Pedestrian and Cyclist Facilities

### Need

Walking and cycling play an important health and recreational role in a community. All residents should have the opportunity to walk or cycle to the nearest community facilities. They should also be provided with safe and convenient links to major destinations outside of the neighbourhood.

Residents will be encouraged to walk or cycle if the street planning and design and pathway network is safe, convenient and legible. This includes designing for children, who typically form a large proportion of the pedestrian and cycling population; aged pedestrians and cyclists; and people with disabilities.

### Planning

Planning for pedestrians and cyclists must be integral to the total transportation network. A development plan or traffic calming plan in an established area may identify special networks for pedestrians and cyclists. Neighbourhood pedestrian routes and cycleways also need to be designated on subdivision or integrated development plans in new areas. Direct paths should be provided to local activity centres and schools, using lower-order streets and the open space system. Alignment with heavily trafficked streets should be avoided unless special provision is made. Appropriate street and intersection treatments will be required.

Issues of safety, convenience and cost-effectiveness must be addressed when providing for pedestrians and cyclists in residential areas must be approached with care. The design philosophy which underlies the classification of the residential street system recognises the need for a safe environment for pedestrians and cyclists. This is reflected in the different types of streets, appropriate speed and traffic volumes without emphasis on design and construction so that target speeds are not exceeded.

It is important to recognise that the local, low-volume street system is important for children to learn to ride their bikes on streets, which will, ultimately, enable them to ride on higher-order streets and roads.

Furthermore, the degree to which of-road pedestrian and cyclist routes can be provided (eg linear parks) will often be governed by the need to provide a prescribed proportion of a new neighbourhood development for public open space. The provision of linear parks which include direct pedestrian and cyclist routes will often be at the expense of other recreational areas, such as neighbourhood parks, playing fields etc. Usually the easiest way of providing linear pedestrian and cycle paths is where there is a requirement for multiple-use drainage corridors.

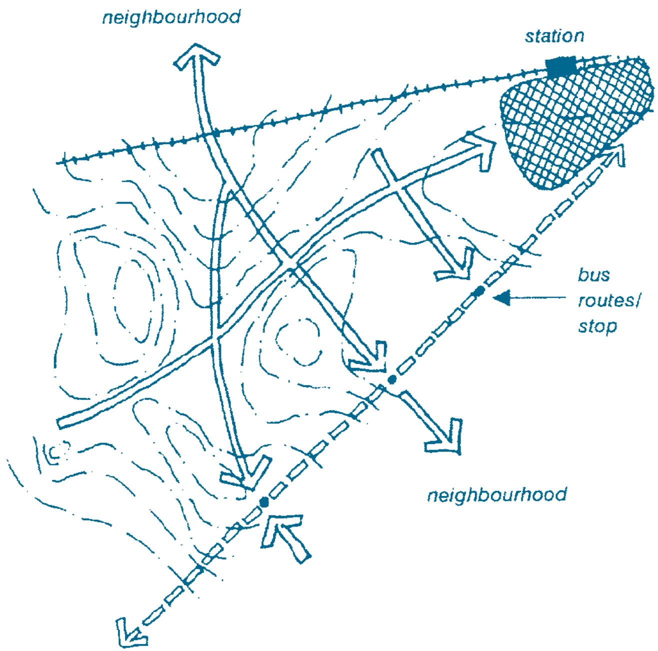



**Figure 1: Pedestrain and cycle lines.**

## Pedestrian Facilities

All residential developments should be designated to provide for safe and convenient movement of pedestrians. Particular attention needs to be given to the aged, young children, people using prams, and people with disabilities.

In access lanes and places of low-volume access, it is often possible to provide for pedestrians on the street pavement. However this is likely to restrict pedestrian access for people with disabilities. Therefore the likely needs of an existing or future population must be assessed to determine whether a footpath should be provided.

In access streets carrying higher traffic volumes (eg excess of 300 vpd), a footpath should be provided on one side of the road.

Although many new subdivisions have been developed with a footpath adjacent to the kerb (usually to encourage for residents to maintain the landscaped verge between the property line and the footpath/street), this is not as convenient as one that is located closer to the front property line. This location separates pedestrians for parked or moving vehicles, enables the planting of trees between the footpath and the kerb (thus encouraging a canopy effect over the street), and avoids the possibility of motorists parking on the footpath where rollover kerbs are provided.

On collector streets, where traffic speeds and volumes are higher, a footpath should be provided on both sides of the street. In some circumstances eg where one side of the street is generally used, a footpath can be omitted.

Although footpaths are usually funded by the developer, they are often 'bonded' to be constructed after roads, services and houses to prevent damage during the long construction phase. It is therefore important to clarify location their so that purchasers can plan their front garden landscaping.

Footpath materials should be safe for people with disabilities and should improve the visual appearance of streets. For example, in high-density residential areas where there are a larger number of driveway crossovers, consideration should be given to ensuring that driveway crossovers and pedestrian footpaths are constructed using the same materials and colours to create an integrated streetscape effect.

## Cyclist Facilities and Shared Paths

The planning of cycle and street networks should allow for all user groups (eg school children, recreational and commuter cyclists, etc.) to use paths and all residential streets. Where there is likely to be a significant number of cyclists, particularly near a school, a cycle path may be needed.

Adequate provision should be made for bicycle parking at local and neighbourhood activity centres as well as at public transport stations and interchanges.

There will be situations where separate pedestrian and cycle paths are needed. This may occur, for instance, where there are schools adjacent to collector streets or more heavily trafficked roads.

There may also be opportunities for the provision of cycle paths arising from the land form, open space system or pattern of subdivision. However, attention should be given to casual surveillance of pedestrians and cyclists; routes along backways that are hidden should be avoided.

Paths should be well lit.

Arterial roads and collector streets usually provide more direct linkages to places of employment and activity centres, link neighbourhoods, and therefore meet the needs of cyclists.

Within neighbourhoods the emphasis should be on providing ‘low stress’ routes, which are particularly useful for beginners, children and elderly people. Such routes can be on the street network or on off-road paths. Off-road paths are primarily for recreational use.

In recent years, however, there has been considerable concern about the use of off-road shared paths, particularly in terms of safety. Commuter cyclists or cyclists travelling at speed have worried pedestrians, particularly elderly people and people walking with young children. While shared paths are more cost-effective, either segregated or separate paths should be considered as a preferred option, especially where large numbers of cyclists are envisaged.

## Safe Street Crossings

Particular attention should be given to the safe crossing of streets where traffic volumes exceed 3000 vpd or speeds exceed 50 km/h. Controlled access points should be created with the use of pedestrian refuges, slow points, thresholds or other appropriate mechanisms.

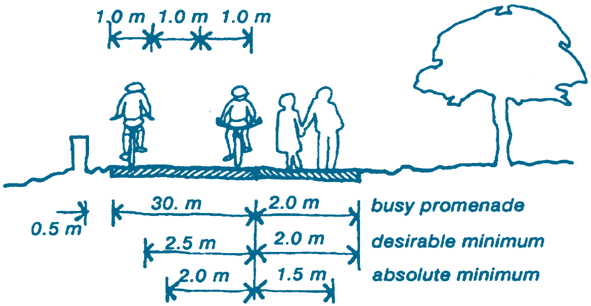
Path ramps connecting footpaths and cycle paths to streets should, in particular, provide for the needs of people with disabilities (eg wheel chairs/sight-impaired people).

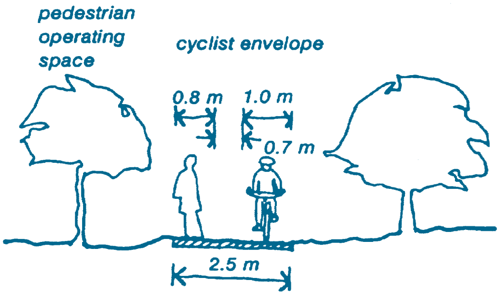
Where main pedestrian paths and cycle routes intersect with arterial roads, traffic signals or pedestrian activated signals should be provided.

## Additional Information

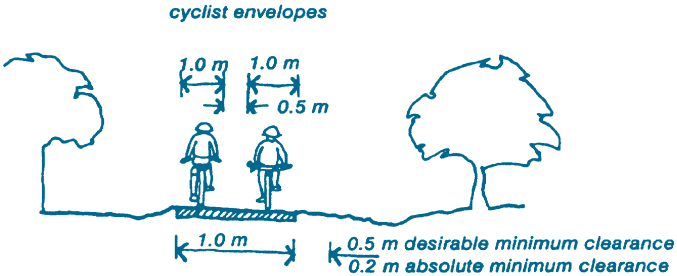
There needs to be for a systematic approach to the planning and design of cyclist facilities, in which system continuity, safety, and gradients must be considered. Technical details for cycleways and on-road facilities can be found in *Bicycles, Guide to Traffic Engineering Practice* (AUSTROADS, 1993).

**Segregated path dimensions**




**Desirable minimum shared path**




**Desirable minimum bicycle path**

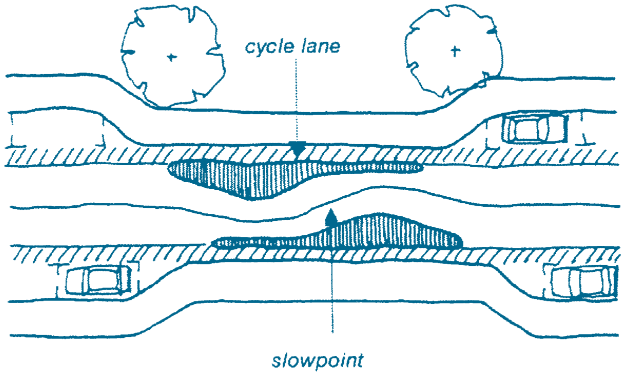



**Figure 3: Designing for cyclists at vehicle slow point.**

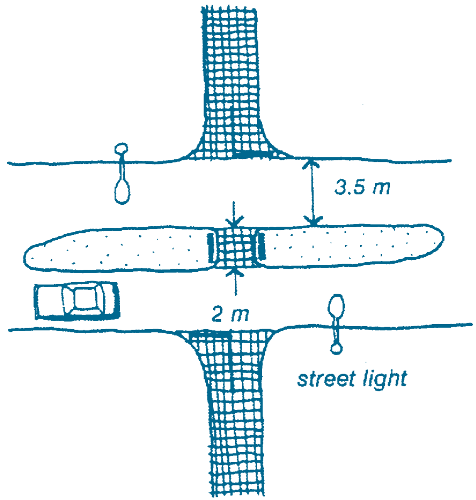



**Figure 4: Safe pedestrian crossing point on higher taffic volume streets streets.**

# Element 1.4
# Pedestrian and Cyclist Facilities

## Intent

To encourage walking and cycling by providing safe, convenient and legible movement networks to points of attraction within and beyond the development.

## Performance Criteria

The intent may be achieved where:

### Planning

**P1** The residential street and path network provides a network of pedestrian routes, and low speed and volume routes for cyclists, with connections to adjoining streets, open spaces and activity centres.

**P2** A network of pedestrian ways and cycle routes is provided in accordance with:

- the need to encourage walking and cycling;
- likely users (eg school children, parents with prams, the aged and/or people with

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

### Planning

*(in relation to P1 and P2)*

**A1** Where a development plan, traffic calming plan or an approved pedestrian and cycleway plan exists, pedestrian and cyclist paths are provided in accordance with that plan and are constructed to an approved standard.

## Performance Criteria (continued)

disabilities, commuter and recreational cyclists);

- opportunities to link open space networks and community facilities, including public transport stations/ stops, local activity centres, schools;
- topography;
- cyclist and pedestrian safety.

**Location and design**

**P3** The location of footpaths and cycleways in a street reservation is determined by:

- whether vehicle speeds and volumes are low and the use of the street pavement by cyclists does not affect the comfort and safety of pedestrians;
- whether pedestrians and cyclists are protected from parked vehicles and vehicles moving along the street and on driveways;
- whether postal delivery will be significantly inconvenienced;
- the location of physical services;
- cross falls;

## Acceptable Solutions (continued)

**Location and design**

**A3.1** Footpaths and cycle paths are provided in accordance with Table 1 in Element 2.1

OR

**A3.2** Footpaths are provided on one side of streets with traffic volumes over 300 vpd and less than 2000 vpd, and on both sides of streets with traffic volumes over 2000 vpd.

## Performance Criteria (continued)

- landscaping;
- whether there is any development fronting that part or side of the street;
- cyclist and pedestrian personal safety;
- cost-effective construction.

**P4** The alignment of paths allows safe and convenient use by pedestrians and cyclists and is varied to preserve trees and other significant features. A focus on vistas and landmarks add visual interest where they exist.

**P5** Pedestrian paths and cycleways are well lit and located where there is casual surveillance.

**P6** Footpaths or shared paths are designed and constructed of appropriate width, longitudinal gradient and sight distance to cater for the number of projected pedestrians and cyclists, and user types (eg the aged, the very young, people with prams and in wheelchairs, and people with disabilities).

## Acceptable Solutions (continued)

*(in partial satisfaction of P6)*

**A6.1** Collector streets on which there is access to lots or where there is a planned pedestrian or cyclist path are provided with a separate path on each side clear of the carriageway pavement.

AND

**A6.2** A pedestrian (only) footpath, where required, is 1.2 metres wide and has a maximum grade of 15 per cent.

| Performance Criteria (continued) | | Acceptable Solutions (continued) | |
|---|---|---|---|
| | | | AND |
| | | **A6.3** | Footpaths are widened to 1.4 metres minimum in the vicinity of meeting points, schools, shops and other activity centres. |
| | | | AND |
| | | **A6.4** | Cycle paths and shared paths have widths in accordance with Figure 2. |
| | | | AND |
| | | **A6.5** | Maximum longitudinal gradient of cycle paths to be no greater than that at any adjacent street pavement. |
| **P7** | Design of the street and the pavement accommodates pedestrian and cyclist use of street pavements in access places, and cyclist use of street pavements in access streets and collector streets. | | |
| **P8** | Provision is made for the location of seats at appropriate points. | | |
| **P9** | There is adequate provision for passing with paths widened at potential conflict points or junctions on high use facilities to allow for passing of pedestrians/cyclists in opposite directions. | **A9** | Paths are widened at potential conflict points or junctions in areas of high use. |

## Performance Criteria (continued)

### Safe crossings

**P10** Safe street crossings are provided for all street users with safe sight distances and adequate pavement markings, warning signs and safety rails (where appropriate for cyclists).

### Construction

**P11** Pedestrian and cyclist paths are constructed to provide a stable surface for projected users which is easily maintained.

## Acceptable Solutions (continued)

### Safe crossings

*(in partial satisfaction of P10)*

**A10.1** Where traffic volumes exceed 3000 vpd or speeds exceed 50 km/h, safe crossings are created with the use of pedestrian refuges, slow points, thresholds or other appropriate mechanism.

AND

**A10.2** Pram and wheelchair crossings are provided at all kerbs and are adequately designed for this purpose as well as assisting sight-impaired people in accordance with AS1428.1 — 1993.

### Construction

**A11.1** Footpaths are constructed of bitumen, concrete or blockwork to the approved construction standard.

AND

**A11.2** Cycle paths are constructed of bitumen, concrete or cement stabilised crushed rock to the approved standard.

# Element 1.5
## Public Transport

### Need

Adequate provision for public transport cannot be an afterthought in residential planning. Just as choice in lot size and housing type is important, so is choice in transport mode. Public transport services generally exist in established areas, whereas in urbanising areas some public transport service (perhaps operated by a private company) may eventually be provided. However, in most areas, other than in inner suburbs and areas close to a railway station or tramway stop, the level of service rarely presents an adequate choice.

### Planning

Of the many factors that determine the opportunity for a high level of service, residential density, population characteristics, transport technology and operating characteristics are the most significant.

The location of higher density forms of residential development near existing rail or tramway lines should be given priority as it enables better use of the existing infrastructure. In other areas, the location of housing should be related to proposed public transport routes so as to enhance its early provision.

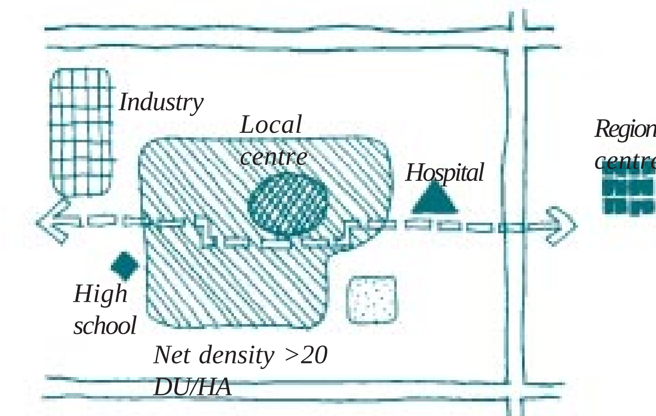
When new development is not directly served by rail or tramway lines, planning provision should be made for appropriate extensions where practical. Such planning will include reserving land for the public transport service and stations or stops, and designating higher residential densities and/or mixed uses in areas close to stations to support the service.

In all areas the integrated street networks should be planned to provide the framework for a street-based public transport system. Consideration should be given to major travel demand routes, but planning should allow for all collector streets to be a potential bus route (large buses on major collectors and smaller buses on minor collectors), with changes possibly occurring as development proceeds.

Different systems and networks may need to be considered for peak and off-peak conditions. This may influence route planning and the location of stops.

# Route Location and Design

Although there are environmental advantages in rail-based systems in areas of major urban growth, the bus is likely to be the common form of public transport in many urbanising areas. The street network should provide for bus routes that will give an acceptable level of accessibility to the bus service by residents and visitors, and a reasonably direct route for bus operators without excessive turning movements. A bus route should preferably not be any longer than 30% of a comparable car trip.




*Residential density, the location of activity centres and bus route planning should be considered simultaneously.*

**Figure 1: Land use and public transport.**

It is desirable that not less than 90% of dwellings be within 400 metres of existing or proposed bus route, or 500 metres from the nearest existing or proposed bus stop (representing a walk of about five minutes).

Bus operations are adversely affected by speed restrictions and require a relatively wide carriageway. Bus routes are typically accommodated on collector streets and only occasionally on access streets. In some cases there may be justification for introducing short 'bus-only' street sections. Routes with gradients over 8% should be avoided where possible.

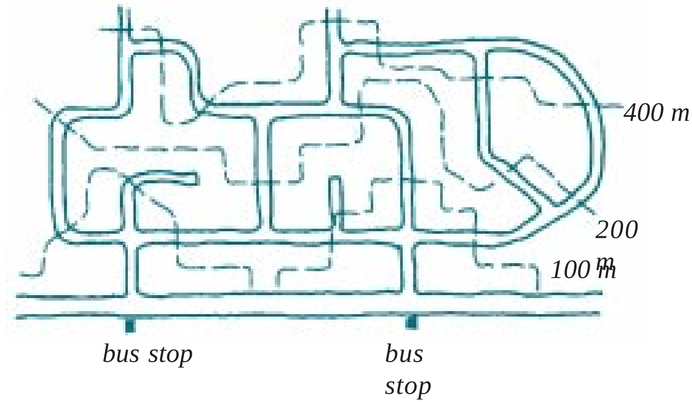



**Figure 2: Areas served by regular bus routes (90% of houses within 400 m of a route).**

A demand-responsive or community bus service (which is likely to be very appropriate for small to medium-sized towns) might also be considered. Technology and operating techniques can offer alternatives to conventional forms of public transport. Routes are likely to vary with demand and the street network should be designed to avoid discontinuity in streets where such a service might operate.

## Stop Location and Design

Bus stops should be positioned at accessible points in the pedestrian network and at activity centres. The location of bus stops and the pedestrian path system should, therefore, be considered together. This means that bus routes and stops should be identified at the planning and initial development stage even if a bus service is not being provided.

In order to provide a reasonable degree of security for bus users, bus stops in residential areas should be located so as to under be in view of adjacent housing. bus stops should have seats, provide shelter and timetable information, and be well lit.

Safety at bus stops is important. There is evidence that accidents occur when alighting

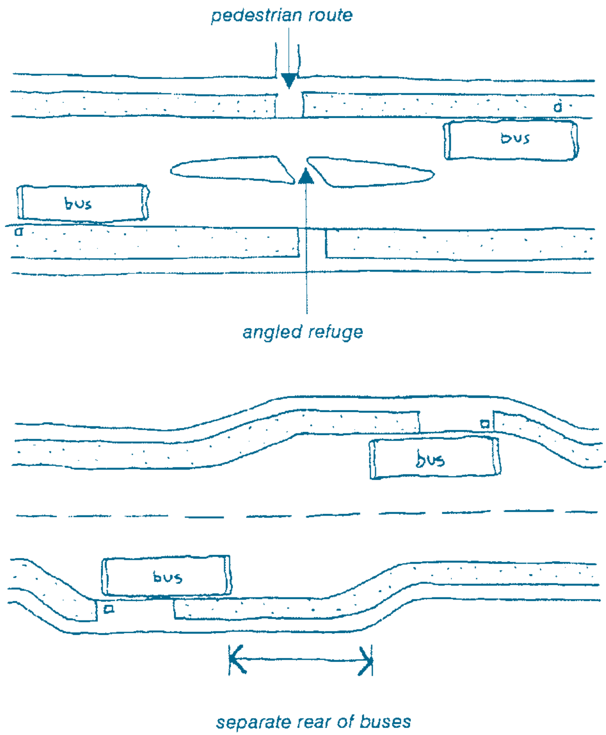



**Figure 3: Examples of traffic control at bus stops.**

passengers attempt to cross the road and are hit by a vehicle overtaking the stationary bus. Bus stop design could prevent this form of overtaking by introducing a pedestrian refuge in the median and ensuring that the carriageway does not permit overtaking. Other options are to design and construct the pedestrian crossing area so that vehicles are forced to travel slowly, or provide indented bus stop bays with adequate separation (Figure 3).

**PERFORMANCE CHECK FOR BUS ROUTES**

| | |
|---|---|
| STREET CARRIAGEWAY WIDTHS | One-way: 6.75 m<br>Two-way: 7.50 m |
| MINIMUM GEOMETRIC LAYOUT | R 12.5 m for single bus unit<br><br>Note: Some routes may require geometry to suit articulated bus. |
| ROUNDABOUTS | Maximum desirable pavement crossfall: 3%<br>Maximum desirable gradient: 6%<br>Absolute maximum gradient: 12% |

**Table 1: Performance check for bus routes.**

# Element 1.5
# Public Transport

## Intent

To increase opportunities for choice in mode of transport and provide cost-effective and energy-efficient public transport services that are accessible and convenient to the community.

## Performance Criteria

The intent may be achieved where:

### Planning

**P1** Neighbourhood densities are set at levels that encourage the economic provision of regular public transport services.

**P2** Net residential densities within walking distance of public transport stations and stops are set at levels that take advantage of the infrastructure investment and support the economic operation of services.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

### Planning

*(in relation to P1 and P2)*

**A1.1** Where a development plan or other planning instrument exists, routes and neighbourhood and net residential densities conform with that plan.

OR

**A1.2** Neighbourhood residential densities are not less than 12 dwelling units per ha and/or net residential densities are not less than 16 dwelling units per ha, or at other such densities as approved by the responsible authority.

## Performance Criteria (continued)

**P3** A network of public transport routes is provided that takes account of:

- projected travel demand
- distribution of likely demand
- scale and time of demand
- characteristics of travellers
- travel time
- operating characteristics
- cost of providing the service
- route location and design.

## Acceptable Solutions (continued)

*(in partial satisfaction of P3)*

**A3** At least 90% of dwellings are within 400 m safe walking distance from an existing or potential bus route, or 200 m safe walking distance from an existing or proposed demand-responsive or community bus service route.

| Performance Criteria (continued) | Acceptable Solutions (continued) |
| --- | --- |
| | *(in partial satisfaction of P4 and P5)* |
| **P4** Convenient connections to adjoining areas and other public transport routes (including future routes), provide for ease of movement of buses between developments, and link activity centres within and external to the development. | **A4** Bus routes linking residential areas across roads which carry in excess of 6000 vpd are designed to enable a left turn into the road from one area followed by a right turn from the road into the adjoining residential area. |
| **P5** Buses are able to safely gain access to the development and cross arterial roads when travelling between developments, without complicated turning manoeuvres. | |
| **P6** The street network offers opportunities for cost-effective operation of demand-responsive services should the need arise, providing for both peak and off-peak regular services and the potential future provision of demand–responsive services. | |
| | *(in partial satisfaction of P7)* |
| **P7** The alignment and geometry of the streets that form the bus route allow for the efficient and unimpeded movement of buses without facilitating high traffic speeds. | **A7** Routes for regular bus services are designed in accordance with Table 1. |
| **Stop location and design** | **Stop location and design** |
| **P8** Public transport stops provide for pedestrian safety, security, comfort and convenience. | **A8.1** Bus stops for regular peak services are, or are projected to be, at 300 m spacings where the route serves residential development. |

## Performance Criteria (continued)

**P9** Bus stops are designed to prevent vehicles from overtaking a stationary bus, or vehicle speeds are reduced to ensure safe pedestrian crossing.

**P10** Bus stops are located and designed to provide shelter or shade, seats, adequate lighting and timetable information, are overlooked from nearby buildings, and are located to minimise adverse impact on the amenity of nearby dwellings.

**P11** Public transport interchanges provide for safe parking and/or storage of bicycles.

## Acceptable Solutions (continued)

AND

**A8.2** The siting of bus stops is related to the pedestrian path network.

# Element 1.6
Public Open Space

## Need

This Element applies where public open space is required as part of a residential development. This will usually occur in larger projects in both established and 'growth' areas of towns and cities. PND 7: Multiple Use of Drainage Systems provides a further public open space design reference source.

## Public Open Space

Public open space provides opportunities for:

- recreation—both active and passive forms;
- conservation—protection or integration of natural features and cultural sites;
- amenity—greening of the urban environment and a spatial setting for housing;
- utility—stormwater management, buffers between different land uses and repair of degraded land.

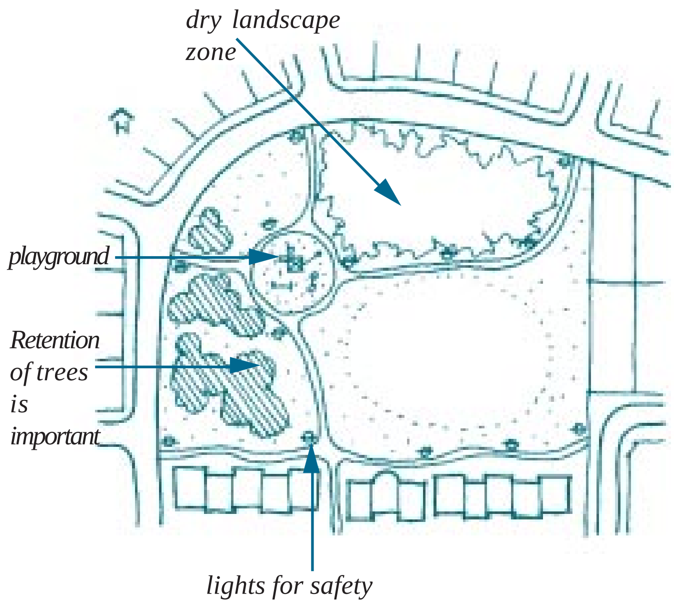



**Figure 1: A variety of recreation settings should be provided.**

The quality (or usability) of open space is becoming more critical in planning. Increasing residential densities and the cost of land require open space to respond better to the needs of individual communities by providing a variety of recreational opportunities or settings.

Open space should be planned and designed to allow adaptation to different future needs.

Where housing is being provided on redevelopment or infill sites, the interest in public open space will probably be focused on the following issues:

- the existing capacity of public open space;
- the possible need to manage increased stormwater load within the existing open space areas;
- whether additional land should be sought, or whether the community would be better served by existing public open space;
- the design considerations for including public open space as part of the development of a site.

## Habitat Retention and Enhancement

Public open space can retain and enhance existing habitats and areas of significant vegetation and landform within urban environments.

Watercourses in land designated for urban development frequently support a wider diversity of habitats than those on adjacent lands. Retaining of such habitats can benefit the preservation of animal and bird populations within new urban release areas. Such benefits have ecological as well as recreation and amenity value.

The integration of existing habitats and natural areas within public open space offers the potential to provide varied settings for the enjoyment of the local community and to provide relief and separation between residential precincts. The retention and enhancement of visually significant natural features add considerably to the amenity of a locality as well as providing shade, shelter and the lowering of ambient temperatures within adjacent areas.

## Recreation Settings

Varied recreation settings are necessary to satisfy recreation needs and demand. Classification of recreation experience and settings (as against the more traditional passive and active open space categories) emphasises the quality aspects of open space provision. It is based on identifying the experiences of users rather than on facilities within an area (see Figure 4).

This approach is consistent with a move away from a standards-based approach which has had an emphasis on quantity to the exclusion of quality.

## Multiple Use of Drainage Systems

The concept of combining stormwater drainage and recreation reserves has evolved from the ‘dual use’ concepts introduced in the 1970s. They now embrace consideration of water quality maintenance (refer to Element 3.2), habitat retention and enhancement, water conservation (refer to Element 3.3) and a wider choice of recreational opportunities.

The integration of drainage systems with public open space is particularly relevant to the achievement of various housing and environmental policies which, among other matters, are influenced by:

- higher residential densities—which will require a greater range of recreational activities within public open space areas and will also result in an increase in the area of impervious surfaces;
- the increasing cost of raw land—which requires more effective and efficient use of land within new residential release areas to achieve housing affordability;
- the conservation of wetlands and urban bushland— where measures can be taken to protect these natural assets;

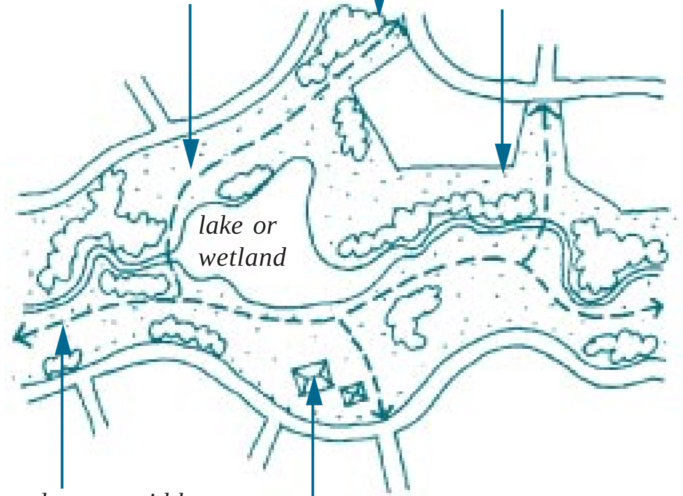



**Figure 2: It is important to provide sufficient space around water features and detention ponds to maximise the land area available for recreation use and to create a quality setting for major elements.**

- the maintenance of water quality in receiving waters— which requires measures to limit sedimentation and pollution of runoff in the upper catchment where they are most effective;

- open space provision—which is shifting from a quantity to a quality-based approach to ensure a sufficient variety of recreational opportunities.

Multiple-use drainage systems can potentially provide for the development of most recreation settings. This potential can be realised if sufficient advance planning occurs, and if design and implementation recognise the particular requirements of development within areas subject to drainage functions.

Multiple-use drainage systems are generally linear shaped spaces, presenting a longer frontage to adjacent development than square or circular plan forms. The advantage is that this provides directly accessible open space for many people.

This linear nature can also facilitate the development of off-road transport networks such as walking trails, and recreational and commuter cycle links with safe access to attractions within and next to open space areas (provided that activities front on to the open space for much of the length).

The potential presence of water within multiple-use drainage systems is also an advantage, as water in the landscape is among the most desirable of recreation settings. Even if flow within the floodways is periodic the design opportunities to create beautiful riverine settings by replicating natural waterways are considerable.

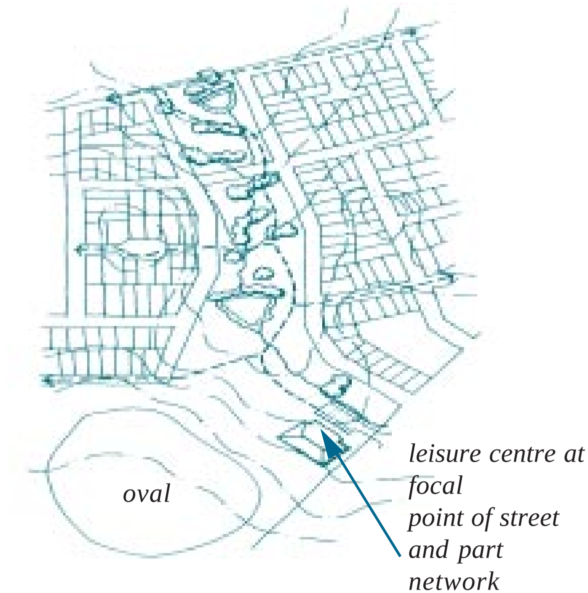



**Figure 3: In this residential estate, the primary function of the detention basin is recreation. A development of this quality should qualify as open space rather than 'drainage' reserve.**

# Element 1.6
# Public Open Space

## Intent

To provide, where appropriate, public open space that meets user requirements for outdoor recreational and social activities and for landscaping that contributes to the identity and environmental health of the community.

## Performance Criteria

The intent may be achieved where:

**P1** The multi-functional role of public open space, and its use as a community facility and for stormwater management, is recognised and promoted.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in relation to P1 and P2)*

**A1.1** Public open space is provided in accordance with an approved open space strategy, neighbourhood plan or development plan.

OR

*(in partial satisfaction of P1 and P2)*

**A1.2** Areas of public open space (incorporating drainage networks designed as part of multiple-use drainage systems) are provided to meet the statutory requirements of State and local authorities.

AND

## Performance Criteria (continued)

**P2** Public open space provides:

- a range of recreation settings, corridors for community paths, and attractive urban environment settings and focal points;

## Acceptable Solutions (continued)

**A1.3** District parks, consisting of 3 ha minimum area and containing a range of recreation settings, are provided within 2 km of all dwellings.

AND

**A1.4** Large local parks consisting of 0.4–1.0 ha minimum area provided within 500 m safe walking distance of all dwellings.

AND

**A1.5** Small local parks consist of 0.2 ha minimum area provided to serve neighbourhood needs within 300 m safe walking distance.

*(in partial satisfaction of P2)*

**A2.1** Landscaping accords with the approved landscape strategy for the area. Compliance is achieved by submission of a plan certified by a qualified landscape architect or designer as meeting the Performance Criteria, and showing:

## Performance Criteria (continued)

- adequate facilities to meet the needs of the community as reflected by indicators such as population density and demographic structure;
- accessibility to users in conjunction with existing facilities;
- acknowledgement of the opportunities and constraints presented by the physical characteristics of the land in the proposed use, landscaping and facilities;
- opportunities for the incorporation of existing trees, rocks, streams and other sites of natural or cultural value, and linkage of habitats and wildlife corridors;
- opportunities to link public open spaces into a legible network;
- public safety and reasonable amenity of adjoining land users in the design of facilities and associated engineering works;
- opportunities for regional or district open space to meet neighbourhood open space requirements;
- a clear relationship between public open space and adjoining land uses established by appropriate treatment including alignment, fencing, landscaping, and issues of security and surveillance; and

## Acceptable Solutions (continued)

- the adjacent street reserves, carriageways, parking bays, footpaths, cycleway systems and street and park lighting;
- existing vegetation and proposed general character of tree planting and landscape treatment (including proposed species);
- existing rare or significant vegetation, natural habitats and features (eg creeks) which are retained, enhanced or otherwise affected.
- general arrangement of hard landscaping elements and major earth cuts, fills and mounding;
- indicative treatment of any multiple drainage systems and the urban edge, along with general information on fencing, access points and furniture;
- proposed recreation facilities.

AND

**A2.2** Parks include provision for lighting where appropriate in accordance with Australian Standard 1158.1 (1986).

AND

## Performance Criteria (continued)

- avoidance of continual lengths of solid fencing along open space areas for security, surveillance, aesthetic and maintenance reasons.

**p3** The design of public open space considers ongoing maintenance requirements, costs and responsibilities.

## Acceptable Solutions (continued)

**A2.3** Parks are located so that at least 50% of their perimeter length has direct frontage to a public road.

# 2. Physical Infrastructure

## Introduction

This Element category addresses the essential physical infrastructure that is a necessary part of neighbourhood development. It relates to projects which require the development of public roads and infrastructure, and is specifically relevant to greenfields development sites and larger infill projects. The need for street design and construction to perform specific functions is also outlined. These include access, carparking, public utility provision, drainage systems and the creation of safe and attractive environments.

A coordinated approach between the various utility providers is encouraged, while various innovations in the provision of more environmentally appropriate utilities are outlined.

The Elements contained within this category are:

2.1 Street Design and On-Street Carparking

2.2 Street Construction

2.3 Utilities.

# Element 2.1
## Street Design and On-street Carparking

### Need

Streets must be designed to perform their designated functions within the street network, accommodate public utility services and drainage systems, and create a safe and attractive environment.

### Function and Width

AMCORD distinguishes two levels of streets: access streets and collector streets. In some developments there may be a need for categories within this two-level system.

On access street the residential environment dominates. Traffic speed and volume are low, and pedestrian and cycle movements encouraged. Vehicle speeds should be controlled by street length, alignment, parked cars, landscape design, built form and activity along the frontage. The relatively low speeds of up to 40km/h in access streets with less than 2000 vpd allow a decrease in safety sight distances, offering greater flexibility in the design of the streetscape and in the horizontal and vertical alignment of the carriageway.

A collector street collects traffic from access streets, carries higher volumes of traffic and may be the location for local bus routes and on-street or off-street cycle paths. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and vehicle speeds (through landscape design, parked cars, built form etc). Vehicle speeds on collector streets should be controlled by street alignment and intersection design, and by special measures at pedestrian and cyclist crossings and where there are bus stops.

Within this broad functional classification, there may be subcategories. For instance, in the case of access streets, a distinction can be made between access lanes, access places and local streets.

Access lanes may be appropriate in some residential developments for service vehicles and rear vehicular access to properties. For instance, there may be a situation where an access lane is provided between two or more adjoining access places.

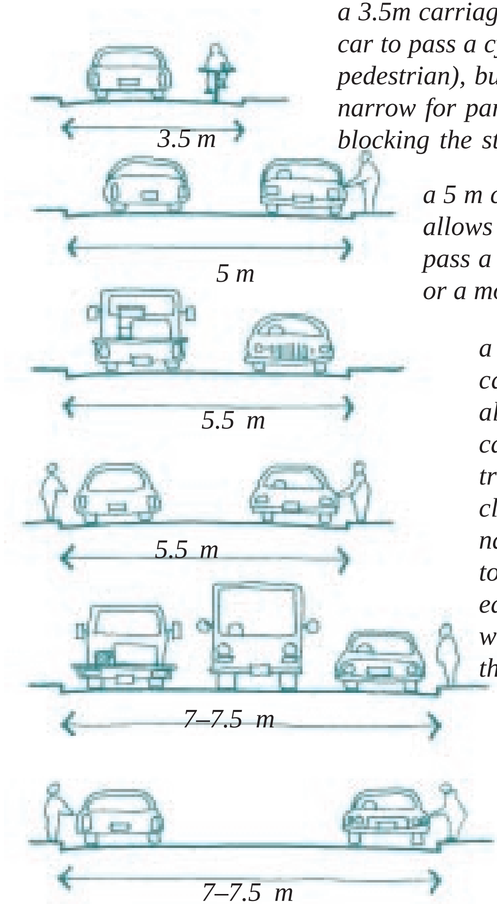
The access place is a street in which the residential environment is dominant and traffic is completely subservient. The access place will generally be accessible only by one entry and exit point (such as for culs-de-sac). The low speed environment of the access place (desirably below 15 km/h) allows pedestrians and cyclists to share the carriageway and permits a reduction in carriageway and verge widths with subsequent savings in development costs.

Local streets are access streets with varying widths and designs depending on traffic volumes (Table 1).

Collector streets can be divided into minor and major collectors. Most collector streets are likely to be minor collectors with traffic volumes of up to 3000 vpd and vehicle speeds not exceeding 50 km/h. However, there may be a need in some developments for a major collector with volumes of up to 6000 vpd. Special care is required to minimise the length and environmental impact of such streets within neighbourhoods.

The need for a major collector can arise in situations where:

- access of local traffic to the external road system is required, and traffic volumes exceed those acceptable for a minor collector;




*a 3.5m carriageway allows a car to pass a cyclist (or pedestrian), but is clearly too narrow for parking without blocking the street.*

*a 5 m carriagway allows a car to pass a parked car or a moving car*

*a 5.5 m carriageway allows a moving car to pass a truck, but is clearly too narrow for cars to park opposite each other without blocking the street.*

*A 7–7.5 m carriageway is wide enough for two vehicles to pass each other while passing a parked car. It is wide enough for a moving car to pass between two parked cars, but is clearly not wide enough for two moving vehicles to pass at once. One must give way.*

**Figure 1: Carriageway width alternatives.**

# Table 1
# Characteristics of street types

| Street type | Indicative maximum traffic volume range (vpd) (1) | Target speed & design speed (km/h) (2) | Street reserve width minimum (m) (3) | Carriageway width (m) (4) | Verge width minimum (m) each side (5) | Parking provision within street reserve | Kerb type (20) | Entrance kerb return minimum (m) | Property access | Street longitu-dinal gradient maximum s% | Footpath | Cycles |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ACCESS STREETS | | | | | | | | | | | | |
| Access lane | 100 | 15 | varies | See note (6) | Not specified | No | Not required | NA | Rear | NA | No | Share with vehicles |
| Access place (7) | 0–300 | 15 | 10.0 | Single-lane 3.5–3.7(8) | See note (9) | 1 Hard standing verge space per 2 dw. with scope for extra space | Layout flush | 5 (10) | Access to all sites (21) | 17 (11) | No | Share with vehicles |
| Access street | 0-300 (1) | 40 | 12.0 | 5.0 only | 3.5 | Carriageway | Layback | 4 | Access to all sites (21) | 15 (11) | No (12) | Share with vehicles |
| Access street | 300–1000 | 40 | 13.0 | 5.0–5.5 only (14) | 4.0 | Carriageway | Layback | 5 | Access to all sites (21) | 12 | No | Share with vehicles |
| Access street | 1000–2000 | 40 | 13.5 | 5.5or7.0 | 4.0 | Carriageway | Layback | 5 | Access to all sites (21) | 10 | 1.2m wide one side (13) | Share with vehicles |
| COLLECTOR STREET | | | | | | | | | | | | |
| Minor collector | 1000–3000 | 50(20 at desig-nated ped-cyc. crossing) | 16.50 | 7.0–7.5 or 6.0–6.5 plus indented parking | 4.5 | Carriageway or indented | Layback (15) | 6 | Access to all sites (17) | 8 (16) | 1.2m wide both sides located away from kerb | Provide within street pavement (22) |
| Major Provide collector | 3000–6000 | | | | Design using the performance criteria | | | | | | located away from kerb (18) | 1.2m wide within street pavement (22) |

# Table 1
# Characteristics of street types

1 For single dwelling allotments apply a traffic generation rate of 10 vpd or a rate based on local data. For multi-unit dwellings apply a traffic generation rate of 6 vpd or a rate based on local data.

2 Streets are to be designed to achieve the target speed, and sight distances to accord with design speed.

3 The minimum street reserve widths apply after satisfying the other criteria within this table and other site-specific requirements.

