Roads and Traffic Authority of New South Wales
and
Federal Office of Road Safety

Sharing the Main Street

November 1993

A PRACTITIONERS' GUIDE TO MANAGING THE ROAD ENVIRONMENT OF TRAFFIC ROUTES THROUGH COMMERCIAL CENTRES

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Contents

Foreword

A journey of a thousand miles begins with the first step.
Lao Tzu

Like fire, the car is a good servant but a poor master. Yet our cities are increasingly surrendering to dominance by motor vehicles, and we pay the price in accidents, pollution, health and loss of amenity.

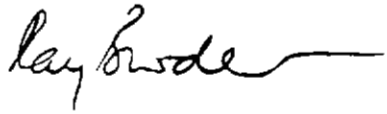
The Roads and Traffic Authority of New South Wales (RTA) has been among those bodies eager to encourage attempts to redress the imbalance between people and vehicles in local areas. Australia has relatively long experience with measures to improve safety and calm the impacts of traffic in neighbourhoods. More recently, these local concepts have been tentatively tried out on busier roads. These first cautious steps showed us that we could indeed restore the human scale to many roads which are currently dominated by traffic without compromising the needs of vehicular movement to an unacceptable level.

"Sharing the Main Street" represents the culmination of research which started over ten years ago at the University of New South Wales into the competing uses of the streetspace through town centres and other activity areas. Encouraged by this research, and local and overseas precedents, the RTA decided to develop guidelines for country and metropolitan local authorities who may wish to consider appropriate changes to their "Main Streets". As these guidelines show, such changes may range from modest improvements to the pedestrian spaces to significant rearrangements of the streetspace. Good urban design is encouraged at all scales.

From the first small steps into environment- and safety-motivated traffic management in living areas during the 1970s and 1980s, we may be on the brink of major shifts in priorities in the management of traffic over large parts of the network. Certainly, there is a substantial community desire to improve the livability not only of residential streets but also local centres, and there is more work to be done to restore the balance.

That there are now guidelines for this challenge is a testimony to the sound research work on which they are based — conducted by Professor Hans Westerman and Professor John Black and their team — and to the commitment demonstrated by the RTA and the Federal Office of Road Safety in funding that work and the production of "Sharing the Main Street".

It is hoped that the Guidelines are indeed a significant step on our journey.



Ray Brindle,
Australian Road Research Board.

Acknowledgements

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A draft of the Guide was reviewed at a series of workshops conducted during July and August 1993, attended by about 150 people with experience or an interest in the topic. Many comments have been incorporated in this revised version. All these contributions are gratefully acknowledged.

Introduction

What is Sharing the Main Street?

'Sharing the Main Street' is 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. The process of adaptation is commonly described as 'environmental adaptation' (Hass-Klau, 1992).

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. These roads now carry more traffic than was ever envisaged. This 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. A key objective of environmental adaptation is to improve the safety and quality of the road environment for all road users.

An integrated process

'Sharing the Main Street' requires an integrated approach. It 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. This document aims to present such an integrated approach towards environmental adaptation.

Purpose and application 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 principles are unrelated to any legal road classification scheme (such as State Roads in New South Wales). 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 appropriate authority.

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* (NAASRA, 1988) but may vary in some details. Discretion and judgement should be exercised in the light of the many factors which usually influence the choice of solution and detailed treatment in any given situation.

How to use the Guide

Structure of the Guidelines

The Guidelines (Figure 1) have 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.

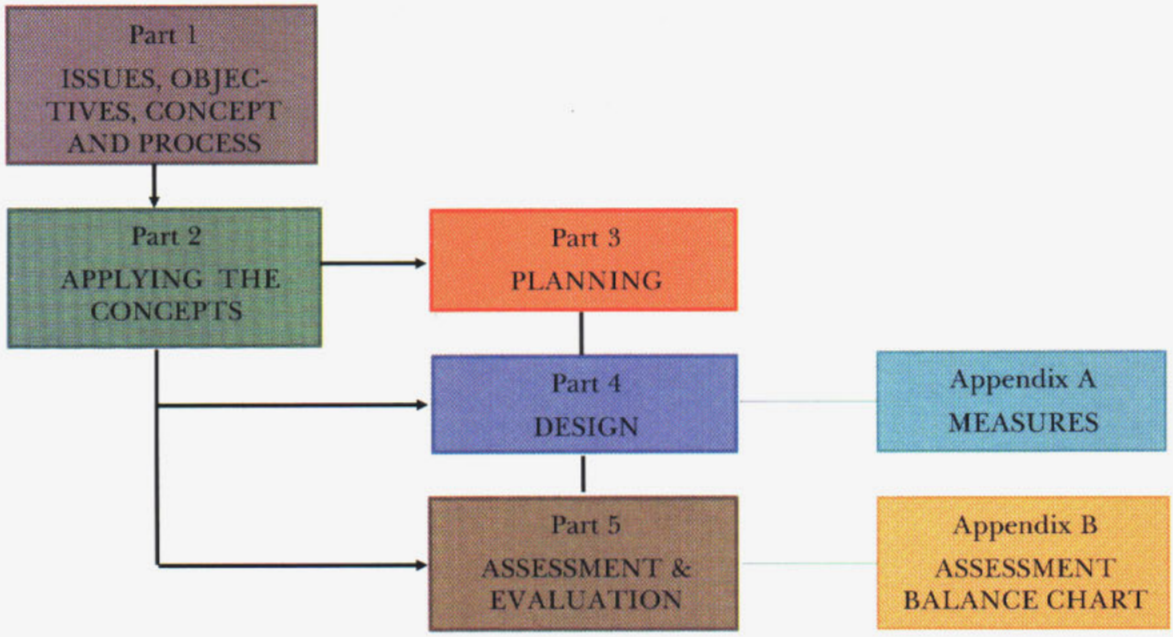


Figure 1: Structure of the Guide

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.

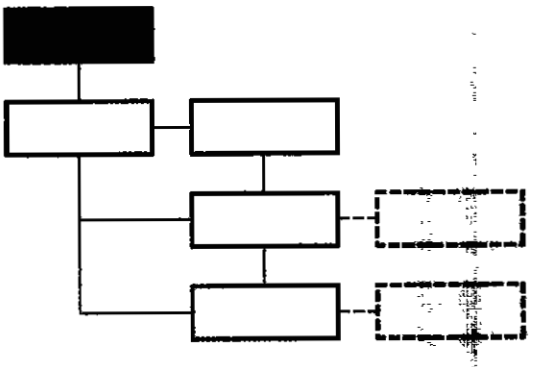
Part 5 provides information on assessment and evaluation. There are different approaches, depending on the scale and nature of the project.

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.

The document is based on a research report prepared for the Federal Office of Road Safety and the Road Safety Bureau of the Roads and Traffic Authority of New South Wales and published in October 1992 (Armstrong, et al., *Environmental Adaptation of the Main Street in Rural Towns: Towards Guidelines)* and on a study of centres along sub-arterial roads published by the Roads and Traffic Authority of New South Wales in 1989 *(Environmental Adaptation of Roads and Frontages: Towards Guidelines for Retail Centres along Traffic Routes).*

Part I



Issues, objectives, concept and process

Issues, objectives, concept and process

1.1 Purpose of Part I

The purpose of this Part 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.

1.1.1 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*).

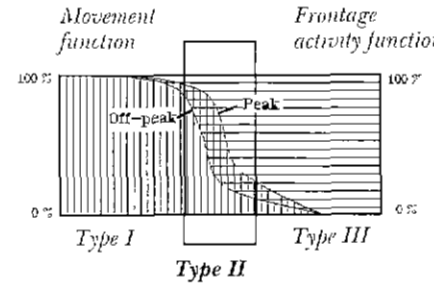


Fig. 1.1 The focus of the Guidelines is on Type II road/environments

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. 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 vehicular traffic (of which some may be through traffic), pedestrian and cycle 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 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 traffic function
- the frontage function
- traffic management
- the road as a space

1.2.2 Issues associated with the traffic 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 broad problem (Fig 1.2):

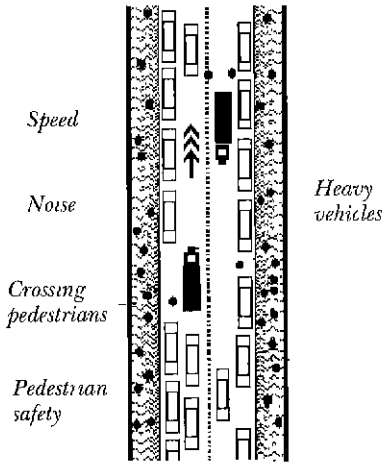


Fig. 1 2 Issues associated with the traffic function

- 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.

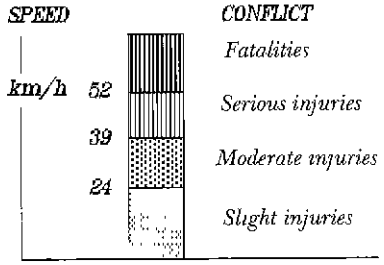


Fig 1 3 Pedestrian safety and vehicle speed

- 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 24 km/h, accidents involving pedestrians are seldom serious, but above 50 km/h fatalities often occur (Fig 1.3). 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 2.3.8).

- it becomes more hazardous for cyclists

  The absence of lanes and right-hand turns at intersections for cyclists makes cycling hazardous when traffic volumes and vehicle speeds increase and there are more heavy vehicles

- traffic noise is increased

  Vehicle speed, traffic volume, the proportion of heavy vehicles in the traffic stream, and the design of the road influence the level of traffic noise on the footpath. An ambient noise level of 65 dB(A) at the footpath is considered reasonable and 68 dB(A) the maximum acceptable in a shopping centre. These noise levels are expressed in dB(A)$L_{10,18hr}$ which represents the noise level which is exceeded for 10% of the time averaged over the period 6 am to midnight.

  By using the CORTN method for noise prediction (U.K. Department of the Environment, 1975), it can be shown that the lowest traffic noise levels are produced when vehicle speeds are about 30 km/h (Fig 1.4). With vehicle speeds at such level, and assuming not more than 10 per cent of heavy vehicles, the maximum acceptable noise exposure on roads of 20 metres width is likely to be exceeded when traffic volumes are 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. 1.5). At high speeds the driver's peripheral vision is narrowly focused, 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. 1.6).

- heavy vehicles affect the pedestrian environment

  The presence of heavy vehicles in the traffic stream affects the visibility of pedestrians crossing, increases noise exposure levels and further contributes to a reduction in air quality.

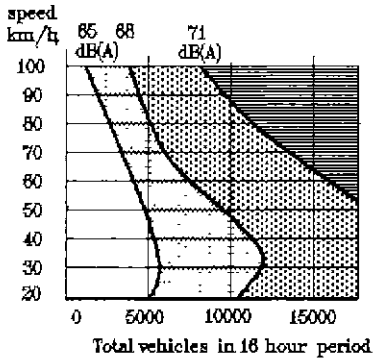
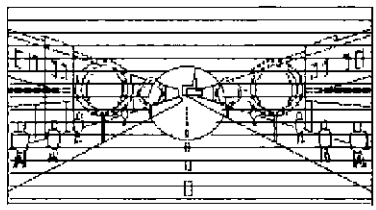
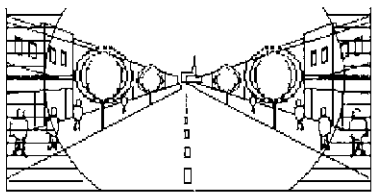


Fig 1.4 dB(A)$L_{10,18hr}$ noise level related to speed and volume (with 10 per cent of heavy vehicles and level grade)



Peripheral vision of the driver at 50 km/h



Peripheral vision of the driver at 25 km/h

Fig 1.5 Peripheral vision and speed

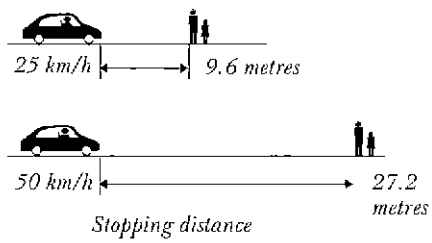


Fig 1.6 With increased speed, the stopping distance is increased

1.2.3 Issues associated with the frontage function

The frontage function of the Main Street or sub-arterial 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.

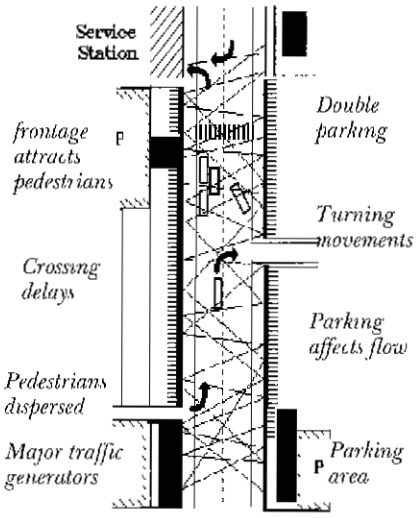


Fig 1.7 Issues associated with the frontage function

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 eight kinds of problems (Fig. 1.7):

- 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 delay. When vehicle speeds are low, a higher proportion of crossers are prepared to jaywalk instead of using designated crossing facilities.

  Wide streets increase the exposure time of pedestrians to moving vehicles. The type of pedestrian is important: walking speeds range from 0.5 m/s for physically impaired people; 0.8 m/s for elderly; 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. Kerbside parking reduces exposure time to moving vehicles.

- parking manoeuvres affect flow

  Vehicles manoeuvring into and out of a parking space delay traffic behind them, depending on traffic volumes and vehicle speed. 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.

- 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. Double parking becomes a problem when traffic volumes exceed 800 veh/h, 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 becomes 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.

- 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. 1.8).

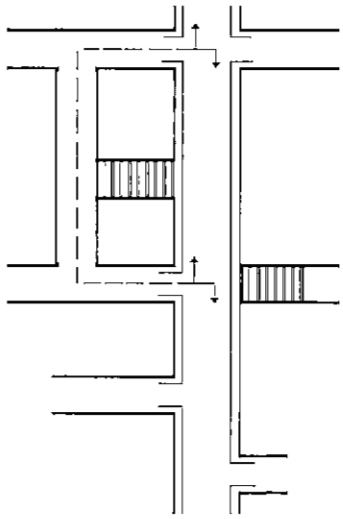


Fig 1.8 Activity centres require side streets for internal circulation

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:

- type of on-street parking

  Angle parking tends to reduce vehicle speed in the adjacent lane more than is the case with parallel parking (Fig. 1.9). This may explain why more jaywalking occurs, compared with parallel on-street parking. Replacing angle parking with parallel parking without narrowing the carriageway (or similar measure) is likely

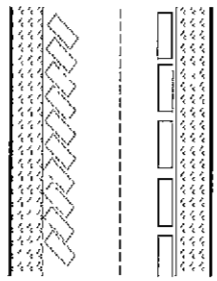


Fig 1.9 Type of on-street parking affects flow. Parking controls can be used to influence driver behaviour and to meet different needs during the day

to lead to an increase in vehicle speed and diminished pedestrian crossability.

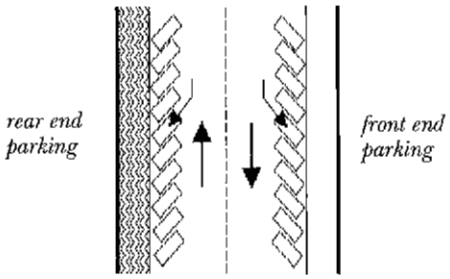


Fig 1.10 Front and rear end parking retard traffic flow. Rear end parking provides a better view of oncoming traffic when exiting from the parking space, but causes pollution on the footpath. It is in use only in NSW.

- 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 (Fig. 1.10).
  Rear end parking is favoured only in New South Wales. It has a greater impact on the speed of traffic than front end parking, but the safety comparison with front end parking is unresolved and there are other disbenefits which rarely make rear end parking preferable. For instance, exhaust fumes disperse towards the footpath, affecting pedestrian amenity.

- 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 and for special events. The overall quality of many Main Streets and most sub-arterial centres is often poor because of five factors:

- catering for vehicles has come first

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

- 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 environment.

- there is no appeal as a 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 (Fig. 1.11). This tends to reinforce the vehicular function of the road and does not convey the shared nature of the space.

Fig 1.11 The road pavement often dominates the view

1.2.6 There are positive associations

This review of issues indicates that there is a conflict in functions between the road as a traffic route and as a place for retail, commercial and community activity. However, there are also positive associations between the road as a traffic route and the activities along its frontage. For instance, service stations and motels serve tourists travelling on the traffic 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.

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 balance between these diverse interests.

1.3 Objectives

1.3.1 Key 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 traffic 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, and is affordable and acceptable to the community.

1.4 Concept

1.4.1 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 by 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 must 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 road space and the traffic within it, and the design and management of the frontage. A central feature of the concept in such an integrated approach is the management of friction and impact.

1.4.2 Managing friction and impact

There is an interdependence 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 air pollution is increased.

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 delicatessen, newsagents and chemists or specialised retail outlets, are sensitive to the availability of frontage parking. Here, the interdependence breaks down when frontage parking is prohibited at certain 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.

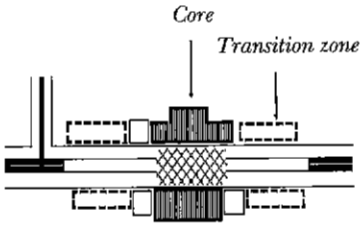


Fig 1.12 Pedestrian-generating activities should be confined to the core

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. 1.12)

  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. 1.13). 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.

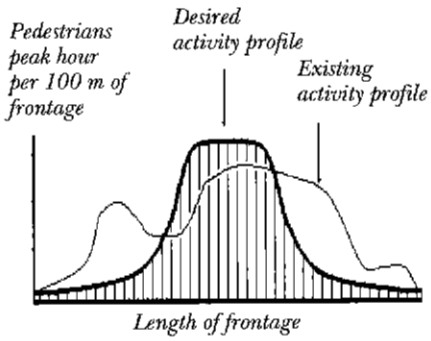


Fig 1.13 Establishing a concentrated pedestrian activity profile is a key principle

- reducing vehicle speed in the core and transition zones (Fig. 1.14)

  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'. There may be a different speed profile for each direction of traffic flow.

  *The notion of target vehicle speed is explained in Part 2 (page 29).

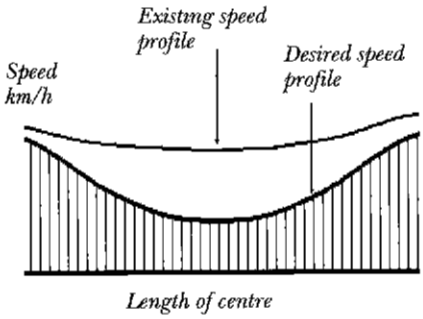


Fig 1.14 Establishing a speed profile is another key principle

- enhancing the quality of the road space (Fig. 1.15 and 1.16)

  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.

