A Practitioners’ guide to managing the road environment and traffic routes through commercial centres

Sharing the main street

2nd Edition
February 2000

A Practitioners’ guide

Roads and Traffic Authority
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Sharing
the main street

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the road environment and traffic
routes through commercial centres

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Foreword

The early 1970’s heralded Australia’s first attempts at improving the safety and ‘livability’ of local streets as the usage of motor vehicles grew significantly. From these initial steps into environment- and safety- motivated traffic management, the focus of local area traffic management has expanded to include the improvement and enhancement of local centres or the ‘Main Street’ so that not only is safety a dominant factor, but so too, the quality of the road environment for all users within the community. Hence the advent of Sharing the Main Street and the need for the “Sharing the Main Street - Practitioners’ Guide”.

The previous 1993 edition of these Guidelines was a joint venture of the RTA and the Federal Office of Road Safety. At that time, the Guidelines were a significant first step, as no such document existed in this area. Subsequently, the Sharing the Main Street concept grew and the RTA encouraged the application of the principles for environmental adaptation by making grants available for local government authorities to carry out feasibility studies. Many local authorities took up this opportunity, further assisting in the development of the Sharing the Main Street concept.

A performance review of the Sharing the Main Street projects was undertaken in 1998. The Review was conducted by Hans Westerman, Emeritus Professor in Town Planning, University of New South Wales; with assistance from Professor John A Black, Professor of Transport Engineering, University of New South Wales; Milly Hawley, Principal of Geoplan, Sydney; and Chris Stapleton, Principal of Christopher Stapleton Consulting, Sydney. The Review showed that overall, there was a high level of satisfaction, perceived safety had improved, speeds were lower, crossing was easier, the quality of the environment was much better, and business had improved.

Each Main Street is unique, and as such, this Guide is aimed at providing information on the principles of environmental adaptation, rather than provide an exact method. The Review clarified that the main principles set out in 1993 remained valid. However, the new Guidelines are dynamic, having evolved from the first edition, to reflect current technical standards and requirements and the experience gained from the Review.

This second edition should be read in the context of current RTA directives and guidelines. The importance of up-front Strategic Planning, is reinforced and the Guide provides more information on design, as well as additional material on public transport, cyclists, the needs of mobility and visually impaired people, and more coverage of safety audits.

An interdisciplinary approach integrating a large number of skills and diversity of stakeholders is a vital mechanism in making these Guidelines a reality through a successfully implemented Main Street scheme. These schemes are designed to ideally be ‘self-enforcing’ so that speeds, crossing patterns and amenities contribute, amongst others, towards a safe and efficient centre for all road users.
The RTA intends these Guidelines to be used by Local Authorities (Councillors and Professional staff), Consultants, Public Authorities, Community groups and bodies such as the Traffic committee and Main Street committee. The RTA’s role in the Sharing the Main Street program is that of promoter of awareness of what latest tools are available to practitioners for the most appropriate safety and environmental adaptation of centres along sub-arterenal roads. The RTA encourages the use of the Guidelines in practice and has a role in ensuring the projects conform with its policies and Guidelines.

It is hoped that these Guidelines will be the next significant step in achieving the safe and efficient interaction of all road users in the Main Street environment.

Paul Forward
Chief Executive
Introduction
Introduction

What is Sharing the Main Street?

‘Sharing the Main Street’ means adapting the Main Street - or a centre along a sub-arterial road - to improve the safety and the quality of the road environment to all its users.

People using these areas have a range of needs:

- Pedestrians need to be able to cross safely and conveniently;
- Visitors need to be able to park;
- Motorists and cyclists need to be able to move safely through the centre;
- Businesses need to attract customers;
- Transport operators need space for loading and unloading;
- People with impairment need to be able to use the area safely and comfortably;
- The community needs an attractive and safe centre to visit and to meet; and
- Public authorities need to keep costs down.

The Main Streets of rural towns, and most sub-arterial roads, not only perform a traffic function, but also provide access to the activities along their frontage. Increased traffic has accentuated two major problems. One, the priority in the traffic function is impeded by the activities along the frontage - particularly in areas where there are high levels of parking turnover or many parking manoeuvres, turning movements and crossing pedestrians. Two, the activities along the frontage suffer from the impact of traffic noise and vehicular pollution, access to sites and difficulties for pedestrians who want to cross.

Environmental adaptation aims to resolve these problems by clarifying the relationship between the road and frontage activity functions and by formulating and implementing proposals to reduce conflicts between them.

‘Sharing the Main Street’ requires an understanding of, and support by, the people and organisations affected (the ‘stakeholders’), collaboration between different disciplines, and arrangements for implementation that may involve different government agencies.

Purpose and scope of the Guide

Each Main Street, or centre along a sub-arterial road, is different. Apart from a unique location and development history, there are differences in road reservation width, traffic volumes, traffic composition, proportion of through and local traffic, extent and type of frontage activity, built form, street design and many other factors.

The purpose of this Guide is to provide information on the principles of environmental adaptation and how they can be applied in a wide range of situations.
The focus of the Guide is on the preparation of conceptual design. The Guide does not address aspects of detailed engineering design, urban design, landscape design and development control.

**Structure of the Guide**

The Guide (Figure 4) has been structured as a practical guide to the planning, design and implementation of proposals for the environmental adaptation of Main Streets and centres along sub-arterial roads.

**Part 1**

sets out the issues to be considered in environmental adaptation, and the type of objectives and strategies needed to address them.

**Part 2**

deals with the range of situations that may occur and indicates which Parts and sections of the Guide may be relevant for different situations.

**Part 3**

addresses planning for environmental adaptation. This will be necessary only in situations identified in Part 2.

**Part 4**

explains the design for environmental adaptation and is relevant in all situations. A wide range of measures is available and the design process for combining these measures is described.

**Part 5**

provides information on assessment and evaluation. There are different approaches, depending on the scale and nature of the project.

**Appendix A**

provides details on the purpose, application and limitations of each of the measures.

**Appendix B**

explains how to construct an Assessment Balance Chart for more complex projects and how to use performance indicators.
Introduction

Context

Background

The original version of this document, published in 1993, was based on a research report prepared for the Roads and Traffic Authority of New South Wales (Westeman et al., 1989) and a study for the Federal Office of Road Safety (FORS) and the Road Safety Bureau of the Roads and Traffic Authority of New South Wales (RTA) (FORS, 1992).

The second edition is based on this original version and a review of its performance and effectiveness, undertaken by Hawley, Stapleton and Westeman for the Roads and Traffic Authority of New South Wales in 1998.

The 1993 document was a joint enterprise between the RTA and FORS and had a national distribution. The second edition is initiated and published by the RTA as an RTA document. It reflects current technical standards and requirements in New South Wales.

As a result there are differences between the two versions and this second edition should be regarded as the operative document in New South Wales.

The Guide in relation to the RTA's planning and management system

The RTA is in the process of developing a Traffic Calming Strategy for New South Wales. Key issues include:

- formalise the road hierarchy;
- effectively discourage and manage through traffic;
- encourage motorists to travel at speeds that are appropriate within the surrounding environment;
- maintain local accessibility;
- overall performance of traffic calming schemes;
- funding of traffic calming schemes;
- improve the access of public transport and emergency vehicles;
- encourage the use of State and Regional Roads; and
- integrate traffic calming schemes more closely with the adjacent land use.

One of the key objectives of the Strategy is to facilitate the consolidation of pedestrian activities into concentration areas within ribbon development shopping and town centres precincts. Eight strategies have been identified, all of which are incorporated in this Guide. It should be noted that the Guide goes beyond traffic calming and also addresses the causes of conflict and the land-use and transport strategies needed to reduce them.

The principles indicated in the Guide are unrelated to any legal road classification scheme (such as State Roads). Where there is a potential conflict between such a classification and the measures contained in the Guide, the scope for modifying the classification and applying the measures should be explored with the RTA.

The information contained in the various Parts is intended to be used as a guide to good practice. It is generally consistent with the Guide to Traffic Engineering Practice (Austroads, 1988), RTA Technical Directions and RTA Guidelines for Local Area Traffic Management Facilities.
Related programs

The Main Street/Small Towns Program is administered by the NSW Department of State and Regional Development (DSRD).

Its objectives are to:

- revitalise small and medium-sized communities outside the Sydney region;
- assist communities to develop a vision for their future and implement a practical community plan; and
- skill local people to make decisions about their community’s economic future.

Communities with a population over 1500 are eligible for planning assistance, and communities with a population over 1500 and less than 15,000 are eligible for co-ordinator and project funding at implementation stage.

Other programs

The focus is on business and enterprise development, marketing and promotion, technology and communication, and continuity in program implementation.

The Metropolitan Main Street program is another and recent initiative of DRSR. Its objectives are similar to the Small Towns program. From July 1998, metropolitan communities have been eligible to apply for assistance for planning and training towards the sustainability and revitalisation of their business areas.

The Department provides advice and resource materials to interested communities.

Integrating programs

There are advantages in integrating these programs with the Sharing the Main Street process of environmental adaptation (Table 1).

<table>
<thead>
<tr>
<th>Issues</th>
<th>Main Street Program</th>
<th>Sharing the Main Street</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic development</td>
<td></td>
<td>Traffic and safety</td>
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<tr>
<td>Social development</td>
<td></td>
<td>Parking</td>
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<td></td>
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<td>Quality of the environment</td>
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<table>
<thead>
<tr>
<th>Vision</th>
<th>What do we want to achieve?</th>
</tr>
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<tr>
<td>Strategies</td>
<td></td>
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<tr>
<td>Business activity</td>
<td>Land use</td>
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<tr>
<td>Tourism</td>
<td>Transport</td>
</tr>
<tr>
<td>Heritage</td>
<td>Built environment</td>
</tr>
</tbody>
</table>

| Development Planning    |                             |
| Business development plan| Concept plan               |
| Tourism promotion plan  | Development plan           |
| Heritage enhancement    | Detailed design             |

| Implementation          |                             |
| Action plans            | Reconstruction             |
|                         | Management of the road space |
|                         | Frontage development control |

| Monitoring and review   |                             |
| What did we actually achieve and can we do better? |

Table 1 Relationship between Main Street programs
Setting up a project

Organisation and management

The Guide is not an exact method to be followed rigorously. Each situation is different and judgement should be exercised in the light of the many factors which usually influence the choice of solution and detailed treatment.

It is important, therefore, to give careful thought to the organisation and management of the project, the interdisciplinary nature of it, the involvement of the many stakeholders and the development of a process which allows for progressive decision-making.

There usually are four main stages: planning, concept design, detailed design and implementation. An indicative organisation is illustrated in Figure 5. At each stage there is a need for assessment and evaluation, involving the active participation of stakeholders, reference groups and decision-makers.

For example, at the design stage, an interdisciplinary design team, consisting of, say, a planner, transport planner, urban designer and engineer, develops the initial concept, and consults with stakeholders and a reference group. After consulting with the Steering Committee (and the Council and RTA if required), the project proceeds to the next stage.

The composition of the team and the role each team member plays can vary with the stage of the project.

---

**Consultation**

- **STAKEHOLDERS**
  - shoppers
  - retailers
  - clubs
  - elderly
  - impaired people

- **REFERENCE GROUP**
  - Traffic committee
  - Main Street committee
  - Bus operator
  - Taxis
  - Service provider

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**Technical work**

- **Planning parameters**
- **Initial concept**
- **Initial design**
- **Final design**

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**Skills**

- **PLANNING TEAM**
  - Strategic planner
  - Transport planner
  - Engineer

- **CONCEPT TEAM**
  - Town planner
  - Transport planner
  - Designer
  - Engineer

- **DESIGN TEAM**
  - Urban designer
  - Transport planner
  - Design engineer
  - Development planner

---

**Decision**

- **STEERING COMMITTEE**
- **COUNCIL**
  - (& RTA)

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*Figure 5 An illustration of an organisational framework*
Issues, objectives, concept and process
1.1 Purpose

1.1.1 The purpose of Part 1

The purpose is to:

- examine the issues associated with the conflict between traffic and frontage functions;
- list the basic objectives;
- outline the concept of environmental adaptation;
- indicate the process; and
- stress the need to involve the stakeholders.

1.1.2 The focus

Most roads and streets have movement and frontage access functions. On some roads, the traffic function is dominant and the frontage activity functions must be adapted to this traffic function. These, typically, are arterial roads with major through traffic functions (‘Type I’ road/environments). On other roads and streets, the frontage activity function is dominant and the traffic is, or should be, subservient. These comprise residential streets and streets used for access and circulation within commercial centres. Local area traffic management is especially appropriate here (‘Type III’ road/environments).

The Guidelines are concerned with ‘Type II’ road/environments (Fig. 1.1). These are roads where both traffic and frontage functions are important - although their relative importance may change during the day, week or year (e.g. during peak hours or tourist seasons).

The Main Street of rural towns and sub-arterial roads in urban areas are examples of ‘Type II’ road/environments. The traffic functions consist of local and through vehicular traffic (including buses and cyclists) and pedestrian traffic, on-street parking and delivery, and parking manoeuvres. The frontage activity functions comprise the retailing, services and special buildings which attract people and their vehicles to the centre.

1.2 Issues

1.2.1 Understanding the critical issues

Environmental adaptation requires an understanding of the issues associated with the conflict between pedestrians and vehicles and the factors that are important in the management of the road space and its frontage.

There are four critical issues:

- the transport function
- the frontage function
- traffic management
- the road as a space.

Fig. 1.2 A typical Main Street (Ulladulla, before partial adaptation).

Fig. 1.3 A typical sub-arterial road (Archer Street, Chatswood).
1.2.2 Issues associated with the transport function

There are three types of vehicle movements which are relevant in Type II road/ environments: local travel; regional travel with a destination in or near the Main Street or sub-arterial centre; and through traffic. The local and regional traffic is the result of the service function of the centre and its relationship with its hinterland. In many rural towns, the main highway runs through the Main Street.

The roads may have been upgraded progressively and traffic volumes, speeds and heavy vehicles have increased. This has caused seven types of general problem (Fig 1.4):

- It becomes harder for pedestrians to cross the road safely
- There usually are few designated pedestrian crossings. “Mid-block” crossing or jay walking are common, and can be hazardous when roads are wide, traffic speeds and volumes are high, or vision is impaired. The incidence of jay running is a sign of a mismatch between vehicle flows and speeds and pedestrian desires to cross the street.
- Pedestrian safety is affected
- Vehicle speed is one of the critical factors in pedestrians crossing and correctly selecting safe gaps in the traffic stream. Below 25 km/h, accidents involving pedestrians are seldom serious, but above 50 km/h, fatalities often occur (Fig 1.5). Pedestrians misjudge vehicle speeds in excess of 50 km/h. The problem is aggravated when traffic volumes are high, there are few gaps in the traffic stream, there is no median to permit crossing in stages or there are many aged pedestrians (see Section 2.3.9).
- Air quality also is a factor
- Similar factors (with the addition of vehicle technology and type of fuel used) contribute to air pollution. There are different types of pollutants with different impacts. In very general terms, air quality can become an issue in areas where there are pedestrian concentrations and traffic volumes greater than 12,000 - 13,000 vehicles (during an 18 hour period).
- Driver vision is confined
- Vehicle speed affects the angle of vision of a driver (Fig. 1.7). At high speeds the driver’s peripheral vision is narrowly focussed, but at lower speeds the driver can take in much more of what happens in the street space and respond accordingly.
- Stopping distance is increased when speeds are high
- At speeds of 50 km/h, the average stopping distance is 27.2 metres; at speeds of 25 km/h it is 9.6 metres (Fig. 1.8).
1.2.3 Issues associated with the frontage function

The frontage function of the Main Street or sub-arterial shopping centre attracts trade, pedestrians and bicycles, and vehicles which need to park or service sites. Some businesses depend on the passing trade and on patronage close to bus stops.

Centres may have grown over time and, as centres become larger and more diversified, pedestrian activity is increased and people make multiple purpose trips. This has caused the following problems (Fig. 1.9):

- Frontage activity attracts pedestrians with a potential for conflict with moving vehicles.

Pedestrian movements in the Main Street or sub-arterial centre are a measure of the activity of the centre. They depend on the amount and type of land-use activities and how they are distributed. Centres may be long ribbons extending for more than 1000 metres in large centres with different attractions e.g active retailing, post office and local hotel. The greater the frontage activity, the more pedestrians there will be and the greater the potential for conflict with moving vehicles.

- Pedestrian activity is often dispersed.

In many centres there are long strips of shops often mixed with drive-in vehicle-oriented businesses near the fringe with the result that pedestrian activity is dispersed and the potential for conflict with moving vehicles is increased. Zoning plans seldom reflect the need to distinguish between pedestrian-generating and vehicle-generating uses.

- Pedestrians who want to cross are delayed.

Traffic volumes determine the presence of gaps in the traffic stream for pedestrians to cross the road. The distribution of these safe crossing gaps will influence pedestrian exposure levels and further contributes to a reduction in air quality.

Large vehicles, such as buses, reduce the ability of crossing pedestrians to see other vehicles.

- People with impairment are not well catered for.

One of the factors is the ability to cross. Wide carriageways increase the exposure time of pedestrians to moving vehicles. Typical crossing speeds for people with physical impairment is 0.5 m/s and 0.8 m/s for elderly. This compares with 1.2 m/s for adults and to 1.5 m/s for children (Studiecentrum Verkeerstechniek, 1984). A median strip allows pedestrians to cross in two stages, waiting for a gap in each of the two directions (Song, 1992). Kerbside parking reduces exposure time to moving vehicles.

Other factors to be considered in planning and design for people with...
impairment are addressed elsewhere in the Guide.

- parking manoeuvres affect flow
Vehicles manoeuvring into and out of a parking space delay traffic behind them, depending on traffic volumes and vehicle speed (Black, 1992). When the number of parking movements exceeds 30 per hour along a 100m section, there is a discernible reduction in the average vehicular speeds of traffic in the adjacent through lane. With frequent manoeuvres, traffic speeds can decrease to about 20 km/h. This reduction may be beneficial if traffic speeds are to be decreased, but can reduce pedestrian safety if overtaking at higher speeds is attempted (Fig. 1.10).

- delivery/pick up from the kerb may affect flow
Many small retailing establishments do not have rear and side access with the result that loading and unloading occurs along the road frontage. Space for delivery and pick up must be provided at the kerb in front. This space may be used for parking and can lead to double parking which delays traffic or leads to potentially dangerous overtaking.

- activity centres require side streets
There is a need for internal circulation in activity centres with a greater frequency of side streets than is necessary for other land uses. However, some side streets can often be closed to increase footpath continuity and improve traffic flow (Fig. 1.11).

1.2.4 Issues associated with traffic management
Traffic management must take account of safety, yet facilitate vehicle movement, crossing pedestrians, parking, deliveries and many other factors. However, there are relationships which can produce problems when they are ignored:

- parallel and angle parking
Angle parking tends to reduce vehicle speed in the adjacent lane more than is the case with parallel parking (Fig. 1.10). Replacing angle parking with parallel parking without narrowing the carriageway (or similar measure) is likely to lead to an increase in vehicle speed and diminished pedestrian crossability.

Bus stops are generally not compatible with angle parking. Where there are many access laneways from the front, angle parking may not be appropriate because large vehicles need space to enter and exit.

- duration of on-street parking
The number of on-street parking manoeuvres per space per hour during business hours is closely related to the time permitted for parking, and thereby can have an impact on vehicle speed. It also can have a bearing on the viability of businesses depending on passing traffic.

- rear and front end angle parking
Both rear and front end angle parking can have a significant impact on vehicle speed in the adjoining lane and can be used as tools for speed reduction.

Rear end parking has a greater impact on the speed of traffic than front end double parking becomes a problem when traffic volumes exceed 800 veh/h (Allan, 1994), and if there is a median which prevents overtaking traffic from using a lane in the opposite direction. With double parking of large vehicles, pedestrian crossing and cycling become more hazardous because visibility is impaired.

- parking restrictions can affect retail turnover
Parking restrictions associated with clearways affect the passing trade. Parking should be close by and clearly signposted to offset these disadvantages.

- searching for parking space affects traffic performance
Slow-moving vehicles with drivers searching for a parking space affect the flow and speed of traffic and air quality.

- activity centres require side streets
There is a need for internal circulation in activity centres with a greater frequency of side streets than is necessary for other land uses. However, some side streets can often be closed to increase footpath continuity and improve traffic flow (Fig. 1.11).
parking, but the safety comparison with front end parking is unresolved. Front end angle parking is more dangerous to cyclists, but exhaust fumes disperse towards the footpath affecting pedestrian amenity (Fig. 1.12).

For both rear and front end parking, there is a need for visibility space which allows drivers to see and be seen by oncoming traffic.
- peak hour clearways and S-lanes

Peak hour clearways and S-lanes (where right hand turning lanes are provided) are sometimes used on sub-arterial roads to increase traffic flow by removing kerbside parking. The proximity of fast-moving traffic to the footpath increases traffic noise on the footpath and reduces the perceived safety of pedestrians, especially the elderly.

Small retail and office uses are most affected where the traffic or traffic management limit accessibility to the frontage (for vehicles as well as pedestrians).

1.2.5 Issues associated with the road as a space

The ‘quality’ of the road as a space can be expressed in amenity and convenience, heritage and character, and the appeal as a place to meet, do business and for special events. The overall quality of many Main Streets and most sub-arterial centres is often poor because of the following factors:

- catering for vehicles has been given priority

More attention has been given to facilitating traffic flow and parking than to the development of the space as an environment for people.

- footpaths are not attractive

There is discontinuity in shopping frontage and climate protection. Pavement materials, street furniture and landscaping are often sterile; traffic noise and vehicle emissions reduce the quality of the pedestrian environment.

- there are no bicycle facilities

Cycleways and secure bicycle parking are hardly provided in the development of the space.

- there is little appreciation of the wide range of users needs

For example, pedestrians comprise adults, elderly people, young people, mothers with prams, and people with different kinds of impairment. There are people coming to shop, browse, sit and observe, meet others over coffee, or do business. They all have different needs.

- there is not a sense of social place

Frequently, the Main Street or sub-arterial centre is not a place for meeting others by choice, for pavement cafes to relax in or for holding stalls on a Saturday morning.

- facades are disjointed and cluttered

Many roads and main streets have a commercial and community centre which has developed over many years. Some may contain buildings of heritage character, but there are many buildings of dubious merit. Advertising on the facade generally lacks coordination and taste. Beyond the core there often is a mixture of activities ranging from service establishments and motels to isolated retail outlets of generally very limited (if at all) urban design quality.

- the road pavement dominates

The view of the Main Street or sub-arterial centre is often dominated by the road pavement. This tends to reinforce the vehicular function of the road and does not convey the shared nature of the space.
1.2.6 There are positive associations

This review of issues indicates that there is a conflict in functions between the road as a transport route and as a place for retail, commercial and community activity. However, there are also positive associations between the road as a transport route and the activities along its frontage.

- Service stations and motels serve tourists travelling on the route, and businesses are visible and accessible to the passing trade.
- The ‘image of the town’ or centre can present a distinctive character to the traveller, whereas freeway by-passes all tend to look the same.
- Public transport operates effectively where a number of trip generators are concentrated along the route.
- Main streets with moving vehicles and adequate street lighting provide a more secure environment for visitors and traders at night than a deserted pedestrian space.

The issues and solutions will be perceived differently by different stakeholders (such as the Roads and Traffic Authority, local Council, truck drivers, business community, local community and pedestrians). The aim of environmental adaptation is to develop and implement proposals which provide an acceptable and workable balance between these diverse interests.

1.3 Objectives

The key objectives of environmental adaptation of the Main Street and sub-arterial roads are to:

- reduce conflict between pedestrians, cyclists and vehicles;
- increase safety of all road users;
- improve the quality of the road environment for all users;
- maintain/enhance the economic performance of the commercial functions along the frontage;
- consistent with the above, maintain/enhance the performance of the transport and parking functions on the roads in the area; and
- develop and implement an integrated plan which offers an acceptable balance between benefits and costs, is acceptable to the community and can be funded.

1.3.1 Key objectives

1.4 An integrated approach

Problems of safety, conflicting functions, excessive vehicle speeds, high traffic volumes, crossing pedestrians, parking and access movements, noise and fumes, inappropriate location of activities and unattractive environment will occur to different degrees in a particular location.

There is often an inclination to address a specific problem with a single solution, but experience shows that there usually are no single solutions and that solutions may create new problems elsewhere. For this reason, environmental adaptation should be approached in an integrated way.

An integrated approach can involve making changes in the road and/or activity function, the design and management of the road space and the traffic within it, and the design and management of the frontage.

Generally, there is a need for a strategic overview of the area as a whole (see Part 3) and for an assessment of the possible consequences beyond the adapted Main Street (Part 5).

A central feature of the concept in an integrated approach is the management of friction and impact.
1.4.2 Managing friction and impact

There is a mutual dependency between the Main Street or sub-arterial road as an activity centre and the traffic along it, but there comes a point where it starts to break down. When the land-use activity in the Main Street/sub-arterial increases, the impediments for traffic travelling through it increase. This ‘friction’ consists of: frequent intersections, turning movements, parking manoeuvring, delivery of goods, and crossing pedestrians (many of whom are jaywalking). If the friction becomes excessively high, traffic speeds decrease, frequent vehicle delays may be experienced, vehicle operating costs rise and vehicle emissions increase.