4 The carriageway width is measured from kerb invert at outer edge of edge strip. Widening is required at bends to allow for wider vehicle paths (using AUSTROADS Turning Templates).

5 Each verge must be of sufficient width to accommodate relevant services, landscaping and, unless other noise attenuation methods are used, to ensure a total setback to residential dwellings which satisfies prescribed traffic noise exposure levels at the facade.

6 Lane width is determined by requirements for access to garages (Table 6). Minimum width is 3.0 m.

7 An integrated design of street and building layout is necessary for speed control and to achieve the optimum result. Appropriate considerations are required for the collection of waste.

8 This requires parking provision and provision for widening to 5.0 m if necessary in the future. Maximum length is 100 m. A passing bay is required if length is greater than 80 m.

9 See Acceptable Solutions for Street Design for minimum verge width for different speeds or provide minimum for services - whichever is the greater.

10 A minimum kerb radius is desirable for pedestrian safety and control of vehicle speeds. A threshold treatment may be used at the intersection entry.

11 The maximum grade is based on the equivalent maximum grade permitted for driveways across the verge. Grades greater than 12% require special design considerations for pedestrians, cyclists, waste collection vehicles and street layout (eg grade on curves, grade for turning vehicles at the street turning head).

12 Includes traditional cul-de-sac-type streets.

13 Footpaths are to be provided on both sides of streets serving as bus routes. Footpaths are to be provided adjacent to multi-unit dwellings.

14 Width is limited to 5.5 m to deter vehicles parking opposite each other and blocking traffic.

15 Upright kerb may be considered for drainage without reducing the carriage-way width, but layback is preferred for safety reasons.

16 Short lengths for bus routes at 10% are acceptable. Collectors not serving as bus routes are permitted to have a maximum longitudinal grade of 10%.

17 Minimum lot frontage of 11 m unless rear access for vehicles is provided.

18 One footpath may need to be combined as a dual footpath/cycleway and the width increased to 1.8 m.

19 Refer to cycleway routes in Development Plan.

20 Upright kerbs are preferred adjacent to public reserves and when needed for drainage.

21 Particular attention needs to be given to vehicle access to allotments in streets with narrow pavements.

22 Refer to Austroads (Part 14: Bicycles).

- an ‘activity street’ is created with mixed use and residential development.

The major collector in the first situation should be short, and residential development with frontage to such a collector should be designed to meet safety and environmental performance conditions. In the second case, the frontage development and collector street should be part of an integrated design.

The first step in street design is often to specify the overall street reservation width. However, this width is derived from a number of other requirements, such as pavement width, on-street parking, pavement edge and verge width (which, in turn, is needed to serve a number of different functions), drainage and utilities, land form, landscaping and preservation of existing trees.

Likewise, the width of the carriageway of streets is not uniform. It is determined by traffic volume, design speed, and parking provisions; the nature of the kerb; the horizontal and vertical alignment of the street, and any devices to control the speed of vehicles; the use of the pavement by pedestrians and cyclists; and landscape (Figure 2).

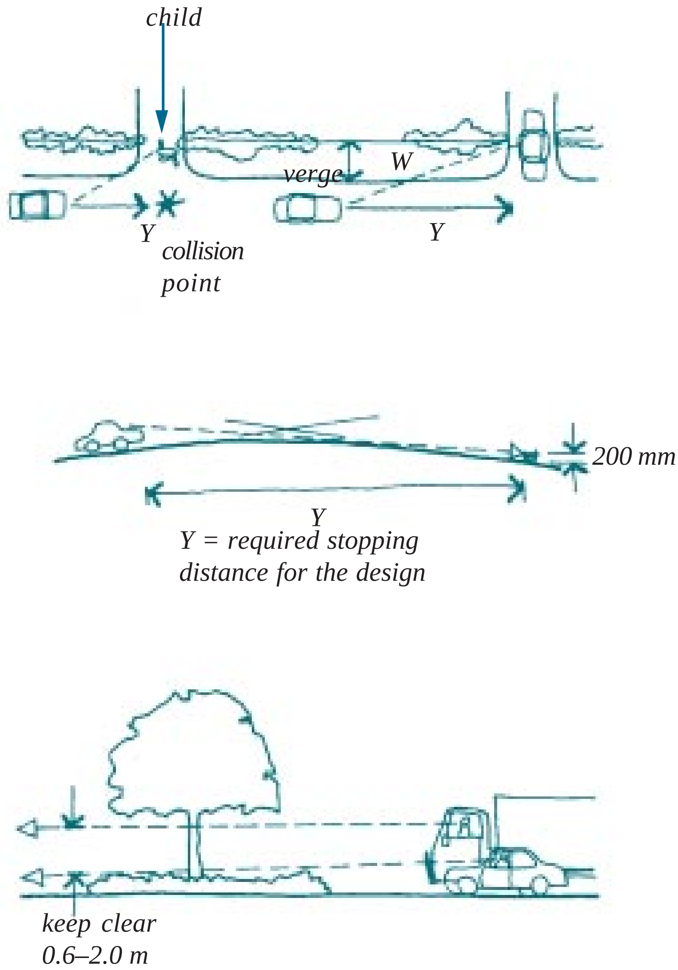



**Figure 2: Street design and visibility**

| Target speed (km/h) | Stopping distances (Y in metres) |
|---|---|
| 15 | 5 |
| 30 | 20 |
| 40 | 30 |
| 50 | 40 |
| 60 | 55 |

**Table 2: Minimum stopping distances.**

| Target design speed (km/h) (m) | Maximum leg length* between 20 km/h slow points |
|---|---|
| 30 | 75–100 |
| 40 | 100–160 |
| 50 | 120–155 |

* Leg length is defined as the distance between intersections or junctions, or points and locations where vehicles must slow to a maximum of 20 km/h.

**Table 3: Street leg length and design speed*.**

| Bend type | Street pavement width (m)* | | |
|---|---|---|---|
| | **3.5 m** | **5.0–6.0 m** | **7.0–7.5 m** |
| Single bend | 60° | 70° | 90° |
| Chicane (two reverse single bends) | 30°–30° | 45°–15° | 60°–60° |

**Table 4: Minimum deflection angles for speed control to 20 km/h.**

| Speed at slow point bend, etc. | Length (m) of street between slow points/bends to limit maximum street speed to (km/h) | | |
|---|---|---|---|
| **(km/h)** | **30** | **40** | **50** |
| 20 | | see table 3 | 135 |
| 25 | 45 | 80 | 115 |
| 30 | | 65 | 100 |
| 40 | | 50 | 80 |
| 45 | | | 90 |

**Table 5: Slow point speed and length of street between slow points.**

| Angle to access lane | Width of laneway or driveway (m) |
|---|---|
| 45° | 3.5 |
| 60° | 4.9 |
| 90° | 6.0 |

**Table 6: Minimum width of access lane and driveways.**

Integrated development presents outstanding opportunities for unifying the design of the street with the siting and design of buildings, and with the access to buildings and sites. This can result in pleasant streets with efficiently used spaces, in marked contrast to typical suburban streets.

## Designing for Safety

A fundamental objective in street design is to make streets safe for pedestrians, cyclists and motorists. Designing for safety involves creating conditions which elicit driver behaviour appropriate to the type of street. Measures to limit vehicle speed, to provide adequate turning facilities and site access, and to maximise visibility are essential.

Speed control measures can be introduced to achieve the selected design speed through:

- limiting the length of straight streets;
- introducing bends;
- controlling on-street visitor parking;
- landscape and streetscape design;
- frontage activities;
- incorporating speed control devices.

Speed control devices can be categorised according to their geometry as:

**Horizontal deflection devices**, including:

– roundabouts

– single-lane slow points

– two-way slow points

– central medians or median islands

– half-street closures

– axial shifts

– street narrowing

– on-street parking.

**Vertical deflection devices**, including:

– speed humps and dips

– raised thresholds or platforms.

Properly located and designed horizontal deflection devices are highly visible, and warn the driver to slow down from some distance

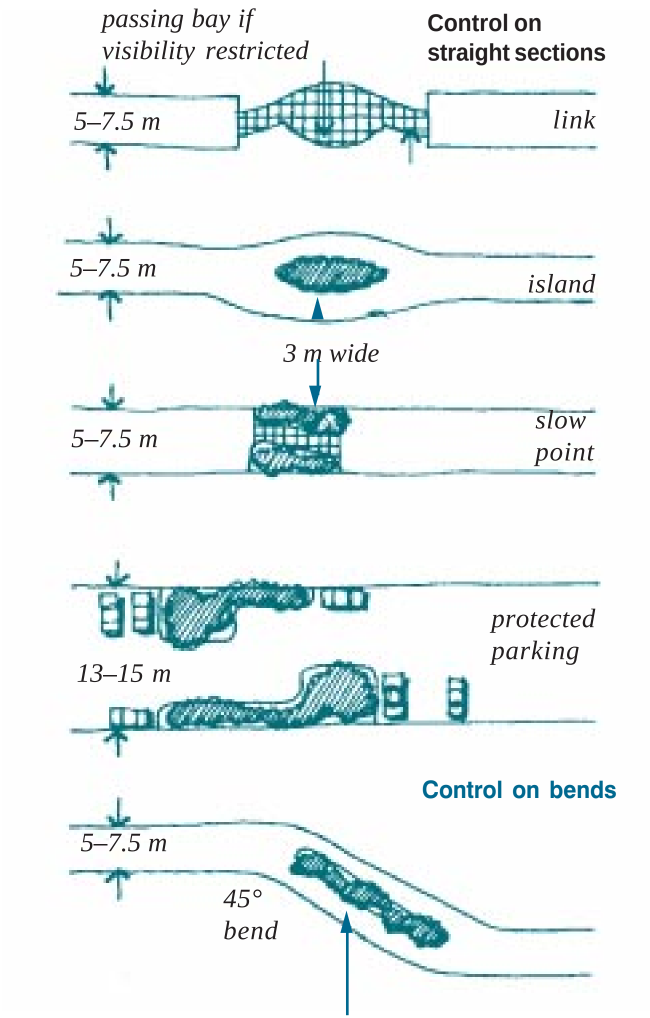



**Figure 3: Measures to control vehicle speed (refer also to Table 4).**

away. In some cases no warning signs are required, preserving visual amenity. Horizontal devices are less damaging to cars and generate less traffic noise and resident complaints than vertical deflection devices.

Roundabouts are primarily used at junctions and intersections to reduce the number of conflict points in turns. They can also be used for speed control (they tend to keep vehicle speeds more constant than other devices, with fewer stops/starts and hence reduce fuel use). Mini roundabouts interrupt the line of vision and prepare the driver to reduce speed.

Single-lane slow points, especially if angled, can be effective speed-reducing devices because they also restrict unlimited visibility. They need to be illuminated, and while they can be used in access streets they are generally not popular with drivers.

Vertical alignments, such as speed humps and platforms, can be effective but are also unpopular with drivers and cause problems for buses, motorcyclists and emergency vehicles. Their use should therefore generally be discouraged.

Central medians and median islands can be designed to perform different functions. Large islands can be landscaped, thereby restricting visibility of the street beyond them, promoting driver caution. Small islands can also be used, but need direction signs to increase their visibility as well as street lights at night. Vertical alignments should not be used as a means of controlling traffic speed.

The introduction of speed control devices should be part of a design for the total street environment. Isolated devices, especially in streets where there is a general expectation of higher speeds, can cause accidents.

The use of speed control devices should be carefully considered because of the potential negative impacts on property access, availability of kerbside parking and the potential for vehicles to collide with parked cars. Further, the architecture of the street should be considered in the use of any devices employed.

The use of traffic management devices should largely be limited to traffic calming in established areas. In new areas, streets should be designed to minimise their use thus avoiding the need to apply potentially controversial and costly devices at a later date.

Providing adequate visibility of vehicles, pedestrians and cyclists is a fundamental requirement in street design. Visibility distances for vehicles that are required to stop are related to vehicle speeds. This design parameter applies to accesses to and from parking areas, entrance and exit drives, junctions and intersections, and to any street where the street space is shared.

## Access and Verge

The verge is an important variable. It may provide space for the movement of pedestrians

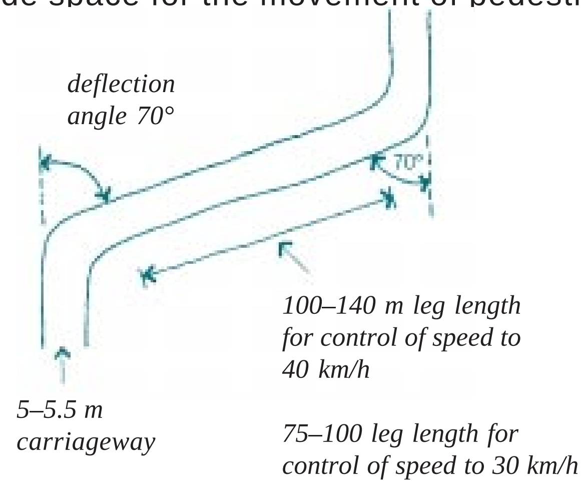
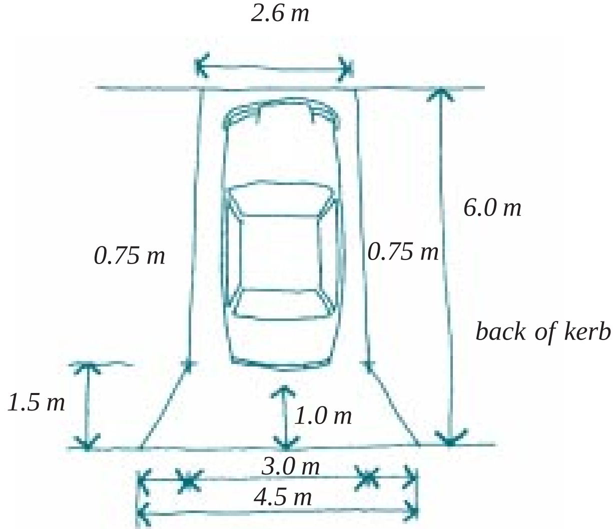
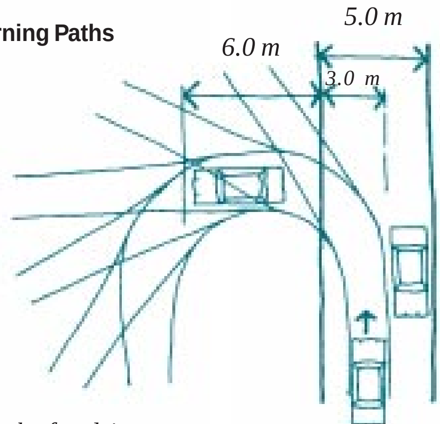



**Figure 4: Deflection angles for speed control-access street.**




*Driveway and kerb crossover design for narrow streets, where pavement is 5.5 m or less in width.*

**VehicleTurning Paths**




*Turning paths for driveway access from carriageway pavement widths of 5.5 m or less*

**Figure 5: Vehicle access to driveways.**

and cyclists, for landscaping, utilities, drainage, parking, or for batters, retaining walls or other structures where there is a crossfall. It also provides for driveways on to a site.

Verge width in some low-volume streets may be reduced to 3.0 m, but care is needed in the location of services (see PND 8).

Verge width may need to be increased to allow space for larger-scale landscaping, indented parking, future carriageway widening, retaining walls, cycle paths or swale drains. Special provision may be required for on-street parking in the verge off the carriageway in streets with a high proportion of medium and high-density developments or narrow-lot frontages.

Motorists should be able to enter or reverse from a lot or site in a single movement. In streets with narrow carriageways (5.5 m or less), the kerb crossover width should be wide enough for vehicles to be able to reverse on to the carriageway street when a vehicle is parked on the opposite side (eg splayed crossover).

Driveway egress movements should not create a safety hazard in streets. This is particularly

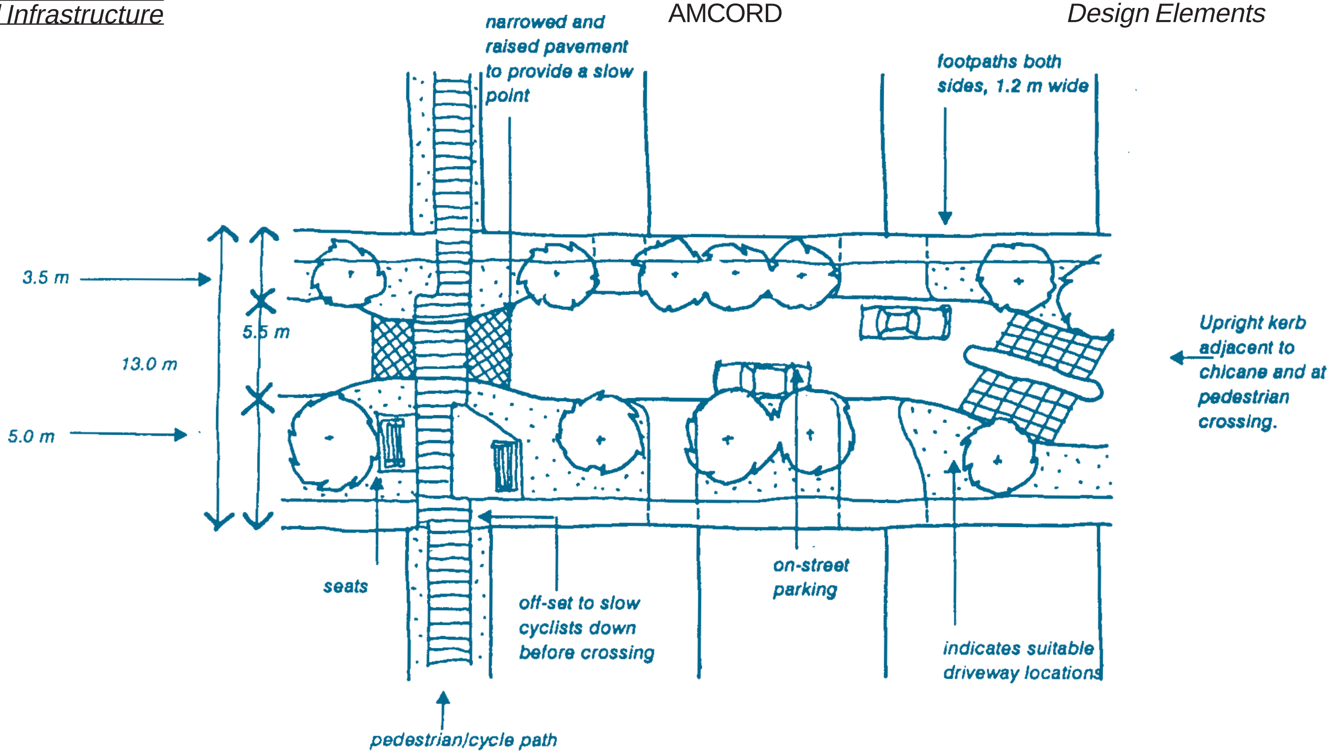



**Figure 6: Example of verge treatment.**

critical in streets that carry more than 3000 vpd, where driveways should be designed to promote forward entry and exit of vehicles from properties.

## Geometric Design

Geometric design includes matters such as longitudinal gradient, super-elevation of curves, crossfall on street pavement and the design of intersections or junctions. AUSTROADS guidelines should be used, with appropriate modifications, and to reflect the lower speed environment of the street system, the need to minimise environmental impacts of street construction and to provide access to properties as a high priority (including service vehicles).

The geometry of streets identified as bus routes should be suitable for the turning, stopping sight distance, grade and parking requirements of buses.

Projected traffic volumes are used in designing all intersections or junctions on traffic routes so that all desired movements can occur safely without undue delay. Kerb radii at intersections should be selected which keep pedestrian crossing distances to a minimum and control the speeds of turning vehicles.

At the head of access places, a sufficient area, using driveway crossovers, should be provided for the ‘design refuse vehicle’ to make a three-point turn (this will also provide for other large vehicles such as furniture and removal vans, emergency vehicles etc).

## On-street Parking

On-street or off-site carparking can be achieved by:

- making it a part of the integrated design for a new subdivision;
- modifying the existing local street to create new parking spaces;
- using the space within the existing street reserve.

Off-site parking of vehicles may lead to cost savings and opportunities to save space. However, this option should only be considered when:

- the existing street is wide enough to accommodate additional parked cars, and can be modified to provide safe and efficient parking;
- a new street can accommodate parked cars both efficiently and safely.

Kerbside parking is a daily reality in many existing urban areas. Many older subdivisions have wider carriageways than is required for local traffic movements. This may enable spillover of parking for residents, visitors and delivery and emergency vehicles.

The demand for on-street parking in most inner suburban areas is expected to be higher than for that in outer suburban areas. For large projects, however, it is important to reduce the pressure on existing residential streets by providing appropriate on-site parking for residents and visitors. Consideration should

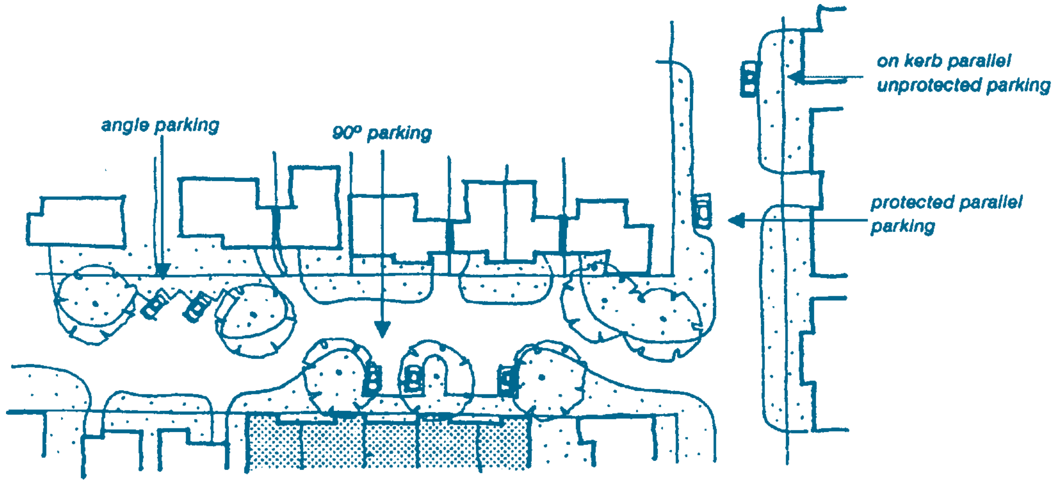



**Figure 7: Types of on-street parking (diagrammatic only).**

also be given to the potential for visitors to use off-site parking opportunities provided by community facilities such as schools, shops, railways, public open space and sporting areas during out-of-hours periods.

## Redesign of Existing Streets for Parking

Wide street carriageways can be reduced in width, with streets reconstructed to provide carparking opportunities. This includes:

- parallel parking bays either on one or both sides of the carriageway;
- angle parking bays either on one or both sides of the carriageway.

Street reconstruction would usually be undertaken in conjunction with traffic calming measures used in more established street networks.

## Parking Provision for New Street Layouts

Parking bays on verges with layback kerbs (or defined paved bays with/without upright kerbs, parking courts, reinforced grass bays etc), can be created for on-street parking in new street layouts. It may also be needed for visitor parking in small lot developments.

These can be designed for either parallel parking or angle parking. Care must be taken to avoid obstructing driveways or access-ways. Further information is provided in PND 14: Parking.

Shared pedestrian and resident off-site parking can also be effectively designed, using the Dutch ‘Woonerf’ principle (a Woonerf is an access place which provides vehicle access to dwellings while also being designed for the safe use of children, pedestrians and cyclists).

# Element 2.1
# Street Design and On-street Carparking

## Intent

To provide for streets that fulfil their designated functions within the street network, accomodate public utility services and drainage systems, and create a safe and attractive environment.

## Performance Criteria

The intent may be achieved where:

**Function and width**

**P1** The design features of each type of residential street convey its primary function.

**P2** The street reserve width is sufficient to cater for all street functions, including;

- safe and efficient movement of all users;,
- provision for parked vehicles;
- provision of landscaping;
- location, constructon and maintenance of public utilities.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**Function and width**

**A2** The following street component for each type of street are as specified in Table 1:

- carriageway widths;
- verge widths;
- parking within the street reserve;
- kerb type;
- pedestrian and cyclist facilities;

## Performance Criteria (continued)

**P3** The verge width is sufficient to provide for special site conditions and future requirements.

### Designing for safety

**P4** The design facilitates safe use by pedestrians, particularly people with disabilities, the aged and children, by:

- providing a carriageway width which allows vehicles to proceed safely at the operating speed intended for that level of street;
- making allowances for restrictions caused by on-street parking;
- providing a horizontal and vertical alignment which is not conducive to excessive speeds;
- promoting the safety of pedestrians where it is intended that they use the carriageway at bus stops and other crossing points;
- promoting the safety of cyclists in streets and at crossings points.

## Acceptable Solutions (continued)

- longitudinal gradients.

**A3** The verge width is increased when required to allow space for larger-scale landscaping, indented parking, future carriageway widening, retaining walls, cycle paths or swale drains.

### Designing for safety

## Performance Criteria (continued)

**P5** Speed reduction techniques and devices are used to achieve desired speeds, as part of a design for the whole street environment, and include the following principles:

- slow points including either horizontal or vertical deflection are designed to slow traffic to design speeds;
- slow points and carriageway narrowings are designed to take into account the needs of cyclists, by ensuring speed compatibility, adequate space for concurrent passage or off-street diversions;
- landscape design, on-street parking and streetscape design are used to complement speed restriction measures;
- speed restriction techniques and devices are not used in isolation;
- the verge, when considered in conjunction with the horizontal alignment and permitted fence, wall and other property frontage treatments, provides safe sight distances, taking into account expected vehicle speeds and pedestrian and cyclist movements.

## Acceptable Solutions (continued)

**A5** Traffic speeds and volumes are restrained through one or more of the following measures:

**Limiting street length**

**A5.1** Where street ‘leg’ length is limited to control vehicle speed, the lengths between slow points are designed to restrict operating speeds as specified in Table 3.

**Introducing bends**

**A5.2** Where bends are introduced to control speeds to 20 km/h or less, the deflection angle in the change of the alignment of a street or pavement is at least the angle determined from Table 4.

**Introducing slow points**

**A5.3** Where slow points are used to allow speeds greater than 20 km/h, the length of street between two bends or slow points complies with the distances specified in Table 5.

**A5.4** Where speed restriction devices are used in isolation, they include:

- full horizontal displacement of the vehicle path;
- swept vehicle paths to have a 20 m radius;

## Performance Criteria (continued)

**P6** Safe sight distances, based on the speeds at which vehicles may travel in the street, exist at access points to properties, pedestrian and cyclist crossings and at junctions and intersections.

### Access and verge

**P7** The carriageway width, together with the verge width and crossover dimensions, allows for unobstructed and efficient access to individual lots and sites, even when a car is parked on the opposite side of the street.

**P8** Driveway egress movements do not create a safety hazard.

## Acceptable Solutions (continued)

- constriction on exit rather than on entry (otherwise there is a risk that the device may be short-cut);
- additional pavement treatment behind the kerb for large vehicles;
- line marking;
- signposting of the devices.

**A5.5** Where speed reduction devices are part of a design for the total street environment, devices conform with those in Figure 3.

### Other techniques

**A6** Sight distances at pedestrian and cyclist crossings and at junctions and intersections conform with those set out in Table 2.

### Access and verge

*(in partial satisfaction of P7 and P8)*

**A7.1** Motorists are able to enter or reverse from an allotment or site in a single movement.

**A7.2** Driveways and direct vehicle access to major collector streets and other streets which carry more than 3000 vpd are designed to promote forward entry and exit of vehicles from properties.

## Performance Criteria (continued)

### Geometric design

**P9** Bus routes have a carriageway width to allow for the movement of buses unimpeded by parked cars, safely accommodate cyclists and avoid cars overtaking parked buses.

**P10** The horizontal and vertical alignments and crossfall reflect physical land characteristics and major drainage functions, while satisfying safety criteria.

## Acceptable Solutions (continued)

### Geometric design

**A9** The geometry of streets identified as bus routes which are suitable for the turning, stopping sight distance, grade and parking requirements of buses (as determined from appropriate design documents) has maximum carriageway widths within the ranges specified in Table 1.

*(in partial satisfaction of P10)*

**A10.1** Longitudinal gradient does not exceed the gradients specified in Table 1.

AND

**A10.2** Super elevation of curves does not exceed 5%.

AND

**A10.3** For downgrades between 5% and 10% on access streets and where the street 'leg' length is 75 m or more, the street design should be based on an increase of the maximum speed by 5 km/h; for grades of 10% or more, this maximum speed should be increased by 10 km/h.

## Performance Criteria (continued)

**P11** Geometric design for intersections, roundabouts and slow points is consistent with the vehicle speed intended for each street.

**P12** Kerb radii at intersections and junctions are kept to a minimum, subject to satisfying required turning templates (including those for service and emergency vehicles), to keep pedestrian crossing distances to a minimum and to control the speeds of turning vehicles.

## Acceptable Solutions (continued)

AND

**A10.4** Cross-fall on street pavement is between 2.5% and 5%.

**A11.1** Geometric design for intersections, roundabouts and slow points is consistent with the vehicle speed intended for each street and consistent with AUSTROADS Guidelines.

AND

**A11.2** For turning movements at the head of culs-de-sac, sufficient area is provided for the 'design refuse vehicle' (as advised by the relevant waste collection authority) to make a three-point turn, using driveway crossovers.

**A12.1** At intersections, turning vehicles are accommodated using AUSTROADS Design Vehicles and Turning Templates, to enable turns to be made in a single forward movement as follows:

- for turns between a major collector, collector streets or access street, the 'design articulated vehicle' (turning path radius of at least 11 m);
- for turns between a collector street and access streets, the 'design heavy rigid vehicle' (turning path radius 11 m), using

## Performance Criteria (continued)

**P13** Siting conditions on land abutting major collector streets ensure that all vehicles can enter or leave the street in a forward direction.

### On-street parking

**P14** Carparking is provided according to projected needs which are determined by:

- the number and size of dwellings proposed;
- the carparking requirements of people of differing socio-economic status, age, cultural background and differing stages of family life cycle;
- availability of public transport;
- the provision of on-site car parking;
- locations of non-residential uses such as schools and local shops;
- the occasional need for overflow parking.

## Acceptable Solutions (continued)

any part of the pavement (Fig. B4 in AS 2890.2, 1989);

- for turns between access streets, the B99 ‘design car’ (turning path radius 7.5 m), using the correct side of the pavement only (Fig. B1 in AS 2890.1, 1986).

**A12.2** Kerb radii do not exceed 6 m, except if required to accommodate turning vehicles as per A11.2.

### On-street parking

**A14** In streets where visitor parking is not provided off-street, one carparking space provided for every two dwellings. These are to be located against the kerb or in parking bays constructed within the verge, located within 60 m from the frontage of each dwelling.

Note: On-street parking is not required where on-site parking has been provided to meet development needs. However, available on-street parking should be taken into account when determining on-site parking.

## Performance Criteria (continued)

### Design

**P15** Carparking is designed and located to:

- conveniently and safely serve users, including pedestrians, cyclists and vehicles;
- enable efficient use of car spaces and accessways including adequate manoeuvrability for vehicles between the street and the lot;
- fit in with any adopted street network and hierarchy objectives, and with any related local traffic management plans;
- be cost-effective;
- achieve relevant streetscape objectives.

## Acceptable Solutions (continued)

### Design

*(in partial satisfaction of P15)<D>*

**A15** The dimensions of car spaces and access comply with the requirements of the local planning scheme.

# Element 2.2
Street Construction

## Need

Streets must be constructed so that the design intentions for the street are supported, and construction and whole-of-life-cycle costs are minimised.

### Construction to Reflect Function

The design and construction of pavements, kerb and edge treatments, as well as the choice of materials, are all important in conveying the function and character of a street and achieving cost-effectiveness.

Different pavement materials can enhance the appearance of a street and signify to motorists its residential function. For example, traffic and parking areas can be delineated by using different types of pavement, edge strip, layback kerb, indented bay treatments, surface textures and other construction details.

## Drainage and Utilities

Drainage is of major importance. A one-way pavement crossfall, with drainage channel on only one side of the carriageway, may be appropriate where topography and drainage requirements permit. Construction of a street pavement at a lower level than the dwelling sites provides safety in times of flooding and enhances the street's appearance.

The need for utility services (eg electricity, gas etc) in streets considerably influence a street's width, design and construction. Common trenching can reduce the combined width required for utilities, but separation distance, depth of coverage, access for initial installation and for future maintenance and

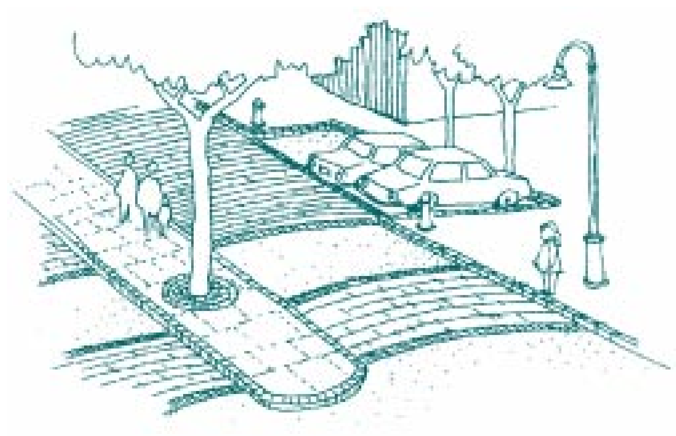


**Figure 1: Pavement treatments and materrials can contribute to an attractive streetscape and enhance traffic calming.**

repairs are issues that have now been resolved by many planning and service agencies around Australia.

## Construction Standards

Construction standards may vary between public streets and private streets or driveways. Life-cycle costing is important in both situations. In public streets, a 20-year pavement design life is often used, but in private streets or driveways, the design life may depend on the type of development and the arrangements for ongoing repair and maintenance. In all situations, liability is a further consideration.

Pavement construction standards and practices adopted by national bodies should be applied to public street construction. These standards are those applied by the Australian Road Research Board (ARRB), the Cement and Concrete Association (CCA), or AUSTROADS.

In selecting materials and designing streets it is important to consider the extent of paving within the road reserve in order to reduce overland stormwater drainage, reduce the cost of constructing the streets, save space to allow quality landscaping, and save on construction materials and their embedded energy.

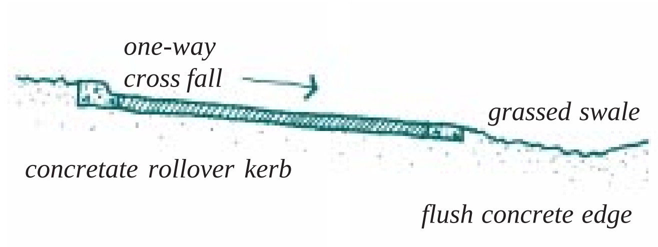



**Figure 2:** **Alternative pavement edges can contribute to an attractive streetscape and assit drainage.**

# Element 2.2
# Street Construction

## Intent

To construct streets that support the design intentions without unnecessary construction and whole-of-life-cycle costs.

## Performance Criteria

The intent may be achieved where:

**P1** The pavement, edging and landscaping support the specified functions and amenity of the street.

**P2** The pavement edge:

- controls vehicle movements by delineating the carriageway for all users;
- assists in reducing stormwater run-off into the reticulated system, by conveying stormwater to a desired outlet or by providing for infiltration into subsoil;

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**A1** Pavement and landscape materials are used, where appropriate, to distinguish different street functions.

*(in partial satisfaction of P2)*

**A2** Pavement edges at pedestrian crossings are constructed for wheelchair access and to assist sight-impaired people in accordance with AS1428 Pt1 and Pt4.

## Performance Criteria (continued)

- provides for people with disabilities, by allowing safe passage of wheelchairs and other mobility aids.

**P3** Street pavement surfaces are well designed and durable enough to carry wheel loads of travelling and parked vehicles; ensure the safe passage of vehicles, pedestrians and cyclists; the discharge of rainfall, and the preservation of all-weather access; and allow for reasonable travel comfort.

**P4** Consistent with the previous Performance Criteria, public street construction and whole-of-life-cycle costs are kept low.

## Acceptable Solutions (continued)

**A4.1** Flexible pavement construction is based on the ARRB residential street pavement design method using equivalent standard axle loadings and a 20-year design life (ARRB, 1989).

AND

**A4.2** Concrete pavement construction is based on the CCA design table, and interlocking block pavement construction is based on the ARRB interlocking block pavement design method.

**A4.3** Kerb and channel profiles accord with Australian Standard 2876–1987 (SAA, 1987) or as specified by the relevant authorities.

# Element 2.3
Utilities

## Need

Residential areas must be adequately serviced with sewerage, water, electricity, gas, street lighting and telecommunications in a timely, cost-effective, coordinated and efficient manner. Apart from street lighting and higher voltage electricity lines, services are generally provided through underground ducts laid within the street reserve, at the rear of the property, and in public open space.

In the past water and effluent treatment facilities have been located at a distance from residential areas which resulted in extensive reticulation and pumping systems. Technology has changed, and authorities and the community have recognised the need to manage utilities in a more environmentally responsive way. As a result smaller on-site treatment, distribution and reuse systems are being implemented.

AMCORD includes PND 7: Services in Narrow Streets, as a further reference source.

## Coordination in Planning

The cost and location of utilities is connected to the density and form of land and housing development. Providing utility services is a major cost component of urban development. Effectively using land to minimise costs to the consumer is a key objective.

The distribution system should be in place before the first houses are occupied, even if some services are not provided immediately, as subsequent construction greatly increases the costs and causes considerable disruption. Development should proceed on a front so that each stage is fully serviced before the next area is opened up. Fragmented development is extremely costly, and may result in thresholds necessary for economic provision of some services not being met.

## Common Trenches

Common trenches can lead to a high level of land efficiency and reduced development costs. Advantages include:

- elimination of several single trenches, each with its own construction, settlement and reinstatement problems;

- accurate location of services for possible repair or maintenance;
- reduced verge width;
- less conflict between services as depth relativities are known;
- more efficient use of construction equipment;
- reduced verge and footpath disturbance, allowing earlier site establishment;
- more space within verge to enable street tree planting.

## Streetscape Issues

Collaboration between those who design streets and those who design the services within them is critical for integrated and attractive streetscapes. This is particularly so when dealing with higher residential densities, increased driveway crossovers and increased demand for on-street visitor parking (often in the form of indented parking bays).

Some of the issues to be dealt with in such a multi-disciplinary approach are:

- type of trees/vegetation, selected in terms of impact on services and pavements;
- soil type (eg reactive clays);
- location of services within the street reserve and future access to underground services;
- proximity of services to trees or drainage trenches;

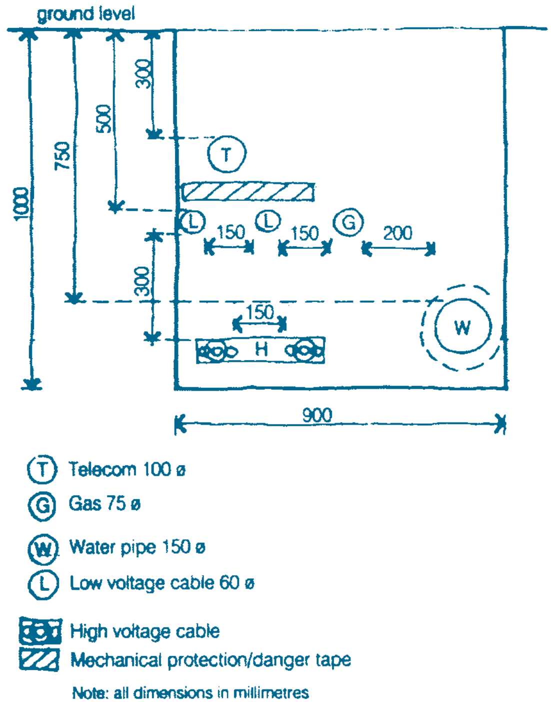



**Figure 1: Typical Joint trenching layout.**

Source: Interim Guide to Joint Trenching for New Subdivisions, NSW Department of Planning,

- effects on overhead power lines;
- location of service connections to narrow lots.

## Effluent Treatment

There are two ways to manage the treatment of effluent from residential development in a more environmentally responsible manner. Firstly, existing effluent treatment systems that currently pollute Australian land and waterways can be replaced and/or upgraded. The new systems can treat effluent to a standard that allows it to be reused for the irrigation of public or private land (eg public reserves and irrigated farmland), or within private lots (eg garden watering, toilet flushing, laundry use etc).

Technology now exists for reasonably small residential developments to be provided with local effluent package treatment plants. These can produce treated water of sufficient quality for reuse. Depending on the location of the existing sewerage mains, such package treatment plants may prove economic in terms of their installation costs. However, even if such a plant had a higher capital cost than a conventional sewerage system, local government could benefit significantly from the availability of cheap irrigation water for public reserves etc. Thus developers and local authorities might have to jointly fund such systems so that councils can significantly save on annual costs in the long term.

Similarly dual water pipe systems will be more expensive to introduce into new residential estates. However there are significant public benefits (including financial) in reducing the amount of potable water used within new neighbourhoods. The benefits have been sufficient to justify the use of these systems in some of Australia's major urban housing projects (eg. Rouse Hill, Sydney).

In some cases, service providers may need to subsidise these additional initial capital costs in order to bring long-term economic and environmental benefits to the wider community.

Secondly, separating 'grey' water from household effluent (ie bathroom and laundry wastewater) is another method of minimising environmental impact and recycling water. This is more easily achievable on larger lots or as part of a multi-unit housing project. Demonstration projects now exist in many parts of Australia (see PND 9).

On-site effluent treatment and disposal systems treat and dispose domestic sewage and/or sullage within the property boundary. These systems provide an alternative for houses which are located in low-density areas or when connection to the main sewerage system is not possible or economically feasible. New aerobic systems provide treated effluent of a standard suitable for garden irrigation.

The effectiveness of on-site systems is reliant upon good planning, site evaluation and installation of the system. Consideration of site suitability should begin before rezoning, if this is to be the adopted method of dealing with wastewater. The area of land should be examined and include detailed soil survey, topographical analysis and drainage assessment, and consideration of potential environmental impacts.

Lot sizes and shapes should be arranged to allow the practical implementation of appropriate design standards. Issues which need to be considered include the available area, surrounding buffers, surface water drainage, and other on-site and adjoining amenities (including patios, pools, clothesdrying areas, children's play areas, garages etc).

The on-site installation and disposal areas on individual lots may need to meet specific

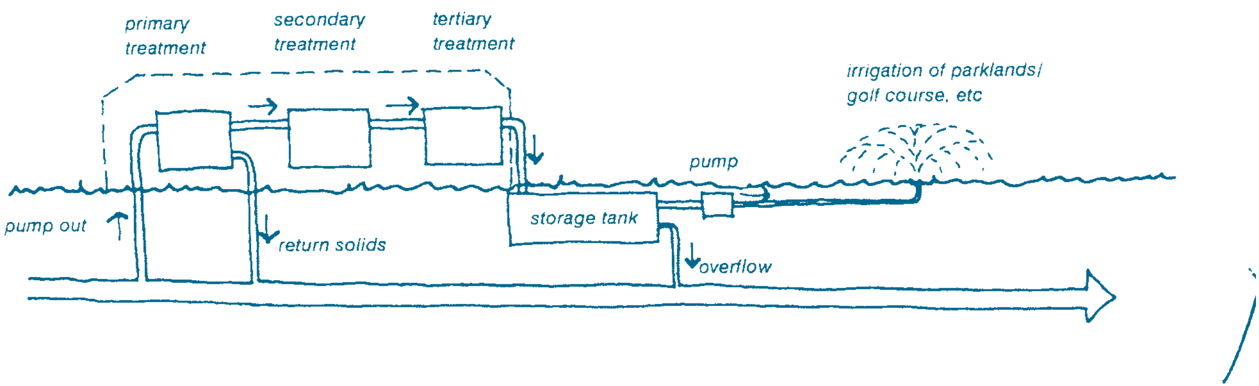



**Figure 2: Diagramatic layout of Southwell Park waste water recycling pilot scheme, North Canberra (plant production 300 KL per day).**

requirements such as minimum setbacks from lot boundaries, and specified distances from vehicle traffic, underground utilities, any underground water tanks, bores or intermittent streams.