Pavement changes, bollards and restoration of historic buildings enhance the quality of the road space (Victor Harbour)

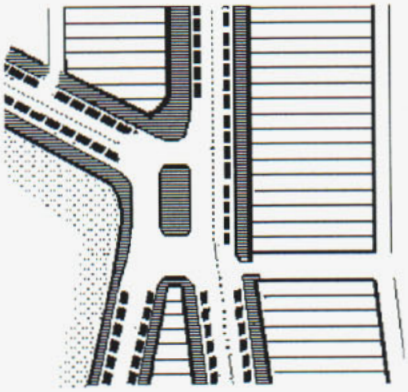


Fig 1.15 A typical situation requiring environmental adaptation

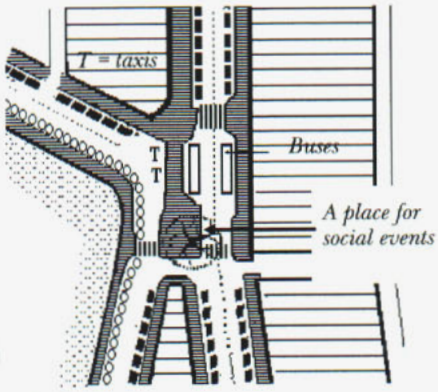
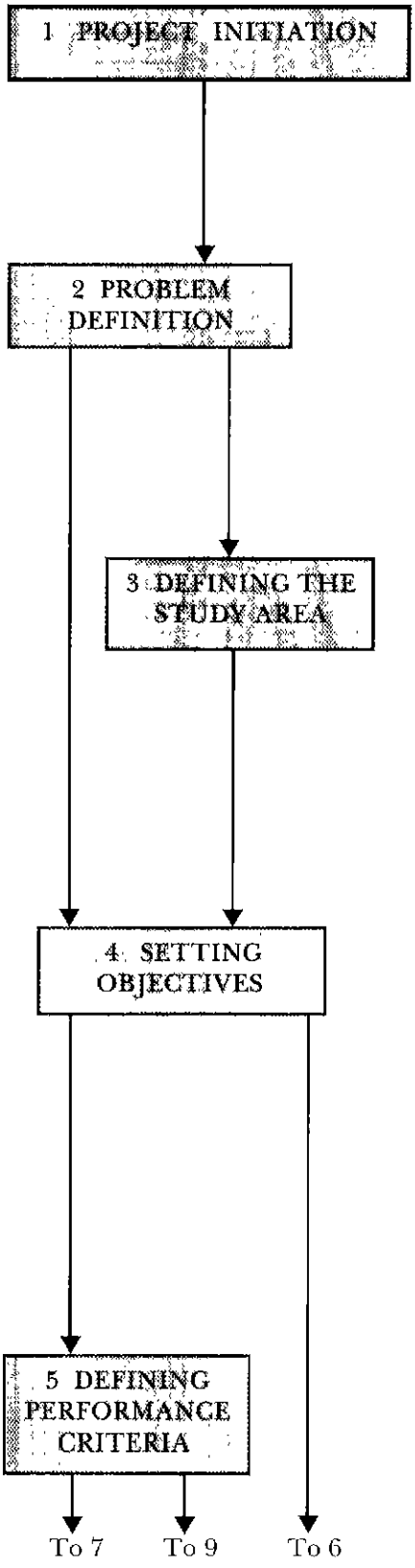


Fig 1.16 Improvement of the quality of the road space should be part of any project for environmental adaptation

Landscaping, pavement materials and verandahs have greatly improved the quality of the pedestrian environment (Cairns)

1.5 Process



1.5.1 Steps in the process

Environmental adaptation requires a systematic process of problem solving. The general planning process is shown in Figure 1-17. 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 may be 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:

Table 1-1: Example of defining objectives

Note: This list is indicative only. Objectives defined should be tailored to suit the local circumstances.

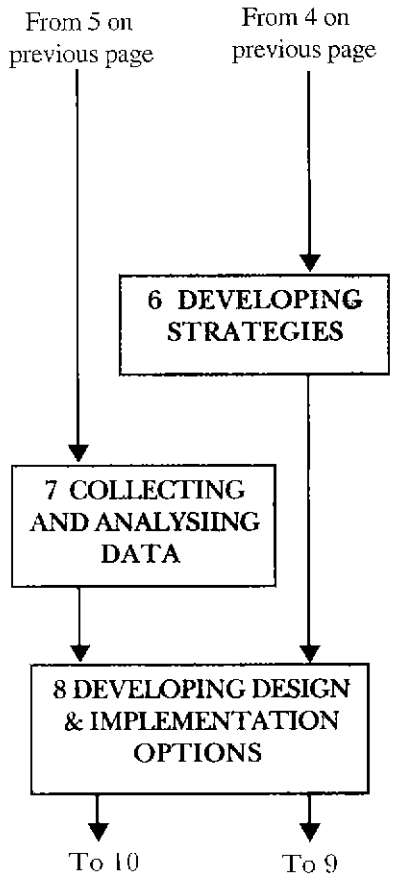
1. To create an environment which will encourage motorists to drive with care and an awareness of safety of other road users such as pedestrians and cyclists.
2. To improve the physical environment by reducing traffic noise, vibration and vehicle-generated air pollution, and to improve the visual appearance of the Main Street/sub-arterial.
3. To reduce the number and severity of pedestrian and vehicle accidents.
4. To reduce the volume of through traffic and heavy vehicular traffic using the Main Street/sub-arterial.
5. To reduce the speed of traffic to a level commensurate with the pedestrian functions of the shopping centre.
6. To encourage the development of land uses within the core of the Main Street/ sub-arterial precinct which are compatible with the higher level of anticipated pedestrian activity.
7. To maintain an acceptable level of accessibility for all residents, customers, emergency vehicles, delivery and maintenance services and public transport within the Main Street/ sub-arterial precinct.
8. To increase the availability of on-street parking in the Main Street/sub-arterial close to the shops and businesses.
9. To improve and/or encourage the opportunities for street-wide social contact within the Main Street/sub-arterial.
10. To obtain a vehicle-free environment for pedestrians and to improve the use of public space for social interaction.
11. Ensure that the cost of the project is affordable within the Council's budget and that, if necessary, the works can be provided in stages.
12. Ensure that any construction works required as part of the scheme incorporate a high level of landscaping and that as far as possible the works blend into the existing streetscape or the theme adopted for the project.
13. Encourage improvements to the buildings, structures and landscape in the Main Street/sub-arterial in keeping with the theme adopted for the project.

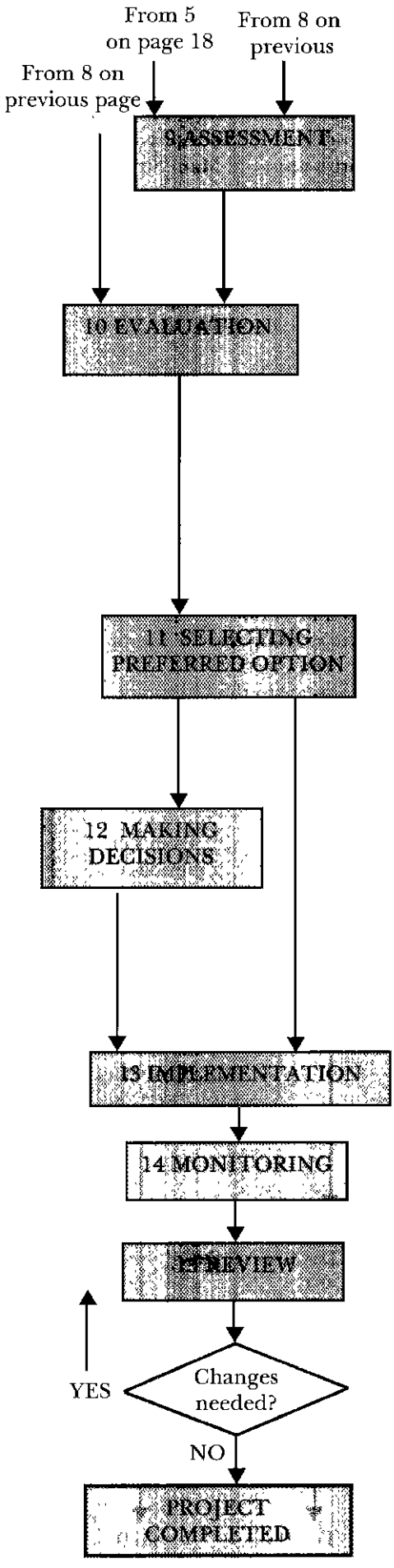
- how it will be known that the project is successful;
- what factors must be measured and what data must be collected;
- what opinions (e.g. the general community, business community) need to be monitored; and
- what performance criteria should be used for assessment and evaluation.

*6 **Developing strategies.*** Strategies must be developed for each objective. It is useful to develop preliminary strategies as these will influence which 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.

1.6 Public involvement

1.6.1 Recognition of the stakeholders

Effective public involvement and effective 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 shopworkers, 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 emergency vehicles, refuse collection, street and gutter cleansing and the maintenance of street furniture and landscaping.

Striking a balance between the often competing and sometimes conflicting interests of all of these groups requires much care.

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.

The Department of Planning's (NSW) Main Street Programme provides useful details of public involvement (see Section 2.3.12).

1.6.2 Consultation process

It is essential to carefully consider 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 concern, 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.

There is a wide range of techniques for public involvement. Details are provided in Armstrong et al. (FORS, 1992)

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 Section 5.4.5.

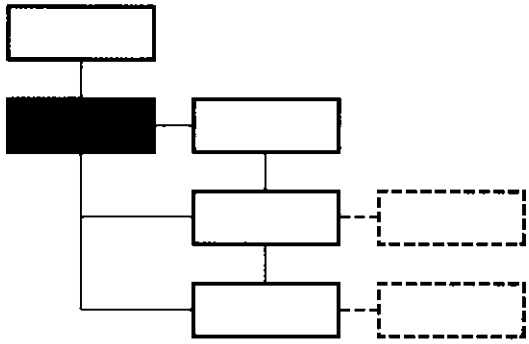
■ Implementation

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 concepts

Applying the concepts

2.1 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:

- 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.

2.1.1 Content

Once objectives have been determined, strategies can be developed for achieving them. However, there usually are constraints which influence the process and scope for environmental adaptation.

> Each centre has constraints 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, but there generally are opportunities for simple, low-cost solutions, or opportunities for staging a project over time.

Apart from this unique local context, there are other 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 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 Strategies

2.2.1 Strategies derived from objectives

While the objectives of environmental adaptation can be achieved through the selective application of measures, 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 severity and extent of conflict between pedestrians and vehicles, and improving safety:

- 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, cycling, physically impaired).

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, bicycle parking and access for the physically impaired; and frontage development control.

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;
- providing continuity in pedestrian circulation;
- providing continuity in weather protection;
- footpaths designed for a range of uses;
- creating 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 and set-back to reinforce the environmental adaptation and 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 Department of Planning 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.

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 staging and low-cost approaches. Consultation with stakeholders throughout the process is recommended (see Section 1.6).

2.3 Key factors

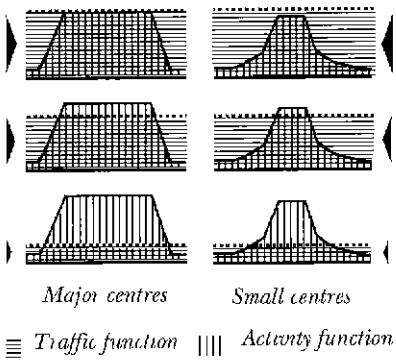


Fig 2.1 There are many combinations of traffic and frontage activity functions

2.3.1 Factors to be considered

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 (Fig. 2.1).

The constraints and opportunities for environmental adaptation 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
- Frontage activity
- Pedestrian behaviour
- Road reservation width
- Physical characteristics
- Urban design character and heritage
- Type of project

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 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.

- 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).

There may also be proposals to change the function of the road (such as a by-pass).

- Area-wide planning studies are needed where there are proposals to change the traffic function of the road (Part 3) before design options are considered (Part 4)

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.

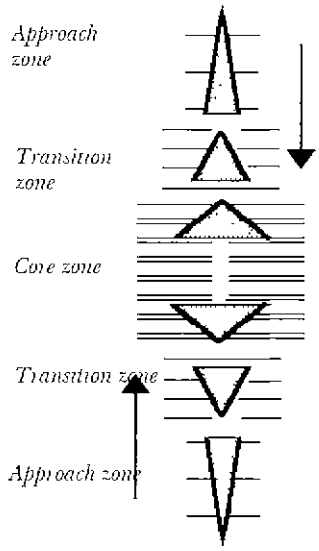


Fig 2.2 Angle of field of vision and vehicle speed Target speed must be linked with the need to get driver attention and response to changed conditions in the road space

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 cicumstances.

The target speed in the core zone may range between 25 and 35 km/h. Where there is no median, a target speed at the lower end of the range should be used; where there is a median, and the carriageway to be crossed by pedestrians does not exceed two lanes, a target speed towards the higher end of the range may be used.

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. 2.3). Information should be obtained for daily and peak hour vehicle flow and at different times of the year.

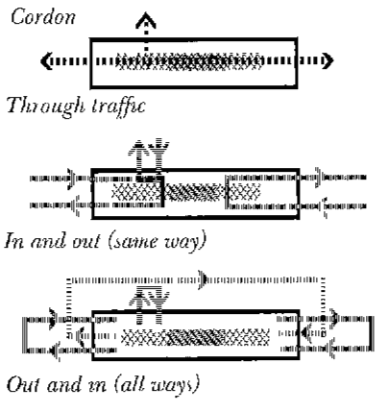


Fig 2.3 The cordon should be established outside the transition zone. Traffic volumes should be measured at points where the road crosses the cordon

- 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. In this case, alternative routes for each group of drivers should be investigated.

- If peak traffic volumes exceed 1000 vehicles per hour (two directions), the range of design and control measures to be used may be constrained (Part 4)

With a road reservation of about 20 metres, an active frontage with many crossing pedestrians, and high peak traffic volumes, a set of conditions exist which limit the range of measures that can be used. If peak-hour traffic volumes exceed 1000 vehicles per hour, one traffic lane in each direction may not suffice. In confined road reservations, the scope for improving the pedestrian environment is limited and efforts should be made to develop arcades off the Main Street or sub-arterial.

- With traffic volumes less than 3000 vehicles per day, there is no need to consider Part 3 of the Guidelines.

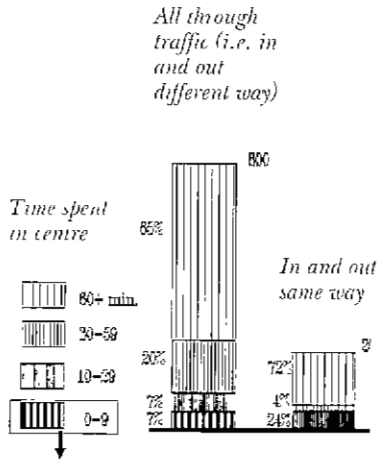
With traffic volumes of that order, area-wide planning studies should generally not be necessary and low-cost solutions may be practicable.

2.3.5 Through traffic

Through traffic is defined in the Guide as 'non-stopping through traffic other than at intersections or pedestrian crossings' (Fig. 2.4). 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 are high volumes or 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.



Vechicles taking less than 10 minutes to travel through the centre are assumed to represent non-stopping through traffic.

Fig 2.4 An example of the results of a number plate survey. A number plate survey at the cordon points enables non-stopping through traffic to be determined. It also provides information on non-stopping heavy vehicles

Variations in the proportion of through traffic may influence the type of measures selected. In many large rural towns, the proportion of through traffic during business hours is likely to be small (ranging between 10–20 per cent), but on many sub-arterial roads the variations during the day are much greater as they often carry heavy through traffic during peak hours.

- On roads where there are major changes in the traffic function during the day, peak-hour flows constrain the range of measures and design to be used (see Part 4).

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 (Westerman et al., 1989). The total number observed during peak pedestrian periods was 60 per hour which, under controlled conditions, did not appear to adversely affect pedestrians crossing.

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).

- 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 Frontage activity

A distinction can be made between active frontage and secondary frontage. ***Active frontage*** is defined as that 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 in 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) 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).

> This should not interpreted as meaning that there is no need to consider a wider area in other situations. Even with smaller centres, it is advisable to consider the area adjoining the Main Street or sub-arterial

Pedestrian activity can vary during the year, especially if the town or the region are tourist destinations. In that case it may be desirable to also ascertain the pedestrian activity at peak tourist periods.

- Where there are major shifts in frontage activity during the year, a planning study should be undertaken first (see Part 3).

2.3.8 Pedestrian behaviour

Pedestrians have limited tolerance to delay and when there is a gap in the traffic stream will tend to jaywalk. This is quite acceptable provided volumes and speeds are low, the crossing distance of traffic lanes is small and there is good visibility. This 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 jayrunners. This also occurs with increased crossing distance and vehicle speeds exceeding 40 km/h. Jayrunning is a useful indicator of potential risk. From observation, it appears that a situation of potential risk exists if the proportion of jayrunning out of all jaywalkers exceeds about 5 per cent.

- In situations where the proportion of jayrunning 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.

2.3.9 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).

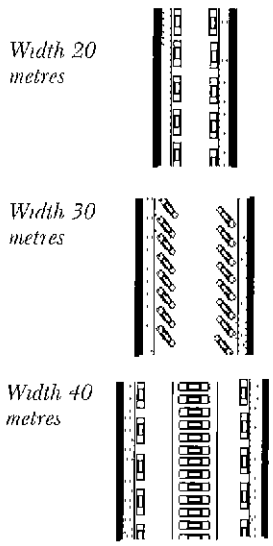


Fig 2.5 The width of the road/street reservation has a major influence on the scope for, and form of, environmental adaptation

- The road reservation width greatly influences the scope for modification (Part 4).

2.3.10 Physical characteristics

Apart from the reservation width, factors which will influence the scope for environmental adaptation include: existing carriageway width, location and construction; 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 factor is the location of underground services and drainage.

2.3.11 Business activity

In 1989, the NSW Department of Planning released the *Main Street Handbook* as part of its Main Street Program. This program was initiated 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 of Planning acts as a catalyst and provides advice.

> The Main Street Handbook is recommended reading as the matters encompassed by the Program complement those addressed in this Guide. It also contains a useful bibliography for further information on the five main features of its approach:
>
> - Organisation
> - Design
> - Heritage Conservation
> - Business Development
> - Promotion

The program addresses other issues than those referred to in this Report. There are therefore considerable advantages in combining the Main Street program with environmental adaptation.

- The Main Street Program should be an integral part of any comprehensive approach to the problems in the Main Street and centres along sub-arterial roads.

Fig 2.6 The often varied skyline gives the Main Street its distinction

2.3.12 Urban design

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. 2.6).

> 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).

2.3.13 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 and similar information before and after completion (see Part 5 and Appendix B).

Summary of key factors

The key factors are summarised in Table 2-1. Its purpose is to serve as a directory for using this Guide. The Table should be regarded as indicative; many factors can not be considered in isolation and judgements must be made in each individual case.

Table 2-1 Directory for key factors

	FACTOR	MAIN STREET Condition	Action	SUB-ARTERIAL Condition	Action
2.3.2	Change of function	By-pass proposed	See Part 3	Not local centre	See Part 3
				Traffic function may change	See Part 3
2.3.3	Vehicle speed		Use target speed		Use target speed
2.3.4	Vehicle flow	Seasonal change	See Part 3	Peak hour flows	See Part 4
		>12,000 vpd	See Part 3	>12,000 vpd	See Part 3
		> 1,000 vph	See Part 3	> 1,000 vph	See Part 3
		< 3,000 vpd	Ignore Part 4	< 3,000 vpd	Ignore Part 4
2.3.5	Through traffic	Heavy	See Part 3	Heavy	See Part 3
				Priority shifts	See Part 4
2.3.6	Heavy vehicles	> 60 vph (ped. pk hr)		See Part 3	>60 vph (ped. pk hr)
		Night use	See Part 4		
2.3.7	Frontage activity	Length >800m	See Part 3	Length >800m	See Part 3
		Seasonal change	See Part 3		
2.3.8	Ped. behaviour	Jay running 5%	Information needs	Jay running 5%	Information needs
2.3.9	Road width		See Part 4		See Part 4
2.3.10	Physical character	Reconstruction	Information needs	Reconstruction	Information needs
2.3.11	Business activity	No condition	Main St. Program	No condition	Main St. Program
2.3.12	Urban design	No condition	See Part 4	No condition	See Part 4
2.3.13	Demonstration project		See Part 5		See Part 5

2.4 Information needs

2.4.1 Importance of context and purpose

Certain information is essential in any project of environmental adaptation: accidents, vehicle speeds, traffic volumes and composition, pedestrian 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. 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.

2.4.2 Performance Indicators

Performance indicators are needed to identify how the current system performs (i.e. problem identification; see, for example, Table 2-2) and to assess whether a proposal or a completed project achieves the desired outcome.

