

Guide to Traffic Management Part 11

Parking



Austroads



Guide to Traffic Management Part 11: Parking



Austroads

Sydney 2017

Guide to Traffic Management Part 11: Parking

Second edition prepared by: Larry Schneider and Michael Moses

Second edition project manager: Robyn Hawkins

Abstract

The Austroads *Guide to Traffic Management* has 13 parts and provides a comprehensive coverage of traffic management guidance for practitioners involved in traffic engineering, road design and road safety.

Part 11: Parking is concerned with the parking management process. It provides guidance for planners and engineers to ensure that parking is provided in a safe and efficient manner and with due regard to considerations of access to and the impact on the wider road and transport system.

Part 11 presents guidelines for determining the demand for and supply of parking and it provides a parking policy framework – how the demand should be addressed. The implementation of on-street and off-street parking for all road users including parking controls in urban centres is addressed as is parking on rural roads and at park-and-ride facilities. Electronic parking guidance systems and signs are also described.

Keywords

Road design, kerbside parking, traffic models, off-street parking, on-street parking, parking, parking control, parking demand, parking guidance, parking policy, parking supply, parking surveys, rural parking, traffic control devices

Second edition published January 2017

First edition published February 2008

This second edition of the Guide includes the following updates.

- Key principles of parking management have been set out at the front of the document in Section 2.
- Section 3.3 expands on shared space together with Commentary C1.1 and Commentary C1.2.
- Intelligent Transportation Systems (ITS) has been included in both Section 6.3, Section 11.2 and Commentary 16.
- Commentary 10 has been replaced by a new Section 7.7 Parking Control and Payment Technologies.
- Commentary 7, Commentary 10, Commentary 14 and Commentary 15 have been reviewed.
- Bicycle parking provision rates have been addressed in Section 4.2.2 and parking management in Section 4.2.1, Section 7.13, and in Commentary C4.5, and C4.12.
- Hybrid vehicles have been addressed in Section 7.7.
- Risk and safety in Section 12 has been expanded.
- Self driving vehicles are included under ITS as a new Section 6.3.
- A section on best practice in permit parking management has been expanded into Section 8.10.4.

ISBN 978-1-925451-54-2

Austroads Project No. NT1800

Austroads Publication No. AGTM11-17

Pages 192

Publisher

Austroads Ltd.
Level 9, 287 Elizabeth Street
Sydney NSW 2000 Australia

Phone: +61 2 8265 3300

austroads@austroads.com.au
www.austroads.com.au



About Austroads

Austroads is the peak organisation of Australasian road transport and traffic agencies.

Austroads' purpose is to support our member organisations to deliver an improved Australasian road transport network. To succeed in this task, we undertake leading-edge road and transport research which underpins our input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.

Austroads provides a collective approach that delivers value for money, encourages shared knowledge and drives consistency for road users.

Austroads is governed by a Board consisting of senior executive representatives from each of its eleven member organisations:

- Roads and Maritime Services New South Wales
- Roads Corporation Victoria
- Queensland Department of Transport and Main Roads
- Main Roads Western Australia
- Department of Planning, Transport and Infrastructure South Australia
- Department of State Growth Tasmania
- Department of Infrastructure, Planning and Logistics Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- Australian Government Department of Infrastructure and Regional Development
- Australian Local Government Association
- New Zealand Transport Agency.

© Austroads Ltd 2017

This work is copyright. Apart from any use as permitted under the *Copyright Act 1968*, no part may be reproduced by any process without the prior written permission of Austroads.

Acknowledgements

First edition prepared by Peter Damen and Anna Huband and project managed by John Erceg

This Guide is produced by Austroads as a general guide. Its application is discretionary. Road authorities may vary their practice according to local circumstances and policies. Austroads believes this publication to be correct at the time of printing and does not accept responsibility for any consequences arising from the use of information herein. Readers should rely on their own skill and judgement to apply information to particular issues.

Contents

1.	Introduction.....	1
1.1	Scope of this Guide	1
1.2	Definition of Parking	4
2.	Principles of Parking Management.....	5
2.1	Changing Approach to Parking	5
2.2	Key Principles.....	6
2.2.1	Principle 1: Parking Supply and Demand.....	6
2.2.2	Principle 2: Occupancy or Utilisation	7
2.2.3	Principle 3: Duration and Turnover	7
2.2.4	Principle 4: Enforcement	8
2.2.5	Principle 5: Partnership	8
2.2.6	Education and Information.....	8
2.3	Pay Parking	9
2.3.1	General Principles	9
2.3.2	Pay Parking Objectives	9
2.3.3	Guidelines to Efficient Pay Parking Pricing	9
2.3.4	On-street Parking Management	10
3.	Demand for Parking	13
3.1	Parking Demand	13
3.2	Factors Affecting Demand	13
3.2.1	Geographic Location	13
3.2.2	Types of Land Use	13
3.2.3	Availability and Attractiveness of Public Transport and Other Alternatives to Car Use	13
3.2.4	Accessibility and Attractiveness of the Parking Facilities.....	14
3.2.5	Demographic/Socio Economic Patterns.....	14
3.2.6	Price Structure	14
3.2.7	Time of the Day, Weekly and Seasonal Variations	14
3.3	Mixed Land Use and Shared Parking.....	15
3.3.1	Shared and Reciprocal Parking for Mixed-use Developments.....	16
4.	Supply of Parking	18
4.1	Different Categories of Parking	18
4.1.1	Off-street Parking	18
4.1.2	On-street Parking	18
4.1.3	Other Categories	19
4.2	Methods of Determining Supply	19
4.2.1	Minimum Parking Requirements	19
4.2.2	Parking Provision Standards	20
4.2.3	Supply Based on a Forecast of Demand.....	28
4.3	Area Required	29
4.4	The Cost of Providing Parking.....	29
4.5	Major Types of Parking Facility	30
5.	Parking Policy Framework	32
5.1	Why Have a Parking Policy?	32
5.2	Parking Policy Objectives	33
5.3	Parking Policy Tools	33
5.4	Consultative Planning and Policy	35
5.5	Time Restrictions, Pricing and Enforcement	35
5.6	Linking Technology to Policy.....	35
5.7	Parking Precinct Plans	35
5.8	Parking Policy Checklist	35

6.	Parking and the Environment	36
6.1	Urban Design Considerations	36
6.2	Environmental Impacts of Parking.....	39
6.3	Driverless Vehicles.....	40
7.	Off-Street Parking.....	41
7.1	The Location of Off-street Parking Facilities Entrances and Exits	41
7.2	Classification of Off-street Parking Facilities	42
7.3	Parking Facility Layout	42
7.4	Parking Facility Access Design	44
	7.4.1 Categories of Access Driveways	44
	7.4.2 Access Driveway Characteristics	44
7.5	General Amenities and Other Considerations.....	44
	7.5.1 Lighting	45
	7.5.2 Pedestrian Treatments	45
	7.5.3 Parcel Pickup.....	46
	7.5.4 Shopping Trolley Requirements	46
	7.5.5 Signs and Pavement Markings.....	47
	7.5.6 Road Humps.....	48
7.6	Specific Requirements of Car Parking Structures.....	48
	7.6.1 Column Location and Spacing.....	49
	7.6.2 Headroom	49
	7.6.3 Express Exit Ramps	49
	7.6.4 Provision for Pedestrians.....	49
	7.6.5 Underground Car Parking Structures	50
	7.6.6 Mechanical Garages.....	51
	7.6.7 Electric Charging Stations	53
7.7	Parking Control and Payment Technologies	54
7.8	Parking Control Systems (PCS)	54
	7.8.1 Ticket Machines.....	54
	7.8.2 Pay and Display.....	54
	7.8.3 Pay by Space.....	54
	7.8.4 Pay by Plate.....	55
	7.8.5 Virtual Phone-based Systems (Apps)	55
	7.8.6 Single Space Electronic Meters.....	55
7.9	Parking Payment Systems	56
	7.9.1 Cash	56
	7.9.2 Credit Card	56
	7.9.3 Mobile Phone.....	56
	7.9.4 Mobile Phone Only	56
	7.9.5 Near Field Communication (NFC)	57
	7.9.6 Virtual Permits	57
	7.9.7 QR Code.....	57
7.10	Payment Compliance Requirements.....	58
	7.10.1 PCI Compliance.....	58
	7.10.2 Cashless EMV Payment Systems.....	58
7.11	Parking Guidance Systems (PGS)	59
	7.11.1 In-ground Sensors	59
	7.11.2 Parking Guidance	59
	7.11.3 Variable Message Signs (VMS).....	59
	7.11.4 Space Counting Systems	59
	7.11.5 Parking Apps	60
7.12	Enforcement Compliance	61
	7.12.1 Hand Held Devices (Handhelds)	61
	7.12.2 Mobile Camera Only Systems.....	61
	7.12.3 Fixed Camera Systems	62
7.13	Information Systems.....	62
7.14	Technology for Unpriced Parking	63

7.15	Parking Provisions for Other Road User Groups	63
7.15.1	Trucks	63
7.15.2	Buses and Coaches	63
7.15.3	Motorcycles.....	63
7.15.4	People with Disabilities.....	64
7.15.5	Bicycles.....	66
7.15.6	Caravans, Trailers and Recreational Vehicles	67
7.15.7	Emergency Vehicles.....	67
7.15.8	Taxis	67
7.15.9	Car Share	68
7.15.10	Other Special Purpose User Parking	68
7.16	Special Event Parking	69
8.	On-Street Parking	70
8.1	Priorities for the Use of On-street Space	70
8.1.1	Kerbside Lane Management	71
8.2	General Priorities for Allocation of Parking Space	72
8.2.1	Parking Hierarchy	73
8.2.2	Parking User Groups	73
8.2.3	Public Transport	73
8.2.4	Loading	73
8.2.5	Disability Permit Holders	74
8.2.6	Drop-off/Pick-up.....	74
8.2.7	Short to Medium-stay	74
8.2.8	Long-stay/Commuter	74
8.2.9	Park and Ride	74
8.2.10	Residents.....	74
8.2.11	Cyclists	75
8.2.12	Motorcycle and Scooter Parking	75
8.3	Commercial Centre Hierarchy Example.....	75
8.4	Provision of Parallel Kerbside Parking	76
8.5	Provision of Angle Kerbside Parking	77
8.5.1	Design of Angled Parking	78
8.5.2	Front-to-kerb versus Rear-to-kerb Angle Parking	78
8.6	Provision of Centre-of-road Parking	79
8.7	On-street Regulatory Parking Restrictions.....	81
8.7.1	Provision of Parking Restrictions.....	81
8.7.2	Provisions for Pedestrians.....	81
8.7.3	Conflict between Parking and Waste Removal Operations	81
8.7.4	Protection of Parking from Through Traffic	81
8.7.5	Unsafe Parking Locations.....	81
8.8	Lighting	82
8.9	Provision for Other Road Users	82
8.9.1	Trucks.....	82
8.9.2	Buses and Coaches	82
8.9.3	Motorcycles.....	83
8.9.4	People with Disabilities.....	83
8.9.5	Bicycles.....	84
8.9.6	Caravans, Trailers and Recreational Vehicles	84
8.9.7	Emergency Vehicles.....	84
8.9.8	Taxis	85

8.10	Parking Control Measures	85
8.10.1	Linear Parking Control	85
8.10.2	Area Parking Control	89
8.10.3	Pay Parking	90
8.10.4	Permit Parking	90
8.10.5	Residential Parking Zones	91
8.10.6	Parking Permit Allocation and Fees	92
8.10.7	Types of Permit Parking Schemes	92
8.10.8	Common Features of Permit Schemes	93
8.10.9	New Developments	93
8.10.10	Technology and Enforcement	94
8.10.11	Implementing Residential Parking Zones	94
8.10.12	Enforcement	94
9.	Rural Parking	96
9.1	Rest Areas	96
9.1.1	Categories of Rest Areas	96
9.2	Other Roadside Amenities	97
10.	Park-and-Ride	98
11.	Parking Guidance and Control Devices	99
11.1	Signs and Pavement Markings	99
11.1.1	Linear Parking Control Signs	99
11.1.2	Area Parking Control Signs	99
11.1.3	Parking Direction Signs	99
11.1.4	Pavement Markings	100
11.2	Electronic Guidance Systems	100
12.	Duty of Care and Risk Management	102
12.1	Risk and Safety	102
12.1.1	Risk Management	102
12.1.2	Conditions of Parking	105
References		107

Tables

Table 1.1:	Parts of the Guide to Traffic Management	2
Table 2.1:	Parking facility choices	5
Table 2.2:	Examples of the types of parking restrictions for a city and related policies	10
Table 4.1:	Example of car parking provision rates	22
Table 4.2:	Example of the number of service bays required for business, shops/restaurants and hotel/motels	23
Table 4.3:	Example of parking ratios	24
Table 4.4:	End-of-trip facilities	28
Table 4.5:	Land areas per parking space for parking structures in the city and town centres in Canberra	30
Table 4.6:	Car park construction costs in Canberra	31
Table 5.1:	Parking policy toolbox	34
Table 7.1:	Classification of car parking facilities	42
Table 8.1:	Commercial centre parking user hierarchy example	76
Table 8.2:	Relative merits of front-in versus tail-in parking	79
Table 12.1:	Car park risk management assessment	103

Figures

Figure 3.1:	Typical example of hourly distribution of parking demands	14
Figure 3.2:	Typical example of weekly variation of parking demands for a tourist precinct.....	15
Figure 5.1:	The context for parking policy within the broader transport system	32
Figure 6.1:	Example of aesthetically designed parking structure Manila, Philippines	37
Figure 6.2:	Example of aesthetically designed parking structure Oklahoma City, USA	37
Figure 6.3:	Example of aesthetically designed parking structure Seoul, South Korea	38
Figure 6.4:	Example of well-designed landscaping treatment of car park Rome, Italy	38
Figure 6.5:	Example of well-designed pedestrian service elements inside parking structures California, USA.....	39
Figure 6.6:	Example of environmentally sensitive paving material design	40
Figure 7.1:	Example of an off-street car park layout	43
Figure 7.2:	Pedestrian conflicts with different parking layouts	45
Figure 7.3:	Examples of good and poor design of pedestrian facilities	46
Figure 7.4:	Examples of poor (lacking) and good trolley corral design	47
Figure 7.5:	Example illustrating good off-street parking bay delineation practice.....	48
Figure 7.6:	Example of a pedestrian access ramp.....	50
Figure 7.7:	Example of mechanical garages.....	52
Figure 7.8:	Electric vehicle charging bays – Adelaide City Council – Market Street car park	53
Figure 7.9:	Pay and Display machine (Cambridge WA)	55
Figure 7.10:	Pay by Space machine (Melbourne VIC).....	55
Figure 7.11:	Mobile phone parking app (Perth WA).....	55
Figure 7.12:	Single space parking meter offering pay by phone option (Vancouver Canada)	56
Figure 7.13:	Mobile phone only parking	56
Figure 7.14:	Virtual permit example (Milton Keynes UK)	57
Figure 7.15:	Parking guidance examples (North Sydney NSW and Claremont WA)	60
Figure 7.16:	Space counting variable message sign (Nottingham UK)	60
Figure 7.17:	Hand held parking enforcement equipment (Melbourne VIC)	61
Figure 7.18:	Mobile Licence Plate Recognition (Melbourne VIC)	61
Figure 7.19:	Street focused CCTV	62
Figure 7.20:	Example of off-street motorcycle parking	64
Figure 7.21:	Example of a well-located parking bay for people with disabilities	65
Figure 7.22:	Example of well-designed car with trailer bay.....	67
Figure 7.23:	Goget car	68
Figure 7.24:	Example of 'parents-with-pram' signs in a shopping centre car park	68
Figure 8.1:	An example of kerbside parallel parking	72
Figure 8.2:	An example of on-street parallel parking used in a one-way street in Melbourne	77
Figure 8.3:	Typical centre-of-road angled parking layouts	80
Figure 8.4:	Examples of confusing signage and restrictions without time limits	87
Figure 11.1:	Examples of consistent car park and wayfinding signage in Parramatta and Fremantle	101

1. Introduction

1.1 Scope of this Guide

Part 11 of the Austroads *Guide to Traffic Management* has been given the title 'Parking' to define the limitations on its scope within the contexts of:

- the 13 different parts of the *Guide to Traffic Management*
- the nine different guides spanning the range of Austroads publications.

The structure and content of the *Guide to Traffic Management* is discussed in *Part 1: Introduction to Traffic Management* (Austroads 2015). The 13 parts are outlined in Table 1.1.

In the context of the *Guide to Traffic Management Part 11: Parking* is restricted to the parking management process in terms of parking policy, demand and supply, data and surveys, on-street and off-street parking as well as types of parking and parking control. Whilst Part 11 refers to issues covered in other parts, it is distinguished from:

- *Guide to Traffic Management Part 3: Traffic Studies and Analysis* (Austroads 2013a), which gives an overview of data collection, storage, retrieval and analysis procedures for traffic performance of roads and intersections
- *Guide to Traffic Management Part 5: Road Management* (Austroads 2014), which addresses good practice for allocation of space for various road users and for lane management
- *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings* (Austroads 2013b), which covers analysis of intersections with access driveways
- *Guide to Traffic Management Part 8: Local Area Traffic Management* (Austroads 2016a), which covers traffic calming techniques including pedestrian facilities
- *Guide to Traffic Management Part 10: Traffic Control and Communication Devices* (Austroads 2016b), which provides guidance on the design and use of traffic control and communication devices including static and electronic signs.

The scope of Part 11 therefore covers **traffic management** in relation to parking facilities.

In the context of the other Guides within the Austroads range of publications, this Guide is restricted to traffic management advice, and refers only briefly to issues more appropriately addressed in other Guides. It is recognised that it is difficult, if not impossible, to discuss many aspects of traffic management without reference to road design and/or safety issues, but the view is taken that within the *Guide to Traffic Management* any such reference should be brief and be supported by references to the *Guide to Road Design* and/or the *Guide to Road Safety* (refer to scope statements in the *Guide to Road Design* and *Guide to Road Safety*).

The following *Guide to Road Design* documents are of particular relevance to this Guide:

- *Guide to Road Design Part 3: Geometric Design* (Austroads 2016c), which provides guidance on road design which caters for on-street parking
- *Guide to Road Design Part 5: General and Hydrology Considerations* (Austroads 2013c), which deals with drainage design for on-street parking
- *Guide to Road Design Part 6: Roadside Design, Safety and Barriers* (Austroads 2010), which provides guidance on rest area design.

Table 1.1: Parts of the Guide to Traffic Management

Part	Title	Content
Part 1	Introduction to Traffic Management	• Introduction to the discipline of traffic management. • Breadth of the subject and the relationship between the various parts of the Guide.
Part 2	Traffic Theory	• An introduction to the characteristics of traffic flow and the theories, models and statistical distributions used to describe many traffic phenomena. • Processes that practitioners should consider.
Part 3	Traffic Studies and Analysis	• Traffic and transport data collection surveys and studies. • Traffic analysis for mid-block situations (including freeways/motorways). • Analysis of signalised and unsignalised intersections, including roundabouts.
Part 4	Network Management	• Broader issues and aspects of managing networks of roads to provide effective traffic management for all road users. • Network needs of freight, public transport, pedestrians, cyclists, motorcyclists and private motor vehicles. • Network management objectives, operating objectives, network performance measures.
Part 5	Road Management	• Focus on managing mid-block traffic conditions. • Good practice for access management, allocation of space to various road users, lane management. • Application of speed limits.
Part 6	Intersections, Interchanges and Crossings	• Types of intersection. • Selection of intersection type and appropriate use. • Traffic considerations in traffic management for intersections, interchanges and other crossings.
Part 7	Traffic Management in Activity Centres	• Planning and traffic management of activity centres and associated transport nodes. • Principles for various types of centre.
Part 8	Local Area Traffic Management	• Principles and processes. • Issues and resources. • Selection of schemes and treatments. • Design and implementation of schemes and devices.
Part 9	Traffic Operations	• Applications used in traffic operations. • Current practice for common systems including: traffic signals, congestion management, incident management, traveller information. • Smart motorway. • Manual systems used in these application areas. • Event management. • Information management issues and principles. • Related systems integration and interoperability issues.
Part 10	Traffic Control and Communication Devices	• Signing and marking schemes. • Traffic signs, static and electronic. • Pavement markings and delineation. • Traffic signals and islands.
Part 11	Parking	• Parking policy. • Demand and supply. • Data and surveys. • On-street and off-street. • Types of parking and parking control.
Part 12	Traffic Impacts of Developments	• Relationship to road level of service and access management. • Development profile and trigger points for treatment. • Traffic impact assessment.
Part 13	Road Environment Safety	• Principles and management of the safety of road environments within a traffic management context. • Links to relevant sections of the GRD (Guide to Road Design) and GRS (Guide to Road Safety).

Within the above limits, the scope of this Guide is broad, addressing parking management matters across a range of situations that include:

- both urban and rural environments
- rural freeways/motorways, arterial roads and local roads
- all categories of road use by cars, trucks, public transport, motor cycles, cyclists and pedestrians, including people who have a visual or mobility impairment.

This Guide is a comprehensive update of the material contained in the Austroads *Guide to Traffic Management Part 11: Parking*. It makes reference to, and should be used in conjunction with, relevant Australian and New Zealand Standards, other Austroads Guides, and national, state and territory specific legislation that relate to parking management, control and design. In particular, the following documents are important:

- Standards Australia (or jointly with Standards New Zealand)
 - AS/NZS 2890.1:2004 Parking Facilities Part 1: Off-street Car Parking
 - AS 2890.2:2002 Parking Facilities Part 2: Off-street Commercial Vehicle Facilities
 - AS 2890.3:1993 Parking Facilities Part 3: Bicycle Parking Facilities
 - AS 2890.5:1993 Parking Facilities Part 5: On-street Parking
 - AS 1742.11:2016 Manual of Uniform Traffic Control Devices Part 11: Parking Controls
 - NZ Transport Agency (2010a) Manual of Traffic Signs and Markings Part 1: Traffic Signs (MOTSAM 1) and NZ Transport Agency (2010b) Manual of Traffic Signs and Markings Part 2: Markings (MOTSAM 2).
- Australian Building Codes Board (2015) Building Code of Australia.

This Guide takes a broad look at the parking management process:

- Section 2 considers key priorities of parking management and pay parking.
- Section 3 addresses factors affecting parking demand including time based issues and the reciprocal use of parking.
- Section 4 addresses parking supply issues, including use of parking provision standards, the appropriate placement of parking facilities, and the impacts of parking supply decisions.
- Section 5 discusses the parking policy framework.
- Section 6 summarises issues relating to parking and the environment.
- Section 7 deals with the interface between the road system and off-street parking facilities, and the design and control of off-street car parks.
- Section 7.7–Section 7.14 deals with new parking technologies.
- Section 8 addresses the criteria for permitting on-street parking, the implementation and control of on-street parking, and regulatory limits relating to on-street parking provision.
- Section 9 discusses rural parking.
- Section 10 outlines issues relating to Park-and-Ride facility provision and implementation.
- Section 11 addresses both electronic parking guidance systems and signs and pavement markings.
- Section 12 briefly discusses issues relating to risk management and duty of care provisions.

Examples of car parking provision rates are shown in Section 4.2.2 and Table C2 1.

Parking policy toolbox descriptions can be found in Commentary 5.

[\[see Commentary 5\]](#)

Additional information on the application of intelligent systems to parking can be found in Commentary 16.

[\[see Commentary 16\]](#)

Additional detail on bicycle parking and end-of-trip facilities can be found in Commentary 9.

[\[see Commentary 9\]](#)

It should be noted that terms used in this document may vary from those used in different jurisdictions across Australia and New Zealand and practitioners are urged to refer to relevant legislation, standards, guidelines, and other documents to ensure consistency with local requirements.

Likewise, legislative requirements vary between New Zealand and the different states and territories of Australia and in all cases the practices and requirements applicable in the relevant jurisdiction should be observed.

1.2 Definition of Parking

Parking can be defined as the act of stopping a vehicle and leaving it in the one location for a period of time, whether or not anyone remains in the vehicle.

Parking forms a necessary component of the transport system. It is needed to allow for the safe storage of vehicles while they are not in use and enables drivers to undertake their intended activity at their destination. It forms an interface between the road network and other land uses.

Parking is provided either at the kerbside in the form of on-street parking or in dedicated car parking facilities outside the carriageway(s) of a street, i.e. off-street.

Parking is not a cause but rather an effect, where demand is generated by land use type and intensity, spatial distribution and availability of supply and choice. Off-street parking is now the preferred option for the mass storage of vehicles, with on-street parking mainly used in city and town centres to service road users with the need for high levels of access including public transport, commercial vehicles, people with disabilities and emergency services.

Legislation specifies where parking is not allowed and generally includes but is not restricted to:

- on, or on the approaches to, a footpath, footpath ramp, intersection or pedestrian crossing
- between any parked vehicle and the centre of the road
- in front of a right-of-way, passage or private driveway
- within a specified distance of a fire hydrant or fire plug (e.g. one metre in Australia)
- in a No Stopping area
- in a No Parking area (except briefly to pick up or put down goods or passengers)
- in parking bays for people with disabilities unless displaying an appropriate parking permit.

Reference should be made to the New Zealand Land Transport (Road User) Rule and Land Transport Rule: Traffic Control Devices 2004 and the Australian Road Rules 2012 for rules concerning parking in these countries.

In all locations where parking is allowed, it is a responsibility of the owner of the premises or the traffic manager (amongst others) to ensure that parking is provided in a safe and efficient manner, and with due regard to considerations of access to, and the impact on, the wider road and transport system.

2. Principles of Parking Management

The type of parking strategy to employ varies based on the overall parking supply and demand needs of a given area. The following Table 2.1 presents different factors that determine a user's choice of parking location and facility.

Table 2.1: Parking facility choices

Parking facility choices		
Decision factor	On-street facilities	Off-street facilities
Location	On-street parking, if available, is dispersed geographically throughout an area and may be closer or further from any single use depending on availability.	Off-street parking is concentrated in a single facility and may or may not be public or dedicated to one use.
Convenience	If parking is widely available, users will likely be able to park close to their destination. In situations where parking is in high demand and street spaces are not readily available, street parking may be perceived as inconvenient.	Dedicated parking attached to a single use may not be open to the general public. Parking in a structure may be perceived as inconvenient.
Visibility and information	Since on-street parking is dispersed, users can easily assess parking options without altering driving path but may cruise multiple blocks looking for parking. Time restrictions are not always readily visible while driving.	Users may be unfamiliar with the price, time restrictions or public nature of a structure or lot and, without visible signage, may be reluctant to turn into the lot or structure.
Safety	Areas with good pedestrian lighting and lots of activity have fewer safety concerns associated with on-street parking. Some users, however, may not feel comfortable parallel parking on busy streets. Others may not feel comfortable parking in areas that feel unsafe or have less desirable uses.	Underground garages and large or poorly lit structures can be perceived as unsafe by users. If so, these facilities may only be used if other parking is unavailable. If a structure is well designed and patrolled, it may be perceived as safer than on-street parking.

Source: Based on City of Denver (2010), page 10.

2.1 Changing Approach to Parking

Historically, the approach by local government to the provision of parking in Australian cities has embodied four key factors:

1. Mandatory minimum parking required
2. In addition to public parking, parking is to be provided by developers/owners
3. Commercial centres are to contain both on-street and off-street parking
4. Each development (land use) is to provide its own parking.

The traditional approach to parking has been that motorists should nearly always be able to easily find convenient, free parking at every destination.¹

¹ The concept has been clearly articulated by Litman (2014) and by Kodransky and Hermann (2011).

Under this 'predict and provide' approach, parking planning is based on the premise that 'parking problem' means 'inadequate supply', and consequently:

- More parking is better.
- Every destination should satisfy its own parking needs (minimum ratios).
- Car parks should never fill.
- Parking should always be free or subsidised or incorporated into building costs.

However, in the last ten years there has been an increasing trend towards more efficient use of existing transport infrastructure as an alternative to expanding roads and parking facilities, incorporated in a technique known as travel demand management (TDM). TDM emphasises the movement of people and goods, rather than motor vehicles, and gives priority to more efficient travel and communication modes (such as walking, cycling, car sharing, public transport and telecommuting), particularly under congested conditions. Environmental concerns and rising fuel costs are other factors prompting a reduction in the reliance on private motor vehicles.

This change in approach to the strategic management of parking has been developed and is being increasingly applied in urban areas where sustainability is a major objective.

This new 'demand management' approach, as distinct from the unsustainable demand satisfaction (predict and provide) approach, aims for parking facilities to be used more efficiently. This means that car parks at a particular destination may often fill (typically more than once a week), provided that alternative options are available nearby, and drivers have information on these options. It does not mean that car parks should have sufficient capacity to cater to once-a-week peak demand. It requires that motorists have a choice between paid parking nearby (user-pay), or free parking a reasonable distance away. It also requires a high standard of walking conditions between parking facilities and the destinations they may serve. Parking planning should therefore include shared and reciprocal parking, parking pricing and regulations, parking user information, and pedestrian improvements.

Parking management policies under this new approach will focus on reducing the trend in motor vehicle use and ownership and help to share the cost of parking infrastructure equitably. It is essential to achieve higher mode share targets for public transport and other forms of transport. It will provide all users (including the elderly, people with a disability, employees, shoppers, students, traders, residents and visitors) with safe and appropriate access to parking, whilst enabling adequate road access for pedestrians, cyclists, emergency vehicles, public transport, street maintenance and delivery vehicles.

2.2 Key Principles

The following presents a set of key parking management 'principles' (City of Denver 2010). This set of parking principles describe the nature of parking universally and provides a base understanding of parking operations.

2.2.1 Principle 1: Parking Supply and Demand

Parking supply refers to the total number of spaces available for use.

Parking in a given area is supplied through many types of facilities that are owned, managed and used differently.

Parking is typically categorised into on-street and off-street parking. These two categories differ in several important ways. Off-street parking falls into four categories:

- Government owned off-street public parking
- Government owned off-street private parking
- Privately-owned off-street public parking
- Privately owned off-street parking that is dedicated to a specific use.

There are critical differences between on and off -street parking when viewed from an administrative or management perspective. The supply of on-street parking is relatively fixed and a city's ability to expand that supply is constrained to changes that can be made through street reconfiguration or reconfiguration of line-marking. Conversely, off-street parking supply can be expanded more readily through construction of new facilities including at-grade (surface or open air) and, deck, multi-story or underground facilities. However, the costs associated with new or expanded facilities can be very high as described in Commentary 2.

[\[see Commentary 2\]](#)

Parking 'demand' refers to the amount of parking that is needed at a specific time and place. Demand is influenced by vehicle ownership, the popularity of an area, the nature of the surrounding uses, availability of alternative forms of transportation, and other external factors like fuel costs. Demand rates typically fluctuate and differ on a daily, weekly, seasonal or even annual basis. The parking characteristics of an area are directly related to the nature of these cycles. For example, demand in an office precinct will peak during the day on weekdays but demand at restaurants and theatres may peak on weekends or evenings.

2.2.2 Principle 2: Occupancy or Utilisation

Parking occupancy is one of the central concepts in parking management. Whether in reference to on-street parking or to an off-street car park, parking occupancy describes the percentage of spaces that are occupied at any given time. Parking occupancy rates, also called 'utilisation', reflect the relationship between parking supply and demand. A low occupancy rate in an area means that there are many spaces that are empty or unused. While this may be convenient for drivers traveling to that destination, lower occupancy rates can also mean that oversupplies of parking or inappropriate parking prices exist in the area. By contrast, an area, or precinct that has a very high level of occupancy could mean that the available parking supply is limited and needs management to accommodate a certain level of demand.

Ideally, the occupancy of parking facilities should be high enough to ensure that they are occupied at a level that justifies the supply but not so high that it is unreasonably difficult to find a space. Eighty-five per cent occupancy at times of peak demand means that approximately one parking space in every seven should be vacant. When peak parking occupancy (the average of the four highest hours of demand in a day) is regularly above 85%, a change to the parking management approach may be necessary. This 85% benchmark is a recognised best practice approach to the management of on-street parking. It means that the parking resource is well used but people can still easily find a space, thus reducing customer frustration and congestion. Generally, parking is considered 'at capacity' when available spaces are 85% occupied at times of peak demand (Shoup 2005).

2.2.3 Principle 3: Duration and Turnover

Parking duration refers to the length of time a vehicle occupies a space. Parking turnover (or churn) describes how frequently a parking space becomes available or 'turns over' during an hour. The rate at which spaces become available is important since it describes the number of opportunities different users will have to occupy a space. For example, a vehicle belonging to a shop employee could either occupy a parking space in front of that shop for a full eight hours (providing access for one person) or it could turn over every 60 minutes and provide convenient access for eight different customers.

Ideally, both on and off-street parking should be managed so that they can accommodate a range of different stay durations based on the needs of the surrounding land uses. A popular retail or commercial area, e.g. requires conveniently located parking spaces that are regulated for 'short term use' – anywhere between 30 minutes and two hours. Parking around entertainment or restaurant districts may require parking durations that are longer than two hours.

2.2.4 Principle 4: Enforcement

Compliance with parking regulations is an important component of the parking system. Parking rules and restrictions are put in place to support parking goals such as turnover or access. The success of parking management strategies are often tied to the level of compliance. Parking infringements or fines are issued to encourage compliance with rules and to maintain the intent of the parking management philosophies in place within a given area. While enforcement is often necessary to ensure that rules and restrictions are observed, there are significant resource implications associated from both a labour and equipment standpoint. A clear definition of existing resources and implications are an important consideration when selecting a management tool or designing a parking management program for an area. If parking management strategies and complementing enforcement are designed well, it increases the likelihood that the desired goals of an area are achieved (e.g. increased turnover, access, utilisation). Under these conditions, parking can truly function as an asset and meet the diverse needs of various stakeholders so that it is easier for those user groups to access the area.

2.2.5 Principle 5: Partnership

A city's strategic planning documents set a clear vision for the future. However, the management of day-to-day parking operations within a diverse land use and transportation system is a more complicated endeavour. To achieve success, partnerships with external stakeholders are an imperative component of any parking management program. Partnerships with those who are impacted most by parking policies can help ensure that strategies are reasonable and are tailored to achieve specific desired outcomes. Extensive stakeholder input and buy-in is needed to effectively understand the implications or potential effects of new policies. Input is necessary from a broad cross-section of stakeholders including business associations, property and business owners, residential organisations, managers of private car parks and other interested individual citizens or groups.

2.2.6 Education and Information

The long-term impacts of the increasing demand for the limited supply of parking creates cost implications and also social, environmental and economic impacts that confirm that current parking trends are unsustainable. Demand satisfaction is unsustainable and there are many more strategic benefits to charging for parking than simply raising revenue.

Extensive and continuous education of the city's stakeholders on the benefits of alternative transport other than private motor vehicles will have long-term positive benefits for a city and the health of people. Parking demand and supply issues and options should be regularly published by the city in its website, brochures, advertisements and other publications. The following rationale should be reinforced in all education and responses to parking issues:

- Drivers cannot expect long-term free parking close to their destination.
- There are environmental aesthetic and financial costs associated with unlimited supply of parking.
- Improved compliance has benefits for all stakeholders.
- The user pay principle is fair and applies to most services and products as well as to every other cost associated with owning and using a motor vehicle.
- Better parking control and management will benefit all stakeholders.

Future parking information should therefore include not only the underlying rationale but also parking user information about the different options available, simpler and easy-to-understand signage easy-to-use equipment and incentives for parkers to investigate and use off-street parking in preference to on-street parking.

2.3 Pay Parking

2.3.1 General Principles

As pay parking generally results in reductions in car use and traffic congestion among other environmental benefits, it is one of the essential transport measures necessary to ensure the long-term viability of commercial centres.

Pay parking increases equity by charging users (user pay) for their parking costs and by reducing the parking costs imposed on non-drivers. Paying directly rather than indirectly benefits consumers because it reduces parking and traffic problems and allows individuals to decide how much parking to purchase giving them an opportunity to save money. Drivers may use a space as long as they want, as long as they are prepared to pay for it.

2.3.2 Pay Parking Objectives

Objectives for pay parking should be considered in order to determine how fees will be structured:

- For traffic management – peak period fees should be high enough to encourage a shift in travel modes or times.
- For parking management – fees during peak demand periods and at the most convenient locations should be high enough to generate a maximum 85% occupancy rate. If prices are too low, parking becomes saturated causing motorists to cruise around in search of a space. The target is to ensure that at times of peak demand, 15% of spaces (one in seven) are available.

2.3.3 Guidelines to Efficient Pay Parking Pricing

The following guidelines are based on Litman (2014) and are separated into what is currently implemented and what should be implemented in the future in a city.

To effectively use pricing for parking management, the following will be necessary:

- Charge higher fees and provide shorter time periods at the most convenient spaces (on-street) to encourage high churn.
- Use incremental price structures in certain car parks to favour short-term users, e.g. \$1 for the first hour then \$1.50 for the second hour etc.
- Daily rates should be set at > 6 x hourly rate, and monthly rates at > 20 x daily rate.
- Ensure that fee structures are flexible and can be amended up or down in order to manage demand. It is inefficient to review fees only once a year in accordance with budget timetables.
- Encourage businesses to price parking and offer discounts or refunds to their bona fide clients.
- Provide discount parking to multi-passenger vehicles (car sharing).
- Ensure a high level of compliance by means of regular and unpredictable enforcement which will require increased staffing and technology resources.
- Implement different parking fees in the evening and on weekends in some precincts.
- Minimise the exceptions to pay parking e.g. all residents, ratepayers, loading vehicles, couriers and disabled parkers using public parking spaces should pay.