## Water Conservation

As discussed above, significant savings in potable water consumption are possible if effluent and stormwater are treated, recycled and made available for irrigation and domestic use. This can be achieved online by intercepting and recycling effluent on its way to a treatment works (Figure 2) or, after the effluent has received treatment, by pumping the treated effluent to where it is needed.

Such conservation strategies are critical for a sustainable residential environment, as well as for the protection of waterways and land areas from environmental degradation.

Water conservation on individual dwelling sites is further discussed in Element 5.10: Design for Climate and PND 15: Landscape Guidelines for Water Conservation.

## Domestic Waste Disposal

### Recycling

An increasing number of Australian local government authorities have introduced domestic waste recycling schemes, each with its own individual characteristics and requirements for involving residents. Developers should therefore obtain information from local councils about their requirements so that they can provide appropriate on-site facilities, particularly for multi-unit and small lot developments.

### Composting

Organic waste is a large part of total domestic waste. A growing number of Australian households are composting this waste for their gardens, and this is obviously to be encouraged. However, the increased popularity of small residential sites can limit the reuse of composted material.

Local authorities can contribute significantly to this through a range of services, including localised composting facilities reasonably close to all houses. This should be considered part of the neighbourhood design and development process. Other services include mulching, free or cheap composting bins, and specialised collections. The costs of establishing such local services would be recouped through reduced land fill costs and associated environmental degradation.

## Communications

Traditionally services for communications have been located in underground trenches, with Telstra being the only service provider. Following the increase in the number of service providers, together with the changes in technology that have led to pay television and other new communication systems, the requirements of a variety of communications providers must be incorporated in the design of underground services and common trenching.

Furthermore, pay television has seen the introduction of above-ground, on-roof receivers which can have considerable visual impact on the attractiveness of streetscapes, as can mobile phone aerials which are required in many districts.

Given the desirability of incorporating these new technologies into new residential areas, advice should be sought from the full range of service providers during the engineering design stage of development. This will avoid the need for subsequent disruption to streets and verges.

## Street Lighting

Public and communal street lighting should minimise energy consumption while maintaining adequate illumination. Many public energy authorities have been experimenting with more energy-efficient lighting systems, and these should be used wherever possible.

Solar powered street and park lights are being successfully used in many locations. They are particularly useful in large parks where the need for expensive underground power cabling can be avoided (Figure 3).

Street lights should also create ambience and character in residential projects, and many power authorities have widened the range of standard fittings available to developers.

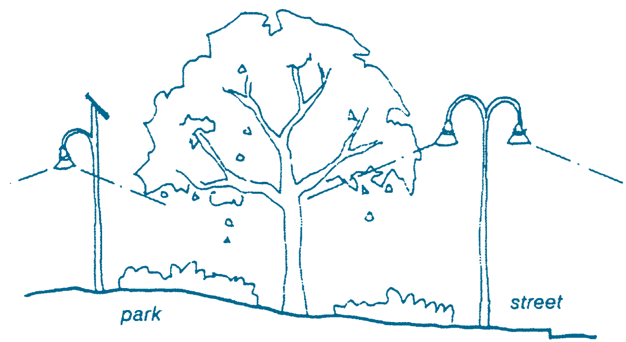



**Figure 3: Street,park interface lighting (incorporating solar park light) provides for safety**

# Element 2.3
# Utilities

## Intent

To ensure that residential areas are adequately serviced with sewerage, water fire-fighting, electricity, gas, street lighting and communication services in a timely, cost-effective, coordinated and efficient manner that supports sustainable development practices.

## Performance Criteria

The intent may be achieved where:

**P1** The design and provision of public utilities, including sewerage, water, electricity, gas, street lighting, and communication services, are cost-effective over their life cycle and incorporate provisions to minimise adverse environmental impact in the short and long term.

**P2** Compatible public utility services are co-located in common trenching in order to minimise the land required and the costs for underground services.

**P3** Transportation, treatment and disposal of sewage wastes are to the satisfaction of the local authority or relevant servicing authority,

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in relation to P1–P11)*

**A1.1** The location, design and proposed construction of sewerage facilities, water supply mains and fixtures, electricity, gas, communication services and street lighting are in accordance with a development plan.

OR

**A1.2** The design and provision of public utilities, including sewerage, water, electricity, gas, street lighting and communication services conform to the cost-effective and environmental performance measures of the relevant servicing authorities.

OR

## Performance Criteria (continued)

and the relevant environmental regulator.

**P4** Development occurs within locations where there is an adequate water supply for domestic and fire fighting purposes.

**P5** Development is staged to ensure that each stage is fully serviced before a new area is released.

**P6** Water supply and sewerage networks are accessible, easy to maintain, and cost-effective based on life-cycle costs.

**P7** The selection of materials used for the construction of water supply and sewerage networks is determined by suitability, durability, ease of maintenance and cost-effectiveness considering whole-of-life-cycle costing, achieving beneficial environmental impacts/ energy savings etc from new materials and technologies.

**P8** Adequate buffers are maintained between utilities and houses to protect residential amenity and health.

**P9** The use of local effluent treatment plants to recycle and reuse waste is achieved in areas where connections to large sewage treatment plants are less economically viable.

## Acceptable Solutions (continued)

**A1.3** The design and construction of sewerage facilities, water supply mains and fixtures, electricity, communications, gas and street lighting are undertaken by properly qualified personnel.

AND

**A1.4** The distribution system for all services will be in place before the first houses are occupied.

## Performance Criteria (continued)

**P10** The feasibility of dual water pipe systems (for potable and non-potable use) is established during the design process.

**P11** The feasibility of 'mining' water from the sewage system on a localised basis for irrigation is established during the design process.

**P12** Site facilities are provided, particularly for multi-unit development, to allow the efficient and easy storage and collection of recyclable materials.

## Acceptable Solutions (continued)

# 3. Stormwater and Integrated Catchment Management

## Introduction

Urban stormwater is a valuable resource which, when managed appropriately, can contribute to the attainment of quality environments and water conservation objectives. This Element category recognises this contribution by promoting the provision of major and minor drainage systems which provide adequate protection while ensuring a positive contribution to the environmental enhancement of catchment areas.

It encourages the adoption of water quality management systems which minimise disturbance to natural stream systems, and promotes stormwater discharge which does not degrade the quality of surface and underground waterways.

Stormwater harvesting methods for irrigation and other second-quality water uses provide guidance on conserving potable water.

The Elements contained within this category are:



# Element 3.1
Storm Drainage

## Need

Storm drainage systems must protect people and the natural and built environments in all flood events up to and including that corresponding to a community-accepted level of risk. The systems should take account of initial and maintenance costs and the benefits of reduced community disruption, trauma and property damage.

AMCORD includes PND 9: Total Stormwater Management as a further reference source.

## Storm Drainage Design Objectives

Drainage systems in urban environments are managed and operated in distinctly separate units, described as major flow systems and minor flow systems.

The major drainage system consists of the arrangement of streams, floodways, retarding basins, major cut-off drains, street pavements and reserves, and open areas such as carparks serving a dual purpose. It should be designed to protect people and indoor property from the effects of an extreme flood with an average recurrence interval (ARI) of 100 years (ie the 1% probability flood). Flows occupying elements of the major system are large and frequently cross municipal boundaries, requiring management by several municipalities or by a regional drainage or catchment authority.

The minor drainage system consists of the arrangement of kerbs, gutters, roadside channels, swales, sumps and underground pipes. It should fully contain and convey a design flow of specified frequency (eg ARI = 2 years) within the major system. The minor drainage system operates to control ‘nuisance’ flows which occur on a day-to-day basis. It is important that the public accepts the appearance of these flows in roadside channels and swales.

The broad objectives of urban storm drainage design are therefore to:

- provide safety for the public in major storm events;
- protect property from damage by flooding;
- provide for the safe passage of minor floods and minimise the inconvenience they cause the public;

- improve urban amenity through maintenance of natural drainage lines;
- optimise the land available for urban purposes including community facilities;
- ensure cost-effectiveness in construction and maintenance of storm drainage works.

## Major System

The main element of the major system is the floodway. This can take the form of a natural waterway, a constructed open channel, a roadway reserve, public open space or, in cases where land is required to be fully utilised, a large-diameter pipe drain. The floodway will be required to carry the discharge 'gap' between the flow conveyed in the minor drainage system and the major flood flow. The design capacity of both systems, acting in conjunction, is equivalent to the ARI = 100 years event.

It is permissible for floodways to encroach on private land, but it is unacceptable for floodwaters moving in a defined floodway to enter residences, or commercial/industrial or public buildings, except in floods of magnitude greater than the ARI = 100 years event. A 'freeboard' should be allowed between floodway design water levels (for ARI = 100 years) and adjacent floor levels.

All streets and roadways may act as floodways or elements of the overland route taken by floodwaters. However, flow depths and velocities should be limited in the interests of pedestrian, cyclist and motorist safety and the reduction of damage to vehicles. Streets and roadways which are regularly used by emergency service vehicles should have a reduced floodway function.

Detention or retention basins may be used in the major drainage system to reduce outflow flood peaks and hence provide increased flood protection for those living downstream. These measures may also be used to limit outflows to target peaks set by municipal authorities, or may include water quality improvement and stormwater harvesting functions where appropriate (see Elements 3.2 and 3.3).

## Minor System

The main purpose of the minor storm drainage system is to provide for the safe passage of minor floods and reduce to an acceptable level the inconvenience they cause the public.

Common practice in the past achieved this purpose by collecting, conveying and disposing of storm run-off 'as completely and as quickly as

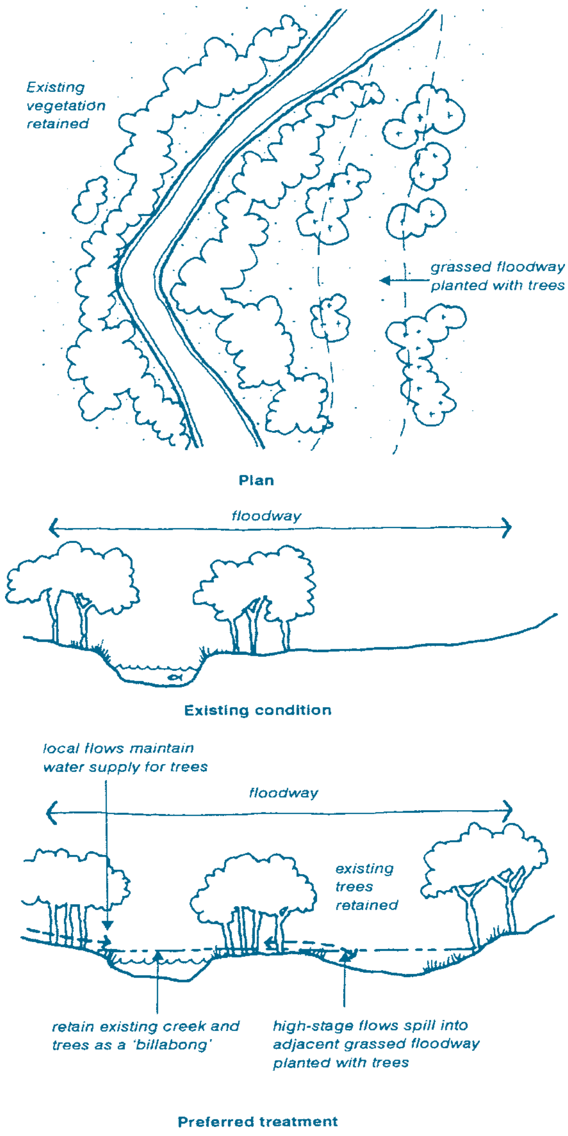



**Figure 1: The cross-section of an existing creek can be retained by constructing a grassed floodway parallel to the creek to accomodate high-stage flows.**

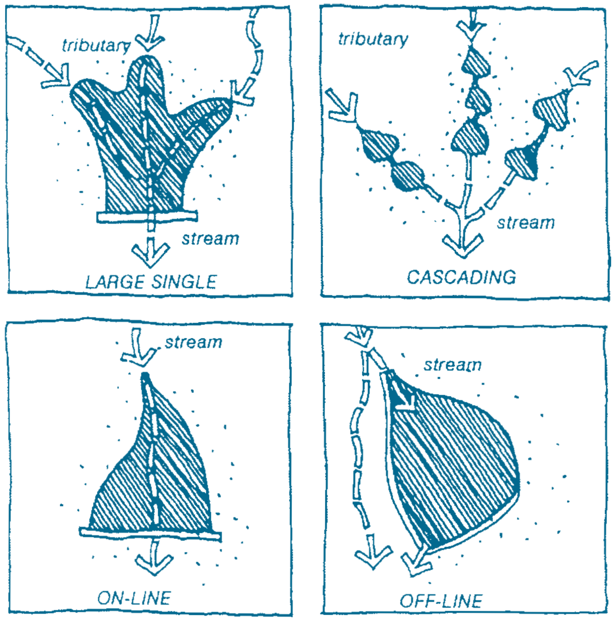



**Figure 2: The type of detention basin chosen should be based on a range of functional requirements and site conditions.**

possible' through networks of concrete pipes and channels. The new approach which seeks to 'hold and use the rain where it falls' leads to smaller flows—compared with conventional practice—in storm drainage networks. It also allows for natural drainage lines to be maintained or re-established. This in turn leads to reduced flows, less pollution entering receiving waters (riverine, marine and groundwater) and the opportunity for catchment 'greening' and mains water replacement.

However, this 'water-sensitive' approach tends to be unfocused. Firstly, every problem has its own set of choices of which there may be many. Secondly its hydrology and hydraulics introduce aspects of local soil behaviour and hydrogeology not previously considered in storm drainage design.

The influence of the new approach is to be seen in every segment of the design process—on-site

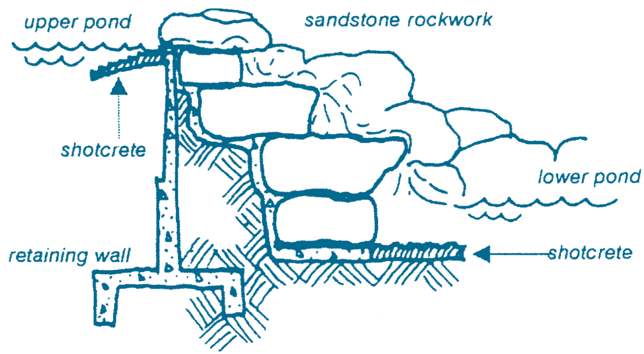



**Figure 3: Drop structures, energy dissipaters and other flow control structures should be made of natural materials.**

stormwater management, street drainage and receiving domain treatment including retardation basins. In some circumstances in urban Australia the entire minor storm drainage system will be represented by on-site gravel soakage trenches and roadside swales. In other places 'best practice' may well be a pipe network little different from one of conventional design. The most common outcome is likely to be a blend of both approaches.

## Provision for Failure

Most flood damage in the urban landscape is the consequence of blocked drains. Locations particularly vulnerable to flooding as a result of blockage are the heads of downhill-sloping culs-de-sac. A well-designed major/minor system will manage overflows in these situations with drainage easement swales or footways incorporated into the urban layout.

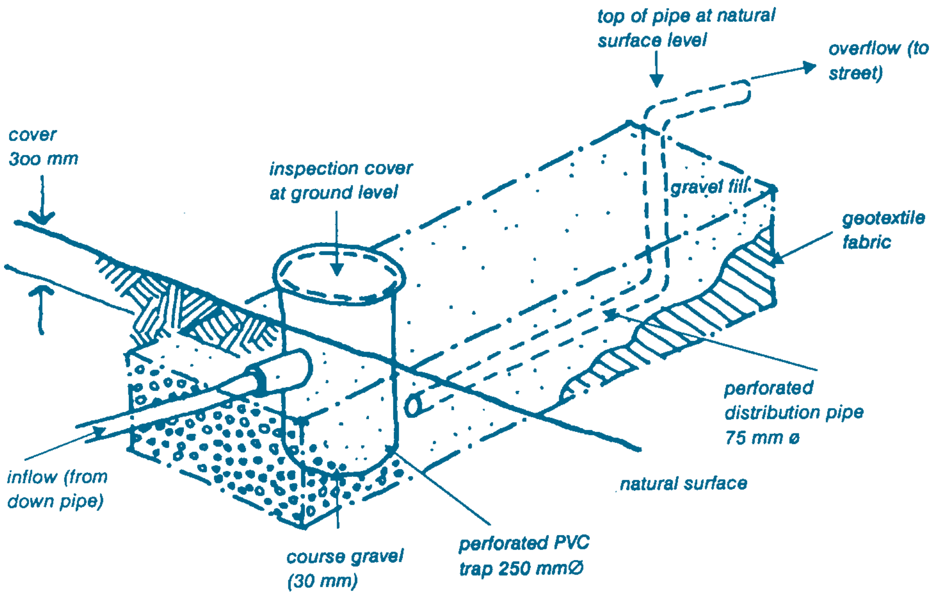



**Figure 4: On-site retention device.**

Another point of vulnerability in minor storm drainage systems is at low points or ‘sags’, where surcharge from a blocked gutter inlet results in direct overflow on to private property. Similar provisions to those described for culs-de-sac apply in these cases.

The vulnerability of these situations to indoor flooding validates a much higher than normal standard of protection, eg ARI = 20 years, being applied to the minor drainage networks in their vicinities.

## Site Drainage

The primary source of run-off in the urban environment is the individual building lot where numerous opportunities exist to ‘hold and use the rain where it falls’. These include:

- provision of rainwater tanks, maximum use of porous surfaces;
- onstruction of paving which drains to grassed areas;
- establishment of trees, especially healthy native vegetation and ground cover;
- provision of an on-site retention device if the soil is suitable and space requirements are met;
- provision of an on-site detention device if retention is not advised;
- provision of an on-site above or below-ground buffer storage tank;
- provision of a retention device with bore-aquifer connection, if appropriate, and if an aquifer is reasonably accessible.

General or local knowledge can guide decisions on most of these items, but specialised knowledge on site soil and local geology is required in order to ‘size’ retention devices and decide the issue of aquifer access. Local knowledge should also influence decisions about on-site retention of storm runoff. Adelaide, Melbourne, Canberra, Sydney, Newcastle and many other areas have water-reactive clays that swell and can cause cracking of domestic footings. There are also wind-blown sands that subside in the presence of ponded water, and other soils ‘collapse’ when saturated.

Retaining water on-site requires a coordinated approach between building and planning controls/approvals. If on- site drainage results in a higher moisture content of the foundation soil or a raising of the water table, then it is vital that footing and building design accommodate these factors.

Where on-site retention and infiltration are not practicable and the site layout and topography permits, site drainage should be directed into the street drainage system. If this is not possible, inter-site drains in easements at the rear of the site should be provided to take the run-off from impervious portions of sites. Run-off from pervious areas may be permitted to run overland into neighbouring sites, but care should be taken to prevent entry of refuse, garden clippings and other material into the inter-site drains.

## Management Issues

The components of the major, minor and site drainage systems are strongly inter-related, and a local drainage management plan should be prepared to determine the basis and scope for specific requirements. Management issues that are relevant in the design and control of residential development and considered part of a development plan include :

- allocation of responsibility for any drainage reserves created within a development;
- ownership and ongoing management responsibilities for any stormwater retarding basins incorporated into public open space.

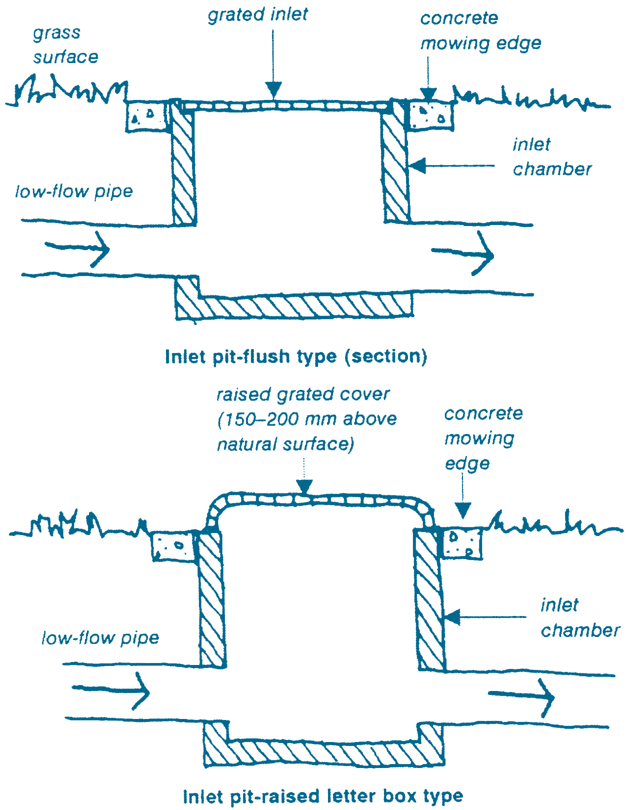



**Figure 5: Typical inlets for floodways and basins. The flush type is less of a visual intrusion, but more subject to blockage.**

# Element 3.1
# Storm Drainage

## Intent

To provide major and minor drainage systems which adequately protect people and the natural and built environments at an acceptable level of risk and in a cost-effective manner, in terms of initial cost and maintenance, and which contribute positively to environmental enhancement of catchment areas.

## Performance Criteria

The intent may be achieved where :

**Major system**

**P1** The major storm drainage system has the capacity to safely convey stormwater flows result from the relevant design storm under normal operating conditions, taking into account partial minor system blockage.

**P2** The major system has the capacity to convey safely, but with significant property damage, stormwater flows resulting from more extreme events than its design storm.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**Major system**

*(in relation to P1–P6)*

**A1.1** The design and construction of the major storm drainage system are in accordance with a development plan and the requirements of the relevant authorities.

OR

*(in partial satisfaction of P1–P6)*

**A1.2** The major system has the capacity to safely convey stormwater flows under normal operating conditions and partial minor system blockage for ARI = 100 years.

## Performance Criteria (continued)

**P3** Ground -floor levels of all buildings are located above the design flood level to provide protection of property in accordance with the accepted level of risk.

**P4** Floodways are developed such that there is a low risk of property damage.

**P5** The major system is designed to ensure that there are no flow paths which would increase risk to public safety and property.

## Acceptable Solutions (continued)

AND

**1.3** The major system design is based on the provisions of Australian Rainfall and Run-off (IE Aust., 1987) and cited references.

**A1.4** The major system design outflow is matched to the capacity of any existing downstream system.

**A3** Habitable rooms have freeboard above the ARI = 100 years flood level given by :

terrain slope <5%: freeboard = 0.20 m

terrain slope >5%:

$$\text{freeboard} = 0.10\text{ m} + \frac{V^2_{ave}}{2g}$$

where $V_{ave}$ = flow mean velocity (m/s).

$g$ = gravitational acceleration of 9.8 m/s$^2$

**A4.1**

Flows within the floodway are limited in depth and velocity by the formula :

$d_{max}$ $V_{ave}$ £ 0.4 m $^2/_s$

where

$d_{max}$ = floodway maximum depth

## Performance Criteria (continued)

**P6** Community benefit is maximised through the retention of natural streams and vegetation wherever practicable, the incorporation of sports grounds and other less flood-sensitive land uses into the drainage corridor and the placement of detention and retention basins for amenity and function.

### Minor System

**P7** The minor storm drainage system has the capacity to control stormwater flows under normal operating conditions for the relevant design storm without blockage.

## Acceptable Solutions (continued)

$V_{ave}$ = flow mean velocity (m/s)

OR

**A4.2** Flow depths on streets do not exceed 200 mm above the kerb-side gutter invert, through control of footpath levels if necessary.

AND

**A4.3** Flows within the street are limited in depth and velocity by the formula :

$$d_{max} V_{ave} < 0.4 \text{ m}\ ^{2}/_{s}$$

where

$d_{max}$ = kerb-side flow depth (m).

$V_{ave}$ = flow mean velocity (m/s).

### Minor system

*(in relation to P7–P14)*

**A7.1** The design and construction of the minor system is in accordance with a development area plan and the requirements of the relevant authorities.

OR

*(in relation to P7–P10)*

## Performance Criteria (continued)

**P8** Drainage networks are well-defined to ensure there are no hidden flow paths which could reduce their capacity to convey design flows.

## Acceptable Solutions (continued)

**A7.2** The rainfall intensity derived for the area in which the design is proposed, is based on ARI = 2 years for suburban residential lots with neighbourhood densities not greater than 20 dwellings per ha, and ARI = 10 years for neighbourhood densities greater than 20 dwellings per ha.

AND

**A7.3** Design is based on the provisions of 'Australian Rainfall and Run-off' (IE Aust., 1987) and cited references.

AND

**A7.4** A coefficient of run-off for impervious area of 0.9 is used, and that coefficient which is derived from 'Australian Rainfall and Run-off' or from locally-based research for pervious areas.

**A7.5** Piped drains operate with flow velocities of between 0.6 m/s and 5.0 m/s under normal conditions.

**A7.6** Piped drains may be assumed to operate under head during a design flow unless a detailed hydraulic grade line analysis demonstrates that this is not the case.

| **Performance Criteria (continued)** | | **Acceptable Solutions (continued)** | |
|---|---|---|---|
| **P9** | The minor system design minimises undesirable ponding for a prolonged period resulting from the relevant design storm. | **A9** | The minor system prevents ponding for a period not greater than 1 hour after cessation of rainfall, unless specifically otherwise required resulting from a stormwater flow of ARI = 2 years. |
| **P10** | The design of the minor system takes full account of existing downstream systems. | **A10** | The minor system design outflow is matched to the capacity of any existing downstream system. |
| | | | *(in partial satisfaction of P11)* |
| **P11** | The minor system design allows for the safe passage of vehicles at reduced speed on streets which have been affected by runoff from the relevant design storm. | **A11** | The minor system allows for the safe passage of vehicles at reduced operating speeds on streets which have been affected by run-off from an ARI = 2 years storm event. |
| | | | *(in partial satisfaction of P12)* |
| **P12** | The minor system is accessible and easily maintained. | **A12.1** | Where swale drains on access streets are used, ponding for greater than 1 hour after cessation of rainfall is unlikely and the turf used is resistant to scour and erosion, and tolerant to submersion when operating flow velocities are less than 1.5 m/s. |
| | | | AND |
| | | **A12.2** | Drainage pits are spaced at intervals not greater than 90 m to accommodate maintenance requirements. Drains are placed so that the minimum depth in streets from top of pipe to top of kerb is 0.75 m, and, in lots from top of pipe to the finished surface is not less than 0.3 m. |

## Performance Criteria (continued)

**P13**

Where a portion of the minor system lies within a site, access is available for maintenance.

**P14** The selection of materials used for the construction of the minor system is based on their suitability, durability, maintainability and cost-effectiveness.

### Site drainage

**P15** Design of site drainage provides for:

- the scope for on-site stormwater detention and retention, including the collection and storing of water in appropriate devices including roofs and communal car parks;
- on-site infiltration;
- the ability to withstand the likely effects of retained water on site soil and the consequences of these effects on the structural integrity of footings;
- a site drainage system that can be economically maintained, with ready access provided to all relevant components;
- the minimisation of detrimental impacts on existing water balance; and,

## Acceptable Solutions (continued)

*(in partial satisfaction of P14)*

**A14** Pipe materials are durable, cost-effective, and of sufficient strength to withstand heavy loadings (T44), having regard to the backfill material and conditions of pipe laying.

### Site drainage

*(in partial satisfaction of P15 and P16)*

**A15.1** Where soil and site geological conditions permit, on-site retention in storage tanks, soakage trenches or aquifers is provided.

OR

**A15.2** Where site conditions do not permit on-site stormwater retention, on-site detention in storage tanks is provided.

OR

**A15.3** Where site conditions do not permit either on-site stormwater retention or detention, site drainage is directed into the street drainage network of the minor system.

**A15.4** Where the topography of the site makes it necessary to discharge storm run-off to the rear of the site, inter-site drainage is designed

## Performance Criteria (continued)

- the safety and convenience of pedestrians and people with disabilities using the site.

**P16** Provision is made for on-site drainage which does not cause damage or nuisance flows to adjoining properties.

## Acceptable Solutions (continued)

to accept the run-off from all directly connected impervious areas.

**A15.5** The full range of appropriate practices and devices reviewed in *'Planning and Management Guidelines for Water-sensitive Urban (Residential) Design'* (Whelans et al 1994) are addressed.

AND

**A15.6** The design of drainage systems is undertaken by properly qualified personnel, using recognised and locally accepted hydrological, hydrogeological, soils, hydraulic and residential parameter data and design methodologies.

# Element 3.2
## Water Quality Management

### Need

Water pollution control systems must ensure that stormwater discharging to local streams, rivers, lakes, the marine environment and aquifers, both during construction periods and in the developed catchment, does not degrade the quality of water in the respective receiving domains.

Urbanisation of previously rural catchments leads to greatly increased export of pollutants from the land. These include coarse material (eg sediment and litter), nutrients, microbial contaminants, and toxic materials (eg pesticides, heavy metals and oil).

There are adverse consequences if these pollutants reach the receiving waters. The results include high treatment costs where the waters are used for town supply, illnesses contracted through body contact or through consumption of water-borne food (eg oyster, fish), and an overall loss of amenity much needed by our urban communities.

### Water Pollution Control Design Objectives

The peak period for sediment movement through an urban catchment is during the construction stages of the initial urbanising process and, again, when redevelopment takes place. Pollutants discharged from the stabilised, fully developed catchment include substantial quantities of litter and floating material along with more harmful toxic pollutants, bacteria and nutrients attached, for the most part, to fine sediment particles conveyed in the flow.

The broad objectives of a water pollution minimisation system operating in an urban catchment are therefore to:

- stabilise the land form and control erosion;
- provide a catchment-wide system that optimises the interception, retention, collection and disposal of water-borne pollutants prior to their discharge to receiving waters;
- minimise the environmental impact of urban run-off on the quality of surface receiving water;
- minimise the environmental impact of urban run-off, diverted underground, on groundwater

quality;

- provide and maintain in healthy condition a wide diversity of water environments in the urban landscape;
- ensure cost-effectiveness in construction and maintenance of water pollution minimisation works.

## Measures During Construction

The primary action to minimise sediment generated and conveyed in run-off during a construction project is for the developer, design engineer and contractor to provide an integrated plan for controlling erosion.

Measures aimed at minimising soil erosion in the first instance include restricting the area affected to the minimum necessary; avoiding wet periods where possible; completing the construction schedule as speedily as possible; diverting inflows around the site; and, following completion of the project (or stage of the project), implementing revegetation and/or soil stabilisation measures.

It is inevitable that some erosion will occur. Measures to contain the sediment so mobilised

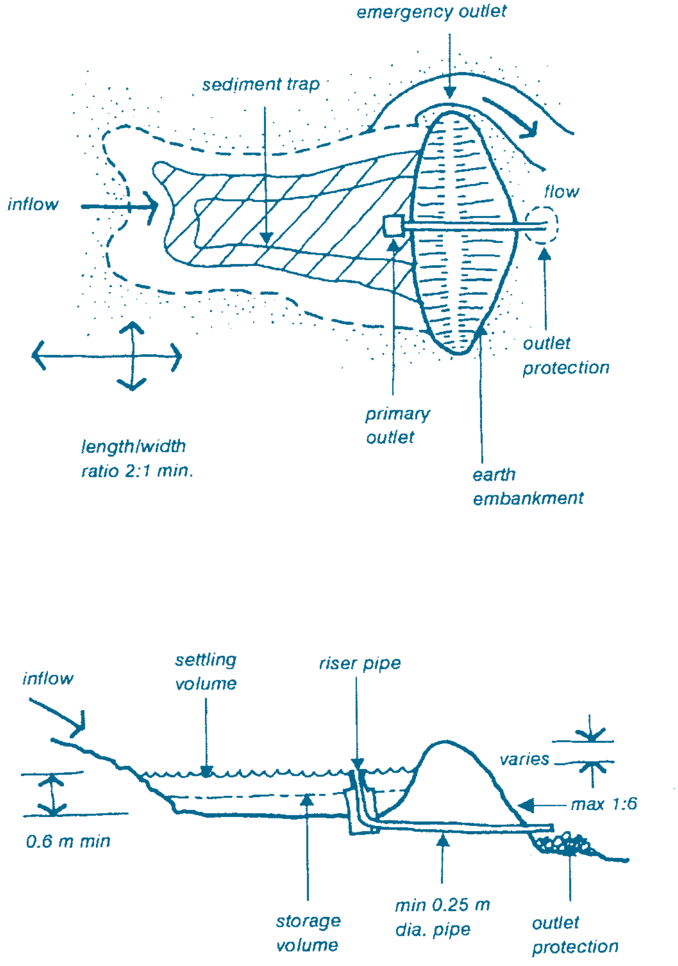



**Figure 1:** **Sedimentation basins enable the collection of sediment from eroded or disturbed areas before it reaches waterways. They are generally replaced by more permanent wetlands upon completion of major construction.**

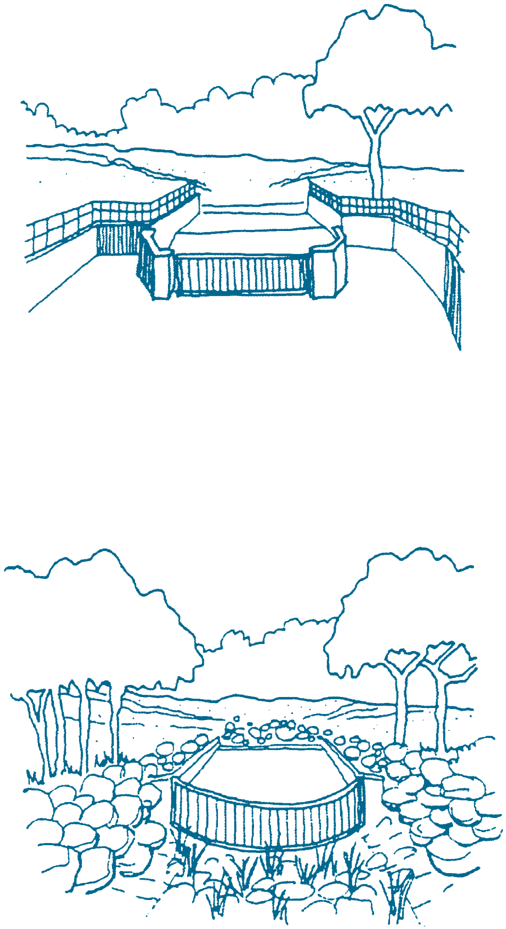


**Figure 2: The adverse impact of large gross pollutant traps (GPT's) on the amenity of an area can be overcome with good design to integrate the facility with its surroundings.**



must therefore also be identified in the erosion control plan. The measures adopted will vary according to the magnitude and duration of the project. In small projects, hay bales placed across flow paths may suffice or, for larger projects, filter fences and filter screens around inlets of street drainage systems may be required.

Large projects may require a formal sedimentation basin with earth embankment, spillway and discharge pipe. In extreme circumstances it may be necessary to include alum treatment of temporarily ponded run-off before discharging it to a sensitive receiving domain.

## Pollution Control in the Developed Catchment

The problems associated with the pollution of our surface and underground water sources, lakes, rivers and coastal environments are not recognised as 'crises' until a favourite recreational waterway is suddenly declared 'unsafe', or seafood taken from a particular estuary causes illness, or gross pollution littering the shores of a prime tourist destination raises concern at city and government levels.

There are no ‘quick fix’ solutions to these crises and the attraction of ‘end-of-pipe’ solutions as the sole pollution control strategy is regrettable. Cost considerations, and the fact that such solutions are effective against the most visible pollution, jointly account for this situation.

Long-term pollution control requires catchment-wide commitment to reducing storm run-off and pollution by every means possible; undertaking litter reduction education and action programs; using ‘micro’ and ‘macro’ gross pollution traps; and applying ‘fitness for use’ criteria to all stormwater diverted underground to recharge aquifers.

The value (for water pollution control) of reducing storm run-off lies in the reduced volume of stormwater that downstream treatment facilities must handle. For example the removal of, say, the ‘clean’ run-off component derived from all domestic roofs in a catchment leads to an increase in the pollution concentration of run-off conveyed through the catchment via its formal storm drainage network. At some point, which may be a local or ‘bottom-end’ gross pollution trap, sedimentation tank or pollution control pond, this highly polluted flow must be treated. The cost of this treatment is related closely to the total volume of flow throughput.

It follows that the more concentrated the pollution load conveyed to a treatment facility, the smaller, cheaper and more efficient it is in performing its treatment function. All of the practices which are effective in reducing the quantity of urban run-off therefore contribute positively to the goal of pollution minimisation.

The formal storm drainage network is used by some for the illegal disposal of waste materials and toxic liquids during periods of storms. State and local government authorities therefore have a major role to play, not only in law enforcement and public education, but also in leading by example with street-sweeping programs and regular cleaning of pits.

Technical solutions to water quality control problems using numerous devices and practices, such as gross pollution traps, sedimentation ponds, ‘first-flush’ tanks and wetlands, continue to be developed by research teams around the globe. The dominant trend of this research in recent years has been away from purely physical or chemical treatment towards integrated physical, chemical and biological processes present in constructed wetlands.

Issues similar to those outlined above for surface waters are also raised when stormwater enters the groundwater domain, either as seepage to an unconfined water table or, perhaps more purposefully, as recharge to a confined aquifer. As before, degradation of the receiving water quality is of prime concern.

Groundwater is used in urban Australia for irrigation of open-space areas such as sports grounds, golf courses and parks, to which a less-than-potable quality standard may be applied. High concentrations of suspended solids, salts, heavy metals, bacteria and nutrients are unacceptable for recharge of such resources. However, low levels of these pollutants, meeting clearly-defined 'fitness for use' criteria, are acceptable.

# Element 3.2
# Water Quality Management

## Intent

To provide water quality management systems which ensure that disburbance to natural stream systems is minimised and stormwater discharge to surface and underground receiving waters, both during construction and in developed catchments, does not degrade the quality of water in the receiving domains.

## Performance Criteria

The intent may be achieved where:

**P1** Adequate provision is made for measures during construction to ensure that the land form is stabilised and erosion is controlled.

**P2** The system design optimises the interception, retention and removal of water-borne pollutants through the use of appropriate 'fitness for use' criteria, prior to their discharge to receiving waters.

**P3** The system design minimises the environmental impact of urban run-off on surface receiving water quality and on other aspects of the natural environment, such as creek configuration and existing vegetation, by employing all possible techniques which are

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in relation to P1–P7)*

**A1.1** The design and proposed implementation of the water quality control system are in accordance with a development plan and the requirements of the relevant authorities.

OR

*(in partial satisfaction of P1–P7)*

**A1.2** The full range of appropriate practices and devices reviewed in *Planning and Management Guidelines for Water-sensitive Urban (Residential) Design* (Whelans et al. 1994) are addressed.

## Performance Criteria (continued)

technically appropriate and effective in reducing run-off and pollution travel in the catchment.

**P4** The system design minimises the environmental impact of urban run-off, diverted underground, on groundwater quality.

**P5** The system design ensures the continuation, in healthy condition, of a wide diversity of wetland environments in the urban landscape.

**P6** Sewage overflows into the stormwater system are prevented.

**P7** Point sources of pollution in the catchment should be identified and their impact minimised until they can be eliminated.

## Acceptable Solutions (continued)

AND

**A1.3** The design of the water pollution minimisation system is undertaken and certified by properly qualified personnel using recognised and locally accepted hydrological, hydraulic, hydrogeological, soils, water quality and biological data and design methodologies.

**A1.4** Water pollution control ponds or wetlands should be developed (where appropriate) for final treatment before discharge to the wider environment and should be sited to minimise impacts on the natural environment.

AND

**A1.5** Appropriate water quality criteria in accordance with 'fitness for use' requirements should be applied to all stormwater diverted underground to recharge aquifers.

AND

**A1.6** Litter reduction education programs, frequent street sweeping and regular pit cleaning operations should be carried out.

# Element 3.3
## Stormwater Harvesting

### Need

Water authorities, environmental agencies and community groups around Australia are questioning past approaches to stormwater drainage, in particular the focus on collection, conveyance and disposal of run-off from our urban centres. One of the arguments typically used against the harvesting of stormwater is the difficulty of transferring winter abundance to summer demand in southern Australia, and of summer-to-winter transfer in the tropics.

Dams and reservoirs perform this storage/ transfer function to meet community water needs at the ‘macro’ scale. However, application of the same technology at the individual household level is clearly impracticable.

Enormous potential exists for using stormwater. For example, it has been estimated that in Adelaide, South Australia, the total volume of stormwater passing through the city on its way to disposal in the sea each year is equivalent to the quantity of water imported to the city—much of it untreated, through 60 km pipelines—to meet annual potable water demand.

There is growing interest, therefore, in developing stormwater to supply a range of second-quality community needs presently met by potable water from town supply systems.

### Stormwater Harvesting Objectives

Systems for harvesting stormwater may be divided into two broad use categories:

- ***direct use*** , involving the collection and storage of storm run-off for relatively short periods (without treatment, or with treatment applied subsequently) before use;

- ***indirect use***, in which storm run-off is collected and treated before passing to storage for relatively long periods with subsequent retrieval and use.

The main objectives of stormwater harvesting are to:

- enable direct and indirect use of storm run-off;

- reduce waste of valuable potable water supplies;

- foster positive community attitudes to the use of alternate water resources;

• ensure cost-effective replacement of potable water by storm run-off for some uses.

## Direct Use of Stormwater

There is a range of direct uses for stormwater that do not involve long-term (season-to-season) storage.

At the domestic level there is roof run-off collected in rainwater tanks. Valid reasons may preclude the use of this water, untreated, for human consumption (particularly in parts of cities with high air pollution levels). Recommended uses include water cisterns, laundry, garden watering, or as basic feed for household hot water systems (raising the water temperature to 65°–72°C constitutes an effective form of 'light treatment' to destroy pathogenic bacteria, its most harmful component).

Direct use may also be made of run-off collected from paved surfaces and carpark areas. In these cases 'light treatment' may consist of passing the collected water through a coarse sand filter before use. Ultraviolet irradiation should be employed to clean this water for body contact, where applicable, but significant additional treatment would be required to bring these supplies to potable standard.

Recent initiatives aimed at multiple uses for stormwater installations and facilities have included detention basins with low-level ponds. The upper-level storage capacity of such a basin is designed for flood-control, while the low-level pond which remains after each flood provides a resource for limited open-space irrigation in the pond vicinity. Treatment of the pond water before this direct use usually involves little more than filtration. The wetlands environments created through such initiatives represent valued public amenities which often also lead to increased local property values.