Road users also vary in their response: through traffic (especially long-distance trucks) is much more sensitive to friction than local traffic, and peak hour traffic is more sensitive to friction than off-peak through traffic.

Conversely, if traffic volumes and speed increase, the quality of the centre is impaired. This environmental impact manifests itself in increased pedestrian delays and accident risks, parking difficulties, excessive traffic noise, loss of trade and an unattractive centre.

There are different tolerance limits for different activities and road users. Some activities, especially those dependent on the passing traffic, such as service stations and take-away establishments, are not seriously affected by increasing traffic volumes, provided convenient off-street parking is available on-site.

Establishments which are partly dependent on the passing trade, such as delicatessens, newsagents and chemists or specialised retail outlets, are sensitive to the availability of frontage parking.

Here, the mutual dependency breaks down when frontage parking is prohibited at times of the day or removed for traffic management reasons.

For all other activities there are limits as to how much impact they can endure. They depend on attracting pedestrians, but pedestrians are sensitive to the local environment, traffic speed, traffic noise and air pollution.

Environmental adaptation attempts to manage friction and impact in such a way that the general objectives of increased safety and amenity are achieved. It requires an approach which achieves desired behaviour through design and does not depend on police enforcement.

1.4.3 Three related actions

The management of friction and impact is done by three related actions:

- concentrating pedestrian-oriented activities in a ‘core zone’ and vehicle-oriented activities in adjoining ‘transition zones’ (Fig. 1.13)

Activities are grouped (or zoned) according to the degree of conflict with moving vehicles. Small retailing and personal service establishments are treated as pedestrian-oriented activities whereas drive-in commercial establishments are regarded as vehicle-oriented activities. An indicator of pedestrian-oriented activity is the number of pedestrians on the footpath during the pedestrian peak hour per 100 metres of frontage.

The distribution of this pedestrian-oriented activity along the length of the Main Street or sub-arterial centre is called an ‘activity profile’ (Fig. 1.14). There is likely to be a different activity profile for each side of the street or road. The concentration of pedestrian-oriented activities in a core zone and vehicle-oriented uses in the transition zone is a long-term strategy and requires environmental planning initiatives. Market forces will generally determine the speed and success of the process.
reducing vehicle speed in the core and transition zones

Target vehicle speeds should be between 25 and 35 km/h in the core zone where pedestrian activity is greatest. However, as there is a potential for accidents if speeds are reduced suddenly, there should be a progressive reduction in speed.

The distribution of the target vehicle speed along the length of the Main Street or sub-arterial centre is called a ‘speed profile’ (Fig. 1.14). There may be a different speed profile for each direction of traffic flow.

The notion of target vehicle speed is explained in Part 2 (Section 3.3).

enhancing the quality of the road space (Fig. 1.15)

The actions required to achieve the desired activity and speed profiles usually involve changes of the road space and road frontage. By selective application of design, construction and control measures, the quality of the road space can, at the same time, be improved.

1.5 Steps in the process

Environmental adaptation requires a systematic process of problem solving. The steps in the process are outlined below.

1. Project initiation

A project may be initiated by the Council, a community group, the local business association or any other interested party. It is important to identify the stakeholders at an early stage so that the different interests and priorities are understood and recognised.

2. Understanding the problem

There is a need to identify actual and perceived problems. The actual problem may be of a technical nature and should be investigated. However, community input is essential and may well indicate other concerns which are not immediately apparent. The community should be involved in this step.

3. Defining the study area

The focus of environmental adaptation will be confined to the Main Street or sub-arterial road, but the study area may need to be larger. There usually are broader planning and development issues which influence the options available. Furthermore, introduction of a particular set of measures to solve a specific problem should not transfer problems elsewhere. Further details are provided in Part 2.

4. Setting objectives

It is important to set clear and achievable objectives. The objectives for projects of environmental adaptation should be achievable in a reasonably short-term time frame and with modest expenditure. The objectives are derived from the problems identified (2) and should address:

- what the stakeholders want to achieve (with a focus on the end results desired); and, in respect of the Council,
- how the objectives serve the Council’s corporate aims.

An example of the kind of objectives which may be determined is set out in Table 1-1.
5. Defining performance criteria for the project
Before conducting a detailed investigation, consideration should be given to:
- What needs to be known to judge that the project is successful;
- what factors must be measured and what data must be collected;
- what opinions (e.g. the general community, business community) need to be monitored; and
- what performance criteria should be used for assessment and evaluation.

6. Developing strategies
Strategies must be developed for each objective. It is useful to develop preliminary strategies as this will influence what data should be collected.

7. Collecting and analysing data
Information required will depend on the nature of the problem, the objectives to be achieved, strategies proposed and funds available. Details are set out in Parts 2 and 3.

8. Developing integrated design and implementation options
The principles of environmental adaptation are used to develop integrated design and implementation options. These options should incorporate control measures (of both frontage development and traffic) and design and construction measures (see Part 4).

9. Assessment
The formulation of integrated options should be followed by an assessment of their likely consequences. The assessment should include the feasibility of a staged implementation program.
Information is provided in Part 5 and Appendix B.

**10. Evaluation**

Evaluation involves the making of judgements about the alternatives. The central question is how each alternative achieves the selected objectives and at what costs (see Part 5 and Appendix B). Many costs and benefits cannot be expressed in money terms and stakeholders will attach different value to them. The determination of preferences and priorities must, therefore, be made in consultation with the general and business community.

**11. Selecting the preferred option**

The preferred proposal is now determined and the objectives it will achieve are further clarified. Details of implementation, including staging and budgeting, are finalised.

**12. Making decisions**

The proposal - a summary of what it intends to achieve, costs and benefits, information on the degree of support, budget implications and implementation - is presented to Council for support and approval. It is possible that certain aspects of the proposal may require further consideration and some steps may have to be retraced.

**13. Implementation**

Following Council approval, the proposal is implemented. Implementation may proceed in stages.

**14. Monitoring**

Once completed - in whole, or in part - the operation of the scheme is monitored (see Part 5).

**15. Review**

The results of the monitoring phase may lead to a need to make changes. In that event, parts of the process may be repeated.

The steps outlined above represent a generic model. They relate to strategic planning, concept planning, and design, with an exploration of options and a decision at each stage before proceeding to the next. An example is provided in Part 2.

In practice, the details of the study components may vary from this generic model.

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**1.6.1 Recognition of the stakeholders**

Environmental adaptation projects often present a rare opportunity to revitalise the core of an established community. They can have a profound effect on behaviour, affect the business and general community, and can involve significant expenditure.

Effective public involvement and consultation in the development of a proposal for environmental adaptation are both crucial to its success. The project is likely to affect shop keepers, owners and tenants, office and shop-workers, delivery vehicle drivers, tourists and visitors and members of the community, both young and old. Consideration must also be given to public transport, cyclists, access for people with impairment, emergency vehicles, refuse collection, street and gutter cleansing and the maintenance of street furniture and landscaping. There may also be regional interests, especially in the case of the adaptation of Type II corridors.

Striking a balance between the often competing and sometimes conflicting interests of all of these groups requires much care. The RTA’s Community Involvement Manual provides practical guidance in dealing with these issues.

Community feeling, pride and attachment can only come about if people have an opportunity to participate in shaping the future of their Main Street, the symbolic centre of the community, or, in the case of a sub-arterial centre, the revitalisation of an established urban centre. Experience shows the synergy and positive effects on the community spirit which such projects can generate.
1.6.2 Consultation process

It is essential to consider carefully the appropriate level of community consultation commensurate with the particular project and to budget for the cost of this phase of the investigations. This is a matter that is often overlooked in planning a project.

Community participation in most local government projects is a multi-staged process. There may be five stages:

- Gathering information
  The first stage is gathering of initial information on matters of community concerns, such as high accident rates, traffic noise or pollution, lack of parking or a deteriorating shopping environment.

- Developing objectives and strategies
  An important step is to present the results of the collected data to the local community and obtain their response to the information. This response is then used to identify and define the objectives of the project and provide some vision for what might be achieved. The consultation process should be sufficient to ensure that the business people and the residents understand and endorse those objectives.

  It is also important to place these objectives into their relative priority and to reach some agreement with the community on this, as it provides the basis for comparing and evaluating alternatives later. Without such a clear understanding, assessment of proposals will always be subjective and may be divisive.

- Developing proposals
  The extent of community consultation in developing proposals depends on the particular circumstances. In simple schemes, it may be possible for the professional staff of the Council, or consultants, to develop solutions to the identified problems and present them in the form of a public exhibition as solutions to the agreed objectives. This is an economical way of producing a project but is open to the claim that it has been prepared by the Council and is not completely “owned” by the people and stakeholders most affected.

  In other cases, a representative committee could be used to develop the scheme with the Council staff or its consultant. This will be more time consuming and may prove to be more costly but is also more likely to be accepted as the community’s solution.

- Evaluating proposals
  The community should have the opportunity to express its views on the proposals. This aspect is further considered in Part 5 (Section 5).

- Approval of the Traffic Management Plan component
  Councils in the Sydney Operation’s Directorate, under the ‘Delegation to Councils on the Regulation of Traffic’ are required to submit Traffic Management Plans (TMP) to the RTA where measures proposed in Schedule 3 are to be introduced. Procedures exist which specify their preparation, presentation to the Local Traffic Committee for comment or directly to the Regional RTA Office, and approval.

  Many of the traffic measures commonly used in environmental adaptation projects would come within the Schedule.

- Implementation
  The community should be advised of the nature and timing of the proposed works. It is likely that there will be disruption to vehicular and pedestrian traffic patterns and possibly business activities.

- Does the project work?
  The community should have the opportunity to comment after completion as part of a monitoring program.
PART 2

Applying the concept
Applying the concepts

2.1 Purpose

2.1.1 Purpose of Part 2
The purpose of this Part of the Guide is to assist practitioners in determining how to proceed in different situations. Information will be provided on:
- the importance of the local context;
- general strategies for sharing the Main Street;
- the key factors which influence how the strategies are carried through in planning and design;
- how to use the Guide depending on these factors; and
- what kind of information may be needed and why.

2.1.2 Constraints and opportunities
Once objectives have been determined, strategies can be developed for achieving them. However, there usually are constraints and opportunities which influence the approach, process and time frame for environmental adaptation.

Each centre has constraints and opportunities arising from its unique location, development history and character. The built environment is the outcome of cumulative public and private investment, generally expended over a long period of time. Much of this investment is above ground and visible, but there is often also a considerable investment below ground.

Adaptation of the built environment requires resources and time, and involves both the public and private sector. A Sharing the Main Street project has a primary focus on actions in the public realm, but can be a stimulus for the private sector. Reconstruction of the Main Street itself can be undertaken within a few years, but adaptation of development and activities along the frontage has generally a much longer time frame. Yet it is important to consider adaptation of the Main Street and the frontage as an integrated project. Hence there is a need to include a framework for the type and form of future development along the frontage as part of the project.

2.1.3 Local factors
It is within this unique local context of constraints and opportunities, that there are local factors that influence how environmental adaptation should be approached in a specific situation. They are examined in this Part and determine:
- whether there is a need for area-wide or strategic planning first (Part 3: Planning);
- whether there are limits in the application of design and control measures (Part 4: Design); and
- how the project is to be assessed and evaluated (Part 5: Assessment and Evaluation).
2.2.1 Strategies derived from objectives

The objectives can be achieved through the selective application of measures (see Appendix A). However, there is a need to first define a set of strategies so that there is a clear link between the use of incidental measures and the expected outcome.

The following strategies are presented as illustrations.

2.2.2 Strategies for reducing the conflict between pedestrians and vehicles

- identification of a core zone where pedestrian activities are not exposed to high vehicle speeds;
- identification of a transition zone where vehicle speeds are reduced;
- introduction of a speed profile related to the type of zone; and
- introduction of an activity profile with a concentration of pedestrian-oriented frontage activities in the core zone and vehicle-oriented frontage activities in the transition zone.

The kinds of measure which may be considered include: those which, through managed friction, influence driver behaviour; measures which, over time, limit the extent of pedestrian concentration to the core zone; on-street parking; and other traffic management tools.

2.2.3 Strategies for reducing the impact of traffic on frontage activities

- facilitating pedestrian crossing;
- facilitating parking within close proximity of retail outlets and personal service establishments;
- providing access for service vehicles;
- reducing traffic noise on the footpath;
- reducing fumes on the footpath; and
- providing for special needs (e.g. taxis, cyclists, aged and people with impairment).

Appropriate measures include: measures to control vehicle speed, traffic volume and composition; separation of the traffic stream from footpaths; the location and design of crossing facilities; narrowing of carriageway; provision of median; provision, type and duration of parking; facilities for taxis, safe shared conditions for cyclists, bicycle parking and access for the physically impaired; and frontage development control.

There will different views on where parking is to be located. By locating parking at the rear of buildings, the streetscape is enhanced, but many retailers claim that their viability depends on parking in front.

2.2.4 Strategies for improving the quality of the environment

- streetscape design to reflect different friction/impact conditions of sections of the Main Street or sub-arterial road;
- enhance business opportunities;
- providing continuity in pedestrian circulation;
- providing continuity in weather protection;
- bus stops provided with shelters
footpaths designed for a range of uses;
creating spaces and places for social interaction and events; and
preserving heritage and enhancing townscape qualities.
The kind of measures which may be considered include: selective side street closure; widening the footpath in the core; provision of arcades, awnings and verandahs in the core; street trees, landscaping street furniture and building lines to reinforce the desired character of the Main Street or sub-arterial road; physical and visual measures to separate pedestrians on footpath from vehicles; street lighting for pedestrian security and safety and for perception of amenity in the core; and implementation of the NSW Department of State and Regional Development Main Street Program.

2.2.5 Strategy for facilitating circulation consistent with previous objectives

- ensure that there is adequate provision for different circulation needs, irrespective of the changes introduced to satisfy the previous objectives.

This can be addressed during the planning stage (Part 3), the assessment stage (Part 5) or both.

2.2.6 Strategies for implementing an acceptable and affordable scheme:

- a process designed to ensure that there is proper understanding of the options and implications; and
- an acceptance of the preferred scheme, including the costs of implementation.

Implementation of these strategies requires adequate investigation of alternatives including staged and low-cost approaches.

2.3 Key factors

Type II road/environments come in a variety of forms. There are road/environments where the respective functions vary during the day or week, such as heavy through traffic during peak hour and mainly local traffic during the rest of the day. There are some with major shopping strings along the frontage, and others which are small and mainly provide a local function. There are many combinations of traffic and frontage activity functions along roads with different widths (Figure 2.3).

The constraints and opportunities for environmental adaptation in a specific context depend, to a large extent, on the nature of the local traffic and activity functions, the characteristics of the road space and the development along its frontage. The key factors which influence the planning and design for environmental adaptation are:

- Changes in function
- Vehicle speed
- Vehicle flow
- Through traffic
- Heavy vehicles
- Bus stops
- Frontage activity
- Pedestrian behaviour
- Cyclist needs
- Needs of people with impairment
PART 2

Local conditions in relation to these factors determine whether there is a need for an area-wide planning study first in order to discover which planning parameters are relevant. They also provide an indication of the constraints in the design for environmental adaptation.

While some factors can be considered in isolation, there are others which are closely linked and must be considered together (e.g. traffic flow and road reservation width). Some of these relationships are further considered in Parts 3 and 4.

2.3.2 Changes in function

The Main Street is usually the dominant centre, serving local as well as regional needs. Centres along sub-arterial roads can vary widely in function and are susceptible to shifts in the economics of shopping centre development in urban areas (Figure 2.4).

Area-wide planning studies for all but local centres along sub-arterial roads may be required to ascertain whether any likely changes in the hierarchy of centres in future could affect the planning for environmental adaptation (Part 3).

For example, in Taree, the development of major shopping mall away from the Main Street led to a major shift in shopping patterns, parking and pedestrian movements and this influenced the approach to adaptation (Part 3, Figure 3.4).

There may also be proposals to change the function of the road (such as a by-pass). Area-wide planning studies are then needed before design options are considered.

At The Entrance, the establishment of a by-pass route created the opportunity for a pedestrian mall and a shared zone on the previous through route. In Taree, the construction of the Pacific Highway bypass made it possible to reduce the carriageway from 4 to 2 lanes, increase the pedestrian space by 70 per cent and marginally increase the number of on-street parking spaces.

2.3.3 Vehicle speed

Vehicle speed is a critical factor in environmental adaptation and it is important to define it. A distinction can be made between target speed, operating speed, and design speed.

The target speed prescribes the degree of physical restraint on vehicle operation which is imposed in the design. It is the speed aimed at in (or adopted as the upper limit for) the design, and is usually expressed in terms of the 85th percentile, i.e. the speed which no more than 15 per cent of the vehicles are expected to exceed.

The operating speed (sometimes called the ‘street speed’) describes the actual speeds observed in the street. The 85th percentile operating speed is that speed exceeded at any point in the street by no more than 15 per cent of vehicles. The maximum operating speed should not be greater than the design speed for safe operation.

The design speed is the speed adopted for the fixing of geometric features or characteristics of a street or carriageway element for safety purposes, and thus reflects the sight distances and alignment characteristics which are built into the design. It must be greater than the
maximum operating speed for safe operation.

In this Guide the target speed is the speed used for environmental adaptation.

- The target speed should be compatible with the frontage function of the zone, rather than the legal speed limit which may be excessive for the circumstances.

2.3.4 Vehicle flow

Vehicle movements in the centre may be through traffic (Section 2.3.5), traffic entering and leaving through the same route, and traffic leaving the centre and returning along the same or another route.

Measuring vehicle flow in the core may not provide an accurate picture. Hence vehicle flow should be measured at cordon points close to the centre but outside the transition zones (Fig. 2.6). Information should be obtained for daily and peak hour vehicle flow and at different times of the year.

- If significant variations occur during the year (e.g. tourist season), planning studies may be necessary (see Part 3).

- If there are significant peak hour flows during the day there may be design constraints (see Part 4).

- If total traffic volumes exceed 12000 vehicles per day, the road performs a major traffic function and there is a need for an area-wide investigation about its future role (Part 3).

With traffic volumes of this magnitude, there is a need for a clear picture of the nature of the traffic. The pedestrian environment may be impaired by traffic noise on the footpath and difficulties in crossing the road.

The scope for adaptation is greatly influenced by the number of lanes required for moving vehicles. Volumes of 12000 vpd can usually be accommodated in two lanes (one in each direction). In some highly urbanised areas, volumes as high as 16000 vpd have been managed with two lanes (e.g. Beamish Street, Campsie and Marrickville Road, Marrickville).

- Alternatively, consideration may be given to placing a cap on traffic volumes - that is, defining the environmental capacity of a route. This may occur where there is a high level of conflict and priority must be given to pedestrian safety and the quality of the environment. In the event of such a trade-off, alternative transport routes must be provided as part of the project.
With traffic volumes less than 3000 vehicles per day, there is no need to consider Part 3 of the Guidelines.

With traffic volumes of that order, area-wide planning studies should generally not be necessary and low-cost solutions may be practicable.

### 2.3.5 Through traffic

Through traffic is defined in the Guide as ‘non-stopping through traffic other than at intersections or pedestrian crossings’. Where there is a high amount of through traffic, delay becomes an issue. The amount or proportion of through traffic and how they vary during the day are, therefore, significant factors in environmental adaptation.

Where there is a high proportion of through traffic, there may be a need for an area-wide planning study of alternative through traffic routes (see Part 3).

Case studies suggest that there is a need for further study when the proportion of through traffic exceeds 25 per cent on the Main Street and 50 per cent on a sub-arterial road. However, there is insufficient research to support generally applicable guidelines on the relationship between the amount or proportion of through traffic and the scope for environmental adaptation.

### 2.3.6 Heavy vehicles

Heavy vehicles (including buses) in the traffic stream can have a major impact on the pedestrian environment, but measures to reduce this impact may affect the performance of such vehicles.

There is a need for an area-wide planning study of alternative truck routes if the number of heavy vehicles exceeds 60 during the pedestrian peak hour (see Part 3).

The incidence of heavy vehicles can be expressed in the percentage of total traffic or in the number per hour. Case studies of sub-arterials and Main Streets showed significant variations in the proportion of heavy vehicles during the day, ranging from 1.5 per cent for local deliveries to 15 per cent for through routes (Westerman et al., 1989). The total number observed during peak pedestrian periods was 60 per hour which, under controlled conditions, did not appear to affect pedestrians crossing adversely. However, this finding is based on limited evidence and should not be regarded as conclusive. There may be a similar need for an area-wide study if the number is less than 60. Heavy vehicles always are part of the traffic stream on traffic routes, but it is difficult to determine what is an acceptable level of heavy vehicle movements in centres with many crossing pedestrians. In situations where...
there are significant numbers of heavy vehicles, a study of alternatives should be made.
- In some rural towns, there may be a greater proportion or a larger number of heavy vehicles at night than during business hours. This may influence the type of measures to be used and the design of a project (Part 4).
- Visibility at night, when there are no pedestrians and parked vehicles to influence driver behaviour, is of critical importance.
- Towns with tourist functions may have special needs arising from the towing of caravans and the presence of large numbers of tourist coaches. These needs should be recognised and accommodated.

### 2.3.7 Bus stops

The location of bus stops constrains the options available in the design of adaptation. A kerbside location limits parking in the vicinity to parallel parking. This can influence the entire layout of the scheme. In Main Streets or other Type II corridors, where bus stops are located and the constraint of parallel parking is too limiting, alternative locations of bus stops should be explored only after examining the implications for the routing of bus services on both operators and passengers. Bus stops need to be convenient to activities in the Main Street and clearly signposted.

### 2.3.8 Frontage activity

A distinction can be made between active frontage and secondary frontage. Active frontage is defined as frontage with a preponderance of pedestrian-oriented and concentrated activities; secondary frontage is described as low-order retailing with incidental or dispersed pedestrian-oriented activities.

Roads and streets with secondary or dispersed pedestrian activity are more hazardous for pedestrians. Concentration of pedestrian activity combined with speed reduction measures provides a safer environment than the dispersal of pedestrian activity.

The frontage activity in the Main Street or sub-arterial centre is measured by the number of pedestrians on the footpath. The pedestrian activity varies during the day and the week and is observed during the pedestrian peak hour at a normal weekday. Information on pedestrian activity is presented as the number of pedestrians on both sides of the road/street per 100 metres of length.

Research shows that streets with a total of at least 380 pedestrians per hour (on both sides of the street) during peak periods of pedestrian activity have a healthy pedestrian environment irrespective of the width of the street.
The length of active frontage is important in environmental adaptation as, together with other factors, it influences the selection of measures to be used. The active frontage in many rural centres is small (e.g. less than 400 metres) and there may be simple solutions for problems that have been identified.

- Where a centre has an activity frontage exceeding 800 metres and/or active side streets, there is a prima facie case for an area-wide planning study before design options can be developed (see Part 3).

**2.3.9 Pedestrian behaviour**

Pedestrians have limited tolerance to delay and when there is a gap in the traffic stream will tend to jaywalk. There is little risk if traffic volumes and vehicle speeds are low, the crossing distance of traffic lanes is small and there is good visibility. This situation can occur when speeds are less than 35 km/h, there are gaps in the traffic stream and total traffic volumes (both directions) are less than about 550 per hour.

However when traffic volumes are greater and the gaps are small, some jaywalkers become jay-runners. This also occurs with increased crossing distance and vehicle speeds exceeding 40 km/h. Jay-running is a useful indicator of potential risk. From observation, it appears that a situation of potential risk exists if the proportion of jay-running out of all jaywalkers exceeds about 5 per cent.

- In situations where the proportion of jay-running exceeds about 5 per cent, or there is a history of pedestrian/vehicle accidents, there is a need for detailed information on the causes before developing design proposals.

**2.3.10 Cyclist needs**

Cyclists need separate space when vehicle volumes and speeds are high. The latter condition does not apply in the core zone and the road space can generally be shared. However, this may not be the case in the transition zone and a separate cycleway may be needed.

There are other cyclist needs related to vehicle parking, turning movements, surface treatment, intersection design and bicycle storage. These needs will be reviewed in Part 4.

**2.3.11 Needs of people with impairment**

There are several types of impairment: people with disabilities of hearing, vision, ambulatory and intellectual impairment. Their needs are not identical.

Access routes, crossings, footpath widths and gradients, ramps, lighting, tactile and audible features should all be considered as an integrated system.

Clear zones of 1800mm width are needed adjacent to buildings on footpaths and street furniture and pavement activities should not encroach into this zone.
Crossings are of special importance (see Section 1.2.5). Vision impaired pedestrians do not tend to jaywalk and require marked crossings.

### 2.3.12 Road reservation width

Typical widths are 20, 30 and 40 metres (1, 1.5 and 2 chains). The majority of country towns have Main Streets between 20 and 40 metres width, whereas most sub-arterial roads range between 20 and 30 metres in width. With a narrow road reservation width and a heavy traffic function, fewer options for environmental adaptation are available, but with a wide road reservation and a light traffic function, there are numerous possibilities (for details, see FORS, 1992).