2.3.4 On-street Parking Management

On-street parking plays an important role in the effective functioning of commercial centres and access to residential areas. Many businesses rely on on-street parking to provide access for their customers and meet their loading requirements. On-street parking also caters for specific uses such as dedicated space for taxis and mobility parking for people with impaired mobility.

On-street parking management broadly consists of the following:

- **Unrestricted:** where there are no limitations on parking
- **Time restricted:** with a range of time limitations and enforcement used to ensure compliance
- **Reserved parking:** reserved for a certain type of user, such as mobility card holders, or taxis, or for loading zones
- **Priced parking:** with varying rates applying sometimes alongside a time restriction.

The below Table 2.2 outlines types of parking restrictions used by Auckland Transport. Similar parking restrictions could be used by other cities.

Table 2.2: Examples of the types of parking restrictions for a city and related policies

Restriction	Description	Policy
Loading zones	Parking areas designated solely for loading or unloading goods or passengers. This includes: • general purpose loading zones • goods vehicles only loading zones.	• Loading zones will be provided in convenient locations to serve local business, commercial and retail activities. • Goods vehicle loading zones are designated for vehicles of any size, weight and usage that deliver goods in the course of trade. • Goods vehicle loading zones should be used in areas of high parking demand and a high density of retail and commercial premises. • General purpose loading zones should be used in all other areas where there is a general need for loading or unloading. • All loading zones will have a time restriction. This is usually 15 minutes. A user may stay longer than the time restriction if observed to be in the activity of loading or unloading. • Loading zones should be avoided in angle parking bays to prevent larger vehicles overhanging into the carriageway.
Mobility parking	Parking areas reserved for the exclusive use of vehicles displaying a valid mobility parking permit. A valid mobility parking permit must be displayed at all times in the vehicle while it is parked in a mobility parking space.	• Provide mobility parking which is physically accessible, affordable and safe to use. • Mobility parking should be provided, where practical, in angled parking as a preference to parallel parking spaces to enhance safety and accessibility. • Time restrictions should be applied to mobility parking spaces. • In general, mobility parking will not be provided if there are existing and available mobility parking spaces within 200 m of an accessible route to the destination. • Mobility parking spaces will only be considered in commercial and mixed use areas. As a general rule mobility parking will not be provided in residential areas. • Vehicles displaying a mobility parking permit can remain in time restricted on-street parking spaces for double the posted time. • In all on-street paid parking areas vehicles displaying a mobility parking permit are given 1-hour free parking upon payment of the minimum tariff e.g. if a pay and display receipt shows parking is paid until 10:15 am, then a mobility card holder can stay until 11:15 am. • A consistent zero tolerance approach will apply to the illegal use of mobility parking spaces. Offending vehicles will be ticketed.

Restriction	Description	Policy
Motorcycle parking	On-street parking set aside for exclusive use of motorcycles or motorised scooters.	- Motorcycle parking will sometimes be provided in an on-street space that is not suitable for regular car parking. - Long-stay motorcycle parking should be encouraged in off-street parking buildings. - On-street motorcycle parking may be time restricted or priced to prioritise short-term parking. - Pricing may be introduced to manage high demand. The price to park in on-street motorcycle parking spaces will be less than for a car in recognition of the lower impact on congestion and kerbside space. - Motorcycles are not allowed to park on the footpath.
Taxi stands	On-street parking reserved for the exclusive use of taxis.	- Taxi stands are considered where there is high public demand for taxis. Any new taxi stand must be no closer than 400 m from an existing taxi stand. - The length of taxi stand should reflect the turnover of the space but generally taxi stands should be kept to less than three car lengths. - Taxi stands should not be located adjacent to bus stops and loading zones as the taxis will creep into this space. Where possible taxi stands should be located in a separate parking bay where no creep can occur. - Night-time taxi stands will be considered in areas where there is high night-time activity. Using loading zones or bus stops at night will also provide a better utilisation of on-street parking. - In general, taxi stands will not be considered in residential streets.
Buses and coach parking	On-street parking dedicated to waiting and lay-over of buses and tour coaches. The following categories apply: - public transport short-term positioning layover space - public transport longer-term parking - coach parking.	- Longer-term (greater than 2 hours) bus parking should be located on the edge of a commercial centre away from active street frontages. - Coach parking will be considered in locations of key tourist interest where a significant demand can be identified. - Longer-term coach parking will be located at the edge of a commercial centre away from active street frontages. - Time restrictions will be applied to coach parking areas.
Car share parking	On-street parking reserved for car share operators' vehicles.	- Car share organisations must have membership available to all local residents and businesses, and 24-hour booking systems. - The city will support approved car share organisations by providing dedicated on-street parking spaces. - The city reserves the right to charge for the establishment and on-going provision of on-street car share parking spaces. - Car share organisations may be required to regularly report back to the city on the uptake and membership in each area that car share parking spaces are installed.
Car-pool parking	On-street parking reserved for vehicles carrying two or more occupants. This is sometimes referred to as High Occupancy Vehicle (HOV) parking.	- Car-pool parking is often provided in Park and Ride car parks or on-street parking adjacent to high-frequency public transport stations to encourage carpooling and obtain greater benefit from the parking space. - Car-pool parking should be provided at convenient locations to further encourage carpooling. - Vehicles must be carrying two or more occupants when parking to comply with the carpool restriction. The vehicle may have one occupant when exiting the parking space.

Restriction	Description	Policy
Time restrictions	General parking space whereby a maximum permitted time is posted. Parking time restrictions are used to encourage turnover in areas that experience high parking demand.	• There should be some consistency with the time restrictions used around the city to allow for greater legibility. • The following time restrictions should be used: P5, P15, 2P, 3P. • 2P is recommended for shopping high streets where paid parking is not suitable. • Longer time restrictions such as 3P are suitable for the fringes of a commercial centre. • Time restrictions above 3 hours should be avoided as they are difficult to enforce.
Bicycle parking	Space reserved for bicycles provided on the footpath or within an on-street parking space.	• Bicycle parking in place of car parking can provide a vastly more efficient use of the parking resource. Typically six bicycles can be parked in a standard car space. • Bike parking infrastructure will be prioritised in commercial centres and in locations that support public transport use such as transport interchanges and rail stations.

Source: Auckland Transport (2015), Table 1.

3. Demand for Parking

3.1 Parking Demand

Parking demand is generally related to the land use served. Parking demand for a specific land use is dynamic in nature and is influenced by a number of factors. It varies from one location to another, reflecting differences in development and employment density, availability of public transport, car ownership levels, the cost of parking, and economic vitality. In areas with a mix of land uses, such as in city and town centres, parking demand is often reduced by the interdependence of like activities. Parking demand also varies over time and with seasonal changes in activity levels throughout the year (e.g. at Christmas, Easter, or special events).

Parking demand generates a need for safe and efficient pedestrian facilities, since all parkers are also pedestrians. Refer to the fourth dot point in Commentary 3 for more information on parking policy goals for pedestrians.

[\[see Commentary 3\]](#)

3.2 Factors Affecting Demand

There are a number of factors that affect parking demand, some of which are referred to in the following sections.

3.2.1 Geographic Location

Vehicle ownership and use tends to decrease as density, availability of transit service and non-motorised travel, such as walking and bicycling, increases. A reduction in vehicle ownership and use has the result of reducing parking demand particularly in activity centres. The availability of inexpensive secure parking in close proximity to the intended destination also affects choice and demand.

3.2.2 Types of Land Use

The type of land use can have the greatest impact on the demand for parking at a particular site. Land uses with high levels of coincident trip generation and long duration of stay (low parking space turnover) will have higher demand for parking. Examples include shopping centres, office complexes, entertainment precincts and commuter bus and train stations.

3.2.3 Availability and Attractiveness of Public Transport and Other Alternatives to Car Use

The availability of competitively priced, frequent, accessible, reliable and attractive public transport (which can be packaged with Free-Ride within town centres and Park-and-ride) can reduce the demand for car parking at city and town centres. The amount of reduction in demand depends on a number of different factors (Commentary 13).

[\[see Commentary 13\]](#)

Due to its relative attractiveness, in the central area of capital cities, public transport can account for a very large percentage of all trips and reduced demand for parking in these areas.

Availability of other alternatives to car use such as car sharing, travel blending (combining activities to reduce overall trips), walking and cycling may also reduce parking demand.

3.2.4 Accessibility and Attractiveness of the Parking Facilities

If parking is not easily accessible or attractive as an end-of-trip facility (e.g. due to congestion or price) then the demand for it may be reduced when compared to better alternatives. Alternatively, if parking is well located, easily accessible and inexpensive or free, then demand for it will increase.

3.2.5 Demographic/Socio Economic Patterns

The number of motor vehicle licences varies with demographic and socioeconomic patterns, which can be linked to parking demand. It is noted that the number of licenced motor vehicles in Australia has increased by 12.1% between January 2010 and January 2015 resulting in 1.946 million additional vehicles on Australia's roads (Australian Bureau of Statistics (ABS) 2015). All of these vehicles require parking.

3.2.6 Price Structure

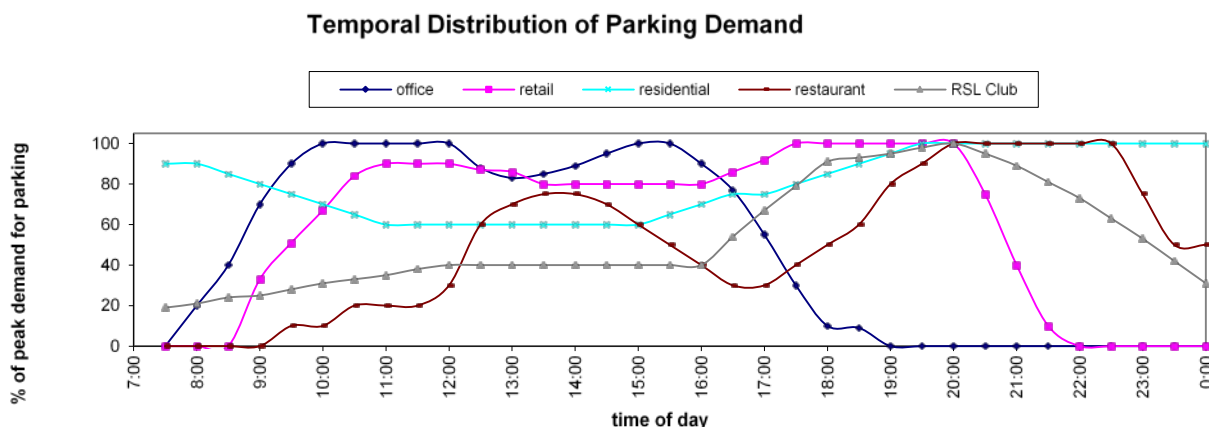
Parking demand generally decreases as the price of parking increases.

To maximise the impact of pricing on parking demand suitable alternatives to parking should be available (e.g. public transport) and pricing should be applied in conjunction with other policy levers (Section 5).

3.2.7 Time of the Day, Weekly and Seasonal Variations

Parking demand varies for different land uses with the time of the day, week, and year, coincident with the level of activity occurring at a point in time. An example of the daily variation in demand is given for a number of different land uses in Figure 3.1. In this example, it can be seen that demand for parking at an office peaks in the morning while the demand for parking in a residential complex and restaurant area occurs much later in the evening. This variation in demand suggests that parts of the same parking area could potentially be shared by a number of different land uses throughout the day, which gives rise to the term 'shared parking' discussed in Section 3.3.

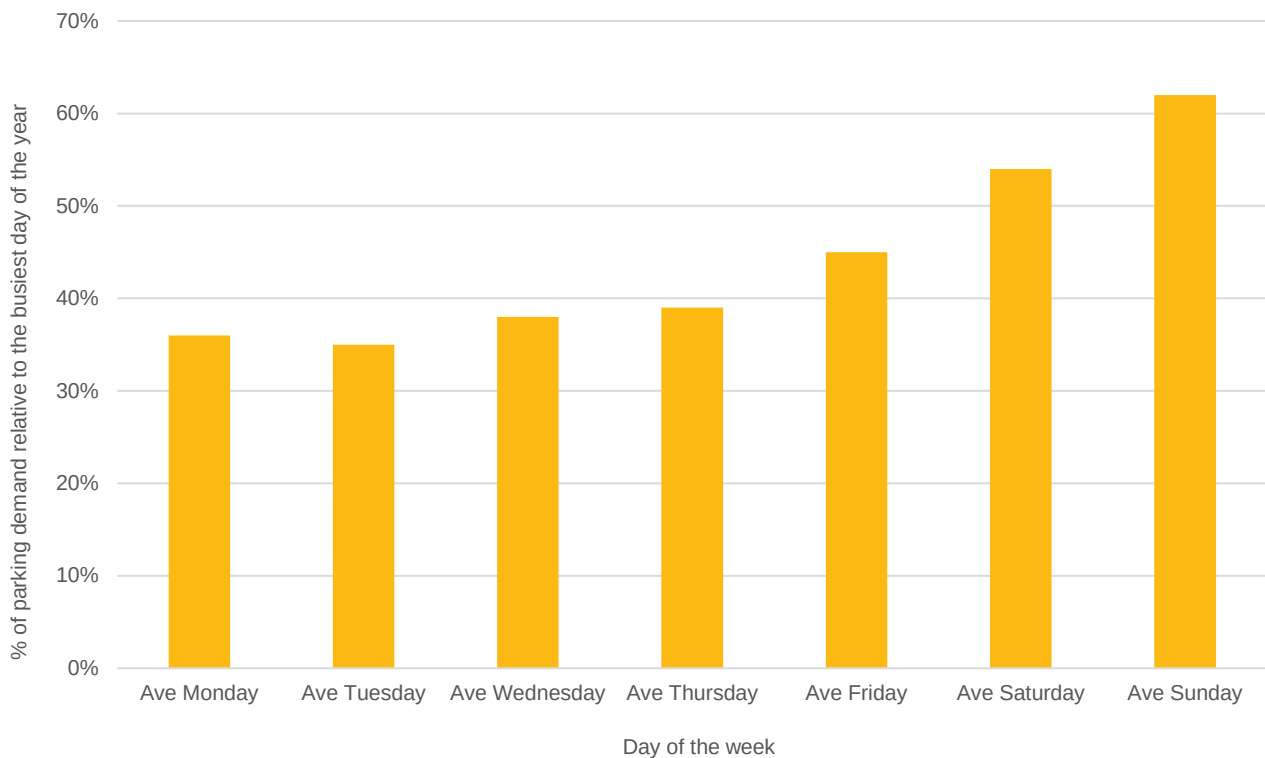
Figure 3.1: Typical example of hourly distribution of parking demands



Source: ARRB Group

This type of data is best obtained from demand studies conducted at other facilities with similar characteristics. Refer to Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* (Austroads 2013a) for details on the methods to collect and analyse this type of data.

A typical example of the variation of parking demand by day of the week at a large tourist shopping and entertainment facility as a percentage of the parking demand on the busiest day of the year is given in Figure 3.2. This figure illustrates that the demand at this type of facility is greatest on weekends, and on weekdays the demand is much reduced. This type of data is best obtained from demand studies conducted at other facilities with similar characteristics.

Figure 3.2: Typical example of weekly variation of parking demands for a tourist precinct

Source: ARRB Group

3.3 Mixed Land Use and Shared Parking

Shared or reciprocal parking recognises that different land uses routinely experience peak utilisation rates at different times of the day, week, or season and that parking spaces not occupied by one use can accommodate the needs of other uses located nearby. There are many locations where a number of different land uses are located in close proximity. These areas are often termed 'mixed use' or 'multi-use' areas, and exhibit different characteristics to single use developments.

In these mixed-use areas parking facilities can be shared to take advantage of different demand profiles and demand peaks between individual land uses (see Figure 3.1). The following examples indicate land uses that work effectively together:

- night time entertainment with daytime employment uses
- suburban transit stations with weekend oriented uses, e.g. markets
- weekend uses, e.g. church, with weekday daytime uses, e.g. employment
- retail/restaurant/support uses in large employment centres.

Individual parking spaces can also be shared by several users, rather than allocating designated bays to individuals. This is especially effective where it is implemented in conjunction with other strategies to promote non-car travel alternatives. This method also works well where motorists have a choice to receive an assigned parking space for a premium price or a shared space for a reduced price. The advantages and disadvantages of shared parking and the concept of complementary uses of parking spaces can be found in Commentary 1 (Commentary C1.1 and Commentary C1.2 respectively).

[\[see Commentary 1\]](#)

3.3.1 Shared and Reciprocal Parking for Mixed-use Developments

There is a distinction between shared and reciprocal parking.

The definition of shared parking is parking facilities on one site shared concurrently by a mixed-use development or separate developments.

The definition of reciprocal parking is parking facilities serving separate uses or a mixed-use development, but not shared concurrently between the users and not necessarily on one site, for example a church which uses its bays in the evenings and on weekends but allows its parking to be used during weekdays by long-term parkers.

If shared parking is to be effective in reducing parking demand, it should be shared concurrently, e.g. shared parking for retail during the day and for restaurants in the evening. The key point is that the land uses sharing the available parking have peak demands that occur at different times meaning that the combined demand is less than the sum of the separate peak demands.

Reciprocal parking is to be conveniently located to both developments. Some guidance on what is regarded as conveniently located is useful. In this regard it is noted that TDM (Victoria Transport Policy Institute 2014) gives a table of acceptable walking distances to parking. These include distances of less than 250 m for residents, professional services and medical facilities; less than 350 m for general retail, employees, restaurants etc.; and less than 500 m for overflow parking and major events.

Legal assurances are necessary for reciprocal use arrangements to ensure that such arrangements are secured and that any future change in use will not result in a parking shortfall especially when there is a charge for use. This can be a significant impediment as enduring legal arrangements can be very difficult to arrange. As an alternative, the City of Stirling for example, simply requires that the parking arrangements are permanent (e.g. through an easement, amalgamation, legal agreement, restrictive covenant or any other formal arrangement acceptable to council such as a condition of a planning approval).

Best practice

Best practices for shared parking include:

- Establish standard procedures for implementing shared parking which specify how to calculate minimum parking requirements for different combinations of land uses, acceptable walking distances, requirements for sharing agreements, verification and enforcement.
- Educate planning officials and developers on the potential for shared parking and procedures for implementing it.
- Provide a maximum amount of on-street parking, and public off-street parking as a substitute for private off-street parking. Encourage use of cash-in-lieu fees to substitute for private off-street parking.
- Use transportation management associations or local planning agencies to provide shared parking matching and brokerage services.
- Ensure that there is good pedestrian access, security and appropriate signage for users in regard to shared parking.
- Perform regular parking studies and obtain feedback from users to identify problems with shared parking.
- Anticipate potential spill-over problems, and respond with appropriate regulations and enforcement programs.

How shared parking is implemented

Shared parking is usually implemented by municipal government policy to allow and encourage it, with sharing arrangements made between developers and property managers. It may require changes to the Town Planning Scheme and development of appropriate standards and practices that transport planners can use to evaluate, manage and enforce the shared parking arrangements. It can be encouraged by establishing parking sharing brokerage services to match potential sharing partners, which can be provided by a transportation management association or similar organisation established by local government.

An easy to implement opportunity for shared parking is revised signage which will clearly permit loading zones to be used after hours for parking on main streets when they are not required for loading purposes.

Shared parking can also be implemented by providing public parking as a substitute for private parking. This can be done by:

- providing a maximum amount of on-street parking in an area such as the conversion of parallel to angle parking
- providing public off-street parking
- managing public parking facilities so the most convenient spaces are available to priority users such as customers
- addressing barriers, such as inadequate walkways that limit use of public parking
- allowing or requiring cash-in-lieu fees instead of private off-street parking.

Travel impacts of shared parking

It is noted that shared parking does not directly reduce vehicle travel if it substitutes for increased parking supply. To the degree that it increases the available supply of parking and reduces parking prices, it can also encourage motor vehicle travel. To the degree that shared parking allows more intense development it can encourage use of alternative modes.

Benefits and costs

Shared parking can reduce parking facility costs (including aesthetic and environmental impacts), allow greater flexibility in facility location and site design, and encourage more efficient land use. Marshall, Garrick and Hansen (2008) found that low-speed urban streets with on-street parking tend to have lower traffic speeds, and concluded that on-street parking is 'a tool to help create places that are safer, more walkable, require less parking, and have more vitality'. Costs of shared parking include reduced motorist convenience and increased vehicle travel if it increases total parking supply.

Stakeholders

Shared parking is primarily implemented by local government policies and agencies, and by individual developers and businesses. Implementation often involves changing current planning, enforcement and design practices, sometimes with the support of professional organisations. The city can provide parking facility brokerage services for example, maintaining a system to match businesses that can share parking facilities.

Barriers to implementation

Shared parking requires overcoming the traditional assumption that society benefits from a maximum supply of free or low-priced parking, and the resistance from land use and transportation planning institutions that are accustomed to inflexible minimum parking ratios. Some public officials consider shared parking difficult to administer; since it requires flexible parking standards, verification and enforcement. It is sometimes regarded as unfair or risky since some developers benefit more than others or it could create spill-over problems. Users accustomed to reserved spaces may also object to it. There may also be inadequate capacity during unusual peak demand periods.

4. Supply of Parking

Parking supply is often an integral part of the success of any development. The supply or provision of parking needs to be well planned. Economic, social, and environmental aspects are often overlooked when undertaking parking studies and assessments.

This section outlines the categories of parking, the methods to determine appropriate levels of supply, and issues relating to the cost and accessibility of parking.

4.1 Different Categories of Parking

4.1.1 Off-street Parking

Off-street parking is classified according to both the way it is used and the type of activity or business it serves.

In the first case, classification according to the manner of its use is covered in detail in AS/NZS 2890.1:2004 where parking is classified into three main classes with a fourth added to cover parking for people with disabilities. The basis of these classifications is the geometric layout of the parking module, i.e. the size of each parking space, the aisle width and the relationship of one to the other. See Section 7.2 for a tabulation of these classes.

The lowest class is intended for long-stay parking and assumes users will be prepared to accept the inconvenience of smaller parking spaces and narrower manoeuvring aisles as a space-saving measure. Applications include employee parking and all-day parking at public transport nodes. A sub-class has a further space-saving concession for residential parking by reducing aisle width to the point where large vehicles may not be able to access an angle parking space in a single manoeuvre.

An intermediate class is intended for shorter stay parking such as entertainment venues and visitor parking at commercial establishments. The highest class is intended for high turnover parking such as at shopping centres, hotels and clubs where both easy vehicular access to and from the parking space and easy access to each vehicle while in the space are desirable.

A car park may be required to cater for more than one class, e.g. employee and visitor parking. The Standard requires all parking in any one location to be provided according to the highest relevant classification unless effective means of separating the two can be provided. In this regard, the management of a parking system in any urban activity centre needs to distinguish between parking categories that serve different parking demands. The distinction between short-stay and long-stay parking is an example where it becomes important to stop short-term shopper or visitor parking spaces being monopolised by employee or commuter long-stay use.

Classification of parking according to the activity or business that it serves is required in order to establish the scale of provision of parking spaces. Recommended scales of provision for a variety of establishments are given in Section 4.2.2.

4.1.2 On-street Parking

On-street parking is generally not amenable to classification according to its manner of use as in most cases it is publicly available for any purpose. However AS 2890.5:1993 provides for a range of space sizes and manoeuvring areas for angle parking, similar to the classes for off-street parking. These are recommended for use where the main parking usage corresponds to one or more of the specified classes. It is also desirable to make an assessment of the activities and businesses served in each locality to determine the degree to which on-street parking needs to be supplemented with off-street parking to meet demand.

4.1.3 Other Categories

Other categories of parking which may need to be provided for include the following:

- *Service vehicle parking:* AS 2890.2:2002 gives design information on the provision of parking and manoeuvring areas for medium and heavy rigid vehicles, and semi-trailer type vehicles. Note that coping with vehicles with more than two points of articulation will require specialist design input.
- *Parking for people with disabilities:* This is characterised by increased space allowance for people to enter and leave vehicles, generally with the extra space required, shared between two spaces or with another purpose.
- *Bicycle parking:* The increasing popularity of bicycles replacing the motor vehicle for commuting, shopping and leisure activities requires facilities for both short and long term bicycle parking. This is addressed in 7.15.5.
- *Motorcycle parking:* Recommended space sizes are given in AS/NZS 2890.1:2004.

4.2 Methods of Determining Supply

There are two methods most commonly used to determine the appropriate supply of parking for a particular development or area demand. These methods are determining supply based on generic parking provision standards or relating supply to an actual estimate of demand based on field observations and/or other survey data. The setting of a parking supply ceiling based on what is considered to constitute the appropriate sustainable level of provision for an area is a variation on the first method.

The estimation of parking demand using either parking standards or survey results, and the subsequent provision of parking capacity to address that demand, may not necessarily always be appropriate to the complex task of engineering efficient, safe, and effective land use transport systems. Practitioners should seek to establish what constitutes an appropriate supply of parking for an area and should then seek to balance the demands for that parking through appropriate management mechanisms. This level of supply may or may not equate closely to the estimated level of demand for parking. This topic is discussed further in Section 5.

4.2.1 Minimum Parking Requirements

To a large extent, minimum parking requirements are a historical by-product of plentiful and inexpensive land and a lack of convenient payment technologies. The requirements were seen as a means for shifting responsibility for catering for parking demand onto private developers, thereby ensuring the safe and efficient operation of the local road network (McCormick Rankin Cagney & Victoria Transport Policy Institute 2008).

The methodology underlying minimum parking requirements is considered to lack accuracy and efficiency in the following ways:

- **Uses conservative design standards:** Minimum parking requirements are typically designed so as to cater for most peak demands. This considers developments independently of the surrounding urban environment and ignores the potential to share parking resources between adjacent developments, leading to an oversupply of under-utilised parking.
- **Results in fragmented parking supplies:** Because of the requirement for individual developments to cater for their parking demands, urban areas are increasingly dominated by fragmented parking areas.
- **Ignores value:** Minimum parking requirements are ignorant of value and give no consideration to the marginal benefits and costs provided by additional parking spaces. The costs of meeting minimum parking requirements tend to increase where land values are higher thereby discouraging intensification and redevelopment. This works against strategies designed to intensify development.
- **Rarely takes into account actions or strategies aimed at increasing the use of public transport, walking or cycling.**

- Is unresponsive to demand management: There are numerous examples of cost-effective parking management measures that do not require increasing the supply of parking. Examples include shower and locker facilities for employees who walk or cycle, unbundling employee parking from salary packages, providing free parking for motorcycles, free passenger transport passes for employees and developing workplace travel plans. Minimum parking requirements fail to account for demand management strategies and therefore provide no incentive for consideration of alternative transport modes.

Empirical research undertaken in some Australian states into parking demand for shops, supermarkets, restaurants and medical centres, shows that the number of spaces required is between 50% and 80% of the rates stated in their planning codes.

The Department of Planning and Community Development reviewed parking provisions in Victoria in 2007.

The review found that not only has the inflated supply of parking artificially lowered the costs of driving, but also encouraged low density land use development that had in turn increased vehicle dependence. This created a positive feedback loop where increased vehicle use created additional demand for parking which was then reflected by increased minimum parking requirements which in turn stimulated increased vehicle use.

Calculations of minimum parking requirements are typically based on statistical relationships between land use and floor area. In many cases, these relationships explain as little as 5% of the actual demand for parking, thereby indicating that other factors are far more significant than floor area in determining demand for parking (Shoup 2005). In addition, parking demands may vary significantly in relation to external socio-economic factors, such as the convenience of public transport, the availability and price of parking at the destination and the price of fuel. While it may be convenient to base parking requirements on floor area and land use, the statistical relationships are generally weak and provide little insight into actual demand for parking, either now or into the future.

An extract of the recommendations in the Department of Planning and Community Development (2012a) *Advisory Committee Report: Review of Car Parking Provisions* is attached in Commentary 2.

4.2.2 Parking Provision Standards

Most local authorities have parking provision rates, or standards, incorporated into their Town Planning Schemes or District Plans. These are usually based on demand studies published elsewhere, and are used to help estimate parking demand for various developments. They are often broadly categorised and may only be applicable to standard land use types. Where land uses are unusual, parking supply will either have to be determined based on relevant demand surveys (Section 4.2.3) or by negotiation with the approving authority. In all cases parking rates should be applied allowing for some level of flexibility to best suit particular circumstances and local conditions. Examples of parking provision rates pertaining to different vehicle categories are given in the following sections.

Interpretation of parking provisions

Parking provision standards for all types of parking should be interpreted and applied with caution. The main reasons are discussed below:

- Provision standards such as those given in Table 4.1 are often quite arbitrary and based on highly scattered data. For example, demand studies for 'General Office Building' published by the Institute of Transportation Engineers (2010) show a range from 0.81 to 5.76 parking spaces occupied per 100 m² of gross floor area. Standards based on averaging the values from such studies result in excessive parking for some buildings and insufficient parking for others.
- Conditions may vary widely for developments and land uses of the same type, and for different locations within an urban region. Specific parking needs may be quite different from those indicated in a rigid table of parking provision requirements. Also, changes in parking demands over a period of time may render documented parking provision standards inapplicable.

- Parking provision requirements are based on parking generation studies that are typically performed at new, suburban sites with unpriced parking. The parking provision standards resulting from this approach tend to be unnecessarily high for urban areas with good multi-modal accessibility options, and where parking is typically priced.
- Setting parking provision requirements does not normally take into account reciprocal parking arrangements that may exist between establishments such as universities, sports clubs etc.
- Many authorities will enforce minimum (unrestricted) parking provision standards but not maximum (restricted) ones. This may result in excessive parking supply instead of recognising the role of public transport particularly in town centres and major retail and commercial centres.
- Application of generous parking provision standards increases the cost for a given amount of development. For example, Willson states that increasing parking requirements from one to two spaces per unit increases the land required for a three-story multi-family housing by approximately 33% (Willson 1995).

Consequently, it is recommended that all parking provision standards be used only as a guide. Developers should be required to investigate the impact of any departure from the standards and justify the demand for, and supply of, parking for their developments with relevant factual information. In addition, flexible requirements that allow for reductions on the minimum standards in return for developer/employer agreements to support public transport, car-pooling, cycling, etc. should be encouraged where applicable.

Car parking provision rates

Although traditionally minimum parking provision rates have been widely applied, it is often appropriate for authorities to publish maximum parking provision rates. The application of maximum (restricted) provision rates is useful as a means to limit car parking supply and car use while enhancing public transport utilisation. Conversely, minimum (unrestricted) provision rates are typically set in situations where public transport accessibility is poor and car occupancy rates are at the lower end of the scale.

Table 4.1 illustrates an example of car parking provision rates incorporating minimum and maximum standards (taken from Adelaide City Council n.d.).

These types of standards should recognise that parking demand may sometimes be modified by the proximity of public transport and other factors. Zones of high public transport accessibility, such as central city areas, often display lower dependence on parking.

Commentary 2 (Commentary C2.1) includes other examples of car parking provision rates used throughout Australia. For New Zealand, refer to the relevant District Plan or to the New Zealand Trips and Parking Database (Trips Database Bureau 2016).

In Victoria, the purposes of the revised Section 52.06 Car Parking of the Victorian Planning Scheme (Department of Environment, Land, Water and Planning 2015) are as follows:

- To ensure that car parking is provided in accordance with the State Planning Policy Framework and Local Planning Policy Framework.
- To ensure the provision of an appropriate number of car parking spaces having regard to the demand likely to be generated, the activities on the land and the nature of the locality.
- To support sustainable transport alternatives to the motor car.
- To promote the efficient use of car parking spaces through the consolidation of car parking facilities.
- To ensure that car parking does not adversely affect the amenity of the locality.
- To ensure that the design and location of car parking is of a high standard, creates a safe environment for users and enables easy and efficient use.

Table 4.1: Example of car parking provision rates

Type of Development	Minimum	Maximum
Residential low rise	1 space for each dwelling being less than 100 m ² . 2 spaces for each dwelling greater than 100 m ² . Multi-unit dwelling should provide 1 visitor space for each 4 dwellings.	2 spaces for each dwelling being less than 100 m ² . 3 spaces for each dwelling greater than 100 m ² . Multi-unit dwelling should provide 1 visitor space for each 4 dwellings.
Residential high rise	No space for each dwelling being less than 100 m ² . 1 space for each dwelling greater than 100 m ² . Multi-unit dwelling should provide 1 visitor space for each 4 dwellings.	2 spaces for each dwelling being less than 100 m ² . 3 spaces for each dwelling greater than 100 m ² . Multi-unit dwelling should provide 1 visitor space for each 4 dwellings.
Aged care facility low care high care	1 for every 5 people the facility is licensed to accommodate and 1 for every 2 employees at work between 8am to 6pm weekdays.	1 per dwelling unit, plus 1 for every 2 employees at work between 8am to 6pm weekdays.
Hospital	1 space for every 3 licensed hospital beds in ward areas plus 5 for every operating theatre plus 1 for every 25 m ² of gross floor area of all areas not assessed as ward areas or operating theatres.	N/A
Consulting room	4 spaces for the 1 st consulting room, plus 2 per each additional consulting room.	4 spaces for the 1 st consulting room, plus 3 per each additional consulting room.
Retail	4 spaces per 100 m ² of building floor area.	6 spaces per 100 m ² of building floor area.
Offices/ancillary retail service	2 spaces per 100 m ² of building floor area.	3 spaces per 100 m ² of building floor area.
Restaurant/café	1 space for every 3 restaurant seats.	1 space for every 2 restaurant seats.
Licensed premise	1 space for every 2 m ² of building floor area available to the public bar, plus 1 space for every 6 m ² of building floor area available to the public in lounge, dining room or beer garden.	1 space for every 2 m ² of building floor area available to the public bar, plus 1 space for every 3 m ² of building floor area available to the public in lounge, dining room or beer garden.

Source: Adelaide City Council (n.d.).

Service vehicle parking provision rates

An example of parking rates for the provision of on-site service bays to be provided for offices, shops/restaurants and hotels/motels is shown in Table 4.2. It should be noted that service vehicles should be given a high priority when allocating limited on-street parking space.

Table 4.2: Example of the number of service bays required for business, shops/restaurants and hotel/motels

Development type	Gross floor area (GFA), m ²	Number of service bays required by vehicle class			
		Small rigid vehicle	Medium rigid vehicle	Heavy rigid vehicle	Articulated vehicle
Business/office	0–99	1	–	–	–
	1 000–2 499	–	1	–	–
	2 500–7 999	1	1	–	–
	8 000–19 999	2	1	–	–
	20 000–34 999	2	2	–	–
	35 000–64 999	2	2	1	–
	> 65 000	2	3	1	–
Shop/restaurant	0–199	1	–	–	–
	200–599	–	1	–	–
	600–1 499	1	1	–	–
	1 500–1 999	2	1	–	–
	2 000–2 799	2	2	–	–
	2 800–4 399	2	2	1	–
	4 400–8 499	2	2	1	1
	8 500–11 499	3	2	1	1
	11 500–20 999	3	3	1	1
	21 000–23 999	3	3	2	1
	24 000–32 999	3	3	2	2
	> 33 000	3	4	3	2
Hotel/motel	0–199	–	1	–	–
	200–399	–	1	1	–
	400–599	1	1	1	–
	> 600	2	1	1	–

Source: Brisbane City Council (2000).

Parking provision rates for people with disabilities

In Australia the *Building Code of Australia* (Australian Building Codes Board 2015) prescribes the minimum number of car parking spaces that should be reserved for persons with a disability as a proportion of the total number of spaces provided. This proportion changes for different classes of building with which the car park or area is associated. In general, the rate is 1–2% of parking spaces in a car park containing more than 10 spaces (it should be noted that this is well below the number of permits issued as a percentage of population – see Australian Building Codes Board 2015) with provision at facilities like hospitals and medical centres being at the higher end of this scale. Refer to the Australian Building Codes Board (2004) for a summary of building classifications and the corresponding parking provision requirements for people with disabilities.

In New Zealand provision of parking spaces for people with disabilities is covered by NZS 4121:2001 Design for Access and Mobility: Buildings and Associated Facilities for the Design of Ramps and Walkways for People with Disabilities cited in the Building Act 1994.

The cited references set out minimum parking space requirements for people with disabilities. In all cases where the forecast demand is likely to be higher than the minimum prescribed level the forecast level of demand for parking of this type should be allowed for in a fair manner.

National Disability Services is the Australian peak body for non-government disability services. Each state has varying policies and design specifications for disability parking on-street and off-street.