Table 2-2 Example of the data that may be used as performance indicators*

Physical characteristics

reservation	30 metres
carriageway	24 metres
lanes	7 metres (2x3.5)
footpaths	3 metres

Frontage Activity	average length
Pedestrian-oriented	
intensive	500 m
low	150 m
Vehicle-oriented	300 m
Vehicle & ped. oriented	100 m
Vehicular access	from rear

Commercial zoning
Post Office proposal in transition zone

Vehicle activity

AADT	4000
Traffic volumes at vehicle peak hour 16.45–17.45	620
Traffic volumes at pedestrian peak hour 12.30–13.30	400
Heavy vehicles	5 %
Proportion of through traffic	
• all day	25%
• vehicle peak hour	50%
• pedestrian peak hour	15%

Pedestrian activity

Peak hour pedestrians 12.30 - 13.30

Pedestrians crossing (Pedestrian peak hour)	
• in core	600
• jaywalkers	250
• jayrunners	10
(Vehicle peak hour)	
• in core	240
• jaywalkers	102
• jayrunners	15

Traffic and parking
Angle 60 degrees
Off-street parking nearby

Vehicle Speed (km/h)	core	approach
V average	25	50
V_{85}	30	55
V_{max}	60	80

Safety (accidents — 3year av)	
• Pedestrian/vehicle	8
• Vehicle/vehicle	12

Economic environment
Passing trade about 10% of turnover

*NOTE: Performance indicators are selected for each project, depending on the problems and objective. The data shown apply to the existing conditions in a case study and will vary with each case.

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 being 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
- parking provision and turn-over
- 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.

2.4.3 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
- Property boundaries and vehicular access
- Building line and setbacks
- Underground services

Frontage function

- Pedestrian, vehicle-oriented and mixed pedestrian/vehicle uses
- Special traffic generators
- Vehicular access
- Existing zoning and development conditions
- Identification of any development proposals within the study area

Pedestrian activity

- Pedestrians on footpaths (midblock, crossing imaginary line)
- Activity profile
- Pedestrians crossing at designated facility, location, time
- Jaywalking numbers, location, time
- Jayrunners numbers, location and time

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 (incluing the proportion of heavy vehicles)
- Proportion of traffic which is through traffic
- Public transport routes and frequency
- Cycling

Vehicle speed

- Speed profiles (both directions) for peak and off peak conditions, based on the 85th percentile speed (V_{85})

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 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 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
- 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

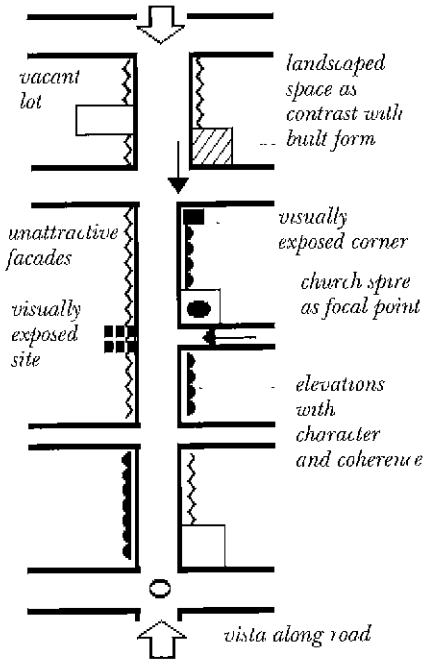
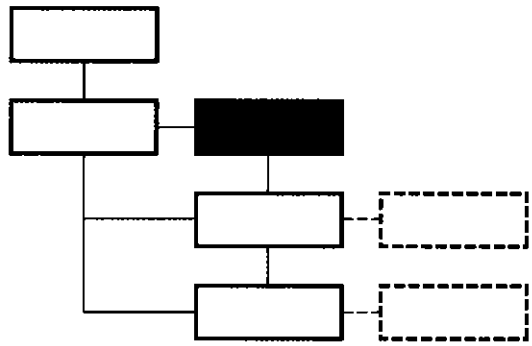


Fig 2.7 A streetscape analysis can identify opportunities for improvement

Part 3



Planning

Planning

3.1 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.

Specifically, this Part addresses:

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

3.1.1. Content

Problems arising from the mix of traffic and frontage functions may not always be resolved by looking at the Main Street or a centre along a sub-arterial road alone.

This may happen if:

- there may be changes in functions or proposals outside the Main Street or sub-arterial road which affect proposals for environmental adaptation;
- 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;
- the centre is large; or
- environmental adaptation is likely to have an overspill effect on the adjoining areas.

The focus in this Part is on identifying the factors that may affect the development of design proposals.

3.2 Relationships

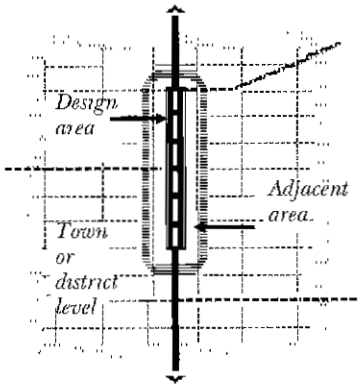


Fig 3.1 Planning areas

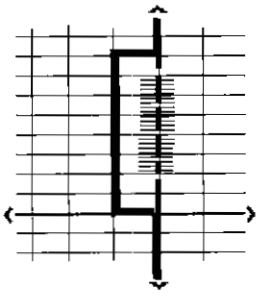


Fig 3.2 Proposals at the town/district level may influence the design approach. Conversely, the traffic function of the Main Street or sub-arterial may warrant examination of alternatives at the town/district level

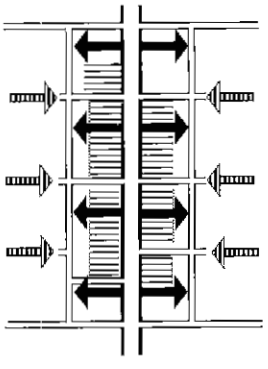


Fig 3.3 There may also be interactions with adjacent areas

3.2.1 The notion of 'design area' and 'planning area'

Environmental adaptation may have consequences for a wider area which may influence the choice of the solution from amongst a number of possible alternatives. There may also be constraints to environmental adaptation (as well as opportunities for it) arising from the longer term planning of the area in which the Main Street or sub-arterial centre is located.

It is useful, therefore, to make a 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 and its frontage.

  The 'design' of this area includes the selection of design, construction and control measures, and the process of combining them into a coherent scheme.

- 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

- 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, there are advantages in enlarging the planning area so that possibilities for integrated approaches can be explored.

3.2.3 Relationship to planning instruments

Local authorities will have prepared statutory plans (Local Environmental Plans 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.

Such plans 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 Local Area Traffic Management (LATM) Plans.

- Environmental adaptation involves both frontage and road-space management. Development Area Plans (Development Control Plans in NSW) 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 (1979). 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 factors

3.3.1 Factors 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 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.

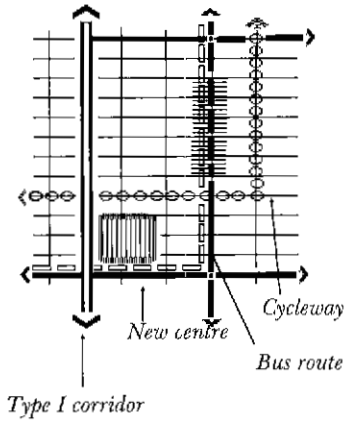


Fig 3 4 Possible changes at town/district level

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);
- 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 asessment.

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.

■ 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 such proposals usually takes time and that the scope for environmental adaptation may be constrained for some time. In that event, 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.

3.3.2 Factors associated with the area immediately adjacent

A similar set of situations can arise in areas in the immediate vicinity (Fig. 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.

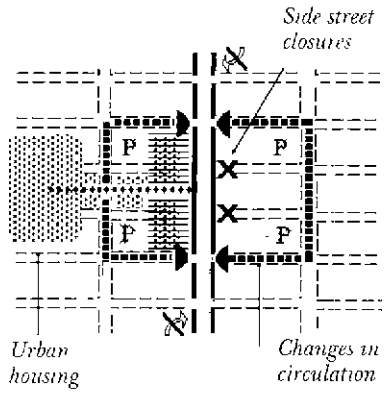


Fig 3.5 Circulation, urban housing and parking are likely to be key parameters

The ***first*** situation can occur if there are proposals 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 or to provide bicycle ways.

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

The ***second*** situation can occur if:

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

■ 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.

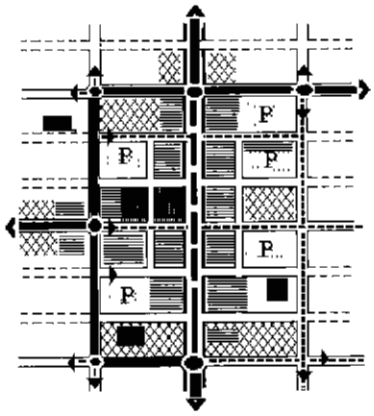


Fig. 3.6 Large centres require a planning study

Legend

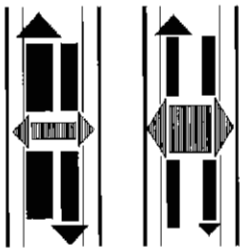


Fig 3.7 Seasonal or wide variations in the level of traffic and activity during the day may constrain the scope for adaptation and the measures used

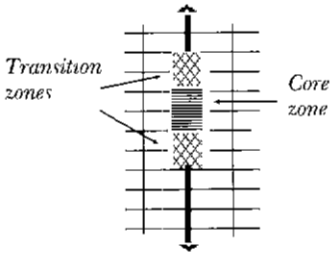


Fig 3.8 The limits of the core and transition zones can be identified at the planning level

3.3.3 Factors associated with both levels

- Large centres require an integrated development plan (Fig. 3.6)

  Where the Main Street or frontage activity along a sub-arterial road is 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 (Fig. 3.7)

  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 this 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 (Fig. 3.8).

  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 accordingly modified.

3.3.4 Time, resources and responsibilities

There are other planning factors 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

3.4 Process

The process of identifying planning factors is illustrated in Figure 3.9.

Step 1 triggers off the process when the key factors, 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 what planning action is necessary because there could be overspill effects for adjacent areas.

Step 8 addresses the town/district interactions and the need for further data collection.

Step 9 addresses the interaction with adjacent areas and the need for further data collection.

Step 10 involves the collection and interpretation of data.

Step 11 deals with community consultation in situations where this may be important.

Step 12 determines the strategies and policies for the planning area.

Step 13 involves the preparation of integrated development area plans and work programs appropriate for the planning area level.

Step 14 establishes the planning criteria for assessment (see Appendix B, Table B-1).

Step 15 is the statement of the planning factors which should be considered in the development of the design. It provides the input into the design process (Part 4).

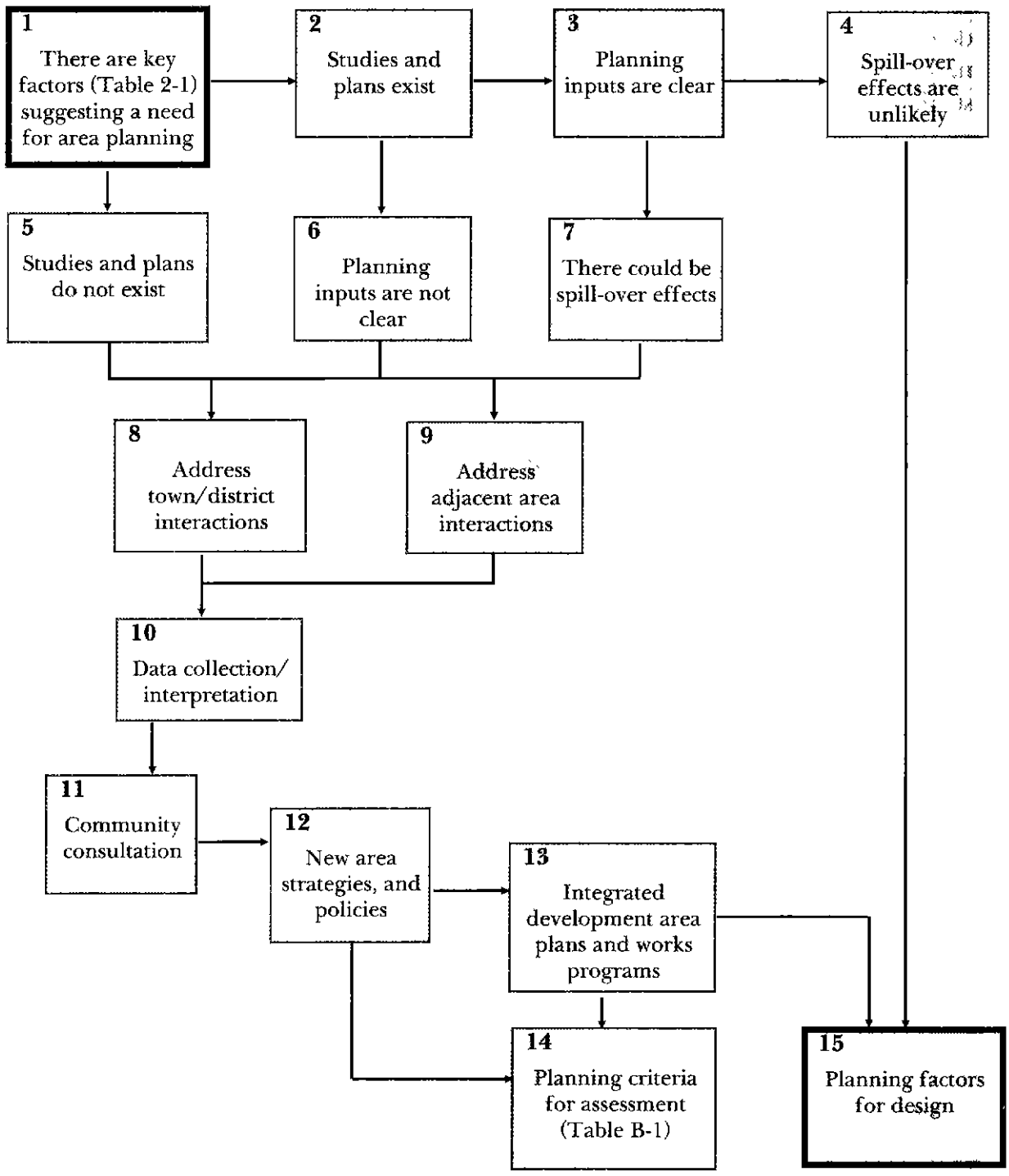


Figure 3.9: Checklist of planning actions

Table 3-1: Summary of Planning Factors

Situation	Planning factors to be considered in design
Town or district level	
There may be land-use and transport changes	
Road network development Traffic management (e.g. truck routes) Role of Main Street/sub-arterial centre	Inputs derived from studies & plans
The traffic function of Main Street/sub-arterial is a constraint	Inputs derived from re-examination of area-wide strategies. Interim arrangements where there are alternatives If no alternatives:
High traffic volumes High amount or proportion of through traffic High proportion of heavy vehicles	place more reliance on traffic signals and medians than on measures involving horizontal or vertical changes in the carriageway
Adjacent areas	
There are proposals for change	Inputs derived from integrated studies and plans
Increased residential densities Traffic calming Public transport or bicycle ways	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
Both levels of planning	
Large centre	Inputs derived from strategy and development area plan
Wide variations in the level of traffic and activity	Inputs derived from special study. If no alternatives, see 1.2 above.
Core and transition zones	Identification of the limits of the core and transition zones
Time, resources and responsibilities	
Changes take time to implement	Provide for interim solutions
Resources	Select cost-effective measures and provide for staged implementation
Responsibilities	Check with other responsible authorities

Design

4.1 Purpose of Part 4

The purpose of this Part is to provide information on:

- the measures available to develop designs for environmental adaptation;
- how they might be combined to achieve specific objectives;
- establishing design parameters;
- details on the application of design and construction measures;
- the process for achieving an integrated design; and
- an illustration of a comprehensive process.

4.1.1 Content

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 the broader planning issues which may need to be considered before commencing a design. Planning factors, derived from the relationship between the town/district or adjacent areas and the Main Street or sub-arterial centre, may constrain or offer opportunities which must be taken into account in the design process.

The focus in this Part is on design and control measures and how they can be used in combination to implement 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.

4.2 Measures

4.2.1 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 further subdivided 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 48 measures. A brief commentary is provided for each measure to highlight its specific aims, characteristics/applicability, limitations and expected impacts.

> Indicative cost figures for measures, where costs can be determined, are provided in FORS (1992, Appendix B).

In the design for environmental adaptation the focus of the Guide is on:

- measures to support a speed profile
- measures to support an activity profile
- 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.

4.2.2 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 (Fig. 4.1).

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.

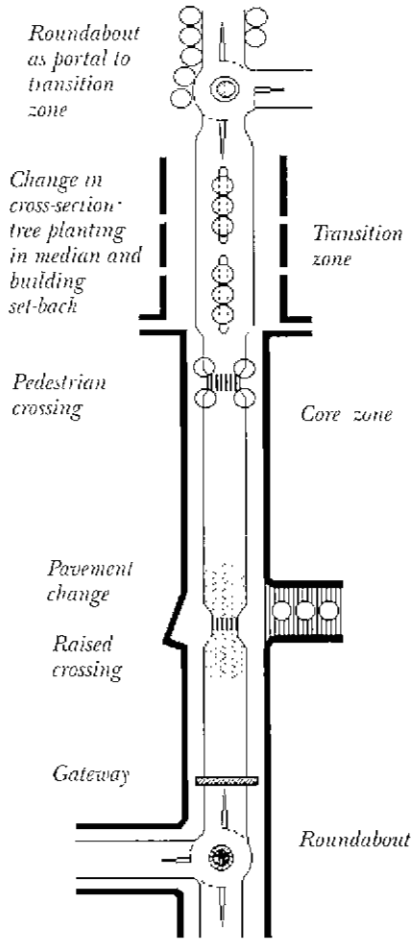


Table 4-1: Measures to achieve a speed profile
(refer to Appendix A)

Number	Measure
	Primary measures
C3	Speed zoning
D11	Gateway
D6	Roundabouts
C8	Traffic signals
D5	Staggered roadway
D19	Carriageway/lane narrowing
D9	Raised pavement within intersection
D3	Raised pavement midsection
D17	Shared/raised pedestrian crossing
C9	Pedestrian crossings
C2	Cross-pavement markings
D2	Different carriageway pavement
C4	Management of on-street parking
C5	Management of on-street loading
D1	Off-line bays
D12	Tree planting in median strip
D13	Tree planting in road shoulder
D10	Two-lane entry threshold
	Supporting measures
D14	Shared space
D16	Side street closure
D7	T Junction rearrangement
D8	Staggered junctions
C1	Channelisation
D18	Street lighting

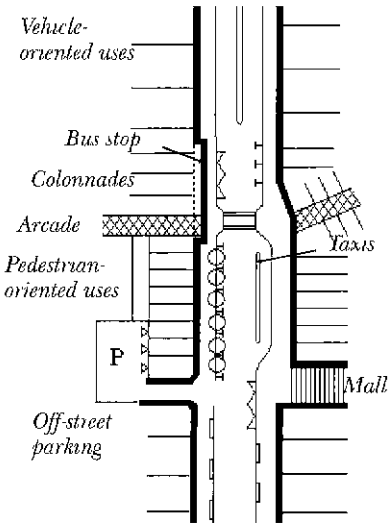


Fig 4.2 Measures to create an activity profile

4.2.3 Measures to support an activity profile

The main objective of establishing an activity profile is to confine the area of pedestrian activity.

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.

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
(refer to Appendix A)

Number	Measure
	Primary measures
C12	Detailed zoning
C13	Frontage width control
C14	Floor space ratio control
C17	Infill/redevelopment
C18	Footpath utilisation
C9	Pedestrian crossings
D22	Narrow median
D23	Wide median
C16	Off-street vehicular access/parking
C4	Management of on-street parking
C5	Management of on-street loading
D16	Side street closure (to create pedestrian continuity)
D25	Awning/verandah (to create climate protection)
	Supporting measures
D15	Road closure – Main Street
D14	Shared space
D22	Narrow median
D23	Wide median
C20	Streetscape
C22	Heritage conservation
C19	Advertisement control
D26	Tree planting in footpath
D12	Tree planting in median strip
D13	Tree planting in road shoulder
D18	Street lighting
C10	Bicycleway
C11	Bicycle storage

4.2.4 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.