- The road reservation width greatly influences the scope for modification Figure 2.13.

### 2.3.13 Physical characteristics

Apart from the reservation width, factors which will influence the scope for environmental adaptation include: existing carriageway width, location and construction (because major reconstruction is costly); footpath width, design and construction; median; gradient and crossfall; location and design of public utilities and drainage; street lighting; parking location, type and management; and designated pedestrian crossings.

- For projects involving reconstruction of the road space, there are more exacting information requirements than for projects relying on the application of control measures. A major cost factor is the location of underground services and drainage.

### 2.3.14 Business activity

In 1989, the NSW Department of Planning (Department of Urban Affairs and Planning, NSW) launched the Main Street Program. The program is now managed by the NSW Department of State and Regional Development and has been renamed the Main Street/Small Towns Program (see Introduction).

The purpose of the program is to encourage local communities to improve the overall quality of the Main Street and sub-arterial centres and revitalise the business activities in them.

It is driven by the local community and the program’s success depends upon active partnership between local businesses, the Council and the community. The program proposes a comprehensive approach to community consultation and participation. The Department acts as a catalyst and provides advice.

- The Main Street/Small Towns Program should be an integral part of any comprehensive approach to the problems in the Main Street and to centres along sub-arterial roads.
2.3.15 Parking provision
Adaptation inevitably involves changes in the redistribution of parking spaces. Parking is of critical importance for businesses operating in the Main Street or sub-arterial road.

- Where there is, or likely to be, an under-provision in parking, parallel actions to increase supply nearby may be necessary.

For example, in Wagga Wagga, the Main Street adaptation was not supported by the business community unless additional parking nearby was provided (Fig. 2.17). This has since been done.

2.3.16 Streetscape character
The Main Street in country towns is a major element in our heritage; it is a distinctly Australian vernacular space suited for different needs (Fig. 2.14).

With its linear character, unique proportions, and its verandahs (or awnings and trees), the Main Street is a successful model of a robust environment which serves as a common setting for both pedestrians and vehicles. The set of linked spaces, with active edges, strong light and shade effects and often varied roofline, provides a clear and meaningful expression of the climate, people and their lifestyle.

Sub-arterial centres generally do not display such character, although often there are buildings and spaces worth preserving.

- Environmental adaptation should enhance the character and heritage of the centre (Part 4).

2.3.17 Type of Project
If a project is a demonstration project, there is a need to ensure that the experience gained will be of benefit in other projects. This influences the approach towards data collection and interpretation both before and after completion of the project. For demonstration projects, there is a need obtain sufficient information before and after completion (see Part 5 and Appendix B).

2.4.1 How the key factors fit into the process
The key factors are summarised in Table 2-1. The Table shows at what point in the process they should be considered. The Table should be regarded as indicative; many factors can not be considered in isolation and judgements must be made in each individual case.

2.4.2 How the set up a process in a specific context
The generic process described in Part 1 should be adapted to the conditions which apply in a specific situation. In many cases, there is a need for a strategic planning stage during which planning options are explored. This is followed by a design concept stage where options are again developed and assessed. The final stage is the consideration of detailed design options (typically including matters such as street furniture, and paving materials).

As choices have to be made at each stage before proceeding to the next, the process should be designed around a stakeholder participation process with progressive collection and presentation of relevant information at each stage. The process in Taree (NSW) is illustrated in Figure 2.15.
2.5.1 Information needs depend on context and purpose

Certain information is essential in any project of environmental adaptation: accidents, vehicle speed, traffic volumes and composition, pedestrian and cyclist movements, frontage activity, parking and the characteristics of the road space.

Information needs vary greatly and it is not practicable to identify all the information that may be required. For small projects, the process can be relatively simple and results can be achieved quickly, but in large projects or those involving reconstruction of the road space, more detailed investigation will be required.

Information needs also vary with each stage of the process. The level of accuracy for a strategic component is lower than the level required for engineering design.

If the project is a demonstration project, the information is to serve three purposes:
- to provide a clear insight into the problem areas;
- to establish the database for generating and assessing options; and
- to enable comparison of the situation before and after a proposal has been implemented.

If the project is not a demonstration project the before and after comparison may not be critical, but it may still be useful to obtain information to ascertain whether the objectives of the project have been achieved.

The specific information to be obtained in a particular case depends on the problem to be addressed, the objectives to be achieved, the design approach and the criteria used for assessing alternative solutions. The use of performance criteria is relevant here.

2.5.2 Performance Indicators

Performance indicators can be used to discover how the current system performs (i.e. problem identification; see, for example, Table 2-1) and to assess whether a proposal or a completed project achieves the desired outcome. Performance indicators, in this context, are not specifications of required performance.

An example of a performance indicator is vehicle speed. It must be measured in the core and transition zones to determine driver behaviour at times when there may be a conflict with pedestrians crossing. The vehicle speed must be measured both before a project is commenced (i.e. the ‘base case’) and after measures have been introduced to achieve a particular speed profile.

Data collection can be costly and should be limited to essential information. It is
important, therefore, to be clear what performance indicators will be relevant before a feasibility study is undertaken or a project is conceived.

For example, data collection will depend on whether changes are to be assessed in:
- the speed profile and the activity profile
- through traffic volume and the proportion of heavy vehicles (if alternative routes are present)
- travel time for through vehicles
- delay to pedestrians
- impediments to cyclists
- parking provision and turn-over
- public transport operation
- risk of accidents and their severity
- traffic noise exposure
- quality of the pedestrian environment.

Part 5: Assessment and Evaluation provides details on a range of performance indicators and the information needed for comparing proposals and projects before and after completion.

### Table 2-1 Example of the data which may be used as indicators for describing the existing system*

<table>
<thead>
<tr>
<th>Physical characteristics</th>
<th>Pedestrian activity</th>
<th>Pedestrian activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reservation</td>
<td>Peak hour pedestrians</td>
<td>12.30 - 13.30</td>
</tr>
<tr>
<td>Carriageway</td>
<td>Pedestrians crossing in pedestrian peak hour</td>
<td></td>
</tr>
<tr>
<td>Lanes</td>
<td>in core</td>
<td>600</td>
</tr>
<tr>
<td>Footpaths</td>
<td>jaywalkers</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>jayrunners</td>
<td>10%</td>
</tr>
<tr>
<td>Frontage Activity</td>
<td>Vehicle peak hour</td>
<td>17.00 - 18.00</td>
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<tr>
<td>Pedestrian-oriented</td>
<td>Pedestrians crossing in vehicle peak hour in core</td>
<td>240</td>
</tr>
<tr>
<td>Intensive</td>
<td>jaywalkers</td>
<td>102</td>
</tr>
<tr>
<td>Low</td>
<td>jayrunners</td>
<td>12.00%</td>
</tr>
<tr>
<td>Vehicle-oriented</td>
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<tr>
<td>Low</td>
<td>Vehicle-oriented</td>
<td></td>
</tr>
<tr>
<td>Vehicle &amp; ped. Oriented</td>
<td>Low</td>
<td>150 m</td>
</tr>
<tr>
<td>Vehicular access</td>
<td>Low</td>
<td>150 m</td>
</tr>
<tr>
<td>Post Office</td>
<td>Low</td>
<td>150 m</td>
</tr>
<tr>
<td>Vehicular access</td>
<td>Post Office in core</td>
<td></td>
</tr>
<tr>
<td>Vehicular access</td>
<td>Vehicular access from rear</td>
<td></td>
</tr>
<tr>
<td>Post Office</td>
<td>Post Office</td>
<td></td>
</tr>
<tr>
<td>Vehicular access</td>
<td>Vehicular access</td>
<td></td>
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<tr>
<td>Vehicle activity</td>
<td>Vehicle activity</td>
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<tr>
<td>AADT</td>
<td>Vehicle activity</td>
<td></td>
</tr>
<tr>
<td>Traffic volumes at vehicle peak hour 16.45 - 17.45</td>
<td>Vehicle activity</td>
<td></td>
</tr>
<tr>
<td>Traffic volumes at pedestrian peak hour 12.30 - 13.30</td>
<td>Vehicle activity</td>
<td></td>
</tr>
<tr>
<td>Heavy vehicles</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Proportion of through traffic all day</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>vehicle peak hour</td>
<td>50%</td>
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<tr>
<td>pedestrian peak hour</td>
<td>15%</td>
<td></td>
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<tr>
<td>Traffic volumes at pedestrian peak hour 12.30 - 13.30</td>
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<tr>
<td>Traffic volumes at vehicle peak hour 16.45 - 17.45</td>
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<tr>
<td>Heavy vehicles</td>
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<tr>
<td>vehicle peak hour</td>
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</tr>
<tr>
<td>pedestrian peak hour</td>
<td>15%</td>
<td></td>
</tr>
</tbody>
</table>

* The data shown apply to existing conditions in a case study and will vary with each project.
2.5.3 Information checklist

Information may be required on the following:

**Physical characteristics**
- Road/street pattern in the study areas
- Reservation width
- Cross-sections and longitudinal section
- Intersections and treatment
- Property boundaries
- Driveways and vehicular access
- Building line and setbacks
- Underground services

**Frontage function**
- Pedestrian, vehicle-oriented and mixed pedestrian/vehicle uses activities
- Major pedestrian traffic generators
- Active and secondary frontage
- Major vehicle traffic generators
- Vehicular site access and laneways
- Existing zoning and development conditions

- Identification of any development proposals within the study area

**Pedestrian and cyclist activity**
- Pedestrians on footpaths (midblock, crossing imaginary line)
- Activity profile
- Pedestrians crossing at designated facility, location, time
- Jaywalking numbers, location by street block, time
- Jay-runners numbers, location by street block and time
- Cyclist movements at intersections

**Traffic function**
- Traffic volumes (daily and peak hour at cordon points); additional information should be obtained if significant variations occur during the year (e.g. tourist season)
- Traffic composition (including the proportion of heavy vehicles)

![Diagram](image)

**Figure 2.16 Jay running/crossing (midday). When the ratio exceeds 10%, alarm bells should start to ring (Wagga Wagga City Council, 1997).**

**Figure 2.17 Parking provision is of great importance for business activity.**
● Proportion of traffic which is through traffic
● Public transport routes, frequency and patronage
● Cycling

**Vehicle speed**
● Speed profiles (both directions) for peak and off peak conditions, based on the 85th percentile speed (V85)

**Safety**
● Accidents (3 year average): fatalities, injuries, property damage, proportion involving pedestrians
● Accident pattern by age of driver/age of pedestrians, day of week, time of day, type of accident (road user movement)
● Perceived safety by drivers, cyclists and pedestrians
● Perceived unsafe locations

**Traffic and parking management**
● Intersection control
● Pedestrian crossings
● Speed control
● Provision for cyclists
● Taxi ranks
● Provision for disabled
● Bus stops and other transit stops nearby
● Loading and unloading zones
● On-street parking parallel/angle, numbers, duration, utilisation
● Off street parking spaces, numbers, location, duration, utilisation

**Streetscape and street quality**
● Streetscape entity
● Views and vistas
● Weather protection
● Landscaping
● Street furniture
● Sites/areas with heritage significance
● Verandahs
● Street lighting and powerlines
● Stormwater drainage

**Economic environment**
● Catchment area, population and economic growth
● Reliance on passing trade
● Viability of Main Street/sub-arterial businesses
● Vacancy rates
● Potential for further development

**Social environment**
● Perceived problems
● Community concerns and issues
● Street activities
● Community characteristics

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2.18 A streetscape analysis can identify opportunities for improvement.
Applying the concept
PART 3

Planning
PART 3  Planning

3.1 Purpose

3.1.1 Purpose of Part 3

The purpose of this Part of the Guide is to provide information on the relationship between the ‘design area’ and the surrounding ‘planning area’.

It is possible that the solutions to the problems can be resolved at the design level, without a need to consider a wider area. In that event, this Part of the Guide can be regarded as a checklist.

3.1.2 Content

Experience shows that an effective and acceptable scheme usually requires a strategic planning study up-front, even in situations where strategic planning has been undertaken before. Adaptation often raises issues which were not considered at the time or have consequences which were not foreseen.

For example:

- there may be changes in functions or proposals outside the Main Street or sub-arterial road which influence the scope for and approach towards environmental adaptation;
- environmental adaptation is likely to have an overspill effect on adjoining areas or the existing road hierarchy;
- the traffic function of the Main Street or sub-arterial road is dominant at peak periods (including tourist seasons) or throughout the day;
- the Main Street or sub-arterial road is a major truck route; or
- the centre is large.

The focus in this Part is on identifying the factors that may affect the development of the design concept, including:

- the kind of relationships that should be considered;
- the type of planning factors that may be relevant; and
- the process of identifying them.

3.2 Relationships

3.2.1 The notion of ‘design area’ and ‘planning area’

It is useful to make a distinction between the ‘design area’ and the ‘planning area’ (Fig. 3.1).

- The design area is confined to the Main Street or sub-arterial road, its frontage and adjacent environment. The ‘design’ of this area includes the selection of design, construction and control measures, and the process of combining them into a coherent scheme.

As will be explained in Part 4, there are two stages in the design process: concept design and detailed design.

The planning area comprises other areas which may influence the approach to the design of, or are influenced by what happens with, the Main Street or sub-arterial centre.

The planning of this area includes the location of major land uses and transport routes and measures for environmental protection.
3.2.2 There are two planning area levels

The two levels are:

- town or district level (fig 3.2)

The extent of the area varies with each Main Street or sub-arterial centre and depends on the situation. For instance, there may be proposals for a new arterial route or a major commercial centre. If such proposals could have an impact on the development of the design area, the planning area should be defined to encompass them.

- adjacent areas (fig 3.3)

The extent of the area to be considered depends on the local street pattern, type of land uses, parking and access to the centre. In cases where there is a parallel service/access street, the impact area may be small, but in other cases the overspill area may require consideration of a larger area. If there are proposals for change in an adjoining area, such as the provision of additional parking, there are advantages in enlarging the planning area so that possibilities for integrated approaches can be explored.

3.2.3 Strategic and development planning

Strategic planning is a continuous and systematic process, when organisations make decisions about intended future outcomes, how they are to be accomplished, and how success is to be measured and evaluated. Strategic planning is needed for integrated approaches towards urban areas as a whole, and for major parts of them (Austroads, 1998).

In the context of this Guide, strategic planning is used to establish the broad parameters for the Main Street or sub-arterial adaptation.

Development planning is an activity which focuses on the achievement of development on the ground. Development planning is used in the preparation of ‘masterplans’, development concepts and development control plans as a means of integrating public and private development (Austroads, 1998).

In the context of this Guide, development planning can take two forms: (i) the planning of adjoining areas (including the preparation of development control plans, and road hierarchy plans), and (ii) the concept planning of the Main Street or sub-arterial road itself. The second form is addressed in Part 4.
3.2.4 Relationship to planning instruments

Local authorities will have prepared statutory plans (Local Environmental Plans or LEPs in NSW) and exercise development control based on such plans. There may be a need to review them, at least in respect of the zoning provisions that apply to the Main Street or sub-arterial road, so that there is a legal basis for implementing the principles of environmental adaptation.

- Similar actions may be needed for road hierarchy.

LEPs do not always provide the detailed context for development control, and there are considerable advantages in preparing more detailed development area plans (Development Control Plans in NSW) for the Main Street or sub-arterial road and its immediate environment.

Such plans are often prepared as land-use plans with little or no detail in respect to the road space and the way it is managed. Details on the road space and its management are sometimes set out in separate plans, such as Traffic Management Plans (TMP) (see Part 1, 1.6.2).

- Environmental adaptation involves both frontage and road-space management. Development Control Plans should be prepared and implemented as integrated plans, where changes in land use, transport and the environment are considered together.

An integrated approach also provides a basis for the development (in NSW) of a Section 94 contribution plan under the provisions of the (NSW) Environmental Planning and Assessment Act (1994). The contribution plan links the nature and level of contribution of any proposed private development in an area to the public improvements which need to be made associated with this development.

3.3 Planning parameters

3.3.1 Parameters associated with the town or district area

There are two basic interactions which require consideration at the town or district level. They are:

1. transport and land-use developments and proposals may influence the scope for environmental adaptation of the Main Street or sub-arterial centre; and

2. the opportunity for environmental adaptation may be constrained by the traffic function unless major transport initiatives are taken.

The first situation arises when there are proposals to Fig 3.4):
- change the traffic function of the Main Street or sub-arterial (for example by developing an internal or external by-pass);
- travel demand management;
- re-route heavy vehicles; and/or
- expand the centre or to reduce its role because major commercial development is likely to occur elsewhere.

- The impact of such changes must be considered at the town/district level. There are conventional planning techniques for undertaking such an assessment.

The second situation may occur if traffic conditions on the Main Street or sub-arterial impose a constraint on the scope for environmental adaptation. This situation occurs when (see Section 2.3):
- existing traffic volumes on the Main Street or sub-arterial road exceed about 12,000 vpd;
- the amount or proportion of through traffic (defined as vehicles that have no intention of stopping in the centre)
during normal business hours is high; and

• the number of heavy vehicles exceeds 60 per hour during normal business hours.

• there is agreement that a cap should be set on the amount of traffic in the Main Street or sub-arterial road by limiting the number of lanes for movement (eg one lane in each direction; or one or two lanes in one direction)

In all these situations, there is a need to investigate on an area-wide basis whether through traffic or certain types of vehicles for the whole day or part thereof can be redirected.

• If there are alternatives, the design constraints may be eased.

It should be understood, however, that the implementation of ancillary measures usually take time and may delay the full implementation of the adaptation project. Alternatively, design and construction measures should be selected which allow for further changes later.

If there are no alternatives, then there are constraints which must be recognised in the design of the Main Street or sub-arterial.

For instance, with heavy traffic volumes or a relatively high number of heavy vehicles, there may be a need to place more reliance on traffic signals and medians than on measures involving horizontal or vertical changes in the carriageway. There may also be a need to restrict right-hand turns.

3.3.2 Parameters associated with the area immediately adjacent

A similar set of situations can arise in areas in the immediate vicinity (Figure 3.5):

(1) transport and land-use proposals in adjacent areas may influence the design for environmental adaptation of the Main Street or sub-arterial centre; and

(2) there may be overspill effects which need to be considered in developing design solutions.

The first situation can occur if there are proposals, for example, to:

• increase residential densities and to provide for urban housing in adjacent areas, or directly above shops (called ‘shop-top housing’);

• introduce local area traffic management or ‘traffic calming’ measures in adjacent residential areas; and/or

• improve public transport, provide bicycle ways. or reroute some main street traffic.

In such a situation, there is a need for an integrated planning study so that the potential benefits of each are maximised.

Figure 3.5 Example of parameters for concept design (Taree).
The second situation can occur if:

- speed control measures could lead to increased traffic in adjoining streets;
- there are side street closures;
- there is lateral expansion of the centre;
- there are changes in circulation: restricted turning movements, improved pedestrian and cycle access;
- parking provision is increased; and
- changes to rear access are required.

If there is a risk of undesirable impacts on adjacent areas, the contributing factors should be identified and become a constraint in the design for environmental adaptation.

### 3.3.3 Parameters associated with both levels

- **Large centres require an integrated development plan**

Where the Main Street or frontage activity along a sub-arterial road are part of a larger centre with extensive lateral development into adjoining streets, there is a need for a planning study of the entire centre. A strategy and an integrated development control plan should be developed so that any factors for environmental adaptation can be considered within a longer term planning context.

- **Major variations in traffic and activity require special study**

*Seasonal* variations in the level of traffic and activity often occur in the Main Streets of towns with a tourist function. The design must have the flexibility to respond to these different situations and his may influence the type of measures that can be used.

Other constraints can arise where there are *daily* variations in the level of traffic and activity. This frequently occurs on sub-arterial roads which serve as major traffic routes at peak periods, but carry mainly local traffic during other times of the day. Pedestrian activity may peak during the day, but still be high during evening peak traffic. The design factors in this case can only be determined after careful study, but it is likely that there is a need for more reliance on traffic signals and medians than on measures involving horizontal or vertical changes in the carriageway.

- **Limits of the core and transition zones should be defined within a planning area context.**

It is not possible to provide definitive information on how such limits should be determined as they are derived from local conditions. However, the aim should be to confine the core zone to those sections where there is active and concentrated pedestrian frontage. The transition zone should also be confined, so that drivers perceive it as a transition and driver behaviour is modified accordingly.

- **Speed zones should also be determined for adjoining areas.**

Speed zoning prevents other streets from being used as ‘rat-runs’ and provides an important legal basis for speed control (Figure 3.6).
3.3.4 Time, resources and responsibilities

There are other planning parameters which may constrain the scope for environmental adaptation:

- time frame: it will take much longer to establish an activity profile than a speed profile, and provision for interim arrangements should be made. However, if the speed profile is correctly designed and implemented, then realisation of the activity profile is likely to be accelerated.

- environmental adaptation of the Main Street or sub-arterial road may depend on other actions.

For example, the preparation of an integrated development control plan may need to precede a design in the case of a large centre.

- resources: available funding, including demonstration grants and Section 94 contributions, may constrain the options and influence their staging;

- responsibilities: there may be shared responsibilities which may affect the type of measures to be used.

3.4.1 Checklist of steps

The process of identifying planning Factors is illustrated in Figure 3.7.

**Step 1** triggers off the process when the key parameters, set out in Table 2-1, apply.

**Step 2** involves a check whether studies and plans exist.

**Step 3** is a check to determine whether such plans provide sufficient information.

**Step 4** examines whether any spillover effects may occur. If this is not likely to be the case, no further planning is needed.

**Step 5** examines the need for further studies and plans if they do not exist.

**Step 6** deals with the situation where existing studies and plans do not provide a sufficient context for the development of the design.

**Step 7** ascertains whether planning action is necessary because there could be overspill effects for adjacent areas.

**Steps 8 and 9** address the interactions in the planning area which requires further data collection.

**Step 10** involves the collection and interpretation of data.

**Step 11** produces alternative strategic approaches.

**Step 12** assesses the possible consequences of each strategic option.

**Step 13** obtains the views of the stakeholders on the options and the consequences.

**Step 14** involves selecting the preferred planning strategy.

**Step 15** consists of the preparation of integrated development area plans and work programs appropriate for the planning area level, where it is necessary for such plans to be prepared.

**Step 16** establishes the planning criteria for assessment (see Appendix B, Table B-1).

**Step 17** is the statement of the planning parameters which should be considered in the development
Figure 3.7 Checklist of planning actions.
Situation Planning parameters to be considered in design

Town or district level

There may be land-use and transport changes
- Road network development (e.g., by-pass)
- Traffic management (e.g., truck routes)
- Role of Main Street/sub-arterial centre

The traffic function of Main Street/sub-arterial is a constraint
- High traffic volumes
- High amount or proportion of through traffic
- High proportion of heavy vehicles
- The pedestrian environment is of greater importance

Inputs derived from re-examination of area-wide strategies. Interim arrangements where there are alternatives. If no alternatives: place more reliance on traffic signs and medians than on measures involving horizontal or vertical changes in the carriageway.

Adjacent areas

There are proposals for change
- Retail/Commercial development
- Increased residential densities
- Traffic calming
- Public transport stops or bicycle ways

Inputs derived from integrated studies and plans.

Pay special attention to provision for turning movements, side street closures, parking and delivery access, pedestrian and cycle ways to and across Main Street or sub-arterial.

There may be spillover effects

Pay special attention to the effects of lateral expansion of the centre changes in circulation & access. Overspill on-street parking is an important issue for residents.

Both levels of planning

Large centre
- Wide variations in the level of traffic and activity

Inputs derived from strategy and development area plan.

If no alternatives, see comment above (under constraint).

Core and transition zones

Identification of the limits of the core and transition zones.

Time, resources and responsibilities

Changes take time to implement
- Resources

Provide for interim solutions.

Select cost-effective measures and provide for staged implementation.

---

TABLE 3-1: Summary of Planning Parameters

<table>
<thead>
<tr>
<th>Situation</th>
<th>Planning parameters to be considered in design</th>
</tr>
</thead>
<tbody>
<tr>
<td>Town or district level</td>
<td></td>
</tr>
<tr>
<td>There may be land-use and transport changes</td>
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</tr>
<tr>
<td>Road network development (e.g., by-pass)</td>
<td>Inputs derived from studies and plans.</td>
</tr>
<tr>
<td>Traffic management (e.g., truck routes)</td>
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<tr>
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</tr>
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</tr>
<tr>
<td>Adjacent areas</td>
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</tr>
<tr>
<td>There are proposals for change</td>
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<tr>
<td>Retail/Commercial development</td>
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<tr>
<td>Increased residential densities</td>
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<tr>
<td>Traffic calming</td>
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<tr>
<td>Public transport stops or bicycle ways</td>
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</tr>
<tr>
<td>Input derived from integrated studies and plans.</td>
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</tr>
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<td>Pay special attention to provision for turning movements, side street closures, parking and delivery access, pedestrian and cycle ways to and across Main Street or sub-arterial.</td>
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<tr>
<td>There may be spillover effects</td>
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</tr>
<tr>
<td>Pay special attention to the effects of lateral expansion of the centre changes in circulation &amp; access. Overspill on-street parking is an important issue for residents.</td>
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<tr>
<td>Both levels of planning</td>
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<tr>
<td>Large centre</td>
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</tr>
<tr>
<td>Wide variations in the level of traffic and activity</td>
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<tr>
<td>Input derived from strategy and development area plan.</td>
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<tr>
<td>Core and transition zones</td>
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</tr>
<tr>
<td>Identification of the limits of the core and transition zones.</td>
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<tr>
<td>Time, resources and responsibilities</td>
<td></td>
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<tr>
<td>Changes take time to implement</td>
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<tr>
<td>Resources</td>
<td></td>
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<tr>
<td>Provide for interim solutions.</td>
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<tr>
<td>Select cost-effective measures and provide for staged implementation.</td>
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</tbody>
</table>
PART 4

Design
4.1 Purpose

4.1.1 Purpose of Part 4

The purpose of this Part is to provide information on:

- the measures available to develop designs for environmental adaptation and how they might be combined to achieve specific objectives;
- general design parameters;
- the relationship between design and construction measures and the use of a package of measures;
- the process for achieving an integrated design;
- an illustration of a concept design process; and
- the steps in moving from concept to detailed design and completion.