Bicycle parking provision rates

An example of parking rates for the provision of bicycle parking is given in Commentary 2 (Commentary C2.2). These bicycle parking provision rates may be used to provide guidance if local standards or data are not available. Transit New Zealand has developed a supplement to this guide which should be used when considering the provision of bicycle parking facilities in New Zealand (Transit New Zealand 2008). It should be noted that the application of these types of provision rates needs to be undertaken with caution as local circumstances may often render them inappropriate. A recent example of minimum parking rates for cars and bicycles (both short stay and long stay) as well as motorcycle scooters, mopeds and disabled parkers is set out below

Table 4.3: Example of parking ratios

Land use	Number of parking spaces		
	Cars	Bicycles (short-stay)	Bicycles (long-stay)
Amusement centre	1 space/20 m ² NFA	1 space/50 m ² NFA Min 2 spaces	-
Bed and breakfast accommodation	1 space/guest bedroom	-	-
Betting agency	1 space/20 m ² NFA	1 space/150 m ² NFA Min 2 spaces	-
Caretaker's dwelling	1 space	-	-
Child day care centre	1 space/5 children	-	1 space
Cinema/theatre	1 space/5 m ² seating area	1 space/100 m ² seating area Min 2 spaces	-
Civic use	Assessed on component uses	1 space/50 m ² NFA Min 2 spaces	1 space/300 m ² NFA
Club premises	Assessed on component uses	1 space/200 m ² NFA Min 2 spaces	-
Community purpose	Assessed on component uses	1 space/200 m ² NFA Min 2 spaces	-
Conference centre	1 space/5 m ² seating area	-	-
Consulting rooms	4 spaces/practitioner	1 space/4 practitioners	-
Consulting rooms (group)	4 spaces/practitioner	1 space/4 practitioners	1 space/8 practitioners
Dry cleaning premises	1 space/20 m ² NFA	-	-
Educational establishment:			
Pre-school	1 space/staff member and 1 space/5 students	-	-
Primary school	1 space/staff member and 14 drop off spaces/100 students (maybe on-street)		1 space/5 students over Year 4
Secondary school	1 space/staff member and 7 drop off spaces/100 students (maybe on-street)		1 space/20 students

Land use	Number of parking spaces		
	Cars	Bicycles (short-stay)	Bicycles (long-stay)
Technical institution/university	1 space/staff member and 1 space/10 students		1 space/20 students
Fish shop	1 space/20 m ² NFA	1 space/150 m ² NFA Min 2 spaces	1 space/300 m ² NFA
Health studio:			
Indoor bowling centre	4 spaces/lane and 1 space/30 m ² NFA open to the public	1 space/200 m ² NFA Min 2 spaces	-
Indoor sports stadium	1 space/50 m ² NFA used for games and 1 space/4 spectator seats	1 space/200 m ² NFA Min 2 spaces	1 space/400 m ² NFA
Squash and tennis courts	3 spaces/court and 1 space/4 spectator seats	1 space/200 m ² NFA Min 2 spaces	1 space/400 m ² NFA
Other:			
Home occupation	1 space	-	-
Home store	Short-stay parking (may be on-street)	2 spaces	-
Hospital	1 space/30 m ² net administration area and 1 space/3 licensed beds	1 space/30 licensed beds Min 2 spaces	1 space/15 licensed beds
Hospital special purposes	1 space/30 m ² net administration area and 1 space/3 licensed beds	1 space/30 licensed beds Min 2 spaces	1 space/15 licensed beds
Hotel	1 space/room, and parking for any public drinking or public dining in accordance with 'Tavern'	If public drinking or public dining is provided, bicycle parking is to be in accordance with 'Tavern'	If public drinking or public dining is provided, bicycle parking is to be in accordance with 'Tavern'
Industry (light)	1 space/75 m ² NFA	-	-
Industry (service)	1 space/75 m ² NFA	-	-
Laundromat	1 space/20 m ² NFA	-	-
Local shop	1 space/20 m ² NFA	1 space/150 m ² NFA Min 2 spaces	1 space/300 m ² NFA
Massage rooms	1 space/20 m ² NFA	1 space/150 m ² NFA Min 2 spaces	1 space/300 m ² NFA
Market	1 space/40 m ² of market area	1 space/50 m ² of market area Min 2 spaces	-
Motel	1 space/room, and parking for any public drinking or public dining in accordance with 'Tavern'	If public drinking or public dining is provided, bicycle parking is to be in accordance with 'Tavern'	-
Motor vehicle and marine sales	1 space/100 m ² display area	-	-
Motor vehicle wash	3 spaces/car wash bay and 1 space/30 m ² net administration area	-	-
Nursing home	1 space/30 m ² net administration area and 1 space/3 licensed beds	1 space/60 licensed beds	1 space/30 licensed beds
Office	1 space/30 m ² NFA	1 space/500 m ² NFA Min 2 spaces	1 space/200 m ² NFA
Open air display	1 space/100 m ² display area	-	-

Land use	Number of parking spaces		
	Cars	Bicycles (short-stay)	Bicycles (long-stay)
Petrol and convenience store	3 spaces/service bay and 1 space/20 m ² NFA	2 spaces	-
Private hotel	1 space/room, and parking for any public drinking or public dining in accordance with 'Tavern'	If public drinking or public dining is provided, bicycle parking is to be in accordance with 'Tavern'	If public drinking or public dining is provided, bicycle parking is to be in accordance with 'Tavern'
Private recreation	Assessed on component uses	1 space/200 m ² land area available to the public Min 2 spaces	1 space/400 m ² land area available to the public
Public worship	1 space/5 m ² seating area	1 space/100 m ² seating area Min 2 spaces	-
Reception centre	1 space/5 m ² public area	-	1 space/750 m ² public area
Restaurant	1 space/5 m ² of seating area	1 space/100 m ² NFA Min 2 spaces	1 space/100 m ² NFA
Restricted premises	1 space/20 m ² NFA	1 space/150 m ² NFA Min 2 spaces	
Retirement village	As per R-Codes (Aged Persons Dwelling)	2 spaces	-
Service station	3 spaces/service bay and 1 space/20 m ² NFA	-	-
Shop	1 space/20 m ² NFA	1 space/150 m ² NFA Min 2 spaces or if in a District Centre zone, 1 space/500 m ² NFA Min 6 spaces	1 space/300 m ² NFA or if in a District Centre zone, 1 space/1000 m ² NFA Min 10 spaces
Showroom	1 space/40 m ² NFA	1 space/1000 m ² NFA	1 space/750 m ² NFA
Small bar	1 space/5 persons	2 spaces	1 space
Take away food outlet	1 space/5 m ² of seating area and 1 space/3 m ² of counter/queuing area	1 space/50 m ² NFA Min 2 spaces	1 space/100 m ² NFA
Take away food outlet (drive through)	1 space/5 m ² of seating area and 1 space/3 m ² of counter/queuing area and 4 car queuing spaces	1 space/50 m ² NFA Min 2 spaces	1 space/100 m ² NFA
Tavern	Bar: 1 space/2 m ² of net drinking or seating area and Lounge and outdoor: 1 space/5 m ² of seating area	Bar: 1 space/25 m ² of net drinking or seating area and Lounge and outdoor: 1 space/100 m ² of seating area	1 space/100 m ² NFA of bars and public areas, including lounges, beer gardens and restaurants
Veterinary clinic	4 spaces/practitioner	1 space/4 practitioners	-
Veterinary hospital	4 spaces/practitioner for the first 2 practitioners and 2 spaces/practitioner thereafter	1 space/4 practitioners	1 space/8 practitioners
Warehouse	1 space/75 m ² NFA	-	-

Source: Town of Cambridge (2009).

Additional provisions for parking provision rates:

- Calculations of parking requirements – Parking requirements shall be rounded to the nearest whole number and in the case of 0.5 rounded up. In the case of calculating parking requirements for different land uses and for different types of bicycle parking (short-stay and long-stay), each environment is to be rounded to the nearest whole number and in the case of 0.5 rounded up, before adding together all requirements.
- Motorcycle, scooter and gopher parking – In addition to the car parking requirements under Table 4.3, parking spaces for motorcycles, scooters and gophers will be required as calculated based on 2% of the total number of car parking spaces required (as calculated before concessions are applied).
- Specific purpose bays – In addition to car and bicycle parking, the responsible authority may require the provision of spaces marked exclusively for the use of delivery and service vehicles, taxis, and courier services, where the nature of the development requires specific purpose bays. Loading and delivering bays shall be located in close proximity to service areas. Specific purpose bays are to be clear of any obstructions at all times unless otherwise approved by the responsible authority.
- Bays for persons with a disability – Provision of spaces for persons with a disability in accordance with the *Building Code of Australia* (Australian Building Codes Board 2015) and AS/NZ 2890.6:2009 will also be required, where applicable. These are to be located in a position easily accessible to the main entry of a building and/or any lifts and ramp facilities.
- Allocation of parking bays – The allocation and location of each type of parking bay and the bay allocation for each use must be specified on the planning approval in all cases. This will include specific allocations of and locations of residential, commercial, visitor, loading bays, disabled bays and any other specific bay parking as required by the Town. The plans must provide for parking in accordance with dimensions specified as per AS/NZS 2890.1:2004.
- For consulting rooms, 50% of the off-street car parking requirement is to be allocated to non-staff of the premises. Parking bays should be marked accordingly in accordance with the relevant Australian Standards (AS/NZS 2890.1:2004 *Parking Facilities Part 1: Off-street Car Parking*).
- Special application of ratios:
 - Traditional strip centres – These centres generally have limited on-site parking available and little opportunity to provide parking bays. Where a change of use or addition are proposed, which result in an increased parking requirement (in accordance with Table 4.3), the responsible authority may determine the parking requirement solely based on the additional number of bays the new use generates compared to the most recently approved use. The shortfall is to be paid by cash-in-lieu with no further parking concessions applicable. In this circumstance, a cash-in-lieu payment in excess of 25% of the parking requirement can apply.
 - Retail in mixed use development – To encourage active ground floor uses (e.g. retail, cafe or restaurant) in a predominantly office or residential development and where these are ancillary to the main use, parking requirements to be based on the ratio for office uses (1 bay / 30 m²). The retail use shall be small-scale and not a large format retail shop and the majority of development shall be non-retail. If then the retail premises is reformatted into large format retail premises, parking supply is to be increased in accordance with the standard parking ratio for shop use.
- Car parking provision exceeding the requirements specified in Table 4.3 will generally not be supported, in order to limit traffic congestion and encourage more sustainable modes of transport. The responsible authority may determine that the provision of bays exceeding the required number under the policy provisions is not justified or required and will impose an adverse impact on amenity, safety and traffic management in the surrounding locality. In some circumstances, the responsible authority may require there to be fewer parking bays than required under the policy if the number of bays proposed is likely to present an adverse impact on amenity, safety and/or traffic management.

End-of-trip facilities

Where developments are required to provide long-stay bicycle parking as per Table 4.3 above, the provision of end-of-trip facilities is also required, in accordance with Table 4.4.

Note: Primary and secondary schools are exempt from having to provide end-of-trip facilities.

Table 4.4: End-of-trip facilities

No. long-stay bicycle spaces provided	No. of lockers	No. of showers
1–2	1–2	0
3–5	3–5	1
6–10	6–10	2 (one male, one female)
11–20	11–20	4 (two male, two female)
More than 20	20 or more	4 (two male, two female) Plus Additional showers at the rate of 2 showers (one male, one female) for every 1 long stay parking spaces over 20 provided thereafter

Notes:

To be of suitable volume and dimensions to allow storage of clothing, towels, cycling helmets and footwear; well ventilated, secure and lockable; and located close to shower and change room facilities (where provided). A ratio of one locker to one bicycle space is to be provided.

Change room facilities must also be provided and may either be a combined shower and change cubicle or communal change room for each gender directly accessible from the showers.

Source: Town of Cambridge (2009).

Parking provision rates for caravans, trailers and recreational vehicles

The number and location of parking spaces for caravans, trailers and recreational vehicles should generally be provided in response to demand. The following number of spaces can be taken as indicative:

- camp sites: one car-with-trailer [caravan] space for every six camp sites (additional to one car space per camp site)
- boat harbours: 40 to 60 car-with-trailer parking bays per boat access ramp situated immediately adjacent to the ramps
- Refer to Section 4.2.2.

4.2.3 Supply Based on a Forecast of Demand

The alternative to using parking provision standards and a more accurate method of linking supply to demand is to base the provision of parking on estimates of demand. This is typically done by conducting parking demand surveys at the site under investigation or at other sites that exhibit similar characteristics. Alternatively, the demand may be estimated based on patronage numbers or other data that provides a good indication of the profile of use of the site. This approach is often employed for mixed-use development and special event sites. In either case the estimated level of demand should take into consideration the availability of access to alternative transport options.

Although this is an effective method to determine supply the applicability of this approach needs to be considered in the context of the overarching parking policy for an area taking into account sustainable community goals and objectives and the likely impact that will result. For instance, it may be inappropriate in many situations to allow individual developments to supply parking based on satisfying demand. It should also be noted that land use may change in the future which may affect parking demand.

When forecasting demand, an important aspect is to specify a parking activity level ('design day') that determines the parking supply. This is particularly for land uses where the demand varies considerably throughout the year (e.g. shopping centres).

Conventional practice is not to provide parking supply to meet demand on the busiest day of the year as this approach would be uneconomical because parking supply would exceed demand for all but one day of the year. Likewise, it would be inappropriate to link the supply of parking to the demand on an average day as this would mean that there would be insufficient parking available on half the days of every year. Instead accepted practice is to adopt a level of supply to satisfy the parking demand that will only be exceeded for a number of hours or days each year. This demand is most often taken to be equivalent to the 85th percentile hourly utilisation level experienced throughout the year. Where this is difficult to accurately determine often the peak hour demand on the tenth (or fifteenth) busiest day of the year is used. However, in those cases where overflow will have a significant detrimental effect on adjacent areas a higher level of supply may be appropriate.

It should be noted that a parking system operates at optimum efficiency when the system is being used slightly less than at full capacity. The occupancy at which a parking facility achieves optimum efficiency is generally accepted as being in the range of 85 to 95% of capacity (Urban Land Institute & National Parking Association 2000). Supply should therefore be about 10% higher than the estimated demand for parking when using this approach. This allowance provides for vehicle circulation and manoeuvring, operating fluctuations and loss of parking attributable to misparked vehicles.

4.3 Area Required

The average area required per public car parking space including the parking space itself and circulation and manoeuvring areas is approximately 35 m² (refer to Section 7.3 and AS/NZS 2890.1:2004 for design detail).

In car parks where the average area per parking space falls as little as 10% (i.e. to 32 m²) problems with insufficient circulation routes and inadequate sight distance at the end of parking aisles will be evident. Car parks where the average area per parking space is less than 30 m² usually have serious congestion and safety problems.

4.4 The Cost of Providing Parking

Parking is a relatively expensive commodity incorporated into the costs of buildings and roadway facilities and added as a hidden surcharge to the price of effectively any good or service. Consumers pay for parking facilities through higher rents for residential parking, lower wages and benefits for employee parking, higher prices for retail goods for commercial parking and environmental degradation. Shoup (1999) estimates that the total value of parking facilities exceeds the total value of motor vehicles and that providing minimum parking requirements is estimated to cost 4.4 times as much per square metre of developed building as other municipal services combined.

It should however be noted that whilst the cost of car parking is a cost to the developer it also adds value and may be vital to some developments. For example, an outer suburban shopping centre with poor access to public transport would be uneconomical without car parking whereas a shopping centre in a major CBD with excellent public transport would not need car parking to be economically viable.

Costs of parking can be separated into six broad categories:

- land costs (Commentary C2.4)
- design and development costs (Commentary C2.5)
- construction costs (Commentary C2.6)
- maintenance and operation costs (Commentary C2.7)
- decommissioning costs (Commentary C2.8)
- costs of environmental and aesthetic impacts (Section 5 and Commentary C2.9).

4.5 Major Types of Parking Facility

Parking facilities are either at-grade (surface) or above or below ground. Above ground refers to a free-standing deck car park. Undercroft parking is above ground but incorporated within a mixed use structure.

At-grade parking areas consume the greatest volume of land per car space at 35.70 m². Undercroft parking when using 3 levels of parking and 6 levels of offices or other use configuration provides the most efficient use of land at 3.55 m². Underground parking areas range from 10.67–32.00 m². Ground level parking is 32.00 m². Above ground parking ranges from 4.73 m² to 14.60 m².

The table below indicates land utilisation rates.

Table 4.5: Land areas per parking space for parking structures in the city and town centres in Canberra

Type	Construction method	Land area per space (m ²)
1	At-grade parking areas	35.70
2	Above ground parking stations – 2 storey	14.60
3	Above ground parking stations – 3 storey	9.73
4	Ground level undercroft parking (3 storey office)	8.00
5	Above ground parking stations – 4 storey	7.10
6	Above ground parking stations – 5 storey	5.68
7	Above ground parking stations – 6 storey	4.73
8	Partially underground undercroft parking (3 storey office)	8.00
9	Underground parking – 1 level	32.00
10	Underground parking – 2 level	16.00
11	Underground parking – 3 level	10.67
12	Undercroft parking – 2 levels (6 storey office)	4.00
13	Undercroft parking – 3 levels (6 storey office)	3.55

Source: Luxmoore Parking Consulting (2010).

Floor area per car space (Table 4.6) is consistent regardless of the construction method used. The most efficient method is above-ground multi-level (4–6 storey) at 28.40 m². The least efficient is at-grade parking being 35.70 m². All other methods of construction range from 29.20 m² to 32.00 m².

Table 4.6: Car park construction costs in Canberra

Type	Construction method	Rate (\$/m ²)	Floor area per space (m ²)	Construction cost per space
1	At-grade parking areas	\$75	35.70	\$2 677
2	Above ground parking stations – 2 storey	\$450	29.20	\$13 140
3	Above ground parking stations – 3 storey	\$555	29.20	\$16 206
4	Ground level undercroft parking (3 storey office)	\$555	32.00	\$17 760
5	Above ground parking stations – 4 storey	\$690	28.40	\$19 596
6	Above ground parking stations – 5 storey	\$690	28.40	\$19 596
7	Above ground parking stations – 6 storey	\$690	28.40	\$19 596
8	Partially underground undercroft parking (3 storey office)	\$850	32.00	\$27 200
9	Underground parking – 1 level	\$1 715	32.00	\$54 880
10	Underground parking – 2 level	\$1 715	32.00	\$54 880
11	Underground parking – 3 level ⁽¹⁾	\$1 715	32.00	\$54 880
12	Undercroft parking – 2 levels (6 storey office)	\$1 135	32.00	\$36 320
13	Undercroft parking – 3 levels (6 storey office)	\$1 135	32.00	\$36 320

Rawlinsons Handbook does not provide cost estimates for 3 level underground parking facilities. The construction cost for 2 level underground parking facilities has been applied as a best estimate only. It is recommended that if a specific site was selected for this style of parking facility, that the construction cost and ground conditions be investigated thoroughly prior to the commencement of any works.

Source: Luxmoore Parking Consulting (2010).

These figures show that, based on construction and land costs, the most efficient solution for the substitution of at-grade bays is above-ground deck parking between 2 and 3 levels in height.

5. Parking Policy Framework

5.1 Why Have a Parking Policy?

Various factors determine the demand for parking as outlined in Section 2. Changing existing trends in the relationship between these factors will require action across a broad spectrum of policy areas including improved public transport provision, better management and access to existing urban centres and commitment to travel demand management measures such as the limitation of parking supply in congested central-city locations.

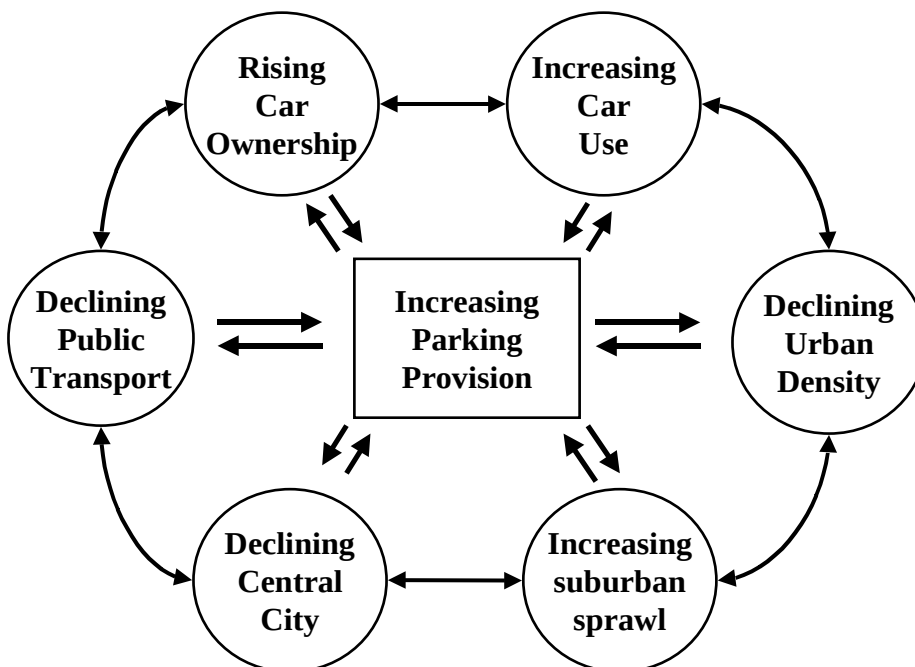
The timing of these actions is crucial. For example, it would make little sense to introduce new parking policy measures aimed at constraining traffic growth in central-city locations before ensuring that public transport and other travel modes are an attractive travel alternative to the car. Likewise, if parking supply is inadequately constrained, enhancing public transport services is likely to be more difficult to justify and sustain.

Strategic parking policy needs to be supportive of the broader transport strategies for an accessible and sustainable city. In other words, parking should not be the 'tail that wags the dog'.

Without a consistent and supportive parking policy it may be virtually impossible to achieve sustainable community goals and objectives such as the influence that parking supply, efficiency, location, price and demand management have with respect to travel behaviour and mode-choice decisions (Figure 5.1).

Traffic engineers and managers will have varying degrees of influence to guide the direction of parking policy, nonetheless all should be aware of the different policy tools that are available.

Figure 5.1: The context for parking policy within the broader transport system



Source: ARRB Group

5.2 Parking Policy Objectives

Parking policy should document a framework of objectives that reflects both the continued importance of the car for access to activity centres and the need to establish a balanced and sustainable transport system. It should target the provision of safe convenient and efficient parking facilities to meet the reasonable demands for car access to an area whilst supporting the amenity, environmental quality and human ambience of the city. It should do this by ensuring that the adverse impacts of vehicle traffic do not exceed acceptable levels. Parking must also achieve acceptable standards in terms of provision for people with disabilities (Commentary 7, Section 7.15.4 and Section 8.9.4).

[\[see Commentary 7\]](#)

In this respect the goals of a parking policy should demonstrate how the parking system will assist in achieving wider transport planning and system objectives.

5.3 Parking Policy Tools

Good parking policy should support a broad range of objectives, by first establish an appropriate supply of parking for an area, then balance the demands for the parking through appropriate management mechanisms. These mechanisms or policy tools may be thought of in the context of being efficiency demand pricing or location orientated.

Attempts to use parking policies especially supply limitation policies as a travel demand management (TDM) tool, which depend on there being only limited alternatives to access goods and services and other opportunities. Where alternative locations exist to satisfy trip desires, the restraint of parking supply may lead to a change in choice of destination rather than a change in mode of travel. For example, limiting parking at one retail location that is similar in its attributes to a number of other locations may simply result in shopping trips being diverted to those other locations.

Whilst parking supply tends to be a stronger determinant of car use than the price of parking, especially where prices are set at low levels, price-based demand management does have a potentially significant role in the successful management of the parking system, and in the delivery of an integrated transport strategy.

Parking policy tools shown in Table 5.1 are among those that constitute best practice in parking system management. They form a toolbox of potential policy from which practitioners may select to develop policies appropriate to their town or region. A description of many of these policy tools is contained in Commentary 5.

Parking management policies and programs should be coordinated throughout a district or region rather than applied only in a few areas such as a town centre. Indeed, the evolution of metropolitan-wide parking policies – linked to metropolitan transport system strategies – will inevitably need to address the relationships between, and the coordination of parking supply, price type and location throughout the entire region. Not only in major town centres and other 'hot spot' urban activity centres.

Table 5.1: Parking policy toolbox

Context	Policy objective	Policy tools
Supply and efficiency oriented	Encourage more efficient use of existing parking facilities and reduce distortions that favour driving, excessive parking supply and sprawl by providing better information and choice	• Provide information on parking facilities • Share parking facilities (Commentary C4.1) • Encourage use of remote parking (use shuttle service as required) • Regulate parking price and duration (Commentary C4.2) • Regulate time or season of use • Regulate types of users • Reduce parking regulations and subsidies • Unbundle parking (Commentary C4.3) • Apply minimum standards • Introduce parking allowance maximums (Commentary C4.4) • Apply parking supply 'ceilings' or 'freezes' (Commentary C4.5) • Introduce a cash-in-lieu payment scheme (Commentary C4.6) • Parking brokerage services (Commentary C4.7)
Demand management orientated	Manage parking and transportation demand by implementing programs that favour travel by high occupancy vehicles and other modes	• Encourage higher vehicle occupancy (Commentary C4.8) • Encourage public transport walking, cycling and other sustainable transport options (Commentary C4.9) • Encourage company travel plans (Commentary C4.10) • Modify parking requirements relative to the proximity of public transport (Commentary C4.11). <i>(A case study example is given in Commentary C4.11.1)</i> • Establish transport management associations (Commentary C4.7)
Price orientated	Manage parking by setting appropriate pricing regimes	• Introduce pricing (Commentary C4.12) • Set pricing on what the market will accept (Commentary C4.12) • Cash-out free parking programs (Commentary C4.13) • Tax parking (Commentary C4.14) • Introduce parking levies (Commentary C4.15.1). <i>(Case study examples are given in Commentary C4.15.1 and Commentary C4.15.2)</i> • Create parking benefit districts (Commentary C4.16) • Price relativities for short and long stay parking (Commentary C4.17)
Location orientated	Encourage appropriate use of parking by applying location specific regulation	• Define parking policy zones (Commentary C4.12) • Apply location specific standards (Commentary C4.19) • Introduce permit schemes (Commentary C4.20) • Improve regional / municipal / private sector coordination

Source: ARRB Group

5.4 Consultative Planning and Policy

Stakeholders should be consulted and involved in planning parking policies and programs. Access to knowledge about the parking system and the generation of ownership of and commitment to parking strategies and programs is enhanced through inclusive planning. In addition, the likelihood of promoting efficiency in the management of the overall parking system is increased where the knowledge and commitment of all stakeholders is harnessed.

Stakeholders should be educated about the unsustainability of many current parking practices (Section 2.1) especially where increasing demand in an area or precinct is exceeding the expansion of additional parking supply.

5.5 Time Restrictions, Pricing and Enforcement

Whilst time limits and parking charges provide the means to ensure the turnover of on-street parking spaces in areas of high demand, it should be noted that an increase in parking turnover also results in an increase in traffic volumes and vehicle movements. Whilst the use of kerbside road space for a variety of purposes including vehicle parking is acknowledged as an integral part of a city's life, a proliferation of kerbside parking can lead to significant levels of searching for parking spaces which may disrupt traffic flow, reduce the attractiveness of an area for pedestrians and obviate improvements to streetscapes that would benefit a broad cross-section of different users.

Only the shortest-stay parking requirements for essential private business and commercial motor vehicles should be permitted on inner-city and town centre streets. To encourage medium-stay and longer-stay parking to be satisfied in off-street car parks, time restrictions for kerbside parking should generally be short and enforcement should be actively applied.

Additional information on this topic is provided in Section 8.2.

5.6 Linking Technology to Policy

The availability of a diverse range of technology systems presents significant opportunities for innovation and enhancement in the management control and utilisation of parking. ITS technologies are extensively covered in Section 11 and Commentary 15.

5.7 Parking Precinct Plans

A parking precinct plan is a locally prepared strategic plan that contains parking provisions for an area or precinct. It allows all issues arising in a precinct to be considered and if determined necessary, it can identify specific parking provision rates and reduce or remove the need for potentially complex parking investigations to support individual permit applications. The parking precinct plan is essentially an implementation plan that addresses the overarching parking policy and other statutory mechanisms for an area and provides procedures for evaluating the specific characteristics pertaining to each use.

5.8 Parking Policy Checklist

A checklist may be useful as a guide to the preliminary planning and development of parking policies that support broader transport system and city planning goals (see Commentary 5).

6. Parking and the Environment

When designing parking systems consideration should be given to the aesthetics of the urban environment, the safety and convenience of users and minimisation of the environmental impacts of parking.

6.1 Urban Design Considerations

Large expanses of parked vehicles or paved areas can be quite unattractive and can detract from the character of a street, an area or a development. In order to avoid this situation, surface parking areas should be detached into smaller groups of bays separated by landscaping or other uses or activities especially where parking areas front the street. For this same reason private off-street parking should generally be located at the rear of buildings or in undercroft facilities.

Innovative approaches to parking design should be adopted in order to maintain amenity and encourage the use of parking areas for community activities in addition to parking such as weekend markets, fairs, sporting activities and other entertainment activities.

All parking areas should be paved with consideration given to the appropriate use of surface materials, textures and colours. Paving stones, coloured concrete and other such material may enhance the look of paved areas. Concrete pebbled sections combined with grass can provide a firm base that will blend in with surrounding grassed areas.

Carefully planned landscaping can be used to soften the appearance of car parks and improve the feel of the immediate environment. The use of architectural features such as solid or intermittent brick walls, earth mounds and fences can also help to blend off-street car parks in with the surrounding environment and promote a more user-friendly atmosphere.

The application of good urban design principles can be very effective in shielding deck and multi-storey parking structures to reduce visual impact and in sensitively integrating parking structures into the urban fabric of the street. The design of parking structures should complement the surrounding built form in terms of scale height and character. Parking structures should also be co-located with other building uses such as retail and office space in order to maintain pedestrian interest and activity at street level. Underground parking facilities where land values are high enough to justify the cost, present opportunities for the construction of buildings or parks above the parking levels.

The following general design principles should be promoted where appropriate:

- provide incentives to create more efficient and attractive parking areas e.g. financial and zoning incentives. This could be carried out by the local government as part of the approval process
- encourage mixed-use of parking areas
- apply water-sensitive urban design drainage and stormwater management principles wherever possible
- require landscaping as a component of any car park design
- screen unsightly areas from the public and blend in with the urban fabric of the street
- provide space and facilities to accommodate seating, market stalls, outdoor eating or street entertainment as appropriate
- create continuous active frontages and avoid blank walls, large gaps and expanses of unsightly asphalt
- locate access driveways on minor roads away from intersections and with due consideration of the form and nature of other activity in the street: at the same time ensure that as far as possible, access to parking is in a location which is identifiable and attractive to use
- use consistent construction materials throughout
- prohibit on-site car parking between the footpaths and the fronts of buildings

- require the incorporation of well-designed pedestrian and cyclist service elements inside parking structures and overall connectivity to adjacent land uses
- encourage unconventional landscaping and screening such as fountains, pools, sculpture, benches, plazas, walkways and false facades.

Figure 6.1: Example of aesthetically designed parking structure Manila, Philippines



Source: Abong (2011).

Figure 6.2: Example of aesthetically designed parking structure Oklahoma City, USA



Source: Parking and Traffic Consultants (2010).

Figure 6.3: Example of aesthetically designed parking structure Seoul, South Korea



Source: Sun Namgoong (2012).

Figure 6.4: Example of well-designed landscaping treatment of car park Rome, Italy



Source: Dolza Moto BMW Motorrad

Figure 6.5: Example of well-designed pedestrian service elements inside parking structures California, USA



Source: McDonald (2015).

6.2 Environmental Impacts of Parking

Excessive paving reduces adjacent property values, increases water pollution and stormwater flooding reduces privacy (Nelessen 1994) and can result in a loss of greenspace.

Surface water quality is seriously degraded when 5% of a watershed surface is covered with an impervious surface (Horner et al.1996). Paved surfaces have a 'heat island' effect (Stutz 1995). In fact, research indicates that urban areas are two to eight degrees hotter in summer due to solar gain from dark coloured roads, parking lots and roofs which increases energy demand, smog and human discomfort (United States Environmental Protection Agency 1992).

Cars driving around looking for a place to park add to the amount of air pollution. Exhaust fumes trapped within parking structures intensify the problem. Exhaust fans or open structures reduce the levels inside the structures by spreading the pollutants to the outside. However, this still adds to pollution levels.

Car parking clearly does have environmental impacts and appropriate consideration should be given to ways to ameliorate these impacts in the design of any facility.

Some of the design features of an environmentally sensitive parking design are as follows:

- Reduce the amount of land paved for parking. This can be done through strategies such as cluster development which is a cost-effective solution to developers and communities leading to a net increase in tax revenue (Schueler 1995).
- Use on-site stormwater storage and percolation with the use of natural wetland for filtering (Childs 1999).
- Maximise greenspace through strategies such as preserving trees, streams and shorelines. This approach can also increase property values (Schueler 1995).
- Use paving materials that allow water to percolate and grass to grow.

An example of environmentally sensitive paving materials is shown in Figure 6.6.

Figure 6.6: Example of environmentally sensitive paving material design



Source: Westcon

6.3 Driverless Vehicles

Current consideration is being given to the introduction of driverless vehicles into the parking industry. Driverless vehicles will change how car parks are operated and raise future questions in respect to the following:

- car park design
- connectivity
- car sharing
- future technology.

7. Off-Street Parking

Streets are multi-modal public places that are central to accessibility. To this end wherever possible, off-street parking should be provided for the majority of parked vehicles and on-street parking should be used to mainly support those road users with needs for high levels of access, such as public transport couriers and service vehicles, people with disabilities and emergency services.

This section addresses the location of off-street parking facilities and provisions for road users other than car drivers, special event parking and parking payment systems. It should be noted that other forms of parking such as valet parking also exist but they are not dealt with in this Guide.

The minimum requirements including the design of parking modules, circulation and ramps, access driveways as well as general amenities and additional design requirements for car parking structures are set out in AS/NZS 2890.1:2004 *Parking Facilities Part 1: Off-street Car Parking*. This Section provides additional supporting material to that presented in that Standard. Material in this Guide that differs from AS 2890 is provided where current best practice varies from the minimum standards given in AS 2890.

7.1 The Location of Off-street Parking Facilities Entrances and Exits

Off-street parking systems form an interface between the road network and other land uses. Therefore, parking facilities are best located between the main access route and the land use served.

When locating the entrances and exits of off-street parking facilities consideration should be given to the following:

- the impact that the increased traffic flow may have on the performance of the surrounding roads and intersections
- the likely effects of entry/exit traffic on the safety of pedestrians and other non-motorised road users on adjacent footpaths and bicycle lanes
- the dispersal of entrances and exits to take advantage of existing side streets where possible but not if the side street contains abutting uses that would unduly conflict with the increased traffic likely to be generated by the parking facility
- the location of the parking facility so that pedestrians do not have to walk across an arterial road to get to their destination
- grade separation or pedestrian treatments such as pedestrian refuges, pedestrian 'zebra' crossings or marked signalised foot crossings where heavy pedestrian movements occur across busy circulating roadways
- the location of parking areas close to and having good accessibility to arterial roads in order to minimise traffic intrusion into local street areas.

Where large parking areas e.g. shopping centres occur on major arterial roads, access to parking areas may need to be controlled by traffic signals. Vehicle access treatment should be based on car park size and vehicle turn over/traffic volume. In other cases, it is preferred that car parks be located on intermediate or collector type roads to minimise disruption to major traffic movement:

- entrances and exits of all major parking facilities to be well clear of road network intersections, or designed as major intersections. Sufficient queuing space between choke points (such as ticket gate) and property boundary to prevent vehicles banking up in the street
- placement of parking facilities in the approach direction of one-way streets i.e. so that a car can turn left into it: the ideal arrangement is to place the entrance from a one-way street carrying inbound traffic and exit onto an outbound route.

It should be noted that changes are sometimes made to street patterns and one-way streets may become two-way and vice versa. The prohibition of turns particularly right turns at intersections or entrances may also be introduced for traffic management reasons. Such changes may impact on the entrance or exit of the parking facility. Hence the location and design of parking facilities should be kept as flexible as possible so that they can operate when unforeseen changes take place.

To ensure that the impact on the surrounding road network is acceptable and the requirements of all road users have been considered, it is generally appropriate that a transport/traffic assessment be carried out prior to any approvals being granted, e.g. a Transport/Traffic Impact Assessment (TIA) or a Transport Management and Accessibility Plan (TMAP). An important element of this process is the need to ensure that the design process incorporates an adequate response to any recommended actions.

7.2 Classification of Off-street Parking Facilities

Off-street car parking facilities should be classified according to the type of user as defined in AS/NZS 2890.1:2004 (Table 7.1).

Table 7.1: Classification of car parking facilities

User class	Required door opening	Required aisle width	Examples of uses
1	Front door first stop	Minimum for single manoeuvre entry and exit	Employee and commuter parking (generally all day parking)
1A	Front door first stop	Three point entry and exit into 90° parking spaces only otherwise as for User Class 1	Residential domestic and employee parking
2	Full opening all doors	Minimum for single manoeuvre entry and exit	Long-term city and town centre parking sports facilities, entertainment centres, hotels, motels, airport visitors (generally medium-term parking)
3	Full opening all doors	Minimum for single manoeuvre entry and exit	Short-term city and town centre parking, parking stations, hospital and medical centres
3A	Full opening all doors	Additional allowance above minimum single manoeuvre width to facilitate entry and exit	Short-term high turnover parking at shopping centres
4	Size requirements are specified in AS/NZS 2890.6:2009		Parking for people with disabilities

Source: Adapted from AS/NZS 2890.1:2004.