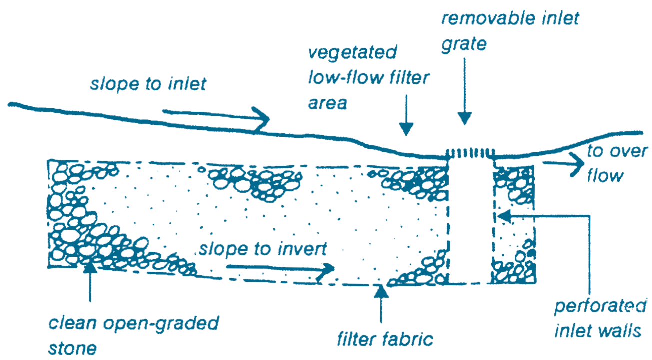



**Figure 1: Underground infiltration trenches may be constructed to accept run-off from urban areas and carparks. These installations must be preceded by sediment collectors. Porous pavements can also promote infiltration.**

# Indirect Use of Stormwater

The need for winter-to-summer storage of stormwater arises where run-off occurs mainly in winter and the water is to be used in summer. The bulk of storm rainfall and open-space irrigation in southern Australian cities conforms to this pattern, while the opposite—summer run-off for (irrigation) use in winter—is more characteristic of tropical locations.

The simplest indirect use of storm run-off for these requirements involves disposing of the resource in ‘leaky’, below-ground storages, such as perforated wells or gravel-filled trenches. From here the stored water seeps slowly into the surrounding soil, maintaining soil moisture levels for long periods after each rainfall. Such systems are often capable of meeting the water needs of trees and shrubs through spring and much of summer in southern Australia, and through the corresponding autumn and winter seasons in the tropics.

However, the need for more dependable, long-term storage can be met by suitable and accessible aquifers. Consideration of an aquifer’s suitability raises issues of its hydraulic characteristics and its water quality in relation to

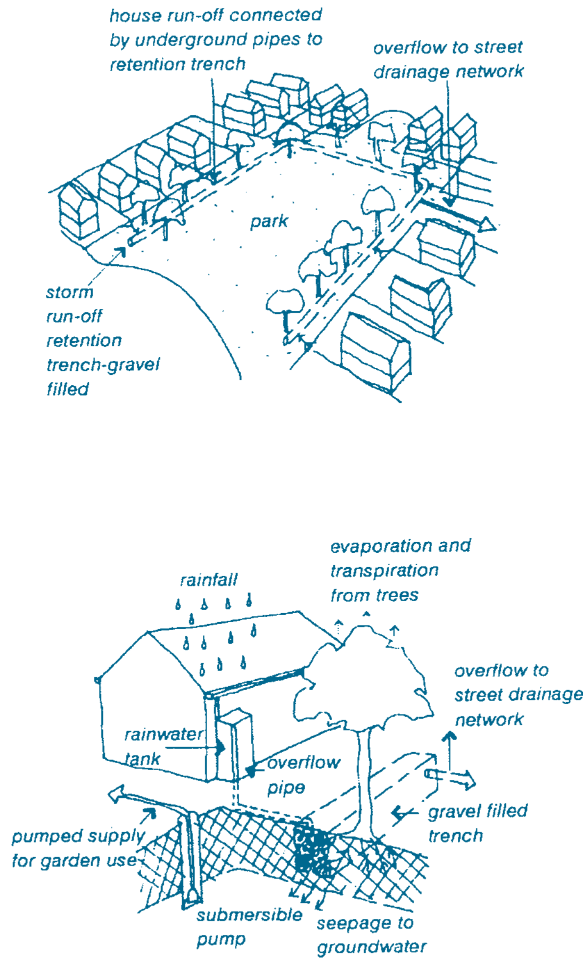



**Figure 2: General view of New Brompton Estate with detail of outlet standpipe and access bore.**

the intended use. Ideally, an aquifer for stormwater storage should have a very flat hydraulic gradient, which implies slow movement. For example, the velocity of water passing through the confined aquifer at New Brompton Estate, South Australia, which successfully demonstrates this technology, is estimated at 20 m per year.

An aquifer that does not 'hold' recharge water in the vicinity of a bore for the relatively long periods required for inter-season transfer should not be used. It is possible that, in this case, injected water will emerge in private property downstream, causing damage and/or nuisance flooding.

The ambient water quality of the aquifer considered for storage duty may be too saline at, say, 2000 mg/L for open-space irrigation. However, with a mixture of stormwater and aquifer water, the retrieved water salinity may be a very usable 400–500 mg/L. Contaminated aquifers should, of course, be avoided.

Aquifer accessibility is important for the feasibility of stormwater transfer because of its influence on the infrastructure that must be installed to exploit the resource. Where the soil mass is compacted sand, the water table aquifer is virtually accessible to all sites individually, even to every roof-to-ground downpipe. However, where the uppermost suitable aquifer is confined at, say, 30 m below ground level, cost considerations may dictate that stormwater is collected from a group of residences and passed to a single bore point to be filtered prior to injection.

Simple gravity recharge is appropriate where this technology is employed at the individual house or group-housing level. Pressure injection using pumps is only warranted where standing (aquifer) water is close to ground level and a large quantity of water is to be recharged.

An example of the latter case is where the injection-storage process is associated with wetlands constructed to receive and provide final 'polishing' of storm run-off. The magnitude of such operations, and the strategy which seeks to inject the cleansed water as rapidly as possible, may call for pumped injection. In all cases where a bore is required to access the groundwater storage domain, it is recommended the same bore be used for water retrieval (for economic and aquifer maintenance reasons).

These illustrations of indirect use of storm run-off involving aquifer storage carry an important overriding constraint: annual extracted volume must be as close as possible to annual recharge volume. Where this is ignored, aquifer pressure levels can either build up (extraction less than recharge) or fall (extraction greater than recharge), with potential adverse consequences.

# Element 3.3
# Stormwater Harvesting

## Intent

To develop the resource potential of stormwater to supply a range of second-quality water uses presently met from town supply systems.

## Performance Criteria

The intent may be achieved where:

**P1** Direct stormwater use systems are effective in collecting, storing and applying appropriate physical treatment to storm run-off for immediate use.

**P2** Indirect stormwater use systems are effective in collecting, applying physical treatment to, storing and retrieving storm run-off for use as required.

**P3** Stormwater use systems provide the community with opportunities to reduce mains water use.

**P4** Stormwater use systems provide the community with water for second-quality uses,

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in partial satisfaction of P1–P7)*

**A1.1** Roof run-off collected in rainwater tanks is heated to 65°–72°C or subject to ultraviolet irradiation disinfection before use as potable supply.

**A1.2** Run-off from roofs and/or paved surfaces which has been filtered may be passed to surface storage devices for slow release into the surrounding soil mass for take-up in the root zone of trees and shrubs.

AND

**A1.3** Soil swelling behaviour is allowed for in siting surface storage devices holding stormwater.

## Performance Criteria (continued)

leading to cost reductions.

**P5** Stormwater use systems which incorporate constructed wetlands environments make positive contributions to urban amenity.

**P6** Stormwater use systems are effective in reducing the costs of downstream storm drainage.

**P7** Aquifers chosen for long-term storage of storm run-off can be effective components of comprehensive direct and indirect stormwater use schemes.

## Acceptable Solutions (continued)

**A1.4** Storm run-off from roofs and/or paved surfaces which has been filtered is passed to temporary surface storage devices and then, via recharge bores, to underground aquifers for long-term storage and subsequent retrieval via the recharge bores.

AND

**A1.5** The volume of water recharged to an aquifer on an annual basis equates to the volume retrieved from the aquifer.

**A1.6** Constructed wetlands receiving storm run-off are effective components of comprehensive direct and indirect stormwater use schemes.

AND

**A1.7** The design of stormwater use systems is undertaken and certified by properly qualified personnel using recognised and locally-accepted hydrological, hydrogeological, soils, hydraulic and water demand data and design methodologies.

# 4. Streetscape and Neighbourhood Character

## Introduction

The enhancement of neighbourhood character is an important objective for new housing. Streetscape character and building appearance are important elements in achieving better housing outcomes. This Element category is relevant to infill development projects set within established suburbs, as well as larger infill and greenfields projects which involve the creation of neighbourhood street networks. It addresses the various components which affect the identity and character of neighbourhoods, including public and communal streetscape and landscape, building appearance and design, and fences and walls.

The Elements contained within this category are:

# Element 4.1
Streetscape and Landscape

## Need

The character of streetscapes is a major factor in defining or creating overall neighbourhood character. Streetscape character and quality concern not only the incoming occupants of housing projects, but also their neighbours and the wider community. The success of a streetscape design can be a major factor in securing wider community acceptance of diverse housing forms.

Streetscape priorities include the development of attractive streetscapes in new residential areas, the reinforcement of existing attractive streetscapes in established areas, and the improvement of streetscapes in areas undergoing a planned transition in urban character.

Streetscape quality takes on greater significance in areas with special environmental attributes, such as heritage conservation areas. Here design of housing should strive to reinforce streetscape character and be sympathetic to the special qualities of the street and the locality.

AMCORD includes PND 10: Streetscape and Neighbourhood Character, as a further reference source.

## Defining Streetscape

**Figure 1: Streetscape design encompasses building, street and landscape design and should aim to establish a clear identity.**

Streets have a number of roles in the urban context including providing access for vehicles, pedestrians and cyclists; providing corridors for physical infrastructure; defining territorial space and location; providing recreation space; encouraging social interaction; providing visual continuity and space; and contributing to the environmental system.

Streetscape encompasses both public and communal streetscapes (ie internal private streets that serve more than two dwellings), buildings, street and landscape design and includes all adjacent buildings, and landscaping

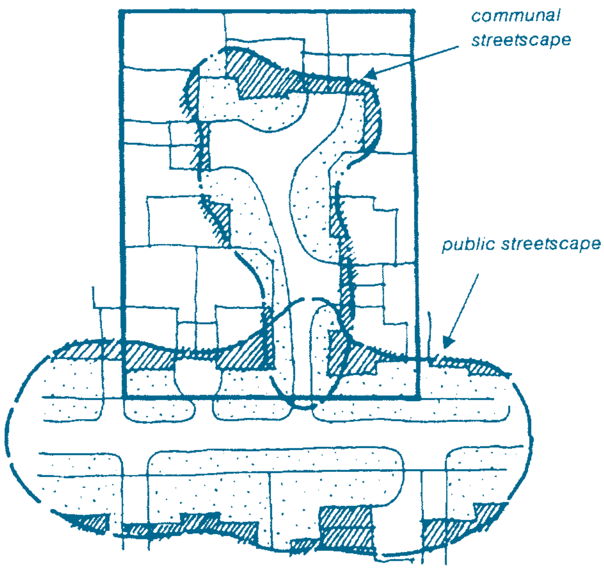



**Figure 2: It is useful to categorise streetscape as communal streetscapes where the street is privately owned and as public streetscapes where vested in a Council.**

and fencing, traffic treatments, paths, driveways, street surfaces and utility services. The spatial arrangement (including building setbacks) of these components and their visual appearance determine the streetscape character.

## Streetscape Components

### Paving design

Street design is not the outcome of engineering considerations alone. Pavement of streets and edges, driveways, on-street parking and paths should be considered as a network of surfaces responding to the physical characteristics of the locality, and the to need for safety, identity and sense of place.

### Verge width

Verge width should respond to street function, services alignment and landscape needs. A wider verge may be required for a number of reasons, such as:

The ground falls or rises from the invert of the kerb to building fronts.

The street alignments take up part of the verge width.

On-street parking is to be located within the verge.

The verge is part of the overland stormwater collection and conservation network.

**Building siting and appearance**
Building siting and design influence streetscape success and are considered in Element 4.2.

**Landscape and street trees**
Landscape in street reservations contributes significantly to streetscape appearance. Research confirms its crucial role in residents' satisfaction with a living area, as it is the most publicly visible aspect of a development.

Vegetation can screen unattractive views, create features or focal points for the street, modify the microclimate, clean the air, provide bird flight corridors, and assist with crime prevention and community safety.

**Fences and walls**
Fences and walls are outlined in Element 4.3. Their design becomes more critical as development intensity increases. A balance must be found between the use of fences for increased privacy (visual and acoustic), the impact on street appearance, loss of casual street surveillance and loss of social interaction. Coordinated fence design can assist in achieving a sense of identity for integrated higher-density projects.

**Street furniture**
Lighting, seats, bollards, litter bins, signs, tree guards, and structures such as bus shelters, substations, mail boxes and garbage bin storage areas all contribute to streetscape character. A clear theme can aid street identity and continuity.

## Design of New Streetscapes

When designing a new public or communal streetscape, it is important to consider the desired streetscape character. There are two

**Figure 3: Two-storey terrace housing defines and enclose a inner-city street.**

distinct approaches to organising buildings and space that define streetscapes:

- **Buildings containing space —** this occurs where the street space is defined and enclosed by buildings, rather than by landscape.

- **Landscape containing buildings** — this occurs where open space and landscape dominate and provide a setting for the buildings.

Some types of housing, such as town houses, terraces and apartment dwellings, tend to provide an urban built edge to a street. Attractive streets can result from such a design approach, typified in the sought-after inner areas of many Australian cities (eg Paddington in Sydney, Spring Hill in Brisbane, and Carlton in Melbourne). Where a less sharply defined urban quality is desired, integrating landscape features, particularly large-canopy trees, with the buildings and street design can 'soften' the streetscape.

Generally the major visual indicators of a street are the edge, the street spaces and the overall atmosphere or feel of the street. These factors influence not only street character, but also traffic movements and driver behaviour.

**The edge**

The streetscape edge is defined by buildings and/or landscape. Where buildings are to remain prominent, much greater care is required with respect to architectural appearance. If landscape is to predominate,

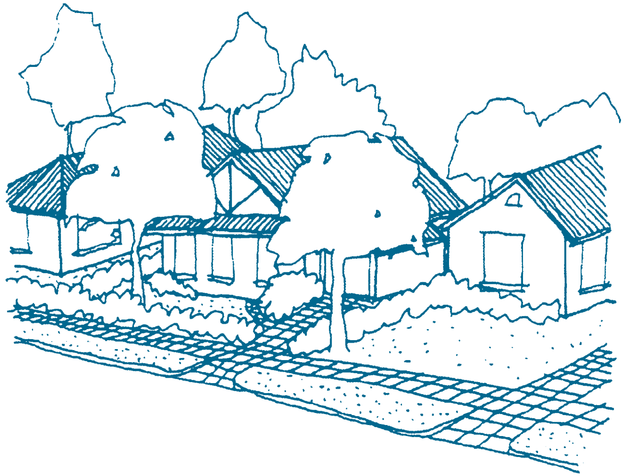


**Figure 4: Open streetscape and landscape provides a setting for buildings.**

care is needed to ensure that this will actually happen. Gaps in the street edge should coincide with important vistas and unwanted gaps should be screened.

**The street spaces**

Creation of interesting street spaces of comfortable proportions requires attention to their proposed shape and building height to space ratios. Tree height and spread characteristics also play a role in defining the spatial qualities of the street.

A more dynamic streetscape may be possible by using a series of narrow and contrasting open spaces. This can create a pleasing atmosphere, a sense of place, as well as a visually interesting streetscape.

**The atmosphere**

The feel of a street depends on the relationship of all its components. The extent of enclosure created by buildings and trees is a key aspect of urban streetscapes. With the built form generally more dominant in more intensive housing, the quality and detailing of all surfaces that abut the street edge (eg fences, wall and building design) as well as street paving, paths, landscape and the like, are important.

## Landscape

Street landscape should be designed to satisfy a number of roles and objectives. These are outlined below.

**Creating or enhancing character**

- creating an image or identity for a street and for precincts in the local area;
- blending new development into an existing

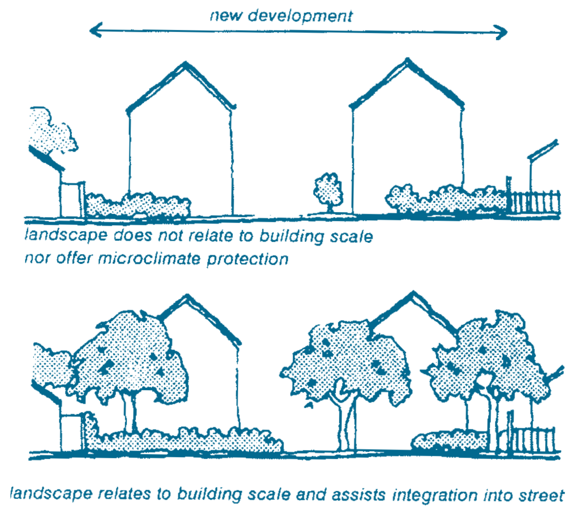



**Figure 5: Landscape designed to integrate new development into a street.**

streetscape through planting of similar vegetation to that already existing in the area;

- providing large trees for visual amenity, particularly given that it can not be guaranteed that large trees will be planted in private lots in new housing areas (especially on small lots);

- providing compatible types of landscape in significant streetscapes such as those with heritage characteristics;

- visually enhancing the streetscape with natural colours and soft shapes to contrast with the hard built edge and paving of the streetscape;

- providing thematic consistency in street landscape to strengthen identity.

**Defining street spaces**
- delineating spaces or providing special landscape features within a street either to focus on a particular space or to separate one space visually from another;

- providing continuity of enclosure as well as edge definition of the street spaces, which will also help to screen unwanted views and control vistas;

- providing a transition in scale.

**Ensuring movement, legibility and safety**
- assisting traffic calming by helping to slow vehicle speed through streets, with landscape design and treatment providing drivers with visual and physical cues;

- reinforcing the legibility and function of the street;

- providing comfortable and attractive conditions for pedestrians and cyclists that will encourage walking and cycling;

- providing screening and filtering to control privacy and reduce overlooking;

- enhancing recreational and leisure opportunities through design of the street for play, promenading, jogging or passive use;

- assisting safety and crime prevention by allowing street surveillance and by not having excessively screened paths.

**Maintaining environmental integrity**
- controlling stormwater by introducing water permeable verges and pavement treatments to absorb water and minimise run-off;

- assisting water conservation by selecting appropriate plants and watering systems that require low maintenance and reduced water consumption;

- assisting energy conservation in buildings through attention to microclimate and shading control (eg street tree species selection influenced by suitability for creating year-round shading in hot–humid and hot–arid climates, or summer shading and winter sun penetration in temperate and cooler climates).
- promoting air quality improvement through tree planting and retention;
- providing large trees for bird habitat;
- providing linkages to habitat areas for wildlife movement.

# Element 4.1
# Streetscape and Landscape

## Intent

To provide attractive streetscapes that reinforce the functions of a street, enhance the amenity of buildings, and are sensitive to the built form, landscape and environmental conditions of the locality.

## Performance Criteria

The intent may be achieved where:

**Public and communal streetscape**

**P1** The street, building and landscape design achieves:

- the creation of attractive residential environments with clear character and identity;
- respect for existing attractive streetscapes in established areas;
- appropriate streetscapes in areas where desired future urban character has been defined;

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria:

**Public and communal streetscape**

*(in relation to P1 and P2)*

**A1.1** A Streetscape Concept Plan* is submitted that demonstrates how the Performance Criteria are met, showing:

- the street reserve and indicative locations of the carriageway, parking bays, footpaths, cycleway systems, speed control devices and, where practicable, driveways, bus stops, street lighting and substations;
- location of existing vegetation to be removed or conserved;

## Performance Criteria (continued)

- the infiltration of stormwater run-off wherever practicable (subject to climatic, soils and urban character criteria);
- provision for appropriate street tree planting taking into account the image and role of the street, solar access requirements, soils, selection of appropriate species, and services;
- use of such features of the site as views, vistas, existing vegetation and landmarks.

**P2** The design of the landscape in public and communal streets:

- defines a theme for new streets, or complements existing streetscapes and integrates with new development;
- is sensitive to site attributes;
- complements the functions of the street;
- reinforces desired traffic speed and behaviour;

**Public and Communal Streetscape (continued)**

- is of an appropriate scale relative to both the street reserve width and the building bulk;
- promotes safety and casual street surveillance;

## Acceptable Solutions (continued)

- location, species and general character of tree planting and hard and soft landscape treatment;
- location and indicative treatment of building form (eg setbacks, front elevation, garage/ carport location and design, front garden treatments etc.) and street furniture.

AND

**A1.2** For infill housing that abuts an existing public street, information should be submitted that demonstrates how the development fits in with an existing attractive streetscape or any statement of future urban character for that area.

** This plan may form part of or include a landscape plan. The need to complete such a plan will depend on local implementation requirements.*

**Public and Communal Streetscape (continued)**

*(in relation to P1 and P2)*

**A1.3** Landscaping is in accordance with the approved landscape strategy for the area. Compliance with this requirement is achieved

## Performance Criteria (continued)

- improves privacy and minimises unwanted overlooking;
- incorporates existing vegetation, where possible;
- appropriately accounts for streetscapes and landscapes of heritage significance;
- assists in microclimate management;
- maximises absorptive landscaped areas for on-site infiltration of stormwater where appropriate;
- integrates and forms linkages with parks, reserves and transport corridors;
- enhances opportunities for pedestrian comfort;
- achieves lines of sight for pedestrians, cyclists and vehicles;
- provides adequate lighting for pedestrian and vehicle safety;
- provides attractive and coordinated street furniture and facilities to meet user needs;
- satisfies maintenance and utility requirements and minimises the visual impact of above-ground utilities.

## Acceptable Solutions (continued)

by submission of a plan certified by a qualified landscape architect or designer as meeting the Performance Criteria, and showing:

- boundaries and areas of communal open space including sites for specific recreational uses;
- existing vegetation and proposed general character of landscape treatment;
- general arrangement of hard landscaping elements and major earth cuts, fills and mounding; and
- indicative treatment of floodways, drainage lines and the urban edge, along with general information on fencing, access points, furniture, pavement style, and treatment of the verge including any associated parking or drainage requirements.

# **Element 4.2**
Building Appearance and Neighbourhood Character

## Appearance from Streets

While design is a subjective matter (what is attractive to one person may be unattractive to another), there are some shared community expectations about acceptable housing appearance. Generally only those parts of a building that can be readily seen from a public place or from adjoining properties should be subject to planning controls and codes, as their appearance impacts upon streetscapes and parks and possibly on the amenity of neighbouring rear gardens. There may be special environments where greater design control over new buildings is justified, eg in areas of heritage significance or those having special architectural merit.

There should be greater design flexibility for building appearance within development sites. The housing development industry often creates communal streetscapes to meet its assessment of the market. Future residents can see what they are buying or renting and do not need the judgement of the wider community to know what is best for them.

AMCORD includes Practice Note Design PND 4: Responsive Urban Design and PND 10: Multi-Dwelling Design Checklist, as further reference sources.

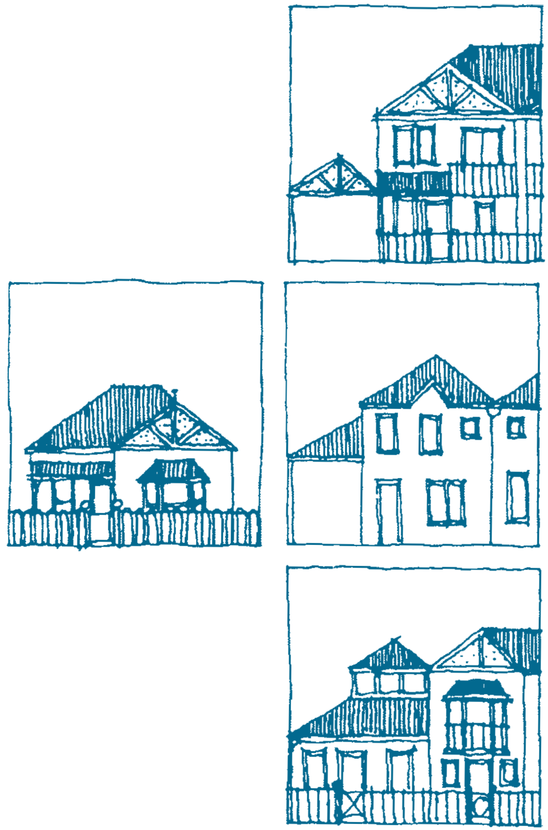


**Figure 1: Dwelling design to suit context, with similar roof pitch and height within one storey of neighbour at street frontage.**

## Context and Identity

Where different dwelling types are introduced, the likelihood of residents and neighbours being mutually satisfied is increased if the external appearance is similar to existing built forms, at least overall if not in detail (eg apartment housing built in the same form as surrounding large houses).

The appearance of adjacent dwellings should not simply be replicated. However, it is desirable to continue the use of certain details, patterns or forms which help to establish an attractive theme or character for a locality. In larger-scale developments, a new internal design context can be established to provide some conformity in the appearance of buildings. However, some individuality of dwelling appearance is still needed to help make the housing seem more 'home-like'.

## Emphasis

The emphasis in building design should be on the components that affect streetscape: how a dwelling is sited and designed to face or address a street, building height, roof pitch, articulation, detailing, form, materials, colours, textures, and identity.

The front of a building usually forms the dominant element abutting the street. It is considered to be good design practice for the front entrance of a dwelling prominently sited, with the building facing the street rather than away from it. It is also desirable for the building to be an integral part of the streetscape rather than concealed behind walls, garages or other such structures.

## Silhouette

The silhouette formed by the roofs of buildings contributes to streetscape appearance. A roof silhouette can have both visual harmony and rhythm. Where housing abuts a public street, dwellings should generally not be dramatically different in shape or height from their immediate

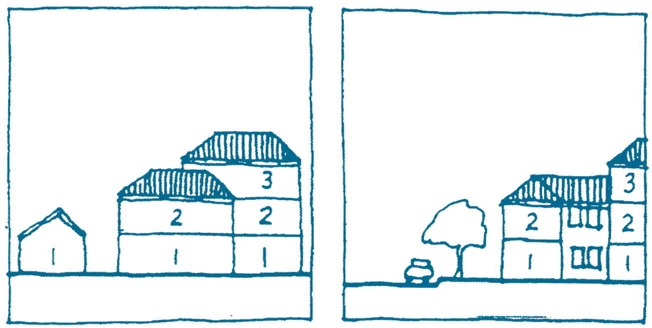



**Figure 2: Building height related to neighbouring development at the public street frontage.**

neighbours. Where change does occur, architectural devices should be adopted to assist the visual transition (eg use of attic rooms, which provide additional floor space with little streetscape impact).

## Balance

Three techniques can assist in providing a balanced appearance:

- use of various building projections, cutbacks, cutouts and additions such as doors, windows, dormers, balconies, bays and other articulations;
- a balance between the ratio of solid walls to openings;
- a balance between horizontal and vertical shapes.

## Building Materials

Today there is a wide variety of building materials available for use in house construction. In established areas whose character is to be reinforced, it is usually desirable to utilise, to some extent, materials and colours that are commonly used in surrounding buildings. Clearly in new areas and in areas where the existing character is intended to be upgraded, materials selection can be less constrained.

**Figure 3: Garage location and design to enhance steeetscape and building appearance.**

There has been a developing trend in new projects and neighbourhoods for developers and/ or councils to apply restrictive covenants limiting materials selection to a narrow range (eg masonry walls and tiled roofs). This is undesirable, especially given the opportunities for design innovation and aesthetic interest provided by composite design techniques (ie a mix of masonry, lightweight and decorative materials), but also because lightweight construction can be used to create a rendered masonry wall effect.

Such composite design techniques, used in appropriate proportions, can have advantages in terms of:

- assisting in the integration of new housing within established areas (most older housing incorporates a range of materials and decorative elements);

- reducing the scale of larger buildings and large expanses of exposed brick walling (by using lightweight materials in feature panels, gable ends and/or the upper half of walls);

- improving the articulation of walls (eg as features above windows, particularly useful on reactive clay soils).

For housing on small lots and in medium density multi-unit projects, roofing materials should be carefully selected to create simple, unobtrusive forms (eg high profile tiles are often not suited). Similarly, a small range of predominantly light coloured materials and simple building forms are more suited to medium density projects.

# Element 4.2
# Building Appearance and Neighbourbourhood Character

## Intent

To ensure that building appearance from public streets and adjoining sites is attractive and visually compatible with either attractive surrouding development or the identified future urban character of the area.

## Performance Criteria

The intent may be achieved where:

**P1** The frontage of buildings and their entries are readily apparent from the street.

**P2** Building height at the street frontage maintains a compatible scale with adjacent development.

**P3** Buildings are designed to reflect relevant features of the prevailing character of surrounding attractive streetscapes, features and built form character that have been identified as part of the desired future character of the area.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria:

**A1** Buildings adjacent to the public street address the street by having a front door and/ or living room or kitchen windows facing the street.

**A2** Differences in building height between existing buildings and new development are not more than one storey when viewed from the public street and adjoining properties. This requirement applies to the building for a depth of one room.

*(in partial satisfaction of P3 and P4)*

**A3.1** The majority of the roof form viewed from the public street and adjoining properties pitched at an angle not less than 5$^{o}$ below the dominant roof pitch in the site's visible

## Performance Criteria (continued)

**P4** Buildings are designed to enhance existing attractive built form character by translating the following characteristics found in the surrounding built form into innovative design solutions:

- mass and proportion;
- building materials, patterns, textures, colours, and decorative elements;
- ground-floor height above natural ground level;
- floor to ceiling height;
- roof form and pitch;
- facade articulation, detailing, and window and door proportions;
- verandahs, eaves and parapets;
- driveway crossovers, fence style and alignment.

**P5** The appearance of dwellings within a multi-unit development is varied if they are located in an established area of diverse building styles.

**P6** New development complements or enhances any treed landscape character of the area by:

- providing sufficient open space for the

## Acceptable Solutions (continued)

locality. Where adjacent roofs are flat, steeper roof pitches that contribute to the streetscape are permitted.

AND

**A3.2** Building design, roof form, detailing and materials visible from public areas and adjoining properties are not in strong visual contrast with the character of attractive neighbouring buildings.

AND

**A3.3** Buildings have a maximum unarticulated length of 15 m to the public street frontage. Punctuation by bay windows, verandahs, balconies or wall offsets is considered to be adequate articulation.

AND

**A3.4** Building design enables individual dwellings to be identified from public streets.

## Performance Criteria (continued)

planting of trees to complement the landscape character of the neighbourhood;

- retaining and protecting existing vegetation where possible;
- protecting neighbouring trees from damage to their root systems;
- using building footing designs, where necessary, that allow root growth of large trees.

**P7** The building design, detailing and finish provide an appropriate scale to the street, add visual interest and enable differentiation between dwellings when viewed from public streets.

**P8** Buildings are designed and sited to acknowledge the private open space of surrounding development, by:

- keeping upper story parts of buildings away from neighbouring private open space so as to avoid an unreasonable sense of visual enclosure; and
- using articulation, colour and detailing to reduce visual bulk.

**P9** Garages and parking structures are sited and designed so as not to dominate the street

## Acceptable Solutions (continued)

**A9** Carports and garages are designed to be compatible with the dwelling design and with

## Performance Criteria (continued)

frontage, by:

- minimising the frontage width;
- ensuring that roof form, materials and detailing complement that of the associated dwelling.

**P10** Existing dwellings in sound condition that contribute to the streetscape character and items of heritage or conservation significance are retained, incorporated and sympathetically treated, where possible.

## Acceptable Solutions (continued)

a maximum width of garage or carport opening of 6 m or 50% of the frontage width, whichever is the less, where they face the street.

**A10** Items of heritage or conservation significance retained and sympathetically treated.

# Element 4.3
Fences and Walls

## Need

Front fencing design has implications for streetscape appearance, privacy and security. It has the potential to be a dominant design element and requires careful thought in the design process.

Front fences and walls have both advantages and disadvantages. They can define territorial boundaries, provide a safe area for children to play and offer some acoustic and visual privacy. Furthermore, some high walls are installed as a security measure. However, front fences and walls can also unduly dominate a street and their design may not always be in keeping with the streetscape and built character. In addition, they can reduce pedestrian amenity and opportunities for social interaction in the street and may (as Neighbourhood Watch notes) prevent resident surveillance of the street and of homes for security.

## Design Approach

Many of the concerns in relation to fencing can be solved through good design. For housing where space is at a premium fencing may allow better utilisation of the front yard. In some circumstances it will be appropriate to allow high front fences and walls as-of-right, such as when the most desirable area of private open space is to the street (eg. best solar orientation) or where noise generated by traffic is high.

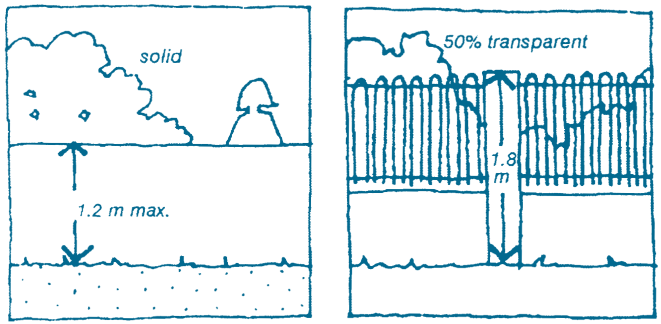



**Figure 1: Higher front fences should generally be partially transparent.**

In many area, particularly in new, developing areas, front fencing forward of the building line may not be warranted or desirable. The resultant streetscape has a more open, landscaped character which can be most attractive, particularly if significant landscaping of the front garden area takes place. In these situations garden design and planting can effectively define the front property boundaries, while their approach can encourage residents to maintain the verge down to the street kerb.

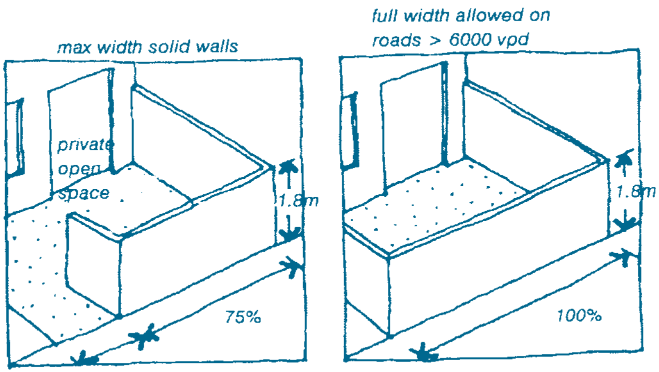



**Figure 2: Fence width at frontage related to traffic conditions and location of private open space.**

In established areas, where residential densities might be higher and/or fences more characteristic, front fencing can help integrate new housing into an existing streetscape or integrate new housing within a new housing project.

## Privacy and Territory

The traditional Australian approach to gardens is for the front yard to function as a semi-public space. This role conflicts with the desire generated in many housing developments for the private open space to the street to be enclosed.

A means to resolve this dilemma is to provide partial high privacy screening from the street whilst maintaining some degree of visual connection, and overall design cohesion.

- Privacy can be achieved through building design, detail and planting, rather than by high fencing.
- Fencing can be used effectively to define territory and ownership. It is preferable, therefore, for fencing to be sited at the property boundary to give a clear definition of both territory and responsibility for care and maintenance of land on the street side of the fencing.

## Safety and Surveillance

Designing for security means maintaining the opportunity for casual surveillance of the street by residents from their dwellings or front yards. This has implications for the height, extent and transparency of fencing.

# Element 4.3
# Fences and Walls

## Intent

To ensure that front fences and walls, where used, improve amenity for residents and contribute positively to the streetscape and adjacent buildings.

## Performance Criteria

The intent may be achieved where:

**P1** Subject to P2, front fences and walls enable some outlook from buildings to the street to achieve safety and surveillance.

**P2** Where appropriate, front fences and walls enable use of private open space abutting the street and/or provide an acoustic barrier if traffic noise is excessive.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in relation to P1 and P2)*

**A1** Front fences and walls are no more than 1.2 m high if solid (forward of the building line). This height may be increased to 1.8 m if the fence has openings which make it not less than 50% transparent;

OR

**A2** Solid front fences and walls to 1.8 m high limited to where:

- the main private open space is in front of the dwelling,

OR

## Performance Criteria (continued)

**P3** Front fences and walls assist in highlighting entrances;

**P4** The design and materials of front fences and walls are compatible with the associated development and with attractive fences and walls in the nearby visible locality.

**P5** Front fences and walls are compatible with facilities in the street frontage area, such as mail boxes and garbage collection areas.

**P6** The use and/or design of fences and walls in streetscapes of significance is appropriate to the heritage context.

**P7** Where overland water flows are probable (eg in hot–humid and hot–arid climates) fences with strip footings provide for the movement of surface stormwater.

## Acceptable Solutions (continued)

- traffic volumes exceeds 6000 vpd

PROVIDED THAT:

- the width is limited to a maximum of 75% of the frontage where private open space fronts the street;
- some surveillance of the street is maintained from the dwelling;
- fences do not exceed 10 m in length without some articulation or detailing to provide visual interest.

**P7** Where overland water flows are probable (eg hot–humid and hot–arid climates), fences with strip footings provide for the movement of surface stormwater.

# 5. Site Planning and Building Design

## Introduction

This Element category covers the variety of site-specific design issues which together play an important role in the creation of successful residential environments. The design principles promoted are primarily applicable to infill development, the design of individual houses or multi-dwelling projects on specific sites, and housing in special environments.

Specifically, it details the broad range of issues which affect how pleasant, attractive, manageable, resource-efficient and sustainable living environments are developed.

The Elements contained within this category are:



# Element 5.1
Site Planning

## Site Planning Objectives

As outlined in Section 2.4, successful site planning stems from thorough analysis of the site and its development context. Design skills are then required to balance factors affecting site layout.

To achieve a pleasant and attractive living environment for residents and their neighbours, site planning should ensure that a development:

- is compatible with the desired character of the locality, and considers the amenity of neighbours;
- takes advantage of the site's best attributes;
- satisfies reasonable privacy, security and other user needs;
- makes good use of outdoor space;
- is environmentally sensitive;
- is attractive and functions effectively.

## Defining a Site

A site may be defined in one of two ways:

- as a parent site, ie encompassing the entire area of of land proposed for development;
- as a dwelling site, ie the area of land set aside for the exclusive use of a dwelling.

Where a distinction is not made between the two, then the criteria should be regarded as applying to both.

## Layout Issues

The arrangement of buildings and spaces on a site will have an important influence on the quality of the residential environment. Key components to be considered include:

- the building 'footprint' or site development plan;
- private open space (eg rear garden or courtyard);
- seml-public open space (eg front garden or setting for the dwellings);
- communal open space;

- setbacks for amenity;
- street appearance;
- access and parking;
- services and facilities.

Issues to be considered in site layout include:

- appropriateness of built form and landscape In relation to the site context, topography and the desired urban character:
- cost-effective utilisation of the available land;
- arrangement of buildings, especially in relation to streets and open spaces;
- the role of streets and accessways/paths in providing connections within and beyond the site;
- location, function and control of open space;
- ongoing site management considerations and the future role of any body corporate;
- relationship of buildings and open spaces;
- the qualities of spaces;
- personal privacy and security;
- parking arrangements;
- energy efficiency in building design and siting;
- heritage and conservation opportunities and constraints;
- environmental appropriateness.

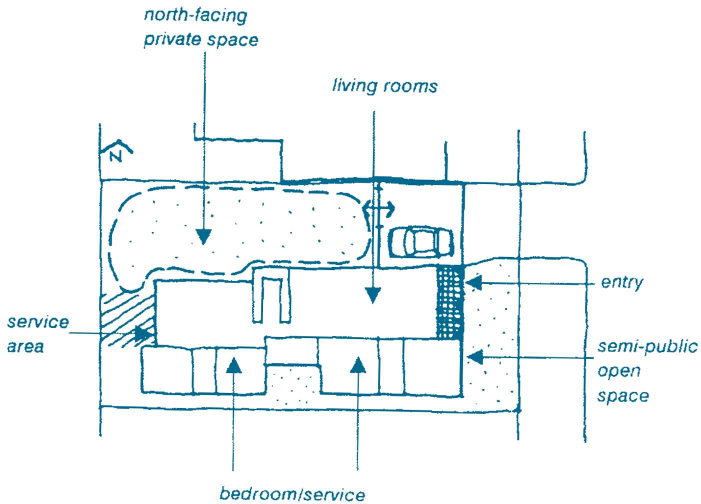



**Figure 1: Site planning for a single dwelling site (E-W in a temperate climate)**

## Site Development Plan

A site development plan is the primary means of illustrating layout and design. Where there are communal facilities of body corporate responsibilities, the plan should include a statement of management objectives for those items. For example, the statement might indicate the extent to which the body corporate is intended to control, and be responsible for, landscape maintenance, or the extent to which private responsibility for landscape maintenance is proposed. Implementation by the body corporate may be a condition of planning approval.

For large-scale urban housing developments, the site development plan may initially be conceptually defined, with full details being provided in stages.

For smaller-scale developments, the level of detail required at the planning approval stage will depend on local implementation requirements.

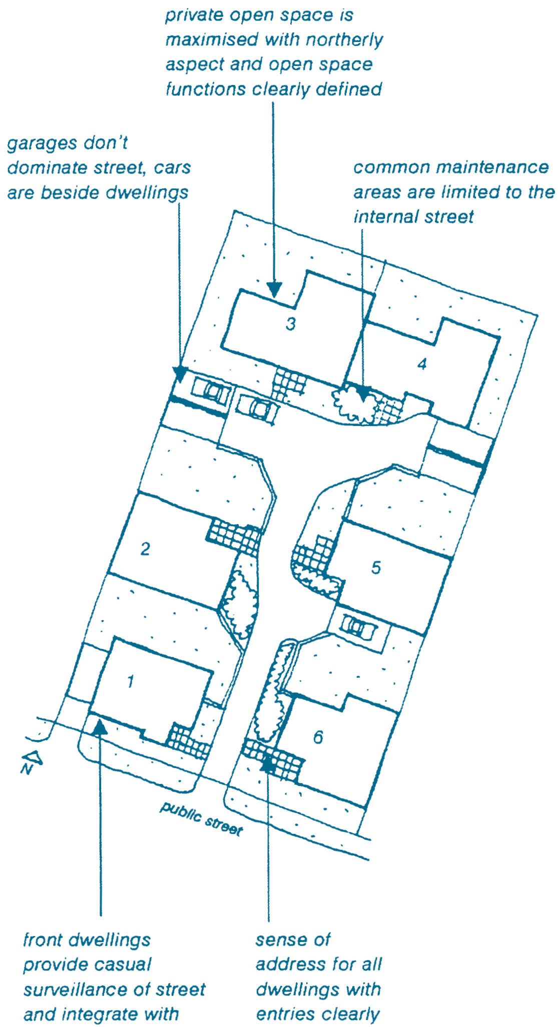



**Figure 2: Consider image of development, amentity and ongoing management at the site layout stage.**

# Element 5.1
# Site Planning

## Intent

To achieve a coherent site layout that provides a pleasant, attractive, manageable, resource-effecient and sustainable living environment.

## Performance Criteria

The intent may be achieved where:

**Site layout**

**P1** The site layout integrates with the surrounding environment through:

- adequate pedestrian, cycle and vehicle links to street and open space networks;
- buildings facing streets and public open spaces;
- building, streetscape and landscape design relating to the site topography and to the surrounding neighbourhood character or desired future urban character;

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria:

**Site Layout**

**A1** Submission of a Site Development Plan which demonstrates how the Performance Criteria are met, showing:

- adequate pedestrian, cycle and vehicle access is provided to connect into the neighbourhood;
- existing natural features (if any) have been maintained or enhanced where possible;
- natural watercourses are retained and buffered by endemic vegetation;

## Performance Criteria (continued)

- the preservation or creation of habitat corridors and the protection of natural creek lines.