4.1.2 Context

Design for environmental adaptation means the selection of design, construction and control measures and the manner in which they are combined to achieve specific objectives.

Part 3 provided information on setting the planning issues parameters before commencing a design. The focus in this Part is on design and control measures and how they can be used in combination to achieve the objectives and strategies referred to in Parts 1 and 2.

The information provided should be used as a guide. Each situation is unique and requires an individual approach.

There are two stages in the design process for a Main Street project.

![Fig. 4.1 From parameters for concept design](image1)

![Fig 4.2 To concept design](image2)
1. the development of a concept design

This stage involves the exploration of alternative layouts and concludes with the selection of a concept or sketch plan. The emphasis in Part 4 is on the development of a concept.

2. detailed design

Detailed design starts with the concept and develops it to the point where tenders can be called for construction. There are three components: detailed urban design, engineering design and documentation, and the development of a financial plan.

4.2 Types of measures and their roles

A range of measures can be used for the design of integrated proposals for environmental adaptation. The measures in the Guide are divided into two major groups:

- C: Control measures; and
- D: Design and construction measures.

Each of these groups could be subdivided further according to whether a control measure relates to traffic or development control, or whether a design/construction measure relates to the vehicle space, the pedestrian space, or to both.

The measures vary a great deal in nature, cost and time frame required for implementation. Although some measures are relatively inexpensive and simple - and these could be taken up by the majority of small local communities - some more expensive, and longer-term, measures have also been included to develop a comprehensive inventory. Taken together, they provide ideas for more extensive designs.

Appendix A contains 55 measures. A brief commentary is provided for each measure to highlight its specific aims, characteristics/applicability, limitations and expected impacts.


It is beyond the scope of the Guide to include the detailed technical requirements, specified in these document. They should be consulted in developing detailed design (see References).
4.2.2 Measures to achieve desired outcomes

The focus of the Guide is on:

- measures to support a speed profile;
- measures to support an activity profile; and
- measures to improve the quality of the road environment.

A range of measures exist to achieve a particular objective. Some are essential and these are called ‘primary’ measures. There are also measures which can be used to support the primary measures; these are listed as ‘supporting’ measures.

Successful environmental adaption depends on a package of measures. Apart from a distinction between primary and supporting measures, there also are associations of measures which are compatible and others which are not compatible. Some of these associations will be outlined in Section 4.4.

4.2.3 Measures to achieve a target speed profile

The principal objective is increase safety by reducing vehicle speed. One single measure can seldom provide a solution for a reduction in vehicle speed. The effectiveness of a measure also varies. For example, speed zoning, through signs indicating the maximum permissible speed, require policing, but a well-designed roundabout and angle parking can be very effective in reducing vehicular speed without the need for policing.

The control of speed should ensure that there is a gradual and not a sudden change in speed. A speed profile should be established, requiring a combination of measures to achieve a gradual change (see Part 1, Figure 1.15).

Typically, it may commence with a gateway and/or a roundabout, followed by changes in the road cross-section, changes in parking layout and duration, pavement, vegetation and street lighting, type of pedestrian crossings and intersection treatments.

Table 4-1: Measures* to achieve a speed profile

<table>
<thead>
<tr>
<th>Number</th>
<th>Measure</th>
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<tbody>
<tr>
<td></td>
<td><strong>Primary measures</strong></td>
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<tr>
<td>C3</td>
<td>Speed zoning</td>
</tr>
<tr>
<td>D12</td>
<td>Gateway</td>
</tr>
<tr>
<td>D7</td>
<td>Roundabouts</td>
</tr>
<tr>
<td>C8</td>
<td>Traffic signals</td>
</tr>
<tr>
<td>D6</td>
<td>Staggered roadway</td>
</tr>
<tr>
<td>D22</td>
<td>Carriageway/lane narrowing</td>
</tr>
<tr>
<td>D10</td>
<td>Raised pavement within intersection</td>
</tr>
<tr>
<td>D4</td>
<td>Raised pavement mid-section</td>
</tr>
<tr>
<td>D20</td>
<td>Shared/raised pedestrian crossing</td>
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<td><strong>Supporting measures</strong></td>
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<td>D14</td>
<td>Shared space</td>
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<td>D16</td>
<td>Side street closure</td>
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<td>T Junction rearrangement</td>
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<td>Staggered junctions</td>
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</tr>
<tr>
<td></td>
<td>C9</td>
</tr>
<tr>
<td></td>
<td>C2</td>
</tr>
<tr>
<td></td>
<td>C3</td>
</tr>
<tr>
<td></td>
<td>C4</td>
</tr>
<tr>
<td></td>
<td>C5</td>
</tr>
<tr>
<td></td>
<td>D1</td>
</tr>
<tr>
<td></td>
<td>D13</td>
</tr>
<tr>
<td></td>
<td>D14</td>
</tr>
</tbody>
</table>

* refer to Appendix A

Fig 4-4 Measures to support a speed profile (Batemans Bay).
### 4.2.4 Measures to support an activity profile

The main objective of establishing an activity profile is to confine the area of pedestrian activity (Part 1, Figure 1.14). This can be achieved by creating a core where pedestrian-generating activities are concentrated and a transition zone where vehicle-oriented activities are located. Activities which attract both pedestrians and vehicles, such as supermarkets, may be located between these dominant forms of activity. Alternatively, they can be located with a pedestrian frontage at the front and a vehicle orientation at the rear.

Although zoning and development control are important measures, there are others which can assist greatly in strengthening the core of a centre. These include footpath width, pavement and utilisation, continuity in weather protection and pedestrian movement (e.g., side street closures) and measures which assist the retail trade in the core.

### Table 4-2: Measures* to achieve an activity profile

<table>
<thead>
<tr>
<th>Number</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary measures</strong></td>
<td></td>
</tr>
<tr>
<td>C13</td>
<td>Activity-based zoning</td>
</tr>
<tr>
<td>C14</td>
<td>Frontage width control</td>
</tr>
<tr>
<td>C15</td>
<td>Floor space ratio control</td>
</tr>
<tr>
<td>C16</td>
<td>Mixed use development</td>
</tr>
<tr>
<td>C19</td>
<td>Infill/redevelopment</td>
</tr>
<tr>
<td>D2</td>
<td>Footpath extension</td>
</tr>
<tr>
<td>C20</td>
<td>Footpath utilisation</td>
</tr>
<tr>
<td>C9</td>
<td>Pedestrian crossings</td>
</tr>
<tr>
<td>C12</td>
<td>Bus stops</td>
</tr>
<tr>
<td>C18</td>
<td>Off-street vehicular access/parking</td>
</tr>
<tr>
<td>C4</td>
<td>Management of on-street parking</td>
</tr>
<tr>
<td>D20</td>
<td>Shared/raised mid-block crossing</td>
</tr>
<tr>
<td>D18</td>
<td>Side street closure (to create pedestrian continuity)</td>
</tr>
<tr>
<td>D29</td>
<td>Awning/verandah (to create climate protection)</td>
</tr>
<tr>
<td><strong>Supporting measures</strong></td>
<td></td>
</tr>
<tr>
<td>D17</td>
<td>Road closure - Main Street</td>
</tr>
<tr>
<td>D16</td>
<td>Shared space</td>
</tr>
<tr>
<td>D25</td>
<td>Narrow median</td>
</tr>
<tr>
<td>D26</td>
<td>Wide median</td>
</tr>
<tr>
<td>C22</td>
<td>Streetscape</td>
</tr>
<tr>
<td>C24</td>
<td>Heritage conservation</td>
</tr>
<tr>
<td>C21</td>
<td>Advertisement control</td>
</tr>
<tr>
<td>D30</td>
<td>Tree planting in footpath</td>
</tr>
<tr>
<td>D13</td>
<td>Tree planting in median strip</td>
</tr>
<tr>
<td>D14</td>
<td>Tree planting in road shoulder</td>
</tr>
<tr>
<td>D21</td>
<td>Street lighting</td>
</tr>
<tr>
<td>C10</td>
<td>Bicycle way</td>
</tr>
<tr>
<td>C11</td>
<td>Bicycle storage</td>
</tr>
</tbody>
</table>

* refer to Appendix A
4.2.5 Measures to improve the quality of the road environment

Many of the measures available for creating a speed and activity profile can also be used to improve the quality of the road environment. For instance, side street closures may be used to create small urban spaces for recreation or social events.

Fig 4-6 Measures to improve the quality of the road environment (Campsie).

Table 4-3: Measures to improve the quality of the road environment

<table>
<thead>
<tr>
<th>Primary measures</th>
<th>Supporting measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>D12 Gateway</td>
<td>C11 Bicycle storage</td>
</tr>
<tr>
<td>C23 Views and vistas</td>
<td>C12 Bus stops</td>
</tr>
<tr>
<td>C22 Streetscape</td>
<td>C18 Off-street vehicular access/parking</td>
</tr>
<tr>
<td>D2 Footpath extension</td>
<td>C6 Light traffic thoroughfare</td>
</tr>
<tr>
<td>D27 Footpath pavement design</td>
<td>C13 Activity-based zoning</td>
</tr>
<tr>
<td>C20 Footpath utilisation</td>
<td>C16 Mixed use development</td>
</tr>
<tr>
<td>D13 Tree planting in median strip</td>
<td>C17 Infill/redevelopment</td>
</tr>
<tr>
<td></td>
<td>(Numbers refer to Appendix A)</td>
</tr>
</tbody>
</table>
4.3.1 Design parameters

Apart from determining the planning parameters (where appropriate, see Part 3), there is also a need to establish the design parameters before the design process can commence. There are both general and site-specific design parameters.

Four factors, taken together, have a significant influence on the application of design and construction measures. They are: peak hour traffic volumes; traffic composition; road reservation width; and temporal shifts in the priority of traffic and activity functions.

- The scope for environmental adaptation decreases with increased peak hour traffic volumes and narrower road reservations (Figure 4-7).

With peak hour traffic volumes in excess of 1000 vehicles per hour, the need to provide for a significant number of crossing pedestrians, and a road reservation of the order of 20 metres, there is often limited scope for measures involving a re-alignment of the carriageway. However, the objectives of environmental adaptation can still be achieved by using other measures for establishing a speed profile.

- The scope for narrowing the carriageway is influenced by the composition of the traffic stream, particularly the presence of large vehicles.

Road narrowing is an important tool in environmental adaptation. It reduces vehicle speeds and the distance pedestrians have to cross.

If the proportion of large vehicles is less than 5 per cent (or the number of large vehicles is less than 30 per hour), traffic volumes do not exceed 1000 vph and there is a separate route for cyclists, the carriageway can be reduced to 5.0 metres (both ways). However, if the proportion of large vehicle is greater but less than 10 per cent (or the number of large vehicles is less than 60 per hour) and the same other conditions apply, the width should not be less than 6.00 metres.

Other widths apply where there is a median separating opposing traffic streams and where there is angle parking along the kerb or in the median.

- Bus routes and stops have major influence on design

Most Type II corridors are also trunk bus routes and the location of pedestrian crossings in relation to bus stops has an important influence on design.

- A significant factor is the form of provision for cyclists.

The Guide to Traffic Engineering Practice, Part 14, Bicycles (Austroads, 1993) recommends a width of 1.20 metres for a cyclist lane (in one direction) on roads where the traffic speed is 40 km/h in a shared arrangement or 1.5m marked cycle lane with a 2m marked vehicle parking lane.

However, the concept of Sharing the Main Street is based on sharing the carriageway under lower vehicle speed conditions (25km/h without a median and up to 35km/h with a median). There is no need for a separate bicycle lane, provided vehicle speeds are within this range, the number of cyclists is small and traffic volumes are moderate (Figure 4.8).

The situation could be different in transition zones where vehicle speeds may be 40 km/h. In that event, a separate cycleway may be justified if safety considerations and/or traffic volumes warrant it. Decisions should be based on a cycleway study for the area (see Part 3).

- Where there are shifts in traffic function during the day, priority measures need to be selected which do not impede peak hour traffic flow and also provide safe conditions for pedestrians at all times (Figure 4-9).
There are many sub-arterial roads which carry a high proportion of through traffic in the peak hour, but mainly local traffic during off-peak periods. On-street parking controls, signal setting and turning bans, for example, can be used to change the level of friction at different times of the day.

The provision for parking and unparking manoeuvres and its effect on following traffic and jaywalking pedestrians deserves careful attention. There are significant differences in this relationship between vehicle peak and off-peak conditions and between pedestrian peak and off-peak conditions.

Special attention should be given to overtaking vehicles and pedestrian movements in transition zones.

In the transition zone of rural towns, but preferably before the zone is entered, there may be a need to make provision for overtaking vehicles. Vehicles may have been prevented from overtaking slow moving vehicles on the open road. Careful attention should be given to the need for pedestrians to cross safely if there are pedestrian generating activities such as schools. There is evidence to suggest that pedestrian/vehicle accident rates are greater in the transition zone than in the core. Further pedestrian-generating activities should be discouraged through development control.

The design of the road space should recognise that pedestrians and motorists perceive the road environment differently (Figure 4-10).

In the core zone, more attention should be given to the pedestrian perception of the road space. The siting and design of buildings should be related to pedestrians, road pavements should reduced, a series of smaller spaces should be created, and close attention should be given to enclosure, climate protection, landscaping, lighting and street furniture.

- Landscape elements can make a significant contribution to the objectives of environmental adaptation, but must be used with care.

Canopies provide shade and can enhance the streetscape, but can also be used to affect driver behaviour. Although conditions are very different from those on the open road, safety should always be a major concern.

Small trees do not provide shade and reduce visibility. Trees located on footpaths should be free of overhead awnings. Aerial bundle conductors are a relatively low-cost option where overhead powerlines exist.

Trees located in road shoulders require robust guards to protect them from vehicles. Trees planted in the median must have adequate soil preparation, an area in which to grow and branches that do not conflict with passing traffic.

Safe conditions should be created for all users.

Attention should be given not only to pedestrians, but also to cyclists in a shared road environment. For example, collisions between cyclists and doors of parallel-parked cars constitute a significant proportion of bicycle accidents and a minimum width of 3.5 metres is necessary for a bicycle/car parking lane (Austroads, 1993).

Design measures should also ensure safe conditions for drivers at night and during inclement weather. Measures which create friction during the day when there is much activity in the centre.
may not elicit the same driver behaviour at night when there are no pedestrians.

- The special needs of people with disabilities must be considered.

About 2 per cent of the population is visually impaired. To assist persons with such impairment, street furniture and displays should be positioned so that a continuous obstruction-free space is maintained.

The use of tactile tiles should be used to provide a physical ‘shoreline’ to follow with directional tactile links to buildings and the kerb at pedestrian crossings and near vehicle access drives. Tactile tiles can also be used where facilities such as pedestal type phone booths can not be detected with a long cane. Tree branches should not be lower than 2 metres above the pavement.

There are other forms of impairment which require special measures (see Appendix A).

- Safe conditions should be created at any stage in the development of a project.

In many rural towns, but also in sub-arterial centres, the rate of change in frontage development is often slow. As a result, it will be difficult to achieve an activity profile quickly. The design should consider this disparity and ensure that a safe environment is created at all stages in the environmental adaptation process.

- Emergency vehicle access should always be factor in design.

### 4.3.2 Site-specific design factors

Site-specific design factors are determined after investigation and identification of local requirements. It is useful to list and present these requirements before commencing design. An example of the kind of design factors used in a specific situation is shown in Table 4-6.

In most situations, there will be engineering constraints (e.g. drainage, gradients) and requirements by service and utility authorities. Alterations to underground services are invisible, but can be costly and should be considered early in the development of the design.

### 4.3.3 Summary of design parameters

Table 4-4 shows an indicative list of design parameters for projects of environmental adaptation.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Design parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>If peak hour flow is high</td>
<td>Measures not to impede peak flows</td>
</tr>
<tr>
<td>If there are heavy vehicles</td>
<td>Carriageway widths to take account of traffic composition or alternative route</td>
</tr>
<tr>
<td>If there are major shifts in traffic function during the day</td>
<td>Select measures appropriate for peak and off-peak conditions</td>
</tr>
<tr>
<td>If there are pedestrians in the transition zone</td>
<td>Special attention to crossing pedestrians</td>
</tr>
<tr>
<td>In all situations</td>
<td>Recognise special needs (cyclists, aged, people with disabilities)</td>
</tr>
</tbody>
</table>
4.4 Associations and applications

4.4.1 Where and when measures can be used

Table 4-5 shows the scope for applying different design and construction measures depending on peak hour flow, width of road reservation and shifts in priority. The table provides a summary of the circumstances where certain measures could be used (Y), where they should not be used (N), and where their application depends on the particular situation (D). The measures are grouped in three categories:

- vehicular space-related;
- pedestrian & vehicular space-related;
- pedestrian space-related.

Control measures (C) have not been included in Table 4-5 as they are generally not dependent on peak hour flows.

4.4.2 Associations

There are associations between measures, which need to be understood when developing a concept plan. For example:

- Bus stops are generally incompatible with angle parking;
- Taxi stands require a forward movement after picking up a passenger and are generally not appropriate in angle parking locations;
- Roundabouts are only compatible with pedestrians and cyclists where speeds and volumes are low;
- Rear angle parking adjoining footpaths with active pedestrian frontage are a potential health hazard;
- Where there is angle parking, a single lane and a median, extra space, a mountable median is required for emergency access in case of a breakdown or there should be occasional breaks in the median;
- Traffic signals create gaps for jay walking, roundabouts are less effective;
- There are design implications with right-hand turning bays at signal controlled intersections, which may affect jay walking and cyclists;
- There are also traffic management implications with signalisation which gives less priority to minimising delays to vehicles and greater priority to reducing the waiting time for pedestrians;
- In cases where there is a significant number of large vehicles, visibility may be impaired for pedestrians; visibility may also be reduced for drivers involved in parking and un-parking manoeuvres;
- Bus stops and pedestrian crossings;
- There are situations, where pedestrian crossings require signalisation; in other situations, signalisation is not necessary;
- Pedestrian type pavement should not be carried across the carriageway, unless pedestrians have priority and the appropriate “zebra” or “pedestrian crossing” markings are in place;
- There should be consistency in the use of different kinds of pavement, so that it is clear where the pavement is intended to be shared or allocated to a particular road user;
- Safety depends on unambiguity. Road markings are as important in low speed environments as they are in high speed environments and should be considered during detailed design; and
- The need for clarity (as well as safety) is also reflected in RTA Technical Direction 98/6 which relates to the design and marking of pedestrian crossings (see further Appendix A, D20).
### Table 4-5 Guidelines for using design and construction measures

<table>
<thead>
<tr>
<th>No</th>
<th>Measure</th>
<th>VEHICULAR SPACE-RELATED</th>
<th>PEDESTRIAN &amp; VEHICULAR SPACE-RELATED</th>
<th>PEDESTRIAN SPACE-RELATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Off-line bays</td>
<td>Y Y N Y Y D Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D2</td>
<td>Footpath extension</td>
<td>Y Y N Y Y D Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D3</td>
<td>Variable carriageway pavement</td>
<td>Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D4</td>
<td>Raised pavement</td>
<td>D D D D D D D Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D5</td>
<td>By-pass roads</td>
<td>D D D D D D D D D Y Y D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D6</td>
<td>Staggered roadway</td>
<td>Y Y N Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D7</td>
<td>Roundabouts</td>
<td>D D D D D D D Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D8</td>
<td>T Junction re-arrangement</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D9</td>
<td>Staggered junctions</td>
<td>Y Y N Y Y D Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D10</td>
<td>Raised pavement within intersection</td>
<td>N N N D D D Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D11</td>
<td>Two-lane entry threshold</td>
<td>D D D D D D D Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D12</td>
<td>Gateway</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D13</td>
<td>Tree planting in median</td>
<td>Y Y N Y Y D Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D14</td>
<td>Tree planting in shoulder</td>
<td>Y D D Y Y D Y Y Y D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D15</td>
<td>Visibility</td>
<td>Y D N Y Y D Y Y Y D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D16</td>
<td>Shared space</td>
<td>N N N D D D Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D17</td>
<td>Road closure (mall)</td>
<td>D D D D D D D D D D</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D18</td>
<td>Side street closure</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D19</td>
<td>Creating a community focus</td>
<td>Y Y D Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D20</td>
<td>Shared/raised pedestrian crossing</td>
<td>D D D Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D21</td>
<td>Street lighting</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D22</td>
<td>Carriageway/lane narrowing</td>
<td>D D D Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D23</td>
<td>Railing of footpath/median</td>
<td>D D D N N D N N N N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D24</td>
<td>Grade-separated pedestrian crossing</td>
<td>N N D N N N N N N N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D25</td>
<td>Narrow median</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D26</td>
<td>Wide median</td>
<td>Y D N Y D Y Y N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D27</td>
<td>Footpath pavement design</td>
<td>Y Y N Y Y Y D Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D28</td>
<td>Provision for the impaired</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D29</td>
<td>Awning/verandah</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D30</td>
<td>Tree planting in footpath</td>
<td>Y Y Y Y Y Y Y Y Y Y Y</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Y = Yes  N = No  D = Depends on specific situation  -  other factors apply: eg. target speed, pedestrian volumes, visibility and gradients
### 4.5 Concept design

#### 4.5.1 Elements in concept design

There are a number of key elements - all of which are related to each other, and they can be integrated into a concept design in different ways. The elements are:

- the extent of the core and transition zones
- the speed and activity profiles appropriate for these zones
- portals (or ‘entry gates’)
- provision for turning movements
- intersection treatments
- the location of bus stops and taxi stands
- service access to sites and laneways
- parking
- lane width
- median and centre line
- pedestrian crossings
- pedestrian space
- treatment for cyclists
- sightlines
- overall character and landscaping.

The relevance of each of these key elements will be outlined in the following sections.

---

### Core and transition zone

There generally is a clearly identifiable core of active pedestrian frontage. However, there often are dispersed retail outlets and the question then arises whether the core should be extended or whether further intensive retailing should be curtailed in such an area.

The core should be confined and the length of the active frontage is an important variable. The transition zone should not be extensive, but sufficient in length to prepare the driver for a different driver behaviour.

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### Speed and activity profiles

The speed profile fixes the target speed for the core and transition zones and provides for a gradual change in speed. The activity profile shows the intended concentration of pedestrian activity.

There could be a separate speed profile for each direction of flow and a separate activity profile for each side of the road. A reasonable target in the core is 25 km/h for an undivided carriageway and 35 km/h when there is a median.

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### Portals (or ‘entry gates’)

Portals are intended to alert drivers to the need for changed driver behaviour. It is desirable to place them at the entry to the transition zones. There are different ways in which a portal can be designed (see Appendix A).

For example, a median with road narrowing can be introduced with a large tree in the median (or in the verges on each side). There are other options, such as a design feature, which create a distinctive image of the centre.
Turning movements

Careful thought should be given to the need to retain all existing turning movements as they have a significant influence on the design options available. Right-hand turns affect the design, because of the need to provide turning bays and safe pedestrian crossings.

There are trade-offs at intersections in providing for vehicle movement and crossing pedestrians. The turning movements of large vehicles (including buses) are especially important.

Intersection treatments

The principal criteria in the design of intersections are the need for safety and convenience. The design is often dominated by the needs of vehicles, but in the core of centres the needs of pedestrians should be considered first.

There are different ways of combining the needs of pedestrians and vehicles.

Pedestrian priority crossings (e.g. 'zebra' crossings) are an effective way of giving priority to pedestrians, but only where vehicle speeds are low, there is adequate visibility (at night and day and on wet days), and turning movements are light. They are less satisfactory for vehicle traffic when right hand turning movements occur and there is a lack of clarity about priority.

Traffic signals can serve both pedestrian and vehicle movements. The timing of the cycles can be adapted to suit different conditions and priorities during the day. With heavy turning movements and large pedestrian flows, however, performance and/or convenience may suffer.

Pedestrian convenience may be increased by a scramble phase during which no vehicles can enter and pedestrians can cross diagonally. A scramble phase may reduce the vehicle capacity of the intersection, but still allow it to function properly.