7.3 Parking Facility Layout

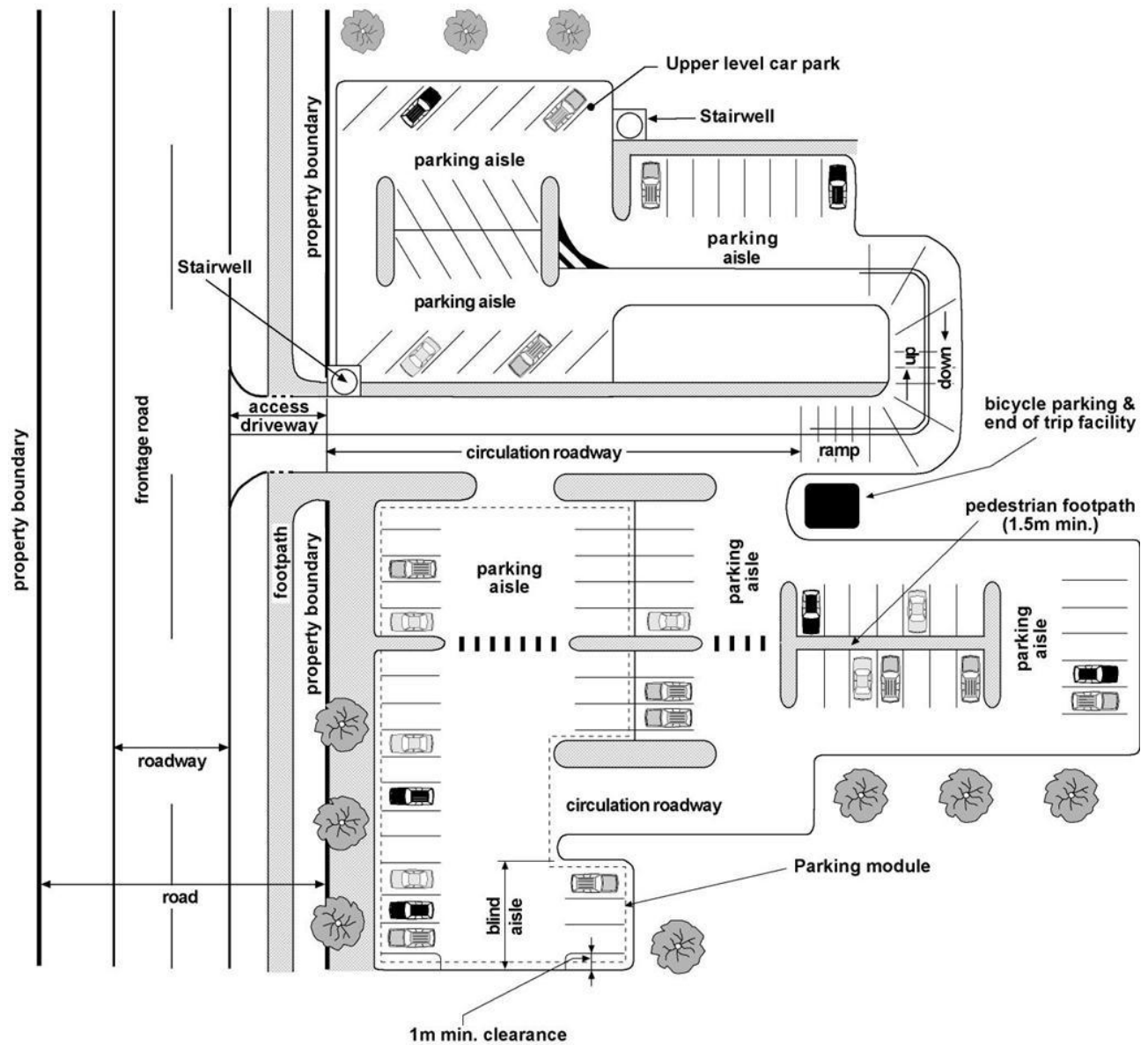
Parking facility elements including parking modules consisting of parking bays and parking aisles, circulation roadways and ramps should be designed in accordance with AS/NZS 2890.1:2004.

An example of an off-street car park illustrating appropriate treatment of car parking elements is shown in Figure 7.1.

It should be noted that small car bays can also be provided in certain circumstances to increase parking efficiency.

[\[see Commentary 6\]](#)

Figure 7.1: Example of an off-street car park layout



Source: Adapted from AS/NZS 2890.1:2004.

7.4 Parking Facility Access Design

7.4.1 Categories of Access Driveways

Access driveways to off-street parking areas are categorised based on the class of parking facility, the frontage road type and the number of parking bays served. These requirements are summarised in AS/NZS 2890.1:2004.

7.4.2 Access Driveway Characteristics

Access driveways should be located in the following areas:

- clear of intersections and other locations of complex traffic movements
- where conflicts with pedestrians and cyclists are minimised
- where bank-up traffic into the street is minimised (refer to AS/NZS 2890.1:2004 for the minimum queuing length at a car park)
- where adequate sight distance to street traffic (including pedestrian and possible bicycle movements) is available.

In general, the width and length of access driveways will be determined from a comprehensive car park analysis. The analysis should take into consideration a number of factors including the total number of peak hour vehicle movements, the proposed number of entry/exit locations, the number of entry and exit lanes including left turning capacity (e.g. slip lanes), the vehicular capacity of the lanes (see AS/NZS 2890.1:2004), pedestrian volumes and any other additional factors affecting access to the car park. In most cases entrances need only be one or two lanes wide as entering traffic flows are limited by single lane turns.

Access driveway design requirements are given in AS/NZS 2890.1:2004. It should also be noted that where two or more exit lanes are provided particularly to arterial roads with high traffic flows, traffic control signals or some other form of traffic control may be required. The Austroads *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings* (Austroads 2013b) covers methods for analysis of these types of intersections. In the absence of a comprehensive car park analysis the access driveway widths given in AS/NZS 2890.1:2004 should be used for the appropriate user category.

7.5 General Amenities and Other Considerations

This section covers the following amenities:

- lighting
- pedestrian treatments
- parcel pick up
- shopping trolley requirements
- signs and pavement markings
- road humps.

It should be noted that this Guide does not cover:

- pavements kerbs fencing landscaping and maintenance – these should be designed in accordance with AS/NZS 2890.1:2004
- drainage – refer to Austroads *Guide to Road Design Part 5: General and Hydrology Considerations* (Austroads 2013c).

7.5.1 Lighting

Lighting of parking areas, access points and pedestrian areas should be undertaken in accordance with AS/NZS 2890.1:2004. In addition, minimum lighting levels for open-air car parks including rooftop areas should be designed in accordance with AS/NZS 1158.3.1:2005 *Lighting for Roads and Public Spaces: Pedestrian Area (Category P) Lighting: Performance and Design Requirements*.

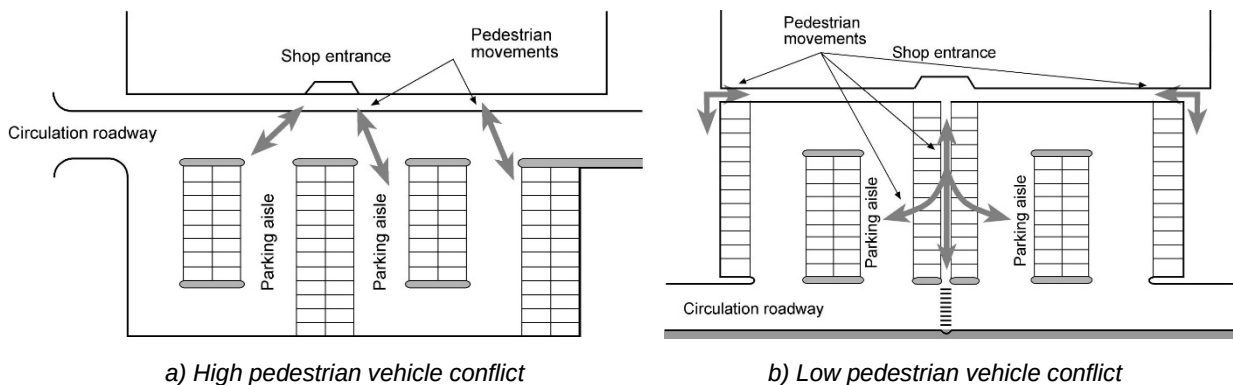
7.5.2 Pedestrian Treatments

The following principles should be considered in parking facility planning to allow the safe interaction of vehicles and pedestrians:

- Pedestrian entrances and exits should be separate from vehicular ones and pedestrian movements should be restricted on circulation roadways since these involve faster moving traffic (Figure 7.2).
- Safe crossing points should be located away from major concentrations of vehicular movement, be positioned at right angles to the traffic flow and be provided at locations with adequate sight distance. Pedestrians should be guided to crossing points using appropriate signs and pavement markings (AS 1742.10:2009 *Manual of Uniform Traffic Control Devices Part 10: Pedestrian Control and Protection* and MOTSAM 1 (NZ Transport Agency 2010a) and MOTSAM 2 (NZ Transport Agency 2010b)).
- Raised pedestrian footpaths can be used in large car parks to separate rows of cars and to provide favourable walking conditions where high pedestrian flows are expected.
- Parking layouts should be planned so that the aisles are parallel with the desired pedestrian routes rather than across them. Otherwise frequent pedestrian links through the rows of parking will be required.

Refer to Austroads *Guide to Traffic Management Part 8: Local Area Traffic Management* (Austroads 2016a) for more detail on pedestrian facility planning.

Figure 7.2: Pedestrian conflicts with different parking layouts



Source: ARRB Group

Figure 7.3 gives examples of good and poor design of a pedestrian facility. In the example illustrating bad practice although a marked pedestrian crossing has been provided for pedestrians across the main circulating aisle outside of the building it has been constructed in such a way that it terminates at a raised island that does not have a sealed smooth surface or a kerb ramp. Anyone who is in a wheelchair or pushing a pram or other wheeled device would find it extremely difficult to negotiate up and over or around this island. Good practice is to provide easily accessible connective pathways along the main pedestrian desire lines through the car park.

Figure 7.3: Examples of good and poor design of pedestrian facilities



An example of a well designed pedestrian facility provided in a shopping centre car park orientated along a significant pedestrian desire line.



This example illustrates poor practice as pedestrians are required to cross multiple surfaces and elevations.

Source: ARRB Group

7.5.3 Parcel Pickup

Parcel pickup areas should be provided in accordance with AS/NZS 2890.1:2004.

7.5.4 Shopping Trolley Requirements

At medium to large shopping centres space within the parking modules should be set aside specifically for trolley storage to prevent patrons from leaving trolleys in aisles or parking bays. In these spaces, trolley corral facilities should be constructed either with kerbs or rails of appropriate dimensions to suit the storage of standard shopping trolleys (Figure 7.4)

Trolley corrals should be located at regular intervals on the shopping centre interface with the parking modules and near the main entries of the shopping centre itself. If well placed shoppers should be able to easily access a corral without extensive backtracking or sideways movement. Ideally trolley corrals should be located on a slight decline so that trolleys pushed in will not roll out into the circulation aisle.

Figure 7.4: Examples of poor (lacking) and good trolley corral design

An example of 'trolley herding' on a major pedestrian spine. This example shows what happens when there are insufficient conveniently located trolley corrals provided in an area.



An example of a 'trolley corral'. This shopping centre has regularly-spaced well-located trolley facilities which encourages their use.

Source: ARRB Group

7.5.5 Signs and Pavement Markings

Suitable signs should be used to direct all car park operations in accordance with the AS/NZS 2890.1:2004 and AS 1742 series in Australia or *MOTSAM 1* (NZ Transport Agency 2010a) in New Zealand. It is noted that in Australia it is acceptable to use signs smaller than those used on roads in car parks as the speed of travel is generally much lower.

Signs and pavement markings are required in car parks for the following reasons:

- to warn against hazards to personal safety or potential damage to vehicles
- to control traffic conflicts, traffic movement and driver behaviour (e.g. speed)
- to direct and inform drivers entering and circulating within the car park about vehicular entry points, exits and parking areas
- to direct pedestrians to amenities such as elevators, stairs, buildings, routes to fire escapes etc. and to identify parking modules to help people find their parked vehicle easily.

It is important to note that in off-street car parks in Australia the term 'Exit' is reserved for signs indicating pedestrian emergency exits. Signs showing a vehicle route to be taken to leave the car park are required to use the term 'Way Out'.

Signs should be clearly visible easy to read and simple to follow and not used excessively as this may lead to confusion.

Pavement markings should be used to delineate parking bays, pedestrian crossings and pavement arrows in accordance with AS 1742, AS/NZS 2890.1:2004 and *MOTSAM 2* (NZ Transport Agency 2010b) as appropriate. Special waterborne acrylic paints should be applied over a newly paved area to prevent paint discolouration. The use of ceramic markers to delineate parking bays is not encouraged as they may pose a tripping hazard.

Figure 7.5: Example illustrating good off-street parking bay delineation practice



Note: In this example illustrating good practice, wide off-street parking bays have been used allowing the delineation of a clearzone between parked vehicles using pavement marking (double/hairpin lines).

Source: ARRB Group

Further information on signs and markings is provided in Section 11.1.

7.5.6 Road Humps

Road humps (or cushions) can be used within car parks to slow down traffic speeds. The type of road hump chosen depends on the location and range of speed reduction required. AS/NZS 2890.1:2004 addresses the application of off-road devices for use in car parks while AS 1742.13:2009 and the Austroads *Guide to Traffic Management Part 8: Local Area Traffic Management* (Austroads 2016a) address the application of on-road devices.

7.6 Specific Requirements of Car Parking Structures

Car parking structures are typically constructed in the following circumstances:

- where the land cost is high and hence it becomes more economically viable to expand parking vertically in a structure rather than horizontally
- where land availability is limited
- where walking distances would be excessive
- where parking is provided as an element of a mixed use development e.g. part of an office complex.

The basic principles for car park design as discussed in Sections 7.1–7.4 are also applicable to car parking structures. This section addresses additional design requirements for car parking structures and briefly describes underground car parks and mechanical garages.

7.6.1 Column Location and Spacing

The dimensions for locating columns in a short span structure and the required clearances between columns and car parking bays are given in Section 5 of AS/NZS 2890.1:2004. The spacing of columns should allow for the additional space that may be required for manoeuvring and passing at bends and intersections. In general, there should be at least three parking spaces between columns. Also columns should not be located at the edge of a parking aisle and directly opposite a car door. The use of flexible material around the columns at these locations should also be considered to minimise impact should vehicles come in contact with the columns.

7.6.2 Headroom

The height between the floor and an overhead obstruction or headroom/overhead clearance should be provided in accordance with the provisions of AS/NZS 2890.1:2004.

7.6.3 Express Exit Ramps

Large parking structures with high turnover or special parking conditions are usually served best with an express ramp for exiting traffic. These ramps can be straight or spiral and provide one-way traffic movement. They improve operating efficiency by reducing travel time but add to structure costs.

7.6.4 Provision for Pedestrians

Statutory requirements for pedestrian access to stairways, lifts and escalators are usually covered in local building codes and ordinances. However, these provisions are usually limited to prescribing maximum exit travel distances to stairs in case of fire. Other provisions catering for pedestrian safety comfort and convenience are as follows:

- The overall design layout consistent with the principles of crime prevention through environmental design (CPTED) is encouraged. This is based on the premise that the design and effective use of the physical environment can produce behavioural effects to reduce the incidence and fear of crime (Crowe 1991). Refer to the relevant state/local government guidelines for more information on these principles (Australian Institute of Criminology 1989).
- Lifts should be constructed in parking structures above three levels high. A wheelchair accessible lift should also be provided in structures that contain parking bays at levels higher than ground level for people with disabilities. Lifts should be prominently marked to make them easy to find.
- Stairways should be located adjacent to each lift or set of lifts and should be prominently signed and marked. Stairways should also be located at the split level in split level car parks to provide pedestrian access between these levels.
- Pedestrians require a protected path of access and a safe and visible route to their parking space. All approaches to stairways and lifts should be positioned to cater for pedestrian safety and security. Also it is useful to label the spaces, columns or rows to enable returning customers to easily find their park thus reducing pedestrian risk.

Figure 7.6: Example of a pedestrian access ramp



In accordance with AS 1428.1:2001 pedestrian/disabled access ramps like the one shown should be provided between car parking levels in parking structures three levels high or less if there is no provision for lifts.

Source: ARRB Group

7.6.5 Underground Car Parking Structures

Underground car parks may be provided where parking demand is high and land availability is limited. The basic principles for car park structure design addressed above still apply but additional emphasis should be placed on signs and markings. Emphasis should also be given to high levels of lighting and other security measures.

Underground structures cost more than aboveground car parks when compared on a 'per parking bay' basis. The difference in cost is due to requirements for excavation, concrete retaining walls, potential continuous dewatering systems, a more extensive lighting system, added air circulation and exhaust systems and a roof slab that is usually designed to support other structures. Hence the number of levels in underground structures is usually restricted to three or four on the basis of cost.

7.6.6 Mechanical Garages

Mechanical garages use machines, lifts, elevators or other mechanical devices to move vehicles from the street to an elevated parking bay and then back to street level.

Mechanical garages have been used for many years widely throughout Europe and North America where the pressures of land availability, cost etc. have been more prevalent. In Australia and New Zealand their use has been very limited to date. However mechanical garages do present new opportunities for the future provision and management of parking particularly in some larger cities like Sydney and Melbourne.

It should be noted that the construction cost of mechanical garages is generally considerably higher than a similar sized ramp access parking structure but nonetheless mechanical garages do have a number of advantages (Beebe 2001):

- Mechanical garages provide an economically viable alternative for parking in congested urban areas as less land area is required for construction.
- Security risks are minimised as parkers do not enter the structure.
- The parking facility can be completely covered by an architectural façade hence minimising aesthetic issues.
- Many mechanical garages require no staff or only a single attendant which reduces labour costs.
- Vehicle emissions, glare and noise are reduced due to short vehicle travel time.
- Disruption is minimised due to reduced construction activity.

Other than construction cost, mechanical garages also have a number of disadvantages including:

- Maintenance problems and possible equipment failure (Pline1999). Chrest et al. (2001) notes that the reliability of mechanical garages has improved tremendously in the last 10 to 20 years as multiple transfer devices, lifts and computers provide backup in the event of failure and sensors detect equipment degradation before failure occurs so that maintenance can be performed.
- The inability to accept surges of inbound or outbound traffic which requires the provision of a large reservoir area and results in slow car retrieval (Pline 1999). Chrest et al. (2001) notes that those problems may be overcome to an extent by the use of multiple lifts and robots that can operate simultaneously using sophisticated computer software.

Access to mechanical parking installations should be by means of driveways and circulation roadways designed in accordance with the requirements outlined in AS/NZS 2890.1:2004. Sufficient vehicle storage should be provided to ensure that vehicle queues do not extend beyond the property boundary of the parking facility under normal operating conditions.

Examples of mechanical garages (Figure 7.7) include those with an access loading area for an underground facility (Trevipark n.d.), car lifting mechanisms (WÖHR Auto Parksysteme n.d.), multi-level structures used as a car display tower (Architonic n.d.) and those with internal turntable devices (WÖHR Auto Parksysteme n.d.).

Figure 7.7: Example of mechanical garages

(a) Underground facility – Italy



Source: Trevipark

(b) Car lifting mechanisms – Germany



Source: WÖHR Auto Parksysteme

(c) Multi-level structures used as a car display – Germany



Source: Architonic

(d) Internal turntable devices



Source: WÖHR Auto Parksysteme

7.6.7 Electric Charging Stations

Plug-in hybrid or electric vehicles (EV) require electric re-charging stations. Parking spaces for electric vehicles require special signing. An example is presented in Figure 7.8. Some parking providers have installed these and some provide the re-charge for a discounted fee.

Figure 7.8: Electric vehicle charging bays – Adelaide City Council – Market Street car park



There are three levels of electric re-charger. The first is a Level 1 15amp 3 pin power point. Level 2 is a three phase 32 amp charger based on 240 V. This is the most common in car parks. It re-charges at a much faster rate than Level 1. Level 3 is a rapid, vehicle specific charger. Many car parks also incorporate charging for electric bicycles.

The cost of installation of each Level 2 re-charge station varies between \$2500 and \$4000, excluding the cost of providing power to the charger.

No provider yet imposes a fee for the re-charge, other than the parking fee if the re-charging station is within a car park. This lack of control can lead to abuse by some drivers who leave their vehicles for long periods at the re-charging station. It is likely that some form of user-pay system will be introduced future.

Adelaide City Council has offered electric car charging stations at several of its UPark car parks since 2010. This was in anticipation that the demand for electric cars would grow on the basis that if there are more places to charge electric cars, more people will buy them and buy into a greener form of transport. Presently, electric car owners pay only the normal car parking charges and the recharge electricity is provided without charge.

The number of electric sedan vehicles registered in South Australia has increased by 217% over six years from 41 in December 2011 to 130 in January 2016.

Brisbane City Council car park customers can park their car in the city and recharge their car for free during business hours in one convenient location. King George Square Car Park is the only car park in the city with this facility which promotes the reduction of CO₂ and pollution. Specially marked bays are located on Level B for this free service. Drivers of full electric and hybrid vehicles pay half the casual parking fee during certain hours.

Examples of electric vehicle charging stations in car parks include Berman (2014) and Neubauer (2012).

7.7 Parking Control and Payment Technologies

The technologies considered below for the management of on and off-street parking are divided into five major categories:

1. Parking control systems (PCS) – ticket machines pay by space or virtual phone-based systems (Section 7.8)
2. Parking payment systems (PPS) – cash, credit card and mobile phone (Section 7.9 and Section 7.10)
3. Parking guidance systems (PGS) – in-ground sensors and wayfinding space indicator signs (Section 11)
4. Compliance – enforcement technologies (Section 7.2)
5. Information systems – integration of the data available from all of the systems into valuable management information to ensure effective achievement of objectives (Section 7.13).

The Guide describes each technology and gives examples of where it is currently installed. It then presents in table format the different technologies and their benefits and drawbacks.

The Guide lists each current supplier, the unique advantages of each and the potential issues associated with the integration of the different technologies.

A detailed consideration of commercial issues related to the supply, installation and on-going maintenance of the technologies has been included.

Estimates of installation and on-going costs associated with each technology over a five-year period have been prepared.

7.8 Parking Control Systems (PCS)

This section describes each technology and clarifies many of the associated terms and acronyms.

7.8.1 Ticket Machines

There are a variety of parking control systems available in Australia and worldwide which can accommodate different needs. The machines are known by different names.

7.8.2 Pay and Display

Pay and Display also known as Ticket Parking machines (Figure 7.9) are standalone machines which are commonly used on-street or in large car parks where drivers park and walk to their closest machine select and pay for the duration of stay they require. The machine produces a ticket recording the time and date of purchase and the expiry time and date. The driver will then display this ticket in a visible location (usually under the windscreen) so that compliance officers will be able to view it during inspections. It is the most common form of on-street ticket parking system in Australia.

Pay and Display is also used in off-street surface and a few deck car parks where boomgates are not practical such as at remote parking facilities for park and ride or for special events.

7.8.3 Pay by Space

Pay by Space machines (Figure 7.10), also known as 'Multi-bay Meters', are similar to Pay and Display except they do not issue a ticket but require the driver to insert their parking bay number and then pay for their selected time. Drivers pay for the duration of stay at the closest machine according to the parking bay number marked on the ground (or otherwise displayed). Pay by Space is a greener option than Pay and Display as it does not produce tickets and requires less maintenance because of less moving parts.

Most manufacturers of Pay and Display also offer Pay by Space and Pay by Plate (Section 7.8.4).

Figure 7.9: Pay and Display machine (Cambridge WA)



Figure 7.10: Pay by Space machine (Melbourne VIC)



Figure 7.11: Mobile phone parking app (Perth WA)



Source: ARRB Group

7.8.4 Pay by Plate

Similar to Pay by Space these do not issue a ticket. The machine requires an alphanumeric key pad which allows drivers to type in their vehicle registration number then select and pay for the duration of stay they require. Tickets are not issued. An example of a Pay by Plate machine can be seen in Advanced Parking Solutions (n.d.).

7.8.5 Virtual Phone-based Systems (Apps)

Virtual phone-based systems are also known as 'ticketless systems'. This is a payment by mobile phone that can be added to many electronic parking pricing systems. The mobile acts as a meter recording the commencement time and counts down the duration of stay according to the payment made.

Mobile phone-based applications (apps) (Figure 7.11) allow drivers to top-up payment to extend their duration of stay which is beneficial for unexpected or unpredicted situations where the drivers require more time for parking. This would only be allowed where the top-up does not exceed any time restrictions. The system can alert drivers of the expiry of their parking by phone call or SMS.

7.8.6 Single Space Electronic Meters

Single space meters which have been in operation since 1936 allow payment for a single space. New electronic meters accept payment by cash and other means but the systems are inflexible, unsightly and rarely used in Australia. They are however often used for paid motorcycle parking.

An example of a single space meters is those in operation in Canberra ACT (Roemmele 2011).

7.9 Parking Payment Systems

7.9.1 Cash

In NSW on-street parking machines must offer payment by coins. Sometimes payment by notes is practical where fees are high such as for all day parking.

7.9.2 Credit Card

Credit card requires a third party 'gateway' to process the card data to a bank for delayed payment to the council. As new encryption and security requirements are regularly evolving, software upgrades are necessary for existing machines and likely to require retro-application to newer machines. Credit card payment requires implementation and an understanding of Payment Card Industry (PCI) standards and Europay Mastercard and Visa (EMV) requirements. These terms are explained in Section 7.10.

An example of a wave and pay available on a parking meter operating in Westminster UK may be seen in ITS International (2011).

7.9.3 Mobile Phone

Mobile phones can be used solely as a form of payment. Once a driver has registered their mobile phone number with a supplier (which implies linking it to a credit card), the driver avoids the need for small change or payment by credit card.

7.9.4 Mobile Phone Only

Parking control and payment machines can be replaced by mobile phone only technology. At Curtin University students can only park their authorised vehicle by using their mobile phone. The system eliminates the need for tickets, permits or boomgates. It assumes every user has a mobile phone and has pre-registered their vehicle. Thus it is unsuitable for visitor or public parking at the university or other public parking environment where not all drivers can be expected to have an iPhone that will allow payment.

Figure 7.12: Single space parking meter offering pay by phone option (Vancouver Canada)



Source: ARRB Group

Figure 7.13: Mobile phone only parking



Source: Curtin University (2013).

7.9.5 Near Field Communication (NFC)

A Near Field Communication (NFC) parking system uses special stickers posted onto pay and display machines in parking locations that allow NFC-enabled smart phones to pay for parking using the tap and go principle. The NFC stickers have a passive electronic chip which does not require a battery and stores information such as the unique parking space location number. This data can be read wirelessly by any NFC-enabled phone.

7.9.6 Virtual Permits

This uses a Pay and Display ticket parking machine not just to issue tickets but also to issue resident/business permits as well. Residential business loading and other parking permits can be purchased by pre-registered authorised users directly from the machine. This saves on council administration time and provides convenience for customers who can purchase a permit at any time similar to an airline check-in.

The machines can also be used to pay infringements.

Figure 7.14: Virtual permit example (Milton Keynes UK)



Source: Cobalt Telephone Technologies (2012).

7.9.7 QR Code

QR codes are optical machine readable labels that read faster and have greater storage capacity than standard bar codes. They are commonly used on airline boarding passes. They are particularly useful for scanning by mobile phones and can be used to allow phone payment for on-street parking or authorised entry into off-street car parks or for registered parking permit holders to park for free.

7.10 Payment Compliance Requirements

7.10.1 PCI Compliance

PCI DSS is the acronym for Payment Card Industry Data Security Standard. It was formed and implemented by the major credit card brands to protect cardholder data by maintaining an information security policy and a risk management program.

PCI Compliance requires bank card issuers and merchants to manage cardholder data securely and to ensure that third parties who store, process or transmit cardholder data have adequate security and risk management procedures. An organisation such as a car park operator or a property owner can no longer simply rely on the hardware or software of the payment processing equipment to ensure security. In particular, the organisation is required to ensure that cardholder details and numbers are not retained or sent unencrypted.

For example, if a customer sends an email, fax or letter querying a payment, the operator or organisation should have a procedure to ensure any sensitive data is deleted.

The whole issue of PCI compliance is constantly evolving and there is no single standard or benchmark.

Firstly, the parking equipment hardware and software must provide the necessary encryptions and when the system is queried or any reports are obtained, only the first 4 and last 4 digits are to be made available. This is fairly standard now especially with equipment that is manufactured in Europe.

Secondly if the equipment supplier also offers to process the credit card payments or a third party gateway is used they too must also provide a PCI Certification of Compliance.

Of far greater importance and difficulty is the establishment of procedures by the parking provider to ensure compliance with all the requirements of PCI auditors. This requires stringent procedures in regard to handling, recording and shredding every piece of paper that is obtained from the equipment or from the banks or from parkers querying payments. Procedures are to be in place and enforced so that no information is recorded on a C Drive or in any other form. For example, if a parker emails or sends in a payment query and states their credit card number in the correspondence, there needs to be a procedure to ensure this information is handled and destroyed/deleted. If credit cards are being processed by a third party, then their systems and their locations need to be fully PCI compliant as part of the audit process.

It is important to ensure all of the internal processes and location procedures are in place in order for ACC to be PCI compliant with all types of parking equipment installed. Mere encryption by the hardware devices and the reports generated by the parking equipment is not enough on its own.

7.10.2 Cashless EMV Payment Systems

EMV is the acronym for Europay MasterCard and Visa a global standard for authenticating credit and debit card transactions in particular those where a signature cannot be obtained such as the use of contactless cards ('PayPass, PayWave, ExpressPay') at a parking meter.

EMV is being phased in across the world under names such as 'IC Credit' and 'Chip and PIN'. In Australia all new and existing payment machines that accept Mastercard must be made EMV compliant in accordance with a timetable. VisaCard has a similar but slightly different timetable.

Councils must ensure EMV compliance in any new payment technology that is purchased and if necessary will need to retrospectively fit compliant readers to existing credit card enabled meters. This will need to be implemented according to a different roadmap provided by the banks. All new ticket parking or similar machines purchased in Australia with a credit card facility must be EMV compliant. EMV compliance will also require a small increase in credit card transaction fees.

7.11 Parking Guidance Systems (PGS)

These have a dual purpose. Firstly, they supply data to parking information devices such as apps or variable messaging signs providing parking or wayfinding information. Secondly the data is used by enforcement officers to determine whether and how long a vehicle has been parked in a particular space. Both purposes assist in reducing congestion and improve the efficient management of parking.

7.11.1 In-ground Sensors

In-ground parking bay sensors also known as PODS (parking occupancy detection systems) are underground embedded devices which detect the presence of a vehicle in a designated area. They record the arrival and departure time of the vehicle and transmit this data to a central server which collates the data and forwards it to the parking guidance system or other device. They are often integrated with hand-held devices to inform compliance officers where vehicles have overstayed.

7.11.2 Parking Guidance

Parking guidance can take many forms but the term refers to signage and information which assists drivers to find available parking and inform them on the availability of vacant spaces.

Parking guidance can vary from a simple directional arrow to a sign with real-time information on parking availability to the provision of the data on an app or an in-car device. Examples are shown in Figure 7.15.

Fremantle, Claremont and North Sydney Councils and many large Westfield shopping centres have installed detailed parking guidance systems which advise the location and number of spaces available both on and off-street in particular precincts.

7.11.3 Variable Message Signs (VMS)

Variable message signs (Handsfield 2014) can be used for multi-purposes such as daily parking guidance or special event management. They allow the display of numbers and also multiple messages in short sentences on different slides.

7.11.4 Space Counting Systems

On-street space counting uses in-ground sensors (PODS) to provide real time occupancy/vacancy information and guidance to drivers prior to entering a car park or a parking precinct. It improves parking utilisation and directs drivers to empty parking bays before they arrive at their destination. This reduces 'cruising' for a space and associated queuing and congestion. An example of a space counting variable message sign is provided in Figure 7.16.

In order to provide maximum value a precinct based parking guidance system will need to incorporate all car parking in the precinct. Data will be required from on-street spaces and from off-street car parking operators who will all benefit from up-to-date information available to drivers. Fremantle City Council has secured the cooperation of private car park owners to its new precinct-based parking guidance system.

Figure 7.15: Parking guidance examples (North Sydney NSW and Claremont WA)



Figure 7.16: Space counting variable message sign (Nottingham UK)



Source: ARRB Group

7.11.5 Parking Apps

Apps provide real time information on parking availability and other information such as fees and operating hours. Australian car park operators now offer i-Phone apps which allow customers to search for car parks by location operating hours and surrounding attractions. They provide the user with a map and directions to the car park.

While the use of a mobile phone while driving is illegal, many drivers use apps to pre-plan their trips or obtain up-to-date information from an app or an in-car device while driving. Parking apps can be designed to provide verbal directions.

The most sophisticated parking app in Australia is offered by the City of Perth. It has received an Excellence Award from the Parking Association of Australia (2003).

Unfortunately, all of the current Australian apps are deficient in one significant respect; they only provide information on the car parks operated by the provider and not on any other parking located on-street or nearby.

To avoid this problem and to provide an excellent level of service to all drivers planning to park in the city centre, a city will need to integrate the availability of all public parking bays in the city centre into the city's parking app. This will require negotiation with other providers.

7.12 Enforcement Compliance

The current method of monitoring compliance in many councils by chalking a tyre is antiquated inefficient and labour intensive. While Pay and Display or similar machines reduce the labour cost by almost 50% not all parking bays will be subject to user pay. There are several technologies that can be used to improve the level of compliance and reduce the costs of monitoring and enforcement at all bays.

7.12.1 Hand Held Devices (Handhelds)

These assist enforcement officers to monitor vehicle parking compliance with the regulations and restrictions in each bay. They not only issue and print an infringement, they can take a picture of an offending vehicle, record a conversation with a driver and check back to base data for the vehicle's history of offences.

New devices automatically pinpoint their location and pre-populate an infringement notice making them far quicker and easier to issue. An example is shown in Figure 7.17.

7.12.2 Mobile Camera Only Systems

This is a camera which records vehicle registration numbers and is mounted on vehicles which travel along streets recording the date and time of parked cars. Also known as Licence Plate Recognition (LPR) or automatic number plate Recognition they are commonly used for enforcement.

Licence plate recognition is gaining prominence for detecting occupancy and compliance. The programs are data-driven and use occupancy data to determine rates in different neighbourhoods to record parking turnover and to pass on information about violators to parking and information officers. Additionally, the occupancy data can be relayed to web interfaces and smartphone applications for end users to access. An example is shown in Figure 7.18.

Figure 7.17: Hand held parking enforcement equipment (Melbourne VIC)



Figure 7.18: Mobile Licence Plate Recognition (Melbourne VIC)



Source: ARRB Group

7.12.3 Fixed Camera Systems

Fixed CCTV cameras are used in many cities not only for security purposes but specifically to monitor the illegal use of restricted areas such as bus-lanes and taxi and loading zones.

These cameras improve compliance by providing evidence of unauthorised use contrary to posted signage. They are an inexpensive and reliable security and monitoring device. An example is shown in Figure 7.19.

Figure 7.19: Street focused CCTV



Source: ARRB Group

7.13 Information Systems

The greatest challenge in the implementation of new parking technology is the integration of the different systems because of the wide variety of hardware and software platforms used by the different manufacturers. The available technology includes many different hardware sensors, dynamic messaging systems and traffic control devices, wireless telecommunications systems, computer servers and hardware drivers and application interfaces. In addition, customers use many different devices as well such as parking tag transponders, licence plates (some of which are machine readable), mobile smart phones and embedded telematics systems. Connecting all of these devices from many vendors and tying them together into one platform is the greatest challenge in reducing the cost and complexity of parking management.

There are currently few sophisticated fully integrated hardware-intensive parking systems but they are being developed and applied in Australia.

The manufacturers and Australian local agents of the different technologies described above seldom supply more than a few integrated products. These are often from different manufacturers which are very protective of their source code and proprietary software. Thus it is important to ensure the required level of integration of the various hardware and software items and particularly the reporting from each type of technology. There are a number of manufacturer independent Australian companies that have expertise in such integration. They are equipment agnostic and specialise in integration of parking system data.

Apps such as Ubipark has been created to interface the different technologies used for a city's parking management. It provides programs for local government to formulate one set of reports across all technologies.

7.14 Technology for Unpriced Parking

Not all parking bays will be subject to 'user pay' however in order to provide current information on availability and ensure effective and compliant use of the bays technology is still important.

As on-street parking is only one component of a city's parking solution, it is desirable where possible given private and public parking assets, that guidance compliance and other technology should consider both on and off-street parking to ensure that integrated and comprehensive parking information is collected and relayed. This will ensure that the whole parking network operates in a more efficient manner. All parking providers need to be persuaded on the benefits of providing their data to a central system to inform drivers.

Further detail on new technologies for parking payment is given in Commentary 16 (Commentary C16.3 and Commentary C16.4).

7.15 Parking Provisions for Other Road User Groups

It is important to consider road users other than cars when determining off-street parking provision. These may include the following vehicle/user groups:

- trucks
- buses and coaches
- motorcycles
- people with disabilities
- bicycles
- caravans, trailers and recreational vehicles
- emergency vehicles
- taxis
- special purpose uses.

Parking provision for the above groups is discussed in Sections 7.15.1 – 0 below. Readers are encouraged to refer to Section 8.9 for information on on-street parking provision for other users.

7.15.1 Trucks

The minimum requirements for truck parking design are set out in AS 2890.2:2002 *Parking Facilities Part 2: Off-street Commercial Vehicle Facilities* in Australia and relevant district plans in New Zealand.

7.15.2 Buses and Coaches

Bus parking areas such as coach parking and layover areas should be designed to satisfy the specific needs of rigid and articulated buses. Bus parking may generally be treated in the same manner as truck parking (Section 7.15.1).

7.15.3 Motorcycles

Motorcycle parking bays in off-street locations are usually provided in groupings in response to demand e.g. near educational institutions, entertainment areas, shopping centres etc. Exclusive parking bays for motorcycles may be provided free, time restricted or controlled by parking meters in accordance with AS 1742.11:2016. Refer to AS/NZS 2890.1:2004 for design detail. An example is shown in Figure 7.20.