Table 4-3: Measures to improve the quality of the road environment
(refer to Appendix A)

Number	Measure
	Primary measures
D11	Gateway
C21	Views and vistas
C20	Streetscape
D12	Tree planting in median strip
D13	Tree planting in road shoulder
D24	Footpath design (including extension)
C18	Footpath utilisation
D26	Tree planting in footpath
C22	Heritage conservation
D25	Awning/verandah
C19	Advertisement control
D18	Street lighting
	Supporting measures
D14	Shared space
D16	Side street closure
D19	Carriageway/lane narrowing
D22	Narrow median
D23	Wide median
C9	Pedestrian crossings
C4	Management of on-street parking
C5	Management of on-street loading
C11	Bicycle storage
C16	Off-street vehicular access/parking
C6	Light traffic thoroughfare
C12	Detailed zoning
C13	Frontage width control
C17	Infill/redevelopment

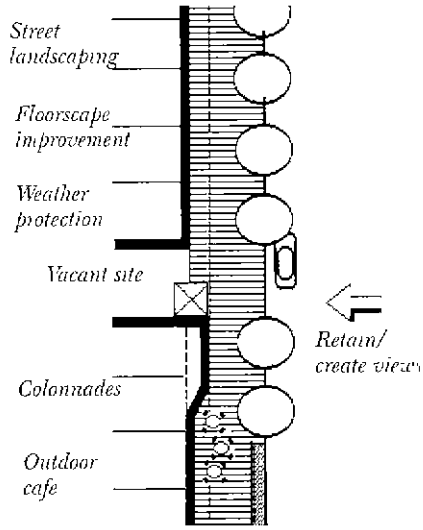


Fig 4.3 Measures to improve the quality of the environment

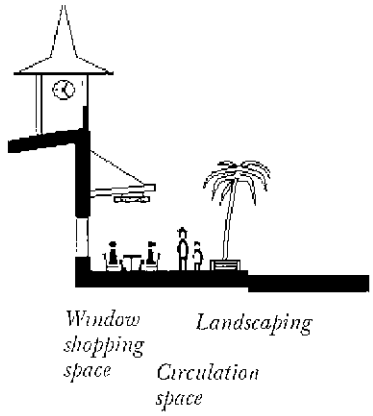


Fig 4.4 Footpaths should be of sufficient width to enable them to be used for a variety of purposes

4.3 Design factors

4.3.1 General design factors

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

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 (Fig. 4.5 and 4.6).

  With peak hour traffic volumes in excess of 1000 vehicles per hour and the need to provide for crossing pedestrians, there is likely to be a need for more than one lane in each direction. Where the road reservation is of the order of 20 metres, there is often very limited scope for measures involving a re-alignment of the carriageway. Other measures will have to be used 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 and cyclists.

  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 5.50 metres.

  If there is a need to make provision for cyclists, the width of the carriageway must be increased. The Draft Guide to Traffic Engineering Practice on Bicycles (AUSTROADS, 1993) recommends a width of 1.20 metres for a cycle lane (in one direction) on roads where the traffic speed is 40 km/h. There are no Australian guidelines for a shared road with lower speeds, but in the UK the suggested overall width of the carriage way in such a situation is as shown in Fig. 4.7.

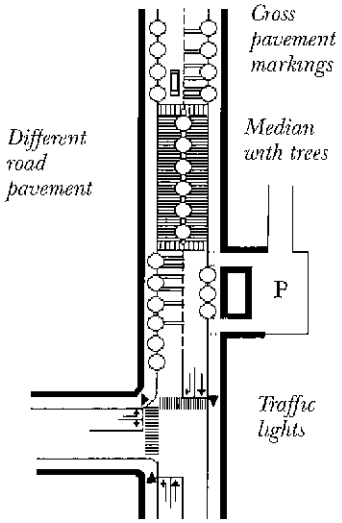


Fig. 4.5 Narrow road with high peak volume

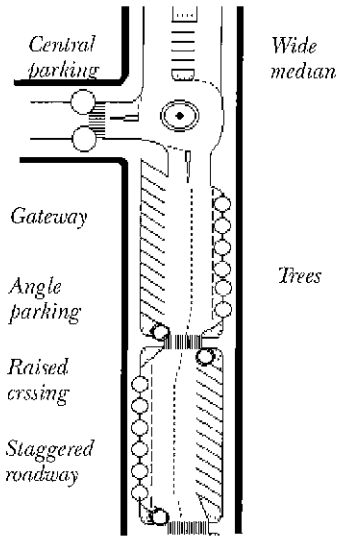
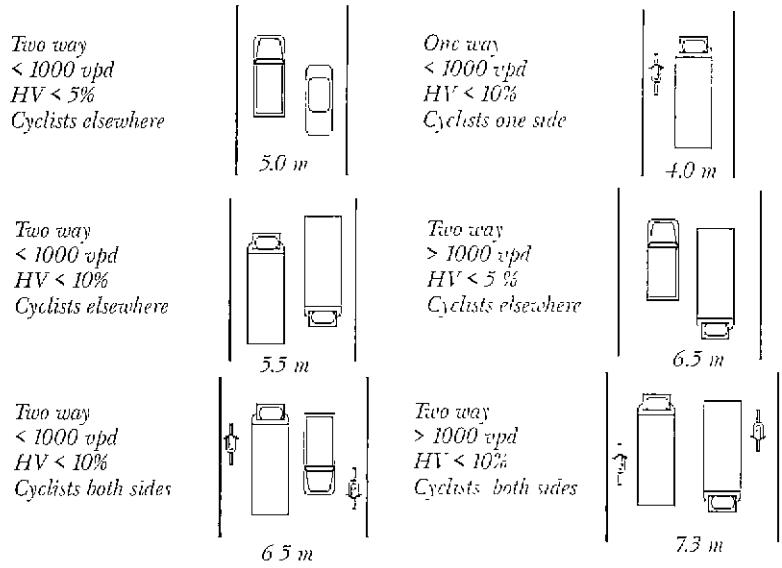


Fig 4.6 Wide road with light peak volume



HV - Heavy vehicles

Fig 4.7 Guidelines for road sharing in the UK

(After Devon County Council, 1992)

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.

- 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 (Fig. 4.8).

  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, 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.

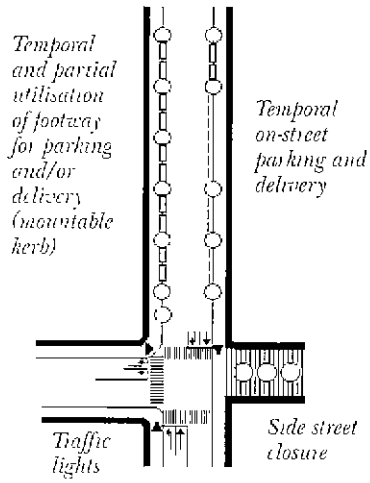


Fig 4.8 Shifts in priority of traffic function

- 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 (Fig. 4.9).

In the approach zone, the motorist's perception should dominate. In the transition zone, there should be a marked contrast in the appearance of the road and its environment. This can be achieved, for example, by different cross-sections, building setbacks, parking and access arrangements and more frequent intersections.

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 be reduced, a series of smaller spaces should be created, and close attention should be given to enclosure, climate protection, landscaping, lighting and street furniture.

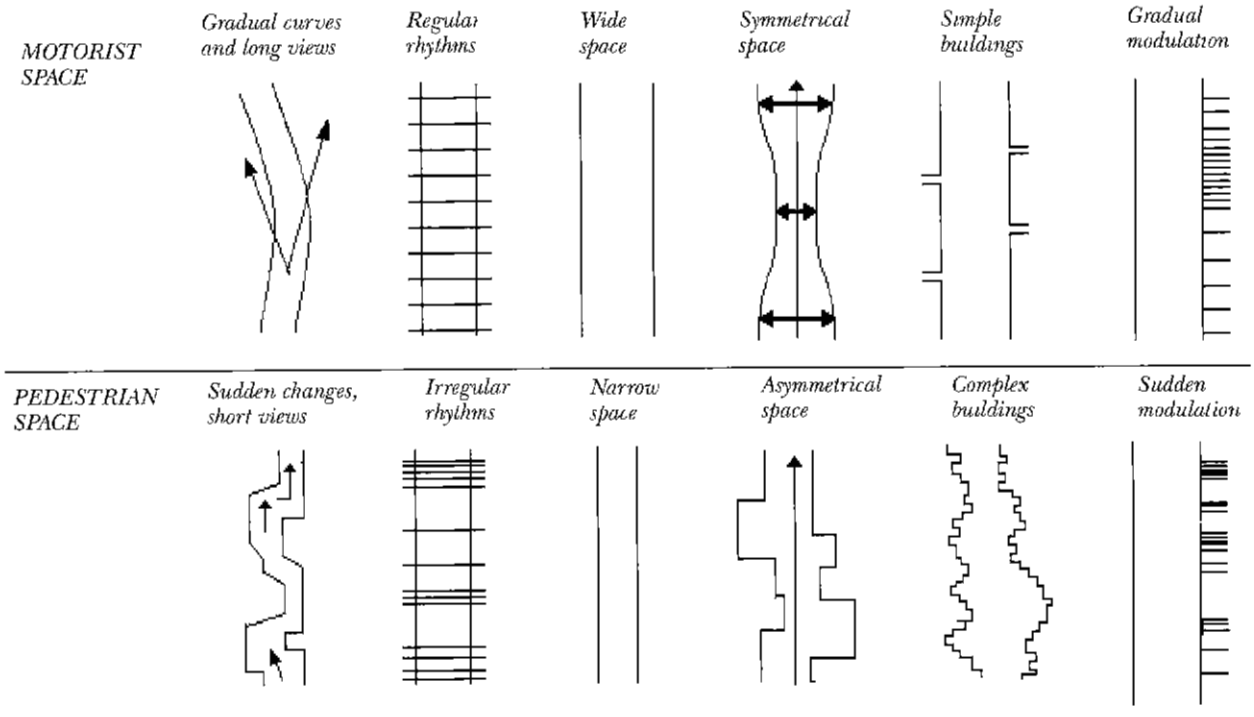


Fig 4.9 Motorists and pedestrians perceive the road space differently
(After Rapoport, 1977)

■ 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 (Fig. 4.10). 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.

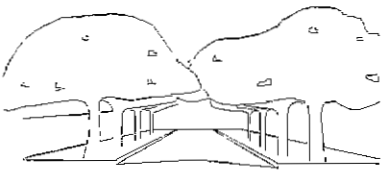


Fig. 4.10 Enclosed tree canopies provide a sense of containment and encourage reduced speed

■ Safe conditions should be created for all users.

Attention should be given to the provision for cyclists in a shared road environment. Under no circumstances should a bicycle lane be provided between parked cars and the kerb. Bicycle/car parking lanes can be used for both parallel and angle parking. 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 (Fig. 4.11) (AUSTROADS, 1993).

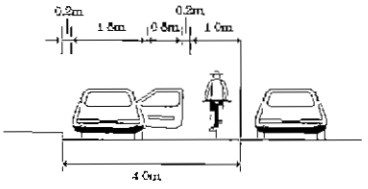


Fig 4.11 Minimum width of bicycle/car parking lanes is 4.0 metres

■ 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 an obstruction-free space is maintained (Fig 4.12) (VicRoads, 1993). The use of tactile tiles should be used at the kerbside of 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.

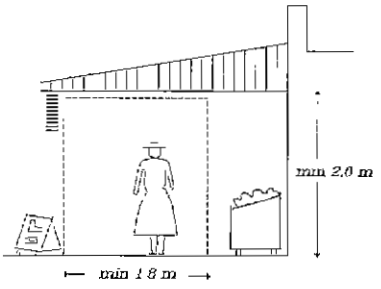


Fig 4.12 An obstruction-free space should be available on the footpath (VicRoads 1993)

■ 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.

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 (Table 4-4).

Table 4-4 Example of site-specific design factors

Item	Core zone	Transition zone
	Existing data, derived from local study	
Volumes	6000 vpd	
Through traffic	about 8 per cent	
Heavy vehicles	20 vph	
Target design speed	25 km/h	35 km/h
Turning lanes	NO	YES
Pedestrian signals	NO	YES
Vehicle signals	YES	YES
Cycleways	NO	YES
Bus provision	Bays	NO
Taxi ranks	Side street	NO
Parking for handicapped	YES	NO
Parking for delivery	No constraint	
Underground services*	No constraint	

*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.

4.3.4 Summary of design factors

Table 4-5 shows an indicative list of design factors for projects of environmental adaptation.

Table 4-5 Summary of design factors

Situation	Design factors
General	
If peak hour flow is high	Measures not to impede peak flows
If there are heavy vehicles and cyclists	Carriageway widths to take account of traffic composition
If there are major shifts in traffic function during the day	Select measures appropriate for peak and off-peak conditions
If there are pedestrians in the transition zone	Special attention to crossing pedestrians
Site Specific	Derived from investigation
In all situations	Recognise special needs (cyclists, aged, people with disabilities)

4.4 Application of design and construction measures

Table 4-6 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; and
- pedestrian space-related.

Control measures (C) have not been included in Table 4-6 as they are generally not dependent on peak hour flows.

A raised pedestrian crossing at the start of the core zone connects with a parking area at the rear (Sunbury)

Pedestrian safety and amenity can be improved at modest expense (Orange)

Table 4-6: Guidelines for using design and construction measures

Refer to Appendix A

No	MEASURE	Peak hour flow (both ways)								
		> 1000 vph			1000–500 vph			< 500 vph		
		Reservation width			Reservation width			Reservation width		
		40m	30m	20m	40m	30m	20m	40m	30m	20m
	VEHICULAR SPACE RELATED									
D1	Off-line bays	Y	Y	N	Y	Y	D	Y	Y	Y
D2	Different carriageway pavement	Y	Y	Y	Y	Y	Y	Y	Y	Y
D3	Raised pavement	N	N	N	D	D	D	Y	Y	Y
D4	By-pass roads	D	D	D	D	D	D	D	D	D
D5	Staggered roadway	Y	Y	N	Y	Y	Y	Y	Y	Y
D6	Roundabouts	Y	Y	Y	Y	Y	Y	Y	Y	Y
D7	T Junction rearrangement	Y	Y	Y	Y	Y	Y	Y	Y	Y
D8	Staggered junctions	Y	Y	N	Y	Y	D	Y	Y	Y
D9	Raised pavement within intersection	N	N	N	D	D	D	D	D	D
D10	Two lane entry threshold	N	N	N	D	D	D	Y	Y	Y
D11	Gateway	Y	Y	Y	Y	Y	Y	Y	Y	Y
D12	Tree planting in median	Y	Y	N	Y	Y	D	Y	Y	Y
D13	Tree planting in shoulder	Y	D	N	Y	Y	D	Y	Y	D
	PEDESTRIAN & VEHICULAR SPACE RELATED									
D14	Shared space	N	N	N	D	D	D	Y	Y	Y
D15	Road closure Main St.	D	D	D	D	D	D	D	D	D
D16	Side street closure	Y	Y	Y	Y	Y	Y	Y	Y	Y
D17	Shared/raised pedestrian crossing	D	D	D	Y	Y	Y	Y	Y	Y
D18	Street lighting	Y	Y	Y	Y	Y	Y	Y	Y	Y
D19	Carriageway/lane narrowing	D	D	D	Y	Y	Y	Y	Y	Y
D20	Railing of footpath/median	D	D	D	N	N	D	N	N	N
D21	Grade separated pedestrian crossing	N	N	D	N	N	N	N	N	N
D22	Narrow median	Y	Y	Y	Y	Y	Y	Y	Y	Y
D23	Wide median	Y	D	N	Y	D	D	Y	Y	N
	PEDESTRIAN SPACE RELATED									
D24	Footpath design (including extension)	Y	Y	Y	Y	Y	Y	Y	Y	Y
D25	Awning/verandah	Y	Y	Y	Y	Y	Y	Y	Y	Y
D26	Tree planting in footpath	Y	Y	Y	Y	Y	Y	Y	Y	Y

Y = Yes N = No D = Depends on specific situation

NOTE

The application of the measures is not dependent on peak hour traffic alone.

Other factors apply, such as target speed, pedestrian volumes, visibility and gradient.

4.5 Design process

4.5.1 Steps in the process

The principal steps in the development of the design are (although not necessarily all in this sequence):

1 determine the extent of the ***core*** and ***transition zones;***

2 determine the ***speed*** and ***activity profiles*** appropriate for these zones;

There could be a separate speed profile for each direction of flow and a separate activity profile for each side of the road.

3 consider need for ***turning movements***;

The turning movements of large vehicles are especially important.

4 consider ***bus stops*** and whether special bays are needed; consider ***bicycle routes***, ***taxi stands*** and provision for the ***disabled***;

5 consider ***service access*** to sites and whether there are any special requirements for on-street loading/unloading;

6 consider ***parking*** amount, duration, distribution and access;

7 consider scope for lateral ***expansion*** of pedestrian core, selected ***side street closures*** and pedestrian ***footpath continuity*** in the core zone; consider opportunity for ***social spaces*** and their urban design requirements;

8 consider ***pedestrian crossing*** points and the type of crossings needed; consider ***carriageway alignment*** and whether horizontal or vertical deflection measures are to be used;

9 decide on ***cross-sections***, footpath width and utilisation;

10 select appropriate ***measures*** and prepare ***integrated design***; consider possible ***staging*** options and estimate ***costs*** of each option.

11 ***revise*** design as necessary.

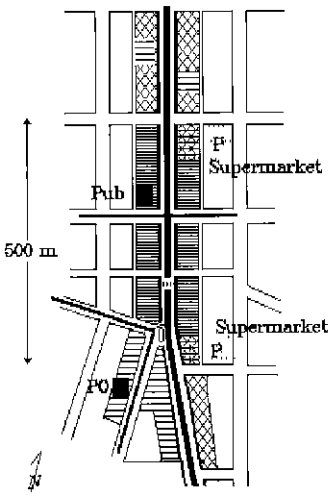
All needs should be considered

Pedestrians and vehicles share the Main Street with a terminus for regional bus routes (Cairns)

Widening of the footpath has created opportunities for a variety of pedestrian activities (Canberra)

4.5.2 Illustration of the design process

The purpose of this illustration is to indicate how the design process can be followed. It must NOT be assumed that the options presented are necessarily the most appropriate in a real situation. Each situation is unique and requires individual study and community involvement.



Existing situation

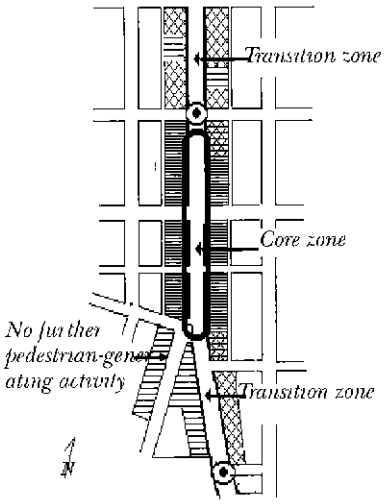
Assumptions

The most significant variable in the design for environmental adaptation is the road reservation width available after the basic movement function has been satisfied. In the following illustration, a situation has been selected where the road reservation is 30 metres and there are 2 lanes for moving vehicles.

The length of the activity frontage is another important variable and it is assumed that the active pedestrian-oriented frontage is 500 metres. It is assumed that there are no broader planning issues to be considered first and that there is no significant junction of regional routes in the centre itself.

It is also assumed that public utility services and stormwater drainage facilities are in good condition and not affected by any proposals. There are no special conditions related to gradients.

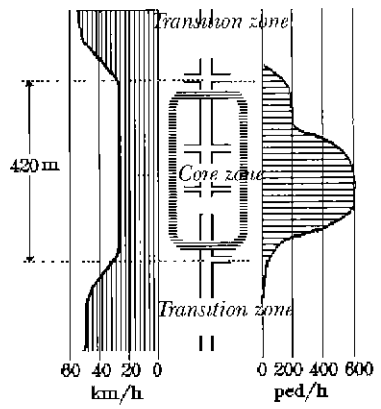
Assumptions have also been made about the nature of the problem and the objectives to be achieved. Indicative options have been prepared for part of the core zone.



Step 1 Identifying zones

Step 1

Determining the 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 retailing should be curtailed in such an area.