## Acceptable Solutions (continued)

- habitat areas on-site or adjacent to it are enhanced by linking corridors of endemic vegetation;
- visual links to views or features of significance are created or maintained;
- living areas and private open space have a northerly aspect wherever possible;
- streets and driveways are orientated to maximise solar access for the dwellings wherever possible, and/or are orientated to facilitate cross-ventilation of cooling breezes through a site.
- buildings face streets and public open space with their entries visible;
- building, streetscape and landscape design incorporates local landscape and building themes;
- street verges and communal open space can be cost-effectively maintained;
- the principal areas of ground-level private open space are away from public street frontage, except where such spaces satisfies the requirements of Element 5.7: Private Open Space.

## Performance Criteria (continued)

**P2** The site layout takes into account on-site features, topography, views, landmarks, vegetation, structures, drainage, services, access, orientation and microclimate considerations and, where appropriate, incorporates existing buildings and vegetation, retaining any item or natural site feature of identified conservation or heritage value.

**P3** The site layout takes into account attractive neighbouring sites and streetscape conditions and maintains a reasonable level of amenity.

**P4** The site layout enhances personal safety and minimises potential for crime, vandalism, and fear.

**P5** Dwellings are sited and designed to minimise fossil fuel use and maximise solar access to living areas, and breeze access generally to all parts of the house in the hot–humid tropics.

**P6** Where the layout provides open spaces, these contribute to the legibility and character of the development, provide for a range of uses and activities, are cost-effective to maintain, and contribute, wherever possible, to stormwater management.

**P7** In areas exposed to significant levels of off-site noise, the site layout and building forms assist in minimising noise entry.

## Acceptable Solutions (continued)

# Element 5.2
Lot Layout

## Need

Lot design or arrangement is an integral part of the layout of a residential area. Since land for residential development is a scarce resource, design guidance is needed to ensure its best use.

There is a good range of material available on innovative approaches to lot design, which link the creation of lots with house design and no longer treat lot creation as simply land subdivision.

AMCORD includes PND 12: Integrated Housing and PND 13: Lot Layout and House Siting, as further reference sources.

## Design Synthesis

Perceptive and effective site planning is required to achieve a pleasant living environment. As outlined in Section 2.4: Development Context and Site Analysis, successful site planning stems from thorough analysis of the site and its context. The arrangement of future buildings and spaces will also have an important influence upon the quality of the residential environment and should be considered as part of lot design.

Design issues to be considered include:

- appropriateness of built form and landscape in relation to the site context, topography and the desired urban character (see Element 4.1: Streetscape and Landscape and Element 4.2: Building Appearance and Neighbourhood Character) and the need to retain special qualities or features such as trees and views;
- cost-effective servicing and utilisation of the available land;
- arrangement of lots and hence buildings, especially their situation in relation to solar access, to streets and open spaces;
- the role of streets and accessways/paths in providing connections within and beyond the site (see all Elements in 1. Neighbourhood Planning and Movement Networks);
- location, function and control of open space (see Element 1.6: Public Open Space and Element 5.8: Communal Open Space and Landscaping);

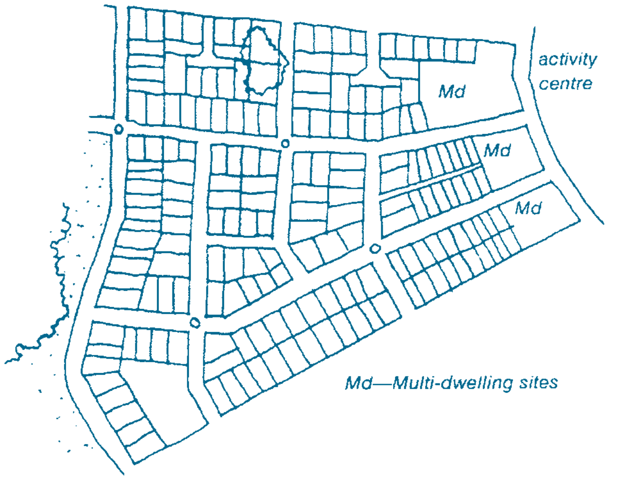



**Figure 1: Example of lot size mix from less than 300 m² to 650 m² and lot types ranging from multi-dwelling sites, dual occupancies, terrace lots and detached housing of various sizes.**

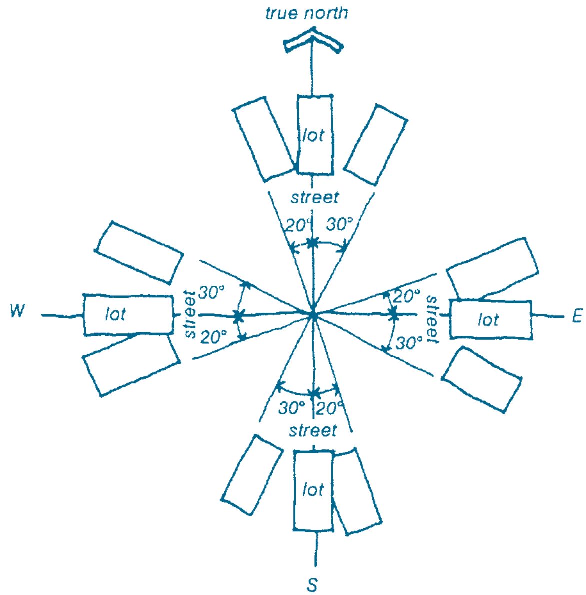



**Figure 2: Orientated lots for solar access in temperate and hot-arid climates.**

- the qualities of private open spaces (see Element 5.7: Private Open Space);
- personal privacy and security (see Element 5.5: Privacy and Element 5.9: Safety and Security);
- parking arrangements (see Element 2.1: Street Design and On-Street Carparking and Element 5.6: On-Site Carparking and Access);
- energy efficiency in subdivision layout, building design and siting (see Element 5.10: Design for Climate);
- heritage and conservation opportunities.

## Allotment Diversity

As a result of changing demographics and make-up of Australian households, and also as a result of the need to create affordable housing options, a diversity of allotment and dwelling sizes should be provided in new housing developments. Houses on separate allotments are being created in Australian towns and cities in the range of 100 m²–600 m², and are appealing to a wide range of household types (eg singles, adults with and without children, elderly people) and income groups.

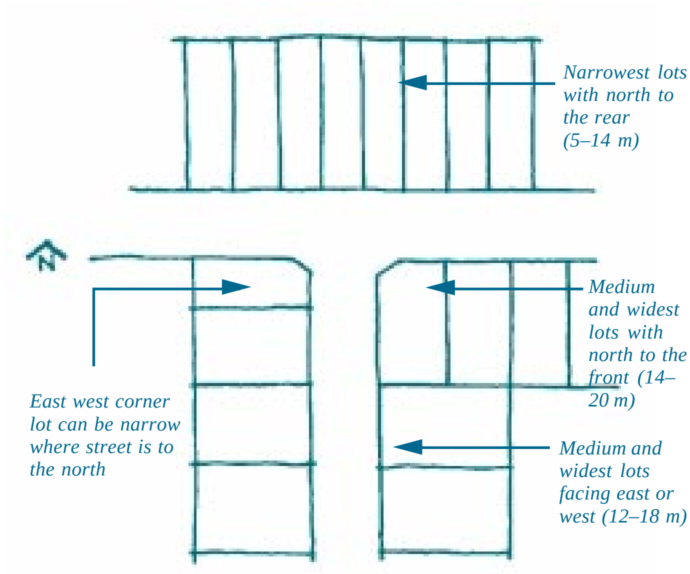



**Figure 3: Lot width varied to improve solar access.**

## Lot Orientation for Energy Conservation

Energy conservation and access to sunlight are important, and are strongly correlated with the orientation of the dwelling and the location of the living areas, which may in turn be influenced by the lot orientation.

The number of lots with orientations that will promote good solar access should be maximised. This should result in narrow lots on the north side of east–west streets, with wider lots located with their long axis east–west or north–south on the south side of an east–west street. This is further discussed in PND 13: Lot Layout and House Siting.

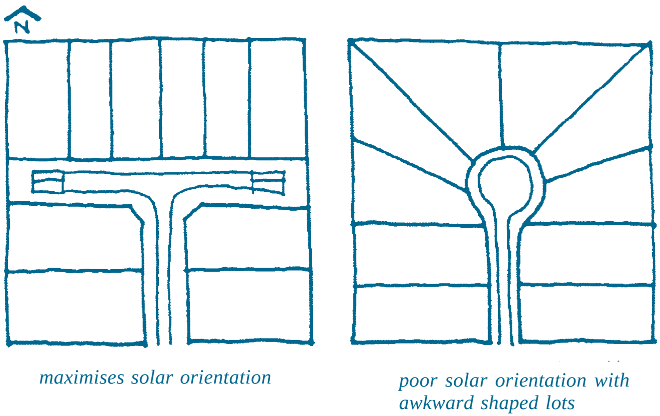



**Figure 4: Solar orientation at head of cul-de-sac.**

## Responding to the Site Characteristics

Lot size and layout may need to respond to the physical characteristics of an area such as slope (e.g. small lots are more difficult to develop on steep slopes),existence of significant vegetation (e.g. large trees retained on larger lots or in rear or front gardens), or proximity to desirable features or views (e.g. smaller lots to maximise number of households benefiting).

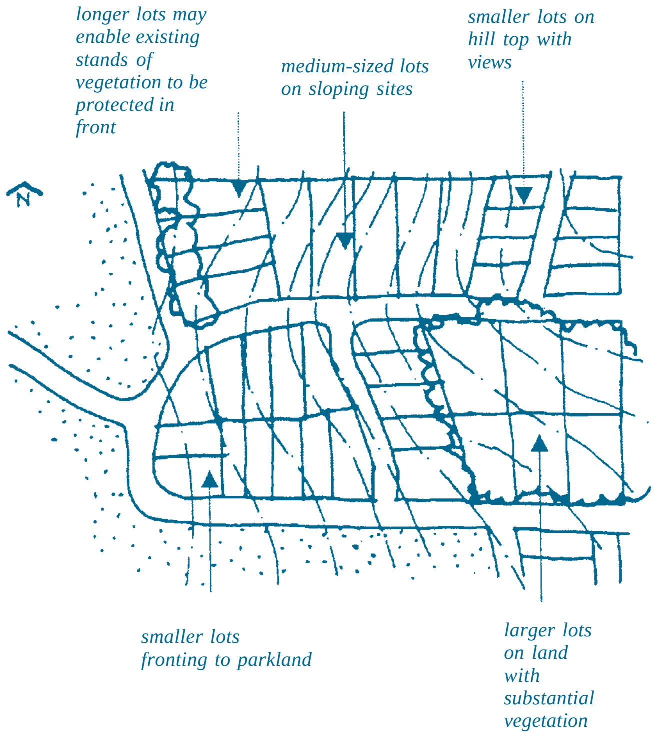



**Figure 5: Lot size variation to suite site characteristics.**

# Element 5.2
# Lot Layout

## Intent

To provide a range and mix of lot sizes to suit a variety of dwelling and household types, with areas and dimensions that meet user requirements; and to provide lots that are oriented where practicable to enable microclimate management, including the application of energy conservation principles.

## Performance Criteria

The intent may be achieved where:

**Size**

**P1** Lots have the appropriate area and dimensions for the siting and construction of a dwelling and ancillary outbuildings, the provision of private outdoor space, convenient vehicle access and parking.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria:

**Size**

*(in partial satisfaction of P1)*

**A1.1** Lots with an area of greater than 450 m$^2$ are capable of containing a rectangle measuring 10 m by 15 m (or 9 m by 15 m where a boundary wall is nominated as part of the building envelope).

AND

**A1.2** Lots with an area between 300 square metres and 450 m$^2$ capable of containing a rectangle measuring 9 m by 15 m and where the long axis of the lot is within 30° E and 20° W of

## Performance Criteria (continued)

**P2** Lot size and dimensions take into account the slope of the land and the desirability of minimising earthworks/retaining walls associated with dwelling construction.

**P3** Lot size and dimensions enable dwellings to be sited to:

- protect natural or cultural features;
- acknowledge site constraints including soil erosion and bushfire risk;
- retain special features such as trees and views.

**P4** Lot sizes meet the projected requirements of people with different housing needs, and provide housing diversity and choice.

**User requirements**

**P5** Lot frontages are orientated to streets and open spaces so that personal and property security,

## Acceptable Solutions (continued)

true north.

AND

**A1.3** Lots with an area less than 300 m$^2$ are square or rectilinear in shape.

**A2** Lots with an area of 350 m$^2$ or less are located on land with a slope of less than 1 in 10 across the road frontage of the lot.

## Performance Criteria (continued)

deterrence of crime and vandalism, and surveillance of footpaths and public open space are facilitated.

### Orientation and energy

**P6** Lots are orientated to facilitate the siting of dwellings to take advantage of microclimatic benefits, and have dimensions to allow adequate on-site solar access and access to breezes (especially in the hot–humid tropics), taking into account likely dwelling size and the relationship of each lot to the street.

## Acceptable Solutions (continued)

### Orientation and energy

**A6** 75% of lots in new residential areas have a 3-star rating or higher in accordance with the National House Energy Rating Scheme (or State scheme if appropriate).

# Element 5.3
Street Setbacks

## Role

Street setbacks are perceived primarily as a means of protecting neighbour amenity and assisting in the establishment of streetscape character. They may provide:

- a landscape and visual setting for the building;
- space for carparking;
- a noise attenuation zone (in which barriers can be constructed);
- privacy from the street and facing buildings;
- a buffer to street activity;
- an area that allows daylight and sunlight to reach the building;
- a territorial threshold between the public or communal street and the private home;
- continuity with the existing streetscape.

Efficient site utilisation is critical in new housing projects, where the demands for available space are many. A requirement for unduly large front setbacks can limit site planning options and have a detrimental impact upon the quality of other spaces. Conversely, small setbacks can impact negatively on attractive streetscapes, particularly in established areas. It is possible to design attractive and functional streetscapes with minimal or no setbacks; however, this requires a high degree of skill. In such instances, Performance Criteria are offered for designers to demonstrate that such a proposal is satisfactory.

## Public and Communal Street Setbacks

Differentiation is made between setbacks for public streetscapes and those for communal streetscapes. Communal streetscape setbacks (internal to a site containing more than two dwellings) may be related to the carriageway edge rather than the communal street boundary, which is often not defined. Setbacks to public streets, on the other hand, are generally measured from the street reservation boundary. Both public and communal street setbacks are

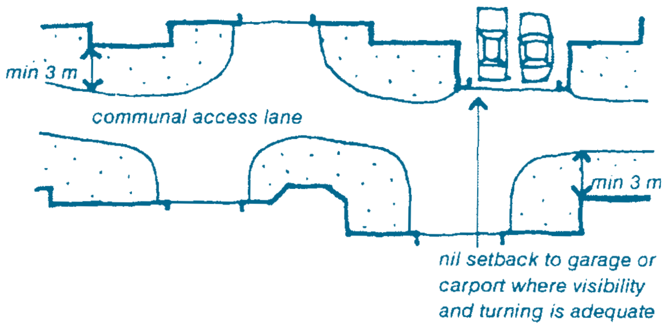



**Figure 1: For communal streets, setbacks are measured from the carriageway edge to the building.**

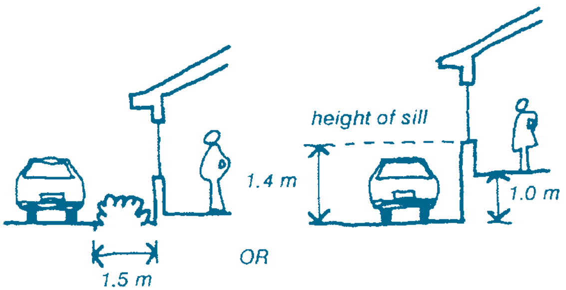



**Figure 2: Location of accessways adjacent to habitable rooms.**

also related to privacy. Element 5.5: Privacy addresses building separations to achieve privacy.

## Setbacks in Context

Setbacks should relate to the traffic function of the street and to setbacks of adjacent development.

In established areas, the objective is to blend new development into the public streetscape. Adopting similar setbacks to those already existing helps to integrate the new development, and is an important design requirement in urban conservation areas and areas with significant streetscapes and a defined urban character.

Where setbacks of adjacent buildings are approximately the same, it may be better in terms of the streetscape to introduce a new building at the same setback as one of the adjacent buildings, rather than introduce a third setback distance. Where setbacks of adjacent buildings differ significantly, it is usually better to average the setbacks of the two adjacent buildings.

In many established areas close to urban centres, existing setbacks may be less than 3

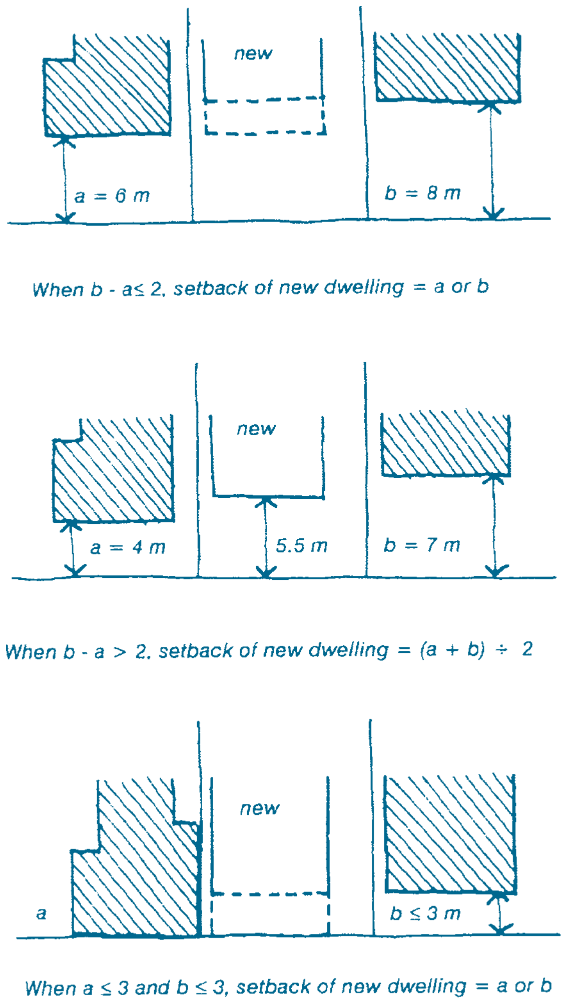



**Figure 3: Front setbacks in established areas determined by the relative variation in the setbacks of adjacent development (refer Acceptable Solutions A1.2 and A1.3).**

m (or in fact, built to the front property boundary). In these cases infill development is best located at the same setback as one or the other of the adjoining dwellings.

## Carports and Garages

Attitudes to carports and garages fronting the street vary widely. Housing on small lots generally provides a narrow street frontage per dwelling, and carports and garages have the potential to dominate the street's appearance. This in turn may reduce opportunities for surveillance of the street from dwellings or restrict views of the buildings from the street. Importantly, opportunities for social interaction can also be diminished because of garaging. Where possible, designers are encouraged to recess covered parking behind the building frontage or in such a way that it is not prominent when viewed from the street.

Where additional on-site uncovered parking of resident or visitor vehicles is considered an advantage, or when two on-site resident spaces are required but only one garage/carport is to be provided, garages and carports should be set back from front property boundaries to provide additional tandem vehicle storage in the driveway (eg 5.5 m).

In situations where garages are provided on the secondary street frontage, setbacks for double garages should respect the setback of any existing adjacent development facing the secondary street, and should generally not be located forward of their associated main dwelling.

# Element 5.3
# Street Setbacks

## Intent

To set back buildings and garages/carports from the street to provide adequate space for landscape or open space, visual and acoustic privacy and vehicle parking, while assisting in establishing an attractive streetscape.

## Performance Criteria

The intent may be achieved where:

**P1** The setback of buildings contributes to existing or proposed streetscape character, assists the integration of new development into the public streetscape, makes efficient use of the site and provides amenity for residents.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**A1.1** In areas being urbanised or newly-developed areas, setbacks (inclusive of any verandah, porch etc) from the street boundary should be as follows:

**Table 1: Street setbacks in new areas[1]**

| Street type | Minimum frontage setback (m) | Minimum side setback to corner street (m) |
|---|---|---|
| Access Place and Access Street | 3.0 | 1.0 |
| Collector Street | 4.0 | 2.0 |

[1]The setback may be averaged, providing no part of the building is set back less than 2 m.

## Performance Criteria (continued)

## Acceptable Solutions (continued)

OR

**A1.2** In established areas where the setback of an adjacent building is greater than 3 m, infill development is to be set back:

- the same distance as one or the other of the adjoining buildings, provided the difference between the setbacks of the two adjoining buildings is less than or equal to 2 m; or
- the average of the setbacks of the adjoining dwellings, if the difference between the setbacks of the adjoining buildings is greater than 2 m.

**A1.3** In established areas where the setbacks of adjacent buildings are 0–3 m, infill development is to be set back the same distance as one or the other of the adjoining dwellings.

**A1.4** Setback of buildings in significant urban conservation and heritage streetscapes shall match that of adjacent development unless an alternative policy has been developed for that street.

OR

**A1.5** Walls of dwellings incorporating a habitable room to be set back a minimum of 1.5 m from shared driveways, communal streets and internal carparks. This setback may be

## Performance Criteria (continued)

**P2** The location of carports and garages does not diminish the attractiveness of the streetscape, does not dominate views of the dwelling from the street and integrates with features of associated dwellings.

## Acceptable Solutions (continued)

reduced to 1.0 m when there is an intervening fence 1.5 m or greater, or where the window sill is a minimum of 1.4 m above the driveway.

**A2.1** Single garages/carports associated with dwellings for which more than one on-site parking space is required are to be set back from the public street frontage:

- a minimum of 5.5 m;
- a minimum of 0.5 m from the main face of the associated dwelling, or in line with the main face of the associated dwelling, if the dwelling incorporates a verandah, portico etc projecting forward of the main face.

OR

A2.2

Single garages/carports are set back from the communal street frontage and double garages/carports are set back from the public or communal street frontage:“

- a minimum of 0.5 m from the main face of the associated dwelling; or
- in line with the main face of the associated dwelling if the dwelling incorporates a verandah, portico etc projecting forward of the main face.

| **Performance Criteria (continued)** | **Acceptable Solutions (continued)** |
|---|---|
| | AND |
| | **A2.3** Single garages/carports associated with dwellings for which more than one on-site parking space is required are to be set back from a corner or secondary street frontage a minimum of 5.5 m. |
| | OR |
| | **A2.4** Double garages/carports are set back from a corner or secondary street frontage to not less than half the setback to the street of any existing adjacent dwelling that faces the secondary street, provided that the setback is not less than that of the associated dwelling. |

# Element 5.4
Building Envelope and Siting

## Need

The siting and scale of a building–its height and the setbacks from its site boundaries–set the dominant character of any development. This Element enables some certainty of outcome in relation to the scale of new development and the distribution of its bulk across a site, and the protection of adequate daylight and amenity sunlight.

## Impact at the Site Interface

The effect of new development on adjoining residential areas is most critical at the site interface. There is an expectation in most areas that any attractive prevailing neighbourhood character will be respected. Concerns of neighbours in relation to building appearance and visual and acoustic privacy are addressed in Elements 4.2 and 5.5.

## Control Methods

The following are the main recommended devices to control these aspects of development:

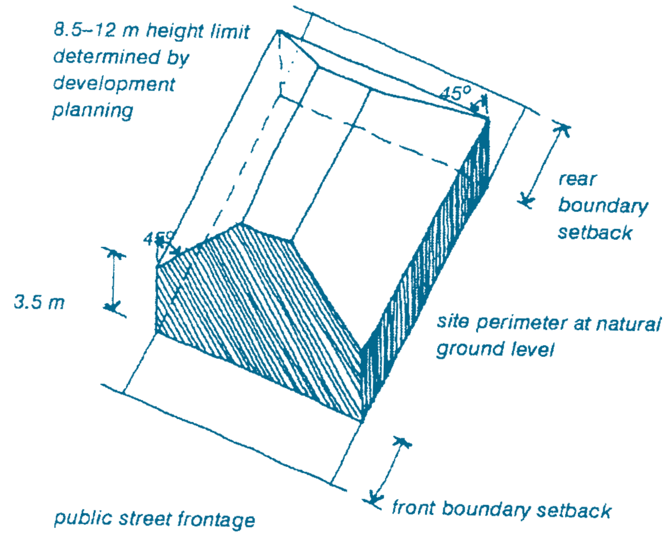



**Figure 1: The building envelope extends from the side perimeters of a site. The building height to the public street frontage is determined by streetscape criteria with setbacks from rear boundaries determined by neighbourhood character.**

- creating a building envelope over the site that limits the setback to height relationship in respect to all boundaries;
- limiting the height of walls built to a boundary to an average of 3.0 m, with length related to adjoining property boundaries and desired neighbourhood character:

- increasing setbacks opposite existing habitable room windows to protect daylight;
- siting to maintain winter sun to private open space.

## Building Envelope

The building envelope in this Element increases side and rear setbacks as the building height increases. This assists in the integration of new housing and helps to minimise the impact of building bulk on neighbours. It also partially addresses access to daylight and sunlight (Figure 1 and 2).

Building height at the public street frontage is determined by streetscape criteria specified in Element 4.1. An 8.5– 12 m height limit is applied over this envelope for two or three storey building respectively (reference should be made to Elements 4.1 and 4.2 when determining preferred overall height limits). Planning authorities may find it appropriate to determine this height based on the desired built form character of certain precincts within their municipalities. Where topography varies significantly across a site (particularly a larger site) it may be appropriate for the maximum height to be fixed.

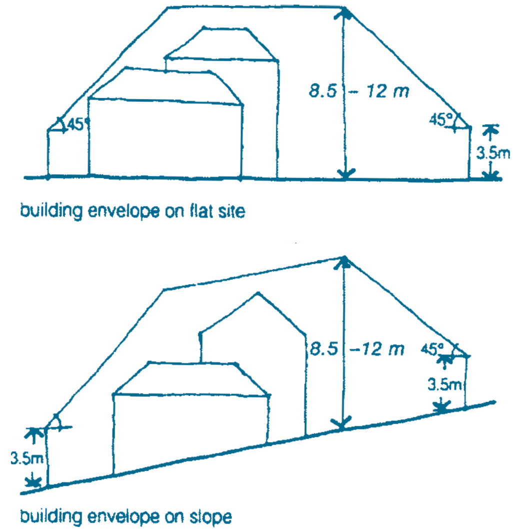



**Figure 2: The building envelope adjusted for sloping sites**

## Storeys

This Element does not define a floor built within the roof space or basements wholly below ground as a storey. This technique provides additional floor area (and usable living space), without adding significantly to the building bulk.

## Slope

Designers are encouraged to allow buildings to follow the slope contours and to minimise the foundation and underfloor level wall height. This minimises unusable underfloor space and contributes to the cost-effectiveness of building, whilst minimising disturbance to the land form.

## Building To The Boundary

This is an important technique for improving site utilisation and offering high levels of privacy to adjacent residents. Building to the boundary removes the difficult to use spaces between the boundary fence and the building, and can also provide more usable open space in other areas on the lot. A higher level of privacy can be achieved for neighbours abutting the boundary wall, and internal privacy of the dwelling is also improved.

However, building to the boundary in established areas not characterised by this building form requires careful consideration and should preferably take into account the views of adjoining residents. Determining the extent of building to boundaries in established areas should be undertaken during the development planning process.

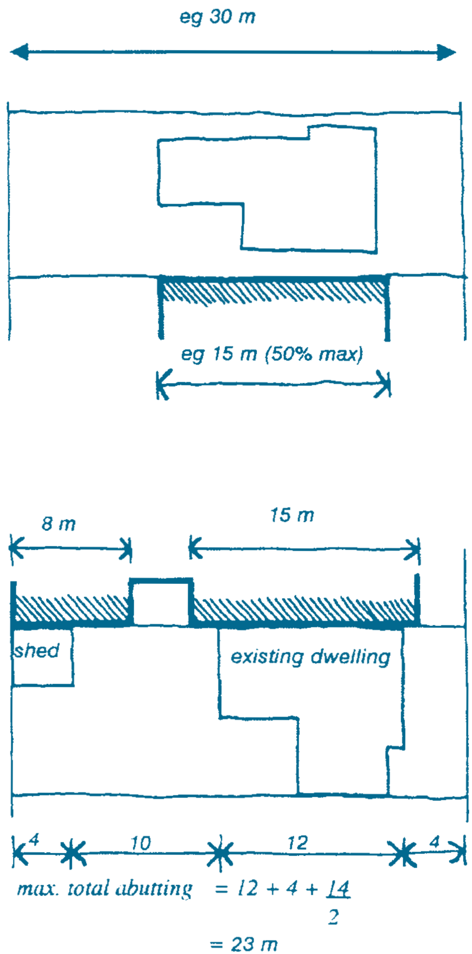



**Figure 3: Length of building on boundary.**

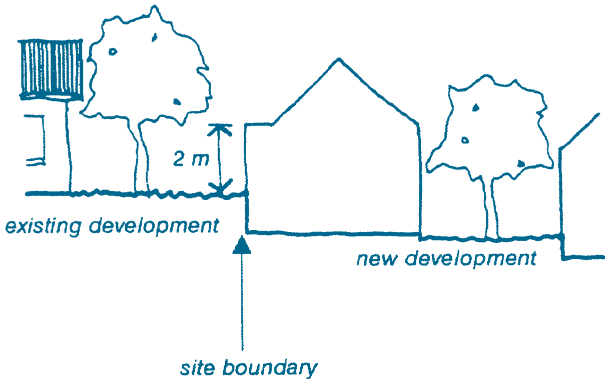



**Figure 4: Boundary walls on sloping sites.**

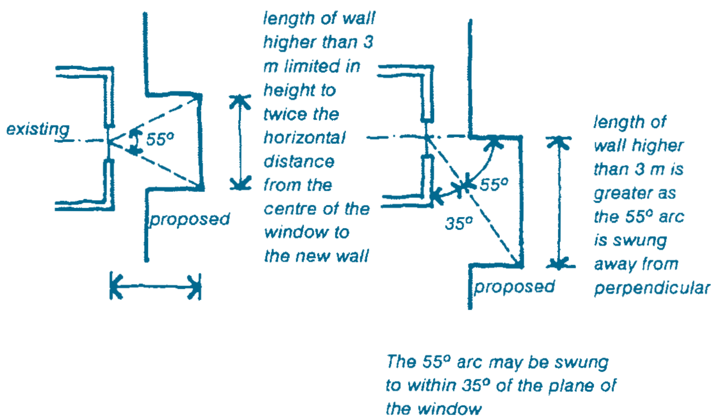



**Figure 5: Daylight to existing windows in temperate climates.**

## Daylight To Habitable Rooms

Daylight standards are difficult to set as expectations and needs vary widely. The Building Code of Australia (BCA) requires that habitable room windows receive minimum levels of daylight based on prescribed health, amenity and safety standards. The levels of available daylight in this Element are based on amenity and the ability to carry out activities inside habitable rooms of dwellings without the constant need for artificial light. They are different to the BCA provisions.

## Sunlight To Private Open Space

This Element focuses on sunlight for amenity—the energy benefits of sunlight for rooms are addressed in Element 5.10.

In temperate and cooler climates a substantial proportion of dwellings should be designed to have good access to sunlight to private open space in the cooler months. It is acknowledged that there would be design difficulties if all housing were required to meet this criterion.

## Overshadowing Protection

For neighbouring dwellings, which may already receive quite widely varying levels of sunlight to private open space at ground level, the intention is to ensure some winter sunlight is retained. Designers should aim to minimise the degree of overshadowing by using such measures as changes in wall setbacks and height, roof variation and buildings forms that incorporate attic rooms.

In the hot–humid tropics, overshadowing is not as significant. However, blocking prevailing breezes to neighbouring houses is to be avoided.

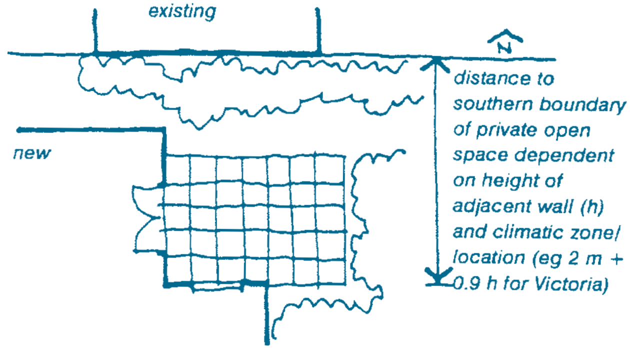



**Figure 6: Width of private open space dependent on height of walls to north to provide for adequate solar access.**

# Element 5.4
# Building Envelope and Siting

## Intent

To enable flexibility in building siting while protecting reasonable neighbour amenity expectations, maintaining appropriate residential character and visual bulk, and providing adequate daylight to dwellings and sunlight to private open space.

## Performance Criteria

### Building Envelope Setbacks

**P1** Setbacks are progressively increased as wall height increases to reduce bulk and overshadowing while maintaining adequate daylight and sunlight.

**P2** Building siting and height is related to land form, with minimal cut and fill.

**P3** Building bulk is generally distributed to reduce impact on neighbours and on the public street.

**P4** Building heights are similar to those in the public streetscape, with higher buildings sited so as to minimise adverse impacts on neighbours and on the streetscape.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

### Building Envelope and Setbacks

*(in partial satisfaction of P1–P5)*

**A1.1** Buildings are sited within a building envelope determined by the following method (see Figure 1) and in accordance with A7.1–A7.6. Planes are projected at 45° from a height of 3.5 m above natural ground level at the side boundaries and at 3 m in from the rear boundary, to a maximum height of 8.5 m for two-storey and 12 m for three/four-storey development (height to be determined in approved development plan). Where the site abuts a public street, the envelope has a street boundary setback determined by

## Performance Criteria (continued)

**P5** Building forms enable a sharing of views with neighbours.

**P6** Building to the boundary maximises privacy for neighbouring dwellings and their private open space.

**P7** Boundary walls are limited in length and height, to minimise the impact on neighbours.

## Acceptable Solutions (continued)

streetscape criteria in Element 4.1 and setback criteria in Element 5.3.

AND

**A1.2** A side boundary setback of 1 m minimum where the wall is not built to the boundary.

AND

**A1.3** Provided the distance to the boundary is not less than 1 m, fascias, gutters, downpipes, eaves up to 0.6 m, masonry chimneys, flues, pipes, domestic fuel tanks, cooling or heating appliances or other services may encroach beyond the building envelope. The following may encroach without restriction:

- pergolas, screens or sunblinds, light fittings, electricity or gas meters, aerials;
- unroofed terraces, landings, steps or ramps not more than 1 m in height.

**A7.1** Walls built to side boundaries have:

- an average height of 3.0 m
- a maximum height of 3.5 m, unless they;

## Performance Criteria (continued)

## Acceptable Solutions (continued)

- abut a higher existing or simultaneously constructed wall;
- are in accord with an approved building envelope plan;
- abut a side or rear lane (in which case the maximum height shall be 5.5 m).

AND

**A7.2** Where there are no existing boundary walls, the maximum boundary wall length is determined in accordance with a relevant development plan for the area or with an approved building envelope plan linked to a plan of subdivision.

OR

**A7.3** The length of new boundary walls matches the length of existing boundary walls.

OR

**A7.4** In areas where it has been determined to provide for an increase in development built to boundaries, the length of new boundary walls is limited to (refer Figure 3):

- 50% of the length of the adjacent side boundary;

## Performance Criteria (continued)

### Daylight and Sunlight

**P8** Buildings are sited and designed to provide adequate daylight to habitable rooms, and in temperate and cooler climates, winter sunlight to ground level private open space of new and neighbouring dwellings.

## Acceptable Solutions (continued)

OR

- the length of existing boundary walls plus 50% of the length of the remaining boundary.

OR

**A7.5** In areas characterised by buildings with boundary walls extending for the full length of adjacent side street or rear lane boundaries, new boundary walls can extend for the full length of adjacent side street or rear lane boundaries .

OR

### Daylight and Sunlight

**A7.6** Where slope or retaining walls or fences would result in the effective height of a boundary wall being less than 2 m on the adjacent property boundary, the new boundary wall can extend the full length of the side or rear boundary less any front boundary setback distance.

**A8.1** Habitable rooms in dwellings have clear windows:

- totalling in area at least 10% of the room's floor area;

**Performance Criteria (continued)**

**Acceptable Solutions (continued)**

- located to face a light court (of minimum area 3 m2 and dimension l m), other outdoor space open to the sky, open verandah or open carport;
- not less than a horizontal distance of 1 m clear to sky (or 1 m between eaves) from any boundary or other building measured perpendicular to the face of the window.

AND

**A8.2** The height of walls higher than 3 m2 opposite existing walls containing habitable windows is limited to twice the horizontal distance between the two walls for a distance defined by a 55° arc from the centre of the existing window (refer Figure 5).

AND

**A8.3** Where the existing window is above ground level, the height restriction is calculated from the floor level of the room containing the window.

AND

**A8.4** In temperate and cool-temperate climate zones, sunlight to at least 50% (or 35 m2 with minimum dimension 2.5 m, whichever is the lesser area) of the principal area of ground level private open space of adjacent

**Performance Criteria (continued)**

**Acceptable Solutions (continued)**

properties is not reduced to less than two hours between 9 a.m. and 3 p.m. on June 21. Where existing overshadowing by buildings and fences is greater than this, sunlight is not further reduced by more than 20%.

# Element 5.5
Privacy

## Need

There is a need to give significant consideration to privacy measures (both visual and acoustic), as adequate privacy has an important bearing on residents' satisfaction with a dwelling and on the attitudes of neighbours to a proposed development. If housing design provides inadequate privacy, residents may have to adapt by changing their living styles, modifying their behaviour or introducing visual screening. Such adjustments are not always easy and warrant making an effort to provide for privacy at the design stage.

Planning for privacy begins at the site planning stage, when the privacy needs of both residents and neighbours influence the location of dwellings and the placement of windows and private open space. It continues into the detailed building design stage with selection of materials and construction techniques to maximise privacy levels.

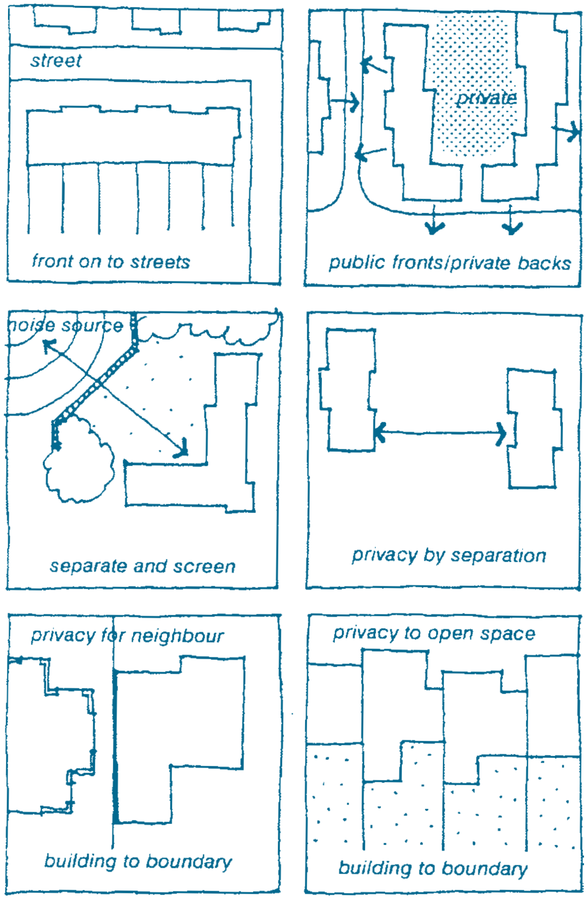



**Figure 1: Privacy is a key consideration at the site planning and layout stage.**

## Protection Between Neighbours

Attitudes to privacy are, to some extent, affected by cultural factors and personal preferences. However, there are some shared perceptions of a range of privacy boundaries that should be protected. It is recognised that complete protection of privacy in closely developed areas is not always possible. Also, some people are happy to trade-off a high level of privacy for increased opportunities for the social contact associated with higher-density living.

Standards of privacy therefore need to balance the need for more intensive housing with the attainment of a reasonable level of privacy. This approach places an onus on adjacent residents to take supplementary action to secure their required level of privacy rather than requiring a new development to provide total protection of a neighbour's privacy.

A greater emphasis is placed on maintaining privacy between and in living areas and private open space than for bedrooms. The hours of occupancy of bedrooms and the ability to screen with curtains offset priority for privacy.

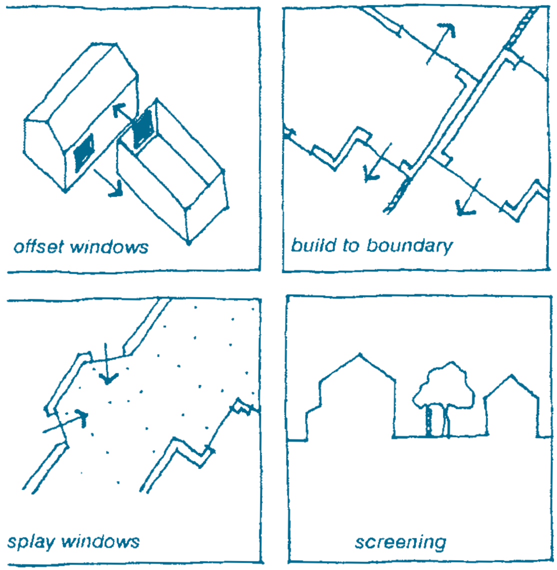



**Figure 1: Locating windows to limit overlooking.**

## Visual Privacy

Visual privacy can be achieved by:

- layout that avoids overlooking
- screening
- separation or remoteness.

Many overlooking problems can be avoided at the design stage. Techniques such as directing the outlook from habitable rooms towards either the street or private open space, rather than towards adjacent dwellings or neighbours' private open space, help achieve a more neighbourly and private layout.