Roundabouts are an effective way of providing for safe and efficient vehicle movement through an intersection. They perform well when there are significant turning movements and no dominant traffic flows at particular points of entry.

However, roundabouts are not friendly for pedestrians and cyclists. Pedestrian crossings near roundabouts can be a problem for both pedestrians and drivers. They have to be located away from the roundabout for reasons of safety and operational efficiency (normally a distance of at least three vehicle lengths) and this makes them less convenient for pedestrians. Barriers then have to be put in place to prevent pedestrians crossing where the pedestrian desire lines are.

At intersections where pedestrian movements are dominant and traffic volumes and speeds are low, crossings can be closer, but vehicle delays have to be expected.

Shared-use intersections are intersections where the Traffic Act of NSW for shared zones applies: “When driving upon the shared zone one must lessen the speed of, or stop, that motor vehicle and allow to pass in front any pedestrian who is upon the shared zone and with whom that motor vehicle might collide”.

Shared zones carry a reduced speed limit of 10 km/h to allow pedestrians and motorists to interact safely. Signs are placed at the entry points to identify changed conditions for motorists, entry points such as raised thresholds may be incorporated and the design of the streetscape is often improved to make the area more pedestrian friendly. The vehicle traffic capacity is reduced, but convenience for pedestrians is increased and pedestrian safety is not impaired.
Bus stops and taxi ranks

Mid-block bus stops are convenient for pedestrians, but an impediment if it is proposed to provide angle parking adjacent to the bus stop. A mid-block bus stop should be 27 metres in length; a stop near an intersection should be 18m in length. The actual location of the bus stop depends on the function of the area. In the case of sub-arterial roads (Type II corridors), bus stops are of critical importance and a dominant factor in design.

It may be possible to associate the bus stop with parallel parking on one side and provide angle parking on the opposite side. By staggering the bus stops on each side, the centreline can be varied and used as a speed reducing measure.

Taxi ranks should be located close to, or within, the core. The need for easy movement in and out of a taxi rank and quick access to a traffic route means that ranks should have parallel parking and be close to an intersection.

Service access and laneways

Rear access for servicing sites is ideal, but not always available. Laneways from the Main Street or sub-arterial road often provide service access. This constrains the options available for parking and widening of the footpath. Similar constraints arise from kerb-side loading and unloading.

Laneways combined with angle parking reduces the number of parking spaces by about 3 for each laneway.

Parking

The amount, duration, distribution and access will have been identified during investigation. The amount of parking and its proximity to active frontage are matters of crucial importance to the business community. It may be possible to increase the number of parking spaces in the Main Street or sub-arterial road by converting parallel parking to angle parking.

However, there is also an argument for giving priority to the improvement of pedestrian space and this may conflict with the need to increase on-street parking. Satisfying both objectives involves making trade-offs. Any loss in parking space should be compensated for nearby. Re-arranging employee and owner parking to maintain customer parking close to shops may also be needed.

Front angle parking is preferred in areas where there are many pedestrians on the footpath and there is significant vehicle traffic. In order to ensure safety and visibility, it is essential to provide a buffer space between angle-parked and moving vehicles of 1.5 metres.

Before preparing concept design options, it is useful to establish some basic dimensions for the elements of design. For example, for 60 degree angle parking (including the buffer strip), the distance from the kerb to the lane for movement should be 7 metres with parking bays of 3.7 metres width. For parallel parking, the dimensions are 2.7 metres (width) by 6 metres (length).

Lane width

Lane width is another important dimension. Generally, lane width for moving vehicles should be between 3.0 and 3.5 metres, but there may be circumstances where a greater width is required (see Section 4.3.1).
**Median and centre line**

A median assists in separating traffic streams, providing pedestrians with the opportunity to cross in two stages and improving the amenity of the Main Street. A wide median creates more space for landscaping and for turning bays. However, it takes up space which may be better utilised when the reservation width is limited. A wide median can then reduce the range of options.

A median can be used when there is only one lane in each direction, but care is needed to ensure access for emergency vehicles in case of a breakdown. One way is to create gaps in the median. Another is to construct a roll-over or mountable median in sections.

There are different views on the minimum width of a median. In a low speed, low volume environment, the median can be as narrow as 0.6 metres. If trees are to be placed in the median, the width should be increased to at least 1.2 metres. Trees should be selected for their suitability (e.g. branches, leaves and root systems).

The centre line can be straight or shifted along its axis varying along its length. It can also be in the centre or off-centre. Abrupt changes are undesirable, but barely perceptible changes have no effect on vehicle speed.

The balance between a clear zone and perceptual narrowings is a critical factor in safety and driver behaviour. Abrupt changes and poor sightlines should be avoided.

**Pedestrian crossings**

Pedestrian crossings should generally be provided at intersections and in mid-block locations, but if the street block length is greater than 300 metres, additional crossings may be required. The selection of mid-block crossings should be related to pedestrian desire lines and significant pedestrian-generating activities along the frontage or areas nearby.

Environmental adaptation is not limited to the provision of crossings along existing desire lines. There may be good reasons to locate crossings at points where future pedestrian-generating activities are to be encouraged or a social focus is to be created. There may also be scope for side street crossings and lateral expansion of the core.

**Pedestrian space**

The minimum width for pedestrian movement without obstructions in areas of pedestrian is 2.5 metres, but when light poles, litter bins, seats and other obstructions are added, a minimum width of 3.0 metres is recommended. Pedestrian space greater than 3.0 metres can be used for street activity, such as cafes.

It may be desirable to increase the pedestrian space on one side only. This can create more effective space for community and other activities, and permits larger landscape elements, such as shade trees and fountains to be introduced. It is also possible to vary the width of the footpath along its length. However, there is a need for a continuous interrupted space for people with impairment.

The pedestrian space can be enlarged for special events, when parking areas and the carriageway can be closed for vehicles.
Overall character and landscaping
Adaptation, especially if it involves reconstruction, offers a rare opportunity to create a new environment in the heart of the community. Attempts should be made to identify the unique qualities of the Main Street and establish a distinctive overall character. An overall theme can help to shape to concept, but can also constrain it.

For example, there can be a conflict between the desire to create an avenue-type of boulevard and to also provide the maximum number of on-street parking spaces. Trees need to be regularly spaced where they do not interfere with awnings and verandahs and this may put them on an alignment where on-street parking spaces are proposed.

The RTA’s Roadscape Guidelines may assist with the understanding of visual and landscape environments, and provides guidelines for how to manage visual and landscape elements on roads.

Sightlines
Sightlines should be considered carefully in several conditions:

- Visibility of pedestrians by drivers both during the day and at night; and
- Visibility of approaching vehicles, again during the day and at night.

Sight lines are determined by vehicle speed, intervening objects, illumination and ability to stop in the event of a conflict. In a low-speed environment, sight distances can be much lower than in higher speed environments (see for example, figure 1.9).
4.5.2 Developing options

- Integrated options
Although all concept options should aim to satisfy the general objectives of environmental adaptation and the specific objectives established for the area, the central task is to develop a concept which integrates land use, road space and environmental design, and which is affordable.

- There are alternatives
There are different ways in which the elements can be combined. There will always be trade-offs and it is important for these to be explored (Figure 4-26).

For example, it is possible to create a pedestrian-friendly environment by increasing the amount of pedestrian space. It is also possible to develop a concept which maximises the availability of on-street parking. In most projects, there will be alternatives in the re-allocation of the road space and the views of the stakeholders should be sought.

- All options should include a package of measures
There are considerable risks if the concept focuses on a few measures, such as changing a parking layout, without other measures. The application of a few isolated measures may reduce safety, instead of enhancing it. Table 4-6 illustrates how a combination of design elements can produce different options.

- There will be options with different costs and staging potential
Environmental adaptation can involve significant expenditure of public funds and it is important to be aware of costly items.

There will be different price tags attached to each option and there will be differences in staging opportunities. These should be understood when options are evaluated.

Different approaches can lead to significant differences in costs.

- Costs are greatly influenced by the reconstruction of pavements and

<table>
<thead>
<tr>
<th>DESIGN ELEMENT</th>
<th>A</th>
<th>B</th>
<th>OPTION</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community focus:</td>
<td>mid-block</td>
<td>mid-block</td>
<td>Manning St</td>
<td>mid-block</td>
</tr>
<tr>
<td>Bus stop</td>
<td>mid-block</td>
<td>edge of core</td>
<td>near intersections</td>
<td>mid-block</td>
</tr>
<tr>
<td>Amount of pedestrian space</td>
<td>Increased</td>
<td>Increased</td>
<td>Increased</td>
<td>no major change</td>
</tr>
<tr>
<td>Location of pedestrian space</td>
<td>on both sides</td>
<td>on river side</td>
<td>variable</td>
<td>as is</td>
</tr>
<tr>
<td>Parking:</td>
<td>marginal increase</td>
<td>marginal increase</td>
<td>marginal increase</td>
<td>maximised</td>
</tr>
<tr>
<td>Centre line</td>
<td>axial shift</td>
<td>to the left</td>
<td>axial shift</td>
<td>centre parking</td>
</tr>
<tr>
<td>Intersection treatment</td>
<td>signals</td>
<td>signals</td>
<td>roundabout at Manning St</td>
<td>signals</td>
</tr>
<tr>
<td>Cross-links (Based on Taree project)</td>
<td>arcades</td>
<td>major EW</td>
<td>major EW</td>
<td>arcades</td>
</tr>
</tbody>
</table>
Option A This is a least cost option. The focus is at the mid-block crossing. There is a narrow median and much of the existing pavement can be re-used.

Option B The pedestrian space has been increased on the river side and served by angle parking. The bus stop has been moved.

Option C The focus has been moved to create a stronger link with the river. There is a narrow median with an axial shift.

Option D Greater weight is given to increased parking which is located in the centre.

Fig 4.26 An example of design concept options (based on the Taree adaptation project)

Table 4-7: Example of actual costs of adaptation*

<table>
<thead>
<tr>
<th>Category</th>
<th>Items</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provision for traffic</td>
<td>Pavement marking</td>
<td>$95,076</td>
</tr>
<tr>
<td>Intersection treatment</td>
<td>Traffic signals, roundabouts (not used here)</td>
<td>$122,950</td>
</tr>
<tr>
<td>New traffic signs</td>
<td>Traffic and street signs, including replacement and warning signs</td>
<td>$11,239</td>
</tr>
<tr>
<td>Drainage</td>
<td>Excavation and backfill, pipes and drains, drainage structures</td>
<td>$325,901</td>
</tr>
<tr>
<td>Earthworks</td>
<td>Excavation, demolition and disposal</td>
<td>$103,190</td>
</tr>
<tr>
<td>Alteration to services</td>
<td>Telstra, electricity, consumer mains</td>
<td>$68,546</td>
</tr>
<tr>
<td>Pavement for vehicles</td>
<td>Pavement surface, sub-base and base course</td>
<td>$163,546</td>
</tr>
<tr>
<td>Kerbs</td>
<td>Pedestrian areas, parking areas, medians</td>
<td>$112,102</td>
</tr>
<tr>
<td>Driveways</td>
<td>Laybacks and dish crossings</td>
<td>$25,804</td>
</tr>
<tr>
<td>Pavement for pedestrians</td>
<td>Medians and pedestrian areas</td>
<td>$377,748</td>
</tr>
<tr>
<td>Landscaping</td>
<td>Trees (advanced stock) and shrubs, garden areas, tree grates and</td>
<td>$160,779</td>
</tr>
<tr>
<td></td>
<td>guards, planter boxes</td>
<td></td>
</tr>
<tr>
<td>Lighting</td>
<td>Includes bollards and banner poles</td>
<td>$330,424</td>
</tr>
<tr>
<td>Street furniture</td>
<td>Seating, play equipment, litter bins</td>
<td>$32,466</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td>$22,823</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>$1,952,594</td>
</tr>
</tbody>
</table>

Table 4-7 provides information on actual costs (1998) incurred in the environmental adaptation of the Main Street of Taree. The project involved 400 metres of roadway (30 metres wide), three sub-courses, modifications to stormwater drainage and relocation of underground services.
intersections and reconstruction of the pavement.

In the example, the expenditure associated with this work accounted for one third of the total costs. Changes to intersections can also be costly, especially if major reconstruction is planned. Other major items are: pedestrian pavement (19%), street lighting and furniture (18%), landscaping (9%) and kerbing (6%).

4.6 Detailed design

In the example, the expenditure associated with this work accounted for one third of the total costs. Changes to intersections can also be costly, especially if major reconstruction is planned. Other major items are: pedestrian pavement (19%), street lighting and furniture (18%), landscaping (9%) and kerbing (6%).

4.6.1 Components

The concept design evolves through assessment, evaluation, revision and detailed design. There are three components of detailed design: urban design, engineering design and documentation, and the development of a financial plan.

4.6.2 Streetscape design

Streetscape design involves establishing the overall design theme, general image, geometry of space and streetscape design elements.

- General image
  Matters to consider include: the design of the portals, tree planting, upgrading of the building facade, retention of posted awnings, character of new buildings and parking areas.

- Geometry of space
  A major item is the design of the pedestrian space: routes and width, public seating areas, café space and permanent security.

- Design elements
  The design elements include pavement of pedestrian areas, vehicle crossings, pedestrian crossings, setbacks, street furniture, awnings, lighting, banners and bollards and public art.

  It is good practice to seek the participation of the stakeholders. They can relate to the design as it evolves and often make valuable comments which can be incorporated in the final design.

- Master plan
  It is useful to prepare a master plan if implementation is staged over an extended period. This has the advantage that the overall intentions are not lost when development resumes at a later stage.

4.6.3 Engineering design and documentation

Engineering design focuses on drainage, services, pavement design and construction, traffic management, line-marking, safety, access and circulation arrangements during construction, and costs.

Interim parking arrangements also need to be addressed and publicised.

It is good practice to undertake a safety audit and consult with property owners who will be affected during construction.
4.6.4 Financial planning

It is essential to prepare a financial plan which indicates how the project can be funded and whether there is a need for staging. The plan should also identify whether any contributions will be sought from property owners or levies will be introduced to help pay for the scheme. All these aspects of detailed design may lead to a need to revisit the concept design.

4.6.5 Legal responsibility

Another issue is that of legal responsibility in case of an accident. A duty of care always applies, and common sense is equally important. However, it is essential to avoid confusion, and this means careful use of measures, materials and signs. These principles are well established for the design of public parking areas, which also rely on a low speed environment.

The principle of shared use of the road space is already enshrined in the NSW Traffic Act. Shared zones carry a reduced speed limit of 10 km/h to allow pedestrians and motorists to interact safely. Signs are placed at the entry points to identify changed conditions for motorists.

A legal speed limit of 40 km/h is used in Main Street projects with a legal facility sign for each facility.

It should be noted that research and experience show that target speeds not exceeding 25 km/h are desirable in the core (or 35 km/h if there is a median).

There is merit in creating a special type of zone for the core in Shared Main Street schemes with a signposted advisory speed limit of 25 km/h (or 35 km/h) for the core zone as a whole, rather than a series of legal facility signs for each facility.

It should be stressed that this may be a possibility in future, but is not yet within the bounds of current procedures.
Assessment and evaluation
5.1 Purpose

5.1.1 Purpose of Part 5
The purpose of this Part is to provide information on:
- how to undertake an assessment;
- evaluation and decision-making; and
- monitoring and review after completion.

5.1.2 Content
The activities of assessment and evaluation should be considered separately. Assessment is a technical activity to demonstrate what is likely to be the outcome of a proposal. Evaluation is the activity to determine whether the expected outcome is desirable, or acceptable, and must involve those with an interest in the result. Both assessment and evaluation are needed to establish whether the objectives will be or, in the case of a completed project, have been met.

It is often possible to satisfy objectives in different ways, but the costs and benefits may not be the same. Thus, there is a need to assess the likely consequences of each proposal, to compare the different proposals in terms of advantages and disadvantages, and to evaluate which proposal offers the best value for money.

It is also necessary to ensure that the RTA Guidelines for Traffic Management Plans are observed and the schemes comply with the technical standards which have been set.

There are different techniques for evaluation.
Assessment and evaluation can be used for comparing alternative proposals and selecting the preferred solution. Performance indicators are the principal tool in this process. Performance indicators can also be used for monitoring the performance of a project after completion and for determining whether it has been successful.

Projects can be assessed with varying degrees of detail. In this Part, information will be provided on the general approach towards assessment and evaluation of projects for environmental adaptation. More detailed information is set out in Appendix B.

5.2 Process

5.2.1 Three stages of assessment and evaluation
There usually are three stages of assessment and evaluation (Figure 5.1).
- The first stage is part of a ‘Needs Study’. The purpose of assessment and evaluation is to establish whether a Council wants to proceed with a Feasibility Study.

There is no need for a detailed examination, but sufficient information is required to determine whether there is a case for proceeding to the next stage of investigation. Consultation with the stakeholders is important at this early stage. Details on how to undertake a Needs Study are contained in the companion document Guidelines for Demonstration Projects.
- The second stage is part of a ‘Feasibility Study’. The purpose of the assessment is to compare alternative proposals with the ‘do nothing’ alternative. The
evaluation starts with this assessment and concludes with a preferred solution.

The criteria for assessment follow from the objectives to be achieved and are defined at the beginning of the feasibility study. The evaluation involves a cost-effectiveness or a benefit/cost study and consultation with interested groups. Funding sources and staging aspects must also be included.

The information should be presented in a format to enable the Council or other funding body to make its own assessment and evaluation for the purpose of deciding whether financial assistance can be provided. Details on how to undertake a feasibility study are contained in the companion document Guidelines for Demonstration Projects. For major or potentially controversial projects, there may be a need for a more detailed assessment (see Appendix B).

5.3.1 Performance indicators

Assessment is the process of examining the likely or actual consequences of a particular project for a range of different criteria or ‘performance indicators’. The outcomes are compared with the ‘do nothing’ situation. Assessment does not entail making judgements about the merits of the project - that is part of the evaluation process.

Performance indicators are a central feature of assessment. A performance indicator in the context of this Guide is not a specification, but a parameter which shows how a system or a project performs.

Examples of such parameters are: vehicle speed, ability for pedestrians to cross safely, accidents, parking turnover, and changes in the type of business along the frontage.

Performance indicators are derived from the project’s objectives.

For instance, if one of the objectives is to reduce the conflict between pedestrians and vehicles, then performance indicators could be accidents, pedestrian crossability (measured in delay, convenience and perceived safety), vehicle speed, traffic volumes and number of heavy vehicles at times of pedestrian activity.

Performance indicators can be used to:

- measure the overall performance of the existing situation, using a number of parameters;
- predict or estimate the likely performance of the proposed situation; and
- measure the actual performance of the new situation after the project has been implemented.

There will be several phases during this second stage which all require assessment and evaluation (eg., planning, design concept, traffic management plan, and detailed design).

- The third stage occurs after the project has been implemented. The purpose is to determine the extent to which the objectives have been achieved. It is a key component in the case of a demonstration project. Information on the process and timing of undertaking this assessment is provided in ‘Monitoring and Review’, later in this Part.

At each evaluation stage, there is an opportunity for value management. It includes considering whether the desired outcomes are achievable with available funds and whether there are ancillary or mitigating actions which should be taken.

5.3 Assessment

NEEDS STUDY

Is there a need?

No

Yes

FEASIBILITY STUDY

Council keen to proceed?

No

Yes

IMPLEMENTATION

PROJECT COMPLETED

MONITORING & EVALUATION

Changes needed?

No

Yes

REVISION

END

Fig. 5.1 Stages
5.3.2 Types of performance indicators

Objective and subjective aspects
A distinction can be made between objective and subjective performance indicators. Objective indicators are those which can be observed and quantified, such as the number of traffic accidents. Subjective indicators are criteria of perception - for instance, how people feel about safety or the quality of the road environment.

Both types of indicators can be measured, but the subjective indicators require opinion surveys and usually yield a spread of perceptions. The likely objective performance of a project can generally be predicted, but this is much more difficult in the case of subjective indicators. It is important, therefore, to assist people in making their judgement about alternative proposals by providing illustrative material to which they can relate (see 4.5.1 Part 4).

Monetary and non-monetary items
There is also a distinction between items which can or cannot be expressed in monetary terms.

5.3.3 What is an Assessment Balance Chart?
An assessment balance chart is a table which presents information to assist in the evaluation of the results. It estimates the costs and benefits for the performance indicators for each project alternative. Where they cannot be computed in monetary terms, information is provided in non-monetary quantitative terms, estimates are made, or the results are listed as unknown or ranked.

The important feature of the approach is that the performance indicators are listed separately for different stakeholders and that impacts are shown for each performance indicator.

There will be a range of items in proposals for environmental adaptation where costs and benefits cannot be determined in this way. Furthermore, some benefits may occur in the short term, while others may only occur in the long term. Yet it is important that all costs and benefits be identified in any assessment. This can be done by using an ‘Assessment Balance Chart’ (Appendix B).

Indicators related to stakeholders
There are advantages in listing indicators according to the groups affected.

This can help to clarify how the costs and benefits (including non-monetary items) of a project are distributed amongst the different stakeholders and can assist in making decisions at the evaluation stage.

The different stakeholders for a project involving environmental adaptation could be grouped as follows:
- road users directly affected
- road and non-road users directly affected
- non-road users directly affected
- those concerned with the quality of the environment
- public authorities.

Details on the construction and content of an assessment balance chart, and on techniques for using performance indicators, are provided in Appendix B.
### 5.3.4 How much detail is required for assessment?

The preparation of an Assessment Balance Chart can be demanding. Data collection can be costly and a careful judgement must be made about the selection of performance indicators.

There are different levels of detail ranging from the more thorough and quantitative assessment of the ‘Assessment Balance Chart’ to simple and non-quantitative assessments. The general dictum of ‘horses for courses’ equally applies to the assessment of projects for environmental adaptation.

**Comparing alternative proposals**

The information needs for comparing alternative proposals are different from those for comparing before and after situations. Here, the assessment is undertaken to predict and compare likely outcomes.

There are techniques to predict the probable consequences of some individual measures, such as the effect of a particular type and design of speed hump on vehicle speed. However, it is more difficult to predict the consequences of a range of measures designed to achieve a number of different objectives. Given the current state of knowledge of environmentally adapted roads, estimates for many performance indicators may have to be made and a simple ranking for comparison may be sufficient.

Experience shows that there usually is no need to construct a detailed planning balance chart. Comparative assessment can be confined to those aspects where the concept options vary. This simplification also makes it easier for stakeholders to evaluate the options.

### Table 5-1 Example of a simple comparative assessment*

<table>
<thead>
<tr>
<th>Assessment Criteria</th>
<th>Option</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian space (1)</td>
<td></td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Business activity (2)</td>
<td></td>
<td>3+</td>
<td>5</td>
<td>4</td>
<td>3+</td>
</tr>
<tr>
<td>Site access (3)</td>
<td></td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Pedestrian crossibility (4)</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Parking spaces overall (5a)</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Parking spaces central (5b)</td>
<td></td>
<td>3+</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Vehicle safety (6)</td>
<td></td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Vehicle speed (7)</td>
<td></td>
<td>4+</td>
<td>4</td>
<td>4+</td>
<td>4+</td>
</tr>
<tr>
<td>Bus stops (8)</td>
<td></td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Intersection treatment (9)</td>
<td></td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Urban design potential (10)</td>
<td></td>
<td>3+</td>
<td>4</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Costs (11)</td>
<td></td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2+</td>
</tr>
</tbody>
</table>

An illustration of a simple comparative assessment is given in Table 5-1.

*EXPLANATION* In comparing the options, a ranking scale of 1 to 5 was used for each of the relevant criteria. A value of 3 represents no change with the present situation - the *base case*. Where the option is an improvement on the base case, a value of 4 (better) or 5 (much better) was selected. Where the option in respect of a relevant criterion is worse than the present, a level of 2 (worse) or 1 (much worse) was selected.
For the cost criteria, 1 represents considerable expenditure, 2 moderate expenditure, 3 no change and 4 a modest saving. As there is always a problem with a classification, a + or - is used where a simple number does not give a sufficient picture. A plus (+) signifies a slightly higher ranking and a minus (-) a slightly lower ranking.

In order to keep the presentation simple, only those items where there are significant differences between the options are highlighted.

**Comparing before and after situations**

It is important for all projects to ascertain whether the objectives of environmental adaptation have been achieved. Table 5-2 illustrates the result of a simple before and after assessment. Sufficient and identical information should be collected before and after a project is implemented so that an effective comparison can be made.

The amount of detail collected for assessment should depend on the objectives which the project aims to achieve. This may not be practicable when resources are scarce and there are conflicting priorities. However, it is often possible to limit data analysis to a few key indicators.

Data collection is more critical in the case of demonstration projects, because of the intention to use the results as a resource for future projects. The data should increase the ability to predict consequences of similar projects proposed in other communities.

In the longer term, such a data base may also form the springboard for developing a computer-based expert system to help designers with the environmental adaptation of roads in urban areas, as well as in country towns.