Target speed during peak pedestrian activity *Pedestrian activity per 100 metres of frontage*

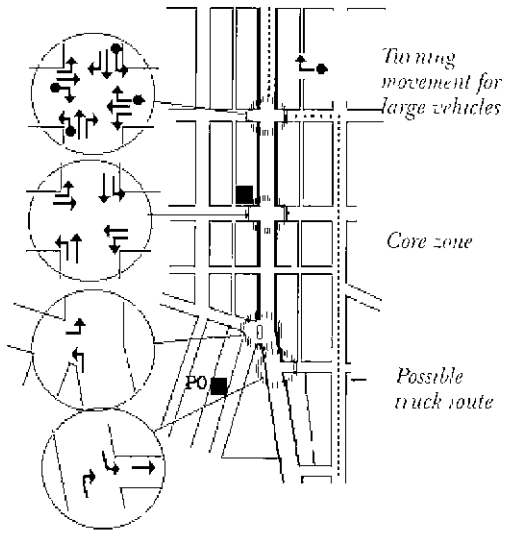
Step 2 Determining profiles

Step 2

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.

Step 3

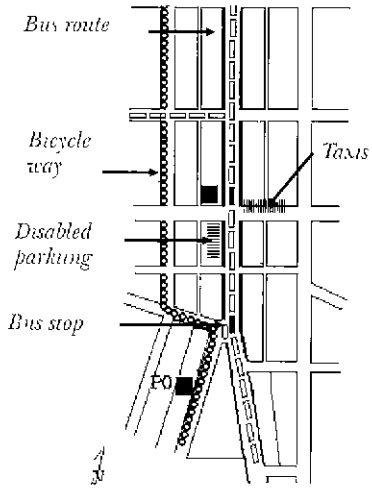
Turning movements which must be retained are identified. The turning movements of large vehicle are important here.



Step 3 Identifying turns

Step 4

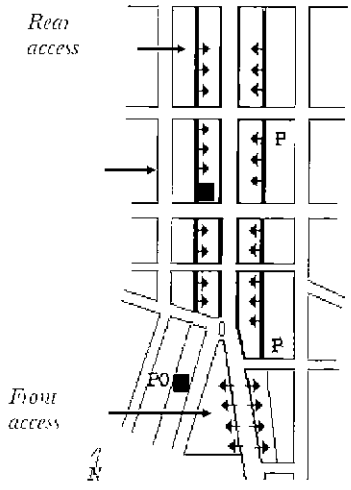
Bus routes, bus stops, bicycle routes, taxi stands and the needs of the disabled are considered.



Step 4 Public transport and special needs

Step 5

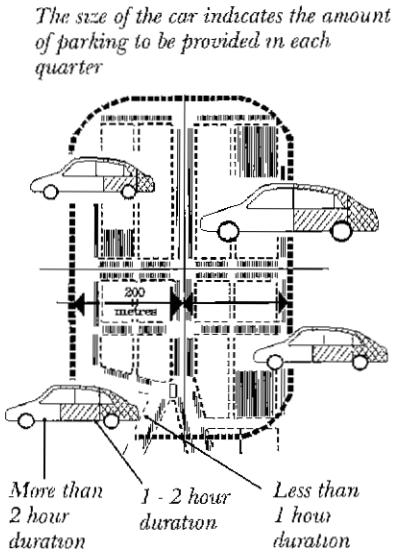
Access for service vehicles is considered, including the need for special loading bays in the core zone. In this example, there are rear access lanes.



Step 5 Consider access

Step 6

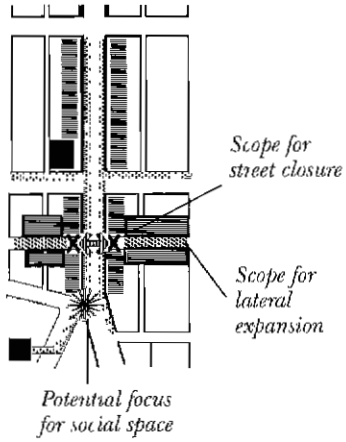
It may be desirable to reduce the amount of parking in the Main Street or sub-arterial, but any loss must be compensated nearby.



Step 6 Parking requirements

Step 7

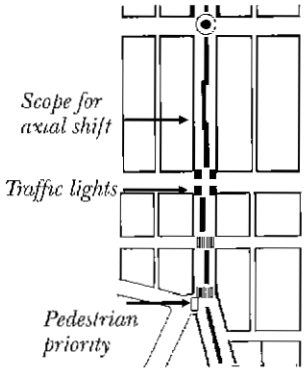
The scope for side street closure and lateral expansion of the core should be explored. There may also be an opportunity to create a social focus as part of the project.



Step 7 Scope for expansion

Step 8

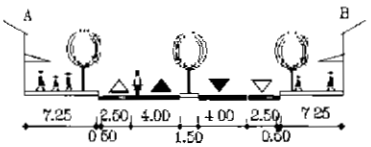
Pedestrian priorities are now determined and the scope for modifying speed behaviour through horizontal or vertical deflection measures is considered. The selection of measures is influenced by the traffic characteristics and the width of the road reservation. In this example there is scope for horizontal deflection measures.



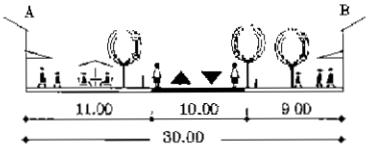
Step 8 Modifying carriageway

Step 9

The determination of the cross-sections has great bearing on the quality of the road space. There are options and trade-offs.



Possible cross-section mid-block



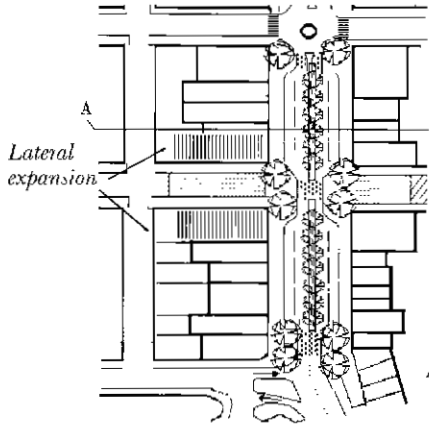
Possible cross-section where footpath activity is encouraged

Step 9 Determine cross-sections

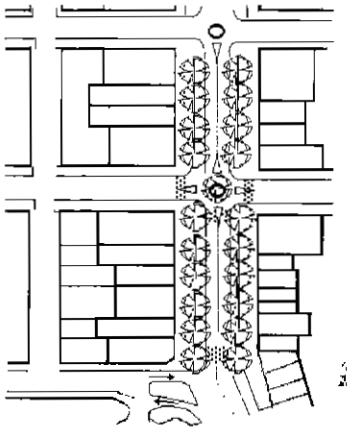
Step 10

The next step involves the development of alternative integrated schemes, including different implementation measures. There will be different price tags attached to each option and there will be differences in staging opportunities. An illustration of comparative costs is set out in Table 4-7. Further information on costs is provided in FORS (1992, Appendix B).

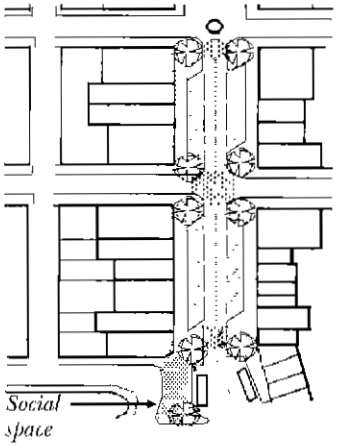
In all cases, there is a need to develop and implement integrated projects, as the application of single measures may reduce, instead of enhance, safety.



In this option angle parking has been replaced by parallel parking and a wider footpath. A median strip with trees and closure of some side streets with lateral retail expansion are other features.



In this option the carriageway has been reduced, there is parallel parking and trees are planted Alternative space for parking will be made available elsewhere.



This is a least cost option Lines defining the carriageway are painted on the pavement, but the pavement is changed in some places where pedestrian crossing is encouraged..

Step 10 Alternative integrated options

Assessment and evaluation

5.1 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.

5.1.1 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.

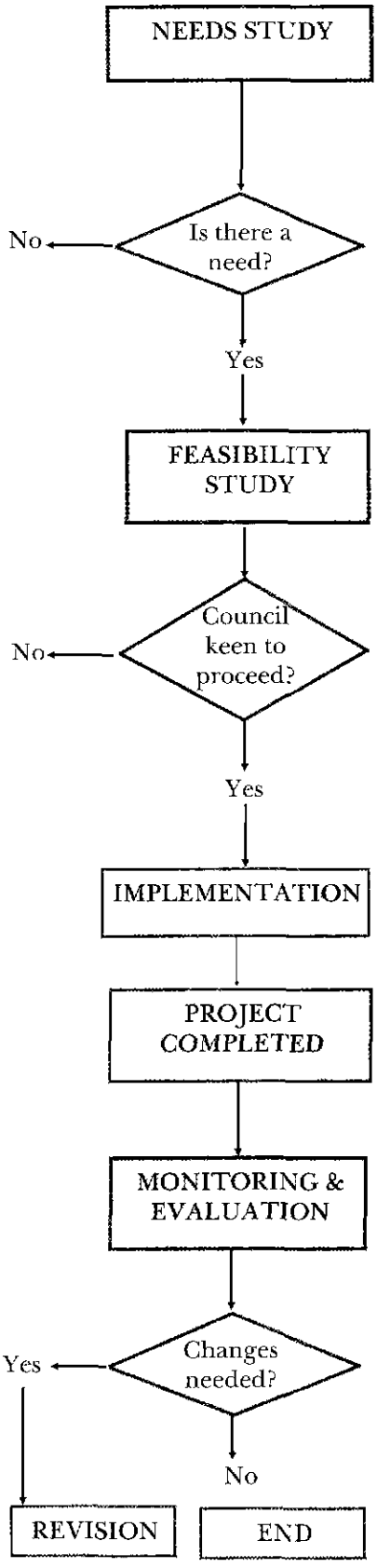
It is often possible to satisfy objectives in different ways, but the costs and benefits may not be the same. Thus, there is a need to assess the likely consequences of each proposal, to compare the different proposals in terms of advantages and disadvantages, and to evaluate which proposal offers the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

Some benefits, such as a pavement cafe (Fremantle), cannot be quantified, but may make an important contribution to a project

5.2 Process



5.2.1 Three stages of assessment and evaluation

There usually are three stages of assessment and evaluation (Fig. 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 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).

- 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.

5.3 Assessment

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' or 'pre-facto' 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 is 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 overall performance of the proposed situation; and
- measure the overall performance of the new situation after the project has been implemented.

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.

Monetary and non-monetary items

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

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'.

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.

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. 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 preformance 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.

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

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.

Table 5-1 Example of a simple comparative assessment

Objective	Performance Indicator	Level of achievement of option Compared with the base case A	B	C
Reduction in conflict between pedestrians and vehicles	Accidents (veh/ped)	L	M	H
	Vehicle speed in core	L	M	H
	Jay runners/walkers (%)	L	M	H
	Perceived safety	L	M	H
Reduction of impact on frontage	Noise	L	M	H
	Business activity		M	M
Improvement in quality of the environment	Footpath width	L	L	M
	Weather protection	L	L	M
	Urban design	H	L	H
Maintain circulation	Site access	H	M	L
	On-street parking		M	M
	Adjoining areas	H	M	L
Affordability	Capital expenditure	H	M	L
	Maintenance cost		H	M

L = Low M = Medium H = High

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

Objective	Performance Indicator	Level of achievement of project Before	After	Comment
Reduction in conflict between pedestrians and vehicles	Accidents (veh/ped)	3	na	Needs 3year+ period
	Vehicle speed in core	45	30	
	Jay runners/walkers (%)	7	2	
	Perceived safety		greatly improved	
Reduction of impact on frontage	Noise (facade)	70 dB(A)	66 dB(A)	
	Business activity			unchanged
Improvement in quality of the environment	Footpath width (m)	4	5.5	Average
	Weather protection	70%	70%	Needs time
	Urban design		improved	Descriptive
Maintain circulation	Site access		unchanged	
	On-street parking (core)	200	180	
	Adjoining areas		side street closure	
Affordability	Capital expenditure		$300,000	
	Maintenance cost (yr)	$40,000	$50,000	

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 database 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.

When is accuracy needed?

For the purpose of comparing alternatives only estimates of likely changes are required. Generally, the level of accuracy should be higher for those performance indicators where there are likely to be significant differences between alternative schemes. For example, greater accuracy is required on likely costs.

If there is an intention to assess what changes have occurred after implementation of a project, a decision should be made before the start of the project on which performance indicators should be used for comparison.

This is essential in the case of demonstration projects. The NSW Treasury Guide and the RTA *Economic Analysis Manual* (1992) specify levels of reporting for different sizes of investment. Therefore, the results of an assessment will need to form a part of a submission for funding, explaining the case for a particular proposal.

5.4 Evaluation

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 rigourous 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 = 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 (Table B-1).

5.4.5 Consultation

The importance of involving the stakeholders was stressed in section 1.6. Consultation is useful 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.
>
> The form of presentation should be clear and understandable. 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.

- There are different techniques for consultation during the evaluation stage.
  - Public meetings, discussion groups, seminars or workshops with key players and resident groups;
  - Meetings with selected groups who have a direct interest in the project;
  - Local press releases;
  - Issue of information brochures with provision for comment;
  - Opinion surveys;
  - Public displays of the options and their assessments with provision for comment from the community; and
  - Establishing an information or contact centre.

There are variations of these methods (see FORS, 1992) and the techniques selected must be appropriate to local circumstances. The Council must ultimately decide which to use in the light of the local political climate. In making such a decision it is important to remember that complete community support is most unlikely to be achieved; that compromises will almost

certainly be needed and that the Council must eventually be the decision maker as it has to allocate the necessary funds.

It should be emphasised that any program of community involvement requires commitment, resources and expertise. There is a need for a person (or persons) who can confidently give information and allay fears.

5.4.6 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.

5.5 Monitoring and review

5.5.1 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 any details which could have been done differently; 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 the Regional Office of the State road/traffic agency.

5.5.2 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.

5.5.3 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.

5.5.4 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.

5.5.5 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.

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.*

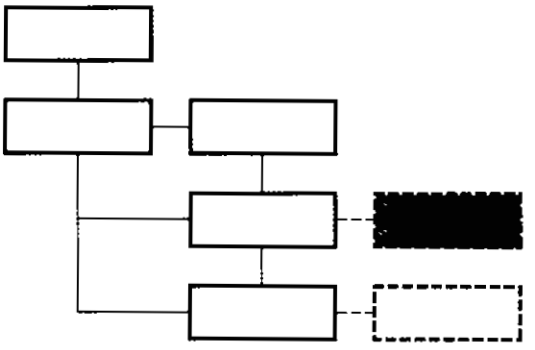
Speed profile: the distribution of *target speeds* along the length of the Main Street or a sub-arterial road.

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.

Appendix A



Measures

CONTROL MEASURES (C)

TRAFFIC CONTROL

C1	Channelisation
C2	Cross-pavement markings
C3	Speed zoning
C4	Management of on-street parking
C5	Management of on-street loading
C6	Light traffic thoroughfare
C7	One-way road system
C8	Traffic signals
C9	Pedestrian crossings
C10	Bicycle way
C11	Bicycle storage

DEVELOPMENT CONTROL

C12	Detailed zoning
C13	Frontage width control
C14	Floor space ratio control
C15	Control of business hours
C16	Off-street vehicular access/parking
C17	Infill/redevelopment
C18	Footpath utilisation
C19	Advertisement control
C20	Streetscape
C21	Views and vistas
C22	Heritage conservation

DESIGN AND CONSTRUCTION MEASURES (D)

VEHICULAR SPACE RELATED

D1	Off-line bays
D2	Different carriageway pavement
D3	Raised pavement
D4	By-pass roads (including environmental adaptation in the Main Street)
D5	Staggered roadway
D6	Roundabouts
D7	T Junction rearrangement
D8	Staggered junctions
D9	Raised pavement within intersection
D10	Two-lane entry threshold
D11	Gateway
D12	Tree planting in median strip
D13	Tree planting in road shoulder

PEDESTRIAN & VEHICULAR SPACE RELATED

D14	Shared space
D15	Road closure — Main Street
D16	Side street closure
D17	Shared/raised pedestrian crossing
D18	Street lighting
D19	Carriageway/lane narrowing
D20	Railing of footpath/median
D21	Grade-separated pedestrian crossing
D22	Narrow median
D23	Wide median

PEDESTRIAN SPACE RELATED

D24	Footpath design (including extension)
D25	Awning/verandah
D26	Tree planting in footpath

C1

CHANNELISATION

AIM

- Separate conflicting traffic movements
- Direct traffic to specific lanes
- Reduce or prevent turning movements
- Separate pedestrians/vehicular traffic
- To provide advance warning for drivers, approaching other treatments.

APPLICATION

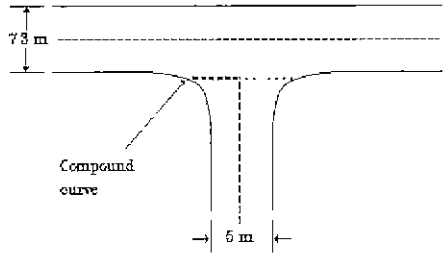
- Where protection is required for pedestrian crossings
- Where traffic control is required because of accident history or traffic congestion
- Can be used in most situations in by means of concrete or landscaped traffic islands, wide painted medians and ripple paint (vibraline), and safety bars/rumble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

LIMITATIONS

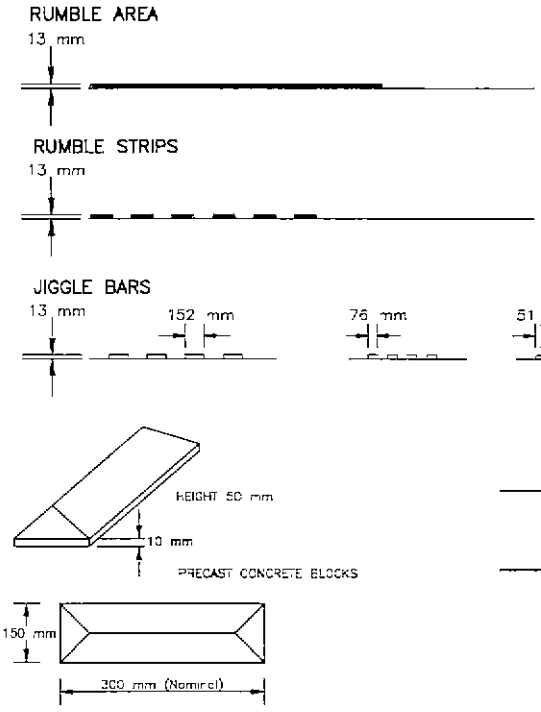
- Concrete islands require sufficient space to maintain road lane widths
- Painted medians may not be suitable for high vehicle/pedestrian activity situations as the markings will be difficult to see or be disregarded.

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
- Rumble bars can be a hazard if dislodged and can be a hazard for pedestrians and cyclists
- Can be used to prevent overtaking and to increase friction through parking vehicles
- Increased lane discipline.

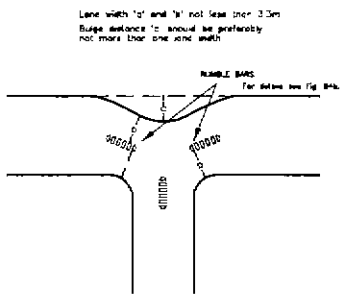


Standard layout



RUMBLE BARS (Suggested Design)

NB: Vertical scale slightly exaggerated on these drawings.



RUMBLE BARS AT T–INTERSECTION

AIM

- To gradually reduce speed

APPLICATION

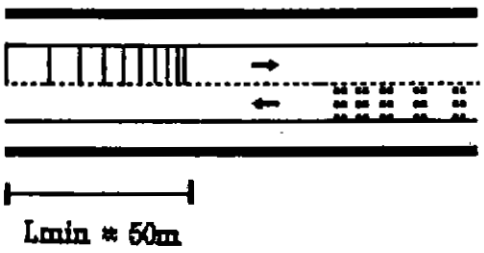
- In the transition zones of the centre parallel strips across the traffic lane(s) at diminishing intervals; either painted or made of rough textured material (e.g. cobble stone).