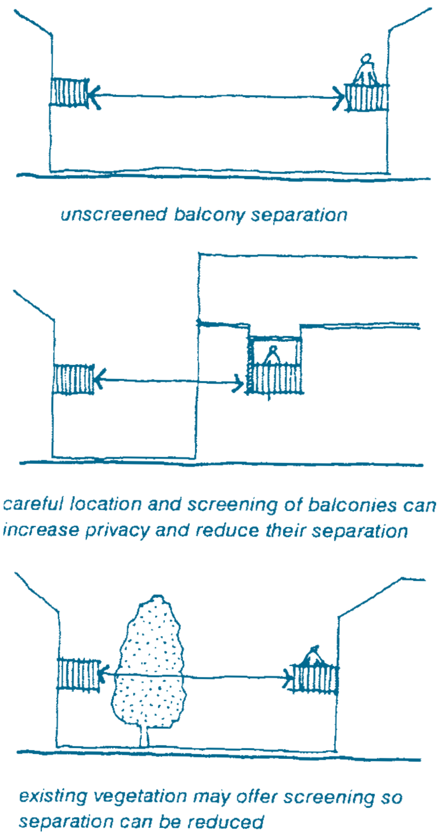



**Figure 3: Screening can reduce the need for separation and improve the level of privacy.**

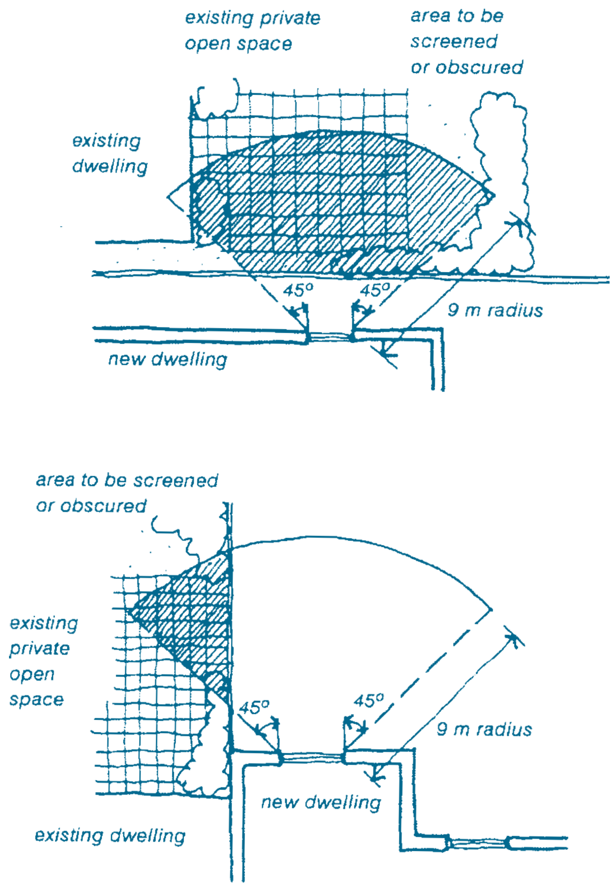



**Figure 4: Screening views to adjacent private open spaces.**

Close, intimate views can often be effectively screened although, for above-ground viewpoints, fixed screening can be difficult. Residents are also able to exercise some control over the extent of overlooking when indoors, through their choice of such window screening as curtains or blinds.

Where privacy is achieved through remoteness rather than screening, there is no exact distance at which it can be assured. A judgement must be made about issues such as the intimacy and frequency of the activities being overlooked, the likely frequency and ease of overlooking, other distracting views, the obliqueness of the line of view, and cultural expectations.

Privacy is particularly important for infill developments, where the protection of privacy of existing residents is critical. Within multi-unit developments privacy levels may be reduced to some extent, given that prospective purchasers will be able to assess whether the development meets their privacy expectations. Careful attention must be given to the combination of design techniques used to protect overlooking from upper-level windows, due to the need to create habitable rooms with reasonable levels of amenity. Consideration also needs to be given to

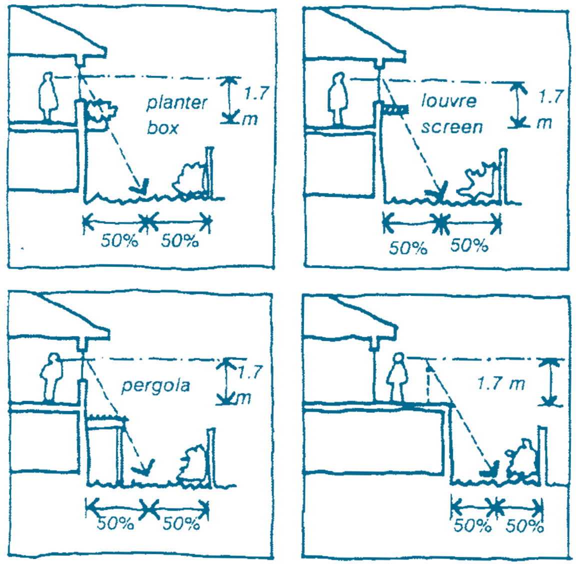


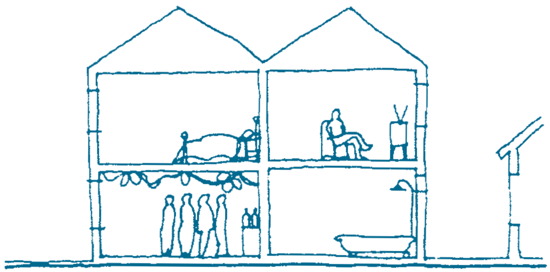

**Figure 5: Techniques for providing privacy to a lower dwelling's private open space.**

the longevity, maintenance requirements and aesthetic treatment of screens and windows.

## Acoustic Privacy

While visual privacy can often be achieved at short distances, acoustic privacy may not be as easily assured. Noise can be transmitted both through air and structures, and is important in the design of attached housing.

Making any major building changes to achieve acoustic privacy is different once construction is complete. This attention should be given at the design stage to siting, building and room layout, window and wall location and design, and the selection of construction materials and methods.



*Acoustic privacy begins with site and dwelling layout and is reinforced in building design*

**Figure 6: Acoustic privacy by design.**

For example, the building layout should locate garages and living rooms away from the bedrooms of adjacent dwellings. Where traffic noise is a major concern, the exposure of habitable rooms may be minimised to avoid the need for expensive forms of acoustic treatment such as double glazing of windows.

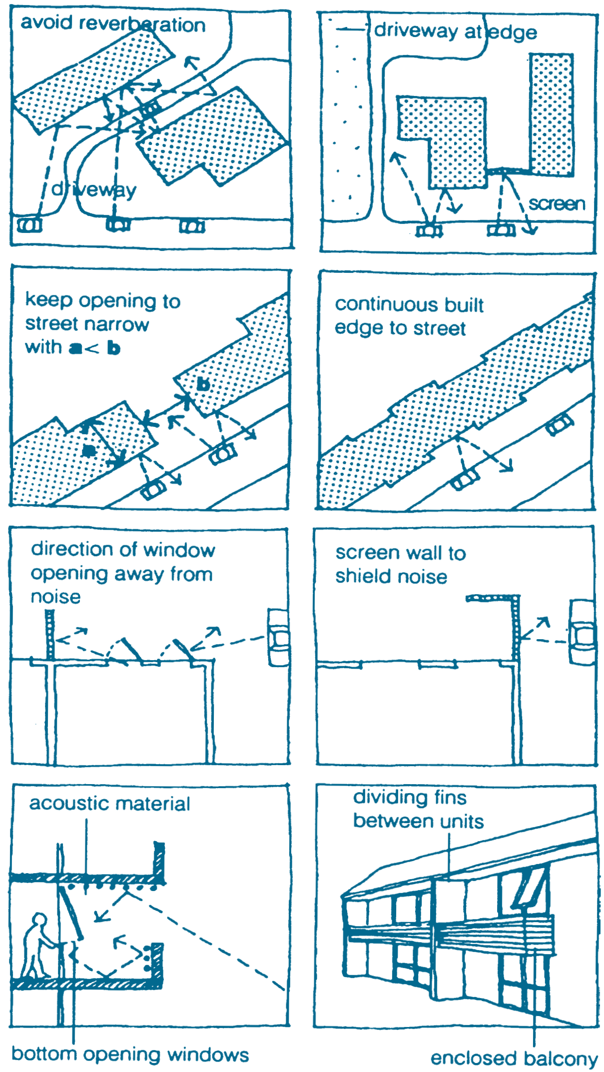



**Figure 7: Some ideas for achieving acoustic privacy.**

Based on the types of complaints received by councils and State Government agencies, care should be taken in the design, location and screening of common noise sources (eg air conditioning units, swimming pool pumps).The impact of traffic noise and railway noise and vibration on building design and layout is specifically dealt with in Element 5.13: Housing on Traffic Routes. Noise impact associated with aircraft, adjacent industrial activities and sporting venues needs detailed assessment at the development planning stage.

# Element 5.5
# Privacy

## Intent

To site and design buildings to meet projected user requirements for visual and acoustic privacy, and to protect the visual and acoustic privacy of nearby residents in their dwellings and private open space.

## Performance Criteria

The intent may be achieved where:

**P1** The privacy of buildings and outdoor spaces is protected taking into account projected community expectations.

### Visual privacy

**P2** Direct overlooking of main internal living areas and private open spaces of other dwellings is minimised by building layout, location and design of windows and balconies, screening devices and landscape, or remoteness. Effective location of windows and balconies to avoid overlooking is preferred to the use of screening devices, high sills or obscured glass. Where these are used, they should be integrated with the building design and have minimal negative effect on residents' or neighbours' amenity.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

### Visual privacy

**A2.1** Habitable room windows with a direct outlook to the habitable room windows in an adjacent dwelling within 9 m:

- are offset from the edge of one window to the edge of the other by a distance sufficient to limit views into the adjacent windows;
- have sill heights of 1.7 m above floor level; or
- have fixed obscure glazing in any part of the window below 1.7 m above floor level.

## Performance Criteria (continued)

## Acceptable Solutions (continued)

AND

**A2.2** Outlook from windows, balconies, stairs, landings, terraces and decks or other private, communal or public areas within a development is obscured or screened where a direct view is available into the private open space of an existing dwelling.

If screening is used, the view of the area overlooked must be restricted within 9 m and beyond a 45° angle from the plane of the wall containing the opening, measured from a height of 1.7 m above floor level (see Figure 4).

No screening is required where:

- windows are in bathrooms, toilets, laundries, storage rooms or other non-habitable rooms and they have translucent glazing or sill heights of at least 1.7 m;
- windows are in habitable rooms and they have sill heights of 1.7 m or more above floor level or translucent glazing to any part of a window less than 1.7 m above floor level.

AND

**A2.3** Windows and balconies of an upper-level dwelling are designed to prevent overlooking of more than 50% of the private open space of a lower-level dwelling directly below and within the same development (see Figure 5).

## Performance Criteria (continued)

### Acoustic privacy

**P3** Site layout separates, by way of barriers and/or by distance, active recreational areas, parking areas, vehicle accessways and service equipment areas from bedroom areas of dwellings, and minimises high levels of external noise entering dwellings.

**P4** Dwellings close to high-noise sources (eg busy roads, railway lines, airport flight-paths or industry) should be designed to locate noise-sensitive rooms and secluded private open spaces away from noise sources, and be protected by appropriate noise-shielding techniques.

## Acceptable Solutions (continued)

AND

**A2.4** Direct views described in A2.2 and A2.3 may be obscured by solid translucent screens or perforated panels or trellises which have a maximum of 25% openings, and which are:

- permanent and fixed
- of durable materials
- designed and painted or coloured to blend in with the development.

### Acoustic privacy

*(in partial satisfaction of P3)*

**A3** Bedroom windows are at least 3 m from shared streets and driveways and parking areas of other dwellings.

*(in partial satisfaction of P5)*

**A5.1** Bedrooms of one dwelling do not share walls with living rooms or garages of adjacent dwellings.

AND

## Performance Criteria (continued)

**P5** Building design assists in minimising the transmission of sound through the building structure, and particularly protects sleeping and living areas from possible noise intrusion.

## Acceptable Solutions (continued)

*(in partial satisfaction of P5)*

**A5.1** Bedrooms of one dwelling do not share walls with living rooms or garages of adjacent dwellings.

AND

**A5.2** Shared walls and floors between dwellings are constructed in accordance with the noise transmission and insulation requirements of the Building Code of Australia.

# Element 5.6
## On-site Carparking and Access

### Need

The total parking demand generated by both residents and visitors is relevant to all forms of residential development. This demand may be met in two ways: by on-street parking (see Element 2.1) or by on-site parking.

Resident and visitor parking off the street or on the site is mainly provided by:

- uncovered space next to the dwelling;
- uncovered tandem space next to the dwelling;
- uncovered space, as part of communal carparking;
- covered space next to the dwelling;
- covered space as part of communal carparking;
- basement carparking.

Parked cars can visually overwhelm a residential environment, unless care is taken in the design of parking. Element 4.2: Building Appearance and Neighbourhood Character provides information to help ensure that the overall appearance of a residential development is not compromised in this manner. AMCORD includes PND 14: Parking, as a further reference source.

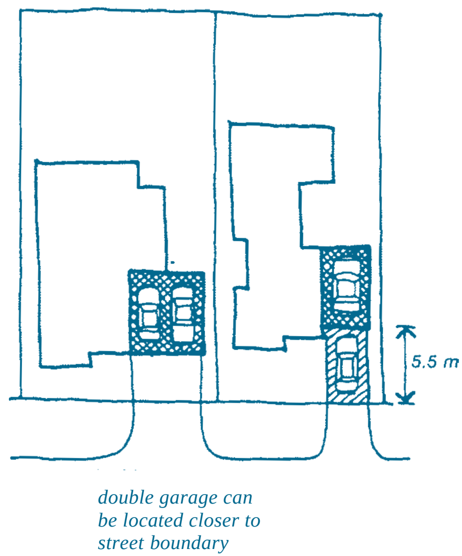



**Figure 1: Carparking on detached house lots.**

## The Quantity of Carparking

The amount of carparking provided for residents will vary. Over-generous provision is discouraged in the light of general community goals that seek to minimise the use of non-renewable resources and boost support for the use of public transport.

Generally, each dwelling will need at least one covered (ie carport or garage) resident carparking space on-site. For multi-dwelling projects close to urban centres, a lesser amount may be required. Alternatively, carparking spaces can be sold separately to dwellings so that those who do not wish to own a car can purchase housing at a reduced cost.

In areas and markets characterised by more than one vehicle per household, two spaces (one of which shall be covered) per dwelling are usually required, with tandem parking acceptable. Provided sufficient spare capacity exists, some resident carparking for infill housing close to urban centres may be provided on-street.

Not all visitor parking should be provided on-site. Account should be taken of available parking on existing public streets. Additionally, note should be taken of such factors as proximity to public transport and availability of nearby off-street parking, which might be used during peak visitor demand.

It is inappropriate to try to provide for peak parking demand in residential areas, and infrequent events (eg parties, garage sales, auctions) during which parking is overloaded should be accepted as a part of living in an urban community.

## The Location of Parking

The location of parking will often strongly influence the site layout for an infill housing project. So too will any requirement for covered parking.

Market preference is for each resident to have their own parking space as near as possible to the dwelling’s main entrance. While this has been generally accepted, there are many successful examples, particularly in denser localities where space for vehicles is at a premium, of a more flexible response to the location of car spaces.

Where the topography suits, or where density is high enough, parking can be wholly or partly underground.

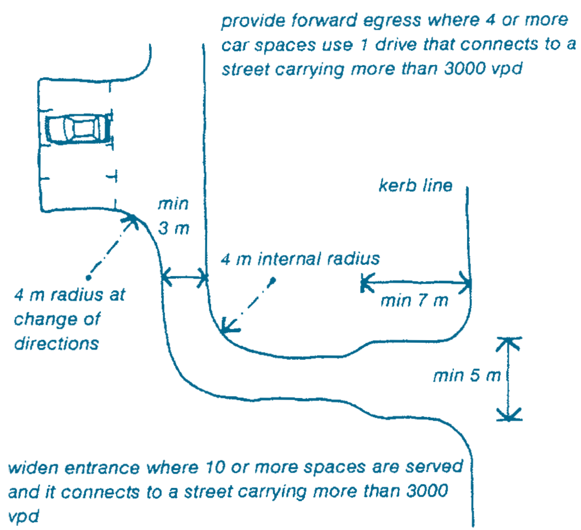
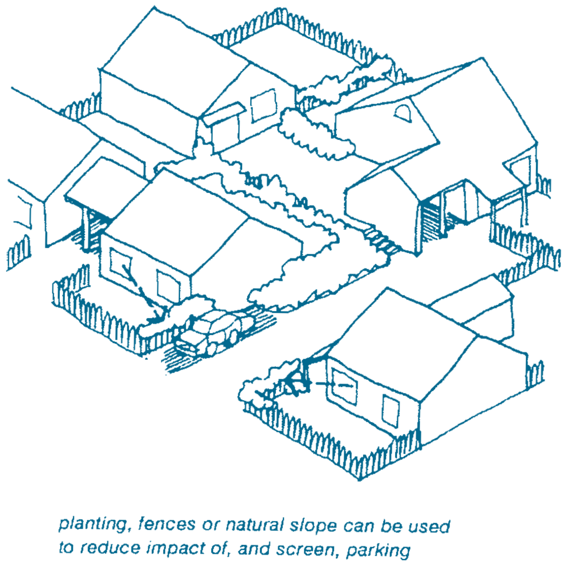



**Figure 2: Access lanes and driveways.**

For larger urban infill projects, a mixture of garages, carports and uncovered spaces is appropriate. This usually works well for housing for aged people where car ownership levels are not as high.

## Security

Security also requires careful consideration. Ideally, carparking areas should be capable of easy surveillance by residents. If there is basement carparking, the following design factors are important:



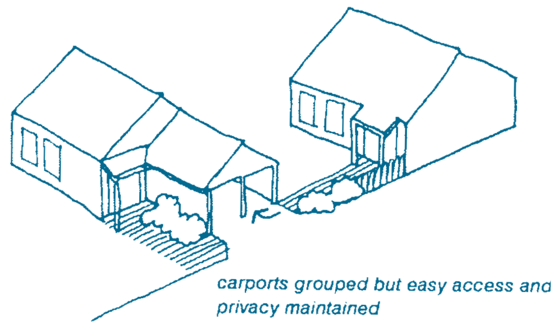




**Figure 3: Reducing the impact of parked or garaged vehicles in multi-unit housing projects.**

- Parking areas should have a limited number of entry points as well as security locking.
- Good lighting should be provided.
- Casual surveillance should be maximised.

## Design Factors

Adequate access and ease of use should be part of the design layout for a project.

Taking security requirements into consideration, it is still important to ensure there is proper landscaping of carparking areas. This generally requires a landscaped strip at least 2 m wide to ensure a satisfactory area for growing some trees, along with appropriate shrubs and groundcovers.

Visually garages and carports can have a significant influence on streetscape appearance. This factor needs to be carefully considered for housing on small lots and medium-density multi-unit dwelling projects. Methods of improving appearance include:

- integrating the garage/carport design with the design of the main dwelling;
- setting the garage/carport back from the main building alignment;
- allowing only a single garage/carport for lots with 11 m frontage or less;
- highlighting (via the elevation treatment) the dwelling entry and/or rooms rather than the garage;
- locating the garage under the roof of two-storey dwellings (eg terrace houses);
- designing double garages to divide the elevation into two (eg use of separating columns, stepping one garage back, use of roof-form, providing interest in door treatments);
- providing a rear lane for vehicle access to narrow allotments (although this requires care in design to create a safe and attractive lane streetscape).

# Element 5.6
# On-site Carparking and Access

## Intent

To ensure adequate provision of secure and accessible on-site parking for residents and visitors.

## Performance Criteria

The intent may be achieved where:

**Parking provision**

**P1** Carparking is provided according to projected needs which are determined by:

- the number and size of proposed dwellings;
- availability of public transport;
- the availability of on-street carparking;
- locations of non-residential uses such as schools and local shops;
- the possible demand for carparking space from adjoining localities;

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**Parking provision**

**A1.1** Dwellings on separate lots are provided with two on-site parking spaces, one of which is covered (the second space can be tandem).

OR

**A1.2** For multi-unit dwelling projects, the number of spaces provided is to comply with the following:

## Performance Criteria (continued)

- the occasional need for overflow parking;
- the carparking requirements of people of differing socio-economic status, age, cultural background and differing stages of family life cycle.

### Design

**P2** Carparking facilities are designed and located to:

- conveniently and safely serve users, including pedestrians, cyclists and vehicles;

## Acceptable Solutions (continued)

| **Dwelling size or No. of bedrooms** | **Average spaces per dwelling *** | |
|---|---|---|
| | A | B |
| Small or 1 bedroom < $75^2$ | 0.75 | 1.00 |
| Medium or 2 bedroom 75 m$^2$ – 110 m$^2$ | 1.00 | 1.50 |
| Large or 3 + bedroom > 110 m$^2$ | 1.25 | 2.00 |
| Add for visitors per dwelling | 0.25 | 0.25 |

*Round up to nearest whole number

**Dwelling location**

A – < 200 m from railway station, busway or tram stop.
B – any other circumstances.

NB: Development plans may identify areas in which a lesser provision may be appropriate, based on housing density, accessibility to public transport and employment areas etc.

### Design

**A2.1** The dimensions of car spaces and access comply with the local planning scheme, Development Plan or Figure 2.

## Performance Criteria (continued)

- enable efficient use of car spaces and accessways, including adequate manoeuvrability for vehicles between the street and the lot;
- fit in with any adopted street network hierarchy and objectives of the hierarchy, and with any related local traffic management plans;
- be cost-effective;
- achieve relevant streetscape objectives.

**P3** Carparking areas and accessways are designed, surfaced and sloped to facilitate stormwater infiltration on-site.

**P4** Open carparking areas and accessways are suitably landscaped to enhance amenity while providing for security needs of residents and visitors.

## Acceptable Solutions (continued)

**A2.2** Accessways and driveways are designed to enable vehicles (the 98 percentile vehicle) to enter the designated parking space in a single turning movement, and leave the space in no more than two turning movements.

*(in partial satisfaction of P3)*

**A3** Open carparking spaces are surfaced with materials that provide for stormwater infiltration

# Element 5.7
Private Open Space

## Need

There has been significant change to the demand for private open space in housing development and in the way it is located and used, particularly arising from changes in household structure and lifestyle. More frequently, such open space is being sited above-ground or used for passive enjoyment in the form of landscaped gardens, while more people are finding recreational opportunities beyond the boundaries of their own properties or inside their homes.

Higher-density forms of housing are sought after in locations that offer community benefits, such as those close to commercial and community facilities, public transport, employment and entertainment centres, and public open space, as well as those that offer significant views. Efficient use of space is especially important in these locations as it may not always be possible to provide the same amount of private open space as for other locations where space is not so scarce.

The provision of private open space is only one of the factors in the housing choice equation. Some people in urban communities will continue to choose housing with large areas of private open space, while many others will demand less than average areas of private open space, or even none at all, in order to be located in areas offering some of the abovementioned community benefits.

## Functions

Private open space can fulfil a number of different functions, including:

- the extension of social and recreational pursuits also conducted in the dwelling such as entertaining, eating and relaxing;
- play, particularly scope for children and household play equipment;
- utility storage and space, including clothes line and drying areas, compost bins, tools and equipment, and outdoor furniture;
- a space which is wholly private and capable of being used exactly as the occupant sees fit without the prospect of neighbours' intrusion;

- an area where planting and landscaping can occur to soften the built form, enhance the appearance of the space, provide shade and comfort to the outdoor space, and supplement household food requirements.

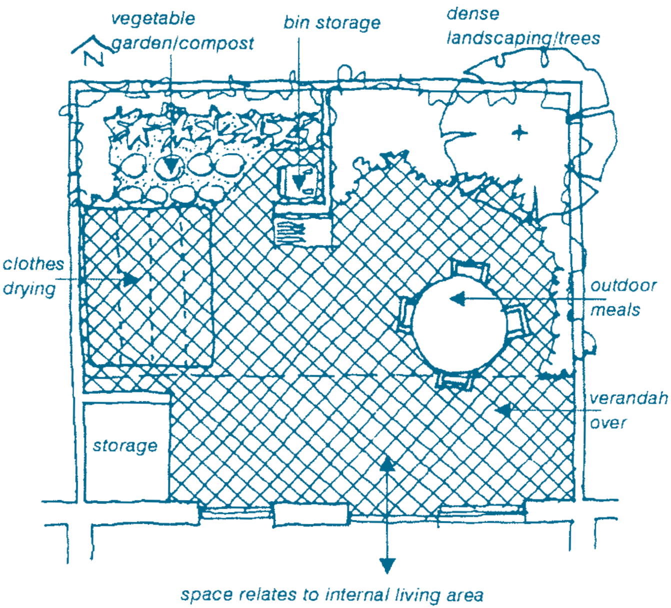



**Figure 1: Private open space fulfills a number of functions.**

## Determining the Amount of Private Open Space

Ideally, private open space should be provided in a way that meets projected needs of the future dwelling inhabitants. However, inhabitants and needs may change, while the amount of open space provided remains the same. Accordingly, the most practical approach is to establish a minimum level of provision while leaving opportunities for flexibility in the use of private open space.

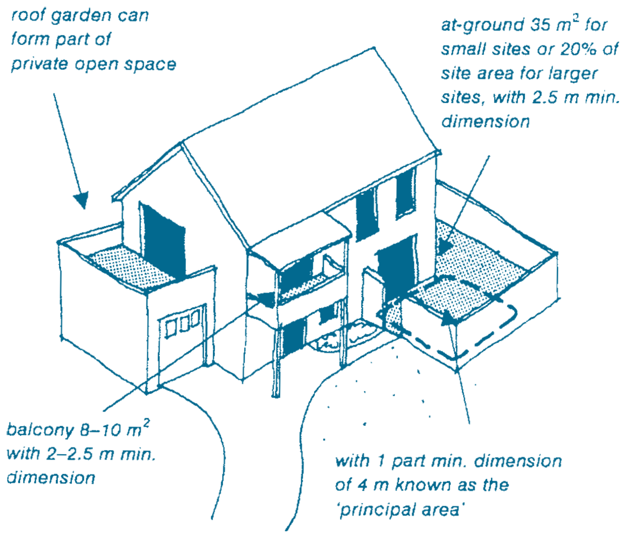



**Figure 2: Guidelines for minimum dimensions of private open space, where provided.**

For small private open spaces to be of real value, they must be of an appropriate shape and size. It is useful, therefore, to provide guidance on the minimum dimensions and area for these spaces. In inner city areas, there is often market demand and/or a need to cut back on the amount of space allocated for a dwelling. Most commonly, this results in a reduction in private open space, dwelling size and/or car parking provision.

The provisions of this Element are based on the notion that it is difficult to define accurately a minimum level of private open space below which residents would suffer detriment. Clearly purchasers have fewer expectations or requirements for private open space for housing on small sites than on large sites. As already indicated, many people are prepared to make this trade-off in return for proximity to other facilities that offer a range of benefits.

Some guidance is provided on Acceptable Solutions for private open space. Minimum areas and dimensions are suggested for at-ground private open space and above-ground level for both dwellings on individual lots and for dwellings within multi-dwelling developments. The Performance Criteria can be used where such areas and dimensions are not appropriate.

## Location and Amenity

Private open space is best located adjacent to and accessible from living/family rooms if it is to serve as an outdoor extension of the dwelling. In temperate and cool climates it is best located to the north of dwellings to facilitate solar access and provide for maximum year-round use. In hot–humid and hot–arid climate zones protection from excessive sunlight and exposure to cooling breezes are more important considerations.

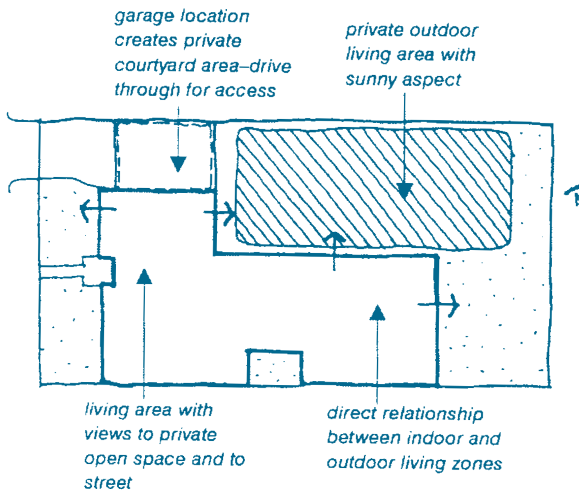



**Figure 3: Private open space considerations on east-west lot.**

Amenity and privacy can be improved by siting buildings on boundaries which enclose the space between buildings (providing protection)

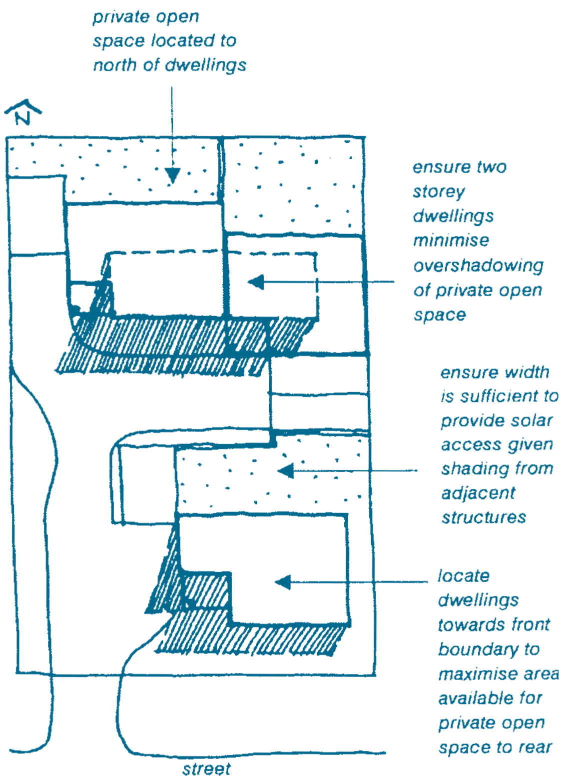



**Figure 4: Shape and aspect of private open space in multi-dwelling projects.**

and by reducing the number of windows and living rooms on neighbouring properties that might overlook the space (the reverse is true for proposed balconies—refer to Element 5.5).

## Energy and Water Conservation

Landscaping and planting provide a visual screen and the basis for summer and winter shading (hot–humid), and summer shading and winter sun penetration (temperate, cool and hot–arid).

Selection of vegetation species and irrigation techniques should consider minimising garden watering.

Landscaping guidelines are included in PND 15: Landscape Guidelines for Water Conservation.

# Element 5.7
# Private Open Space

## Intent

To ensure that the private open space provided for dwellings is clearly defined, usable and meets user requirements for privacy, access, outdoor activities and landscaping.

## Performance Criteria

The intent may be achieved where:

**P1** Private open space is clearly defined for private use.

**P2** Private open space areas are of dimensions to suit the projected requirements of the dwelling occupants, and to accommodate some outdoor recreational needs as well as providing space for service functions.

**P3** Part of the private open space is capable of serving as an extension of the dwelling for relaxation, dining, entertainment, recreation and children's play, and is accessible from a main living area of the dwelling.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in partial satisfaction of P1–P3)*

**A1.1** For dwellings with a site density of 40 dwellings per ha or less, private open space for the dwelling comprises:

(a) At-ground level

- total minimum area of 20% of the site area (or average site area per dwelling for multi-dwelling developments), with a minimum dimension of 3.0 m;
- one part with an area of 25 m² with a minimum dimension of 4 m and directly accessible from a living area of the dwelling;

| **Performance Criteria (continued)** | **Acceptable Solutions (continued)** |
|---|---|
| | • a maximum gradient of 1 in 10;<br>• screening provided (minimum 1.8 m) where necessary to ensure privacy to users of the open space.<br><br>(b) At above-ground level<br>• a balcony or rooftop area conveniently accessible from a main living area of the dwelling, having a minimum area of 10 m² with a minimum dimension of 2 m (2.5 m in hot–humid and hot–arid climates);<br>• adequate screening to protect the privacy of neighbours (refer to Element 5.5).<br><br>OR<br><br>**A1.2** For dwellings with a site density of more than 40 dwellings per ha, private open space for the dwelling comprises:<br><br>(a) At-ground level<br>• total minimum area of 35 m² (minimum 20% of site area for site densities greater than 60 dwellings per ha);<br>• a minimum dimension of 2.5 m;<br>• a maximum gradient of 1 in 10; |

## Performance Criteria (continued)

**P4** Location of private open space takes advantage of outlook and natural features of the site; reduces adverse impact of adjacent buildings on privacy and overshadowing; and addresses surveillance, privacy and security issues where private open space abuts public space.

**P5** Orientation of private open space helps to achieve comfortable year-round use.

## Acceptable Solutions (continued)

- one part with an area of 16 $m^2$ with a minimum dimension of 4 m and directly accessible from a living area of the dwelling;
- screening provided (minimum 1.8m) where necessary to ensure privacy to users of the open space.

(b) At above-ground level:

- adequate screening to protect the privacy of neighbours (refer to Element 5.5);
- a balcony or rooftop area directly connected to the dwelling, having a minimum area of 8 $m^2$ with a minimum dimension of 2 m (2.5 m in hot–humid and hot–arid climates).

# Element 5.8
Communal Open Space and Landscaping

## Communal Open Space

Communal open space is described as open space that is available for exclusive use by residents of a multi-dwelling housing development for relaxation and recreation, and is designated as such. It generally does not include the open space that forms part of the communal streetscape of multi-dwelling housing, which is usually in the form of the verge or landscaped area between the pavement of the access driveway/street and the the dwellings (see Element 4.1).

The designer and developer must decide whether communal open space will be provided in multi-dwelling housing development. The decision will depend on their assessment of likely market response to a proposal incorporating this form of open space and its effect on the provision of private open space, as well as the proximity of public open space to the proposed development.

One design approach is not to allocate as much space for private use and, instead, provide that space in single or multiple areas as communal open space. This can help create environments that have extensive landscaped areas, and/or retain existing significant vegetation/habitat, which can then be maintained to a high standard for the benefit of all residents. Communal open space can also contain shared facilities, such as a swimming pool, community hall or tennis court. These facilities should be relevant to the projected needs of residents of the development.

Communal open space areas require careful design and even more careful management once a housing development is occupied. For this reason many residents prefer to maximise private open space and have little or no communal open space. This particularly applies to small developments, where there are limited management resources.

## Landscaping

Landscaping of multi-dwelling developments plays an important part in their integration into the surrounding streetscape and greatly increases the satisfaction of neighbours and prospective residents. Attention should be paid to:

• public and semi-public areas such as streets, public open spaces and front gardens;

- communal areas such as entries, driveways, service areas and landscaped recreation areas;
- private open space.

The extent of landscaping will vary according to the style of the development, its location and the potential market. The landscaping of a multi-dwelling site should form part of a comprehensively designed concept which brings together the:

- design of the buildings;
- uses to be made of private, communal or public land;
- existing landscape character of the streetscape.

Paved surfaces are extensively used in most multi-dwelling developments. The choice of material and the detailing of surfaces are critical to the success of a development. Careful attention to layout can help limit the area of paving required, while surface texture and choice of materials can ensure that problems such as slip, glare and excessive surface run-off are minimised.

Ground level areas should provide easy access for the infirm or people with disabilities. Lighting should be provided to driveways, carparks and walkways for the safety of residents.

The location and choice of vegetation should take account of soil conditions and the possible structural effects of changing moisture content of the soil.

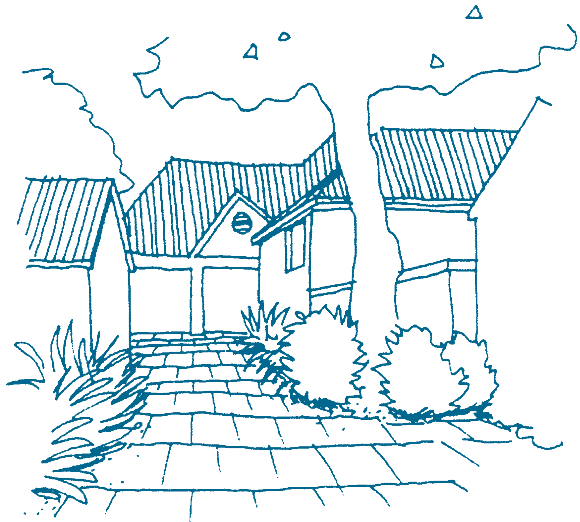


**Figure 1: Pervious areas adjoining paved areas reduce stormwater run-off.**

Planting should be used to:

- maintain or establish a treed environment (incorporating 'canopy' trees) compatible with the neighbourhood and, where relevant, reinforce the specific planting character of a street or area;
- visually reduce the bulk or scale of new development and mellow the appearance of new buildings;
- provide summer shade, windbreaks and access to winter sun (other than in hot–humid climatic areas);
- create an attractive environment without prejudicing personal safety;
- enable large trees to grow given the need to create habitat within medium density housing developments.

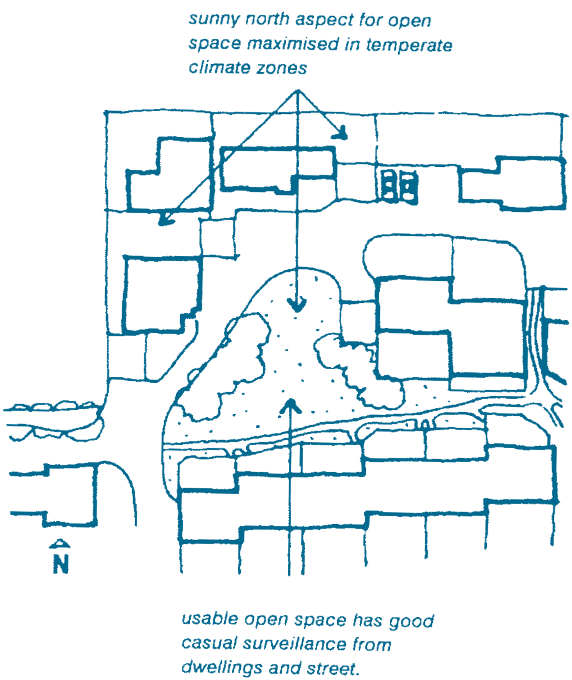



**Figure 2: Orientation of communal open space.**

Existing mature trees, especially those located near property boundaries, should be retained and incorporated in the development wherever practicable. Special attention should be given to protection of the root systems, protection of the tree during construction, the design of footings to protect structures, the distance between the tree and any structure, and the design and location of hard surfaces around the tree to maximise availability of water around its root system (refer to PND 16: Guidelines for Tree Protection). Furthermore, such mature trees should preferably be incorporated within communal rather than private open space to enable all residents to enjoy the amenity provided.

## Surface Run-off

Surface run-off is usually much greater for multi-dwelling developments than for single detached dwellings on larger allotments. Planted areas should therefore be designed with good absorption capacity to minimise stormwater run-off, while paved areas should generally be minimised and/or designed to provide for stormwater infiltration. On-site retention devices (as outlined in Elements 3.1 and 3.3) should also be incorporated into communal open space areas wherever possible.

## Maintenance

Landscape design should consider maintenance. Easy, low-cost maintenance of communal areas is usually required, but design should be sufficiently flexible to allow for alterations by future residents. Areas which incorporate small areas of lawn are often impractical, especially if lawn mower access is inconvenient.

Species selection and landscape design should minimise the need for garden watering (refer to PND 15: Landscape Guidelines for Water Conservation).

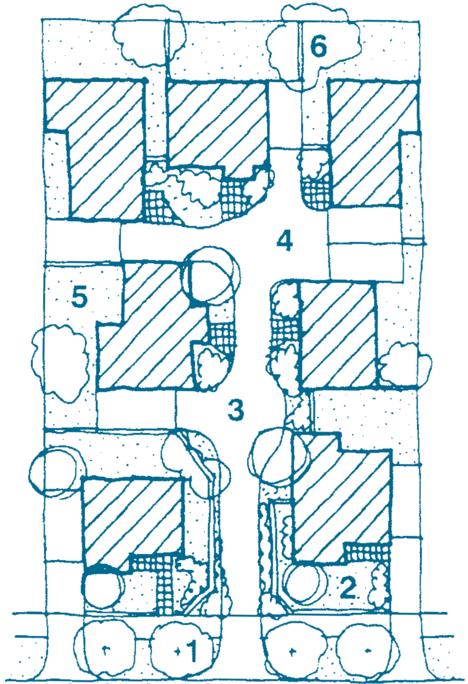



**Figure 3: Site landscaping.**

1 *Advance tree species appropriate to the street provided or reinstated*

2 *Front gardens landscaped to a standard and a character compatible with those in the rest of the street*

3 *Driveways and communal spaces landscaped with low maintenance in mind*

4 *Paving for driveways chosen to complement the development and constructed to maximise on-site infiltration*

5 *Landscape treatment of private open space leaving scope for residents to develop*

6 *Existing mature trees retained where practicable, especially when along property borders*

# Element 5.8
# Communal Open Space and Landscaping

## Intent

To ensure that any communal space provided for dwellings is clearly defined and usable, and helps create a pleasant, safe and attractive living environment.

## Performance Criteria

The intent may be achieved where:

**P1** Communal open space is designed according to projected user needs and is determined by: overall housing density; quality and extent of alternative private or nearby public open space; the need to distinguish communal open space clearly from private or public open space; type of activities envisaged; future maintenance and management requirements; the need to maintain the privacy of nearby dwellings; projected needs of children for outdoor play; the need for landscaping to enhance a sense of enclosure of communal open spaces, while allowing informal surveillance and meeting security needs; traffic implications; and hours of operation of communal facilities.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.“

*(in partial satisfaction of P1–P8)“*

**A1** Landscaping shall be in accordance with an approved landscape plan for the site, certified by a qualified landscape architect or designer as meeting the Performance Criteria, and showing:

- the street reserve, carriageway, parking bays, footpaths, cycleway systems, street lighting and driveways;
- existing vegetation and proposed general character of tree planting and landscape treatment (including proposed species and proposed means of ensuring the ongoing health and development of retained trees);

## Performance Criteria (continued)

**P2** Unpaved or unsealed landscaped areas are maximised and are designed to facilitate on-site infiltration of stormwater run-off subject to soil/drainage conditions.

**P3** Major existing trees are retained wherever practicable through appropriate siting of dwellings and structures.

**P4** The landscape design specifies the location and species of trees, shrubs and ground cover in a way that:

- uses vegetation types and landscaping styles which blend the development into the streetscape;
- does not adversely affect the structure of the proposed buildings;
- contributes appropriate planting to streets fronted by the development;
- considers personal safety, by ensuring good visibility along paths and driveways and avoiding shrubby landscaping near thoroughfares;
- contributes to energy efficiency and amenity by providing substantial shade in summer, especially to west-facing windows and open carpark areas, and admitting winter sunlight to outdoor and indoor living areas (other than in the hot–humid and hot–arid climatic areas);

## Acceptable Solutions (continued)

- general arrangement of hard landscaping elements and major earth cuts, fills and mounding;
- location and design of any communal recreation facilities, including methods of protecting the privacy of nearby dwellings;
- clear delineation between communal and private areas of the site;
- how informal surveillance of the communal open space can be achieved;
- proposed irrigation and maintenance systems;
- proposed lighting arrangement;
- indicative treatment of any floodways and drainage lines, along with general information on fencing, access points, furniture and pavement style.

| **Performance Criteria (continued)** | **Acceptable Solutions (continued)** |
| --- | --- |
| • improves privacy and minimises overlooking between dwellings;<br>• minimises risk of damage to overhead and underground power lines and other services;<br>• provides adequate sight lines for vehicles and pedestrians, especially near street corners and intersections.<br><br>**P5** Paving is provided to driveways, walkways, entries, outdoor patios and in the vicinity of garbage bin enclosures, letter boxes and clothes lines. Such paving should be:<br>• semi-porous or graded (ie gravels) to maximise on-site infiltration of stormwater (if practicable);<br>• in materials and colours which complement the development and alternative adjoining streetscapes;<br>• finished in non-slip surfaces;<br>• suitable for use by people dependent on walking frames and wheelchairs. | |

## Performance Criteria (continued)

**P6** Planting will not obscure or obstruct dwelling entries, paths and streets in a way that reduces the actual or perceived personal safety and security of residents and other pedestrians.

**P7** Lighting is provided to pedestrian ways, dwelling entries, driveways and carparks to ensure a high level of safety and security for residents and visitors at night.

**P8** Requirements for maintenance meet the needs of the owners and proposed management of the landscaped area.

## Acceptable Solutions (continued)

# Element 5.9
Security

## Need

There is increasing research into crime prevention through environmental design. This has led to the design of streets, public and communal open space, sites and dwellings that discourage crime and increase residents' sense of security.