Figure 7.20: Example of off-street motorcycle parking



Source: ARRB Group

7.15.4 People with Disabilities

People with disabilities find some activities more difficult to manage than other people. They need to park their vehicles as close to their destination as possible. They also may need extra space for wheelchairs and walking aids. This is why specially designed parking bays with special access provisions are needed for people with disabilities.

Parking requirements for people with disabilities should be in accordance with AS/NZS 2890.6:2009.

This section addresses the parking provisions and summarises general parking considerations for people with disabilities in Australia only. It should be noted that all the requirements also apply to car parks that do not ordinarily provide self-parking bays such as valet/attendant parking and mechanical garages.

Disabled parking permits are issued through planning or road agencies, local councils or ACROD. Note that different types of permit categories may be applicable.

The slip resistance of all areas should be a minimum Class W (wet pendulum test) as specified in AS 4586:2013 *Slip Resistance Classification of New Pedestrian Surface Materials*.

Refer also to AS 1428.1:2001 *Design for Access and Mobility – General Requirements for Access – New Building Work* and NZS 4121:2001 *Design for Access and Mobility: Buildings and Associated Facilities for the Design of Ramps and Walkways for People with Disabilities*.

Signs and pavement markings

Australian Road Rules – Rule 203 requires disability parking sign or pavement marking in parking for people with disabilities. All signs used to identify parking for people with disabilities should include the international symbol of access as specified in AS 1428.1:2001 or Symbol No S22 in AS 1743:2001. A disabled access sign at the entry point, direction signs for navigating people to parking should be used throughout.

Lighting

Lighting of parking bays and pedestrian access paths for people with disabilities should conform to AS/NZS 1158.3.1:2005 – (category P) for outdoor car parks and AS/NZS 1680.2.1:2008 for enclosed car parks.

Location of parking bays

Parking bays for people with disabilities should be located as close as possible to the wheelchair accessible entrance to the building or facility that the car park services or to a wheelchair accessible lift or ramp. The building entrance or the lift/ramp should be accessible by a clearly identifiable continuous pedestrian path of travel from the parking bay in accordance with AS 1428.1:2001. The parking bays shown in Figure 7.21 are well-located and provide excellent wheelchair access to the building.

Parking bays for people with disabilities should also be located so that people getting into/out of vehicles and moving towards/away from the vehicles who may be at risk from passing traffic can be seen by approaching drivers so that they can avoid conflict.

Refer to Section 5.2 for information on parking policy objectives regarding people with disabilities.

Refer to Section 8.9.4 for information on parking provision for people with disabilities for on-street parking.

Figure 7.21: Example of a well-located parking bay for people with disabilities



Source: ARRB Group

7.15.5 Bicycles

Bicycle parking facilities should be designed in accordance with AS 2890.3:1993 *Parking Facilities Part 3: Bicycle Parking Facilities*, Transit New Zealand (2008) and Austroads (2016d) as appropriate.

Disability Discrimination Act 1992 compliance needs to be incorporated into the design for bicycle parking facilities.

Planning codes and policies in various jurisdictions may contain certain mandatory requirements for bicycle parking and other end-of-trip facilities such as showers and lockers in new developments. These facilities may also be installed as a result of the outcomes of local strategic bicycle plans, urban planning strategies or based on specific needs.

General requirements of facilities

In general, every bicycle parking facility should satisfy the following requirements:

- be safe for all users of the designated space, securely fixed and conveniently located for users
- accommodate and support a standard bicycle with sufficient space so as to minimise damage while parked and during movement into or out of the parking space
- do not obstruct or hinder pedestrian access ways, loading zones, public help access points, fire hydrants, fire escapes, areas adjacent to accessible car parking as required by AS/NZS 2890.6:2009, and the like
- include a minimum of 20% of ground level (horizontal) bicycle parking devices (BPDs) in any bicycle parking facility
- enable wheels and frame to be locked to the device without damaging the bicycle
- be placed in view of staff, customers and passers-by or covered by CCTV cameras
- be located outside pedestrian movement paths, segregated where possible and possibly allowing extra footpath width in anticipation of cycles chained to poles
- be easily accessible from the road
- be arranged so that parking entries and exits will not damage adjacent vehicles
- be protected from manoeuvring motor vehicles and opening car doors
- be as close as possible to the cyclist's ultimate destination
- be well lit by appropriate new or existing lighting
- be protected from the weather
- be attractive and designed to blend in with the surrounding environment
- be appropriately signed
- be well-maintained and kept free from graffiti: it should be noted that recurring maintenance costs should receive as much consideration in budgeting as the initial construction and installation costs
- convenient cut-down crossing (pram/kerb ramp) near bicycle parking facilities should be provided.

Monitoring of demand/use should be carried out regularly in order to determine the effectiveness of the end-of-trip facility.

Information on the location of parking, types of parking and signs and pavement markings used is given in Commentary 9 (Commentary C9.1, Commentary C9.2 and Commentary C9.3 respectively).

[\[see Commentary 9\]](#)

7.15.6 Caravans, Trailers and Recreational Vehicles

Caravan, trailers and recreational vehicles parking areas should be designed to satisfy the specific needs of their users. They may generally be treated in a similar manner as truck parking with regard to swept path templates, circulation roadways and access roadways (see AS 2890.2:2002).

The parking bays shown in Figure 7.23 are of suitable dimension and have been flexibly designed to allow one 'car with trailer' bay to be shared by two separate cars when needed.

Refer to Section 8.9.6 for information on parking provision for caravans, trailers and recreational vehicles on-street.

Figure 7.22: Example of well-designed car with trailer bay



Source: ARRB Group

7.15.7 Emergency Vehicles

Australian and New Zealand road rules provide an exemption from parking restrictions for emergency vehicles provided the driver is taking reasonable care and it is reasonable that the restriction should not apply.

7.15.8 Taxis

The design of taxi ranks should be treated in the same manner as the design of standard car parking bays. If designated taxi bays are provided they should be located close to the entrance of the building or buildings which the taxi rank is servicing and should be visible from the access driveway and/or frontage road.

7.15.9 Car Share

Car share or short term car rental is increasing in many urban areas. Companies such as Flexicar, Go-Get and GreenShareCar require convenient access to parking in inner city residential areas. A recent report (Phillip Boyle & Associates 2015) found many transport environmental and financial benefits of car share including a reduction of nine privately owned vehicles for each car share vehicle. The City of Sydney has found economic benefits of car share outweigh costs by a ratio of 19:1. It is generally accepted that on-street parking for car share should not be provided free of charge.

Figure 7.23: Goget car



Source: ARRB Group

7.15.10 Other Special Purpose User Parking

Special purpose parking can be provided to meet the special needs of particular road user groups. One example is 'parents-with-pram' parking which is provided at many retail centres in acknowledgment of the additional manoeuvring space required to get prams in and out of vehicles whether it be through the side doors or the rear of a vehicle. If parents-with-pram bays are provided they should be located close to building entrances, appropriately signed and should be a minimum of 0.5 m wider than the standard dimension space for the relevant user class.

Figure 7.24: Example of 'parents-with-pram' signs in a shopping centre car park



Source: ARRB Group

It needs to be acknowledged that such restrictions are not enforceable under the road rules however parkers are usually courteous about complying with them.

7.16 Special Event Parking

The following parking requirements should be considered for special event sites:

- A comprehensive special event parking access and traffic management plan should be prepared for each event. It should be provided well in advance to event organisers. Parking and access options during the event should be clearly communicated to event patrons on the city's website.
- The direct costs of implementing and managing the event parking access and traffic management plan should be recovered in advance from event organisers.
- Many sites adopt a zero tolerance approach to parking compliance for an event.
- There should be adequate signposting of parking areas.
- No-Stopping or No-Parking zones should be implemented on streets and verges in nearby areas (if applicable) to restrict special event parkers from affecting the amenity of residents in those suburbs or business/commercial operations.
- Traffic management plans may need to be submitted to the local council or other responsible authority.
- Traffic marshals may be required to direct drivers to parking areas.
- The supply of parking in a CBD location will be less than in a suburban location because of the availability of better public transport and the ability to use nearby parking facilities to meet a portion of demand.
- Temporary bicycle parking can be provided with the help of volunteers or local assistance and is a space-efficient solution to reducing traffic congestion associated with events.
- Due to large volumes of pedestrians moving about it is important to ensure adequate separation of vehicles from pedestrians especially at vehicle access driveways.
- Efforts should also be made to minimise the exit time through appropriate design of the parking facility and payment means such as Pay-on-Entry or Pay-on-Foot systems.

8. On-Street Parking

On-street parking in urban areas is a valuable commodity with fierce competition for parking on streets with high demand which requires effective enforcement to manage kerbside space. Well-planned on-street parking facilities for cars can provide valuable short-stay parking space. However plentiful on-street parking or complicated parking restrictions can lead to significant time being spent searching for parking spaces adding to traffic circulation and disrupting traffic flow.

As a general rule the regulation and use of on-street parking should be prioritised to support those road users with needs for high levels of access such as pedestrians, public transport, taxi operators, car share couriers and service vehicle users, people with disabilities and emergency services. Section 8.2 outlines the principles for allocation of road space in more detail.

On-street car parking design requirements are dealt with in Austroads *Guide to Road Design Part 3: Geometric Design* (Austroads 2016c). The minimum requirements for on-street parking design are set out in AS 2890.5:1993 *Parking Facilities Part 5: On-street Parking*. This section provides additional supporting material to that presented in that Standard. Material that differs from AS 2890 is provided where current best practice varies from the minimum standards and it is desirable that more generous dimensions apply.

8.1 Priorities for the Use of On-street Space

Priorities for the use of kerbside space should essentially be established in the public interest.

Traffic routes/arterial roads should favour the needs of moving traffic and parking. Hence the prohibition of kerbside parking is generally necessary on high volume or high speed roads (≥ 60 km/h) to protect motorist safety and amenity unless adequate clearance is provided between the parking and trafficable lane in accordance with AS 2890.5:1993. Numerous studies of parking on arterial roads show that removing parking from arterial roads reduces crashes and hence reduces crash costs (Morgan 2002).

Collector and local streets may permit parking especially where off-street space is not available. On-street parking can also be used as an environmental and amenity tool to discourage aggressive driving.

In order to determine whether parking should be permitted on the street the following factors should be taken into account (Valleley 1997):

- safety
- road type or function
- road location
- type of frontage activity/land use pattern
- traffic flow characteristics
- public transport and bicycle requirements
- availability of off-street parking
- visual impact
- service vehicle, emergency vehicle and access driveway requirements.

There are a number of strategies available for managing parking on arterial roads (Commentary 11).

[\[see Commentary 11\]](#)

8.1.1 Kerbside Lane Management

Time restrictions, pricing and enforcement

Whilst time limits and parking charges provide the means to ensure the turnover of on-street parking spaces in areas of high demand, it should be noted that an increase in parking turnover also results in an increase in traffic volumes and vehicle movements in city streets. Whilst the use of kerbside road space for a variety of purposes, including vehicle parking is acknowledged as an integral part of a city's life, a proliferation of kerbside parking can lead to significant levels of searching for parking spaces, which may disrupt traffic flow, reduce the attractiveness of the city for pedestrians and obviate improvements to streetscapes that would benefit a broad cross-section of city users.

Furthermore, only the shortest-stay parking requirements for private motor vehicles should be permitted on inner-city streets. To encourage medium-stay and longer-stay parking to be satisfied in off-street car parks, time restrictions for kerbside parking should generally be short and enforcement should be actively applied.

Both the absolute amount of, and the relativity of prices, for different types of parking are important aspects of overall parking strategy for a city. Relative pricing structures should ensure that a premium is paid for short-stay on-street parking. On-street parking therefore should cost more than off-street parking for the same length of time.

Kerbside lane management plans

For proposed new developments the land use/transport system interaction is administered through planning schemes and the interests of affected persons are protected through rights of appeal and other legal processes. However, in Australia no such right of appeal exists in situations where road agencies are considering the implementation of clearways or parking restrictions.

The implementation of clearways or parking restrictions can adversely affect the viability of some businesses which directly abut arterial roads; typically convenience stores such as milk bars/delis, newsagencies and take-away food shops that rely on passing trade and operate on small margins. Patrons of these businesses usually park for a short time and if convenient parking is removed are likely to seek alternative suppliers. In addition, patrons are unlikely to use alternative off-street parking because of the increase in time to undertake their business.

Clearways and parking restrictions are normally implemented in consultation with local authorities. Implementation is often accepted along arterial roads that have abutting residential development but proposals through strip shopping centres are often strongly opposed.

A kerbside lane management plan (KMP) is the plan that describes a proposed kerbside lane management scheme over a given length of arterial road. Although there is no legal requirement to prepare a KMP in a given situation it is good practice.

A KMP should contain the following elements (Holdsworth 2001):

- a technical traffic engineering assessment of need
- documentation of factors relevant to assessing potential impacts
- development of desirable future land use objectives
- investigation of opportunities for staging and compensating actions
- the integration of a KMP into a more comprehensive preliminary local area management plan (LAMP)
- identification of necessary planning and implementation processes.

More information on the relationship between a LAMP and KMP and a summary of the planning process for assessment of KMPs is discussed in the Austroads *Guide to Traffic Management Part 5: Road Management* (Austroads 2014).

Economic evaluation of kerbside lane parking

The Parklane Model V2.0 was developed by Austroads to provide a tool that would help planners and traffic engineers to assess the benefits of parking controls on arterial roads. In planning for parking there had been implicit recognition of a trade-off between the value to traffic flow of being able to drive in the kerbside lane and the value of parking to adjoining land occupiers. However, this trade-off had not generally been supported by comparative economic evidence. Hence a model was developed to undertake quantifiable analysis of the value in alternative uses of kerbside lane space.

The model is reported in Austroads (2002b) and may be used as a tool for investigating the use of kerbside lane space for parking on urban arterial roads.

Refer to Section 8.10 for more information on parking control measures.

Figure 8.1: An example of kerbside parallel parking



Source: ARRB Group

8.2 General Priorities for Allocation of Parking Space

The provision of on-street parking should support the primary activities and land uses in a street. The general priorities to be applied when determining how best to meet competing demands for kerbside space are given below:

- Parking can affect traffic safety and the amenity of road users and adjacent properties. Safety of all road users should be given priority at all times when considering parking and stopping of vehicles. This requirement includes issues such as intersection visibility, the visibility of pedestrians and the obstruction of traffic lanes.
- Bus stops, taxi stands, loading zones and parking for people with disabilities should be provided where necessary to assist road users with limited transport options.

- In addition to the above the following principles should apply:
 - In commercial areas parking associated with business should take priority. This includes short-term parking for clients or customers. Parking spaces should be allocated on the basis of the most sought after spaces being available to the greatest number of people by the graduated use of time limits.
 - In industrial areas depending on the extent of off-street parking, priority is given to short-term parking for clients and long-term parking for employees in order to avoid a spill of all-day parking into adjacent non-industrial areas. No Stopping restrictions may be necessary to ensure that heavy vehicles can access driveways into off-street service areas. Australian Road Rules already apply No Parking restrictions to all driveways.
 - In residential areas preference may be given for resident parking in accordance with the state regulations and local guidelines for resident parking permit schemes. This can be done by implementing time-limit parking for vehicles other than those displaying resident parking permits or by implementing a permit zone for the exclusive use of vehicles displaying special permits.

8.2.1 Parking Hierarchy

When different parking user groups are competing for the same parking space and demand exceeds the supply, there occurs a saturation of parking facilities. There needs to be recognition of different user priorities through the introduction of a parking hierarchy.

The objectives of the parking hierarchy are to:

- uphold the safety and convenience of all road users
- encourage the use of alternative transport modes such as walking, bus, train and cycling
- promote equitable and transparent allocation of parking spaces across all user groups
- facilitate consistent decision-making regarding parking infrastructure.

8.2.2 Parking User Groups

To enable equitable sharing of parking resources, it is necessary to identify all the different parking user groups in a commercial centre or precinct and prepare a parking hierarchy. The parking hierarchy assumes there are no other competing interests for the kerbside or off-street parking spaces e.g. pedestrian paths and footpath trading or eating, bus priority or cycle lanes. The following describes different parking user groups their definitions and priority requirements.

8.2.3 Public Transport

Parking restrictions are applied to indicate a bus or taxi zone specifically reserved for these vehicles/users. This user group should generally have priority when considering kerbside allocation.

8.2.4 Loading

Service vehicles are vital to the operation of a commercial centre. They should have a high priority for the allocation of a limited number of on-street parking spaces. However, planning requirements should ensure all new developments provide for service vehicles within the development itself. Loading zones should not be provided unless off-street loading facilities are not available.

They should cater for the needs of legitimate goods-carrying vehicles only. These vehicles are usually permitted to stand in a loading zone for 30 minutes while engaged in picking up or setting down goods. Proper enforcement is necessary to prevent loading zones from becoming private parking for owners or staff of commercial businesses. Private use motor vehicles should not be entitled to park in loading zones during business hours but signage should clearly permit shared parking (short-medium stay parking) after hours.

Consideration should be given to clearly signing loading zones to allow free parking in the evening and on weekends.

8.2.5 Disability Permit Holders

The Australian Disability Parking Scheme helps eligible people park nearer to their destination. Disability permit holders are entitled to park:

- in any space provided for a person with a disability in an on-street or off-street parking location such as shopping centres, hospitals etc.
- in local government metered or regulated parking areas on-street for double the maximum time allowed as follows:
 - a. if the time limit on the sign:
 - i. is less than 30 minutes; 30 minutes; or
 - ii. is 30 minutes or more but 1 hour or less; 2 hours; or
 - iii. is more than 1 hour; twice the period indicated on the sign; or
 - b. if another law of this jurisdiction permits the driver to park for a longer period; the longer period.

Spaces allocated for persons with a disability should be given particular priority in the immediate vicinity of uses that have a high demand for disability access such as medical facilities. Wherever possible parking bays for the disabled should be located off-street to provide additional convenience and safety to the driver.

8.2.6 Drop-off/Pick-up

Short-term parking for drop-off/pick-up (e.g. 5–15 minutes parking) should be given priority in premium parking locations in close proximity to some facilities such as at schools. Enforcement should ensure the turnover of this parking.

8.2.7 Short to Medium-stay

Short to medium-stay parking for business and retail needs: Generally short-stay parking is for up to 2 hours and medium-term parking between 2 and 4 hours. These user classes should be provided for town and commercial centres, hospitals, sports facilities, entertainment and activity centres and hotels. Enforcement should ensure compliant turnover of this parking.

8.2.8 Long-stay/Commuter

Long-stay parking (4–24 hours) is provided to cater for employees, commuters and other long-term parkers. This user class should generally be allocated a relatively low priority particularly on-street and in areas with high public transport accessibility.

8.2.9 Park and Ride

This parking is provided to cater for people transferring to another mode of transport to complete their journey (e.g. catching a bus or train). Park and ride should be given priority at satellite/remote public transport nodes. This type of parking is generally not considered appropriate in town or commercial centres or at transit-oriented developments.

[\[see Commentary 14\]](#)

8.2.10 Residents

Parking for residents and their visitors: Most residential properties will have access to at least one off-street car parking space. However, this may not be the case in the future in a high density precinct. Residential parking policy/permit schemes should manage the demands of resident and visitor parking whilst discouraging motor vehicle use. Enforcement must ensure that access is not blocked to residents' off-street parking.

8.2.11 Cyclists

Parking for cyclists falls into two broad categories:

- all-day parking for employees and park-and-ride parking at public transport stations
- short-term parking for visitors to shops, restaurants, offices, recreational facilities and other institutions (within 50 m of a destination).

Parking for cyclists should be given a high priority and planning requirements should ensure that adequate parking provisions and end-of-trip facilities for cyclists be incorporated into all new developments. See Commentary 9.

[\[see Commentary 9\]](#)

8.2.12 Motorcycle and Scooter Parking

Motorcycle parking which includes scooters is generally treated no differently to that of cars. If vehicles are to be charged for parking this should apply equally to motorcycles if they use spaces allocated to cars. An incentive for these motorcycles is to provide them with free parking in dedicated motorcycle spaces many of which can be located in areas that cannot accommodate a standard car parking bay.

There are no applicable Australian standards relating to the number of motorcycle bays that should be provided. As car parking spaces can be easily divided into two motorcycle spaces there is flexibility to convert spaces depending on demand. Planning provisions should identify the environmental benefits of motorcycle/scooter use over cars and provide developers with incentives to provide motorcycle/ scooter parking in lieu of car spaces.

8.3 Commercial Centre Hierarchy Example

Table 8.1 shows the desirable parking user hierarchy for a commercial centre. This hierarchy is desirable to support growth and intensification goals.

It is noted that parking restrictions required for road safety reasons, pedestrian crossings, emergency purposes and services take precedence over all other users.

Requests for alterations to kerbside allocation should be reviewed according to Table 8.1 to determine if they fit within the parking hierarchy for the precinct or location. This hierarchy is desirable to support growth and intensification goals. It may need to be amended to fit in with specific locations, e.g. where commuter and short-term parking is required in the day but not at other times.

Off-street residential parking is considered to be appropriate in private driveways, garages and designated parking areas and in parking areas which are not specifically designated in off-street car parks; however residents will not be prevented from using these shared parking options in off-street car parks.

It is noted that off-street public car parking is considered to include all parking available for use by the general public (rather than private driveways or small privately owned and managed parking areas).

Table 8.1: Commercial centre parking user hierarchy example

Priority	Inner core of commercial centre		Outer area	
	On-street	Off-street	On-street	Off-street
	Loading	Disability permit holders	Public transport	Long-stay/ commuter
	Public transport	Short to medium-stay	Residents	Short to medium-stay
	Drop-off/pick-up	Drop-off/pick-up	Short to medium-stay	Drop-off/pick-up
	Short to medium-stay	Loading	Disability permit holders	Park and ride
		Motorcycle/ scooter	Loading	Residents
	Motorcycle/ scooter and cyclists	Long-stay/ commuter & residents	Long-stay/ commuter	Motorcycle/ scooter
Least important	Disability permit holders	Cyclists	Drop-off/pick-up and motorcycle/ scooter and cyclists	Disability permit holders and loading and cyclists
Not allowed in this zone	Long-stay/ commuter and Park and ride	Park & ride		Public transport
	Residents	Public transport		

Source: Glenorchy City Council (2007).

For example, disabled parking is inconvenient and unsafe on-street and consequently a low priority within the inner core. Disabled parking is therefore given a high priority in off-street car parks.

However, the allocation of priorities for the use of kerbside space does not necessarily require that a higher priority use will **always** be preferred to a lower priority use. For example, it does not necessarily follow that in any street in any given precinct, bus zones will always be preferred to parking bays for people with disabilities, though the process of assigning relative priorities may imply this outcome, unless a degree of flexibility is applied in interpreting priorities for the use of street space.

8.4 Provision of Parallel Kerbside Parking

Parallel kerbside parking in the direction of traffic flow is the most common form of on-street parking. It has the following advantages:

- Road crashes associated with parking manoeuvres are minimised compared to angle parking.
- It requires less lane width than angle parking.

The main disadvantages of parallel parking are that the number of vehicles able to park along any given length of kerb is not as high as in angle parking and manoeuvring into and out of spaces can cause disruption to other traffic. This latter disadvantage can also be an advantage where traffic calming is a primary objective (see Austroads *Guide to Traffic Management Part 8: Local Area Traffic Management (LATM)* (Austroads 2016a).

The typical dimensions, width limitations and layout of parking bays are given in AS 2890.5:1993. Essentially parking bays should be designed to provide sufficient space for reversing manoeuvres.

In areas of high demand and turnover, parking bays should be marked. This should be carried out in accordance with AS 1742.11:2016 *Manual of Uniform Traffic Control Devices Part 11: Parking Controls*.

Parallel parking is required to be carried out in accordance with the relevant jurisdiction's road rules (Australian Road Rules 2012 and Land Transport Rule: Traffic Control Devices 2004 (NZ)).

Figure 8.2: An example of on-street parallel parking used in a one-way street in Melbourne



Source: ARRB Group

8.5 Provision of Angle Kerbside Parking

Angle parking involves parking at angles other than 0 degrees (parallel parking). It has the following advantages:

- It can accommodate up to twice as many vehicles per unit length of kerb as parallel parking. This difference is a function of the angle used where low angles of 30 degrees and less give little advantage and the maximum advantage occurs where 90 degrees is used.
- The parking manoeuvre is easier for angle parking than parallel parking especially for small angles.

Disadvantages of angle parking include:

- More roadway width is required for angle parking bays and associated parking manoeuvres. This requirement may present a problem for commercial vehicle parking as the increased length of those vehicles may encroach into traffic lanes. Hence adequate parallel parking space should be provided for those vehicles.
- All angle parking presents a greater hazard to road users than parallel parking. This situation is mainly due to the fact that parking at an angle always requires reversing which causes bottleneck effects in the moving traffic and may lead to collisions directly involving the reversing vehicle.
- There can be sight/visibility issues and increased conflict with pedestrians crossing midblock.

The decision whether to use angle parking should be based on consideration of:

- width of road
- traffic volume
- type of traffic
- traffic speed characteristics
- vehicle dimensions
- expected turnover
- land use served
- functional road classification.

It is recommended that angle parking be avoided on higher speed (> 50 km/h) roads. However, if angle parking is provided, for it should be used in conjunction with other protective measures such as indented (embayed) parking and manoeuvring space to lessen its negative effects.

8.5.1 Design of Angled Parking

Classification dimension and layout of angle parking bays as well as the minimum widths between the barrier line or edge of the road/median and the kerb should be designed in accordance with AS 2890.5:1993. As with off-street parking it is important to note that the classifications are not rigid in their application. It is recommended that a road safety audit should be carried out to determine if the proposed car parking design is safe. Refer to Section 12 for information regarding road safety audits as the most common tool of hazard identification and risk management of the physical road environment.

8.5.2 Front-to-kerb versus Rear-to-kerb Angle Parking

Reversing out of front-to-kerb angle parking bays involves some of the vehicle protruding into the adjacent road space before the driver can see oncoming vehicles. This affects safety and also interferes with traffic movement. Unless there is a manoeuvre space between the parking bays and the traffic lanes, the obstructed sight lines when reversing out are particularly dangerous for the less visible and more vulnerable bicycle traffic, making rear-to-kerb angle parking preferable on designated bicycle routes or in areas with significant bicycle use.

Reversing into rear-to-kerb angle parking bays may reduce many of the problems associated with forward entry parking. However, it creates a traffic hazard as the vehicle stops in the moving traffic stream prior to reversing into a parking bay and the nose swings into the adjacent through traffic lane at the start of the back-in manoeuvre. Rear-to-kerb angle parking may also create excessive footpath obstruction from the rear overhang and will produce exhaust fumes on the footpath.

Relative merits of front-to-kerb versus rear-to-kerb parking are presented in Table 8.2.

In a number of jurisdictions (e.g. South Australia) rear-to-kerb angled parking is illegal and cannot be considered as an option. In other jurisdictions rear-to-kerb angled parking does have its applications (e.g. on designated bicycle routes and in loading zones) but based on the relative merits of front-to-kerb and rear-to-kerb arrangements, front-to-kerb angled parking is preferable in most situations.

Table 8.2: Relative merits of front-in versus tail-in parking

Issue	Front-to-kerb parking situation	Rear-to-kerb parking situation	Preferred option
Exhaust emissions	Exhaust facing away from footpath.	Vehicle's exhaust directed onto pedestrian footpath (causing discomfort and staining of footway paving) and into open doors of shops in retail precincts.	Front-to-kerb
Loading/unloading vehicles	Boot/rear hatch faces away from the footpath exposing the motorist/shopper to moving traffic.	Boot/rear hatch faces towards the footpath allowing for safer loading/unloading.	Rear-to-kerb
Judgement in a reversing manoeuvre	Reversing occurs into a space relatively free of fixed obstructions (provided the motorist is able to observe approaching traffic or the approaching traffic poses no significant hazard).	Reversing occurs into a limited and obstructed space.	Front-to-kerb
Motorist confusion	Vacant spaces are clearly visible and a motorist is able to slow down and move directly into a parking space in a single movement causing little confusion or delay to the following motorists.	It is more difficult to observe vacant spaces and a motorist needs to actually pass the parking space in order to reverse into it potentially confusing a following motorist who may also wish to park in the same space.	Front-to-kerb
Disruption to passing traffic when reversing	Motorist reversing out from the parking bay can select a time when passing traffic will not be disrupted.	Stationary motorist about to reverse into the parking bay tends to disrupt passing traffic by trapping a vehicle behind.	Front-to-kerb
Traffic and cyclist safety	Motorist leaving a front-to-kerb space must reverse approximately 1 m or more before gaining a clear view of approaching traffic and cyclists. This is aggravated by increasing numbers of large 4WDs and vans.	Motorist about to drive forward from a rear-to-kerb space has a relatively good view of approaching traffic and cyclists without moving forward significantly.	Rear-to-kerb
Impact with kerb obstructions	Motorist can more easily view high kerbs and footpath obstructions whilst moving in the normal forward motion into the parking space.	Motorist reversing into the parking space cannot easily view the obstructions and the rear overhang is generally greater than the front overhang which results in greater footpath intrusion.	Front-to-kerb
Pedestrian safety	Motorist reverses into a vehicle-based environment.	Motorist reverses into a pedestrian environment. Vehicle projections e.g. tow bars, bicycle racks etc. may also pose an additional hazard for pedestrians.	Front-to-kerb

8.6 Provision of Centre-of-road Parking

Typical centre-of-road parking layouts are illustrated in Figure 8.3. Practitioners are also encouraged to refer to AS 2890.5:1993 for an example of a centre-of-road parking area isolated from through traffic.

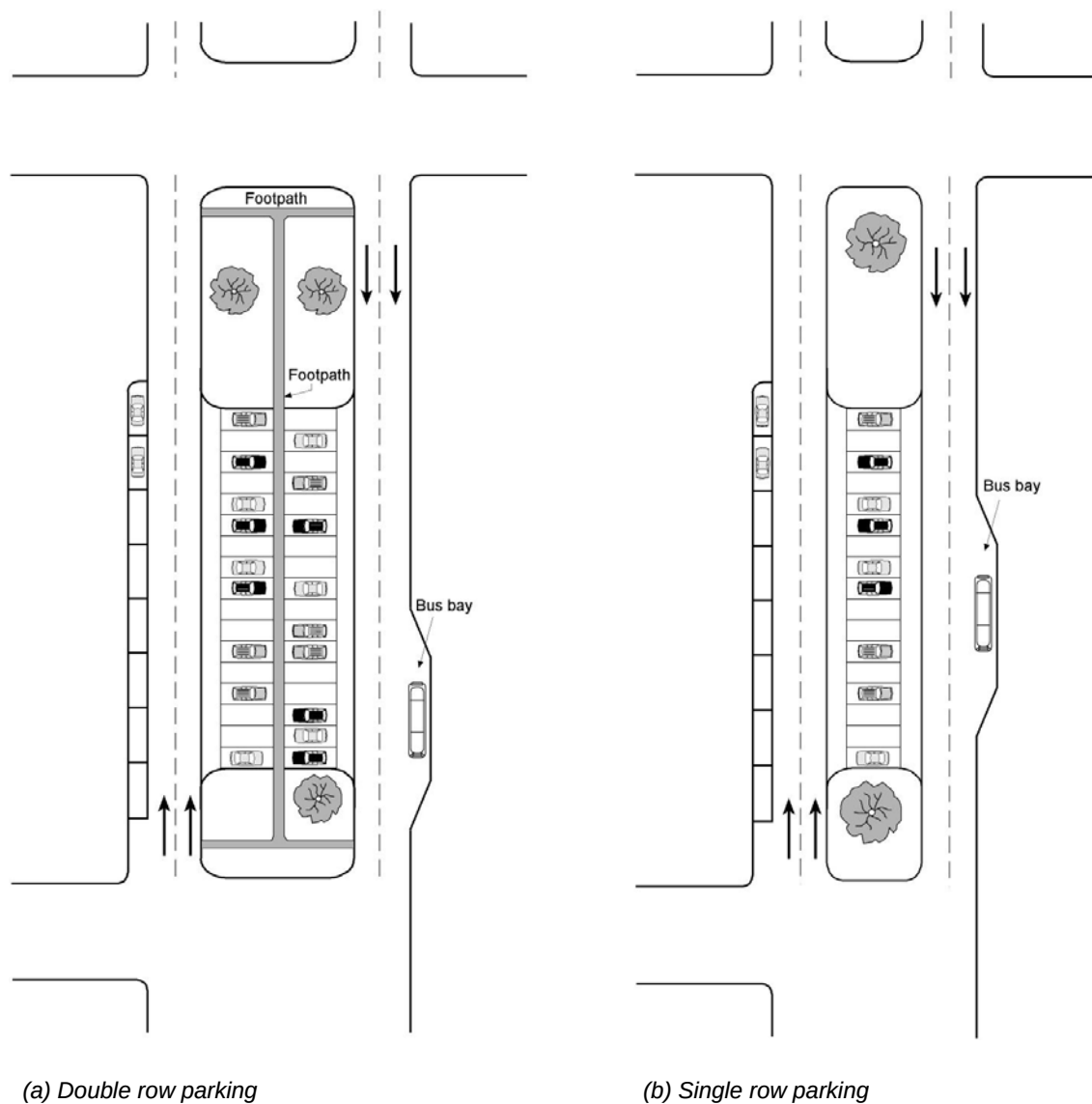
Centre-of-road parking should only be considered on lower speed non-arterial roads (speed limit ≤ 50 km/h) with little through traffic unless the parking area can be well-separated from the through-traffic flow and access points can be well-designed and kept to a minimum number of locations. The provision of centre-of-road parking separates opposing traffic flows and provides a continuous refuge for pedestrians but it does generate additional pedestrian movements across the road.

Centre-of-road parking is often arranged as angle parking in two rows separated by a footpath/median although in New Zealand where it is infrequent it is usually single row parking. In some jurisdictions (e.g. South Australia) centre-of-road parking must be accessed via designated entrance and exit points. Where this requirement does not apply and the characteristics of the road are suitable e.g. a low volume or speed environment, centre-of-road parking can be designed to be accessed directly from the roadway providing that sufficient manoeuvring clearance is provided between the parking spaces and the traffic lanes (see Figure 8.3).

The combination of kerbside parking and centre-of-road parking provides a large number of parking bays per unit length of road. It is rarely possible to combine angle kerbside parking with centre-of-road parking because of the large roadway width required.

If time limits are introduced, a combination of centre-of-road parking with kerbside parking provides an opportunity for different time limits to be used. Short-term parking can be provided at the kerbside while longer-term parking can be assigned to the centre-of-road parking.

Figure 8.3: Typical centre-of-road angled parking layouts



Source: ARRB Group

It is essential that ample visibility at intersections be preserved as hazardous conditions may result by permitting access to centre-of-road parking too close to intersections or pedestrian crossings.

According to the Australian Road Rules a vehicle must enter or leave centre-of-road parking by driving forward (if there are no obstructions) unless a sign indicates otherwise. This restriction precludes the use of centre-of road double row parking (unless the parking is parallel) and centre of road single row parking unless appropriately signed.

8.7 On-street Regulatory Parking Restrictions

Regulatory parking restrictions need to be applied in the interest of road safety traffic flow and convenience of road users. This includes the provision of adequate stopping and parking restrictions at intersections pedestrian and bicycle crossings driveways and other locations on roads in order to protect the safety of all road users.

8.7.1 Provision of Parking Restrictions

In Australia reference should be made to the Australian Road Rules as well as the rules and regulations of each state and territory of Australia for details of application of parking restrictions relevant in that state or territory. In New Zealand reference should be made to the Land Transport Rules.

8.7.2 Provisions for Pedestrians

On-street parking should be arranged to minimise obstruction of pedestrians and encroachment onto pedestrian paths. It is noted that wheelstops may be a trip hazard in highly pedestrianised areas.

8.7.3 Conflict between Parking and Waste Removal Operations

On-street car parking can interfere with waste removal operations if rubbish bins placed at the kerbside or in service areas are rendered inaccessible. Some suggestions to overcome this issue include:

- Waste removal trucks can be made exempt from restrictions to allow them to stop in No Stopping or No Parking zones.
- The waste collection process can be carried out manually and/or in periods of low parking demand.
- Occupiers of properties can be requested to park elsewhere during waste collection times.
- Parking restrictions can be applied (e.g. 'No Stopping' or 'No Parking') on waste collection days or more generally in specific high turnover areas.

8.7.4 Protection of Parking from Through Traffic

Where it is necessary that parking be provided on busy or high speed roads (> 50 km/h) or in unexpected locations it may need to be protected from traffic. This requirement may involve the use of edge lines or transition lines supplemented with raised pavement markers or the construction and delineation of kerb extensions at the leading end or both ends of the parking area. Where raised pavement markers are used it should be ensured that they are not within pedestrian desire lines as they are a trip hazard.

8.7.5 Unsafe Parking Locations

Locations considered to be unsafe for parking include the inside of sharp curves, within a T-junction opposite a high volume, high speed, or a steep terminating road, on islands and reservations including the central island of a roundabout and any locations that cannot be properly protected (Section 8.7.4). Legislation specifies where parking is not allowed and generally includes but is not restricted to those locations specified in Section 1.2 and in documents listed in Section 8.7.1.

8.8 Lighting

Performance and installation design requirements for the lighting of urban roads are given in AS 1158.1.1:1997 *Road lighting: Vehicular Traffic (Category V) Lighting: Performance and Installation Design Requirements*. Category 'A' lighting should be used to illuminate parking on arterial roads and Category 'B' lighting should be used to illuminate parking on local roads.