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
- To assist pedestrian movement across the Main Street.

APPLICATION

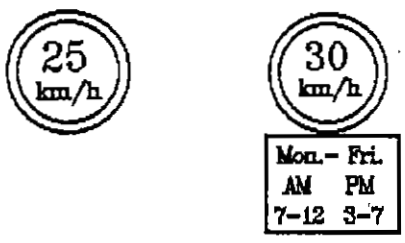
- Where the budget is very limited.

LIMITATIONS

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

IMPACT

- Can give pedestrians a false sense of security by expecting drivers to obey signs.



AIM

- To control the quantity of on-street parking in the Main Street
- To reduce problems of vehicle fumes directed to pedestrian areas
- To regulate the turnover of parking in the Main Street

APPLICATION

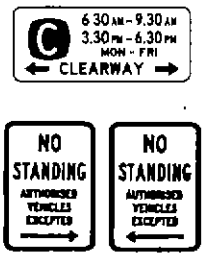
- Used to distribute parking to the appropriate parts of the Main Street
- Can be used as part of the landscape treatment of the Main Street
- Can be used to reduce/increase friction with through traffic.

LIMITATIONS

- Angle parking can increase vehicle fumes in pedestrian areas
- Angle parking requires substantial pavement width
- Parking manoeuvres can be in conflict with through traffic and pedestrian movements
- Period parking requires enforcement.

IMPACT

- Employees and shop owners will be forced to park elsewhere
- A reduction of parking close to shops will be opposed by shop owners
- Large areas of paving required.



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.

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 bypass is available
- Rear access available for delivery vehicles
- Initial low cost solution, but enforcement costs are ongoing

LIMITATIONS
- Difficult to enforce
- Increased journey time for delivery vehicles.

IMPACT
- Confusing and/or inconvenient for non-locals
- Reduced road pavement loading
- Improved pedestrian and vehicular safety
- Reduced noise, fuel emission and vibration.

C7

ONE-WAY ROAD SYSTEM

AIM
- To create a partial mall within the Town Centre, enhance the Town Centre and/or provide additional on-street parking and safer conditions.

APPLICATION
- Where there is insufficient road width for two-way movements
- Where there is an alternate route for the displaced traffic movement.

LIMITATIONS
- Bus routes which may not be altered.

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
- Increased vehicle speeds
- Possible confusion for emergency and delivery vehicles.

C8

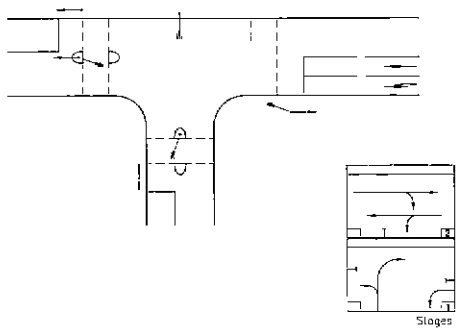
TRAFFIC SIGNALS

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.

LIMITATIONS
- High cost
- Not suitable at poor sight distance locations without complementary measures
- Specialist maintenance and servicing required
- High pedestrian and vehicular volumes needed to justify the expenditure

IMPACT
- Control of traffic speed
- Increased noise, fuel emission
- Possible increase in accidents if sight distance is inadequate
- Can provide flexible control of vehicular and pedestrian flows
- Could be out of character with the Town's streetscape
- Can arrange traffic into plateaux which create gaps for pedestrians to cross the road.



C9

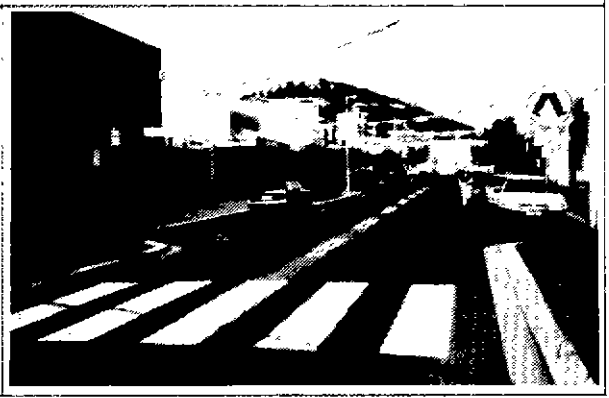
PEDESTRIAN CROSSINGS

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 light.

LIMITATIONS
- Vehicle approach speeds should be kept low
- May not be appropriate near large roundabouts
- Require adequate sight distance and pedestrian visibility
- Restrict traffic flow on Main Street.

IMPACT
- Reduced travel speeds
- Improved pedestrian safety
- Increased opportunity for pedestrians to cross
- Restricted vehicular access to properties
- Reduced potential for jay-walking.



C10

BICYCLEWAY

AIM
- To improve road safety
- To promote bicycle use
- To decrease pollution

APPLICATION
In active centres where bicycle use has some tradition, popularity or potential, provision for cycling is incorporated into the Main Steet environment including:
1) segregated bike lane (as part of the carriageway)
2) without segregation in mixed traffic with low vehicle speeds; or
3) on shared footpaths.

LIMITATIONS
- On-street parallel parking/delivery may create hazard for cyclists
- Road pavement must be in perfect condition
- Drainage pits may need readjustment
- Climate can be an interfering factor in bicycle use.

IMPACT
- Possible increase in bicyle use and consequent decrease in local vehicular traffic
- Increased catchment of the Main Street for people without access to private car.

C11

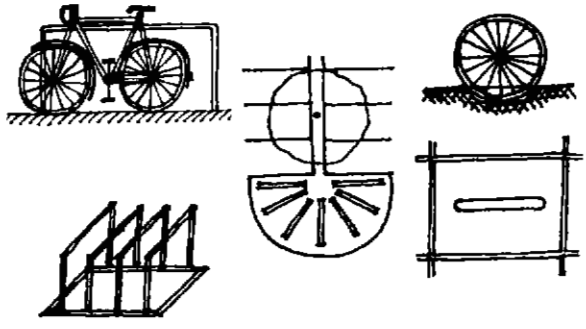
BICYCLE STORAGE

AIM
- 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 (slots in the pavement, ranks, railing, etc.)

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

IMPACTS
- Increased bicyle use by local shoppers
- More effective footpath utilisation.



C1S

DETAILED ZONING

AIM

- To establish appropriate activity profile for the centre, with grouping compatible uses.

APPLICATION

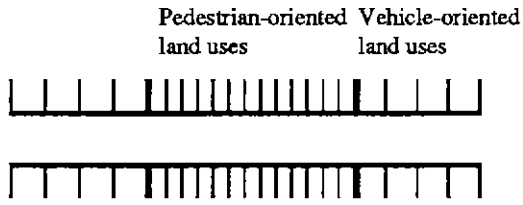
- In long centres which dynamically develop, or where businesses change over time
- A high activity core is zoned for predominantly pedestrian-oriented uses and low activity transition zones are created on either side of the centre, predominantly for vehicle-oriented uses. Uses which rely on both can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

LIMITATIONS

- It may be difficult 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).



LAND-USE ACTIVITY PROFILE

C1S

FRONTAGE WIDTH CONTROL

A) max. 20 m.

AIM

- A) to encourage visual diversity of the pedestriar core and to make it compact
- B) to reduce friction in the transition zones.

APPLICATION

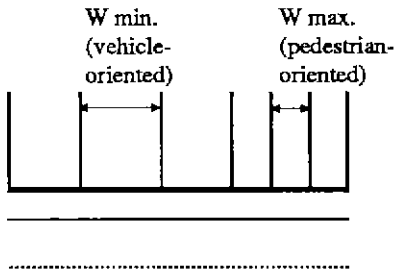
- A) narrow fronted, relatively deep lots in the pedestrian-oriented core zone, with arcades and possible vertical expansion
- B) the number of ingress and egress points (driveways) per unit length are controlled in the vehicle-oriented parts of the centre (e.g. 5/100m – min. frontage width is 20 m)
- implemented slowly over time by private (redevelopment).

LIMITATIONS

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

IMPACT

- A) visually more stimulating pedestrian-oriented centre with a well confined conflict area
- B) friction caused by parking manoeuvring can be kept at a tolerable/desirable level.



C14

FLOOR SPACE RATIO — FSR

AIM

To control the generated number of pedestrians and vehicles to reduce conflict.

APPLICATION

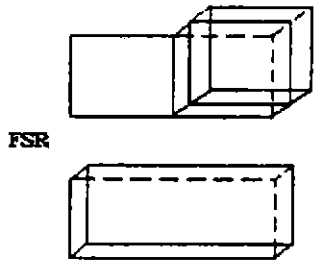
All development control plans (DCP's) should contain detailed measures for the Main Street. Through FSR control the friction caused by parking manoeuvring and turning movements can be controlled in the case of vehicle oriented uses, while in the pedestrian-oriented core it will affect the generated number of pedestrians and thus pedestrian density and crossing.

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.



C15

CONTROL OF BUSINESS ACTIVITY/ SHOPPING HOURS

AIM

- To reduce friction caused by major traffic generators.

APPLICATION

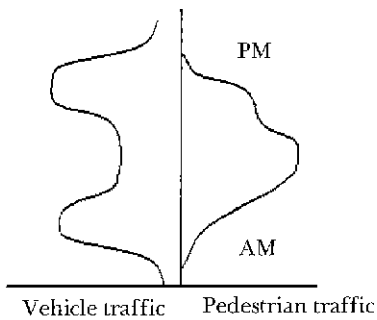
Where the daily fluctuation of traffic is significant, with demand in distinct peak periods exceeding the capacity of the roadway, the functioning period of major traffic generators, which cannot provide off-street access facilities, is restricted, with excluding the peak hours from the permitted shopping hours.

LIMITATIONS

- Turnover of affected businesses may fall significantly.
- Implementation and enforcement are difficult both politically, legally and technically.

IMPACT

- Segregation of through and local traffic in peak periods
- Fewer accidents
- Increased road capacity and speed if combined with parking restrictions.



C16

OFF-STREET VEHICULAR ACCESS/ 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.

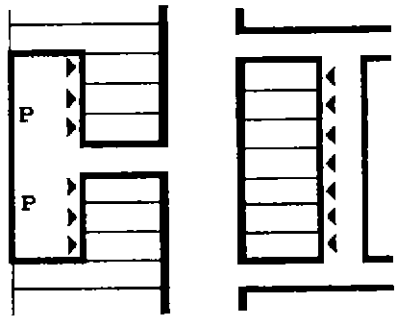
LIMITATIONS

Feasible only if:

- Redevelopment is likely to occur, or
- Back lanes/streets exist and the interior layout of shops can be reorganised accordingly.

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.



C17

INFILL/REDEVELOPMENT

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)

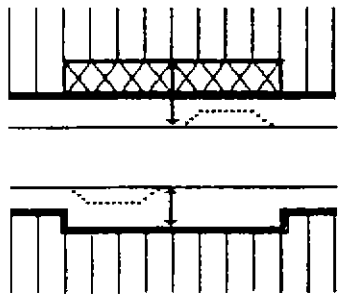
Emphasis on ground floor design and prevailing character (building lines, height, proportions, roofline, fenestration, materials, colour, etc).

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
- (May provide opportunity for grade-separated pedestrian crossing).



C18

FOOTPATH UTILISATION

AIM

- To improve the quality of the footpath/ped. env.
- To coordinate the actions of various players.

APPLICATION

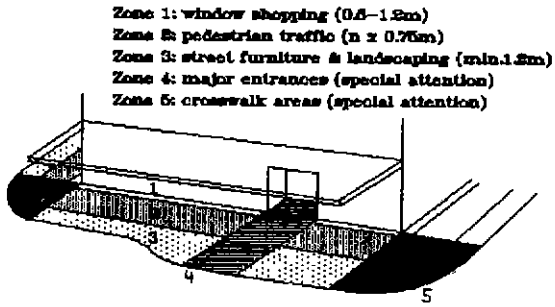
- Improvements of the pedestrian space are guided by the technique of functional zoning as part of the DCP. Zones with explicit design criteria are established for window shopping, pedestrian traffic, street furniture and landscaping, major entrances and crosswalk areas.

LIMITATIONS

- Careful and site-specific considerations are required to determine the design parameters of each zone. Danger of rigidity and uniformity.

IMPACT

- More functional (convenient and safe) pedestrian environment
- Improved aesthetics
- More cost-effectiveness in public sector improvements.



PEDESTRIAN SPACE ZONING CONCEPT

C19

ADVERTISEMENT CONTROL

AIM

- To reduce the visual complexity (clutter) of the streetscape
- To control visual stimuli.

APPLICATION

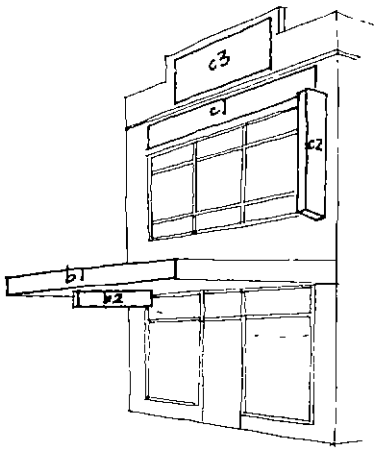
- Coordinated outdoor advertising policy/guidelines/controls are introduced to complement or enhance the streetscape and/or to affect speed
- The elements of control may include: number of signs/per site (or unit length), size, purpose/content, placement/location design, etc

LIMITATIONS

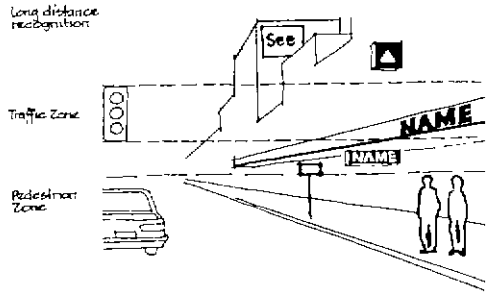
- Sensitive area-specific control requires detailed studies
- Implementation requires effective consultation and working relationship with the shopkeepers.

IMPACT

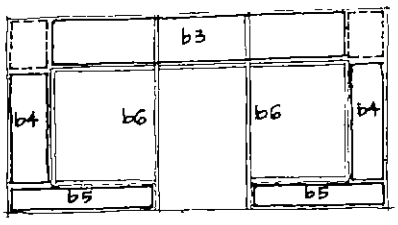
- Improved streetscape
- Compatibility between speed and the rate of information for both drivers and pedestrians (reduced density of stimuli may contribute to the reduction in accident rates).



KEY NUMBER OF SIGNS PER SITE



VISIBILITY ZONES



Source: Department of Planning (1991) Outdoor Advertising

C20

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:

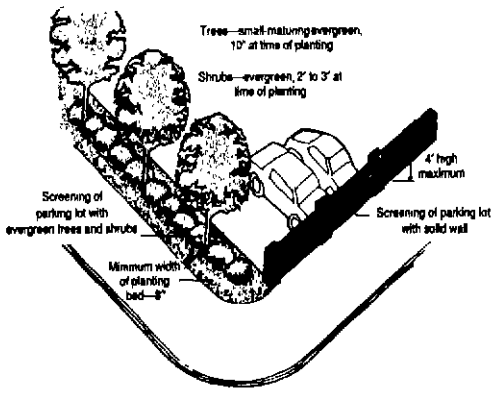
- Space definition (H/W ratio, continuity, setback, active frontage, etc.)
- Roofline/skyline
- Wallscape (interface between the private and public domains)
- Floorscape (both of the footpath and of the carriageway)
- Landscaping, street furniture and signage.

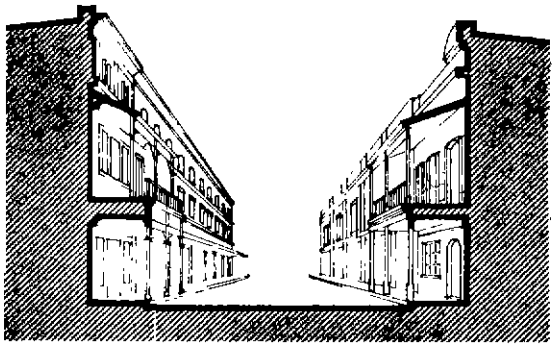
LIMITATIONS

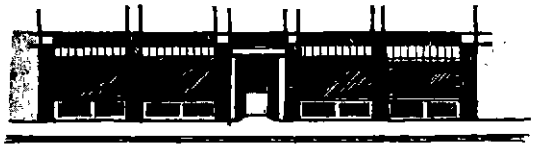
- Property prices and rents may increase which may push out certain businesses
- Effective negotiation and coordination are required between authorities and property owners involved.

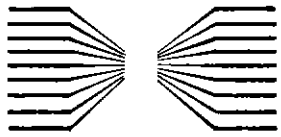
IMPACT

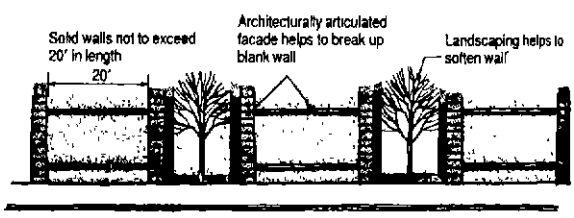
- Increased popularity, growing tourism and local trade
- Increased business turnover
- Increased development activity.

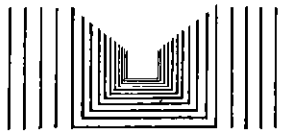












C21

VIEWS AND VISTAS

AIM

- To protect or enhance the identity/character of the centre.

APPLICATION

The DCP of the centre should also include measures for the protection and enhancement of pleasant, and for the hiding of unpleasant, views, with controlling building height/line and envelope, landscaping, and removing overhead power-lines. They may include:

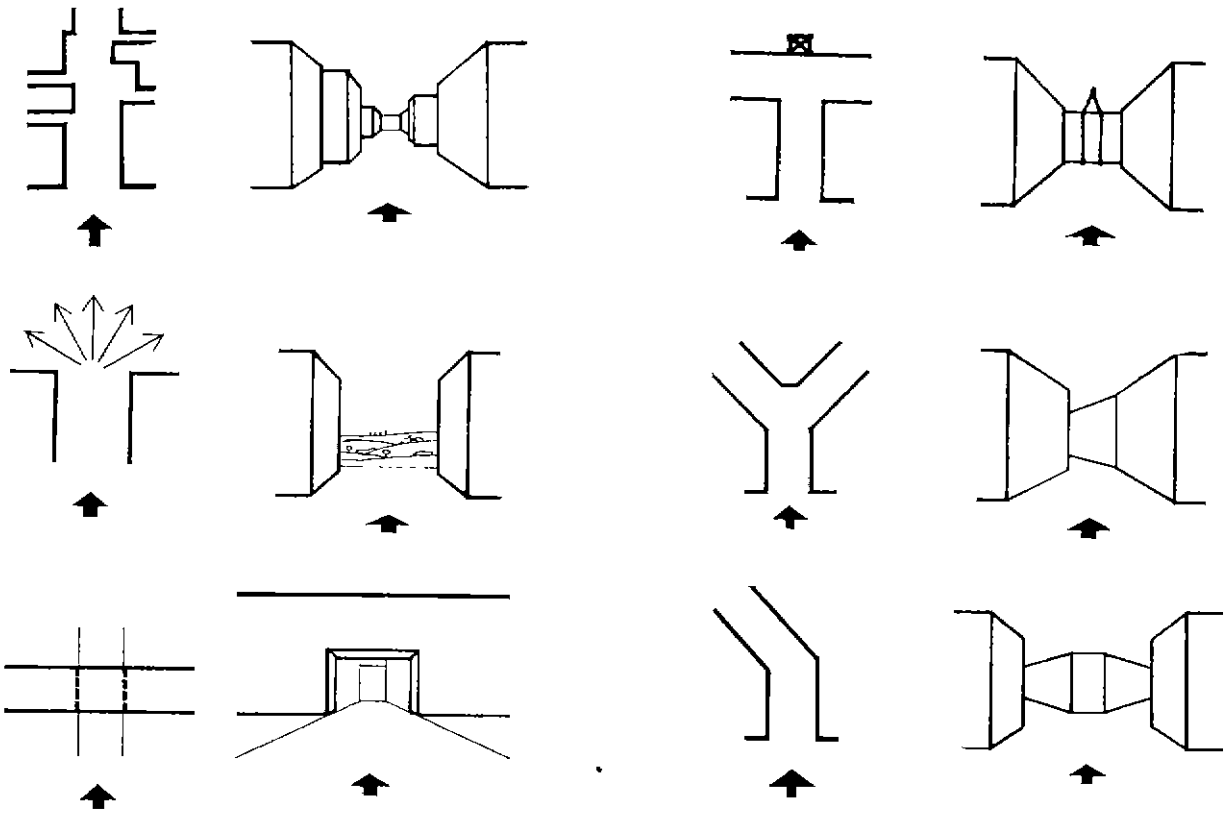
- Closed/end vistas
- Panoramic views
- Grandiose vistas
- Framed views
- Screened views

LIMITATIONS

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

IMPACT

- Distinct character
- Increased popularity (tourism as well as local trade)
- Decreased speed
- Varied visual experience (serial views).