Security not only protects people from injury and property from damage, but also reduces anxiety and fear. Security may be enhanced through active management (eg appointing security supervisors, installing locks and alarm systems), or through planning, community and economic development initiatives, neighbourhood and site planning, and building design.

Throughout the Design Elements, references have been made to issues of safety and crime prevention. This Element provides additional material to help deal with this community issue. Further guidance is available in PND 17: Guidelines for Crime Prevention.

## Defensible Space/Manageable Space

Planning for security embodies the concept of 'defensible space' (Oscar Newman, 1972). At the site planning level, this is achieved by arranging buildings, open spaces and accessways so that residents can contribute to their own security through collective observation of the public areas around their dwellings. It is most effective where the layout makes the passer-by aware of this potential for resident scrutiny, and where the residents are led to feel some degree of responsibility for, or ownership of, the surrounding areas.

The concept of manageable space (Donald Perlgut, 1983) emphasises the relationship between physical design and management. Particular attention is paid to the hierarchy of open spaces (public, communal, semi-private and private); group territories; surveillance of paths, parking and open space; avoidance of ambiguous spaces; buffers between uses; control of non-resident use; avoidance of 'us and them' situations with potential for associated conflict; and 24-hour use of non-residential areas.

Vandalism can be reduced by the use of sturdy materials; speedy and careful maintenance and repair; rapid completion of building projects;

community responsibility; and sensitive, non-confrontational, user-orientated management.

## Situational Crime Prevention

Effective crime prevention through environmental design acknowledges the interdependency and interrelationship of all relevant factors, including the reasons for the criminal act. In essence 'situational crime prevention' demands specific solutions to specific problems. The following guidelines should therefore be tailored to the unique circumstances of a particular project or area. Importantly, crime prevention should be collaborative, involving the various design disciplines, planning authorities, and the community of eventual users.

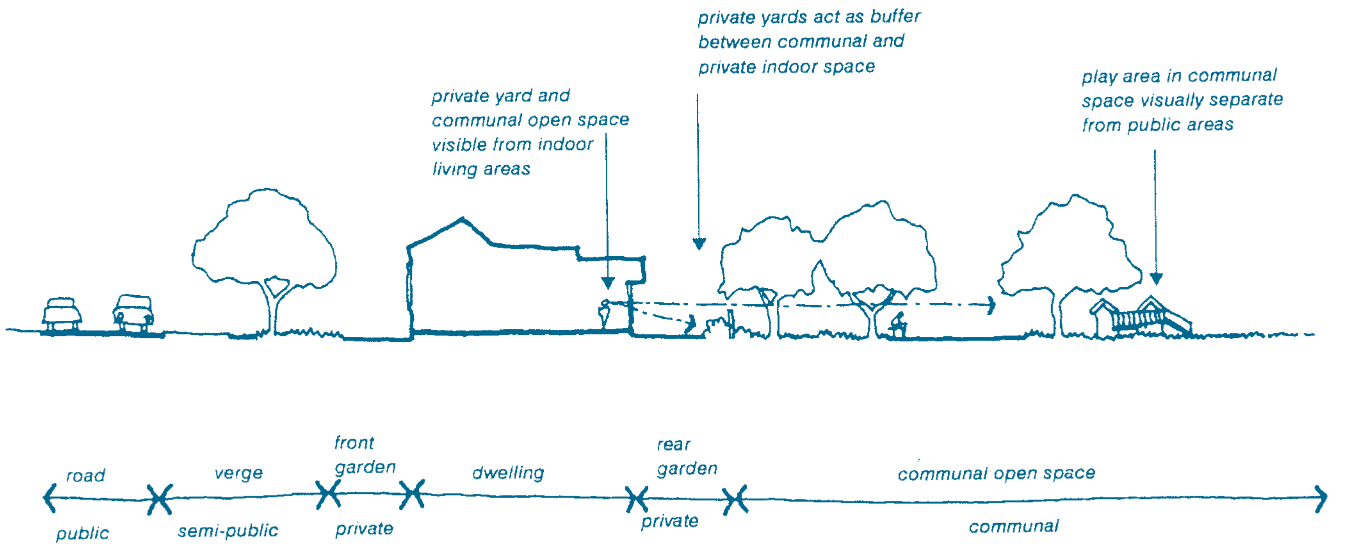



**Figure 1: Space hierarchy.**

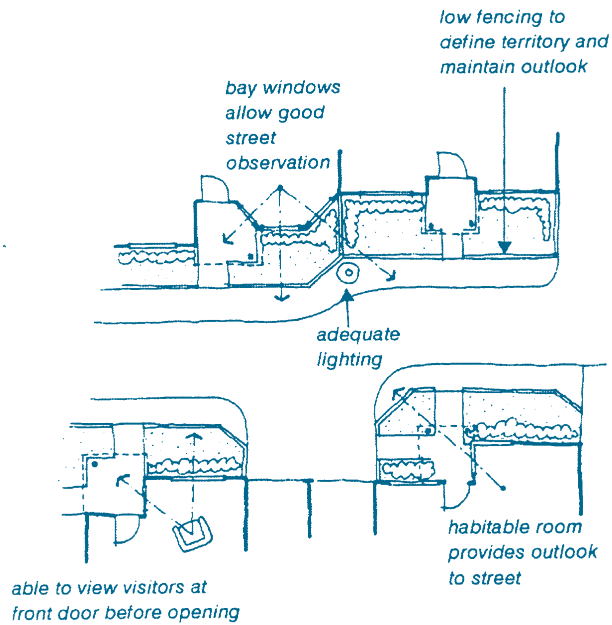



**Figure 2: Security by design—casual sureillance of the street.**

## Some Guidelines

The following guidelines are indicative of the design issues that can contribute to more secure environments within multi-unit housing developments.

- Include local streets in the site plan.
- Without violating the privacy of any unit, place windows or activity rooms and locate entries to maximise natural surveillance of the site.
- Ensure that the enclosure of private open space will not prevent surveillance.
- Clearly delineate public space (streets), community space (shared open space, play areas etc) and private space (dwellings and private open space).
- Subdivide the site into specific territorial zones.
- Assign territories to dwellings or groups of dwellings to assist residents in identifying intruders.
- Limit the number of dwellings using a shared entry in order to foster acquaintance among some residents and hence a sense of ownership.
- Employ real or symbolic barriers to discourage strangers intruding into communal landscaped spaces intended for use by residents only.
- Avoid the use of highly vulnerable materials (eg flimsy panelling, delicately made light fittings,

fencing which can be easily removed, exterior fixtures which are easily prised off).

- Although robust materials are a wise precaution, they should not be used at the expense of appearance. Avoid obvious ‘problem’ materials, such as heavy-duty mesh or cyclone fencing or grilles, which encourage wilful damage.

- Provide direct access to dwellings from carparking areas, public transport and city streets.

- To assist in finding addresses, all internal streets, courtyards and other identifiable common areas should be named, and numbers of dwellings should be legible.

- Design the lighting of footpaths to provide a sense of warmth, variety and brightness, rather than overall even illumination.

- Ensure that circulation patterns enhance other security measures.

- Open carparks should be relatively small and within view of some dwellings.

- Well-used public accessways require bright, even and vandal-proof lighting.

- Dwellings should be designed to allow residents to see who is at the door before opening it.

- Provide sturdy locks on all exterior doors.

- Provide high-quality, sturdy construction for all exterior doors and avoid hollow-core doors for exterior use.

- Provide sturdy hardware for sliding glass doors, or avoid external sliding doors if possible.

- Avoid designs that might assist entry via the roof or upper-storey windows.

- Provide adequate, secure internal and exterior storage space.

- Encourage casual use of public and semi-private open spaces during evening hours so that spaces can be ‘animated’ and filled with legitimate activities.

- Ensure the prompt repair of damage and graffiti.

# Element 5.9
# Security

## Intent

To provide personal and property security for residents and visitors and enhance perceptions of community safety.

## Performance Criteria

The intent may be achieved where:

**P1** Buildings are designed to overlook public and communal streets and other public areas to provide casual surveillance.

**P2** Site planning, buildings, fences, landscaping and other features clearly define territory and ownership of all public, common, semi-private and private space.

**P3** Appropriate lighting is provided to all pedestrian paths between public and shared areas, parking areas and building entries, and building entries provide a sense of security for both residents and visitors.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**A1** Buildings adjacent to public or communal streets or open space have at least one habitable room window with an outlook to that area.

*(in partial satisfaction of P3 and P4)*

**A3.1** Building design allows visitors who approach the front door to be seen without the need to open the door.

AND

**A3.2** Shared entries serve a maximum of eight dwellings and are able to be locked.

## Performance Criteria (continued)

**P4** Large development sites are 'subdivided' into specific territorial zones which are 'assigned' to groups of dwellings.

**P5** Buildings are designed to minimise access between roofs, balconies and windows of adjoining dwellings.

**P6** Vulnerable materials are avoided and robust materials which are aesthetically pleasing are used in public or communal spaces.

**P7** Pedestrian site access and carparking are clearly defined, appropriately lit, visible to others and provide direct access to buildings from areas likely to be used at night.

**P8** Major pedestrian, cycle and vehicle thoroughfares are identified and reinforced as 'safe routes' through:

- appropriate lighting;
- the potential for casual surveillance from houses;
- minimised opportunities for concealment;
- landscaping which allows long-distance sight lines;

## Acceptable Solutions (continued)

| Performance Criteria (continued) | Acceptable Solutions (continued) |
| --- | --- |
| • avoidance of 'blind' corners. | |
| **P9** Individual dwellings are clearly identifiable by visitors and emergency vehicles. | |
| **P10** Public facilities, including public toilets and street furniture, are located to maximise opportunities for casual surveillance, and are designed and constructed of high-quality, robust materials. | |
| **P11** A diversity of complementary land-use activities is provided to encourage a public presence at different times of the day and night. | |
| **P12** Landscape and fencing do not present a security risk by screening doors, windows and major paths. | |

# Element 5.10
Design for Climate

## Need

Commonwealth, State and local Governments are adopting policies for ecologically sustainable development (ESD) and to reduce greenhouse gas emissions. One component of these policies is to conserve energy and water in and around our housing. Response to this need will vary according to the different climate zones in Australia and the particular site characteristics. This Element refers to four generalised climate zones:

- Temperate (eg Adelaide, Melbourne, Perth, Sydney)
- Cool–Temperate (eg Hobart, Canberra)
- Hot–Humid (eg Cairns, Darwin)
- Hot–Arid (eg Alice Springs, Broken Hill).

There are more than four climate zones in Australia that affect the design of dwellings for energy conservation. Most States have more than one climate zone within their boundaries, and local authorities must therefore develop Performance Criteria and Acceptable Solutions based on their individual climatic conditions.

AMCORD provides further information in PND 18: Design for Temperate Climates, PND 19: Design for Hot–Humid Climates, and PND 20: Design for Hot–Arid Climates.

## Design Approach

Housing should be designed to minimise energy consumption for heating in winter and cooling in summer. This is best achieved at the design stage although retro-fitting of existing housing can achieve considerable improvements.

There are five main design principles for low-energy housing:

- site planning, orientation and layout;
- size and location of glazing and shading;
- construction type (thermal mass and insulation);
- ventilation;
- appliances.

Energy conservation in temperate, cool–temperate and hot–arid climates can be made easier if solar access to dwellings is available and properly managed. The design approach adopted by AMCORD assumes the availability of solar access, even though it is recognised that this may not always be the case. When solar access is not available or possible for all dwellings, a range of design techniques will be necessary to achieve reasonable levels of energy savings. This Element also focuses on 'passive' rather than 'active' design responses (eg mechanical heating and cooling/ventilation), and variations on recommended design approaches may be necessary if, for example, air conditioning is to be assumed.

A national scheme for rating the energy efficiency of all types of dwellings has been developed (NATHERS). When this scheme is adopted at the State and Territory level it will be possible to simplify the detail provided.

The increasing costs of developing infrastructure to collect, store and treat potable water, as well as the economic and environmental costs of removing and treating stormwater and wastewater from urban housing, provide compelling reasons for water conservation initiatives in and around the house. Ultimately, the conservation of water and energy will result in significant cost savings to individual households as well as important wider benefits to the economy and the environment.

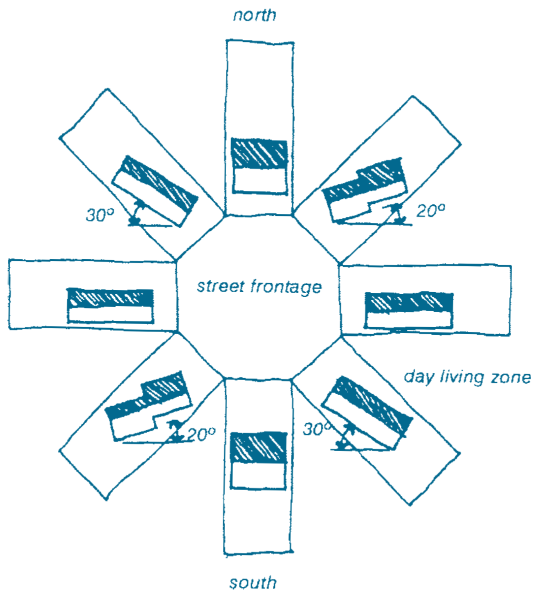



**Figure 1: Suggested positioning of houses on sites with varied aspects to achieve low-energy housing in temperate climate zones.**

## Building Form

Compact, attached housing forms such as terraces and low-rise apartments are more energy-efficient than detached dwellings. Buildings of two or three storeys with shared

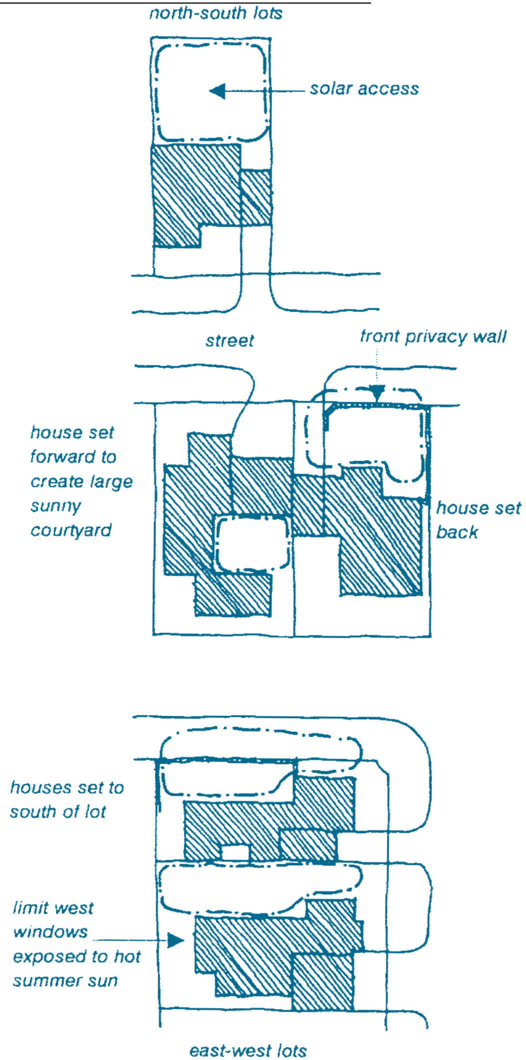



**Figure 2: Siting of dwellings in temperature climates to maximise solar access to provide open space and the dwelling.**

walls and floors, shallow depth for good cross-ventilation, insulation, and north-orientated living areas (with appropriately sized and shaded glazing) are relatively energy-efficient.

## Site Planning, Orientation and Layout

In *temperate, cool–temperate* and *hot–arid* climates in particular, the orientation of spaces within and outside the house relative to the sun's movement can significantly influence temperatures within a building and thus the ability to use the spaces throughout the year. In these climates designers should attempt to arrange rooms so that the main living areas of a house (ie lounge, dining room, family room, kitchen, principal area of private open space) are orientated towards the north for solar penetration during winter.

Ideally, buildings should be positioned with the long axis extending east–west to maximise the length of north-facing walls and windows to living areas. A depth of 10–14 m is ideal to allow natural light and cross-ventilation.

In *hot–humid* climates the desire for solar penetration into north-facing rooms will vary according to the latitude. For instance, in areas of north Queensland, allowing for solar penetration into the house during winter will probably increase temperatures to an uncomfortable level.

In *hot–humid* climates an important design objective is to allow for cross-ventilation. This can be achieved through the orientation of the building to capitalise on cool prevailing breezes. An elongated building design one room in depth and the placement of external openings on opposite walls will facilitate cross-ventilation.

In *hot–arid* climates a landscaped and shaded courtyard can act as a cool air well. The courtyard should be located directly adjacent to a main living area and should preferably be shaded by the house. Narrow, tall and vegetated courtyards are most effective.

In *all* climates there is a case for designing houses which minimise the external wall and roof area of each room, thereby providing less area through which undesirable heat loss or gain can occur.

Landscaping around the house plays an important role in modifying the microclimate of a site and the energy efficiency of a building. In *temperate* and *cool–temperate* climates wide-canopied deciduous trees and deciduous vines

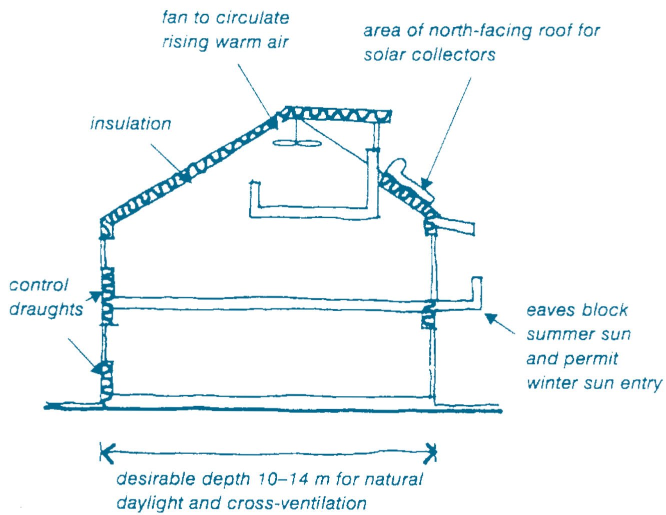



**Figure 3: Some considerations for energy-efficient housing in temperate climate zones.**

grown on a pergola at the north of a dwelling will provide shade and reduce glare during warmer months and allow solar penetration during the coolest months. However, as many deciduous species can block sun during early autumn and late spring, the use of eaves to control sun penetration is most important. The landscaping strategy should be considered together with room and private open space layout.

In *all* climate zones it is preferable to locate evergreen trees to the west and east of a dwelling. The sun is at a low angle in the

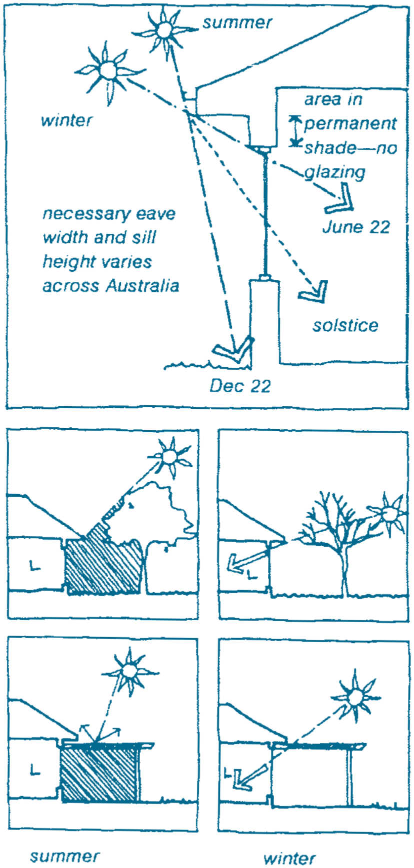



**Figure 4: Protection of north-facing walls and windows.**

mornings and afternoons, and shade trees can prevent considerable glare and heat on these sides. The careful design of landscaping around the house can also serve other functions, such as screening winter and summer prevailing winds, deflecting cooling summer breezes into the house, providing cooling air through leaf transpiration, reducing glare and generally modifying ambient temperatures throughout the year. In *hot–arid* climates, in particular, vines grown on walls and over roofs can effectively insulate against summer heat.

## Size and Location of Glazing

The size and location of glazing needs to consider the desire to allow solar penetration and prevent heat loss during cooler months, prevent heat intake during warmer months, and allow for cross-ventilation (particularly in *hot–humid* areas). Accordingly, in *climate zones other than cool–temperate* it is preferable to minimise the area of glazing to the east and west of a building where the sun will be at its lowest angle, and where it is therefore difficult to prevent heat intake during warmer months.

It is preferable to have glazing in north-facing rooms with a northerly aspect to allow solar penetration during cooler months. Glazing with a southerly aspect should generally be kept to a minimum and considered with a view to cross-ventilation and natural lighting.

In *cool–temperate* climates double glazing in conjunction with minimising the area of south, east and west-facing windows may be necessary to reduce the potential for heat loss during cooler months. Shading devices, such as eaves overhang, awnings, pergolas and casement shutters, should be designed to provide shading for windows during warmer months.

Careful attention should be paid to incorporating skylights and clerestory windows into buildings to reduce heat loss and gain during cooler and warmer months respectively. Adjustable louvres, double glazing and shading devices can be utilised, and such windows are best kept small and out of heated areas.

## Construction

Heavyweight building materials (eg concrete slab floors, cavity brick, concrete blocks, stone walls, mud brick, rammed earth) absorb heat during the day (when it is warm outside) and release it at night (when it is cooler), resulting in cooler indoor conditions during the day and warmer conditions at night. These characteristics can be used to good effect in all climate zones in Australia, except the *hot–humid* zone, if considered in conjunction with glazing (solar penetration) and insulation (to prevent heat loss). To be most effective, materials with thermal mass should be located inside the insulated fabric of the house in north-facing rooms.

In *tropical hot–humid* climates the use of heavyweight materials is less desirable, particularly in sleeping areas, as they will prevent the house from cooling down at night. Here it may be possible to construct the daytime living areas using heavyweight materials and the bedrooms using lightweight materials, providing the deleterious effects of using the heavyweight materials are adequately managed.

In *hot–arid* climates the relatively constant temperature below the ground may be used to advantage by building partly underground or by building up earth mounds around the base of the building.

## Insulation

All of the strategies suggested above need to be considered in concert with the insulation and weather sealing of a dwelling, which are the most important elements to reduce heat intake and loss. Generally, bulk and reflective foil laminate insulation of the roof and walls will be required, although the R-value of the insulation should reflect the prevailing circumstances of a location.

In *hot–arid* and *cool–temperate* climates, placing insulation along the edge and under the slab for about a metre will limit heat loss during cool nights. In *cool–temperate* and *hot–humid* climates it is also desirable to install a vapour barrier between the insulation and the inside (for cool–temperate) or the outside (for hot–humid) wall or ceiling lining to avoid the condensation of water vapour.

External surfaces of dwellings exposed to summer solar radiation should be light in colour to reflect as much heat as possible, particularly in *hot–arid* areas.

## Air Movement

Harnessing cooling breezes and providing fresh air indoors is important during warmer months in all climates, particularly in *hot–humid* conditions where increased air movement can help evaporate perspiration. Accordingly, in *hot–humid* areas buildings should be orientated or otherwise designed to receive the prevailing cooling breezes. If this is not possible other strategies, such as deflecting breezes into rooms with fencing or densely planted vegetation can be used.

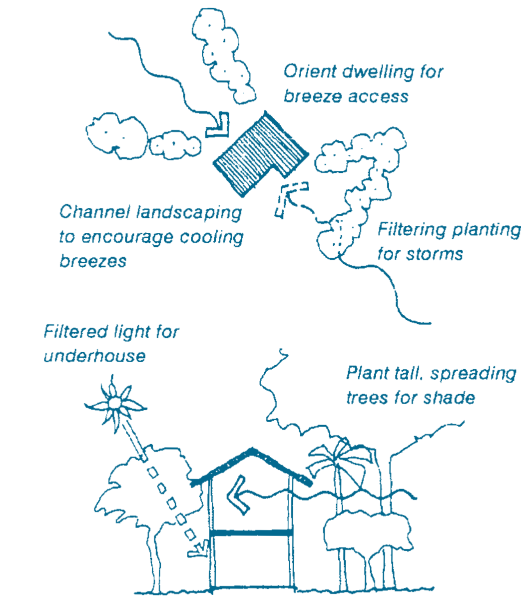



**Figure 5: Design for a hot-humid climate.**

Maximum air movement can be obtained by locating smaller openings low on the windward side and large openings high on the leeward side. In *hot–humid* areas the movement of air through these openings can be facilitated by designing the house to be only one room wide (suitable for wider, large lots). The selection and location of windows can also influence the degree of cross-ventilation.

In *hot–arid* conditions, incoming air should be moistened and cooled. This can be achieved by directing the incoming air through vegetation or underground ducts where it has been cooled by its contact with the ground, or by encouraging incoming air from a shaded, moist and cool courtyard.

The 'stack effect' (where warm air rises and is replaced by cool air) can be utilised in all climate zones. Here it is necessary to allow warm air to escape the room through openings (about 5% of the overall floor area), and ensure it is replaced by cool air from outside the house.

In *hot–humid* and *hot–arid* climates, 'roof cap' devices installed in conjunction with insulation will allow hot air to escape the roof space and cooler air to enter through vents (subject to the requirements of the Cyclone Code). This also ensures that fibrous bulk insulation is kept dry and cool for maximum effectiveness. Draught proofing of openings is very important to minimise heating and cooling costs and create comfortable internal conditions.

## Services, Lighting and Appliances

Considerable energy savings can be achieved through the choice, location and use of various services, lighting and appliances within the house. The most energy-intensive appliances are those used for heating and cooling the dwelling during winter and summer. Incorporating the above measures should result in comfortable living conditions with limited need for mechanical heating or cooling. Where heating or cooling is required, these areas can be separated from unheated/cooled areas by the use of walls and doors.

Other design considerations include:

- Choose solar hot water systems, and ensure that the roof pitch and orientation facilitate solar collection.

- Insulate hot water pipes, place the hot water tank/heater close to rooms where most hot water will be used, and group hot-water rooms together.

- Locate cooking tops away from windows and fridges and freezers.

- Use 'task' lighting (ie focus lights on particular areas where lighting is required instead of trying to illuminate the whole of the room) and use energy-efficient globes.

- Use light internal colour schemes, and maximise opportunities for natural lighting, taking into consideration the above measures.

- Provide outdoor clothes drying spaces with good solar access, and cover them if they are in areas where consecutive rainy days are common.

## Building Materials

The choice of building materials has energy and other environmental implications. For instance, the use of Australian and imported rainforest timbers is not sustainable in the long-term and causes significant ecological damage. Recommended alternatives, becoming more readily available at competitive prices, are plantation timbers (eg radiata pine, poplar), Australian regrowth timbers (eg blackbutt, spotted gum, cypress pine, Sydney blue gum, flooded gum, manna gum, jarrah, stringy bark, red ironbark), recycled timbers or manufactured timbers (eg custom wood).

Consideration should be given to the use of building materials that are:

- manufactured from abundant or renewable resources and are energy-efficient with low contained energy;

- non-polluting and recyclable;

- manufactured by environmentally acceptable production methods;

- durable with low maintenance requirements.

The health effects of different types of building materials are also important, particularly in regard to their chemical content. Many people are particularly susceptible to the effects of materials (eg chemicals, glues, soft plastics, insulation materials), and alternative, healthier materials are generally available.

There is continuing research on the energy, greenhouse gas and health implications of various building materials. Until more definitive information becomes available it is not intended to include any Reference Standards or Acceptable Solutions in AMCORD.

## Household Water Conservation

Within the house a number of measures can be incorporated, preferably during construction, to

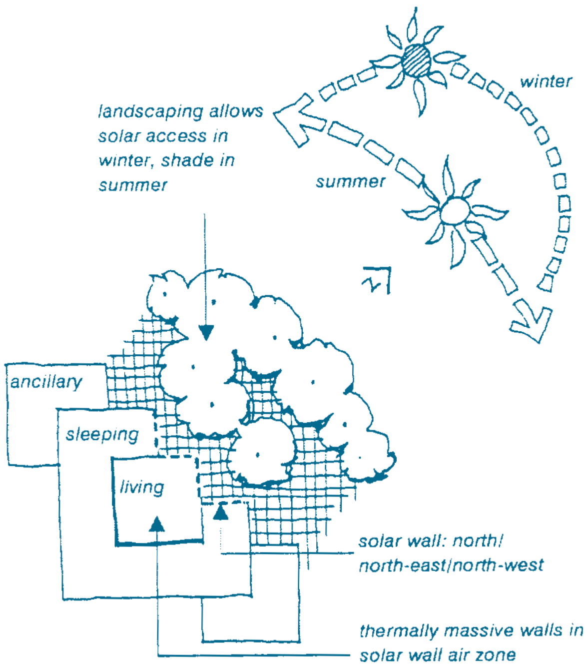



**Figure 9: Design for a hot-arid climate.**

minimise water consumption. These include fitting low-flow water regulators on kitchen and bathroom taps and fitting a mixing valve to the water heater outlet to ensure that the temperature of hot water delivered does not exceed 55°C, thereby improving safety and saving on heating costs.

Rainwater tanks with direct plumbing to the house can also contribute to savings in mains water consumption while minimising the amount of run-off into the drainage system. Waterless toilet systems are also available and dual flushing systems are now commonplace (and required by law in some States).

## Water Conservation in the Garden

Irrigating gardens and lawns represents a significant proportion of total household water usage. Simple, effective measures can minimise water consumption while still maintaining a healthy garden, such as:

- Keep areas of lawn to a minimum, and choose drought-resistant species.
- Select appropriate native and exotic species of trees, shrubs and groundcovers, bearing in mind their water requirements, height and spread, colour, productive capacity, and influence on the thermal characteristics of the house.
- Locate and group plants to reduce water usage.

Group together plants with similar watering needs.

- Set up an irrigation system to minimise water wastage. Ensure that the system responds to the varying watering needs of different sections of the garden.

- Maximise water retention within gardens by directing run-off from hard impervious areas and water tanks to vegetation.

- Minimise the area of land covered by impervious materials such as concrete or paving blocks.

Depending on soil and climate characteristics, the size of allotments and the location and extent of buildings, it should be possible in the drier areas of Australia to retain most roof water run-off within water tanks and in the garden. Similarly, provided that health standards are maintained, greywater may be used on garden areas to assist with irrigation.

PND 9: Total Stormwater Management and PND 15: Landscape Guidelines for Water Conservation provide additional information.

# Element 5.10
# Design for Climate

## Intent

To facilitate energy and water conservation measures in and around housing that will assist in establishing ecologically sustainable residential environments, through the reduction in household use of fossil fuels and greenhouse gas emissions and the use of renewable energy sources.

## Performance Criteria

The intent may be achieved where solar access is available and where:

**In all climates**

**P1** Building envelopes and internal layouts are designed to minimise energy consumed for heating and cooling.

**P2** Windows are located, sized and shaded to facilitate good thermal performance.

**P3** Buildings have an area of roof, with appropriate orientation and pitch, that is suitable for the installation of solar collectors and photovoltaic cells.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of achieving the Performance Criteria:

**In all climates**

*(in relation to P1–P5)*

**A1** There is a minimum rating of four stars for any dwelling on its own separate lot, or four stars for 50% of dwellings and three stars for the remaining dwellings within a multi-unit housing development, under a nationally accredited House Energy Rating Scheme.

OR

*(in partial satisfaction of P1–P5)*

## Performance Criteria (continued)

**P4** Building materials and insulation assist in providing acceptable thermal conditions.

**P5** Air movement within dwellings is designed to provide acceptable thermal conditions.

## Acceptable Solutions (continued)

**A2.1** Doors, windows and other openings have adequate draught control.

AND

**A2.2** Mechanically heated or cooled areas can be closed off from other areas of the dwelling.

AND

**A2.3** Buildings (other than in the hot–humid climate zone) are sited within the preferred orientation range shown in Figure 1.

AND

**A2.4** A north-facing room is provided, capable of use as a living area.

AND

**A2.5** Ceiling and wall insulation is provided to at least the level recommended in AS 2627.1-1993 for the locality.

AND

**A2.6** External clothes drying areas with access to sunlight and breezes are available.

## Performance Criteria (continued)

### In all climates (continued)

**P6** Building materials, appliances and fuel sources are selected to minimise energy requirements and greenhouse gas emissions.

**P7** Landscape design assists microclimate management to conserve energy and water.

**P8** Building and landscape design incorporate techniques for conserving mains water.

### In temperate climates

**P9** Buildings are sited and designed to maximise solar access to north-facing windows of living areas and principal areas of open space, having regard to slope, views, existing vegetation and overshadowing.

**P10** Windows are appropriately sized and shaded to reduce summer heat load and permit entry of winter sun.

## Acceptable Solutions (continued)

### In all climates (continued)

AND

**A2.7** Low greenhouse-impact fuels are available.

### In temperate climates

*( in partial satisfaction of P9 and P10)*

**A9.1** Windows to north-facing living areas receive at least 3 hours of sun between 9am and 5pm on 21 June over a portion of their surface.

AND

**A9.2** North-facing windows to living areas of neighbouring dwellings do not have sunlight reduced to less than the above 3 hours.

AND

## Performance Criteria (continued)

### In cool–temperate climates

**P11** Buildings are sited and designed to maximise solar access to north-facing windows of living areas and principal areas of open space, having regard to slope, views, existing vegetation and overshadowing.

**P12** Buildings are designed for maximum solar access during cooler months.

**P13** Buildings and landscaping are designed to ensure protection from winter winds.

**P14** Buildings are mainly constructed of materials with high thermal mass.

### In hot–humid climates

**P15** Buildings are sited to maximise the use of cooling breezes and provide natural ventilation.

## Acceptable Solutions (continued)

**A9.3** Materials of high thermal mass are used for living areas and are located to maximise the absorption of heat from air circulating in the dwelling and from the winter sun.

### In cool–temperate climates

*(in partial satisfaction of P11–P14)*

**A11.1** Windows to north-facing living areas receive at least 3 hours of sun between 9am and 5pm on 21 June over a portion of their surface.

AND

**A11.2** North-facing windows to living areas of neighbouring dwellings do not have sunlight reduced to less than the above 3 hours.

AND

**A11.3** East-facing windows (with external shading to restrict summer sun) are provided for morning sunlight during cooler months.

### In hot–humid climates

*(in partial satisfaction of P15–P18)*

**A15.1** Buildings are designed with openings on opposite or adjacent walls for cross-ventilation.

## Performance Criteria (continued)

**P16** Buildings are designed to:

- minimise the need for mechanical cooling;
- maximise cross-ventilation;
- use shade structures over all windows and external doors;
- naturally ventilate roof spaces;
- provide for covered outdoor living areas;
- avoid long walls along western boundaries.

**P17** Fences are of semi-open construction for breeze penetration.

**P18** Trees and vegetation provide as much shade as possible both on-site and on-street.

## Acceptable Solutions (continued)

AND

**A15.2** All habitable rooms are naturally ventilated, with a minimum openable area of 15% of the floor area of that room.

AND

**A15.3** All external openings are protected from direct sunlight by permanently fixed shade devices.

AND

**A15.4** Roof spaces are ventilated with louvre openings (eg gable end) or by roof-mounted ventilators (subject to Cyclone Code).

AND

**A15.5** Verandahs and balconies are provided and are not less than 10 $m^2$ with a minimum dimension of 2.5 m, and are covered for a minimum of 30% of their area.

AND

**A15.6** Roofs are lightweight and light-coloured, and roofs and walls are insulated to at least the level recommended in AS 2627.1-1993.

AND

**A15.7** A vapour barrier membrane is installed on the outside of the bulk insulation. Perforated breather paper is installed in all other walls (to restrict

## Performance Criteria (continued)

**In hot–arid climates**

**P19** Buildings incorporate courtyards with summer shade and vegetation.

**P20** Buildings are designed to provide midday shade all year round but with some early morning solar penetration.

**P21** Buildings are sited to maximise the use of cooling breezes.

**P22** Buildings are designed to:

- minimise the need for mechanical cooling;
- maximise cross-ventilation;
- use shade structures over all windows and external doors;
- naturally ventilate roof spaces;

## Acceptable Solutions (continued)

condensation buildup).

AND

**A15.8** Lightweight materials are used in buildings in the most northern and hotter regions, particularly within bedrooms.

**In hot–arid climates**

(in partial satisfaction of P19–P23)

**A19.1** Buildings and landscaping are sited and designed to provide shade to walls and the roof all year round.

AND

**A19.2** Courtyards are provided with summer shade and vegetation.

AND

**A19.3** Walls to living areas are constructed using materials of high thermal mass and walls to bedrooms are constructed using materials of low thermal mass.

AND

**A19.4** Buildings are sited to maximise available cool breezes.

AND

## Performance Criteria (continued)

- provide for covered outdoor living areas;
- avoid long walls along western boundaries.

**P23** Trees and vegetation provide as much shade as possible both on-site and on-street.

## Acceptable Solutions (continued)

**A19.5** Buildings are designed with openings on opposite or adjacent walls for cross-ventilation.

AND

**A19.6** All habitable rooms are naturally ventilated, with a minimum openable area of 15% of the floor area of that room.

AND

**A19.7** All external openings are protected from direct sunlight by shade devices.

AND

**A19.8** Roof spaces are ventilated with louvre openings (eg gable end) or by roof-mounted ventilators and are bulk insulated.

AND

**A19.9** Verandahs and balconies are provided and are not less than 10 $m^2$ with a minimum dimension of 2.5 m, and are covered for a minimum of 30% of their area.

AND

**A19.10** Roofs are lightweight and light-coloured, and roofs and walls are insulated to at least the

## Performance Criteria (continued)

## Acceptable Solutions (continued)

level recommended in AS 2627.1-1993.

AND

**A19.11** A vapour barrier membrane is installed on the inside of the bulk insulation in order to restrict condensation buildup.

AND

**A19.12** The house is designed with a longer east–west axis.

AND

**A19.13** Windows are located on the north and south walls only.

# Element 5.11
Dwelling Entry and Interior

## Need

Traditionally, the planning approvals system has had little to do with the internal arrangement of rooms in a dwelling. This Element has been included to promote successful indoor/outdoor spaces, along with flexibility of design.

As the density of housing development increases, the maintenance of acceptable indoor/outdoor relationships becomes more crucial. With larger sites there are generally more connections between indoors and outdoors. On more restricted sites, however, it is reasonable to seek a close relationship between the main living areas and private open space of the dwelling.

Additionally, as demand for a range of housing increases, differing design requirements must be recognised and housing stock must be flexible enough to meet current and future needs.

While not all dwellings need to be designed with this flexibility, a range of house floorplans should be provided in multi-unit housing developments, particularly when the market for the dwellings will include a range of household types.

AMCORD includes PND 21: Design for Different Lifestyles, as a further reference source.

## Entries

The entry to each dwelling should be clearly visible, and easily identifiable from public areas. Entries should be designed to give each dwelling an individual identity and preferably incorporate a transitional space such as a porch or front verandah. They should also be accessible at ground-floor level to people with limited mobility, or be easily convertible.

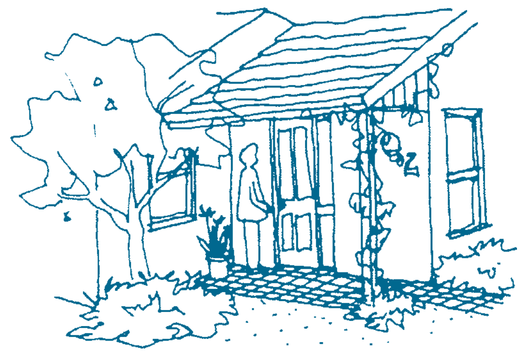


**Figure 1: Dwelling entry designed for individual identity and security.**

## Flexibility of Interiors

The detailed layout of each dwelling should be designed for security and safety, and be adaptable to different household types and lifestyles.

Dwellings for singles should provide flexible living spaces which are suitable for a range of functions and furniture arrangements.

In larger dwellings, flexibility can be improved by providing two or more larger bedrooms of similar size, and separate kitchen or dining and living rooms. Such layouts provide for sharing singles, single-parent families, or those with young adult or elderly dependants, as well as providing opportunities for people to work from home and for a range of cultural requirements. Bedrooms can also be used for study, entertaining or storage. Flexible spaces allow different activities to occur harmoniously within a household while layouts which arrange rooms off a central circulation space provide choice between interaction and privacy.

Dwellings designed for single people may contain more open-plan living spaces suitable for a range of functions. The design should include an area for a guest to sleep and a bathroom accessible to the living/circulation space.

Dwellings designed for elderly people (with or without disabilities) should generally have ground-level access with barrier-free access for wheelchairs. There should also be adequate areas for furniture (often larger pieces) and memorabilia, and for their display and personalisation. Security alarm systems are also important.

## Accessibility

Main private outdoor spaces should generally be accessed from living rooms. Exterior doors should be protected from the weather.

Multi-dwelling living can be enhanced by design that ensures main rooms are accessible for large items of furniture, and by architectural treatment that provides a feeling of space and visual links between interior and exterior.

## Storage

Adequate internal storage space is essential to ensure the attractiveness and livability of multi-dwelling developments. Storage areas can also be provided within garages and carports.

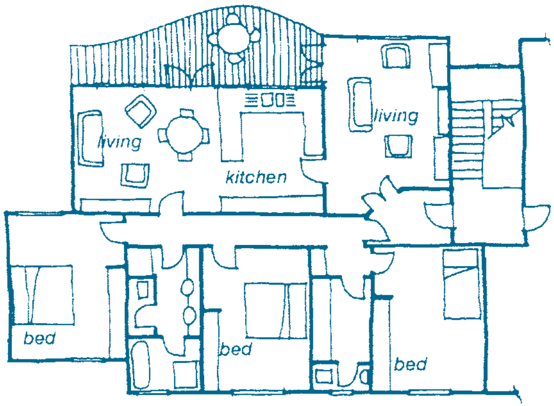



**Figure 3: Flexible layout for two or more independent householder—two or more bedrooms should be of similar size and amenity. Privacy and noise control between rooms can be provided by location of utility rooms and built-in wardrobes. Passages provide for movement without interrupting living activities.**

## Design Checklist

Some of the questions applicable to the design of housing solutions include:

- Is there a variety of housing forms and sizes, as well as internal housing layouts and fittings, provided in multi-dwelling projects?
- Are there sufficient internal and external spaces to safely accommodate children's play?
- Are the rooms' size and shape flexible enough for day and night-time uses, work spaces, sleeping or living areas?
- Can internal spaces be divided into areas with a measure of privacy between them?

# Element 5.11
# Dwelling Entry and Interior

## Intent

To provide dwelling entries that create a sense of individual identity and offer adequate personal security for residents, and provide internal dwelling layouts to suit projected user requirements.

## Performance Criteria

The intent may be achieved where:

**P1** Entries to dwellings:

- are clearly visible from streets or internal driveways so that visitors can easily identify a particular dwelling;
- give the resident a sense of personal address, shelter and transitional space around the entry;
- help provide a level of security for the occupants.

**P2** The dwelling layout ensures:

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in partial satisfaction of P1)*

**A1.1** Entries to dwellings enable visitors to be seen from inside the dwelling without opening the door.

AND

**A1.2** Shared entries, such as semi-interior or interior stairways, corridors or balcony walkways, are limited to service a maximum of eight dwellings.