8.9 Provision for Other Road Users

It is important to consider road users other than cars when determining on-street parking provision. Similar to off-street parking these may include the following vehicle/user groups:

- trucks
- buses and coaches
- motorcycles
- people with disabilities
- bicycles
- caravans, trailers and recreational vehicles
- emergency vehicles
- taxis
- special purpose uses e.g. council drainage vehicles and diplomatic vehicles.

On-street parking provision for these groups is given in Sections 8.9.1–8.9.8. Readers are encouraged to refer to Section 7.15 for off-street parking provision for other users.

8.9.1 Trucks

The Australian Road Rules provide for parking of up to 1 hour by heavy vehicles in built-up areas and do not restrict parking time in non-built-up areas. In New Zealand apart from some lighting and angle parking restrictions there is no specific nationwide restriction on truck parking although some road controlling authorities have imposed local limitations.

Loading zones and truck zones are means of short-term on-street parking for trucks. These are addressed in Section 8.10.1.

8.9.2 Buses and Coaches

Where kerbside parking is required for buses and coaches, it should be positioned parallel to the kerb and the parking area should be made long enough to satisfy the likely demand for parking/layover, while also allowing adequately for all required entry and exit manoeuvres.

The relevant authority in each state or territory should be consulted about the design of on-street bus/coach facilities to confirm the requirements for bay and taper lengths, kerb heights, number of passengers to be accommodated and provision of bus shelters and other facilities. It should be noted that bus/coach stop areas should be designed in accordance with the Disability Standards for Accessible Public Transport (2015).

Temporary school bus parking essentially used at school opening and closing times should also be catered for.

8.9.3 Motorcycles

Motorcycle parking zones are normally provided in groups at on-street locations according to demand (e.g. near universities, entertainment areas, shopping centres etc.). Their provision can be achieved by converting car parking bays or by using irregular spaces and under-size remnants.

Some jurisdictions also allow parking of motorcycles on footpaths as long as it does not obstruct pedestrians, delivery vehicles, public transport users or parked cars. Note that this may create problems with enforcement due to the imprecise interpretation of what is an inconvenience, hindrance or obstruction to pedestrians.

Centre-of-road motorcycle parking may also be applicable in some jurisdictions (e.g. Victoria).

8.9.4 People with Disabilities

On-street parking bays for people with disabilities should preferably be provided in angled parking zones as adequate provision for people with disabilities at parallel parking zones can be difficult to achieve. Where available parking is largely parallel it is often more practicable to provide off-street rather than on-street parking bays for people with disabilities. Where it is considered appropriate to provide parallel parking for people with disabilities this can be achieved through the provision of raised mountable embayed parking.

At locations of on-street embayed parking adjacent to a kerb to the rear of parked vehicles it may be appropriate for a kerb ramp to be provided at the rear to facilitate access to the back of vehicles.

Design of parking bays for people with disabilities should comply with the requirements addressed in Section 7.15.4.

Access to parking bays can be restricted to people with disabilities through the application of a permit system. Alternatively, consideration can be given to the provision of universal access bays that are designed for use by people with disabilities but are not restricted to being used by them (or those that hold a current permit). Universal access bays may be particularly useful at locations where short-term access is required.

Parking for people with disabilities (those eligible for a relevant parking permit) should be provided in the form of separate appropriately signed and marked parking bays and by ensuring that time-limited bays have sufficient turnover to allow people with disabilities to access them. These parking bays have the effect of a 'No Parking' sign with the exception of vehicles displaying the disabled persons parking or mobility permit. Parking concessions such as extensions to time-posted limits or reductions in fee payment may also apply.

Many parking authorities allow people with disabilities to park for no fee or at reduced rates and/or for longer periods than the posted maximum time limit. There is also a reciprocal arrangement between all states and territories in Australia to recognise each other's parking permits for people with disabilities. Overseas permits may also be accepted. More information is provided in VicRoads (2015).

Each state manages their own parking scheme for people with disabilities so there are minor differences in the operational arrangements. The visiting permit holder must therefore comply with parking arrangements of the state or territory being visited.

Parking spaces for people with disabilities should also provide for mobility wheelchair scooters a three-wheel motorcycle with flat rear platform onto which a wheelchair can be locked with the disabled person able to use the handlebar controls.

Refer to Section 5.2 for more information on parking policy objectives for people with disabilities.

8.9.5 Bicycles

Bicycle parking along a street is generally provided in the form of bicycle rails. These facilities should be located parallel to the kerb or footway unless a footpath extension is provided and on both sides of the road where demand warrants it. Bicycle parking devices should be located:

- clear of driveway and building entrances/exits
- clear of pedestrian footpaths where they adjoin the property/building line
- clear of high volume pedestrian movements
- clear of opening car doors
- clear of attachments for blinds or awnings
- clear of access covers set in the pavement
- clear of other street furniture, loading zones, public transport stops and pedestrian crossings.
- with a minimum clearance between a parked bicycle and the edge of a motor vehicle traffic lane, parking lane or roadway of 500 mm
- with a minimum clearance from a disabled access car parking space of 1600 mm where the parking space is parallel to bicycle parking or 2400 mm for other orientations in accordance with AS/NZS 2890.6:2009
- with a minimum clearance for passage of pedestrians between a parked bicycle and any other obstruction on a walkway or footpath of 1800 mm (greater clearance will be needed at high pedestrian volumes).

The minimum clearance in the above cases should be the clearance to any part of a bicycle when attached to the parking device in the intended manner.

Design of bicycle parking facilities is discussed in Section 7.15.5.

When considering the provision of new or modified car parking arrangements, practitioners should also consider the needs for additional facilities for cycling as well as the methods to minimise the impact of car parking on existing or future cycling use. This would normally include consideration of any strategic bicycle plan for the affected road(s) and where practicable, ensuring good visibility for drivers, including designing the layout of parking areas in such a way as to reduce the chance of car doors being opened into the path of oncoming cyclists.

8.9.6 Caravans, Trailers and Recreational Vehicles

Parking for cars with trailers or caravans should be provided where the demand warrants it e.g. at well-known tourist spots/townships. For general design principles pertaining to 'car-with-trailer' parking refer to Section 7.15.6.

8.9.7 Emergency Vehicles

Australian and New Zealand road rules provide an exemption from parking restrictions for emergency vehicles provided the driver is taking reasonable care and it is reasonable that the restriction should not apply.

8.9.8 Taxis

On-street taxi stands should be distributed at convenient locations throughout activity centres.

The stands should be located parallel to the kerb with taxis parked in the same direction as the general flow of traffic so that waiting taxis can enter at the back of the queue and progressively move forward with passengers entering into the front taxi first. The length of a taxi stand should be a minimum of $(5.4n + 1.0)$ metres where n is the number of taxis to be accommodated. Taxi stands should be as long as necessary in order to avoid taxis illegally parking beyond the end of a rank particularly in busy locations (e.g. the CBD). It is important that stands not be split to avoid confusion as to the location of the head of the queue. Taxi parking must be suitable for use by people with disabilities and the dimensions of the first few parking spaces at the head of the queue depending on turnover should be consistent with this requirement.

If the demand is very high such as at an airport or main railway station, the main taxi stand should be fed from a nearby feeder stand located so that the driver of the front taxi in the feeder stand can observe when there is a vacancy at the main stand. A feeder stand may feed one or more main taxi stands. If the taxi feeder area and the main taxi stand are not within sight of each other, automated by means of Closed Circuit Television (CCTV) and monitor screen or manual means of communication may be necessary.

8.10 Parking Control Measures

In many areas of intense residential, business or industrial activity as well as near sporting educational and public transport facilities, the demand for on-street parking space exceeds supply. Hence practitioners will need to estimate the total demand, allocate parking on a priority basis and implement effective parking control measures (refer to Section 5 for more information on this subject related to parking policy).

Parking and stopping is controlled by a combination of:

- regulations: principally in the Road Rules
- signs: the vast majority of parking control is brought into effect through signs; the requirements for these signs are set out in AS 1742.11:2016 in Australia and *MOTSAM 1* (NZ Transport Agency 2010a) in New Zealand
- lines: only a continuous yellow edge line has regulatory effect (e.g. No Stopping at all times on both sides of the line) but some regulations also relate to road markings (e.g. barrier centre line).

Parking control measures include the following:

- linear parking control
- area parking control
- pay parking
- permit parking
- enforcement.

Examples of international trials are included in Commentary 8.

[\[see Commentary 8\]](#)

8.10.1 Linear Parking Control

The following describes the general policies applying to linear parking control and specific requirements as defined in the Australian Road Rules 1999 and supporting legislation. In New Zealand requirements are specified in the Land Transport (Road User) Rule 2004 and Land Transport Rule: Traffic Control Devices 2004. Reference should also be made to Austroads *Guide to Traffic Management Part 8: LATM* (Austroads 2016a) and to relevant state legislation.

Permissive parking with time limits

Where the demand for parking exceeds the supply, time limits can be imposed to increase parking turnover and hence allow more people to use highly sought after parking spaces to gain access to adjacent facilities. The limits that should be applied in any particular locality should be determined only after a proper study of parking patterns. Generally, with adequate enforcement, an efficient time limit results in some bays being vacant at any time. In business districts, limits of increasing duration are usually applied at increasing distances from the heart of the district. This ensures the highest turnover for the highest demand areas while allowing longer-term parking at greater walking distances.

Parking duration and the times of operation indicated on 'Parking' signs should be in accordance with AS 1742.11:2016 *Manual of Uniform Traffic Control Devices: Part 11: Parking Controls* and MOTSAM 1 (NZ Transport Agency 2010a) in New Zealand. The usual periods provided are 5 minutes, 10 minutes, ¼ hour (15 minutes), ½ hour (30 minutes), 1 hour, 2 hours, 4 hours and unlimited parking. The applications of these periods are as follows:

- **5 minute parking** is appropriate in areas with a very high arrival rate e.g. where passengers are dropped off but some waiting is likely. It may apply near cinemas, post offices and hotels and may potentially be used in business districts and near schools.
- **10 minute or ¼ hour (15 minute) parking** can provide for pick-up and set-down outside schools and for a high turnover outside commercial facilities providing a high level of convenience such as banks post offices milk bars and newsagents. It is only appropriate for motorists who wish to go to the one address.
- **½ hour (30 minute) parking** can be applicable directly outside local shops that rely on providing a reasonably high level of convenience to maintain a competitive market position. There is usually a high demand and 1-hour parking would result in inadequate parking turnover. A ½-hour restriction allows people to go to two or three shops.
- **5 minute, ¼ hour (15 minute) and ½ hour (30 minute) parking** is typically unable to be diverted into off-street locations unless off-street parking is located at the site frontage and direct access is provided to and from the abutting road.
- **1 hour (60 minute) parking** is appropriate outside major shopping centres and in other locations where there is a demand for parking and the activity is likely to take longer than half an hour. This type of parking is able to be diverted into off-street locations but parking access needs to be clearly visible from the frontage road.
- **2 hour (120 minute) parking** is sometimes appropriate outside major shopping centres although it can result in enforcement difficulties with some motorists staying excessively long times. It is more likely to be applicable in areas with developments containing professional and personal services. It is also applicable in streets where a resident parking permit scheme applies and time limited parking is available for non-residents. The 2 hour limit results in commuter parking being removed.
- This type of parking can also be diverted into off-street car parks. Access to the car park can be provided via other streets but the access arrangements need to be clearly identifiable from the arterial road.
- **4 hour (240 minute) parking** is appropriate where it is desired to stop all-day commuter parking but allow parking by other local people.
- This type of parking can also be diverted into off-street car parks. While it is desirable that car park access is identifiable from the arterial road it will often be acceptable to assume that motorists are relatively well-informed regarding the access arrangements for the site.
- **Parking with no time limit (all day parking)** is usually generated by employees or park-n-ride motorists and will occur across all types of development. It does not require signs to be used to indicate that parking is permitted where there is no time limit or no user limitation. However, a 'Parking' sign may be necessary where the method of parking (e.g. angle parking) or the method of payment (e.g. voucher) has to be indicated on a sign. Also a 'Parking' sign will be necessary where the parking area is available only for certain classes of users (e.g. 'Motorcycles Only').

It is important to ensure that streets do not have too many different time restrictions as this will lead to confusion for drivers and an increase in disputes related to infringements. Additionally, the start and finish times of the restriction are to be clearly indicated (e.g. Mon–Fri 8am–5pm) and drivers should be aware that outside of these times parking is unrestricted. This will result in more effective use of the parking spaces.

Figure 8.4: Examples of confusing signage and restrictions without time limits



Source: ARRB Group

No Stopping

'No Stopping' restrictions are usually applied to improve safety and traffic flow where parked vehicles would otherwise impede traffic flow or would obscure visibility from side streets or adjacent properties. Where the restriction is implemented for traffic flow purposes it can operate during peak periods so that the kerbside space is available for parking outside peak periods during the remaining business hours. If the length of the restriction is a street block length or more clearway signing should be provided.

'No Stopping' means a driver must not stop their vehicle on a length of road to which a 'No Stopping' restriction applies unless traffic conditions or Road Rules require it e.g. in a queue of traffic. A 'No Stopping' zone is established through the installation of a 'No Stopping' sign which may be supplemented by the painting of a yellow line along the kerb or if it is specified in state regulations it may be used instead of No Stopping signs (refer to Section 11.1.4 for more information on this topic).

Where this restriction is not to apply to a particular type of vehicle an exception may be included e.g. 'No Stopping Delivery Vehicles Excepted'.

No Parking

'No Parking' prohibits the stopping of any vehicles unless the driver is picking up or setting down goods or people. Whilst stopped the driver cannot be further away from the vehicle than three metres and a maximum time limit of two minutes is permitted unless otherwise indicated on the 'No Parking' sign.

'No Parking' areas provide a useful way of keeping kerbside space clear so that it may be used to drop off passengers at a particular location (e.g. a transport terminal) or where lightweight goods can be hand-delivered by a passenger.

It should be noted that in some jurisdictions this requirement may also be referred to in a different manner. For example, in NSW 'No Parking' is an alternative to 'No Stopping ... Excepted' sign.

Special purpose zones

Zone restrictions are an alternative to a 'No Stopping' sign with a user exception (e.g. a BUS ZONE means the same as 'No Stopping Buses excepted').

All zones should be adjacent to the edge of the carriageway. The availability of and demand for zones should be monitored and acted upon. For example, if zones are not being used they can be converted to time limited parking to give a better distribution of available parking space but if it is apparent that, e.g. loading and unloading is occurring from 'No Stopping' areas then additional loading zones are likely to be needed.

Seven types of zones are permitted as follows (see AS 1742.11:2016 and relevant legislation such as the Australian Road Rules 2012 and New Zealand Land Transport Rule: Traffic Control Devices 2004 for more detail). Also refer to Commentary 4 for more information on parking policy goals of which these zones form a part.

[\[see Commentary 4\]](#)

- **Bus zone:** available for public buses only. Bus stops in bus zones should be provided at appropriate intervals along bus routes at locations that are convenient for patrons and in an arrangement that is readily accessible by bus drivers. Note that in Australia bus stops should be designed in accordance with Disability Standards for Accessible Public Transport (2015) which requires the installation of tactile ground surface indicators at all new bus stops as well as a minimum kerb height of 150 mm at the bus stop.
- **Taxi zone:** available for taxis only. Taxi zones are to be provided in sufficient numbers and with adequate capacity for the convenience of taxi users. They should not be located in residential sections of street.
- **Loading zone:** short-term parking zones provided to allow the pick-up or delivery of goods. Reference should be made to AS 1742.11:2016 and relevant state legislation to determine what types of vehicles are permitted to use loading zones and what time periods they are permitted to stay, e.g. 15 minutes, 20 minutes, 30 minutes, 1 hour. In some areas e.g. New South Wales, Ticket Operated Loading Zones are in use where users obtain a free ticket displaying the details of the permitted length of stay.
- Loading zones (and similar short-term pick-up and drop-off areas) should be provided in convenient locations in business and industrial areas where there is a regular demand for loading and unloading of goods. They should be desirably located at one end of a section of parking with a clear length for vehicles to either drive-in or leave directly without having to negotiate around parked cars or kerb extensions. They need to be of sufficient length to accommodate the length of the vehicle plus a length for opening the rear tray or door and the number of vehicles likely to use it at peak demand. Loading zones should not be mixed with angle parking to prevent vehicles overhanging parking bays.
- Refer to Section 8.9.1 for more information on truck parking which is a form of short-term parking in loading zones.
- **Truck zone:** this an alternative to a loading zone where it is desired to restrict the use to delivery vehicles which are trucks. This zone is available only for a truck actually engaged in loading and unloading goods. A time limit should always be displayed on the TRUCK ZONE sign otherwise no time limit applies. Location and design requirements are essentially the same as for loading zones except that the vehicles likely to use it may be larger. Typical truck lengths are 12.5 m for a heavy rigid vehicle and 8.8 m for a medium rigid vehicle.
- **Permit zone:** available only for vehicles with an authorised permit label displayed applying to the zone.
- **Works zone:** available only for vehicles engaged in construction work at or near the zone. Note that PERMIT ZONE signs indicating 'Construction Vehicles' together with a permit system may be more effective (where a parking permit system is in place).
- **Mail zone:** available only for postal vehicles.

Clearways

Clearways are similar in operation to 'No Stopping' areas except that they are implemented over relatively long lengths of the more important urban arterial routes where specific warrants are met. Readers are encouraged to refer to Austroads *Guide to Traffic Management Part 5: Road Management* (Austroads 2014) for more information.

They are defined as a length of carriageway identified by Clearway signs at each end and along which the stopping of vehicles other than a public bus or a taxi is prohibited by Clearway control signs.

Clearways operate on heavily trafficked roads during the peak traffic hours for a particular direction in order to provide an increase in the peak direction capacity at the expense of kerbside parking.

The times of operation of Clearway restrictions should be uniform over as large an area as possible but should also take account of the fact that sometimes the time of the peak period moves progressively with the traffic towards or away from the centre of a large city. The duration of the clearway restrictions should not be less than 1 hour and may extend to 2 or 3 hours or even 24 hours on critical routes.

On critical routes through inner city areas where illegal parking can have an extreme adverse effect on traffic flow and capacity, the clearway signs may be supplemented with 'Tow Away' wording included on the sign that enables offending vehicles to be removed from the roadway.

Composite parking controls

In some situations, it will be necessary to have separate parking controls applying over the same length of kerb at different times of the day or week. The criteria to be applied when considering composite parking controls are:

- the efficient use of kerbside space
- the extent to which the more restrictive limitation may be compromised by the other type of control.

For example, it may be necessary to combine a peak period 'No Stopping' area with time limited parking during remaining business hours. Alternatively loading zones may be converted to time limited parking on Saturdays when loading is unlikely to be carried out. In these cases, the more critical restriction (i.e. the 'No Stopping' or the loading zone) needs to be available for the intended purpose and the effectiveness of the signs should not be diminished by the inclusion of parking at other times.

8.10.2 Area Parking Control

Area parking control signs are used to provide a uniform parking control over a large area. Whereas linear parking control signs control a single line of stopping or parking by using arrows to point to the next sign or other legal device, area parking control signs operate using an entry and exit signing system that defines the boundary of the controlled area. This offers the advantage of reduced total sign cost and improved amenity.

The types of areas most appropriate for area parking controls are:

- large areas consisting of a network of streets over which the same general restrictions are to apply
- areas where positioning of linear parking control signs may be difficult (e.g. in historic and sensitive areas)
- extended lengths of individual streets.

The three types of parking control areas that may be used are 'Parking' areas, 'No Stopping' areas and 'No Parking' areas. Some jurisdictions also identify areas such as shared zones, traffic areas, street by-street permit control etc.

Any exceptions to the signed area parking control or to the statutory restrictions such as No Stopping in the vicinity of intersections should be indicated by the use of an entry sign stating 'Except as signed' and conventional linear parking control signs. Where it is desired to restrict parking within a parking control area to marked bays and thereby avoid the need for additional 'No Stopping' signs, a plate indicating 'Park In Bays Only' is installed adjacent to each entry sign.

Repeater area signs may be required where the control areas are large and/or on-street conditions are confusing. These are specified in AS 1742.11:2016 Section 5.

8.10.3 Pay Parking

It is vital that parking studies are carried out to establish the justification of the pay parking proposal so that it is not seen as solely for the purpose of revenue raising.

The implementation of pay parking should be considered in the following circumstances:

- where an insufficient turnover of parking spaces is identified resulting in illegal parking
- where a high demand is indicated by continuous usage of at least 70% of available parking spaces during business hours
- where studies reveal insufficient off-street parking facilities within reasonable walking distance from developments generating high short-term parking demand.

General requirements

A well-planned pay parking scheme should be attractively designed to enhance the streetscape and eliminate visual pollution, easy for the motorist to understand, simple to use, easy to enforce, cost-effective and adaptable to either small isolated areas or to larger areas involving more than one parking authority.

Properly planned pay parking schemes provide the following benefits:

- discouragement of long term users from parking in areas restricted for short-term use and increased turnover in parking spaces
- an accurate check on parking duration
- increased enforcement efficiency often resulting in a reduction in the number of officers required or greater monitoring coverage
- the opportunity to impose price controls based on the demand for kerb space.

Inadequate planning of pay parking schemes and inappropriate parking fee structures may result in strong public resentment, fee evasion and meter feeding (exceeding the posted time limit by paying the fee again).

Payment systems for on-street parking include Pay-and-Display Meter/Multi-Bay Parking and Coupon Parking. Pay-and-Display systems are addressed in the Commentary 7 (Commentary C7.1) while Commentary 10 (Commentary C10.1 and Commentary C10.2) addresses Meter/Multi-Bay Parking and Coupon Parking respectively. It is important to note that Pay-and-Display ticket machines should be placed adjacent to the kerb to ensure a clear zone along the building line. Monetary payment methods are essentially the same as those for off-street parking addressed in Section 7.7.

[\[see Commentary 10\]](#)

8.10.4 Permit Parking

When considering the implementation of permit parking schemes, authorities should assess both the short and long term compatibility of permit scheme objectives with any adopted (or future) strategic initiatives associated with transport demand management and/or consolidated parking.

Permit parking schemes are intended to give priority parking to those who may be disadvantaged by others taking the limited parking space available. Prior to introducing a permit parking scheme, a parking study and appropriate planning and consultation with appropriate organisations such as adjoining parking authorities, state road agencies and planning authorities, must be carried out.

Permit schemes should not apply to spaces where the general time limit is less than 1 hour parking because these spaces are usually in high demand for short-term parking generated by a nearby activity.

Summary of best practice in permit parking schemes

Very few permit parking schemes are identical. Best practice can be achieved by collating the key findings and procedures implemented at other councils in Australia.

- Permit information documents provide accessible and easy-to-understand information to residents and other interested permit applicants. The most accessible documents have a user-friendly layout and are available in PDF format for download on the council's website.
- Some councils include permit terms and conditions in their permit application forms. This is an important inclusion as the information relevant to the allocation use and management of permits is readily accessible to the applicant who may otherwise be unaware of the information.
- The holder of the permit is never guaranteed a parking space and this is to be emphasised in all permit documents.
- A fee is usually charged for permits to recoup the costs of administering, operating and monitoring the permit system and maintaining the signage and to discourage unnecessary applications.
- A maximum of two residential parking permits are usually issued to the occupier of a residential property and the number of permits issued is reduced by one permit per off-street parking space. It is not clear whether a permit concession is granted if an off-street space has been converted to another use such as a shed or additional accommodation.
- Permits are not issued for occupants of high rise buildings, new multi-unit developments or for dwellings located in the town centre.
- Residential parking permits include the vehicle registration number. This assists with monitoring compliance.
- Permits are assigned to streets or specific precincts via a coding system to protect resident privacy.
- Strict penalties apply for the misuse of permits including fines or the permit being revoked. The Leichhardt Council has advised that the risk of cancellation/revocation of the permit is the most effective sanction to ensure compliance.
- Administration costs are significantly reduced where application of permits is on-line.
- Labour costs are reduced with technology which provides immediate wireless verification of a valid RPP, the vehicle registration it is linked to and the location where it is parked.
- Increasingly more ticket machines are installed in permit areas providing residents with exemptions but generating income from the shared use of on-street bays during business hours.
- Residential permit systems and quantities vary but they generally always require payment.

8.10.5 Residential Parking Zones

Residential parking zones should have a time limit across the zone to prioritise short-term parking and deter commuter parking. Residents should be able to purchase parking permits to allow an exemption to the time restriction.

Due to the permit applying to the zone it does not guarantee a parking space in the resident's street and there will be a cap on the total number of permits available (as a percentage of overall spaces within a zone) to ensure that the scheme is sustainable.

To cater for local businesses, residential visitors and tradespeople, there will be the ability to pay for a full days parking within a residential parking zone. A residential parking zone will also free up parking space for customers of local businesses. The daily price should be adjusted either up or down using the principles of demand responsive pricing.

8.10.6 Parking Permit Allocation and Fees

When consulting on the introduction of a residential parking zone, a city should invite expressions of interest to determine likely parking permit demand. Parking permits should then be allocated based on a priority system. One permit should be allocated to each priority category before issuing a second permit. This will continue if required until the total cap on permits is reached.

Parking permits are for residents in the applicable area and proof of address and registration details will be required. Residential parking permits will be issued by vehicle registration number and on an annual basis. The fee for parking in a residential parking zone will be set to recover the costs of administering the scheme including regular monitoring.

When considering the implementation of permit parking schemes, authorities should assess both the short and long term compatibility of permit scheme objectives with any adopted (or future) strategic initiatives associated with transport demand management and/or consolidated parking.

Permit parking schemes are intended to give priority parking to those who may be disadvantaged by others taking the limited parking space available. Prior to introducing a permit parking scheme, a parking study and appropriate planning and consultation with appropriate organisations such as state road agencies and planning authorities must be carried out.

Permit schemes should not apply to spaces where the general time limit is less than 1 hour parking because these spaces are usually in high demand for short-term parking generated by a nearby activity.

8.10.7 Types of Permit Parking Schemes

Types of permit parking schemes with corresponding permits and their applications are given below. It should be noted that some of the listed schemes might not be applicable in some jurisdictions depending on the legislation applying.

- **Resident Permit Parking Scheme:** used where residents have limited or no off-street parking and have difficulty parking near their residences.

There are two types of controls that may be used to bring into effect a resident permit parking scheme:

- Time limits with resident vehicle exceptions

In these schemes a time limit is imposed on vehicles parking on the street and permits are available to exempt residents' vehicles from these limits. The existence of the resident parking scheme is indicated by a plate underneath the time limit parking signs. Time limits in these areas should not be shorter than 1 hour and a 2 or 4 hour limit generally provides well for visitors while discouraging commuter parking

- Permit zones

Where parking on the particular side of the street is exclusively for permit holders with all other vehicles prohibited from stopping then a permit zone should be used. This type of restriction will only be appropriate where there is a very heavy demand for resident parking and it is necessary to ban all other vehicles. This type of restriction has a disadvantage that it prevents visitors' vehicles from being parked in the zone.

This restriction includes the common situation adjacent to university campuses and on the fringe of the city CBD whereby certain lengths of on-street parking are commonly restricted to residents only during the daytime on weekdays.

- **Residents Visitors Parking Scheme:** similar to Resident Parking Scheme but used to allow a visitor of a local resident to park nearby.
- **Business Parking Scheme:** used where business people have no off-street parking and have difficulty parking near their business premises. These schemes should be restricted to relatively small and easy-to-regulate precincts.
- **Special Event Parking Scheme:** used where parking from a major venue spills into a substantial adjoining area affecting residences or businesses.

8.10.8 Common Features of Permit Schemes

The following features are common to all permit parking schemes:

- A parking authority must set a list of eligibility criteria before issuing a permit and these should be incorporated in the permit application form. Fees may be levied for issuing parking permits but ideally they should not be set with the intention of making a profit but rather to recoup the costs associated with administering, operating and maintaining the scheme. A restriction may be placed on the number of permits issued to each household and this restriction should be linked to the supply and demand for parking in the defined area. Only some classes of vehicle may be eligible and this aspect should be stipulated in the criteria.
- The validity period of permits should be clearly identified.
- There should be a limit placed on the number of permits to be issued based on the capacity of the area to absorb on-street parking.
- The permit does not give exemption from other parking restrictions and laws.
- A permit scheme can be introduced in conjunction with permissive parking or pay parking schemes and may apply on a street-by-street or an area-wide basis as indicated by parking signs. For a permit scheme in a time-restricted parking area the permit area number or other identifier can be indicated on a plate or sticker below the sign. The word 'Excepted' must not be used on the permissive parking sign (see AS 1742.11:2016). For Permit Zones the sign must indicate the category of permit holder e.g. 'Staff' but the words 'Only' or 'Excepted' must not be used.
- Only parking authorities can issue a permit and they may do so for multiple areas at their discretion. The circumstances for the re-issuing of permits when lost, stolen or circumstances change must be clear. Penalties for fraudulent representations for or use of permits should be identified as should the criteria for the cancellation of a permit.
- If permits are to be transferable the conditions (if any) of their transfer should be specified.
- The permit must display information specific to the permit parking scheme including the nature of exemption permitted e.g. exemption from existing parking fees and/or time restrictions.
- A permit holder can only get exemption from the times or charges when the holder's vehicle is parked in a permit parking space located within a parking area or road specified in the permit and designated by the parking authority for use by holders of such a permit. This is done by making sure that the area identifier on the parking sign corresponds with the area identifier shown on the permit. The permit needs to be displayed inside the vehicle to be in force.
- The holder of a permit can park in any part of the defined area or street for which the permit is applicable but they may not be guaranteed a space. If a space is guaranteed by the scheme, then the location of that space should be clearly identified.

8.10.9 New Developments

To protect the sustainability of residential parking schemes, new developments within residential parking zones should not be eligible for parking permits.

This will avoid developers passing on the costs of providing parking to ratepayers. Developers and new residents associated with new developments have a responsibility to ensure they have sufficient off-street parking to meet their needs.

A city should prepare information to assist developers, new buyers and tenants in understanding the new restrictions.

8.10.10 Technology and Enforcement

Parking permits often consist of labels that need to be displayed inside a vehicle's windscreen. This can be a time-consuming process and results in residents not being issued with a permit immediately. A city should consider an online and phone application system linking permits to vehicle registration. This will allow residential and visitor permits to be issued immediately (subject to verification of eligibility).

The linking of permits to vehicle registration reduces the potential for misuse and allows for the implementation of technology such as licence plate recognition (LPR) cameras for enforcement. LPR consists of an in-vehicle camera that reads and recognises each vehicle's licence plate. LPR can identify whether the vehicle has overstayed the time restriction and if the vehicle has a permit. LPR therefore has the potential to become a key element of an effective automated enforcement system that protects permit holders.

8.10.11 Implementing Residential Parking Zones

The implementation of a residential parking zone should be considered when:

- parking occupancy is regularly above 85% occupancy at peak times
- multiple requests are received for a parking zone.

A residential parking zone should have the following components:

- a time restriction across the zone typically 2 hours
- restrictions applying at different times depending on the specific situation but typically Monday to Friday (excluding public holidays)
- the number of residential permits capped at a percentage of the total number of parking spaces
- parking permits will be issued based on priority.

Refer to Commentary C4.20 for more information on permit parking schemes.

8.10.12 Enforcement

The effective enforcement of parking controls is essential to the success of parking policies as it provides the means to ensure that mechanisms introduced to equitably allocate parking spaces are observed and issues sanctions for non-compliance are issued. Without effective enforcement illegal parking will occur causing accidents, congestion, access problems and environmental intrusion (Valleley 1997).

Enforcement may be carried out by authorised officers from parking authorities, government departments and statutory corporations within their area of operation in accordance with appropriate legislation.

There are four main methods used to enforce on-street parking controls:

- parking infringement notices ('tickets')
- wheel clamping
- towaways
- physical measures.

Their usage is as follows:

- **Parking infringement notices** are the most widely used enforcement method. It involves an authorised officer patrolling the streets checking the status of vehicles parked at the kerbside and issuing or mailing tickets to those breaching regulations. The ticket informs the driver of the type of infringement committed, the fine imposed and the payment method.
- The effectiveness of the ticketing system depends on how drivers trade-off the benefit of parking illegally against the perceived likelihood of being caught and the level of fine.
- **Wheel clamping** involves attaching a device to one of the vehicle's wheels to immobilise it and issuing a parking ticket. The parker has to pay the release fee and wait for the vehicle to be released. Clamps are effective as they represent a visible evidence of the enforcement effort. The use of clamping however is inappropriate where the vehicle is dangerously parked. In New Zealand only the Ministry of Justice may clamp vehicles on a public road where there are unpaid Court-imposed fines applying. In several Australian jurisdictions wheel clamping is illegal or severely restricted in its legal application.
- **Towaways** involve illegally parked vehicles being removed from the parking area (e.g. towed around the corner), impounded and a parking infringement notice issued. This method is appropriate when the vehicle is dangerously parked and/or causing an obstruction to moving traffic. Like wheel clamping the towing away of vehicles imposes time and financial costs on the offender. Towaway signs should be provided and stickers are required on meter posts or sign posts advising drivers of a phone number to ring for advice about how to retrieve their vehicle.
- Vehicle removal is a less visible form of enforcement than wheel clamping and drivers may complain about their vehicles being damaged during removal. In New Zealand although parking enforcement agencies may not clamp vehicles they may arrange for towaways.
- **Physical measures** include barriers/bollards and fences at the kerbside which physically prevent vehicles from parking. The major disadvantage of these measures is that they may obstruct pedestrian passage or create hazard to other road users. However, fences which stop pedestrians crossing the road may actually be a safety benefit not a disadvantage.

Some of the above methods of enforcement may not be applicable in some jurisdictions or by particular authorities depending upon the legislation applying.

Comprehensive management and information software is available to assist with enforcement activities such as notice processing, legal action, correspondence, payments, parking asset database management and provision of links to external systems.

9. Rural Parking

Even though most parking problems occur in urban areas the design of rural parking areas also requires the adoption of good practice due to the high speed environment (> 70 km/h) and specific safety and other requirements intrinsic to these locations. Generally, no formal parking facilities are provided within road formations in rural areas however the provision of shoulders accommodates off-road parking.

Research indicates that driver fatigue is a significant factor in rural road crashes (Department of Transport and Regional Services 2002). Roadside amenities improve the safety of the road network by providing all road users with an opportunity to take breaks to reduce driver fatigue and to stop safely for purposes such as vehicle checks, meal breaks, toilet breaks and driver changes. Different roadside amenity configurations will suit different landscapes, environments and road users. In order to improve the effectiveness and safety of roadside amenities they should be:

- conveniently located, readily accessible, highly visible and attractive
- well-signed so that drivers can plan ahead to stop
- provided in such a way that ongoing and future use is encouraged
- well-maintained
- providing a safe and pedestrian-friendly environment.

The main type of roadside amenities are rest areas. Other amenities may include scenic lookouts information bays heavy vehicle assembly areas, roadside vending sites (where permitted by relevant legislation), heavy vehicle interception sites and rural school bus bays.

9.1 Rest Areas

Rest areas are provided on national and state highways and major rural freeways. For existing arterial roads, some authorities address the provision of rest areas as part of an overall long-term strategy for each major arterial road corridor. The strategy should establish the categories of rest area required at various locations, their nature and size.

9.1.1 Categories of Rest Areas

Broad categories of rest area include the following:

- major rest areas/service centres
- minor rest areas
- truck parking bays.

It is recommended that a mix of the three rest area types be provided on any given highway or freight route (ARRB Transport Research 2005).

Major rest areas

Major rest areas are designed for sleep/long rest breaks offering a range of facilities and separate parking areas for heavy vehicles, tourist coaches, passenger cars and cars towing caravans, trailers and recreational vehicles. They may be provided by the road agency or consist of a commercially operated service centre under a licence agreement with the road agency.

Minor rest areas

Minor rest areas are designed for shorter rest breaks and as a minimum should provide sufficient parking space for both light and heavy vehicles. Separate parking areas should also be provided where possible.

Truck parking bays

Truck parking bays are designed to allow heavy vehicle drivers to stop for purposes such as checking their load, completing logbooks and addressing any maintenance issues. They should be designed for ease of access by the largest heavy vehicles using the route.

Factors that need to be considered when planning rest areas include:

- spacing requirements (Commentary C12.1)
- site location (Commentary C12.2)
- access requirements (Commentary C12.3)
- design requirements (Commentary C12.4)
- signs (Commentary C12.5)
- provision for people with disabilities (Commentary C12.6)
- camping and length of stay (Commentary C12.7)
- proximity of rest area to towns. (Commentary C12.8).

[\[see Commentary 12\]](#)

9.2 Other Roadside Amenities

Other roadside amenities include the following:

- scenic lookouts (Commentary C13.1)
- information bays (Commentary C13.2)
- heavy vehicle assembly areas (Commentary C13.3)
- interception sites (Commentary C13.4)
- rural school bus bays (Commentary C13.5)
- roadside vending sites (where permitted by the jurisdictions) (Commentary C13.6).

[\[see Commentary 13\]](#)

Reference should be made to Commentary 12 (Commentary C12.2) for factors that should be taken into consideration when planning the location of roadside amenities.

10. Park-and-Ride

Park-and-ride is a service that enables car users to switch to public transport at least over the last section of their journeys into the city or town centre thereby reducing traffic delays over the most congested sections of the road network.