C12

HERITAGE CONSERVATION

AIM

- To enhance the uniqueness of the place

APPLICATION

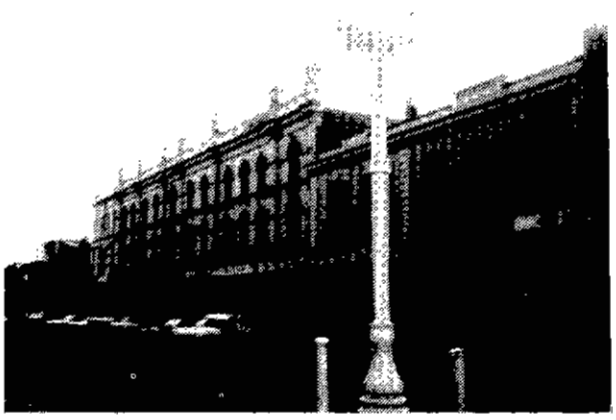
Places that have some cultural significance are identified through careful study for conservation. The different degrees of conservation are maintenance, preservation, restauration, reconstruction and adaptation. Besides possible statutory environmental heritage listing LEP's and DCP's should include 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.
(Techn. ref.: DoP, Main Street Handbook)

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
- Increased community pride and attachment
- Increased tourism
- Rising business turnover.



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 existing character
- Engage conservation consultants where special advice is needed.

Source: DoP, Main Street Handbook)

D)

OFF-LINE BAY

AIM

- To decrease friction caused by on-street parking and
- To servicing and/or to create additional parking space.

APPLICATION

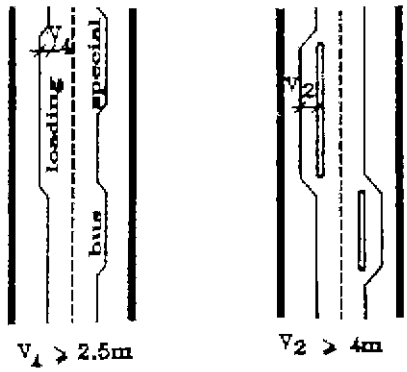
- A) Where footpath width is adequate kerbside bay is provided for loading/unloading, bus stop, taxi stand or parking (parallel or angle)
- B) Where the carriageway width is excessive mid-road parking is provided (parallel or angle).

LIMITATIONS

- Merging and diverging will continue to cause some friction
- Crossfall and awning line may be constraints in the design (A)
- Clear signposting is necessary.

IMPACTS

- Increased traffic capacity
- More on-street parking space (B)
- Clear designation of spaces for competing access functions.



E)

DIFFERENT PAVEMENT MATERIAL

AIM

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

APPLICATION

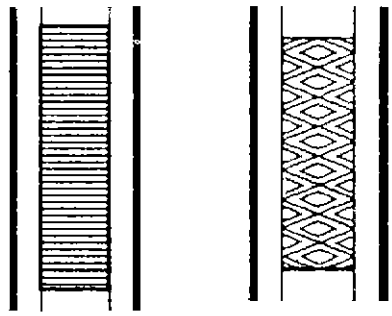
- In the core zone of the centre with high level of pedestrian crossing activity where both traffic and pedestrian densities are high
- The repaved section of the roadway has a different texture and colour, with or without pattern in the floorscape.

LIMITATIONS

- High cost of repaving
- Should be coordinated with utility reconstruction
- Traffic must be restricted or diverted during construction.

IMPACTS

- Reduced speed
- Increased number of crossing pedestrians
- Improved appearance.



D3

RAISED PAVEMENT

AIM

- To reduce traffic speeds and improve residential amenity
- To highlight pedestrian crossings

APPLICATION

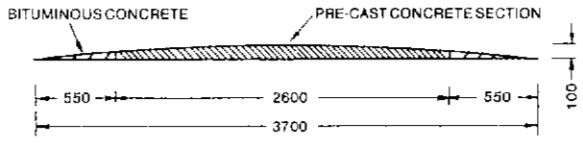
- On main streets with high traffic speeds and high pedestrian activity. Could also be used as entry threshold (refer "gateway" treatment) or in conjunction with pedestrian crossing. This can be achieved in a number of ways: e.g. speed humps and raised platforms.

LIMITATIONS

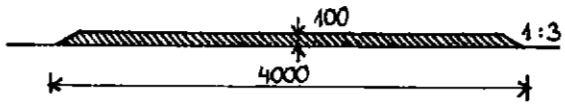
- Not suitable where through traffic volumes are high. Traffic function — veh. — road humps-10000 veh. — not appropriate
- Main street function — application in commercial areas only
- Reservation width — applicable in all situations.

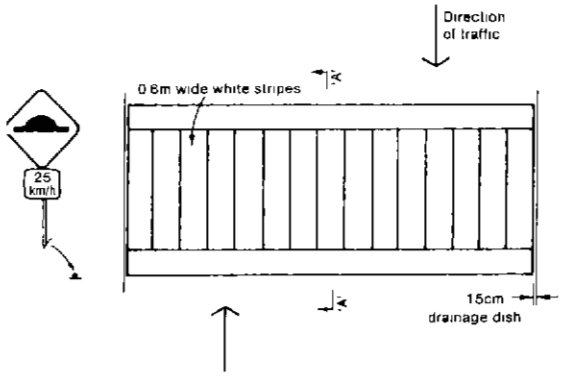
IMPACT

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

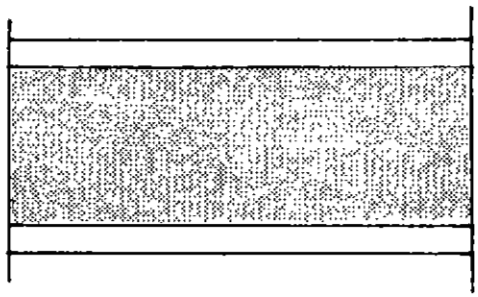


CROSS SECTION A-A' OF HUMP





ROAD HUMP



PLATFORM

D4

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

- Town Centres experiencing high noise and/or air pollution through traffic
- Where a bypass route is economically and environmentally possible
- Can be used to remove bypass traffic to streets adjacent to the town centre or to completely bypass the town.

LIMITATIONS

- A bypass route(s) must be available
- The town centre should not rely on business from through traffic
- The alternative routes for through traffic must be constructed to carry the increased traffic.

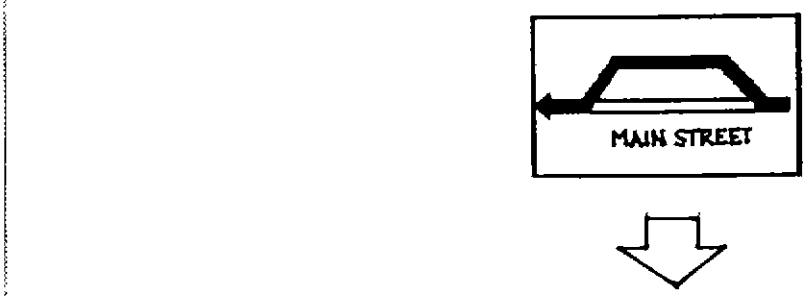
IMPACT

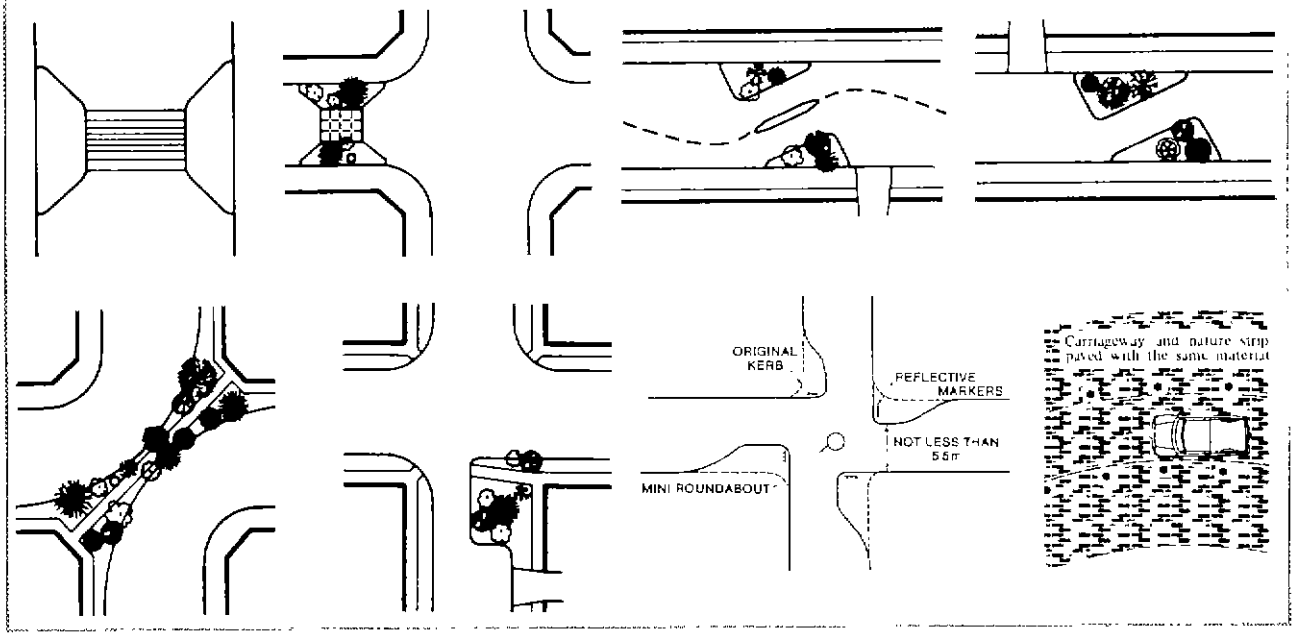
- Environmental problems may be created on the bypass routes
- Reduced traffic in the Main Street can have economic effects on existing shops
- Business activity is likely to be varied initially and some changes of use can be expected.

COMPLEMENTARY MEASURES

The implementation of a bypass road can create opportunities for greater use of the more traditional form of local area traffic management measures such as:

- Speed hump
- Single lane entry threshold
- Two lane angled slow point
- Single lane angled slow point
- Diagonal road closure
- Half road closure
- Catherine wheel
- Shared zone.





D5

STAGGERED ROADWAY

AIM

- To reduce vehicle speeds through the main street.

APPLICATION

- Where through traffic volumes are low, existing road width and roadside parking permissible
- 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 advance speeding.

LIMITATIONS

- Traffic function — design can be varied to suit the traffic volumes (i.e. kerb blisters when volumes are high, full staggering where volumes are low)
- Disruption to through traffic
- High driver awareness required
- Lighting and signposting critical.

IMPACT

- Reduced traffic speed
- Improved pedestrian amenity
- Increased potential for wider footpaths at selected locations
- Can reduce on-street parking
- High visual obstruction created
- Can increase traffic noise
- Restricts passage for heavy vehicles
- Can cause inconvenience for emergency vehicles.

D6

ROUNDABOUTS

AIM

- To reduce entry traffic speeds and to improve local road connections.

APPLICATION

- Preferably at intersections (due to benefit to local access) but also effective midblock if clearly marked.

LIMITATIONS

- Not appropriate where pedestrian activity is high
- Relatively high construction cost, but virtually no maintenance cost.

IMPACT

- Reduction in vehicle approach speed
- Improved local traffic access
- Possible increase in noise in outskirts of town affecting residential amenity
- Require appropriate lighting and signposting
- Can reduce opportunity for pedestrians to cross the roads.

D7

T - JUNCTION REARRANGEMENT

AIM

- To better reflect traffic movement with priority
- To reduce vehicle conflicts.

APPLICATION

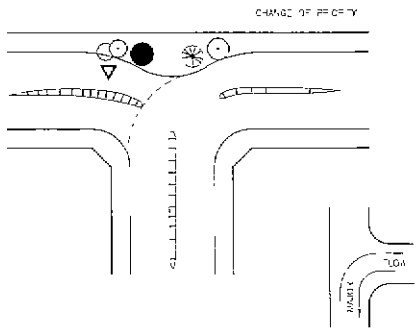
- Where volumes/speeds are high on stem of T
- Use signing, linemarking to change priority used in conjunction with by-passes and malls (See D4 and D15).

LIMITATIONS

- May not be suitable for narrow streets
- Can be confusing and/or inconvenient for pedestrians and drivers

IMPACT

- Reduced speed
- Possible increased noise.



D8

STAGGERED JUNCTIONS

AIM

- To reduce cross-traffic in the Main Street.

APPLICATION

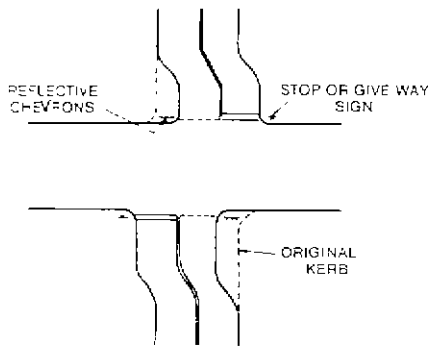
- Where there is a high volume of cross-traffic using a particular intersection
- Where traffic flow in Main Street must be maintained
- Where accident histories at the intersection are high.

LIMITATIONS

- Requires alternative routes for cross traffic.

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.



D9

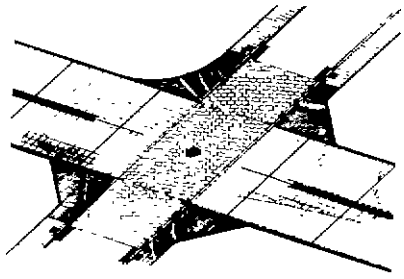
RAISED PAVEMENT WITHIN INTERSECTION

AIM
- To reduce vehicular speed at intersection.

APPLICATION
- Gateway entrance treatment
- Mid-block intersection treatments.

LIMITATIONS
- Can require drainage alterations
- Should be used in conjunction with other treatments
- Often an expensive treatment.

IMPACT
- Reduced vehicle speeds
- Highlights intersection
- Increased pedestrian safety
- Increased vehicular safety
- May be noisy
- Visually attractive.



D10

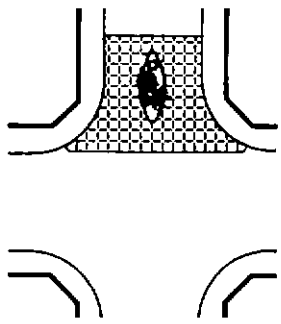
TWO LANE ENTRY THRESHOLD

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.

LIMITATIONS
- Can create traffic congestion at Main Street entrances
- Reduced opportunity for turning movements.

IMPACT
- Reduced entry speed
- Improved pedestrian safety at threshold
- Improved appearance to streetscape ducts opportunities for landscaping
- Provides definition for the boundaries of the Main Street.



D11

GATEWAY

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 drivers behaviour should substantially be modified
- In centres which lack a distinct image

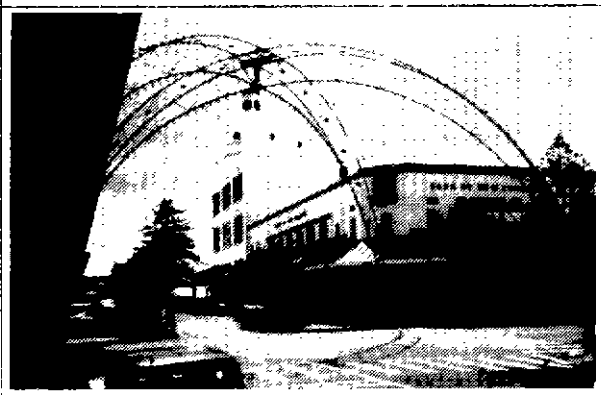
At either end of the centre or the core zone a "gate" is created through the various combination of road construction, threshold/contrasting pavement, portal/arch, tree canopy, signpost, flagpoles, special lighting, etc.

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).

IMPACTS

- Increased driver's awareness
- Reduced speed, compatible with the core zone
- Improved image/character
- A landmark



D 12

TREE PLANTING IN MEDIAN

AIM

- To indicate commercial zone and create a distinct character for it
- To indicate 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.

IMPACTS

- Distinctive demarcation of area of high pedestrian activity
- Aesthetic amenity
- Reduction in glare and dust.

D13

TREE PLANTING IN ROAD SHOULDER

AIM

- To provide shade and reduce glare
- To define street volume
- To reduce rainfall impact
- 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
- Where there is a need to ameliorate urban runoff.

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 desirable for planting.

IMPACT

- Street space definition and identity
- Dust and pollution filtration
- Reduction in storm water runoff
- Shade and glare control.

D14

SHARED SPACE

AIM

- To reduce traffic speeds and to improve pedestrian amenity.

APPLICATION

- Where traffic flows are generally low and the majority of traffic destinations are within the same area. Not generally applicable when through volumes are high unless alternative routes to divert through traffic exist
- Vehicle path may be designated by bollards, paint, or different pavement.

LIMITATIONS

- Traffic function — Not applicable unless volumes smaller than 1,000 vph
- Main street function — applicable in commercial areas where pedestrian activity is high
- Reservation width — most appropriate in narrow reservation widths (i.e. <30m)
- Demands greater attention/awareness of drivers
- Relatively high cost.

IMPACT

- Reduced vehicle speeds
- Discourages through traffic
- Creates additional parking and footpath space
- Streetscape improves
- Improved pedestrian amenity

[illegible]

ROAD CLOSURE MAIN STREET

AIM

- To eliminate through traffic in the Main Street
- To create a traffic-free environment for pedestrians
- To provide additional space for landscaping, car parking, pedestrian activities, etc

APPLICATION

- Where there are alternative routes for through traffic e.g. by-pass routes
- Where the Main Street carries high proportions of through traffic and includes a high proportion of heavy vehicles (semi trailers, etc)
- Where the Main Street has the potential for high pedestrian activity

LIMITATIONS

- If traffic cannot be rerouted
- Access/delivery must be maintained to premises either from rear or front of the mall
- Generally a high cost solution.

IMPACT

- Can meet with opposition from shop owners
- Affects emergency vehicle access
- Confusing for non-regular drivers
- Increased travel distance for motorists
- Improved environment for shoppers
- Safer parking and unparking
- Can change the uses of some shops and commercial properties due to change in turn-over and property prices.

[illegible]

SIDE-STREET CLOSURE
(mini malls)

AIM

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

APPLICATION

- In centres which need additional pedestrian attraction
- 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 sidestreets.

LIMITATIONS

- Local travel should not be increased substantially
- Feasible only if the side street has shops or community facilities or if its buildings next to the main street have a potential for adaptive commercial reuse.

IMPACT

- Increased pedestrian activity and business turnover in the vicinity
- Increased safety for both pedestrian and vehicular traffic
- Opportunity for erecting some special feature (e.g. fountain or clocktower) to create a special atmosphere and to increase the amenity of the area
- Decreased vehicular accessibility and minor loss in on-street parking
- Decreased legibility for drivers
- Reduced access for emergency and delivery vehicles.