## Performance Criteria (continued)

- general surveillance of the site and approaches to entries is possible from inside dwellings;
- ground-floor dwellings are accessible to people with disabilities or can be easily modified to achieve this.

**P3** Dwellings are planned so that:

- noise transmission between them is minimised by not locating the noisy areas of one dwelling next to the quiet areas of another;
- circulation areas are minimised, and floor plans ensure that circulation space facilitates functional use of rooms;
- views and outlook are maximised, particularly from living rooms;
- internal storage space is included;
- direct or convenient access from a living area to private open space is provided.

**P4** Internal layout of dwellings designed for more than one person is adaptable to a range of household types, by maximising potential for personal space and privacy through:

## Acceptable Solutions (continued)

*(in partial satisfaction of P3)*

**A3** Garages are located away from bedrooms of adjacent dwellings.

## Performance Criteria (continued)

- providing more than one larger bedroom (suitable to fit a double bed);
- separating bedrooms from each other with bathrooms or other rooms, or locating them next to walls with minimum noise transmission;
- providing more than one living space or a living-dining space that can be functionally divided;
- arranging rooms off a central circulation space connected to the entry.

**P5** Detailing of dwellings ensures that:

- window design and location contribute to a sense of spaciousness and connection with the outdoors, while enabling control for ventilation and security;
- room shapes and dimensions allow flexibility in use and furniture arrangement;
- entries, doors and passageways are wide enough to allow for furniture movement and wheelchair access.

## Acceptable Solutions (continued)

# Element 5.12
Site Facilities

## Need

The main grouped or shared facilities in multi-unit housing developments requiring design attention are:

- mail boxes
- garbage collection areas
- external storage
- clothes drying areas.

## Mail and Garbage Collection

Poorly designed or unattractive mail and garbage collection areas can spoil an important ‘front door’ image of multi-unit housing. Misuse of garbage bin collection areas can also cause amenity problems, such as smell and unsightly rubbish concentration.

Fortunately, garbage collection practices have changed over recent years, and there is usually no longer a need for formal structures at the front of the site. In large housing projects, the service provider has, on occasions, been willing to enter the site for door-to-door collection.

Suggested design considerations for mail and garbage collection structures are:

- Integrate collection areas visually and physically with other built elements such as fences, walls, buildings and garages.
- Use fencing or landscaping to screen containers.
- Restrict the size of fenced rubbish/garbage bays to discourage dumping of material other than household garbage. At the same time ensure space for recycling in accordance with the local authority’s recycling programs.
- Locate garbage collection containers, if they have to be provided, near windowless end walls, and in the least visually obtrusive positions.
- Provide a water tap and drainage.
- Preferably provide individual mail boxes located at the most convenient entrance point for each resident.
- Ensure that individual or grouped mail boxes

are visible from some of the dwellings, and that they are sturdy, fitted with a strong lock and designed to receive mail easily.

## Storage

Lack of adequate private or communal storage is a frequent cause of dissatisfaction with multi-unit housing developments. For example, where there are dwellings with entrances at first-floor level and above, a lack of ground-floor communal storage may force residents to bring upstairs such bulky items as bicycles, prams, shopping trolleys or large recreational equipment.

It is generally expected that there will be a preference for private storage over communal storage. This requirement may be met by providing a slightly larger garage or a lockable storage unit at the end or side of a carport. Garage roof space can also be used. Other design options include:

- where appropriate, providing lockable storage near the entry for above-ground units (for bicycles, prams, strollers etc);
- providing lockable weatherproof storage for large items, such as garden equipment and materials.

## Clothes Drying

It is important to allow residents to hang clothes to dry in an open, preferably sunny and breezy part of a site. This will generally be valued by residents and will also help to conserve energy by providing an alternative to electric driers. The clothes drying area should also be located in a secure place away from public spaces and screened from public view.

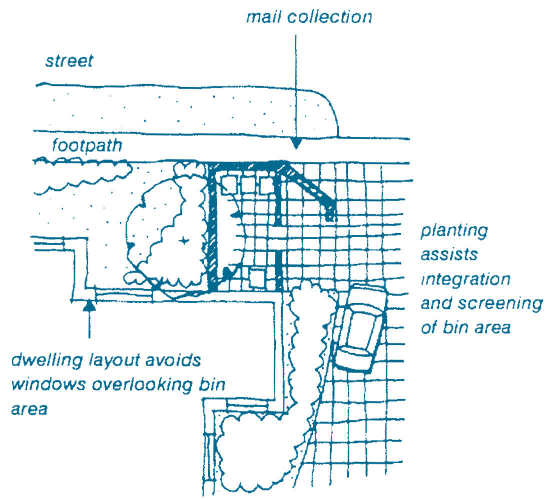



**Figure 1: Mail and garbage collection areas, where provided, should be integrated with building and landscaped areas.**

# Element 5.12
# Site Facilities

## Intent

To ensure that site facilities provide easy access to dwellings, are visually attractive, blend in with the development and street character, and require minimal maintenance.

## Performance Criteria

The intent may be achieved where:

**P1** Garbage bin areas, mail boxes and external storage facilities are sited and designed for attractive visual appearance and function, and complement the architecture and environs.

**P2** Garbage bin areas are designed for efficient and convenient use.

**P3** Site facilities enable collection of recyclable materials.

**P4** Site facilities include parking for bicycles according to projected user needs.

**P5** Mail boxes are located for convenient access by residents and deliverers, in a location visible from some dwellings on the site.

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in partial satisfaction of P5)*

**A5** Individual mail boxes* are located close to each ground-floor dwelling entry, or a mail box structure is located close to the major pedestrian entrance to the site.

## Performance Criteria (continued)

**P6** Dwellings are provided with adequate storage areas and external clothes drying facilities.

## Acceptable Solutions (continued)

**Australia Post mail delivery requirements apply.*

**A6.1** A space of 8 $m^3$ per dwelling is set aside exclusively for storage. This space may form part of a carport or garage.

AND

**A6.2** Open air, communal clothes drying facilities are easily accessible to all residents and visually screened from public streets and from communal streets and recreational areas.

# Element 5.13
## Housing on Traffic Routes

### Need

Major roads have significant traffic volumes which generate noise and air emissions. They also provide access to other roads and various land uses, and play a major role in shaping the character and image of an area or city. Increasingly, policy makers are advocating that land next to major roads offers opportunities for housing development. They stress the proximity to public transport and accessibility to a range of other services and facilities.

These opportunities may be taken up by planning authorities when formulating policy, and by developers and designers when proposing development schemes. It will then be necessary to recognise and design for the attendant impacts of traffic, while satisfying a range of other objectives relating to function, character and occupant comfort.

### Site Planning

There are several site planning techniques that can be adopted to minimise the impact of noise

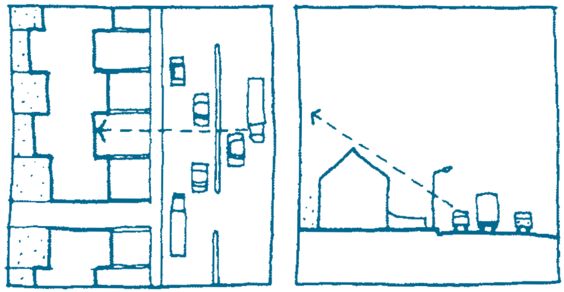


**Figure 1: Using buildings as a barrier to noise.**

from traffic. The most obvious is to maintain considerable distances between the source of the noise and the dwelling. Usually lack of space limits this option. Other measures include siting the building downhill from the noise source, or using the continuous 'wall' of buildings as a noise barrier with minimal or no gaps between buildings. Buildings positioned at an angle to the noise source should be avoided; balconies, offsets and landscaping can be used to reduce inter-reflection between parallel buildings.

It is also preferable to have a lot layout which does away with the need for vehicles to reverse on to the major road and, ideally, limits the number of individual access points on to a major road. The treatment of the interface between the development site and the road needs to respond to such issues as access, pedestrian movement,

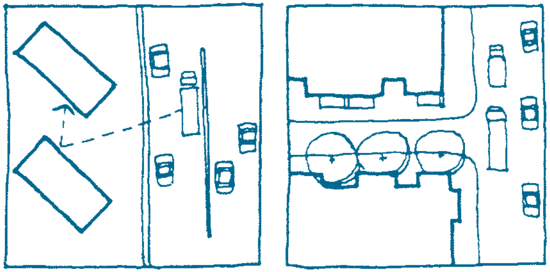


**Figure 2: Angled buildings can reflect noise on to other buildings. Balconies, offsets and trees can reduce inter-reflection between parallel buildings.**

surveillance and public interaction, and streetscape and visual appearance. The importance of these issues will vary according to the characteristics and function of the major road.

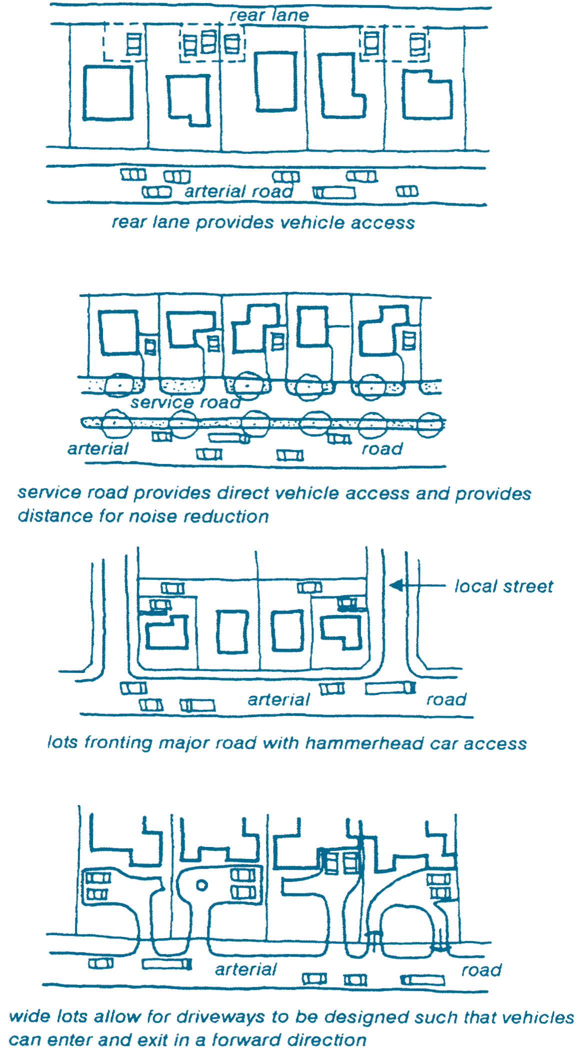



**Figure 3: Various methods for limiting direct access to major roads and allowing vehicles to enter and exit in a forward direction.**

## Landscape and Open Space

Landscaping provides minimal resistance to noise but can perform an important psychological function by visually screening the source of the noise and providing a sense of separation. It can also filter some of the large air-borne particles generated by traffic. Private and communal open space associated with residential dwellings should be shielded from the road by the building.

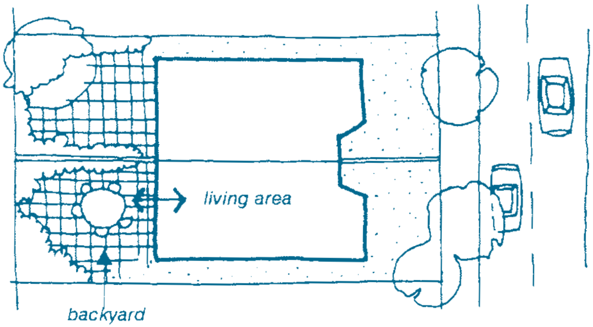



**Figure 4: Using the building to screen private open space.**

## Fences and Walls

High, continuous fences or walls of solid or heavy construction with minimal gaps and solid, well-sealed gates can be effective in screening some noise from passing traffic. However, such a wall will also prevent resident surveillance of the street, and provide a visual screen for intruders. This can be alienating to pedestrians and detract from streetscape character, as well as unnecessarily separating neighbourhoods and concealing houses and entrances. Lower walls (up to 1.2 m) of similar construction can block some noise without compromising other objectives, but are not recommended if noise levels are high.

Higher side boundary walls forward of the building line can reduce noise at the facade of a building by reducing the angle of view to the source of noise. Reflective side walls will negate the benefit, and therefore vegetation in the form of creepers or non-reflective materials should be used to reduce reflection.

**Figure 5: A low front fence will block some noise and allow interaction and surveillance.**

## Building Design and Construction Techniques

Form, layout and construction techniques can assist in creating acceptable living environments. One of the most effective techniques locates the living areas or most noise-sensitive rooms (lounge, dining and bedrooms) away from the noise source. This usually results in the service rooms and areas being located closest to the noise source to act as a buffer. Consequently careful attention must be paid to the design and appearance of the building's facade to achieve human scale and proportion.

In multi-level housing, balconies and balustrades facing the noise source can provide a useful screen for large openings. Balcony materials should be selected to absorb and block noise (eg noise absorptive materials lining the underside of balconies).

There are a number of noise resistant construction techniques that can limit the infiltration of noise into buildings. The essential elements of these techniques are the:

- mass and material of the wall;
- proportion of openings, such as windows and doors, to solid wall;
- design and construction materials of windows, especially double glazing;
- difference between the noise insulation of the wall and the openings;
- extent of cracks and gaps in the facade facing the noise source.

There may be conflicts between satisfying certain noise attenuation objectives and other design objectives. In such circumstances the designer and planning authority must decide which objective is the most important.

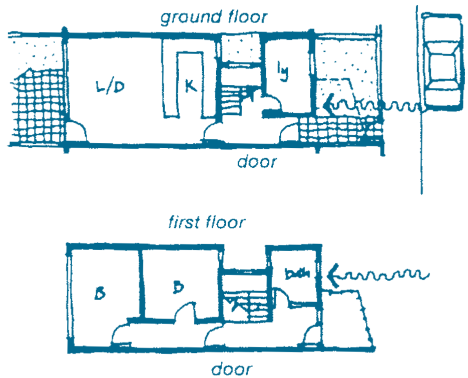



**Figure 6: Service rooms located close to the noise source can protect other more often used and noise-sensitive rooms.**

# Element 5.13
# Housing on Traffic Routes

## Intent

To ensure that housing located next to major roads is designed and constructed in a manner that reduces the adverse impact of traffic and leads to attractive streetscapes, functional roads and comfortable living conditions.

## Performance Criteria

The intent may be achieved where:

**P1** Buildings are sited in a manner which:

- minimises the infiltration of noise into the buildings and the lot;
- provides an acoustic barrier for private and communal open space;
- reduces reflection of noise on to other buildings;
- precludes the need to reverse on to a major road (for new lots and where the nature of an existing lot makes this possible).

**P2** Front fences and walls are designed to:

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

*(in partial satisfaction of P1–P8)*

**A1** Buildings are constructed in accordance with Australian Standard 3671: Acoustics—Road Traffic Noise Intrusion, Building Siting and Construction, and Australian Standard 2107: Acoustics—Recommended Design Sound Levels and Reverberation Times for Building Interiors.

| **Performance Criteria (continued)** | **Acceptable Solutions (continued)** |
|---|---|
| • supplement the noise control of the building facade;<br>• enable some outlook to the street;<br>• highlight entrances;<br>• provide continuity and visual interest to the streetscape.<br><br>**P3** Higher side boundary fences and walls are designed or treated to reduce the angle of view to the noise source and minimise reflection on to the facade.<br><br>**P4** The room layout within buildings is arranged to reduce the impact of noise on the rooms which are most sensitive to noise (eg bathrooms, hallways/stairways, storage rooms, garages).<br><br>**P5** Balconies and other external building elements are located, designed and treated to minimise infiltration and reflection of noise onto the facade.<br><br>**P6** The building plan, walls, windows, doors and roof are designed and detailed to reduce intrusive noise levels.<br><br>**P7** The integrity of the wall as a barrier to noise is maintained while providing adequate cross-flow | |

## Performance Criteria (continued)

ventilation and allowing natural light to penetrate the building.

**P8** The design and appearance of the facade of the building facing the traffic route achieve human scale and proportion, and reflect and reinforce the desired residential character of the area.

**P9** Landscaping is designed which:

- provides a sense of separation between the road and the private living environment;
- is durable and suited to the conditions of the road environment.

## Acceptable Solutions (continued)

# **Element 5.14**
# Bushfire Protection

## Need

Increasingly urban development is encroaching upon areas at risk from bushfires. The tragic consequences of past bushfires throughout Australia indicates a continuing need for planning authorities to limit development in high-risk areas. If dwellings are permitted in such areas, both passive and active protection measures must be adopted. Siting, layout, design and construction of building and landscaping should reduce the impact and damage of bushfires.

The climatic, vegetation and topographic variations throughout Australia produce different conditions and bushfire characteristics. It is therefore essential that the authorities responsible for bushfire management in each State and the local authority are consulted on specific initiatives that are suited to their prevailing circumstances and to the circumstances of the site (most states have their own published guidelines.)

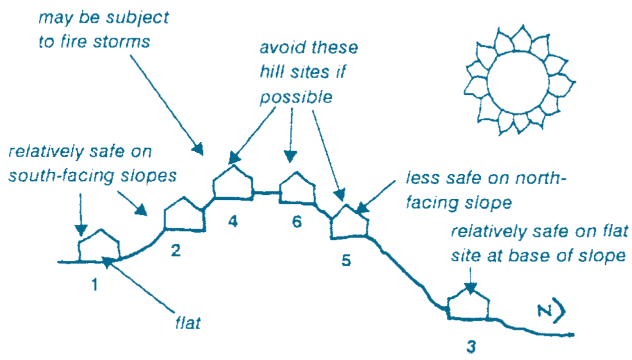



**Figure 1: Relative risk from bushfire according to siting (check local conditions).**

## Siting Considerations

In general terms, fires burn more quickly and with greater intensity up slopes. Sloping sites with a northerly to westerly aspect are also more prone to bushfires, and gullies tend to modify wind direction causing turbulence and erratic fire behaviour. These factors need to be considered in conjunction with other natural and built site characteristics, including the location and type of vegetation, wind breaks, sources of water and access points. Knowledge of the history and behaviour of bushfires in an area should also be used to determine appropriate lot layout and preferred housing sites.

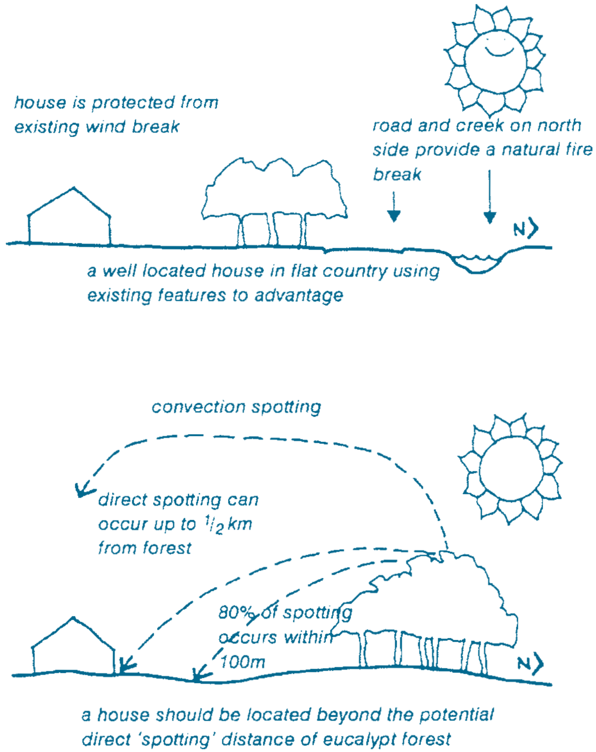



**Figure 2: Appropriate site layout incorporating protection measures.**

Where houses must be constructed on sloping land, then they should be built on cut-in benches rather than elevated or above fill (subject to steepness and soil stability). Location within or immediately next to stands of native vegetation should be avoided, as considerable clearing may be needed to reduce the bushfire hazard.

Subdivisions should be designed so that there is a cleared buffer area (ie reduction in flammable materials) between the lots and the potential hazard. The danger may lie in direct flames, radiant heat or wind-borne sparks and embers. The intensity and heat generated by a fire is influenced by factors such as moisture content, oil content, mineral content, radiant heat and slope.

## Road Design

When roads are designed for a subdivision with a bushfire hazard, access should be provided for fire fighting and for evacuation by residents. It is preferable to provide for at least two different access options and to avoid culs-de-sac. The location of roads should also avoid dense stands of vegetation and steep terrain. Roads should be all-weather and sufficiently wide to accommodate fire fighting vehicles. If culs-de-sac are used, there should be space for fire fighting vehicles to turn.

## Site Layout

Within individual allotments the dwelling, driveways, outbuildings and landscaping should be located to reduce the potential hazard. This is sometimes referred to as establishing a building protection zone, which can be achieved by using paths, driveways, lawn and deciduous trees; locating known fire risk substances well away and to the south (check local conditions) of the dwelling; and using radiation shields such as hedges or solid fences. The building protection zone should allow access to and around the house and outbuildings, and egress to the south or east if required.

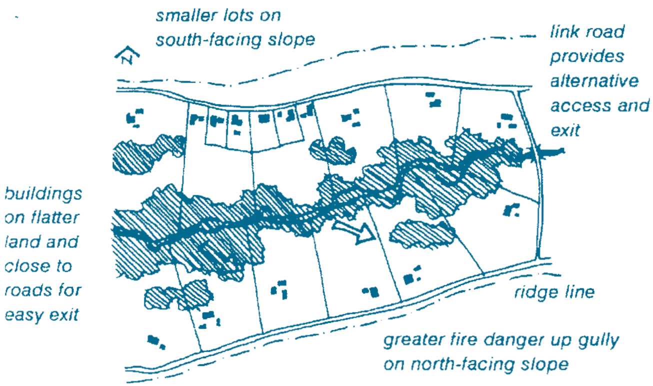



**Figure 3: Road design, siting and lot layout in bushfire-prone areas.**

## Water Requirements

Each State's fire fighting authorities will have specific requirements regarding the amount of water to be retained for fire fighting and the diameter of outlets to allow connections to fire hoses or the filling of tankers. Generally this supply should be independent of the reticulated mains water service and should be provided with an independent back-up pump driven by a small petrol or diesel motor.

In some bushfire-prone areas an external sprinkler system should be installed, either roof-mounted or in-ground. The system must be designed to ensure that water is thrown over both the walls and roof of the buildings.

## Building Design

Several building design and material selection measures can maximise resistance to fire. A fire-resistant building should demonstrate the following design criteria:

- The external structure should provide a barrier to sparks, flames and radiation.

- Vented spaces (eg under the floor, roof or ceiling) should be avoided as far as possible.

- Exterior surfaces should be non-flammable.
- Roof forms should be kept simple and not provide areas where flammable material can accumulate.
- Roof gutters should be avoided if spare rainfall collection capacity exists.

## Landscaping

The planting and management of vegetation around a dwelling can reduce the potential fire damage through:

- reducing wind speed;
- reducing fire spread;
- deflecting and filtering wind-borne sparks;
- providing shelter from radiant heat.

Careful attention must be paid to species selection, location and ongoing maintenance. Management of vegetation for fire protection should involve:

- selecting species that will not readily ignite and burn fiercely;
- locating plants away from buildings and avoiding the creation of a continuous canopy;
- regularly cleaning up and removing flammable fuels.

A more open landscape should be adopted on the northern and western sides of the dwelling (check local conditions).

## References

Most State Governments have produced policies and guidelines relating to the design of houses in bushfire-prone areas (see References).

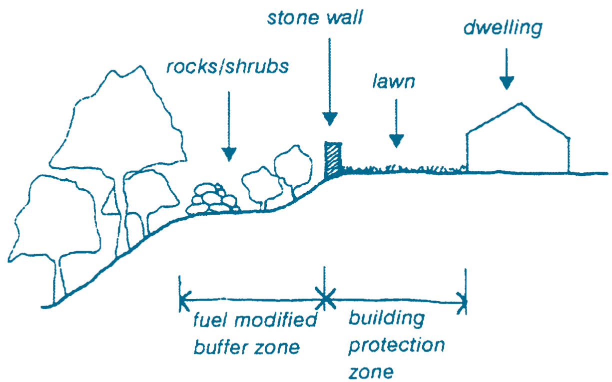



**Figure 4: Indicative example of a fuel-modified buffer zone or building protection zone for an existing house backing on to fire source.**

# Element 5.14
# **Bushfire Protection**

## Intent

To reduce the level of fire risk associated with building in bushfire-prone areas by adopting suitable passive and active protection measures relating to siting, layout, design and construction techniques, and landscaping.

## Performance Criteria

The intent may be achieved where:

**P1** Building design and materials are selected to maximise resistance to fire.

**P2** In moderate and high-risk bushfire areas an external sprinkler system is fitted to protect the walls and roof of a dwelling.

**P3** Each dwelling site is provided with a safe and secure water supply for fire fighting and protection.

**P4** Landscaping is designed to provide protection to buildings and not increase the level of bushfire risk.

**P5** The site layout of buildings, paths and landscaping creates a building protection zone and allows for ease of access to and from

## Acceptable Solutions

The Acceptable Solutions illustrate ONE WAY of meeting the associated Performance Criteria.

**A1** Buildings comply with the Building Code of Australia requirements for construction in bushfire-prone areas, and with relevant State or local authority regulations.

## Performance Criteria (continued)

dwellings and other buildings.

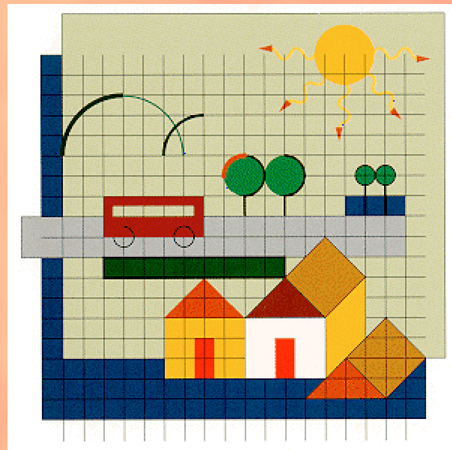
**P6** Land division and housing development are prevented in high-risk bushfire areas (subject to zoning regulations).

**P7** The land division is designed to provide for a fuel-modified buffer area and the creation of building sites that minimise the risk of fire.

**P8** The road layout, design and construction take account of the needs of emergency vehicles and possible evacuation.

## Acceptable Solutions (continued)

# Reference material



# Acknowledgements

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There have been many contibutors to the various AMCORD documents and assistance has been provided by Commonwealth, State, Territory and local governments, the housing and land development industry, professional institutes and organisations and individual submissions.

## AMCORD Study Team

AMCORD: *A National Resource Document for Residential Development* (AMCORD), is a major review, development and amalgamation of AMCORD Ed 2 and AMCORD URBAN, which was undertaken between late 1993 and November 1995.

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**Urban Reform Working Group**

The Urban Reform Working Group (URWG) was established in mid-1993 to advance urban reform by promoting well-designed, land-efficient and ecologically sustainable urban development. One of its main tasks was to oversee the refinement and implementation of AMCORD, and the dedication of members, past and present, in the achievement of this task is greatfully acknowledged.

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**State/Territory Advisory Groups**

As part of the development and review of AMCORD during 1994/1995 (which involved amalgamating and reviewing AMCORD Ed 2 and AMCORD URBAN) State and Territory Advisory Groups were established comprising government, industry and professional representatives.

The assistance of members of these Groups, together with that of members of former advisory and technical groups, working groups and steering committees involved in developing AMCORD Ed 2 and AMCORD URBAN is greatly appreciated.

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Page 97: Hans Westerman

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Page 133: Peter Jensen

Page 147: Queensland Department of Housing, Local Government and Planning

**Previous Documents**

A preliminary draft of the amalgamated AMCORD document was prepared by the key contributors to AMCORD URBAN, namely Hans Westerman (Principal Consultant), Geof Nicol (Principal Planning Consultant) of Insite Consultants Pty Ltd and Anne Dunlop (Principal Urban Design Consultant) of Environs Consulting Pty. Ltd.

**AMCORD URBAN**

AMCORD URBAN was prepared by:Hans Westerman (Principal Consultant), Anne Dunlop (then with Loder and Bayly Pty Ltd) and Geof Nicol, (Insite Consultants Pty Ltd).

Engineering advice was provided by Gutteridge Haskins and Davey Pty Ltd in association with

Professor John A Black (University of New South Wales) and Ms Susan Thomson, environmental design advice was provided by Hassell Pty Ltd in association with Ms Susan Thomson, economic and social aspects were provided by Scott Carver Pty Ltd, and security and design advice was provided by Wendy Sarkissian of Sarkissian and Associates Pty Ltd.

Additional support was provided by Carolyn Stone, Rosslyn Creighton, John Mant, Ted Hall and Quentin Shaw.

**AMCORD Ed. 2**
AMCORD Ed. 2 was prepared under the auspices of the Green Street Joint Venture, formerly the Joint Venture for More Affordable Housing, through the Model Code Task Force.

It was brought together and documented by a team led by Professor Hans Westerman (also Chair of the Task Force), and including Barrie Howe (Project Officer for the former Department of Industry, Technology and Commerce), and Geof Nicol (of Insite Consultants).

AMCORD Ed. 2 was a development of Edition 1 of the Model Code, which was based on four major research projects:

“Background Material for a Model Code of Practice for Residential Land Development” by Scott & Furphy Consulting Group in association with Loder and Bayly (June, 1987);

“Research Study of Siting Related Issues of Residential Development” by Gutteridge, Haskins and Davey Pty Ltd in association with Professor Thorn, Dr Munro-Clark and with surveys by AGB:McNair (March, 1989);

“Research Study into Road Networks and Characteristics in Residential Subdivision” by Pak-Poy and Kneebone Pty Ltd in association with Wallace Planning Consultants (May, 1989);

“Research Study into Drainage Management in Residential Subdivision” by the Scott & Furphy Consulting Group in consultation with Econsult Planning and Development Services (April, 1989).

Edition 2 was based on further research, including:

“Research Study into Design and Siting Requirements for Small Allotments” by The Loder & Bayly Consulting Group (July, 1990);

“Solar Access to Small Allotments” by Solarch (August, 1990);

Design and siting considerations — Insite Consulting Pty Ltd;

Transport issues—Andrew O'Brien and Associates Pty Ltd;

Drainage issues—Scott and Furphy Consulting Group.

**Other Source Material**

Several codes prepared by the Victorian Government were used as source material in the review and development of AMCORD, including:

Victorian Code for Residential Development—Subdivision and single dwellings, 1992;

Victorian Code for Residential Development—Multi-dwellings, 1993;

The Good Design Guide for Medium-Density Housing, 1995.

# Glossary

**Acceptable Solution** means an example of what may enable the achievement of the relevant Performance Criteria (they should not preclude other solutions).

**Access lane** means a rear or side lane providing access to parking on lots with street frontage and/ or short connections between access places or access streets principally to facilitate movement of service and emergency vehicles.

**Access place** means a minor street providing local residential access with shared traffic, pedestrian and recreation use, but with pedestrian priority.

**Access street** means a street providing local residential access with shared traffic, pedestrian and recreation use with local traffic priority.

**AMCORD Ed. 2** means the Australian Model Code for Residential Development Edition 2, 1990.

**AMCORD URBAN** means the Australian Model Code for Residential Development: Guidelines for Urban Housing, Edition 1, 1992.

**Apartment** means a form of residential building where one dwelling is located above another.

**Approved construction standard** means any specification document as described by the words approved construction standard adopted by the Responsible Authority and which outlines the standards of construction for pedestrian paths, bicycle paths and streets. Approved construction standard also includes geometric design standards where not otherwise specified in these provisions.

**AS** means Australian Standard.

**Balcony** means any balustraded platform, 0.3 metres or more above adjacent finished ground level, either cantilevered or supported over open space, with access from the building via a door or window and with a minimum width of 1 metre.

**BCA** means Building Code of Australia.

**Building envelope** means a diagram drawn on a lot of a subdivision plan to the requirements of the Responsible Authority defining the limits for the siting and/or wall height of any dwellings and/or outbuildings, private open space, driveways and/or garages/carports.

**Building height** means the distance between natural surface level of the ground and the apex of a building's roof, but not including any receiving antennae, chimneys or flues.

**Carriageway** means the area of street reserve which is provided for the movement or parking of vehicles and determined by the invert of a kerb and channel and the point adjacent to the pavement edge for kerb (only) and edge strips.

**Categorisation** means a process where 'bundles' of Design Elements are related to commonly used categories of development.

**Clear to the sky** means open to sky, or a roofing material that has 90 per cent light transmission.

**Communal car park** means a group of car spaces under the control of a body corporate or equivalent.

**Communal open space** means usable community open space for recreation and relaxation of residents of a housing development and which is under the control of a body corporate or equivalent.

**Communal street** means the carriageway providing access to a housing development and which is under the control of a body corporate or equivalent.

**Communal streetscape** means the streetscape within a multi-dwelling development, including carriageways, landscaped verges and fences and walls.

**Crossover** refers to the paved accessway between the carriageway of a street and a development site.

**dB(A)** means decibels of the 'A-scale' - a set frequency-weighted scale of noise which allows for lack of sensitivity of the ear to sound at very high and very low frequencies.

**Density** - refer to site density, net residential density, neighbourhood density, urban centre density and population density.

**Detached dwelling** means a separate house on an individual lot (with no shared land or facilities).

**Development Area** means an area identified as having potential for housing following strategic planning and study.

**Development contribution** is a fee or contribution charged against a development for the provision of infrastructure.

**Development Plan** means a plan which identifies the precise conditions for housing and other activities in a Development Area.

**Dwelling site** means the area set aside for the exclusive use of a dwelling.

**Environmental management** in the context of AMCORD involves:

- taking maximum advantage of the natural resources, such as land form, landscape, climate, water and energy resources;

- protecting residential areas and housing development from traffic noise, air, water and soil pollution, flooding and bushfires, and from natural or industrial hazards;

- minimising environmental problems, such as polluted urban run off and the disposal of domestic waste, associated with new residential development;

- minimising the use of non-renewable resources and the use of materials with high embedded energy

**Environmental traffic** capacity means the maximum number of vehicles that should be permitted to pass through a given environmental situation over time under prevailing environmental conditions.

**Established area** means an existing neighbourhood where the vast majority of land is developed.

**Flat or apartment** (including attached to a shop, office etc) includes one or more of the following:

- units constructed over the top of each other;

- shared communal open space in lieu of or as well as private open space;

- shared parking/access arrangements;

- attached to a detached dwelling (with shared access/site facilities).

**Frontage** means the street alignment at the front of a lot and in the case of a lot that abuts two or more streets, the boundary of which, when chosen, would enable the lot to comply with these provisions.

**Greenfields area** means a large area of land zoned for housing development located on the fringe of an urban area.

**Greywater** refers to domestic waste water from washing machines, showers, baths and dishwashing.

**Group or cluster housing** including townhouses, villas etc. means two or more dwellings on a site sharing part of the site for access and/or open space/site facilities (A dual occupancy comprising two detached houses on a site, with no sharing of facilities, would be classified as two detached dwellings. If they share a driveway they would then be classified as group/cluster housing).

**Habitable room** means a room used for normal domestic activities that includes:

- a bedroom, living room, lounge room, music room, television room, kitchen, dining room, sewing room, study, playroom and sunroom, but excludes:
- a bathroom, laundry, water closet, food storage pantry, walk-in wardrobe, corridor, hallway, lobby, photographic darkroom, clothes drying room, and other spaces of a specialised nature occupied neither frequently nor for extended periods.

**Height of a wall** at any point for the purpose of determining its setback from a boundary means the vertical distance between the top of the eaves at the wall line, parapet or flat roof (not including a chimney), whichever is the highest, and the natural ground level of the lot boundary at a point at right-angles to the wall. Where a skillion roof occurs the height shall be measured as the median height of the wall or when a triangular gable roof occurs, the heights shall be measured as the height of the wall together with one-third of the vertical height of the gable.

**Implementation planning** is the process of establishing guidelines and procedures to assist people who use the planning system, to facilitate the preparation and implementation of proposals and to improve their outcomes.

**Infill housing** is a general term used for new housing in existing residential areas and usually involving the use of a vacant site or the removal of an existing dwelling to enable construction of a larger number of dwellings.

**Informal surveillance** refers to the ability to casually observe an area to enhance the level of security.

**Integrated development** means a form of development where all elements of physical infrastructure are designed and developed in an integrated manner (ie land buyers are free to build houses in accordance with council requirements only).

**Integrated housing** means a form of development where:

- housing and associated facilities and infrastructure are planned, designed and built by the same developer or through a developer-builder combination; or

- a developer undertakes the site planning and development of infrastructure as well as establishing detailed requirements for building design without actually constructing the dwellings.

**Integrated residential planning** means the integration of residential planning and development within the broader context of community development.

**Intent** (or Element Intent) means a statement of the desired outcomes to be achieved in the completed development, relating to particular Design Elements.

**Landscape plan** means a plan or document outlining the extent, type and location of proposed landscaping and planting.

**Local area traffic management** means the process of planning and controlling the usage of streets within a local residential area to achieve goals, determined by affected parties, for the improvement of the residential environment.

**Local conditions** means conditions relating to a particular State or Territory, to a local government authority or to an area within a local government authority.

**Lot** means an area of topographical space shown on an approved plan of subdivision and on which it is intended to construct a dwelling or dwellings.

**Major collector street** means a street that collects traffic from surrounding access streets and/or minor collector streets and carries traffic volumes between 3000 - 6000 vpd.

**Minor collector street** means a street that collects traffic from surrounding access streets and carries traffic volumes up to 3000 vpd.

**Mixed-use sites** means an area or a number of sites which accommodate a variety of compatible land uses, arranged adjacent to one another or mixed vertically within a single building.

**Multi-unit dwellings (projects)** means the development of more than one dwelling on a site where facilities are shared (eg access, parking, communal open space/facilities).

**Multiple-use drainage systems** means the integration of drainage systems with public open space, taking into account water quality maintenance, water conservation and harvesting, habitat retention and enhancement, and a wide choice of recreational opportunities.

**Nature strip** refer to verge.

**Neighbourhood density** means the ratio of the number of dwellings to the area of the land (including associated neighbourhood or local facilities) they occupy. The area includes internal public streets, all areas of public open space, local or neighbourhood shops, primary and secondary schools, local community services, local employment areas, and half the width of adjoining arterial roads.

**Net residential density** means the ratio of the number of dwellings to the area of land they occupy (including internal public streets) plus half the width of adjoining access roads that provide vehicular access to dwellings).

**Noise attenuation zone** means the area within which measures should be taken to reduce the exposure of noise from external sources to acceptable levels.

**Parent site** means the entire area of land which is proposed to be used for a housing development.

**Performance Criteria** means criteria to be used in the preparation, submission and assessment of development proposals for measuring performance of the proposals against the Element Intent.

**Private open space** means an open area of land or building attached to a dwelling (eg balcony or roof garden) intended for the exclusive use of the occupants of the dwelling, and located and designed so as to offer visual privacy to the occupants.

**Public open space** means land used or intended for use for recreational purposes by the public and includes parks, public gardens, riverside reserves, pedestrian and cyclist accessways, playgrounds and sports grounds.

**Responsible authority** means the organisation responsible for administering a planning scheme or statutory plan, usually a local counci.

**Row or terrace house** means three of more attached houses (with common walls) each on their own individual lots (with no shared land or facilities).

**Semi-detached dwelling** means two attached houses (with a single common wall) on their own individual lots (with no shared land or facilities).

**Setback** means the minimum distance which a wall-face or window is required to be from a property boundary or another window to a habitable room. It is measured as the horizontal distance between the proposed wall or window and the boundary or other window plus any amount greater than 600 millimetres that any eaves extends beyond the wall face.

**Shop-top housing** refers to buildings in which dwellings are located directly above retail or commercial premises.

**Site analysis** involves the identification and analysis of the existing urban character and adjacent properties to assist in understanding the locality and the development of a range of appropriate design responses.

**Site Analysis Plan** means a plan which demonstrates an appreciation of a site and its context to identify opportunities and constraints on site layout and design. The plan may include information on topography and services, existing buildings on site, vegetation on site, adjoining property conditions, views, noise sources and street character and context.

**Site coverage** means the area of a site covered by buildings (including carports), usually defined as a percentage.

**Site density** means the ratio of dwellings to the area of the site they occupy (including communal streets and communal open space).

**Site Development Plan** means a plan of a housing development showing its boundary conditions, orientation and access, response to streetscape, floor plan and elevations of the proposed buildings.

**Site** means the lot(s) of land on which a building stands or is to be erected.

**Social impact assessment/analysis** refers to the process whereby the likely or possible social effects of a development proposal are considered and the need for social facilities and services generated by a proposal is established.

**Social infrastructure** applies to services such as health, education and community services.

**Storey** means a space within a building which is situated between one floor level and the floor level next above, or if there is no floor above, the ceiling or roof above. It does not include a room contained wholly within the roof space or a parking area contained wholly within a basement which is below the natural ground level.

**Strategic plan** is a document which details a strategy for the future development of an area (usually one or more LGA's).

**Strategic planning** is a process in which the major elements determining the form, structure and development of an area are considered together and viewed in a long-term and broad perspective.

**Street alignment** means the horizontal shape of the street reserve boundary.

**Street** means any street, lane, footway, square, court, alley, right of way, driveway or passage incorporating the full width from property line to opposite property line as well as the street pavement and the verge.

**Street pavement** see Carriageway.

**Street reserve** means the land set aside for a street pavement and verge.

**Streetscape plan** means the portion of the development plan showing the visible components within a street (or part of a street) between facing buildings, including the form of buildings, setbacks, fencing, landscaping, driveway and street layout and surfaces, utility services and street furniture such as lighting, signs, barriers and bus shelters.

**Subdivision** means the division of a parcel of land into two or more parts for the purpose of enabling any of the lots to be disposed of separately in fee simple.

**Transit-oriented development** means development which is centred on transport nodes, with activity centres and higher residential densities located in close proximity to these nodes.

**Transport modes** means the method of travel whether by public transport, private vehicle, bicycle or on foot.

**Transport related impacts** means the effects of transport on an area, and can include traffic noise, air pollution and reduced safety.

**Travelled way** means that part of a carriageway that is used for travel and does not include portions of the pavement normally used for parking.

**Urban centre dwelling density** means the ratio of total dwellings in an urban centre to the area occupied by the urban centre.

**Verge** means that part of the street reserve between the carriageway and the boundary of adjacent lots (or other limit to street reserve). It may accommodate public utilities, footpaths, stormwater flows, street lighting poles and planting.

**Wall height** refer to Height of Wall.

**Weighting** means a process of determining priorities for various Design Elements and Performance Criteria in the consideration of designing and assessing development proposals.

**Window** includes a roof skylight, glass panel, glass brick, glass louvre, glazed sash, glazed door, translucent sheeting or other device which transmits natural light directly from outside a building to the room concerned.

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# AMCORD

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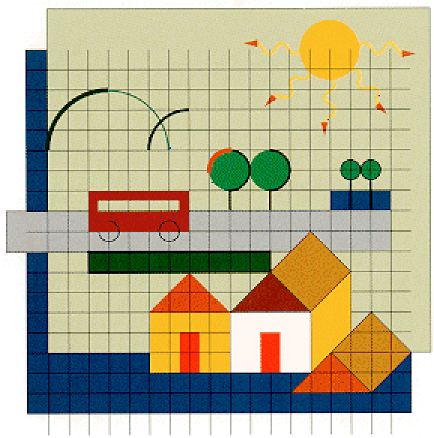
## Practice Notes



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