**Table 5-2 Example of a simple before-and-after assessment**

<table>
<thead>
<tr>
<th>Objective</th>
<th>Performance Indicator</th>
<th>Level of achievement of project</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before</td>
<td>After</td>
</tr>
<tr>
<td>Reduction in conflict between pedestrians and vehicles</td>
<td>Accidents (veh/ped) 3</td>
<td>na</td>
</tr>
<tr>
<td></td>
<td>Vehicle speed in core 45</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>Jay runners/walkers (%) 11</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Perceived safety</td>
<td></td>
</tr>
<tr>
<td>Reduction of impact on frontage</td>
<td>Noise (facade) 70 dB(A)</td>
<td>66 dB(A)</td>
</tr>
<tr>
<td></td>
<td>Business activity</td>
<td></td>
</tr>
<tr>
<td>Improvement in quality of the environment</td>
<td>Footpath width (m) 4</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>Weather protection 0.7</td>
<td>0.7</td>
</tr>
<tr>
<td></td>
<td>Urban design</td>
<td>Improved</td>
</tr>
<tr>
<td>Maintain circulation</td>
<td>Site access</td>
<td></td>
</tr>
<tr>
<td></td>
<td>On-street parking (core) 200</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>Adjoining areas</td>
<td>Side street closure</td>
</tr>
<tr>
<td>Affordable</td>
<td>Capital expenditure</td>
<td>$50,000</td>
</tr>
<tr>
<td></td>
<td>Maintenance cost (annual)</td>
<td></td>
</tr>
</tbody>
</table>
5.4.1 Criteria for evaluation

**Evaluation** is the process of giving weight to the different consequences.

For example, measures to increase pedestrian safety involve a reduction in vehicle speed and an increase in travelling time. Different stakeholders will have different priorities on the relative weight of the consequences and will have different views on the type of measures used.

Evaluation usually addresses questions such as whether a proposal represents value for money and whether the advantages outweigh any disadvantages.

The criteria for evaluating alternative proposals are similar to those for evaluating the success of a project which has been implemented. They include the extent to which the objectives are likely to be achieved or have been achieved, whether they represent value for money and how the stakeholders perceive the balance of advantages and disadvantages.

The issue about value for money involves an economic evaluation, whereas the perception about the balance of advantages and disadvantages requires consultation, communication and political judgement.

While a number of formal procedures for evaluation are available and used by some authorities, their rigorous use has not been widely adopted in the past. In many cases, the decision on programmes and projects has been based on a balance of formal procedures and political judgement and this is likely to continue.

5.4.2 Economic evaluation

With increasing demands upon the resources of local and State Governments, there is the need to justify the often large expenditure involved in projects. Formal economic evaluation methods may be required to demonstrate the economic benefit of the selected proposal.

It is fundamental in an economic evaluation that all of the benefits and disbenefits of each scheme be identified and weighed against each other and against the defined objectives. Compromises and balancing trade-offs can then be made to arrive at the preferred scheme.

The traditional methods of economic evaluation which may be used in ranking various proposals and developing a preferred programme of works are:

- Benefit Cost Analysis (BCA); and
- Cost-effectiveness Analysis (CEA)

5.4.3 Benefit Cost Analysis (BCA)

This method is often used in making a selection from a range of options as well as valuing the economic worth of an overall programme.

The Benefit Cost Ratio is calculated by dividing the net present benefit (NPB) by the net present cost (NPC):

\[ BCR = \frac{NPB}{NPC} \]

In an environmental adaptation project, assumptions must be made to obtain the NPB. They can be based on the savings in such things as accident costs, reduced noise and vehicle emissions, and increased business activity. The NPC will of course include the cost of the works, but should also consider the direct costs that can occur in a variety of items, including usually negative benefits, such as relocation of some businesses.

Some costs and benefits may be realised in the short-term, but others may occur in the longer term. The costs and benefits are therefore discounted by converting them to present-day dollar values.
5.4.4 Cost-effectiveness Analysis (CEA)

There will be many performance indicators where it is not practicable to assign monetary values. In addition, costs and benefits may not affect sections of the community equally. Cost-effectiveness analysis can be used when it is difficult to quantify the benefits (RTA, 1992).

A cost-effectiveness analysis aims to identify the least cost option with costs defined and discounted in the same way as in a BCA. Benefits are not ignored even if they cannot be quantified or captured in dollar values. For example, CEA can be used when the objective is to reduce vehicle speed in a shared Main Street. The reduction can be measured, but is not subject to valuation in monetary terms. However, the benefits arising from speed reduction need to be identified and assessed in relation to quantified benefits and costs.

The outcome of a CEA for a comparison of alternatives or of a before and after situation of the type of project covered by the Guide could, for instance, include:

- Decrease in accidents, injuries and fatalities per dollar of capital investment;
- Decrease in vehicle speed per dollar of capital investment;
- Number of visitors on the footpath enjoying their new urban space per dollar of capital investment; and
- Level of community satisfaction per dollar of capital investment.

An assessment balance chart provides a basis for evaluating the economic and social costs and benefits against the expected (or actual) performance in items that can not be expressed in dollar terms.

5.4.5 Impact analyses

Experience in the assessment of Sharing the Main Street projects has shown that there are three useful analytical tools.

They are: traffic impact studies, parking impact studies and business impact studies.

Traffic impact studies

Traffic impact studies cover such matters as the consequences for the road hierarchy, supplementary actions for intersections nearby, cycleways, and vehicle speed management. These studies would accompany a Traffic Management Plan, required by the RTA (see Section 1.6.2).

Parking impact studies

Parking is always a critical issue. If some on-street parking space are lost, they need to be replaced with spaces nearby, sign-posted and made accessible from the project area.

Business impact studies

In some projects, business impact studies have been initiated by the local Chamber of Commerce to assess the possible consequences of the scheme for the traders affected.

5.4.6 Safety and access audits

Safety audits are normal practice in highway engineering. Austroads have established five stages at which audits can be undertaken:

- Preliminary design;
- Draft design;
- Detailed design;
- Pre-opening; and
- Existing roads.

There are guidelines for undertaking safety audits for highways and rural roads, but no guidelines for low speed road environments, in which measures are used deliberately to induce a change in driver behaviour. A different
approach is needed to assess the safety of all road users.

Important aspects in a low speed environment are:

- all design elements to be consistent with required driver behaviour in a low speed environment;
- the visibility of pedestrians by drivers under all kinds of conditions;
- the visibility of vehicles by pedestrian, also under all kinds of conditions;
- the visibility of measures at night, when there are few pedestrians;
- the need for a transition zone with appropriate measures, alerting drivers of changed conditions ahead;
- unambiguity in measures to indicate whether drivers or pedestrians have right of way; and
- warning signs during the transition period, when a scheme has been completed, and drivers and pedestrians have not yet adapted to the new conditions.

Access audits are needed to check access for people with impairment. Access Advisory Groups should be consulted.

### 5.5 Consultation and decision-making

#### 5.5.1 Consultation

The importance of involving the stakeholders was stressed in section 1.6. Consultation is important throughout the process, but essential during the evaluation stage.

The alternatives considered should be made available, together with information on what they are expected to achieve and a comparative assessment of the advantages and disadvantages. Different groups will give different weight to the advantages and disadvantages of the options and these need to be understood and reviewed. With community and business consultation, the areas of agreement, disagreement, and compromise can be identified.

Efforts should be made to establish the views of the ‘silent’ groups in the community. Care should also be taken that the most vocal groups within the community are not over-represented in community participation programs.

The form of presentation should be clear and understandable. A Planning Balance Chart is too complex for normal use in consultation. A simple statement of the significant differences, advantages and disadvantages is much more effective.

- There are different techniques for consultation during the evaluation stage.
Consultation is not a substitute for decision-making. The Council must ultimately decide which option to implement as it has to allocate the necessary funds. In making such a decision, compromises will often have to be made.

5.5.2 Making decisions

When the options have been evaluated by the groups affected and the results have been interpreted, a report should be prepared by the project officer which summarises the findings and provides the basis for a decision.

For ease of comparison, the alternative proposals, what they are expected to achieve, their impacts and how the advantages and disadvantages are rated by different groups, can be best set out in a tabulated form.

The report should demonstrate that any short-listed options are feasible functionally, aesthetically, financially and economically, socially, politically and legally. It should also clearly identify areas of consensus and disagreement, so that informed judgements can be made by elected representatives.

5.6 Monitoring and review

5.6.1 Why monitoring is important

When a project has been implemented, it must be monitored. The questions which need to be answered are whether:

- the predicted consequences have in fact been realised;
- there are any unforeseen consequences;
- there are aspects which could have been done differently and better; and
- there is a need for further remedial action.

Monitoring of a project is always important as there is a need to establish whether the completed project has achieved its objectives. In the case of a demonstration project, monitoring is essential because it is intended to serve as a model for other urban and rural communities.

The experience gained should be used in the development of future projects. For this reason, the details of assessment and evaluation should be worked out in consultation with the Regional Office of the NSW Roads and Traffic Authority (or its equivalent).

5.6.2 What must be monitored?

Data should be obtained for all the performance indicators which were identified at the inception of the project as being significant. As mentioned earlier, the same kind of data should be collected and the same techniques should be used as was done before the project was implemented. However, as will be explained below, this does not mean that all the data should be collected at the same time.

- It is essential that proper records be kept of the initial data that were collected during the project development stage and that they can be retrieved when needed for comparison later. There may be a need for additional data if unforeseen consequences arise.
5.6.3 When should monitoring be undertaken?

Monitoring should commence as soon as a project is completed and can be undertaken on an on-going basis. There will be complaints and matters will be referred to and considered by the local traffic committee. However, there are two points at which the results should be assessed and evaluated formally. The first point occurs within three to six months; the second within a three to five year period after completion.

The reason for the two steps is that some aspects of a project may have short-term (and perhaps long-term) effects, while others require a much longer time frame.

Changes in the construction or management of the road space will generally have short-term effects (for example, changes in vehicle speed), but there may be longer-term effects too (for example, changes in accident rates). Changes in the control of frontage development may take many years before there are observable results.

- **First step: within about three to six months**
  Assessment and evaluation of the short-term effects (such as changes in the construction or management of the road space), should be undertaken at a point in time when people have become familiar with the new situation and drivers and pedestrians have adjusted their behaviour.

- **Second step: within a three to five year period**
  Assessment and evaluation of the longer term impacts (such as the effect on accident rates and frontage adaptation), should be undertaken when sufficient time has elapsed for the major benefits and costs of environmental adaptation to have become apparent.

5.6.4 How are the results evaluated?

The results are evaluated on the same basis as was done for comparing alternative proposals. The assessment balance chart or a more simple version can be used for economic evaluation, the business community should be consulted and surveys should be carried out to measure community attitudes and changes in perception.

The evaluation is undertaken for each of the two steps (i.e. short and long term). The final interpretation should include a detailed discussion of the effects of the scheme. It should establish whether the objectives have been achieved and identify any issues which should be taken into account in the development and implementation of further projects in environmental adaptation.

5.6.5 Resources

Once a project has been completed, there usually are other priorities, and funds for a properly conducted assessment and evaluation have to compete with new projects.

- It is important, therefore, to allow for such an assessment and evaluation in the project budget.

However, when this cannot be achieved, there is merit in approaching a tertiary institution for undertaking an assessment and evaluation as a research project.

*Fig 5.4 Monitoring is not a matter of traffic performance and safety alone. In the case of the Entrance (and many other projects), business has increased.*
APPENDIX A

Measures
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### DESIGN AND CONSTRUCTION MEASURES (D)

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C1 Channelisation

**Aim**
- Separate conflicting traffic movements
- Direct traffic to specific lanes
- Reduce or prevent turning movements
- Separate pedestrian/vehicular traffic
- Provide advance warning for drivers, approaching other treatments.

**Application**
- Where protection is required for pedestrian crossings
- Where traffic control is required because of accident history or traffic congestion
- Can be used in most situations in by means of concrete or landscaped traffic islands, wide painted medians and ripple paint (vibratine), and safety bars/rumble bars
- Painted medians and rumble bars can be low cost treatments.

**Limitations**
- Concrete islands require sufficient space to maintain road lane widths
- Painted medians may not be suitable for high vehicle/pedestrian activity situations as the markings will be difficult to see or be disregarded
- Rumble bars are a hazard for cyclists.

**Impact**
- Reduces need for driver decision
- Can reduce space for on-street parking
- Can increase street drainage requirements
- Can be unattractive unless wide enough for landscaping (1m)
- Provides mid road refuge for pedestrians
- Provides storage space for turning vehicles
- Will increase costs of cleaning and maintaining the road
- Can be used to prevent overtaking and to increase friction through parking vehicles
- Increased lane discipline.

---

C2 Cross pavement markings

**Aim**
- To gradually reduce speed

**Application**
- In the transition zones of the centre parallel strips across the traffic lane(s) at diminishing intervals; either painted or made of rough textured material (e.g. cobble stone).

**Limitations**
- Regular maintenance of painted marks
- Rough texture may increase noise level.

**Impact**
- Small decrease in speed due to drivers’ perception of relative acceleration.
Aim
• To reduce vehicle speed along Main Street and create a safer pedestrian environment
• To provide a legal basis for speed reduction measures.

Application
• Enforcement of speed limits in environmentally adapted areas
• Where the budget does not permit other measures to be introduced
• Can be used in association with advisory speed signs.

Limitations
• Needs to be constantly enforced
• Usually only effective in conjunction with other measures.

Impact
• Provides a basis for establishing responsibility in case of an accident
• Can give pedestrians a false sense of security by expecting drivers to obey signs.

C3 Speed zoning

Aim
• To provide sufficient, safe and convenient on-street parking
• To regulate the turnover of parking in the Main Street.

Application
• Used to reinforce the business activities in the Main Street which depend on customer access by car
• Can be used to reduce/increase friction with through traffic.
• Used to distribute parking to the appropriate parts of the Main Street
• Can be used as part of the concept and urban design of the Main Street.

Limitations
• Parking space can compete with a need to increase the amount of pedestrian space
• Angle parking requires substantial pavement width
• Rear angle parking can increase vehicle fumes in pedestrian areas
• Parking manoeuvres can be in conflict with through traffic and pedestrian movements
• Cyclists prefer parallel parking to kerb parking on safety grounds
• Period parking requires enforcement.

Impact
• A reduction of parking close to shops will be opposed by shop owners
• Parking management to give priority to visitors will force employees and shop owners to park elsewhere
• Parking duration affects turnover of space and this, in turn, influences the degree of friction
• If parking restrictions are required in peak-hour traffic conditions, parallel parking gives greater flexibility
• Front and rear parking retard traffic flow
• Large areas of paving are required in prime positions.

C4 Management of on-street parking
C5 Management of on-street loading

Aim
- To reduce the use of the Main Street by delivery vehicles
- To provide special space on Main Street for delivery vehicles.

Application
- Where alternate loading/delivery facilities are available
- Where peak traffic demands extra road capacity.

Limitations
- Requires enforcement
- Rear or side access may be required to properties fronting the Main Street
- Adequate advance warning signs are required
- Increase travel distance for delivery vehicles.
- Loading and unloading limitations with angle parking.

Impact
- Can be confusing for drivers of delivery vehicles
- Often ignored by drivers of food delivery vehicles
- Provides additional space for on street parking where delivery vehicles are prohibited
- Reduces on-street parking when special delivery zones are provided
- Special delivery zones can be an inefficient use of road space if not managed flexibly over time.

C6 Light traffic thoroughfare

Aim
- Control of heavy vehicles on Main Street.

Application
- Where there is a high level of pedestrian activity and/or angle parking
- Restrictions may be time-based (e.g. delivery between certain hours, or prohibited at certain times)
- Where bypass or alternative route is available.

Limitations
- Requires enforcement
- Initial low cost solution, but enforcement costs are ongoing.
- Increased journey time for delivery vehicles.

Impact
- Confusing and/or inconvenient for non-locals
- Reduced road pavement loading at certain times of the day
- Improved pedestrian and vehicular safety
- Reduced noise, fuel emission and vibration.
Aim
• To reduce the conflict between pedestrians and vehicles
• To make more effective use of road space (e.g. additional pedestrian space or on-street parking).

Application
• Where there is insufficient road width for two-way movements and street improvements
• Where there is an alternate route for the displaced traffic movement.

Limitations
• Bus routes and stops may need to be altered
• Alternative routes are needed for movement in the opposite direction
• Inconvenient for cyclists

Impact
• Can mean increased vehicle trip length
• Possible loss of business
• Air pollution, noise reduced
• More effective landscaping can be achieved, especially where lane numbers and road widths vary
• Pedestrian crossing is easier
• Improved traffic flow

• Increased parking availability by the conversion of kerb parking from parallel to angled parking
• The number of conflict points are reduced at intersections
• Traffic signal co-ordination optimised
• Parking manoeuvres are less dangerous and cause less disruption
• Bus routes may require re-routing
• Possible confusion for emergency and delivery vehicles.

Aim
• To control traffic speeds
• To improve safety for motorists and pedestrians crossing Main Street
• To control turning vehicles at intersections.

Application
• Mid-block and intersections.
  • Can be used to regulate the amount of traffic through the Main Street at particular times of the day
  • Signals can be co-ordinated to impede or facilitate through traffic.

Limitations
• High cost
• Not suitable at poor sight distance locations without complementary measures
• Specialist maintenance and servicing required
• Pedestrian and vehicular volumes or special safety needs to justify the expenditure.

Impact
• Opportunity to influence traffic speed
• Can provide flexible control of vehicular and pedestrian flows

• Can arrange traffic into plateaux which create gaps for pedestrians to cross the road.
• May lead to increased noise and fuel emission
• Possible increase in accidents if sight distance is inadequate
• Could be out of character with the Town’s streetscape
• Signals should be clearly visible.
C9 Bus stops

Aim
- (A) To provide safe and efficient access and egress of buses
- (B) To provide safe and convenient passenger access to and from bus stops

Application
- (A) Off line bus bays along the kerb
- (B) Bus stops close to areas of high pedestrian activity
- (B) Bus stops close to major pedestrian desire lines across the Main Street

Limitations
- Angle parking should not be located on either side of a bus stop
- Where a bus stop is located upstream of a pedestrian crossing, the crossing should be signal controlled

Impact
- The location of bus stops should be considered at the beginning as it can affect the layout of the whole street block
- Bus stops should be related to pedestrian crossings.

C10 Pedestrian crossings

Aim
- To improve pedestrian safety
- To control speed of through traffic
- To promote business activity on both sides of Main Street.

Application
- At pedestrian desire lines
- Controlled intersections
- Mid-block
- With or without traffic signal.

Limitations
- Proper signposting and marking are of critical importance
- Vehicle approach speeds should be kept low
- Not appropriate near large roundabouts and roundabouts with significant traffic volumes
- Require adequate sight distance and pedestrian visibility
- Pedestrian crossings for impaired pedestrians should preferably be mid-block
- Require high quality and distinctive lighting at night
- Restrict traffic flow on Main Street.

Impact
- Reduced travel speeds
- Improved pedestrian safety
- Increased opportunity for pedestrians to cross
- Reduced potential for jay-walking
- Signals can be set to take account of the people with special mobility needs
- Restricted vehicular access to properties at, and near, mid-block crossing points
Aim
- To improve road safety
- To promote bicycle use
- To decrease pollution

Application
In active centres where bicycle use has some tradition or the local Bike Plan indicates a bicycle route, provision for cycling is incorporated into the Main Street environment including:
1) bike/parking lane or bike lane between the parking lane and travel lane
2) segregated bike lane (as part of the carriageway)
3) without segregation in mixed traffic with low vehicle speeds; or
4) on shared footpaths in areas where pedestrian volumes are low.
There may be different approaches in the core and transition zone.

Limitations
- Angle parking may create a hazard for cyclists
- On-street parallel parking/delivery may also create a hazard
- Road pavement must be in perfect condition
- Drainage pits may need readjustment

Impact
- Climate can be an interfering factor in bicycle use.
- Shared roadway use may lead to low traffic speeds
- Possible increase in bicycle use and consequent decrease in local vehicular traffic
- Increased catchment of the Main Street for people without access to private car.

C11 Bicycle way
Cycle-friendly road space in the Netherlands

Aim
- To create secure bicycle parking
- To improve the convenience of cycling
- To promote cycling

Application
- Near the entrance of major generators and at other selected convenient points, simple but attractive storage facilities are provided primarily for short-term visitors (ranks, railing, etc.)
- Storage facilities should comply with Australian Standard AS 2890-3-1993 Parking Facilities: Part 3 Bicycle Parking Facilities, which requires that both the bicycle frame and wheels can be locked.

Limitations
- Only locations with permanent public surveillance are suitable
- Protection against weather is desirable.

Impacts
- Increased bicycle use by local shoppers
- More effective footpath utilisation
- Decreased bicycle theft.

C12 Bicycle storage
C13 Activity-based zoning

**Aim**
- To establish an appropriate activity profile for the centre, with a grouping of activities based on pedestrian and/or vehicle orientation.

**Application**
- In long centres where businesses change over time
- A high activity core is zoned for predominantly pedestrian-oriented uses and low activity transition zones are created on either side of the centre, predominantly for vehicle-oriented uses. Uses which rely on both can be situated near the edges of the two different zones or in the core with pedestrian uses facing the Main Street and vehicle-oriented uses at the rear.

**Limitations**
- It may take time to establish an activity profile in existing centres where pedestrian-oriented uses are dispersed with vehicle-oriented uses
- Slow process which requires long-term commitment.

**Impact**
- More compact and therefore convenient pedestrian core
- The potential conflict area is confined
- This confinement creates opportunity for speed zoning (e.g. 25 km/h core zone and 40 km/h transition zones).

---

C14 Frontage width control

**Aim**
- To make the pedestrian core compact and diverse
- To improve vehicle accessibility in the transition zones.

**Application**
- Sites for small and varied businesses in the pedestrian core zone, with lateral arcades
- The number of ingress and egress points (driveways) per unit length are controlled in the vehicle-oriented parts of the centre (e.g. 5/100m - min. frontage width is 20 m).

**Limitations**
- Tangible results can only expected in medium to long term, and if development or redevelopment is likely to occur.

**Impact**
- A clearly defined pedestrian-oriented core where the pedestrian/vehicle conflict can be managed effectively
- Friction management of parking manoeuvring in the transition zone is facilitated.
Aim
- To regulate the amount and type of development on a site and thereby influence number of pedestrians and vehicles generated by the development.

Application
All development control plans (DCP’s) should contain FSR measures for development in the Main Street. FSR control can influence:
- the number of pedestrians - and thus pedestrian density and crossing - in the pedestrian-oriented core
- the friction caused by parking manoeuvring and turning movements in the transition zone.

Limitations
As in the case of frontage width control.

Impact
- Possible longer term land use changes
- Friction caused by vehicle manoeuvring and/or pedestrian crossing activity will decrease to a tolerable/desirable level
- Possible source of funds for other public works in the area.

**C15** Floor space ratio - FSR

---

Aim
- To extend the benefits and share the costs of environmental adaptation by encouraging the progressive conversion of retail centres as central places with wide-ranging functions and opportunities for higher density forms of housing.

Application
- Shop-top offices and housing.

Limitations
- Housing above shops need to be designed with separate vehicle access and with protection from traffic noise
- Existing zoning provisions and Floor Space Ratio’s may need to be changed.

Impact
- Increased opportunities for multi-purpose trips and reduction in the number of trips to gain access to facilities and services
- Proximity to activities of services for residents
- Better use of land and parking facilities
- Added economic strength and vitality.

**C16** Mixed use development
APPENDIX A  Measures

C17  Time of business activity and shopping hours

**Aim**
- (a) To reduce friction caused by major traffic generators, or
- (b) To increase the flexibility in opening and closing hours to spread demands of existing facilities

**Application**
(A) Where the daily fluctuation of traffic produces a demand in peak periods exceeding the capacity of the carriageway, on-street parking may be prohibited. This will affect the functioning period of businesses, which cannot provide off-street access facilities.
(B) Any restrictions on the times of business activity can be lifted to attract people to visit an existing centre at different hours.

**Limitations**
- Turnover of affected businesses may fall significantly under (A) and may increase for some businesses under (B)
- Implementation and enforcement have political, legal and technical dimensions.

**Impact**
For (A):
- Segregation of through and local traffic in peak periods
- Fewer accidents
- Increased road capacity and speed if combined with parking restrictions.

C18  Off-street vehicular access and parking

**Aim**
To reduce friction due to parking/delivery and vehicle manoeuvring.

**Application**
- In situations where through traffic function is dominant and the conflict between local and through traffic is significant, and businesses suffer from limited on-street access
- Clear signposting and convenient pedestrian access from the car parks are required. Some on-street parking is necessary for convenience shopping and passing trade.

**Limitations**
Feasible only if:
- Redevelopment is likely to occur, or
- Back lanes/streets exist and the interior layout of shops can be reorganised accordingly.
- Access lanes from the front of the Main Street in the core zone interfere with pedestrian movement and on-street parking

**Impact**
- Improved conditions for through traffic (increased capacity and speed)
- Improved convenience in parking for local traffic
- Some loss of passing trade if accompanied by reduction in on-street parking
- More turning movements at some intersections.
- Access lanes may affect pedestrian safety unless there is adequate visibility combined with a low speed environment.
Aim
• To maintain or enhance the character of the centre with responsive design
• To add to the public space.