D 17

SHARED/RAISED PED. CROSSING

AIM

- To mix pedestrians and vehicles safely at points of potential conflict
- To improve the pedestrian environment.

APPLICATION

- In strong pedestrian-oriented centres with relatively low (mainly local) traffic volume but high speed
- Where vulnerable groups of pedestrians are present in high proportions
- In front of major pedestrian generators
- The pedestrian crossing, or a longer section of the roadway, is raised to the level of the footpath. The road width is kept to a minimum.

LIMITATIONS

- Loss in on-street parking and passing trade (if a shared zone)
- Can be costly if drainage pits need adjustment (spot treatment)
- Expensive if more than a spot treatment
- Ambiguous pedestrian priority for pedestrians if not a marked crossing (as illustrated)

IMPACT

- Increased driver's awareness
- Greatly reduced speed at conflict points
- Increased pedestrian crossing activity
- Slightly reduced traffic volume
- Improved appearance.

D18

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
- Lighting of vehicular and pedestrian space may be treated differently.

LIMITATIONS

- Awnings, existing poles and wires
- Spacing and location should be coordinated with land-use activities (e.g. pedestrian crossings).

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.

D19

CARRIAGEWAY/ LANE NARROWING

AIM

- To widen 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 cause barrier effect for crossing pedestrians
- Where crossing movements cannot be concentrated effectively.

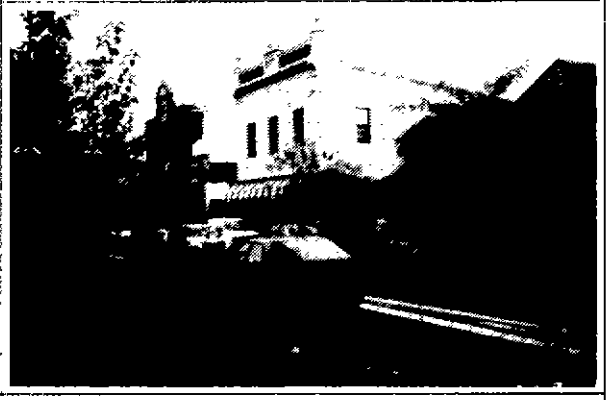
The treatment includes footpath extension, axial shift in the roadway, central landscaped median or mid-road parking.

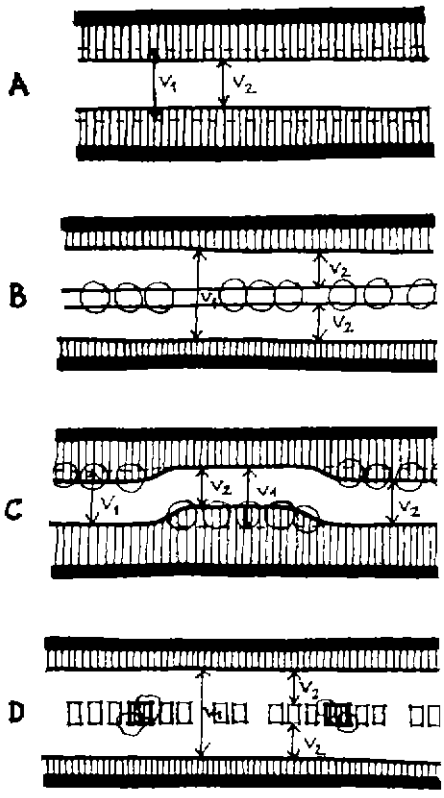
LIMITATIONS

- It is not feasible to widen the footpaths if the crossfall of the road is high
- If median creates divided carriageway the min. width for each roadway is approx. 5m
- Not feasible where (through) traffic volumes are high (close to road capacity).

IMPACT

- Decreased pedestrian density on footpaths (A, B)
- Reduced speed and/or volume (A, B, C, D)
- Increased opportunity for landscaping and street furniture (A, B, D)
- More parking space (C)
- Landscaping can discourage jaywalking (B).





extended footpath

landscaped median strip

staggered footpath extension

parking in the middle

NOTE Minimum lane width (V2) depends on composition of traffic (see section 4.3.1)

D20

RAILING OF FOOTPATH/ MEDIAN

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 raised, landscaped nature strip.

LIMITATIONS

- Kerbside parking and loading/unloading become inhibited (A)
- The min. width of the median is 1.0m for railing and 1.5m for nature strip.
- 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
- Increased potential (on railing) for outdoor advertising.

D21

GRADE-SEPARATED PEDESTRIAN CROSSING

AIM

- To reduce vehicle/pedestrian conflicts.

APPLICATION

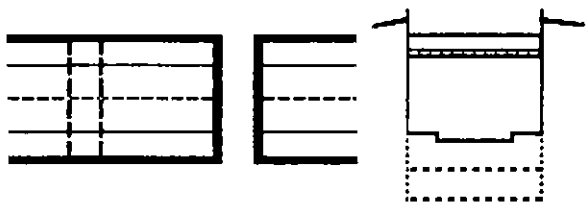
- Where there is space for ramps or stairs or multi-level building development is occurring
- Where it is important to maintain traffic flow on the Main Street
- Where other forms of pedestrian crossing are impracticable or should be complemented.

LIMITATIONS

- Usually only suitable where there is multi-storey business development or redevelopment on either side of Main Street
- Difficult for disabled persons
- Very expensive and unlikely to be appropriate for country towns
- May be unsympathetic with streetscape character
- Requires private sector cooperation.

IMPACT

- Can increase vehicle speeds and activity on Main Street
- Can make pedestrian access very private (biased toward particular developments)
- Can increase space for advertising.



D22

NARROW MEDIAN

AIM

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

APPLICATION

A Where the volume and speed of traffic cause a barrier effect 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.

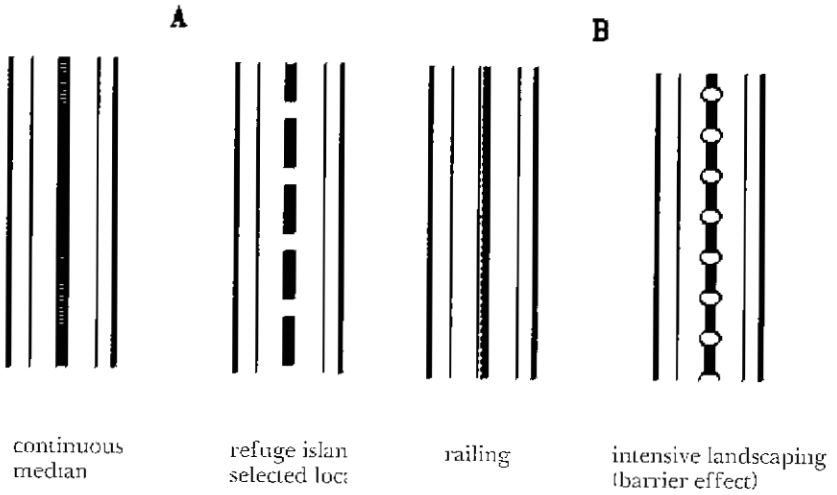
LIMITATIONS

- 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

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.



D23

WIDE MEDIAN

AIM

- To improve pedestrian safety
- To improve on-street parking.
- To reduce pavement width.

APPLICATION

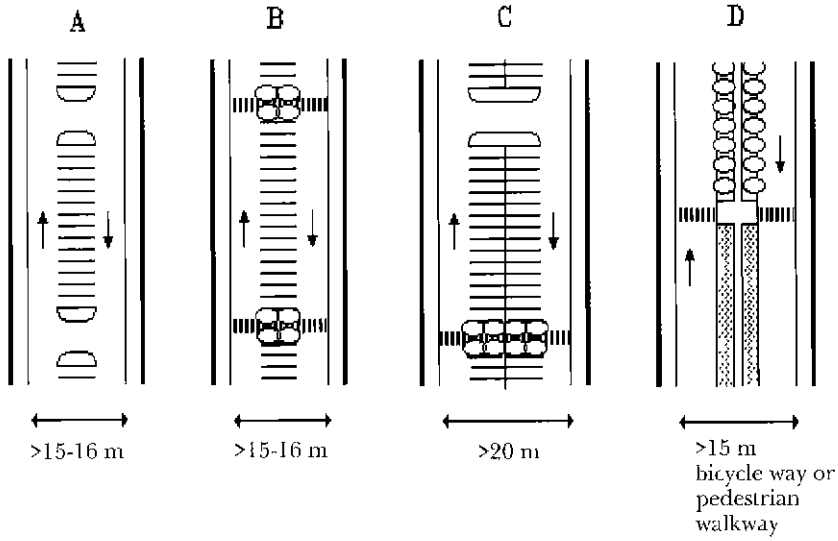
- Where the width of the carriageway is excessive.
- Where the cross-section of the roadway or/and existing kerb and gutter limit the scope for footpath extension.

LIMITATIONS

- Due to parking manoeuvring in the median, speed reduction is required.
- If kerbside (parallel) parking is removed, traffic lanes are shifted closer to pedestrians on footpaths.

IMPACT

- As for narrow medians (D22)
- Increased on-street parking.



D2

FOOTPATH (PAVEMENT) DESIGN

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
- Footpath extension may be applied at selected locations (e.g. in front of civic buildings to mark their entrance with a distinct "forecourt")

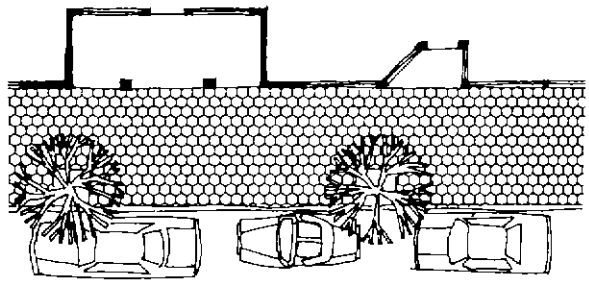
The floorscape can be neutral and patterned, and can even include some simple signs (e.g. street name, numbers, etc.) and other features.

LIMITATIONS

- Repaving should be planned in advance and coordinated with public utility improvement programs
- Man-holes should be integrated with the floorscape
- High cost.

IMPACT

- Increased attractiveness and consequent increase in pedestrian activity and business turnover
- Maintenance (cleaning) may become easier.



D3

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 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
- Advertising and streetscape unifying potential of awning fascias

LIMITATIONS

- Existing mature trees and/or poles may be obstacles
- 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

AIM

- To provide shade for cars
- To reduce pollution.

APPLICATION

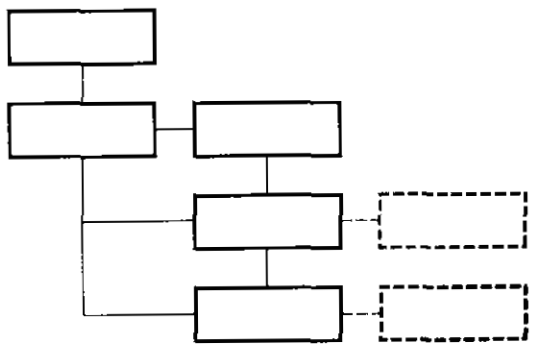
- Where footpaths are wide
- Where there is a high activity core for pedestrian use
- Where the building facades are not particularly attractive.

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
- Avoid visibility conflict with signage
- Vandalism may require frequent replacement.

IMPACT

- Shade
- Dust and pollution filtration
- Definition of secondary pedestrian space
- Improved streetscape
- Obstruction of the visibility of some outdoor advertisements.



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.

Table B-1: Information for constructing assessment balance charts

PERFORMANCE INDICATOR	PROPOSAL ASSESSMENT (Including "do nothing")	ASSESSMENT AFTER COMPLETION Comparing before-and-after situation
Road users directly affected		
Accidents		
vehicle/pedestrian	Rank (statistics)	Number per year by type
vehicle/vehicle	Rank (statistics)	Number per year by type
vehicle/obstacle	Rank (statistics)	Number per year by type
Pedestrian crossability		
delay	Rank (observation)	Pedestrians delayed in pedestrian peak hour (mean delay)
convenience	Rank (observation)	Before-and-after questionnaires
perceived safety	Rank (observation)	Proportion of jay running/jay walking, and before-and-after questionnaires
Cyclists' safety	Rank (observation)	Before-and-after questionnaires
Vehicle speed		
in core/ped peak	Estimates (observation)	V85 km/h
in core/veh peak	Estimates (observation)	V85 km/h
in core/off peak	Estimates (observation)	V85 km/h
profile	Estimates (observation)	Observation
Vehicle traffic		
% through traffic	Estimates (observation)	Observation
number of heavy vehicles	Estimates (observation)	Observation
flows at ped. peak	Estimates (observation)	Observation
flows at veh. peak	Estimates (observation)	Observation
Vehicle operation		
travel time	Estimates (observation)	Comparison in $ (NPV)
operating costs	Estimates	Comparison in $ (NPV)
Road and non-road users directly affected		
Noise		
at footpath (core)	Estimates of levels	Changes in levels and length
at facade	Estimates of levels	Changes in levels and length
at sensitive sites	Estimates of levels	Changes in spot levels
On-street parking		
spaces in/near core	Estimates (observation)	Changes in number of spaces
layout	Description	Description
utilisation	Estimates (observation)	Changes in turnover during pedestrian peak hour
Site access	Ranking (observation)	Changes in properties without side/rear access
Non-road users directly affected		
Land use		
pedestrian orientation	Number of sites outside core (observation)	Number of establishments outside core

Table B-1 (Continued)

PERFORMANCE INDICATOR	PROPOSAL ASSESSMENT (Including "do nothing")	ASSESSMENT AFTER COMPLETION Comparing before-and-after situation
vehicle orientation	Number of sites	Number of establishments inside core inside core (observation)
Retail floor space		
core	Ranking of prospects	Measure
transition zone	Ranking of prospects	Measure
Business activity		
business activity	Rank expected gain	Business survey reports % gain and % loss
passing trade core	Rank expected gain	Business survey reports % gain and % loss
changing occupancy	Not applicable	Descriptive
vacant shops		
core	Not applicable	Number
transition zone	Not applicable	Number
Accessibility		
pedestrians on footpath core/fringe	Estimates (observation)	Changes in volumes - 12 hour period (7 am-7pm)
access to parking	Ranking (observation)	Changes in mean distance to core
delivery and pick up	Rank expected gain	% of establishments reporting gain/loss
Those with an interest in the quality of the road environment		
Footpath in core		
width	Rank expected gain	Changes in pavement width
weather protection	Rank expected gain	Percentage with overhead cover
pavement activity	Rank expected gain	Outdoor frontage-related activity (metres)
Urban character and design		
heritage value	Ranking (observation)	Description
social spaces	Ranking (observation)	Description
landscape elements	Ranking (observation)	Description
townscape elements	Ranking (observation)	Description
Sociability	Rank expected gain	Survey report on perceived change of centre as a social space
Public Authorities		
Capital expenditure		
local authority	Estimated costs	Actual costs
RTA	Estimated costs	Actual costs
service authorities	Estimated costs	Actual costs
Maintenance expenditure		
local authority	Estimated costs	Actual costs
RTA	Estimated costs	Actual costs
service authorities	Estimated costs	Actual costs
Planning Impact*		
*Depends on the nature of the project and need for a study (see Part 3)		
Town or district impact	Derived from planning study	Derived from planning study
Adjoining areas	Derived from planning study	Derived from planning study

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 traffic peak 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 statistical effect of the small number and dispersed nature 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 x 1 + 1.8 x 1 + 1.3 x 3 + 1.0 x 5 = 18.7.

The expected changes in the severity index, I_a, are estimated by

$$\mathbf{Ia = Ab\ q\%}$$

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 and the model should be revised when reliable prediction models have been developed that link accident rates to these factors.

Pedestrian crossability

Pedestrian Mean Delay, W, may be estimated at various crossing points: e.g. at mid-blocks (anywhere and no facilities), signalised intersections, pedestrian refuges, Pelican and Zebra crossings. The recommended time for the measurement of delay is pedestrian peak hour — often referred to as a normal weekday shopping time 12.30–13.30. Delay W at various facilities for different traffic volumes can be read off from Figure B-1. A greater W generally indicates a larger proportion of delayed pedestrians.

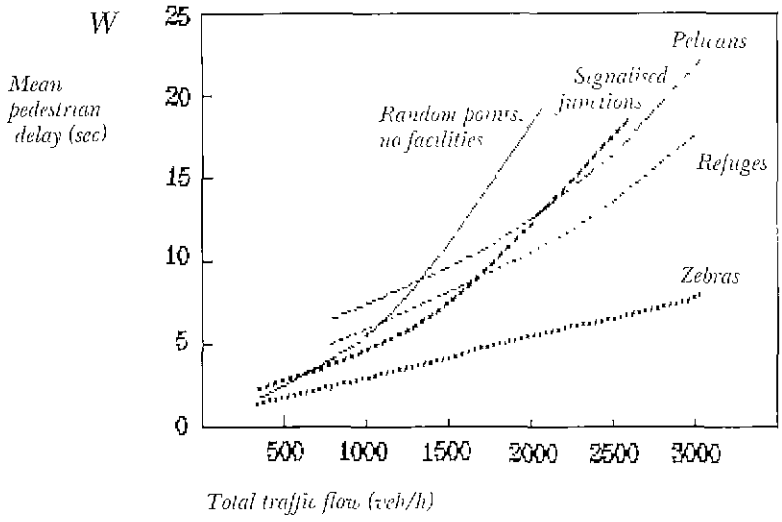


Figure B-1 Mean Pedestrian Delays Associated with Different Road Crossing Situations

Adapted from: TRRL SR 356

Changes in the *convenience* for pedestrians, both in terms of crossing streets and walking on footpaths, are assessed through a questionnaire survey at random locations in the core zone. 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.

Table B-2: Typical Peak and Off-Peak Hours* for Selected Land-Uses along Main Streets/Sub-arterial Roads.

Traffic peak	Pedestrian Peak	Off Peak
17.00–18.00	12.30–13.30	10.00–11.00

* 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. Spot speeds should be measured for at least fifty vehicles during a one-hour period (DMR, 1980).

For traffic control facility design, the 85th percentile speed is important. For observing mean vehicle speeds and their dispersion, the 50th percentile speed is also recommended.

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 1). 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 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 and vehicle drivers. It can be determined by:

$$C_t = (T_a - T_b)\ (v_v + v_p)$$

where T_a and T_b represent the total vehicle travel time after and before the project. v_v is the average value of travel time weighted to four vehicle types (private cars, business cars, light commercial vehicles and heavy vehicles) and is estimated at $21.30 per vehicle-hour (in 1992 prices). v_p is the time value for occupancies in vehicles (1.7 persons per vehicle) and also estimated at $16.06 per person-hour (RTA, NSW, 1992, App. D, Table 7).

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 and is estimated at $3.30 per vehicle-hour (in 1992 prices) (RTA, NSW, 1992b, App. D, Table 2).

Road and non-road users directly affected

Noise

Traffic noise is measured in dB(A). 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.

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 and vehicle speeds that occurred at the time of measurement. The presence of heavy vehicles should also be noted.

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*

Parking duration & type	Parking turnover
10 minute spaces	10 vehicles per hour
1 hour spaces	5 vehicles per hour
2 hour spaces	2 vehicles per hour
Loading zones	8 vehicles per hour
Disabled parking spaces	1 vehicle per hour

* Assumes that traffic flow permits parking and unparking movements

(Source: Beard and Holland, 1991)

Site access

Field surveys and maps provide information on the number of properties without side/rear access before and after completion of a project. For the purpose of comparing alternative proposals, estimates are made of the likely changes and the performance of the alternatives is ranked.

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 and should cover both the core and transition zones.

Any impact may be long term, requiring a long time scale for comparative assessment. Estimates are made for comparing alternative proposals.

Retail floor space in the core and transition zones is measured in gross floorspace. Estimates are made of the likely prospects for each of the alternatives and these are ranked.

Business activity

Four 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.

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:
>
> $v = V_{p15}/15W_e$
>
> 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 cafes 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.

Planning Impact

The planning impact depends on the nature of the project and the results of a planning study where there is a need for such a study. There may be impacts associated with the larger area (i.e. town or district) and with adjoining areas. Impacts should be expressed in performance indicators and be compared.

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