In order to use a park-and-ride system the overall time and cost of the park-and-ride journey must be perceived by the driver as being less than that for a car-only journey. This generally requires the following conditions to be in place:

- a limited and high cost public car parking system packaged with limited private off-street free car parking in the central areas served by the park-and-ride system
- a fast public transport service relative to the car
- a frequent and reliable public transport service between the park-and-ride facility and the central area with an adequate capacity, on-site security and providing a pleasant travelling environment
- a competitive fare for the park-and-ride journey to/from the central area
- secure car and bicycle parking facilities located within a short walking distance to the park-and-ride bus stop/train station
- congested road conditions along routes into the central area.

There are a number of considerations to be taken into account when planning a park-and-ride system. These include:

- park-and-ride success factors (Commentary C14.1)
- demand for park-and-ride (Commentary C14.2)
- the optimum size of park-and-ride facilities (Commentary C14.3)
- design of park-and-ride facilities (Commentary C14.4)
- other factors (Commentary C14.5) and costs (Commentary C14.6).

[\[see Commentary 14\]](#)

11. Parking Guidance and Control Devices

11.1 Signs and Pavement Markings

Parking systems cannot work efficiently without appropriate information on the location type and availability of parking. The control and management of on-street parking is essentially achieved by the following categories of signs and pavement markings:

- linear parking control signs specific to each length of kerb used to regulate on-street and centre of road parking
- area parking control signs indicating the boundaries of the controlled area used to regulate parking on an area-wide basis
- advisory signs to direct drivers to locations where parking is available either on or off-street: this type of signposting is particularly useful in congested urban centres in order to minimise the time taken to find a parking space
- pavement markings used to supplement signs either by the marking of parking spaces on the pavement or by colour coded markings along the kerb to supplement no-stopping and special purpose zones.

Signs should be designed in accordance with AS 1742 in Australia and with *MOTSAM 1* (NZ Transport Agency 2010a) in New Zealand. It should also be noted that in each state and territory there will be statutes and other regulations that set out the requirements in terms of the relevant regulatory signs and their positioning to control on-street parking.

11.1.1 Linear Parking Control Signs

The most common method of regulating on-street parking is by linear control. In Australia the signs required for this purpose should be designed in accordance with Section 3 plus Appendices A-D of AS 1742.11:2016 *Manual of Uniform Traffic Control Devices Part 11: Parking Controls*. Refer to Section 8.10.1 for more information on linear parking control.

11.1.2 Area Parking Control Signs

Area parking control signs are used to provide a uniform parking control over a large area and in Australia should be designed in accordance with Section 5 and Appendix E of AS 1742.11:2016. Refer to Section 8.10.2 for more information on area parking control.

11.1.3 Parking Direction Signs

Parking direction signs are used to guide road users to on- or off-street parking facilities for activities such as business and retail and to provide them with any other relevant information. In Australia they should be designed in accordance with Section 6 of AS 1742.11:2016. Parking direction signs may comprise:

- static signs suitable for directing traffic to full-time parking areas where congestion is not normally a problem
- fully dynamic signs or variable message signs (VMS) suitable for directing traffic to part-time or special event parking areas or to inform of special parking conditions during special events

The use of variable message signs is discussed in Commentary 16 (Commentary C16.2). More information is given in Austroads *Guide to Traffic Management Part 10: Traffic Control and Communication Devices* (Austroads 2016b).

- partial VMS suitable for advising potential users of parking areas and space availability.

The typical information listed on parking direction signs may include the following:

- the name of the parking area or locality or feature which it serves
- the distance to the parking area
- restrictions on the vehicle type
- restriction on parking period
- number of parking spaces and whether the area is full
- direction to disabled parking bays
- other facilities available at or near the parking area e.g. park-and-ride.

It should be noted that direction signing to car parks would not normally be provided on freeways. However, it may be provided in exceptional circumstances such as at freeway exits that lead exclusively to a car park or where there is a strategy to provide direction signs to park-and-ride facilities. If this is the case they should be designed in accordance with AS 1742.11:2016 and AS 1742.15:2007 *Manual of Uniform Traffic Control Devices Part 15: Direction Signs, Information Signs and Route Numbering* in Australia.

11.1.4 Pavement Markings

Pavement markings are most commonly used to supplement linear control of parking. They are used to delineate or set aside parking or mark the edge of the roadway in accordance with Section 7 of AS 1742.11:2016 in Australia and *MOTSAM 2* (NZ Transport Agency 2010b) in New Zealand.

All signs used to identify parking for people with disabilities should include the international symbol of access as specified in AS 1428.1:2001 or Symbol No. S22 in AS 1743:2001. Pavement marking requirements for pedestrian crossings and directional arrows are given in AS/NZS 2890.1:2004.

11.2 Electronic Guidance Systems

As much as 30% of city centre congestion can be attributed to traffic circulating in search of parking space. While improved static guide signing to parking facilities helps reduce parking-related traffic congestion over the past decade increasing attention has been focused on the use of dynamic parking guidance systems (PGS). PGS aim to encourage a more efficient use of parking areas and reduce the amount of parking search within an urban area by informing the driver about location direction and availability of parking spaces. This is done by drawing upon technologies and systems typically associated with Intelligent Transportation Systems (ITS) for vehicle detection, communications, information processing, automated display and other functions.

It should be noted that many people might have already chosen where they will park before they get anywhere near their destination with convenience, habit, route familiarity or closeness to their final destination being the main determinants of parking choice. Therefore, practitioners should not expect that the provision of parking guidance systems will offer an instant panacea to address perceived parking problems.

All users want conveniently located, safe secure and value-for-money parking with signage to their destination and restrictions that are clear consistent and user friendly.

Parking wayfinding refers to a system of signs, directories and other design features which provide an early warning navigational aid. In many cities public and private parking areas are advertised by an inconsistent array of signs and 'P' logos which are usually located within 5 m of the car park entrance. They do not assist drivers coming into the commercial centres to plan their route well in advance so as to reduce their search time and traffic congestion. There is a presumption that 'drivers know where the parking is'.

Drivers want to know where to look for wayfinding information when they need it, understand the way the information is communicated and obtain the information quickly and without fuss.

A single consistent system should guide drivers to all car parks. Once drivers are at the car park then individual branding and signage can be used. Similarly, the city's maps and the website should show all public parking facilities not just car parks owned by the city.

Public parking information should be applied and published uniformly across the entire city equally to the city's and privately owned public car parking areas.

A coherent wayfinding system is a cost-effective means to reduce searching time for bays and unnecessary circulation of cars. Predictable, consistent and authoritative public information is the key to building confidence.

Figure 11.1: Examples of consistent car park and wayfinding signage in Parramatta and Fremantle



Source: ARRB Group

More information on the objectives (Commentary C15.1) and types (Commentary C15.2) of electronic parking guidance systems can be found in Commentary 15.

[\[see Commentary 15\]](#)

12. Duty of Care and Risk Management

Car park owners, managers and operators have a duty of care towards patrons which means that they must do what a reasonable person would do to provide for the safety and security of the patron of their parking facility. This applies to both off-street and on-street parking. Common situations where designers and operators have been found to be negligent arise from the following issues:

- design/construction and maintenance
- protection of car park patrons
- training/supervision of parking attendants.

The first step to making sure that duty of care is observed is to foresee the potential dangers and then to address those that are identified. This is done by assessing and then managing the risk.

Risk management is defined as a 'structured and systematic way of identifying hazards assessing the risks from each and deciding what (if anything) needs to be done'. It can range from simple review processes through to highly complex and formalised procedures. The responsible authority and its professional officers must decide what is the appropriate type and level of risk management to apply in each case.

Road safety auditing offers the most common set of tools for risk management of the physical environment (Austroads 2002a) involving a formalised procedure in which an independent qualified examiner reports on the crash potential and safety performance of a parking facility. Audits can be undertaken throughout various stages of the project but the feasibility and preliminary design stage audits are particularly important since they alert the design team to required changes before works and resources are committed. Hazards that are identified in the audit must be considered by the responsible officers who can then decide what changes if any are required in light of the perceived risks involved. It is imperative that actions taken in response to the hazard identification and reasons for them (especially if no change is made) be clearly documented.

Other risk management tools include car park safety and security assessments, emergency evacuation procedural audits and universal access audits. It is the responsibility of each practitioner to ensure they have access to and apply the appropriate tools in their work and make use of all relevant codes and guides that apply to their specific situation.

Further information on road safety audits is contained in Austroads (2002a) and an example of a risk management method is given in AS/NZS 4360:2004 *Risk Management*. In New Zealand reference can also be made to the Land Transport New Zealand Road Safety Audit procedures.

12.1 Risk and Safety

A large number of criminal acts occur in a car park. Liability of the owner is often based on the fact that the owner or management did not provide adequate security measures to deter criminal activity or risks of injury or damage.

Many lawsuits revolve around lack of sufficient lighting, layout and response and parking providers should be careful to ensure that they are taking 'reasonable care' in their efforts to provide for the protection of employees, invitees and guests against foreseeable criminal threats.

12.1.1 Risk Management

The following checklist (Our Community n.d.) may be used in the context of the parking providers overall risk management policy.

This checklist can do no more than provide a starting point for you to use in the development of specific risk management checklists. Every group has risks that are particular to their own operations, and only investigator/reader/operator can identify them. More about the risk management process can be obtained at www.ourcommunity.com.au/risk.

While this checklist deals with the specific risks associated with car park operations, there are of course other risks involved in running a community group – financial risks, IT risks, HR risks – and organisation will have to take account of them. The list of risk management checklists to see which ones are relevant to each situation.

Table 12.1: Car park risk management assessment

This checklist was commenced on [date] by [name of Risk Management Officer]

What potential risks have you identified?	Date of assessment	Likelihood A, B, C, D, E*	Impact A, B, C, D, E*	Risk rating H, M, L*	What should we do about it?	Who will do it?	When will it be done?	Completed (signed off)
Is your car park and the surrounding area adequately lit?								
Is the entrance and exit area clear and free of obstructions?								
Is there adequate access for emergency vehicles?								
Are parking spots clearly marked?								
If possible do you have a separate entrance and exit to encourage a directional flow of traffic?								
Do you encourage drivers to reverse into parking spaces if possible, to provide better visibility (especially of children) when pulling out)?								
Do you have rules for pedestrians in the car park – especially children (e.g.: no running, always hold hands with a parent)?								

What potential risks have you identified?	Date of assessment	Likelihood A, B, C, D, E*	Impact A, B, C, D, E*	Risk rating H, M, L*	What should we do about it?	Who will do it?	When will it be done?	Completed (signed off)
Do you keep shrubs and trees trimmed to minimise risk of physical injury and ensure maximum visibility?								
Do you have a separate parking area for staff (if space allows)?								
Are surfaces well maintained and free of oil?								
Is signage visible and able to be seen at night?								
Have you allocated sufficient spaces for people with disabilities?								

* Risk charts

Likelihood

Measure	Likelihood	Description
A	Frequent	Will occur regularly – day to day
B	Probable	Will occur on most occasions, circumstances
C	Occasional	Will occur from time to time
D	Remote	May occur but not regularly or often
E	Improbable	Unlikely to ever occur

Impact

Measure	Impact	Effect/description
A	Catastrophic	Death – severe injury (e.g. loss or crushed limb, brain damage)
B	Critical	Major Injuries – require medical assistance (incl. concussions)
C	Marginal	Minor Injuries, cuts, treated internally (incl. minor sprains)
D	Negligible	No injury

Risk rating

Rating		Likelihood					
			A	B	C	D	E
Impact			Frequent	Probable	Occasional	Remote	Improbable
	A	Catastrophic	High	High	High	High	High
	B	Critical	High	High	High	Medium	Low
	C	Marginal	High	Medium	Medium	Low	Low

Source: Adapted from Our Community (n.d.)

12.1.2 Conditions of Parking

It is essential that Conditions of Parking are to be installed to include all users. These should be visible and legible at all points of entry to the car park for drivers, pedestrians and cyclists. They should also be included with any parking licence agreements. An example notice of Conditions of Entry and Limitation of Liability is shown below. This should be checked by the parking provider's insurers and solicitors.

CONDITIONS OF ENTRY AND LIMITATION OF LIABILITY

ATTENTION all persons entering this Car Park.

The following conditions apply when you enter, leave or use this Car Park. If you do not accept these conditions, immediately leave the Car Park. If you are in a vehicle and are unable to turn it around you may, subject to these conditions, proceed directly to the nearest exit where you may leave without charge providing you do not delay.

1. You enter and use this Car Park at your own risk. We may refuse entry by any vehicle or person.
2. We are not liable to you or any person with you for:
 - (a) injury to you or to anybody else;
 - (b) damage to, destruction of, theft of or unauthorised delivery of your vehicle or any other vehicle whether authorised or not; or
 - (c) damage to, destruction of, theft of or delivery of any property (including anything in or on your vehicle or any other vehicle); however caused, and you release and indemnify us from any claim which you might otherwise have against us.
3. You agree to indemnify us in respect of any claim made against us and any expenses incurred by us as a consequence of, in relation to, or in any way arising out of your use of this Car Park.
4. We will not be liable to you for delivery of your vehicle to any person who did not have authority to take your vehicle.
5. We have the right to retain your vehicle until we are provided with a valid parking ticket or evidence of ownership or entitlement to receive the vehicle which, in our opinion, is satisfactory; and
6. If we deliver your vehicle to anyone in accordance with this clause, we will not be liable to you even if the person taking the vehicle does not have your authority.
7. You agree:
 - (a) not to cause any obstruction;
 - (b) not to park anywhere that we designate as a No Parking or reserved area; and
 - (c) not to use this Car Park other than in accordance with instructions we may give.
8. If you breach any of the Conditions in item 6 above, you will pay us liquidated damages of xxx Dollars (\$xxx).
9. While in the Car Park you must comply with all signs and all reasonable directions and requests made by us; and you may have access to or remove a vehicle from this Car Park only during the permitted hours displayed in the Car Park.
10. We have the right, at our discretion, to move your vehicle (including moving it to any location outside this Car Park), even if your vehicle is locked. If we move your vehicle, these conditions continue to apply. We are not liable for any damage caused to your vehicle when we move it.
11. These conditions may only be altered by a written agreement between us and you.
12. If any of these conditions are illegal or unenforceable, the offending part is to be disregarded and does not affect the remaining part.
13. Each exclusion of our liability in these conditions is subject to any law which restricts or forbids that exclusion of liability including the Trade Practices Act and similar State legislation.
14. If you have made arrangements with us to store your bicycle in the Car Park all of these conditions apply to you and your bicycle while in the Car Park.
15. In these conditions references to:
 - (a) 'we', 'us' and 'our' mean xxxxxxx, its employees, agents and independent contractors; and
 - (b) 'your vehicle' includes a vehicle driven, or intended to be driven, by you into this Car Park.

An example of Conditions for Cyclists is shown below. This is to be checked by the parking provider's insurers and solicitors.

CYCLE AND PARK CONDITIONS OF USE

Xxxx agrees to allow you to use the end-of-trip facilities for the intended purpose on the condition that you comply with these Terms and Conditions, obey all posted notices and take due care not to damage the facility. Failure to comply with these directions may result in you being excluded from use of the facility.

Bicycles are not to be taken into the passenger elevators. Access into and out of the basement shall be only along the designated pedestrian/cyclist pathway on the driveway ramp. Cyclists must dismount, proceed and adhere to the posted speed limits when using the ramp. Within the car park cyclists must follow all directional signage.

Xxxx accepts no responsibility for the loss or damage of any bicycles and other equipment in the car park or left in the End-of-Trip facility.

Clothing, towels and footwear are not to be left exposed in the facility but can be hung in the drying room or placed in the lockers. Any clothing left out will be collected, placed in a lost clothing box and disposed of within a week.

Bicycle locks are not to be left on the bike rack but can be left on the lock rails which have been provided for this purpose. Locks left on the bike racks will be removed and disposed of.

The bicycle racks are intended for short-term storage of bicycles only. Xxxx reserves the right to dispose of any bicycle that is abandoned in the facility. Bicycles that have not been used or moved for three months will be considered as abandoned.

Xxxx reserves the right to amend these Terms and Conditions and/or terminate your agreement with xxx for the use of the facility.

References

- Abong, E 2011, 'Parking building of MoA, Manila, Philippines', image, viewed 26 October 2016, <<http://www.panoramio.com/photo/63403215>>.
- Adelaide City Council n.d., 'Off-street car parking provisions-residential and mainstreet zone', internal policy document, Adelaide City Council, Adelaide, SA.
- Advanced Parking Solutions n.d., *Pay by space*, web page, Advanced Parking Solutions, Bangor, Northern Ireland, viewed 26 October 2016, <<http://www.apsparking.com/payment-system-specific.aspx?title=pay-by-space>>.
- Architonic n.d., *Car display tower von Wöhr*, web page, Architonic, Switzerland, viewed 26 October 2016, <<https://www.architonic.com/de/product/woehr-car-display-tower/1085167>>.
- ARRB Transport Research 2005, *National guidelines for the provision of rest area facilities: final report*, National Transport Commission, Melbourne, Vic.
- Arup 1998, *A park-and-ride strategy for the Transperth system*, Arup, Perth, WA.
- Auckland Transport 2015, *Parking strategy*, AT, New Zealand.
- Australian Building Codes Board 2004, *Draft access code for buildings: section 1.3*, ABCB, Canberra, ACT.
- Australian Building Codes Board 2015, *Building code of Australia*, ABCB, Canberra, ACT.
- Australian Bureau of Statistics 2015, *9309.0 Motor vehicle census, Australia, 31 Jan 2015*, ABS, Canberra, ACT.
- Australian Institute of Criminology 1989, *Crime and violence prevention: crime prevention through environmental design (CPTED)*, Australian Institute of Criminology, Canberra, ACT, viewed 26 October 2016, <<http://aic.gov.au/publications/previous%20series/crimprev/1-11/cpted.html>>.
- Austroads 1998a, *Cities for tomorrow: integrating land use transport and the environment: better practice guide*, AP-57-98, Austroads, Sydney, NSW.
- Austroads 1998b, *Cities for tomorrow: integrating land use transport and the environment: resource document*, AP-58-98, Austroads, Sydney, NSW.
- Austroads 2002a, *Road safety audit*, 2nd edn, AP-G30-02, Austroads, Sydney, NSW.
- Austroads 2002b, *Guidelines to economic assessment of on-road parking on traffic flow incorporating ParkLane v2.0*, AP-R199-02, Austroads, Sydney, NSW.
- Austroads 2010, *Guide to road design part 6: roadside design, safety and barriers*, AGRD06-10, Austroads, Sydney, NSW.
- Austroads 2013a, *Guide to traffic management part 3: traffic studies and analysis*, 2nd edn, AGTM03-13, Austroads, Sydney, NSW.
- Austroads 2013b, *Guide to traffic management part 6: intersections, interchanges and crossings*, 2nd edn, AGTM06-13, Austroads, Sydney, NSW.
- Austroads 2013c, *Guide to road design part 5: general and hydrology considerations*, 3rd edn, AGRD05-13, Austroads, Sydney, NSW.
- Austroads 2014, *Guide to traffic management part 5: road management*, 2nd edn, AGTM05-14, Austroads, Sydney, NSW.
- Austroads 2015, *Guide to traffic management part 1: introduction to traffic management*, 3rd edition, AGTM01-15, Austroads, Sydney, NSW.
- Austroads 2016a, *Guide to traffic management part 8: local area traffic management*, 2nd edn, AGTM08-16, Austroads, Sydney, NSW.
- Austroads 2016b, *Guide to traffic management part 10: traffic control and communication devices*, 2nd edn, AGTM10-16, Austroads, Sydney, NSW.

- Austrroads 2016c, *Guide to road design part 3: geometric design*, 3rd edn, AGRD03-16, Austrroads, Sydney, NSW.
- Austrroads 2016d, *Bicycle parking facilities: updating the Austrroads guide to traffic management*, AP-R528-16, Austrroads, Sydney, NSW.
- Axent Global Systems 2014, *Carpark guidance*, Axent, Clayton, Vic, viewed 26 October 2016, <http://www.axent.com.au/index.php?option=com_content&task=view&id=173&Itemid=231>.
- Beebe, R 2001, 'Automated parking: status in the United States: advantages and criteria', *World parking symposium, 3rd, 2001, St Andrews, UK*, Canadian Parking Foundation Calgary, Canada.
- Berman, B 2014, 'The ultimate guide to electric car charging networks', *Plugincars.com*, 25 November 2014, viewed 26 October 2016, <<http://www.plugincars.com/ultimate-guide-electric-car-charging-networks-126530.html>>.
- Brisbane City Council 2000, *Brisbane city plan 2000: volume 2: appendix 2: transport access parking and servicing planning scheme policy*, BCC, Brisbane, Qld, viewed 26 October 2016, <https://www.brisbane.qld.gov.au/sites/default/files/Appendix2_TransportAccess_PSP.pdf>.
- Childs, M 1999, *Parking spaces: a design implementation and use manual for architects, planners, and engineers*, McGraw Hill, New York, USA.
- Chrest, AP, Smith, MS, Bhuyan, S, Iqbal, M & Monahan, DR 2001, *Parking structures: planning design construction maintenance and repair*, 3rd edn, Kluwer Academic, Boston, MA, USA.
- City of Denver 2010, *Denver strategic parking plan*, City of Denver, Colorado, USA.
- City of Sydney 2013, *Local environmental plans*, web page, City of Sydney, NSW, viewed 26 October 2016, <<http://www.cityofsydney.nsw.gov.au/development/planning-controls/local-environmental-plans>>.
- City of Vincent 2016, *Planning & building policies: parking and access policy number 7.7.1*, City of Vincent, Leederville, WA, viewed 26 October 2016, <http://www.vincent.wa.gov.au/Services/Planning/Planning_Building_Policies>.
- Cobalt Telephone Technologies 2012, *Parking permits technology: Milton Keynes Council*, case study 13, Cobalt Telephone Technologies, Basingstoke, UK, viewed 26 October 2016, <https://operators.myringgo.com/pdf/Case%20study_MiltonKeynes_HR.pdf>.
- Crowe, TD 1991, *Crime prevention through environmental design: applications of architectural design and space management concepts*, Butterworth-Heinemann, MA, USA.
- Curtin University 2013, *A better way to park*, Curtin University, Perth, WA, viewed 26 October 2016, <<http://www.hockeywa.org.au/Portals/54/Documents/Curtin-Parking.pdf>>.
- Department of Environment, Land, Water and Planning 2015, *Planning schemes: car parking: clause 52.06*, DELWP, Melbourne, Vic, viewed 26 October 2016, <http://planningschemes.dpcd.vic.gov.au/schemes/vpps/52_06.pdf>.
- Department of Environment, Land, Water and Planning 2016, *Victoria planning provisions*, DELWP, Melbourne, Vic, viewed 26 October 2016, <<http://planningschemes.dpcd.vic.gov.au/schemes/vpps>>.
- Department of Planning and Community Development 2012a, *Advisory Committee report: review of car parking provisions*, DPCD, Melbourne, Vic.
- Department of Planning and Community Development 2012b, *New car parking provisions*, advisory note 25, Department of Planning and Community Development, Melbourne, Victoria
- Department of Transport and Regional Services 2002, 'Transport programmes: the national highway rest areas policy', DOTARS, Canberra, ACT.
- Dolza Moto BMW Motorrad n.d., 'Car park, Turin, Italy', image, viewed 26 October 2016, <http://www.pictaram.com/media/1237725488443409061_1776496903>.
- Giummarra, GJ 1999, 'Darwin City Council: review of on-street parking technologies', contract report RC90211, ARRB Transport Research, Vermont South, Vic.
- Glenorchy City Council 2007, 'Commercial precincts car parking plan: stage 1', Glenorchy City Council, Hobart, Tas.

- Handsfield, W 2014, *Georgetown is swapping parking spaces for sidewalks, which people will enjoy*, Greater Greater Washington, viewed 26 October 2016, <<http://greatergreaterwashington.org/post/28058/georgetown-is-swapping-parking-spaces-for-sidewalks-which-people-will-probably-enjoy/>>.
- Holdsworth, GR 2001, 'Assessing and reviewing kerb lane management plans affecting major traffic routes', *Australian Institute of Traffic Planning and Management (AITPM) national conference, 2001, Melbourne, Victoria*, AITPM, Thornleigh, NSW, pp. 193-208.
- Horner, R, Booth, D, Azous, A & May, C 1996, 'Watershed determinants of ecosystem functioning', in LA Roesner (ed), *Effects of watershed development and management on aquatic ecosystems*, American Society of Civil Engineers, New York, USA.
- Institute of Transportation Engineers 2010, *Parking generation*, 4th edn, ITE, Washington, DC, USA.
- ITS International 2011, 'Developments in cashless parking payment', *ITS International*, March 2011, viewed 26 October 2016, <<http://www.itsinternational.com/categories/parking-access-control/products/developments-in-cashless-parking-payment/>>.
- Johnstone, P 2002, 'Best-practice parking policy review', contract report RC07209, ARRB Transport Research, Vermont South, Vic.
- Kodransky, M & Hermann, G 2011, *Europe's parking U-turn: from accommodation to regulation*, Institute for Transportation and Development, New York, NY, USA.
- Litman, T 2014, *Parking requirement impacts on housing affordability*, Victoria Transport Policy Institute, Victoria, BC, Canada.
- Luxmoore Parking Consulting 2010, 'Parking supply options: section 5.4', report prepared for the ACT Government, ARRB Group, Vermont South, Vic.
- Marshall, WE, Garrick, NW & Hansen, G 2008, 'Reassessing on-street parking', *Transportation Research Record*, no. 2046, pp. 45-52.
- McCormick Rankin Cagney & Victoria Transport Policy Institute 2008, *Strategic parking report*, prepared for Waitakere City Council, MRCagney & VTPI, Auckland, New Zealand.
- McDonald, SS 2015, *Parking facilities*, WBDG, National Institute of Building Sciences, Washington, DC, viewed 26 October 2016, <<https://wbdb.org/design/parking.php>>.
- Morgan, R 2002, *The parking on arterial roads ideas book*, Robert Morgan Traffic Engineering & Road Safety, Surrey Hills, Vic.
- Neubauer, M 2012, *Electric car charging stations in Franklin TN*, Franklin TN blog, USA, viewed 26 October 2016, <<http://franklintnblog.com/2012/06/electric-car-charging-stations-in-franklin-tn/>>.
- Nelessen, AC 1994, *Visions for a new American dream: process, principles and an ordinance to plan and design small communities*, 2nd edn, APA Planners Press, Chicago, IL, USA.
- NZ Transport Agency 2010a, *Manual of traffic signs and markings (MOTSAM): part 1: traffic signs*, NZTA, Wellington, New Zealand, viewed 26 October 2016, <<https://www.nzta.govt.nz/resources/motsam/part-1/>>.
- NZ Transport Agency 2010b, *Manual of traffic signs and markings (MOTSAM): part 2: markings*, NZTA, Wellington, New Zealand, viewed 26 October 2016, <<https://www.nzta.govt.nz/resources/motsam/part-2/>>.
- Our Community n.d., *Car park risk*, Our Community, Melbourne, Vic, viewed 26 October 2016, <<http://www.ourcommunity.com.au/search/?q=CAR+PARKS>>.
- Parking & Traffic Consultants 2010, 'Greenway self-park, Chicago, Illinois, USA', image, viewed 26 October 2016, <<http://www.parkingconsultants.com/the-worlds-10-most-beautiful-parking-garages/>>.
- Parking Association of Australia 2003, 'Investing in car parking: the small investor', *Parking*, no. 2, viewed 26 October 2016, <<http://web.archive.org/web/20031010231339/http://www.parkingmag.com.au/articles/investing.html>>.
- Phillip Boyle & Associates 2015, 'Car share policy', report prepared for the City of Melbourne, Phillip Boyle & Associates, Melbourne, Vic.

- Pline, JL (ed) 1999, *Traffic engineering handbook*, 5th edn, Institute of Transportation Engineers (ITE), Washington, DC, USA.
- Rawlinsons Quantity Surveyors and Construction Cost Consultants 2016, *Australian construction handbook*, Rawlinsons Publishers, Perth, WA.
- Roads and Maritime Services 2012, *Pay parking*, RMS, Sydney, NSW, viewed 26 October 2016, <<http://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/technical-manuals/payparkingv4.pdf>>.
- Roemmele, B 2011, *How are parking meters that accept credit cards connected to the credit card networks?*, Quora, viewed 26 October 2016, <<https://www.quora.com/How-are-parking-meters-that-accept-credit-cards-connected-to-the-credit-card-networks>>.
- Schueler, T 1995, 'The economics of watershed protection', *Watershed Protection Techniques*, vol. 2, no. 4, pp. 469-81.
- Shoup, DC 1999, 'The trouble with minimum parking requirements', *Transportation Research Part A: Policy and Practice*, vol. 33, no. 7/8, pp. 549-74.
- Shoup, DC 2005, *The high cost of free parking*, University of California Transportation Center, Berkeley, CA, USA.
- Smith, M 2005, *Shared parking*, 2nd edn, Urban Land Institute, Washington, DC, USA.
- Stehman, RW 2005, *Parking 101: a parking primer*, International Parking Institute, Fredericksburg, VA, USA.
- Stutz, F 1995, 'Environmental impacts', in S Hanson (ed), *Geography of urban transportation*, 2nd edn, Guildford Press, New York, NY, USA.
- Sun Namgoong 2012, 'Herma parking building, Seoul, South Korea', image, JOHO Architecture, viewed 26 October 2016, <http://www.johoarchitecture.com/ReNew%20homepage/_project/10_Herma%20Parking%20Building/Herma09_04.jpg>.
- Town of Cambridge 2009, *Town planning scheme policy manual*, Town of Cambridge, Floreat, WA.
- Transit New Zealand 1992, *Guidelines for establishing rural selling places*, Ministry of Transport, Wellington, New Zealand.
- Transit New Zealand 2008, *New Zealand supplement to the Austroads Guide to Traffic Engineering Practice: Part 14: Bicycles*, Transit New Zealand, Wellington, NZ, viewed 26 October 2016, <<http://www.nzta.govt.nz/assets/resources/nz-supplement-austroads-gtep-part-14-bicycles/docs/nz-supplement-austroads-gtep-part-14-bicycles.pdf>>.
- Transportation Research Board 1997, *Toward a sustainable future: addressing the long-term effects of motor vehicle transportation on climate and ecology*, special report 251, TRB, Washington, DC, USA.
- Trevipark n.d., *Roma, largo prestinari* (in Italian), web page, Trevi Group, Cesena, Italy, viewed 21 October 2016, <http://www.trevipark.com/viewdoc.asp?co_id=1510>.
- Trips Database Bureau 2016, *New Zealand trips & parking database, TDB*, Christchurch, New Zealand, viewed 26 October 2016, <<http://www.tdbonline.org/home>>.
- Turnbull, KF 1995, *Effective use of park-and-ride facilities: a synthesis of highway practice*, NCHRP synthesis 213, Transportation Research Board, Washington, DC, USA.
- United States Environmental Protection Agency 1992, *Cooling our communities: a guidebook on tree planting and light-colored surfacing*, GPO#055-000-00371-8, USEPA, Washington, DC, USA.
- Urban Land Institute & National Parking Association 2000, *The dimensions of parking*, 4th edn, Urban Land Institute, Washington, DC, USA.
- Valleley, M 1997, *Parking perspectives: a sourcebook for the development of parking policy*, Landor, London, UK.
- VicRoads 2015, *Victorian disabled persons parking scheme*, web page, VicRoads, Kew, Vic, viewed 26 October 2016, <<https://www.vicroads.vic.gov.au/safety-and-road-rules/road-rules/parking-and-clearways/disability-parking>>.

- Victoria Transport Policy Institute 2014, *Online TDM encyclopaedia*, VTPI, Victoria, BC, Canada, viewed 26 October 2016, <<http://www.vtpi.org/tdm/index.php>>.
- Weant, RA & Levenson, HS 1990, *Parking*, Eno Transportation Foundation, Washington, DC, USA.
- Westcon n.d., *Paving the way since 1984*, web page, Westcon, Hampton, VA, USA, viewed 26 October 2016, <<http://www.westconpavers-va.com/>>.
- Willson, R 1995, 'Suburban parking requirements: a tacit policy for automobile use and sprawl', *Journal of the American Planning Association*, vol. 61, no. 1, pp. 29-42.
- WÖHR Auto Parksysteime n.d., *Home page*, Wöhr, Frielzheim, Germany, viewed 26 October 2016, <<https://www.woehr.de/en/home.html>>.
- Young, W 1991, *Parking policy design and data*, Department of Civil Engineering, Monash University, Clayton, Vic.
- Young, W, Taylor, MAP & Gipps, PG 1989, *Microcomputers in traffic engineering*, Traffic Engineering Series no. 1, Research Studies Press, London, UK.
- Yue, WL & Young, W 1998, 'Using Parksim2 to measure safety in parking lots', *Journal of the Institute of Engineers Singapore*, vol. 38, no. 5, pp. 10-20.

Legislation

- Australian Road Rules 1999.*
- Australian Road Rules 2012.*
- Building Act 1994 (NZ).*
- Disability Discrimination Act 1992 (Cwlth).*
- Disability Standards for Accessible Public Transport 2015 (Cwlth).*
- Land Transport (Road User) Rule 2004 (NZ).*
- Land Transport Rule: Traffic Control Devices 2004 (NZ).*
- Human Rights Act 1993 (NZ).*
- Parking Space Levy Act 1992 (NSW).*

Australian and New Zealand Standards

- AS 1158.1.1:1997, *Road lighting: vehicular traffic (category v) lighting: performance and installation design requirements*, (superseded).
- AS/NZS 1158.3.1:2005, *Lighting for roads and public spaces: pedestrian area (category P) lighting: performance and design requirements*.
- AS 1428.1:2001, *Design for access and mobility: general requirements for access: new building work*, (superseded).
- AS/NZS 1680.2.1:2008, *Interior and workplace lighting: specific applications: circulation spaces and other general areas*.
- AS 1742.6-2014, *Manual of uniform traffic control devices: part 6: tourist and services signs*.
- AS 1742.10-2009, *Manual of uniform traffic control devices: part 10: pedestrian control and protection*.
- AS 1742.11-2016, *Manual of uniform traffic control devices: part 11: parking controls*.
- AS 1742.13-2009, *Manual of uniform traffic control devices: part 13: local area traffic management*.
- AS 1742.15-2007, *Manual of uniform traffic control devices: part 15: direction signs, information signs and route numbering*.
- AS 1743-2001, *Road signs: specifications*.
- AS/NZS 2890.1-2004, *Parking facilities: part 1: off-street car parking*.
- AS 2890.2-2002, *Parking facilities: part 2: off-street commercial vehicle facilities*.

AS 2890.3-1993, *Parking facilities: part 3: bicycle parking facilities.*

AS 2890.5-1993, *Parking facilities: part 5: on-street parking.*

AS 4586-2013, *Slip resistance classification of new pedestrian surface materials.*

AS/NZS 2890.6-2009, *Off-street parking for people with disabilities.*

AS/NZS 4360-2004, *Risk management.*

NZS 4121-2001, *Design for access and mobility: buildings and associated facilities for the design of ramps and walkways for people with disabilities.*

Commentary 1

C1.1 Shared Parking Advantages and Disadvantages

For developers, shared parking can reduce the amount and cost of parking (both capital and operating costs). It also has the potential of making a larger area available for the development itself.

The main advantages of shared parking for the public are:

- attract mixed-use developments that promote a more active urban pattern with round-the-clock uses and a more secure environment
- reduce the land area for parking resulting in more area available for tax-revenue-generating purposes and open space/community purposes
- reduce traffic access points thereby reducing conflicts between vehicles and pedestrians and between turning vehicles
- improve the attractiveness of the urban environment through parking area reduction.

The primary potential disadvantages of shared parking are as follows:

- possible shortage of parking may occur if land uses change or demand spikes
- parking cannot be segregated by land use hence it is more difficult to customise design or customise operations or to provide security – note that this can be reduced by signing short-term parking near businesses with a demand for high turnover parking during the day for example
- management problems such as disagreement on maintenance or liability issues may result from property owners sharing a facility
- possibility of undesirable long walking distances for some users
- complexity of dealing with different developers monitoring uses and getting developers to accept different design standard covenants or performance bonds.

A review carried out by Johnstone (2002) established that No Parking standards are currently available for mixed-use developments in Australia. For this reason, it is always necessary to supply parking based on an estimate of the real shared demand. More information about shared parking is provided in Chrest et al. (2001) and Section 5.

Refer to Section 3.3 for more information on mixed land use and shared parking.

C1.2 Complementary Uses

Complementary use occurs when space in a multi-tenant building is utilised by a land use designed to enhance the primary one. The interrelationship with the primary use can result in lowered parking demand from a reduction in vehicle trip generation. For example, the demand for parking at a sandwich shop in a multi-storey office building can be calculated at the same rate as the office space.

Some developments have much greater interaction between land uses than others. When such synergy exists a highly successful development may have lower parking demand and trip generation rates than if it were built separately. For example, a restaurant may have much greater lunch-time patronage than it would otherwise have simply because it is located within walking distance of a large employment centre.

Examples of successful ways to complement a parking facility include the following:

- cars can be serviced or cleaned while parked
- ground floor retail and office space can enhance the look of a large parking facility and offices or housing can be sited on the top level of a car park or on the same site

- empty parking areas can be used for street fairs and markets
- parking areas can be paved and landscaped so they are an attractive part of a building when not in use.

In addition, parking in high-demand precincts can be zoned for complementary uses at different times of the day or week. For instance, a parking space that operates as a commercial vehicle loading zone during weekdays can be dedicated as a zone for taxis on Friday and Saturday nights and as general use ticket or meter parking at other times.