Application
• Where vacant or derelict sites exist (infill)
• Where redevelopment is likely to occur and the width of the road reserve is inadequate (colonnades, increased setback, etc.)
• Where lateral expansion is desirable (arcades)

Emphasis on ground floor design and prevailing character (building lines, height, proportions, roofline, fenestration, materials, colour, etc).

Limitations
• Increased setbacks, varied building line, colonnades can be unsympathetic with the existing character of the centre
• Structure and depth of existing buildings determine the feasibility of colonnades.

Impact
• Adequate room for pedestrian activities and some other competing uses (e.g. parking bay)
• Lateral expansion of the pedestrian environment (through arcades)
• Increased visual diversity
• More flexibility for responsive functional design of the public space

C19 Infill/redevelopment

Aim
• To improve the use of the footpath and the quality of the pedestrian space
• To establish criteria for commercial use of the space.

Application
• Space (or a zone) is set aside for unobstructed pedestrian movement and areas (or zones) are identified where commercial activities may be possible
• Design criteria are established for each space (or zone), such as window shopping, pedestrian traffic, street furniture and landscaping, building entrances, commercial and public activities, and crosswalk areas.

Limitations
• There are opportunities and constraints depending on the pedestrian space available and the presence of laneways and access drives. Conditions will along the length of the Main Street.
• Careful and site specific considerations are required to determine the design parameters of each zone.

Impact
• More functional (convenient and safe) pedestrian environment
• Well-defined areas for commercial and public activity and the design requirements for them
• Improved appearance
• Greater cost-effectiveness in public sector improvements.

C20 Footpath utilisation

Zone 1 window shopping (0.6-1.2m)
Zone 2 pedestrian traffic (min 1.2m)
Zone 3 street furniture & landscaping (min 1.2m)
Zone 4 major entrances (special attention)
Zone 5 crosswalk areas (special attention)

Pedestrian space allocation
APPENDIX A

Measures

C21 Advertisement control

Aim
- To improve the visual cohesion of the streetscape
- To relate the type and number of signs to the function of the road or street
- To ensure traffic safety

Application
- Coordinated outdoor advertising policy/guidelines/controls are introduced to complement or enhance the streetscape and/or to affect speed

- The elements of control may include: number of signs/per site (or unit length), size, purpose/content, placement/location, design, etc.

Limitations
- Sensitive area-specific control requires detailed studies
- Implementation requires effective consultation and working relationship with the business community
- ‘A-board’ type of advertising on footpaths causes a safety hazard to long-cane users.

Impact
- Improved streetscape
- Compatibility between speed and the rate of information for both drivers and pedestrians (reduced density of stimuli may contribute to the reduction in accident rates).

C22 Streetscape

Aim
- To improve the appearance and the image of the centre.

Application
The controls and actions should be based on a careful analysis of assets and detractors. Elements to consider include:
- Space definition (height/width ratio, continuity, setback, active frontage, etc.)
- Roofline/skyline
- Wallscape (interface between the private and public domains)

- Floorscape (both of the footpath and of the carriageway)
- Landscaping, street furniture and signage.

Limitations
- Property values and rents may increase because the area has become more attractive
- Effective negotiation and coordination are required between authorities and property owners involved
- Street furniture should not obstruct pedestrian flow, be of effective colour contrast and be be designed so a long can \(e\) will detect it
- ‘Pedestal’ type phone boxes should not be located in pedestrian walk areas.

Impact
- Increased popularity, growing tourism and local trade
- Increased business turnover
- Increased attraction for business development.
Aim
• To protect or enhance the identity/character of the centre.

Application
The DCP should identify measures for the protection and enhancement of pleasant, and for the hiding of unpleasant, views, with controlling building height/line and envelope, landscaping, and removal of overhead powerlines. They may include:
• Closed/end vistas
• Panoramic views
• Framed views
• Screened views.

Limitations
Different levels of visual simplicity and richness are required for pedestrians and drivers.

Impact
• Distinct character
• Increased popularity (tourism as well as local trade)
• Varied visual experience (serial views).

C23 Views and vistas

Aim
• To enhance the uniqueness of the place

Application
Places that have some cultural significance are identified through careful study for conservation. The different degrees of conservation are maintenance, preservation, restoration, reconstruction and adaptation. Besides possible statutory environmental heritage listing, LEP’s and DCP’s should include provision for their protection. The items may include trees, parks, statues, relics, signs, shopwindows, verandahs, facades, colours, buildings, but whole streetscapes and street layouts, too. Age is an irrelevant factor. It is important that the introduced traffic management devices are sympathetic with the character of the Main Street.

Limitations
• As conservation is a process, involving planning, implementation, coordination, monitoring and maintenance, long-term commitment is necessary
• Public education and participation are essential.

Impact
• Distinct identity
• Community pride and attachment
• Increased tourism
• Rising business turnover.

C24 Heritage conservation

Priorities for Heritage Conservation
• Recognise the value of heritage
• Know your local history
• Identify information resources
• Know the population
• Ensure adequate repair and maintenance of buildings and features
• Know the government heritage protection powers
• Monitor new development and its effect on the character
• Engage conservation where special advice is needed. (DoP, 1993).
**APPENDIX A  Measures**

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**D1 Off-line bays**

**Aim**
- (A) To provide space for service vehicles
- (B) To create additional parking space.

**Application**
- (A) kerbside bay is provided for loading/unloading of service vehicles, bus stop, taxi stand or short term parking (e.g. couriers)
- (B) kerbside bay or centre bay is provided for general purpose parking where the road reservation is excessive (eg. > 30 metres).

**Limitations**
- Width of road reservation and competing uses for the available road space
- Merging and diverging will continue to cause some friction
- There may be safety issues associated with parking manoeuvres in centre bay parking
- Crossfall and awning line may be constraints in the design (A)
- Clear signposting is necessary.

**Impacts**
- (A) Reduced friction for service vehicles
- (B) More on-street parking space
- Clear designation of spaces for competing access functions.

---

**D2 Footpath extension**

**Aim**
- To provide more space for pedestrians and pavement activities
- To improve the quality of the pedestrian environment
- To reduce the space for traffic.

**Application**
- In core zones by conversion of parking spaces
- At selected locations (e.g. in front of civic buildings to mark their entrance with a distinct forecourt)

**Limitations**
- In association with other measures, such as narrowing carriageway, changes in parking layout and landscape design.

**Impacts**
- Desired traffic capacity
- Replacement parking for displaced on-street parking spaces
- Kerbline relocation
- May require changes to stormwater drainage systems.

**NOTE:** See RTA requirements for footpath (kerb) extensions at intersections and midblock locations.
### Aim

- To reduce speed
- To make both drivers and pedestrians aware of potential conflict area
- To enhance character.

### Application

- In the core zone with a high level of pedestrian crossing activity where both vehicle and pedestrian densities are high
- The re-paved section of the roadway has a different texture and colour with or without pattern in the pavement.

### Limitations

- High cost of re-paving
- Should be coordinated with utility reconstruction
- Pavement should not confuse drivers and pedestrians about who has right of way
- Pavements with rough surfaces should not be used (safety of cyclists).

### Impacts

- Reduced speed
- Improved appearance.

### Measures

<table>
<thead>
<tr>
<th>D3 Variable carriageway pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sharing the Main Street</strong></td>
</tr>
</tbody>
</table>

### Impact

- Reduction in overall traffic speeds
- Minor inconvenience to motorists
- Can increase noise levels.

### Limitations

- Not suitable where through traffic is significant
- Not suitable if traffic volumes are greater than 10,000 vpd
- Not suitable if there is a high proportion of heavy vehicles and buses.

### APPENDIX A

<table>
<thead>
<tr>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D3 Variable carriageway pavement</strong></td>
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<tr>
<td><strong>D4 Raised pavement</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Flat road bump (Source RTA, Technical Direction 98/6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOTE In this illustration, pedestrian crossing is discouraged. See D20 for a pedestrian crossing.</td>
</tr>
</tbody>
</table>
APPENDIX A  Measures

D5 Bypass roads

Aim
- To remove non local (through) traffic from the Main Street
- To remove heavy vehicles from the Main Street
- To improve the amenity of the Main Street.

Application
- Improvement in the safety and quality of the main street (or sub-arterial road) is given priority and cannot be achieved without diverting some traffic elsewhere
- Can be used where a cap is placed on traffic volumes so that not more than one lane is required in each direction
- Can be used to remove bypass traffic to streets adjacent to the Main Street or sub-arterial road or to completely bypass the area.

Limitations
- A bypass route is feasible and environmentally acceptable
- The main street should not rely on business from through traffic
- The alternate routes for through traffic may need to be constructed to carry the increased traffic before adaptation of the Main Street can be implemented.

Impact
- Environmental problems may be created on the bypass routes
- Reduced traffic in the Main Street can have economic effects on existing businesses
- Business activity is likely to be varied initially and some changes of use can be expected.

D6 Staggered carriageway

Aim
- To reduce vehicle speeds through the main street.

Application
- Where through traffic volumes are generally low and the road reservation width is sufficient
- As a mid block treatment
- As part of a gateway (D11) - horizontal deflection of inbound traffic
- Should be used in conjunction with other measures to reduce speeding.

Limitations
- Design can be varied to suit the traffic volumes (i.e. kerb blisters where volumes are high, full staggering where volumes are less than 7000 vpd, depending on the off-set and detailed design)
- Disruption to through traffic
- High driver awareness required
- Lighting and signposting are critical.

Impact
- Reduced traffic speed
- Improved pedestrian amenity
- Increased potential for wider footpaths at selected locations
- Can create an opportunity for staggered angle parking bays
- High visual obstruction created
- Can increase traffic noise
- Can restrict passage for heavy and large vehicles (depending on off-set treatment)
Aim
• To provide for turning movements
• To reduce entry traffic speeds
• To improve local road connections.

Application
• Preferably at intersections
• Can be used midblock if clearly marked and width permits.
• In low speed, low volume environments, but only where there are no major pedestrian movements across the intersection.

Limitations
• Conflict with pedestrian crossings if too close
• Not appropriate where traffic and pedestrian volumes are high and priority must be given to pedestrian safety and convenience, or elderly pedestrians
• Design speed generally for 25 km/h or less
• Multi-lane roundabouts are dangerous for cyclists
• Relatively high construction cost, but low maintenance cost (depending on the type of landscape treatment).

Impact
• Reduction in vehicle approach speed
• Improved local traffic access
• Deflection of pedestrian crossing and cyclist movement away from the desire line
• Requires physical measures to prevent pedestrians taking the shortest route
• Requires appropriate lighting and signposting.

D7 Roundabouts
Roundabouts offer opportunities for landscaping and landmarks, provided visibility is never impaired.

Aim
• To reduce vehicle conflicts.
• To better reflect which traffic movement has priority.

Application
• Where volumes/speeds are high on stem of T
• Use signing, line-marking to change priority used in conjunction with by-passes and malls (See D4 and D15).

Limitations
• May not be suitable for narrow streets
• Requires clear visibility on approach
• Can be confusing and/or inconvenient for pedestrians, cyclists and drivers.

Impact
• Reduced speed
• Possible increased noise.
### D9 Staggered junctions

**Aim**
- To reduce cross vehicular traffic in the Main Street
- To improve safety.

**Application**
- Where there is a high volume of cross traffic using a particular intersection
- Where traffic flow in Main Street must be maintained
- Where accident histories at the intersection are high.

**Limitations**
- May divert cross traffic to alternate routes.

**Impact**
- Discourages through traffic in the minor road by increasing intersection delay
- Reduced speeds at intersection
- Possible reduction in accidents
- Can disrupt bus routes out of side street
- Inconvenience to local traffic
- May increase traffic along sections of the Main Street
- Can be confusing for non-local traffic.

### D10 Raised pavement within intersection

**Aim**
- To reduce vehicular speed
- To create distinctiveness and improve the appearance of the area.

**Application**
- At intersections where speed is to be reduced
- Can also be used as 'gateway' entrance treatment.

For raised pavement at mid-block crossings, see D20 for RTA standards.

**Limitations**
- Can require drainage alterations
- Should be used in conjunction with other treatments
- Requires line-marking and adequate illumination
- Often an expensive treatment.

**Impact**
- Reduced vehicle speeds
- Highlights intersection
- May be noisy, but this depends on detailed design and the overall speed environment
- Visually attractive.
Aim
• To provide an entrance gateway to Main Street
• To discourage through traffic
• To reduce entry speed.

Application
• At the boundaries of Main Street project.
• At junctions with side streets.

Limitations
• Can create traffic congestion at Main Street entrances
• Reduced opportunity for turning movements
• Need to avoid squeezing cyclists

Impact
• Reduced entry speed
• Improved pedestrian safety at threshold
• Improved appearance to the core zone
• Provides definition of the boundaries of the Main Street.

Aim
• To make the driver aware of the change in the road environment
• To mark entrance to the centre
• To create an image of the centre.

Application
• In strong pedestrian oriented centres where driver behaviour should substantially be modified
• In centres which lack a distinct image,
• Located at the approach to the transition zones
• Created through the various combination of road constriction, threshold/contrasting pavement, portal/arch, tree canopy, signpost, flagpoles, special lighting, etc.
• With the introduction of lowered speed limit.

Limitations
• Minor loss in on-street parking
• Visibility should be carefully checked
• Certain designs (e.g. portal) may not be sympathetic with the character of the environment (e.g. heritage buildings).

Impact
• Increased driver awareness
• Reduced speed, compatible with the transition zone
• Improved image/character
• A distinctive landmark.
D13 Tree planting in median

Aim
• To create a distinct character for the Main Street
• To highlight areas of pedestrian activity.

Application
• Wide main streets along the length of commercial activity
• Where verandahs/awnings prevent tree planting on footpaths.

Limitations
• Narrow growing area
• Species selected need to be tall with high canopy
• Visibility of crossing pedestrians should be carefully checked
• Tree guards are needed to protect both drivers and the trees
• Species selected should avoid damage to pavement.

Impacts
• Distinctive demarcation of active area
• Aesthetic amenity
• Reduction in glare and dust.

D14 Tree planting in road shoulder

Aim
• To provide shade and reduce glare
• To define carriageway
• To reinforce heritage planting.

Application
• Where road is wide
• Where there is a previous history of tree planting in shoulder, to reinforce cultural landscape character
• Where street space definition is required.

Limitations
• Not appropriate for narrow streets
• Robust tree guards are needed
• Only trees with straight trunks and high spreading canopy
• Overhead powerlines may need to be modified to aerial bundle cables
• Porous material is needed for planting.

Impact
• Street space definition and identity
• Dust and pollution filtration
• Reduction in stormwater runoff
• Shade and glare control.
Aim

- To ensure that drivers can see crossing pedestrians and be able to stop in time
- To ensure that crossing pedestrians can see approaching vehicles
- To ensure that drivers are aware of speed reducing measures during the day and at night
- To ensure that parking manoeuvres can be completed without risk of to moving vehicles and pedestrians.

Application

- All designs should be tested for visibility under different conditions (e.g., day and night). Visibility should be linked with the design speed (see definition in Part 2, Section 3.3) applying to the area
- Bollards should well lit at night.

Limitations

- Essential in all shared situations.

Impacts

- Some measures may not be appropriate in a specific context.

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D15 Visibility

Bollards assist in defining space without impairing visibility.

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Aim

- To create a safe environment for a wide range of road users
- To improve pedestrian amenity.

Application

- Can be used in many situations, especially where traffic volumes can be contained within one lane in each direction
- However, the application of the range of measures described in the Guide depends on transport function and traffic volume (see Table 4-6). Generally, with a significant through function and high traffic volumes, the scope for the application of some measures decreases.
- In low volume situations, the vehicle path may be designated by bollards or different pavement.

Limitations

- Traffic function - Generally applicable where volumes are less than 12,000 vpd in country towns and 16,000 vpd in highly urbanised areas. The opportunities for sharing and the range of measures which can be used are increased when volumes are lower than these upper limits.
- Main street function - applicable in commercial areas where pedestrian activity is high
- Reservation width - most appropriate in narrow reservation widths (i.e., 30m or less)
- Demands greater attention/awareness of drivers
- Vision-impaired pedestrians require marked pedestrian crossings
- Relatively high cost, depending on the measures selected.

Impact

- Reduced vehicle speeds
- Discourages through traffic
- Creates additional pedestrian space
- Improved streetscape
- Improved pedestrian amenity.
# APPENDIX A Measures

## D17 Road closure (mall)

**Aim**
- To create a traffic free environment for pedestrians
- To provide additional space for landscaping, car parking, pedestrians and community activities.

**Application**
- Where the quality of the environment for pedestrians outweighs the need to maintain the transport function and alternative routes for through traffic exist or can be provided
- Where the Main Street has the potential for a high level of pedestrian activity
- Can be used at certain times of the day or week only (eg weekend markets).

**Limitations**
- Personal safety and security after hours
- Depends on the ability to reroute traffic
- Access/delivery must be maintained to premises either from rear or front of the mall
- Adequate parking spaces within close proximity of the Main Street should be available
- May make bus operations less visible and convenient
- Generally a high cost solution.

**Impact**
- Can meet with opposition from the business community
- Emergency vehicle access must be maintained
- Confusing for non regular drivers
- Increased travel distance for motorists
- Improved environment for shoppers
- Safer parking and un-parking
- Can change the uses of some shops and commercial properties due to change in turnover and property prices.

## D18 Side-street closure

**Aim**
- To increase pedestrian space and amenity
- To eliminate or simplify intersections.

**Application**
- Where traffic volumes in the Main Street are high and there is limited scope to improve the pedestrian environment
- Where there is heavy pedestrian traffic along the Main Street
- Where there are too frequent intersections
- Where vehicular access from the side street is not essential
- Where pedestrian generators tend to concentrate around particular corners and/or side-streets.

**Limitations**
- Depends on the location of the side street in relation to the activity profile
- Vehicle access for service and emergency vehicles must be available.

**Impact**
- Increased pedestrian activity and business turnover in the vicinity
- Increased safety for both pedestrian and vehicular traffic
- Opportunity for creating a focus (see D-19)
- Decreased vehicular accessibility and minor loss in on street parking
- Reduced access for emergency and delivery vehicles.
Aim
• To use the opportunity of adaptation to create a focus for community activities and events.

Application
• Side street closure
• Re-arrangement of an intersection
• Part of a redevelopment project along the Main Street.

Limitations
• Location must be part of the core or closely related to it
• Collaboration with the private sector in the case of a redevelopment project. This may involve some form of development bonus or other incentive.

Impacts
• Contributes to giving the Main Street a distinctive identity
• Creates a potential for special events, such as a weekend market or as a space for outdoor cafes.

D19 Creating a community focus

D20 Mid-block crossings

Aim
• To improve the ability of pedestrians to cross safely
• To make it clear to both drivers and pedestrians that pedestrians have priority.

Application
• Used in areas of high level of pedestrian activity, in front of major pedestrian generators, along major pedestrian desire lines and where there is a high proportion of vulnerable pedestrians
• The carriageway is narrowed to reduce crossing distance
• The pedestrian crossing, or a longer section of the roadway, may be raised to the level of the footpath.

Limitations
• Cannot be provided where the warrant for pedestrian crossings does not allow it
• Should be part of an overall concept of pedestrian and vehicle circulation.
• Loss in on-street parking
• Can be costly if drainage pits need adjustment (spot treatment).

Impact
• A clear, unambiguous pedestrian facility
• Increased driver awareness
• Greatly reduced speed at conflict points
• Increased pedestrian crossing activity
• Slightly reduced traffic volume
• Cyclists need space
• Improved appearance.

Raised marked pedestrian crossing (RTA Technical Direction 98/6)
D21 Street lighting

Aim
- To improve pedestrian and traffic safety.

Application
- Where traffic volumes are high, particularly along major tourist routes with high night-time travel. Also applicable where night time pedestrian activity is high
- Distinctive illumination to highlight points where driver attention is essential (e.g. raised crossings, staggered carriageway)
- Lighting of vehicular and pedestrian space may be treated differently
- Illumination of Bus stops.

Limitations
- Awnings, existing poles and wires
- Spacing and location should be coordinated with land-use activities (e.g. pedestrian crossings)
- There are design standards for lighting of transport routes.

Impact
- Improved driver visibility/awareness
- Improved pedestrian security
- Improved pedestrian visibility
- Improvement to roadside businesses
- Annoyance factor of lights to nearby residents
- Relatively high installation and maintenance costs
- Energy consumption.

D22 Carriageway/ lane narrowing

Aim
- To increase pedestrian space and improve amenity
- To reduce vehicular speed and/or flow.

Application
- At selected locations or longer section where the width of the road is excessive
- Where the volume and speed of traffic create a barrier for pedestrians seeking to cross
- Where crossing movements cannot be concentrated effectively.
- The treatment includes footpath extension, axial shift in the roadway, central landscaped median, or centre bay parking.

Limitations
- It may not be feasible if the crossfall of the road is high
- If the median creates a divided carriageway the minimum width is 3.5 metres plus 1.5 metres buffer space where there are on-street angle parking spaces.
- Not appropriate where (through) traffic volumes are high (close to road capacity).

Impact
- Reduced speed and/or volume (A, B, C, D)
- Increased pedestrian space (A, C)
- More parking space (D).
Aim
- To prevent jaywalking
- To improve the level of traffic service.

Application
- In centres with strong traffic function and serious pedestrian/vehicle conflicts where jaywalking should be reduced.
- A) the footpath, B) the median is fenced with rail or a raised landscaped nature strip.

Limitations
- parking and loading/unloading become inhibited (A)
- The minimum width of the median is 1.0m for railing and 1.5m for nature strip.
- Railing should be carried through to the ground so that vision-impaired pedestrians can detect them
- Unexpected, and therefore more serious conflict, if jaywalking does occur.

Impact
- No pedestrian spillover onto the roadway (A)
- Higher perceived level of protection for pedestrians (A)
- Conflict due to pedestrian crossing is concentrated to a few selected points.

D23 Railing of footpath/median

Aim
- To reduce vehicle/pedestrian conflicts.

Application
- Where there is space for ramps or stairs or multi-level building development is
- Where it is important to maintain traffic flow on the Main Street
- Where other forms of pedestrian crossing are impracticable or should be complemented.

Limitations
- Usually only suitable where there is multi-storey business development or redevelopment on either side of Main Street
- Needs to be part of an overall and integrated pedestrian circulation system with easy grades and/or escalators and lifts for disabled persons and people pushing prams
- Very expensive and unlikely to be appropriate for country towns
- Requires private sector cooperation.

Impact
- Can increase vehicle speeds and activity on Main Street
- May be unsympathetic with character
- Can make pedestrian access very private (biassed toward particular developments).

D24 Grade - separated pedestrian crossing
APPENDIX A  Measures

D25 Narrow median

Aim
• To increase pedestrian safety by (A) assisting pedestrian crossing movements (jay-walking) or by (B) blocking them.

Application
A  Where the volume and speed of traffic create a barrier for crossing pedestrians and these movements cannot be concentrated effectively;
B  In centres
• with a strong traffic function
• in conjunction with grade separation
• in situations where jay-walking accidents occur.

Limitations
For A:
• A width of at least 1.5 metres must be available for the median
• Landscaping in the median should not reduce the visibility of jay-walkers
• Pedestrians may need extra protection on the median if vehicle speeds are high.
For B
• Alternative legal crossing must be provided nearby.

Impact
A  Reduced delays in crossing.
B  Reduction in jay-walking.
In both cases:
• Increased pedestrian and vehicle traffic safety (separated flows).
• With good landscaping, improved streetscape.

D26 Wide median

Aim
• To improve pedestrian safety.
• To provide space for turning bays
• To provide space for landscaping and/or parking.

Application
• As for narrow medians.
• Where there is a need to create space for right-hand turns.

Limitations
• As for narrow medians
• If the space is used for turning bays, pedestrian crossing distance at the intersection is increased
• If the space is used for centre parking, speed reduction measures are required.

Impact
• As for narrow medians (D25).
• Increased capacity for right-hand turning movements
• Increased on-street parking.
Aim
• To improve the functional and aesthetic qualities of the pedestrian space.

Application
• In the pedestrian core where the pavement of the footpath is in a poor condition
• When reconstruction of underground utilities becomes necessary
• The pavement can be neutral and patterned, and include some simple signs (e.g. street name, numbers, etc.).

Limitations
• Repaving should be planned in advance and coordinated with public utility improvement programs
• Man-holes should be integrated with the design
• Footpath design at bus stops needs to take account of low floor buses
• High cost.

Impact
• Increased attractiveness and possible increase in pedestrian activity and business turnover
• Maintenance (cleaning) may become easier.

Aim
• To address the needs of people with a wide range of disabilities including the hearing, vision, ambulatory and intellectually impaired
• To comply with the Commonwealth Disability Discrimination Act 1992.

Application
• To all pedestrian spaces in the public domain, particularly at pedestrian crossing points
• Footpath widths, ramps, lighting, tactile and audible features
• Especially pertinent where local land uses include hospitals, clinics, aged or retirement housing, or the retail centre in a popular retirement area.

Limitations
• Clear zones of 1800mm minimum width adjacent to buildings on footpaths for pedestrian use
• Café seating should not encroach on clear zones
• May increase the time for design to ensure stakeholders (eg Council’s Access Committee) are properly involved.

Impacts
• Increased safety and convenience to impaired people
• Increased usage by elderly as well as parents with prams.

NOTE see also the RTA policy (1998) for the placement of tactile indicators at kerb ramps.
### D29 Awning/verandah

**Aim**
- To provide protection for pedestrians against weather impacts and
- To create enclosed secondary space for pedestrians.

**Application**
- Continuous overhead protection along the pedestrian core of the centre
- Where the attraction of more pedestrian street activity is desirable
- Where space is very limited, awnings can be combined with landscaping
- Combination with pedestrian lighting is desirable
- Awnings can be combined with bus stops to provide shelter (e.g., North Sydney)
- There is potential to unify advertising on fascias and relate them with the streetscape.

**Limitations**
- Existing mature trees and/or poles may be obstacles
- Angle parking should be clear of the posts
- In the case of some delicate heritage buildings, it may not be possible to integrate the awning with the design of the facade.

**Impact**
- Increased convenience and attraction of the centre for pedestrians
- Awnings (and tree canopies) can define more enclosed and intimate secondary spaces within a wide, loosely defined road space.

### D30 Trees in footpaths

**Aim**
- To provide shade for cars
- To reduce pollution.
- To reinforce the distinction between the transition and core zone.

**Application**
- Where footpaths are wide
- Where there is a high activity core for pedestrian use
- Where the building facades are not particularly attractive
- Different selection and location of trees in core and transition zones.

**Limitations**
- Where verandahs and awnings exist
- Overhead powerlines need to be modified to aerial bundled cables
- Only trees with tall straight trunks and high spreading canopy
- There should be no conflict with underground services and root systems
- Avoid visibility conflict with traffic signals.

**Impact**
- Shade
- Dust and pollution filtration
- Definition of primary and secondary pedestrian space
- Improved streetscape
- Obstruction of the visibility of some outdoor advertisements.
APPENDIX B

Assessment balance charts and performance indicators
Assessment Balance Charts

What is an Assessment Balance Chart?

An assessment balance chart (ABC) presents information for a wide range of performance indicators and for different stakeholders. Where information cannot be computed in monetary terms, it is provided in non-monetary quantitative terms, described, recorded as estimates or rankings, or listed as unknown.

The different stakeholders for a project involving environmental adaptation could be grouped as follows:

- road users directly affected
- road and non-road users directly affected
- non-road users directly affected
- those concerned with the quality of the environment
- public authorities

How to construct an Assessment Balance Chart

There may be a need for two charts: one to compare alternative proposals and another to compare a project before and after completion. The same performance indicators can be used, but the unit of measurement differs. For comparing alternative proposals, estimates or rankings may be sufficient, but observations and other data are the main form of measurement for comparing the situation before and after completion.

Table B-1 provides information for constructing both types of ABC. The first column shows the performance indicators by stakeholder group. The second column is used for comparing alternative proposals; the third column for comparing projects before and after completion.

The table shows, for each performance indicator, what to observe, measure, estimate or rank. For the proposal assessment, observation of the existing situation is combined with professional judgement and stakeholder assessment (where appropriate) of the alternatives.

There will always be a planning impact, but the form this takes depends on the nature of the project and should be part of an area planning study (see Part 3).

Road users directly affected

Accidents

Information is needed on vehicle-pedestrian accidents, vehicle/vehicle accidents, and vehicle/obstacle accidents. For comparing safety performance before and after completion of the project, data are required for the traffic flow and the 85 percentile vehicle speed in peak pedestrian activity hours and in peak traffic hours, the number and type of accidents, location (core zone, transition zone), type of crossing (legal, illegal), time, and severity. There is a need for data covering a longer period than one year (preferably three years) to eliminate the small number of accidents.

For comparing road safety performance of alternative proposals, all accident types are combined and represented by a severity index. The severity index is based on a weight of 3.0 to fatal accidents, 1.8 to serious injury accidents, 1.3 to other injury accidents, and 1.0 to non-injury accidents (RTA, 1992). For instance, 1 fatal, 1 serious injury, 3 other injury and 5 non-injury accidents are calculated by the index $3.0 \times 1 + 1.8 \times 1 + 1.3 \times 3 + 1.0 \times 5 = 18.7$.

The expected changes in the severity index, $I_e$, is estimated by $I_e = A_b q\%$ where $A_b$ represents the severity index before the project, $q\%$ is the proportional change (expected or measured) of vehicle traffic after completion of the project. A negative
q% indicates a traffic reduction and a positive q% indicates traffic increase.

This simplified approach is based on the assumption that accident reduction is proportional to the reduction in vehicular traffic flow (Department of Transport, UK, 1977). However, there is evidence that vehicle speed, traffic exposure level, and accidents are correlated. Accident risk to pedestrians crossing main roads and local streets in Sydney has been investigated by Song (et al, 1993) using a behavioural probabilistic model based on Bayer’s law:

\[ P(B/A) = \frac{q.g^2 t_c}{\text{s}} \]

where the conditional event B/A is that the pedestrian crosses a road given that the vehicular headway chosen is actually smaller than the pedestrian’s critical gap; \( q \) = vehicles per hour; \( S \) = mean speed of vehicles; and \( t_c \) = pedestrian crossing time in seconds.

For main roads in Sydney

\[ P(B/A) = 38(q.g^2 t_c)^{0.642} \times 10^{-7} \]

where

\[ P(B/A) \] = pedestrian accident risk per million person-years.

**Pedestrian crossability**

*Pedestrian Mean Delay, \( W \)*, may be estimated from well established traffic models for various crossing points: e.g. at mid-blocks also known as random points (anywhere and no facilities), signalised intersections, pedestrian refuges, Pelican and Zebra crossings. Mean delay, \( W \), at various facilities for different traffic volumes can be read off from Figure B-1. This figure is also provided in the UK Manual for road appraisal (UK Department of Transport, 1983).

Recent research suggests that the mean delay to pedestrians crossing at random points shown in Figure B-1 is underestimated when there is bunched traffic flow, which occurs downstream of signalised intersections (Guo, et al, 1998).

Qualitative changes in the *convenience* for pedestrians, both in terms of crossing streets and walking on footpaths, are assessed through questionnaire surveys. The content of the survey should address a range of issues such as adequacy of pedestrian access within the area and to other areas (including parking), crossability, adequacy of access to public transport, and visual pleasantness of the Main Street or sub-arterial road environment.

Changes in the *perceived safety* by pedestrians can be measured by comparing the proportion of jayrunning to jaywalking pedestrians before and after completion of the project in both the core and transition zones. Information on perceived safety can also be obtained through the questionnaire survey.

**Vehicle speed**

Three periods are recommended in comparing vehicle speed in core zones of vehicle-pedestrian conflict. These are pedestrian activity peak hour, vehicle peak hour and vehicle traffic off-peak. The actual times are suggested in Table B-2, although local characteristics should be taken into account.

![Figure B-1 Mean pedestrian delays associated with different road crossing situations](image-url)
### Table B-1: Information for constructing assessment balance charts

<table>
<thead>
<tr>
<th>PERFORMANCE INDICATOR</th>
<th>PROPOSAL ASSESSMENT (Including “do nothing”)</th>
<th>ASSESSMENT AFTER COMPLETION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Road users directly affected</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Accidents</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>vehicle/pedestrian</td>
<td>Rank (statistics)</td>
<td>Number during the past 3 years, by type and location</td>
</tr>
<tr>
<td>vehicle/cyclist</td>
<td>Rank (statistics)</td>
<td>Number during the past 3 years, by type and location</td>
</tr>
<tr>
<td>vehicle/vehicle</td>
<td>Rank (statistics)</td>
<td>Number during the past 3 years, by type and location</td>
</tr>
<tr>
<td>vehicle/obstacle</td>
<td>Rank (statistics)</td>
<td>Number during the past 3 years, by type and location</td>
</tr>
<tr>
<td><strong>Pedestrian</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>delay</td>
<td>Rank</td>
<td>Pedestrians delayed in pedestrian peak hour (mean delay)</td>
</tr>
<tr>
<td>convenience</td>
<td>Rank</td>
<td>Before and after questionnaires</td>
</tr>
<tr>
<td>perceived safety</td>
<td>Rank</td>
<td>Proportion of jay running/jay walking, and before and after questionnaires</td>
</tr>
<tr>
<td><strong>Cyclists safety</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rank</td>
<td>Before and after questionnaires</td>
</tr>
<tr>
<td><strong>Vehicle speed</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in core/ped peak</td>
<td>Estimates (observation)</td>
<td>V85 km/h (survey)</td>
</tr>
<tr>
<td>in core/peak</td>
<td>Estimates (observation)</td>
<td>V85 km/h (survey)</td>
</tr>
<tr>
<td>in core/off peak</td>
<td>Estimates (observation)</td>
<td>V85 km/h (survey)</td>
</tr>
<tr>
<td>speed profile</td>
<td>Estimates (observation)</td>
<td>Survey</td>
</tr>
<tr>
<td><strong>Vehicle traffic</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% through traffic</td>
<td>Estimates (observation)</td>
<td>Survey</td>
</tr>
<tr>
<td>number of heavy vehicles</td>
<td>Estimates (observation)</td>
<td>Survey</td>
</tr>
<tr>
<td>flows at ped. peak</td>
<td>Estimates (observation)</td>
<td>Survey</td>
</tr>
<tr>
<td>flows at veh. peak</td>
<td>Estimates (observation)</td>
<td>Survey</td>
</tr>
<tr>
<td><strong>Vehicle operation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>travel time</td>
<td>Estimates (observation)</td>
<td>Comparison in $ (NPV)</td>
</tr>
<tr>
<td>operating costs</td>
<td>Estimates</td>
<td>Comparison in $ (NPV)</td>
</tr>
<tr>
<td><strong>Road and non-road users directly affected</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Noise</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at footpath (core)</td>
<td>Estimates of levels</td>
<td>Changes in levels and length</td>
</tr>
<tr>
<td>at facade</td>
<td>Estimates of levels</td>
<td>Changes in levels and length</td>
</tr>
<tr>
<td>at sensitive sites</td>
<td>Estimates of levels</td>
<td>Changes in spot levels</td>
</tr>
<tr>
<td><strong>On-street parking</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>spaces in/near core layout</td>
<td>Estimates (observation)</td>
<td>Changes in number of spaces (survey)</td>
</tr>
<tr>
<td>utilisation</td>
<td>Description</td>
<td>Description</td>
</tr>
<tr>
<td></td>
<td>Estimates (observation)</td>
<td>Changes in turnover during pedestrian peak hour</td>
</tr>
<tr>
<td><strong>Site access</strong></td>
<td>Ranking (observation)</td>
<td>Changes in properties without side/rear access</td>
</tr>
</tbody>
</table>
### Table B-1 (Continued)

**Non-road users directly affected**

#### Land use

<table>
<thead>
<tr>
<th>Pedestrian orientation</th>
<th>Number of sites outside core (observation)</th>
<th>Number of establishments outside core (survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle orientation</td>
<td>Number of sites inside core and transition zone (observation)</td>
<td>Number of sites inside core and transition zone (survey)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Retail floor space</th>
<th>Core</th>
<th>Transition zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pedestrian orientation</td>
<td>Ranking of prospects</td>
<td>Measure (see Part 5 for monitoring)</td>
</tr>
<tr>
<td>Vehicle orientation</td>
<td>Ranking of prospects</td>
<td>Measure (see Part 5 for monitoring)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Business activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business activity</td>
</tr>
<tr>
<td>Passing trade core</td>
</tr>
<tr>
<td>Changing occupancy</td>
</tr>
<tr>
<td>Vacant shops core</td>
</tr>
<tr>
<td>Vacant in transition zone</td>
</tr>
</tbody>
</table>

#### Accessibility

<table>
<thead>
<tr>
<th>Pedestrians in core</th>
<th>Estimates (observation)</th>
<th>Changes in volumes - 2 hour period (1200 - 1400)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to parking</td>
<td>Ranking (observation)</td>
<td>Changes in mean distance to core</td>
</tr>
<tr>
<td>Access to public transport</td>
<td>Ranking (observation)</td>
<td>Changes in use of public transport</td>
</tr>
<tr>
<td>Delivery and pick up</td>
<td>Rank expected gain</td>
<td>% of establishments reporting gain/loss</td>
</tr>
</tbody>
</table>

#### Those with an interest in the quality of the road environment

##### Pedestrian space

<table>
<thead>
<tr>
<th>Total space in core</th>
<th>Rank expected gain/loss</th>
<th>Measure change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footpath width</td>
<td>Rank expected gain/loss</td>
<td>Measure change</td>
</tr>
<tr>
<td>Weather protection</td>
<td>Rank expected gain/loss</td>
<td>Percentage with overhead cover</td>
</tr>
<tr>
<td>Pavement activity</td>
<td>Rank expected gain/loss</td>
<td>Outdoor frontage-related pavement activity (metres)</td>
</tr>
</tbody>
</table>

##### Urban character and design

<table>
<thead>
<tr>
<th>Heritage value</th>
<th>Ranking (observation)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social spaces</td>
<td>Ranking (observation)</td>
<td>Description</td>
</tr>
<tr>
<td>Landscape elements</td>
<td>Ranking (observation)</td>
<td>Description</td>
</tr>
<tr>
<td>Townscape elements</td>
<td>Ranking (observation)</td>
<td>Description</td>
</tr>
<tr>
<td>Social environment</td>
<td>Rank expected gain/loss</td>
<td>Survey report on perceived change of centre as a social space</td>
</tr>
</tbody>
</table>

#### Public Authorities

##### Capital expenditure

<table>
<thead>
<tr>
<th>Local authority</th>
<th>Estimated costs</th>
<th>Actual costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTA</td>
<td>Estimated costs</td>
<td>Actual costs</td>
</tr>
<tr>
<td>Service authorities</td>
<td>Estimated costs</td>
<td>Actual costs</td>
</tr>
</tbody>
</table>

##### Maintenance expenditure

<table>
<thead>
<tr>
<th>Local authority</th>
<th>Estimated costs</th>
<th>Actual costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTA</td>
<td>Estimated costs</td>
<td>Actual costs</td>
</tr>
<tr>
<td>Service authorities</td>
<td>Estimated costs</td>
<td>Actual costs</td>
</tr>
</tbody>
</table>
Table B-2: Typical Peak and Off-Peak Hours* for Selected Land-Uses along Main Streets/Sub-arterial Roads.

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic peak</td>
<td>1700 - 1800</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>1230 - 1330</td>
</tr>
<tr>
<td>Off-Peak</td>
<td>1000 - 1100</td>
</tr>
</tbody>
</table>

* hours may vary depending on local conditions

For reasons of simplicity, vehicle speed is measured by spot speeds for each direction of flow. Both should be measured in the core and transition zones. For traffic control facility design, the 85th percentile speed is important. Mean vehicle speeds and their variances are also recommended for the analysis of before and after situations.

**Vehicular traffic**

The proportion of non-stopping through traffic requires an Origin and Destination (O&D) sampling survey at a cordon around the centre (see Part I). It should be undertaken at least during a typical vehicle peak hour, but a longer period including the pedestrian peak hour is recommended. Information on the proportion of heavy vehicles may be obtained from the O&D survey or from roadside observation.

Data on traffic flow during vehicle and pedestrian peak hours can be obtained from field measurements or from hard copies of the output of automatic traffic counters.

For comparing alternative proposals, estimates of likely changes are made and ranked.

**Vehicle operations**

Two aspects are included in this indicator: travel time saving (or increase) and operating cost saving (or increase).

The travel time saving, \( C_t \), mainly refers to the time saving for vehicle drivers and their passengers. It can be determined by:

\[
C_t = (T_a - T_b)(v_o - v_p)
\]

where \( T_a \) and \( T_b \) represent the total vehicle travel time after and before the project, \( v_o \) is the average value of travel time weighted to four vehicle types (private cars, business cars, light commercial vehicles and heavy vehicles); \( v_p \) is the time value for occupancies in vehicles.

State road authorities provide manuals for the economic evaluation of road proposals and the current monetary values of travel time are provided. The equivalent changes in travel times to pedestrians crossing the road should be costed for inclusiveness.

The total saving (or increase) in vehicle operating cost, \( C_o \), can be determined by

\[
C_o = (T_a - T_b)v_o
\]

where \( v_o \) represents unit vehicle operating cost weighted to all vehicle types. Again, economic evaluation manuals should be consulted for these unit rates.

**Road and non-road users directly affected**

**Noise**

Traffic noise can be measured in the field with instruments. In centres where traffic volumes exceed 12,000, traffic noise should be measured at the footpath in the core zone. As there are many factors that influence the noise level, it is desirable to record traffic volumes, vehicle speeds and the proportion of heavy vehicles. The geometry of the site must be measured. Alternatively, the noise level at a specific point in relation to the road may be calculated from the CORTN method providing all of the necessary traffic and geometric conditions are known (Black, et al., 1997)

The ability to carry on a reasonable conversation on the footpath in a centre requires that the traffic noise level on the footpath should not exceed 65 dB(A), with 68 dB(A) being an upper limit.
On-Street Parking

Existing parking spaces within 200 metres of the core zone are determined from field surveys and estimates of future spaces are based on plans. Changes in parking layout in the Main Street/sub-arterial are described. Changes in parking utilisation in the core and transition zones during trading peak periods can be estimated by using Table B-3 or from surveys in the Main Street/centre:

Table B-3: Traffic Generation of Parking Spaces during Peak Trading Periods*

<table>
<thead>
<tr>
<th>Parking duration &amp; type</th>
<th>Parking turnover vph</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 minute spaces</td>
<td>10</td>
</tr>
<tr>
<td>1 hour spaces</td>
<td>5</td>
</tr>
<tr>
<td>2 hour spaces</td>
<td>2</td>
</tr>
<tr>
<td>Loading zones</td>
<td>8</td>
</tr>
<tr>
<td>Disabled parking spaces</td>
<td>1</td>
</tr>
</tbody>
</table>

* Assumes that traffic flow permits parking and un-parking movements.
(Source: Beard and Holland, 1991)

Non-road users directly affected

Land use

There are two indicators of land use: frontage orientation and retail floorspace. Frontage orientation (separately for pedestrian orientation, vehicle orientation and combined pedestrian/vehicle orientation - for definitions, see Part 1), is expressed in the number of sites or establishments. Information can be obtained from field surveys before and after completion of the project. For the purpose of comparing alternative proposals, estimates are made of the likely changes and the performance of the alternatives is ranked.

Business activity

Three indicators are used to illustrate business activities which may be impacted by the proposed project: business activity, passing trade, type of business and vacancy rate.

Comparison of business activity before and after implementation is measured by survey of reported % gain and % loss. Comparison between alternative proposals is based on expected gain and ranked. Similarly, reported estimates of the proportion of passing trade are used for comparing before and after implementation, and ranking for comparing alternative proposals.

Changes in the type of business may also be significant (e.g. from shops to restaurants). The incidence of vacant shops (both in the core and transition zones) is measured by field survey; comparison between alternative proposals does not apply here. It is important to ensure that any reported changes are attributed to environmental adaptation and not to changes in general economic activity.

Accessibility

Performance indicators for accessibility are: the number of pedestrians on the footpath in both the core and transition zones, access to parking, and delivery and pick up provision.

The number of pedestrians on the footpath in the core zone are observed...
for a 12 hour period (7 am - 7 pm) in areas of high activity, such as major centres along sub-arterial roads, but this period can be reduced for smaller centres. Spot checks should be made of the number of pedestrians in the transition zones. Estimates are made for comparing alternative proposals.

Access to parking lots is measured by the mean distance of parking areas to the core.

Estimates are made for comparing alternative proposals.

Delivery and pick up provision is measured by survey of business establishments reporting gain/loss. Ranking of the expected gain is used for comparing alternative proposals.

There are other indicators of accessibility, not addressed here, but discussed in Cities for Tomorrow (Austroads, 1998)

Those with an interest in the quality of the road environment

Footpath in core zone
There are three indicators: footpath width, weather protection, and pavement activity.

Changes in the footpath width are measured before and after completion. Ranking of the expected gain is used for comparing alternative proposals.

If required, an indicator of the level of service (LOS) for pedestrian movement can be used. Computations are based on peak 15-min. pedestrian counts (both directions) \( V_{p15} \). The pedestrian flow, \( v \), is expressed in pedestrians per minute per metre:

\[
 v = \frac{V_{p15}}{15W_e}
\]

in which \( W_e \) represents the effective width (i.e. total width less any obstructions). A reasonable LOS is obtained if \( v < 45 \) pedestrians per minute per metre.

Weather protection, in the form of verandahs or awnings, is measured by the percentage of frontages with overhead cover. Ranking of the expected gain is used for comparing alternative proposals.

Pavement activity can be assessed by a survey of pavement cafe’s and stalls and expressed in the length (metres) of outdoor frontage-related activity in the core zone. Ranking of the expected gain is used for comparing alternative proposals.

Urban character and design
There are four indicators here: heritage value, social spaces, landscape elements, and townscape elements. All of these elements can best be captured by description and ranking.

Sociability
The term sociability is used to describe the Main Street or sub-arterial centre as social space. The pedestrian survey can provide information on how pedestrians view the social quality of the space (e.g. place to meet, place to hold functions). Ranking of the expected gain is used for comparing alternative proposals.

Public authorities

Capital expenditure
Costs need to be compared for the local authority, Roads and Traffic Authority and service authorities separately. For comparing before and after completion, actual costs are used; comparison of alternative proposals is made on the basis of estimated costs. In all cases the costs should be expressed in Net Present Cost.

Maintenance expenditure
Similar information is obtained for maintenance expenditure.
References
References

Australian


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- Part 1 - Traffic Flow
- Part 2 - Roadway Capacity
- Part 3 - Traffic Studies
- Part 5 - Intersections at Grade
- Part 6 - Roundabouts
- Part 7 - Traffic Signals
- Part 8 - Traffic Control Devices
- Part 10 - Local Road Traffic Management
- Part 11 - Parking
- Part 13 - Pedestrians
- Part 14 - Bicycles


NSW Roads and Traffic Authority (various dates) Guidelines for Traffic Facilities
  Part 3 - On-Street Parking
  Part 4 - Pedestrian Facilities
  Part 6 - Speed Humps
  Part 7 - Neighbourhood Road Safety
  Part 8 - Road Closures
  Part 9 - Light Traffic Thoroughfares


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   AS 1428. 3-1992 Requirements for children and adolescents with physical disabilities
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   Part 2 - Traffic Control Devices for General Use, 1986
   Part 3 - Traffic Control Devices for Works on Roads, 1985
   Part 4 - Speed Controls, 1986
   Part 5 - Street Name and Community Services Signs, 1986
   Part 6 - Service and Tourist Signs for Motorists, 1990
   Part 9 - Traffic Control Devices for Bicycle Facilities, 1986
   Part 10 - Pedestrian Control and Protection, 1990
   Part 11 - Parking Controls, 1989
   Part 12 - Parking Controls, 1986
   Part 13 - Local Area Traffic Management Devices, 1991


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* The assistance of Antonio Pratelli , University of Pisa, Italy, in providing European references on traffic calming is gratefully acknowledged.
Glossary

Active frontage: that frontage with a preponderance of pedestrian-oriented and concentrated activity.

Activity profile: the distribution of pedestrian activity along the length of the Main Street or sub-arterial centre.

Assessment Balance Chart: a table which presents information on monetary and non-monetary costs and benefits for different performance indicators.

Cordon: an imaginary line around the perimeter of the Main Street or sub-arterial centre.

Cordon point: a point along the Main Street or sub-arterial road where the cordon crosses such street/road.

Core zone: a zone of concentrated pedestrian activity.

Design area: that section of the Main Street or sub-arterial centre for which a design for environmental adaptation is being prepared.

Environmental adaptation: the process of adapting the Main Street or a centre along a sub-arterial road to meet the needs of all its users in a manner which satisfies objectives of road safety, traffic operations, amenity and cost-effectiveness.

Friction: the impediments to traffic flow caused by intersections, signals, turning movements, parking manoeuvring, on-street goods deliveries, and crossing pedestrians.

Impact: the effect of traffic on pedestrian crossability, safety, parking, trade and appearance, and exposure to noise and air pollution.

Jay walking: pedestrians crossing at other than legally defined points and proceeding at walking pace.

Jay running: pedestrians crossing at other than legally defined points and proceeding at running pace.

Performance indicator: a parameter which shows how a system or a project performs in respect of a specific criterion (such as vehicle speed, or ability to cross).

Planning area: an area extending beyond the design area which must be taken into account in the design for environmental adaptation.

Secondary frontage: that frontage along the Main Street or sub-arterial road with incidental or dispersed pedestrian activity.

Sharing the Main Street: see environmental adaptation.

Speed profile: the distribution of target speeds along the length of the Main Street or a sub-arterial road.

Target (street) speed is the assumed average speed of vehicles at the location within a street segment where vehicles travel at their highest speed. It prescribes the degree of physical restraint on vehicle operation which is imposed in the design.

Through traffic: traffic which does not stop (other than at intersections or legal crossings) between two cordon points.

Transition zone: a zone, adjoining the core zone and consisting of predominantly vehicle-oriented uses.