Refer to Section 3.3 for more information on mixed land use and shared parking.

[\[Back to body text\]](#)

Commentary 2

The following tables provide examples of parking provision rates.

C2.1 Car Parking Provision Rates

Table C2 1: Car parking provision rates – City of Vincent, Western Australia

Activity	Number of car parking spaces (minimum)
Aged or dependent persons' dwelling	As prescribed by the Policy relating to aged or dependent persons' dwelling
Amusement centre	3 spaces plus 1 space per 50 square metres of gross floor area
Amusement facility	3 spaces plus 1 space per 50 square metres of gross floor area
Amusement parlour	3 spaces plus 1 space per 50 square metres of gross floor area
Ancillary accommodation	As prescribed by the policy relating to ancillary accommodation
Animal boarding	1 space per 4 staff employed
Animal keeping	1 space per 4 staff employed
Art and craft centre	1 space per 10 square metres of gross floor area
Art gallery	1 space per 50 square metres of gross floor area
Auction mart	1 space per 50 square metres of gross floor area
Bank	1 space per 50 square metres of gross office/administration floor area plus 1 space per 15 square metres of gross retail banking floor area
Beauty therapist	1 space per 15 square metres of gross floor area
Betting agency	1 space per 15 square metres of gross floor area
Boat sales and hire premises	3 spaces for the first 200 square metres of display and sales area and thereafter 1 space per 100 square metres of display and sales area or part thereof
Building society	1 space per 50 square metres of gross office/administration floor area plus 1 space per 15 square metres of gross retail banking floor area
Business college	As determined by the council
Camping and caravan park	1 space per caravan/park home site plus 1 space per employee plus 1 space per 20 caravan/park home sites for visitors
Caravan park	1 space per caravan/park home site plus 1 space per employee plus 1 space per 20 caravan/park home sites for visitors
Caravan sales and hire premises	3 spaces for the first 200 square metres of display and sales area and thereafter 1 space per 100 square metres of display and sales area or part thereof
Caretaker's dwelling	As prescribed by the Residential Planning Codes
Child care centre	1 space per 5 children
Child day care centre	1 space per 5 children
Child family care centre	1 space per 5 children

Activity	Number of car parking spaces (minimum)
Cinema	1 space per 6 seats provided
Club premises	1 space per 4.5 square metres of gross public assembly area
College	As determined by the council
Consulting room(s)	3 spaces per consulting room
Contractor's yard	3 spaces for the first 200 square metres of yard area and thereafter 1 space per 100 square metres of yard area or part thereof
Dry cleaning premises	1 space per 20 square metres of gross floor area
Education centre	As determined by the council
Fire brigades depot	1 space per 50 square metres of gross floor area
Fish shop	1 space per 15 square metres of gross floor area
Funeral parlour	6 spaces plus additional parking spaces to be determined by the council where a chapel is included
Grouped dwelling	As prescribed by the Residential Planning Codes
Hairdresser premises	1 space per 15 square metres of gross floor area
Hall	1 space per 4.5 square metres of gross public assembly area
Health club	1 space per 30 square metres of gross floor area
Home occupation	As prescribed for the dwelling type defined by the Residential Planning Codes
Home store	3 spaces plus as per Residential Planning Codes for the residential requirement
Hospital	As determined by the council
Hotel	1 space per bedroom or 1 space per 3 beds provided whichever is the greater
Industry	3 spaces for the first 200 square metres of gross floor area and thereafter 1 space per 100 square metres of gross floor area or part thereof
Landscape supplies	3 spaces for the first 200 square metres of display and sales area and thereafter 1 space per 100 square metres of display and sales area or part thereof
Laundromat	1 space per 20 square metres of gross floor area
Library	1 space per 50 square metres of gross floor area
Liquor store	1 space per 15 square metres of gross floor area
Market	3 spaces per stall provided
Medical centre	3 spaces per consulting room
Motor vehicle repair	3 spaces per each working bay provided
Multiple dwelling	As prescribed by the Residential Planning Codes
Museum	1 space per 50 square metres of gross floor area
Night club	1 space per 4.5 square metres of gross public assembly area
Nursing home	1 space per 3 beds provided
Office	1 space per 50 square metres of gross floor area
Open air display	3 spaces for the first 200 square metres of display and sales area and thereafter 1 space per 100 square metres of display and sales area or part thereof
Park home	1 space per caravan/park home site plus 1 space per employee plus 1 space per 20 caravan/park home sites for visitors
Place of assembly	1 space per 4.5 square metres of gross public assembly area
Plant nursery	1 space per 50 square metres of display and sales area
Post office	1 space per 15 square metres of gross floor area
Pre-school	1.25 spaces per classroom provided
Real estate agency	1 space per 15 square metres of gross floor area
Reception centre	1 space per 4 seats provided

Activity	Number of car parking spaces (minimum)
Recreation – indoor outdoor private public	1 space per 30 square metres of gross floor area
Recreation and leisure	1 space per 30 square metres of gross floor area
Residential building	1 space per bedroom or 1 space per 3 beds provided whichever is the greater
Resort	1 space per bedroom or 1 space per 3 beds provided whichever is the greater
Restaurant	1 space per 4.5 square metres of public area
Restricted premises	1 space per 15 square metres of gross floor area
Retail premises – convenience store	1 space per 15 square metres of gross floor area
Retail premises – local shop	1 space per 15 square metres of gross floor area
Retail premises – restricted	1 space per 15 square metres of gross floor area
Retail premises – shop	1 space per 15 square metres of gross floor area
Retirement village	1 space per residential dwelling provided
Salvage yard	3 spaces for the first 200 square metres of yard area and thereafter 1 space per 100 square metres of yard area or part thereof
School	1.25 spaces per classroom provided
Service station	1 space per working bay provided
Serviced apartments	1 space per bedroom or 1 space per 3 beds provided whichever is the greater
Showroom	3 spaces for the first 200 square metres of gross floor area and thereafter 1 space per 100 square metres of gross floor area or part thereof
Single house	As prescribed by the Residential Planning Codes
Storage yard	3 spaces for the first 200 square metres of yard area and thereafter 1 space per 100 square metres of yard area or part thereof
Take-away food outlet	1 space per 4.5 square metres of seating area plus 1 space per 2.5 square metres of queuing area with a minimum of 4 spaces
Tavern	1 space per 4.5 square metres of gross public assembly area
Theatre	1 space per 6 seats provided
Transport depot	3 spaces for the first 200 square metres of depot and gross floor area and thereafter 1 space per 100 square metres of depot and gross floor area or part thereof
Travel agency	1 space per 15 square metres of gross floor area
Twenty-three-hour recovery care centre	3 spaces per consulting room
University	As determined by the council
Vehicle sales and hire premises	3 spaces for the first 200 square metres of display and sales area and thereafter 1 space per 100 square metres of display and sales area or part thereof
Veterinary centre	3 spaces per consulting room
Veterinary clinic	3 spaces per consulting room
Veterinary hospital	3 spaces per consulting room
Video shop	1 space per 15 square metres of gross floor area
Warehouse	3 spaces for the first 200 square metres of gross floor area and thereafter 1 space per 100 square metres of gross floor area or part thereof

Source: City of Vincent (2016).

Table C2 2: Car parking provision rates Victoria

Use	Car space measure	Rate (minimum)
Residential building other than specified in this table	Car spaces to each lodging room	1
Caretaker's house	Car spaces to each dwelling	1
Dwelling other than Caretaker's house if at least two on a lot	Car spaces to each dwelling	2
Shop other than specified in this table	Car spaces to each 100 sq m of leasable floor area	8
Betting agency Market	Car spaces to each 100 sq m of net floor area	8
Restaurant	Car spaces to each seat available to the public	0.6
Office other than specified in this table Postal agency	Car spaces to each 100 sq m of net floor area	3.5
Hotel or tavern	Car spaces to each 100 sq m of bar floor area available to the public plus	60
	Car spaces to each 100 sq m of lounge floor area available to the public	30
Motel	Car spaces to each unit plus	1
	Car spaces to each resident employee plus	1
	Car spaces to each 100 sq m of motel service floor area not available for use by guests	2
Industry other than specified in this table Mail centre	Car spaces to each 100 sq m of net floor area	2.9
Materials recycling Fuel depot Milk depot Motor repairs	Percentage of site area to be set aside for car spaces and access lanes but not driveways	10
Plant nursery Saleyard Store other than specified in this table Timber yard Utility installation	Percentage of site area to be set aside for car spaces and access lanes but not driveways	10
Freezing and cool storage warehouse other than specified in this table	Car spaces to each 100 sq m of net floor area	1.5
Display home	Car spaces to each dwelling for five or fewer contiguous dwellings plus	5
	Car spaces to each additional contiguous dwelling	2
Medical centre Veterinary centre	Car spaces to each practitioner	5
Hospital	Car spaces to each bed available for use by patients	1.3
Place of assembly Funeral parlour	Car spaces to each seat or to each sq m of net floor area whichever is greater	0.3
Golf course	Car spaces to each hole	4
Bowling green	Car spaces to each rink	6
Squash court other than in conjunction with a dwelling	Car spaces to each court	3
Swimming pool other than in conjunction with a dwelling	Car spaces to each 100 sq m of site	5.6
Tennis court other than in conjunction with a dwelling	Car spaces to each court	4
Primary school	Car spaces to each employee	1
Secondary school	Car spaces to each employee	1.2

Use	Car space measure	Rate (minimum)
Tertiary institution	Car spaces to each full time student and three part-time students	0.6
Convenience shop if the leasable floor area exceeds 80 sq m	Car spaces to each premises	10

Source: Department of Environment, Land, Water and Planning (2016).

Table C2 3: Car parking provision rates – Brisbane City Council Queensland

Development	Parking rate (minimum unless stated otherwise)
Caravan park	11 spaces per 10 sites plus 1 space per 10 sites as visitor spaces
Centre activities where in a centre and where: The boundary of the site is within 200 m of a railway station entry or a busway station or A major public transport interchange is incorporated within and directly accessible to the centre and the interchange includes dedicated bus parking bays and transit facilities being seating ticket vending machines and facilities and security posts	A maximum of 1 space per 20 m ² GFA at ground floor level and 1 space per 50 m ² GFA above ground floor level
Centre activities where in a centre in any other circumstance	A minimum of 3 spaces per 50 m ² GFA at ground floor level and 1 space per 30 m ² GFA above ground floor level
Child care facility	1 car space per 5 children. 60% of the parking is to be designated for staff and may be provided in tandem. If the proposal is within the grounds of a site that already provides plentiful staff parking or if there are other alternatives available for car parking the above parking requirement may be modified
Community facilities: - Hospital - Licensed club < 1500 m² GFA > 1500 m² GFA - Hall or theatre - Church Where fronting a designated road Where includes a hall All other cases	5 spaces plus 1 space per 30 m ² GFA 50 spaces plus 1 space per 65 m ² GFA 1 space per 15 m ² GFA 40 spaces plus 1 space per 25m ² GFA 1 space per 10 m ² GFA 1 space per 10 m ² GFA as above and refer to notes at front of Section 5 1 space per 12 m ² GFA
Display and sales activities Except where: Auction depot Vehicle sales yard or Plant sales and hire	3 spaces per 50 m ² GFA 2 spaces plus 1 space per 100 m ² GFA 2 spaces plus 2 spaces per 5 employees
Education purposes: - If primary or secondary school - Tertiary including TAFE - Otherwise	1 space per 2 staff 1 space per 2 staff and 1 space per 10 students Refer to notes at the front of Section 5
House	Refer House Code and/or Residential Design – Small Lot Code

Development	Parking rate (minimum unless stated otherwise)		
Indoor sport and recreation: - Squash - Indoor cricket or other court game - Swimming - Gymnasium - Otherwise	6 spaces per court 20 spaces per pitch or court 15 spaces plus 1 space per 100 m ² GFA 1 space per 10m ² GFA Refer to notes at the front of Section 5		
Industry	2 spaces per tenancy or lot plus 1 space per 100 m ² GFA		
Multi-unit dwelling	As in the following table the total rounded up to the nearest whole number:		
	Dwelling unit size/number of bedrooms	Average vehicle spaces per dwelling	
	Location:	A	B
	Small (< 75 m ²) or 1 bedroom	1	1.25
	Other	1.25	1.5
Retirement village	Where: A means any part of the site is within 200 m of a pedestrian entry to a railway station busway station and ferry terminal or within 100 m of a major road (except where the site has access to a road where on-street parking restrictions apply). Except where: B means any other circumstances Tandem parking may be used where 2 spaces are provided for 1 dwelling		
	1 space per 6 nursing home beds		
	1 space per 4 hostel unit beds		
	1 space per self-contained unit plus visitor parking at the rate of 50% of resident parking requirements		
	1 space per bed		
Boarding house <i>Qualifying for a subsidy for aged persons or persons with disabilities accommodation under any law</i>	1 car space per 3 dwellings		
Office	1 space per 30 m ² GFA		
Outdoor sport and recreation: - Camping ground - Coursing, horse racing, pacing or trotting motor sport - Football - Lawn bowls - Swimming - Tennis	spaces per site 1 space per 5 persons to be seated plus 1 space per 5 m ² of other area 50 spaces per field 30 spaces per green 15 spaces plus 1 space per 100 m ² of site area 6 spaces per court		
• Court games	20 spaces per court		
• Otherwise	Refer to notes at the front of Section 5		
Restaurant < 400 m ² GFA > 400 m ² or greater GFA	1 space per 8 m ² GFA 30 spaces plus 1 space per 20 m ² GFA		
Service station Where vehicle repair and service	10 spaces plus 1 space per 60 m ² GFA		
Shop Except where Retail showroom	2 spaces per 50 m ² GFA 1 space per 50 m ² GFA		

Development	Parking rate (minimum unless stated otherwise)
Short-term accommodation	1 space per unit 1 space per 16 m ² GFA for any dining room as part of a motel 1 space per 30 m ² GFA for non-residential component of a hotel 1 space per 100 m ² GFA and parking for a mini-bus
Except where Backpackers hostel	
Warehouse and storage	2 spaces per tenancy or lot plus 1 space per 100 m ² GFA
Otherwise not defined	Refer to notes at the front of Section 5

Notes:

GFA = ground floor area.

- 1 Indicates that in a case where a car space made available as visitor parking is provided as a tandem parking space in a manner satisfactory to council such car space shall be regarded as a car parking space.
- 2 The applicant is responsible for providing evidence in support of the car parking proposed to be provided for assessment by council in determining the application.

The parking rates above are the minimum requirement unless stated otherwise in the table in the Local Plans (Chapter 4 of Brisbane City Plan 2000 Volume 1) or in the Codes and Related Provisions (Chapter 5 of Brisbane City Plan 2000 Volume 1). In particular Local Plans have requirements which over-ride the above table e.g. car parking within various precincts in the Upper Mt Gravatt Major Centre at pages 486 487 and 488).

The maximum parking rate is set to encourage the use of other forms of Transport such as walking cycling and public transport. In a broad sense the type of developments where a maximum rate is applied are those within 200 m of a rail/bus station entrance or those non-residential developments located in and around the CBD in the area of 'The City Centre and City Frame Areas' as defined by the map 'A' on page 258 of Chapter 5 of Brisbane City Plan Volume 1. The parking rate for the City Centre and Frame is set out in Acceptable Solution A7.3 of the TAPS Code (page 256 of Chapter 5).

Source: Brisbane City Council (2000).

Table C2 4: Car parking provision rates – City of Sydney, New South Wales

Type of proposed use	Maximum parking on site spaces permitted
Dwelling house	2 spaces per dwelling house
Residential building (including housing for aged persons): Studio apartments/bedsitter 1 bedroom apartment 2 bedroom apartment	1 space per 4 studio apartments/bedsitters 1 space per 2 apartments 1 space per apartment plus 1 space per each 5 apartments
Apartment with 3 or more bedrooms	2 spaces per apartment
Hotel and club	1 space per 5 bedrooms 4 spaces per 100 square metres of function room area
Cinema theatre and recital hall	1 space per 7 seats
Serviced apartment	1 space per 4 studio apartments/bedsitters 1 space per 2 one-bedroom apartments 1.2 spaces per two or more bedroom apartments
Other use (not specified above)	Max No = $\frac{\text{Total Other FSA}}{\text{Total FSA within 50m of development}} \times \text{Site Area}$

Note: Parking for service and delivery vehicles motorcycle bicycle parking and car parking for people with mobility impairment is to be compliant with the provisions of DCP 1996.

Source: City of Sydney (2013).

Table C2 5: Car parking provision rates – Manukau City Council, New Zealand

Activity	Parking spaces to be provided (minimum)
Amusement galleries	1 for every 20 m ² of gross floor area.
Auction rooms and second-hand marts	1 for every 50 m ² of gross floor area of building plus 1 for every 100 m ² of open space on the site used for storage purposes plus 1 for every permanent employee employed on site or operating from the site at any one time.
Banks	1 for every 35 m ² of gross floor area.
Boarding houses	1 for every three persons the building is designed to accommodate plus 1 for every two non-resident employees employed on site or operating from the site at any one time.
Building improvement centres	1 for every 30 m ² of retail and display area of building plus 1 for every 40 m ² of other floor space plus 1 for every 100 m ² of open space used for outdoor display.
Car and boat sales showrooms and yards	2 for a display of up to 20 cars or boats in this showroom or yard plus 1 for every additional 10 cars or boats displayed plus 1 for every employee employed on site or operating from the site at any one time.
Child care premises	1 for every staff member employed on site or operating from the site at any one time plus 1 for every ten children where there is parental participation in the daily operation of the facility plus a suitable drop off area.
Churches and church halls	1 for every 5 persons to be accommodated provided that where a church and a hall are erected on the same site and are not used at the same time the minimum requirement applicable shall be the maximum requirement in respect of such church or hall whichever is the greater.
Cinemas and theatres	1 for every 3.5 persons the building is designed to accommodate.
Cleaning depots	1 for every 40 m ² of gross floor area.
Coffee bars and tearooms	1 for every 20 m ² of gross floor area.
Community centres community halls	1 for every 3.5 persons the building is designed to accommodate
Community welfare services	1 for every two persons employed on site or operating from the site at any one time plus 1 for every interview room or booth used by visitors.
Conference centres	1 for every 3.5 persons the building is designed to accommodate.
Container depots and terminals	1 for every two persons employed on site or operating from the site at any one time.
Cultural social and recreational purposes (premises)	1 for every 3.5 persons the building is designed to accommodate.
Educational facilities for adults including tertiary education facilities	2 for every 3 staff employed on site or operating from the site at any one time plus 1 for every 3.5 adult students present on site at any one time.
Electricity substations (bulk supply substation)	1 for every two persons employed on site or operating from the site at any one time
Equipment hire (excluding video hire outlets)	1 for every 40 m ² gross floor area.
Funeral director's premises and mortuary chapel	1 for every five persons the building is designed to accommodate.
Furniture showrooms	1 for every 30 m ² of display and retail floor space plus 1 for every 40 m ² of other floor space.
Garden centres and nurseries (excluding shops selling plants and gardening merchandise where there is no outdoor display)	1 for every 500 m ² of gross land area of the site used for garden centre purposes plus 1 for every person employed on site or operating from the site at any one time plus 1 for every 40 m ² of enclosed indoor selling area.

Activity	Parking spaces to be provided (minimum)
Greenhouses	1 for every three non-resident employees on site.
Homes for the aged	1 for every three persons the building is designed to accommodate plus 1 for every resident employee plus 1 for every two non-resident employees employed on site or operating from the site at any one time.
Household units	2 for every household unit.
Housing for the elderly and Kaumatua housing	1 for every four household units plus 1 for every resident caretaker or warden.
Horse riding clubs and riding schools	10 motor vehicle and trailer (all weather) spaces for every property and adequate vehicle turning area.
Hotels	1 for every four guest rooms plus 1 for every two fulltime staff employed on site or operating from the site at any one time provided that where the premises are also licensed additional parking shall be provided in accordance with the parking requirements below excepting that any restaurant space which serves as hotel dining room shall not be required to provide parking for the number of hotel guests catered for in the dining room plus 1 for every 3.5 persons to be accommodated within restaurant or bars.
Industrial premises	1 for every 45 m ² of gross floor area of buildings plus 1 for every 100 m ² of open space used for industrial purposes or 1 for every two persons to be employed on site or operating from the site at any one time whichever requirement is the greater.
Markets -indoor outdoor	One for every 15 m ² of gross floor area occupied by the market or 3.5 for every stall provided plus the requirements of this Schedule for other onsite uses.
Medical service premises and health centres and industrial health centres	1 for each medical practitioner or professional person employed on site or operating from the site at any one time plus 1 for every two assisting staff employed on site or operating from the site at any one time plus 2 for every surgery or inspection room or booth.
Medical and analytical laboratories	1 for each professional person employed on site or operating from the site at any one time plus 1 for every two assisting staff employed on site or operating from the site at any one time plus 1 for every public counter or treatment room.
Motor vehicle trimmers painters and upholsterers	3 for every workshop bay on the premises plus 1 for every person employed.
Network utilities	1 for every person employed on site or operating from the site at any one time or an area on site sufficient to accommodate a service vehicle for unstaffed sites over 100 m ² .
Offices	1 for every 20 m ² of gross floor area for: (a) areas open to the public including reception areas; and (b) staff areas serving public counter functions; plus 1 for every 40 m ² of gross floor area for areas not open to the public.
Pleasure craft (launching of)	5 motor vehicle and trailer spaces for every 1m width of launching ramp provided that for the purpose of this requirement a motor vehicle and trailer space shall have minimum dimensions of 10 m (length) by 3m (width).
Pleasure craft (berthing and mooring of)	0.8 for every berth or mooring space provided in the adjacent boat harbour anchorage or marina.
Private and public hospitals	1 for every three patients' bed spaces plus 1 for every resident medical practitioner or professional staff employed on site or operating from the site at any one time plus 1 for every two other full-time staff employed plus 1 for every visiting medical practitioner present at any one time.

Activity	Parking spaces to be provided (minimum)
Professional service rooms for veterinary activities and professional offices	1 for every professional person employed on site or operating from the site at any one time plus 1 for every consulting room or surgery or interview room plus 1 for every additional 40 m ² of gross floor area of building.
Quarrying and related activities conducted within the same site	1 for every 45 m ² of gross floor area of building or 1 for every two persons to be employed on site or operating from the site at any one time whichever requirement is the greater.
Recreation and entertainment facilities (excluding those otherwise mentioned)	1 for every 3.5 persons the facility is designed to accommodate.
Restaurants (licensed and non-licensed) and reception lounges	1 for every four persons the building is designed to accommodate plus 1 for every two staff employed on site or operating from the site at any one time plus where a restaurant has a drive-in takeaway service adequate drive in facilities shall be provided to avoid parking and traffic conflict on the site.
Residential and non-residential clubs	1 for every three persons the building is designed to accommodate.
Schools (public or private – primary and intermediate)	2 for every three staff members employed on site or operating from the site at any one time and suitable drop off area.
Schools (public secondary)	2 for every three staff members employed on site or operating from the site at any one time plus 1 for every 30 pupils aged 15 years and over plus suitable drop off area.
Schools (private secondary)	2 for every three staff members employed on site or operating from the site at any one time plus 1 for every 15 pupils aged 15 years and over plus suitable drop off area.
Service garages and service stations including motor vehicle body repair premises	5 for every lubrication bay mechanical repair or working bay for the first two bays (except that this may be reduced to 2 per bay where vehicles are serviced while the driver waits) plus 2 for every additional lubrication mechanical repair or working bay plus 1 for a spare parts sales counter plus 1 for every 40 m ² of retail shop space for the first 240 m ² of retail shop space and an additional space for every 100 m ² of retail shop space above 250 m ² plus 1 for every person employed on site or operating from the site at any one time.
Shops	One for every 20 m ² of gross shopping floor area plus one for every 40 m ² of other uses excluding common pedestrian areas and loading spaces and the area around them used for unloading.
Stalls for the direct sale of farm produce (rural zones)	6 for every property and adequate vehicle turning area and access and egress which can be achieved without undue disruption to traffic.
Totalisator agency board premises	1 for every two persons employed on site or operating from the site at any one time plus 1 for every 20 m ² of gross floor area of public space on the premises.
Takeaway food bars	1 for every 20 m ² of gross floor area.
Taverns	1 for every 3.5 persons to be accommodated.
Technical services	1 for every 40 m ² of gross floor area.

Activity	Parking spaces to be provided (minimum)
Temporary activities	
(a) temporary activities involving the assembly of 100 or more members of the public for any of the following purposes: - educational religious social cultural sporting or community activities and events - indoor or outdoor recreation and entertainment.	1 for every 3.5 persons to be accommodated
(b) temporary activities involving the following operations: - exhibitions and auctions - markets and stalls	1 for every 15 m ² of gross floor area of building or 3.5 for every stall provided.
Travellers' accommodation (including motels holiday flats and motor tourists' lodges)	1 for every accommodation unit plus 1 for every two persons employed on site or operating from the site at any one time plus 1 for every 3.5 persons to be accommodated within a restaurant or bar area excepting that restaurant space which serves as a dining areas for guests shall not be required to provide parking for guests.
Video hire outlet	1 for every 20 m ² of gross floor space.
Warehouses stores storage yards trucking and carrier depots	1 for every 100 m ² of gross floor area of building plus 1 for every 100 m ² of open space used for industrial purposes or 1 for every two persons to be employed on site or operating from the site at any one time whichever requirement is the greater.
Warehouse shop for trade supply and retail to general public operated in conjunction with a warehouse	1 for every 20 m ² of gross floor area of warehouse shop.
Wharekai (dining halls) and Wharenui (meeting houses) in the Papakainga Zone	1 for every five persons the building is designed to accommodate provided that the parking requirement shall only be assessed on the 'Wharekai' in a marae.
Wool stores	1 for every 300 m ² of gross floor area for wool store floor area up to 20 000 m ² plus 1 for every 600 m ² of gross floor area for all wool store floor area in excess of 20 000 m ² or 1 for every two persons to be employed on site or operating from the site at any one time whichever requirement is the greater.
Any other activity not specified	To be determined having regard to the characteristics and circumstances of the particular proposed activity.

C2.2 Review of Parking Provisions in Victoria

The Victorian Department of Planning and Community Development published Advisory Note 25 in June 2012 (Department of Planning and Community Development 2012b) confirming the changes to the car parking provisions in Clause 52.06 of the Victoria Planning Provisions and all planning schemes following a review undertaken by the Car Parking Advisory Committee established in 2011. The advisory note provides information about changes resulting from the review which included car parking provisions, design requirements and measures to encourage sustainable transport modes.

C2.2.1 Car Parking

52.06 CAR PARKING

29/10/2015
VC101

Purpose

To ensure that car parking is provided in accordance with the State Planning Policy Framework and Local Planning Policy Framework.

To ensure the provision of an appropriate number of car parking spaces having regard to the demand likely to be generated, the activities on the land and the nature of the locality.

To support sustainable transport alternatives to the motor car.

To promote the efficient use of car parking spaces through the consolidation of car parking facilities.

To ensure that car parking does not adversely affect the amenity of the locality.

To ensure that the design and location of car parking is of a high standard, creates a safe environment for users and enables easy and efficient use.

52.06-1 Scope

01/07/2014
VC116

Clause 52.06 applies to:

- a new use; or
- an increase in the floor area or site area of an existing use; or
- an increase to an existing use by the measure specified in Column C of Table 1 in Clause 52.06-5 for that use.

Clause 52.06 does not apply to:

- the extension of one dwelling on a lot in the Neighbourhood Residential Zone, General Residential Zone, Residential Growth Zone, Mixed Use Zone or Township Zone; or
- the construction and use of one dwelling on a lot in the Neighbourhood Residential Zone, General Residential Zone, Residential Growth Zone, Mixed Use Zone or Township Zone unless the zone or a schedule to the zone specifies that a permit is required to construct or extend one dwelling on a lot.

52.06-2 Provision of car parking spaces

19/04/2013
VC95

Before:

- a new use commences; or
- the floor area or site area of an existing use is increased; or
- an existing use is increased by the measure specified in Column C of Table 1 in Clause 52.06-5 for that use,

the number of car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay must be provided to the satisfaction of the responsible authority in one or more of the following ways:

- on the land; or
- in accordance with a permit issued under Clause 52.06-3; or
- in accordance with a financial contribution requirement specified in a schedule to the Parking Overlay.

If a schedule to the Parking Overlay specifies a maximum parking provision, the maximum provision must not be exceeded except in accordance with a permit issued under Clause 52.06-3.

52.06-3 Permit requirement

19/04/2013
VC95

A permit is required to:

- Reduce (including reduce to zero) the number of car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay.
- Provide some or all of the car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay on another site.
- Provide more than the maximum parking provision specified in a schedule to the Parking Overlay.

This does not apply if:

- A schedule to the Parking Overlay specifies that a permit is not required under this Clause; or
- Clause 52.06-3A applies.

52.06-3A No permit required

19/04/2013
VC95

Unless a schedule to the Parking Overlay specifies otherwise, a permit is not required under Clause 52.06-3 if:

- the number of car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay for a new use of land is less than or equal to the number of car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay for the existing use of the land; and
- the number of car parking spaces currently provided in connection with the existing use is not reduced after the new use commences.

52.06-4 Exemption from notice and review

19/04/2013
VC95

An application under Clause 52.06-3 is exempt from the notice requirements of Section 52(1)(a), (b) and (d), the decision requirements of Section 64(1), (2) and (3) and the review rights of Section 82(1) of the Act if:

- the application is only for a permit under Clause 52.06-3; or
- the application is also for a permit under another provision of the planning scheme and in respect of all other permissions sought, the application is exempt from the notice requirements of Section 52(1)(a), (b) and (d), the decision requirements of Section 64(1), (2) and (3) and the review rights of Section 82(1) of the Act.

52.06-5 Number of car parking spaces required under Table 1

19/04/2013
VC95

Table 1 of this clause sets out the car parking requirement that applies to a use listed in the Table.

A car parking requirement in Table 1 may be calculated as either:

- a number of car parking spaces; or
- a percentage of the total site area that must be set aside for car parking.

A car parking requirement in Table 1 is calculated by multiplying the figure in Column A or Column B (whichever applies) by the measure (for example square metres, number of patrons or number of bedrooms) in Column C.

Column A applies unless a schedule to the Parking Overlay or another provision of the planning scheme specifies that Column B applies.

Where an existing use is increased by the measure specified in Column C of Table 1 for that use, the car parking requirement only applies to the increase, provided the existing number of car parking spaces currently being provided in connection with the existing use is not reduced.

If in calculating the number of car parking spaces the result is not a whole number, the required number of car parking spaces is to be rounded down to the nearest whole number.

Where the car parking requirement specified in Table 1 is calculated as a percentage of the total site area, the area to be provided for car parking includes an accessway that directly abuts any car parking spaces, but does not include any accessway or portion of an accessway that does not directly abut any car parking spaces.

The car parking requirement specified in Table 1 includes disabled car parking spaces. The proportion of spaces to be allocated as disabled spaces must be in accordance with Australian Standard AS2890.6-2009 (disabled) and the Building Code of Australia.

The car parking requirement specified for a use listed in Table 1 does not apply if:

- a car parking requirement for the use is specified under another provision of the planning scheme; or
- a schedule to the Parking Overlay specifies the number of car parking spaces required for the use.

Table 1: Car parking requirement

Use	Rate	Rate	Car Parking Measure
	Column A	Column B	Column C
	Applies the standard rate to all zones	Only applies where specified in a schedule to the Parking Overlay	
Amusement parlour	4	3.5	To each 100 sq m of net floor area
Art & craft centre	4	3.5	To each 100 sq m of net floor area
Betting agency	4	3.5	To each 100 sq m of leasable floor area
Bowling green	6	6	To each rink plus 50 per cent of the relevant requirement of any ancillary use
Child care centre	0.22	0.22	To each child
Cinema based entertainment complex	0.3	0.3	To each patron permitted
Convenience restaurant	0.3		To each patron permitted
		3.5	To each 100 sq m of leasable floor area
Convenience shop if the leasable floor area exceeds 80 sq m	10		To each premises
		3.5	To each 100 sq m of leasable floor area

Use	Rate	Rate	Car Parking Measure
	Column A	Column B	Column C
	Applies the standard rate to all zones	Only applies where specified in a schedule to the Parking Overlay	
Display home	5		To each dwelling for five or fewer contiguous dwellings, plus
	2		To each additional contiguous dwelling
		3.5	To each 100 sq m of floor area
Dwelling	1	1	To each one or two bedroom dwelling, plus
	2	2	To each three or more bedroom dwelling (with studies or studios that are separate rooms counted as a bedrooms) plus
	1	0	For visitors to every 5 dwellings for developments of 5 or more dwellings
Education centre – other than listed in this table	0.4	0.3	To each student that is part of the maximum number of students on the site at any time
Food & drink premises other than listed in this table	4	3.5	To each 100 sq m of leasable floor area
Freezing & cool storage,	1.5	1	To each 100 sq m of net floor area
Fuel depot	10	10	Per cent of site area
Funeral Parlour	0.3	0.3	To each patron permitted
Gambling premises other than listed in this table	0.4		To each patron permitted
		3.5	To each 100 sq m of leasable floor area
Golf course	4	4	To each hole plus 50 per cent of the relevant requirement of any ancillary uses.
Home Occupation	1	0	To each employee not a resident of the dwelling
Hotel	0.4		To each patron permitted
		3.5	To each 100 sq m of leasable floor area
Industry other than listed in this table	2.9	1	To each 100 sq m of net floor area
Landscape gardening supplies	10	10	Per cent of site area
Mall centre	3.5	3	To each 100 sq m of net floor area
Manufacturing sales	4	3.5	To each 100 sq m of leasable floor area
Market	8	3.5	To each 100 sq m of site area

Use	Rate	Rate	Car Parking Measure
	Column A	Column B	Column C
	Applies the standard rate to all zones	Only applies where specified in a schedule to the Parking Overlay	
Materials recycling	10	10	Per cent of site area
Medical centre	5		To the first person providing health services plus
	3		To every other person providing health services
		3.5	To each 100 sq m of leasable floor area
Milk depot	10	10	Per cent of site area
Motel	1	1	To each unit, and one to each manager dwelling, plus 50 per cent of the relevant requirement of any ancillary use
Motor repairs	3	3	To each 100 sq m of net floor area plus
	1	1	for each vehicle being serviced, repaired or fitted with accessories, including vehicles waiting to be serviced, repaired, fitted with accessories or collected by owners
Office other than listed in this table	3.5	3	To each 100 sq m of net floor area
Place of assembly except amusement parlour	0.3	0.3	To each patron permitted
Postal agency	4	3.5	To each 100 sq m of leasable floor area
Primary produce sales	4	3.5	To each 100 sq m of leasable floor area
Primary school	1	1	To each employee that is part of the maximum number of employees on the site at any time
Research and development centre	3.5	3	To each 100 sq m of net floor area
Residential aged care facility	0.3	0.3	To each lodging room
Residential village	1	1	To each one or two bedroom dwelling plus
	2	2	To each three or more bedroom dwelling (with studies or studios that are separate rooms counted as a bedrooms) plus
	1	0	For visitors to every five dwellings for developments of five or more dwellings

Use	Rate	Rate	Car Parking Measure
	Column A	Column B	Column C
	Applies the standard rate to all zones	Only applies where specified in a schedule to the Parking Overlay	
Retirement village	1	1	To each one or two bedroom dwelling plus
	2	2	To each three or more bedroom dwelling (with studies or studios that are separate rooms counted as a bedrooms) plus
	1	0	For visitors to every five dwellings for developments of five or more dwellings
Restaurant	0.4		To each patron permitted
		3.5	To each 100 sq m of leasable floor area
Restricted retail premises	3	2.5	To each 100 sq m of leasable floor area
Saleyard	10	10	Per cent of site area
Secondary school	1.2	1.2	To each employee that is part of the maximum number of employees on the site at any time
Shop other than listed in this table	4	3.5	To each 100 sq m of leasable floor area
Squash court – other than in conjunction with a dwelling	3	3	To each court plus 50 per cent of the relevant requirement of any ancillary use
Store other than listed in this table	10	10	Per cent of site area
Supermarket	5	5	To each 100 sq m of leasable floor area
Swimming pool – other than in conjunction with a dwelling	5.6	5.6	To each 100 sq m of the site
Tavern	0.4		To each patron permitted
		3.5	Space to each 100 sq m of leasable floor area
Tennis court – other than in conjunction with a dwelling	4	4	To each court plus 50% of the requirement of any ancillary use
Trade supplies	10	10	Per cent of site area
Veterinary centre	5		To the first person providing animal health services plus
	3		To every other person providing animal health services
		3.5	To each 100 sq m of leasable floor area

Use	Rate	Rate	Car Parking Measure
	Column A	Column B	Column C
	Applies the standard rate to all zones	Only applies where specified in a schedule to the Parking Overlay	
Warehouse other than listed in this table	2	2	To each premises plus
	1.5	1	To each 100 sq m of net floor area
Winery	0.4		To each patron permitted
		3.5	To each 100 sq m of leasable floor area

52.06-5A Number of car parking spaces required for other uses

19/04/2013
VC95

Where a use of land is not specified in Table 1 or where a car parking requirement is not specified for the use in another provision of the planning scheme or in a schedule to the Parking Overlay, before a new use commences or the floor area or site area of an existing use is increased, car parking spaces must be provided to the satisfaction of the responsible authority.

52.06-6 Application requirements and decision guidelines for permit applications

29/10/2015
VC101

For applications to reduce the car parking requirement

An application to reduce (including reduce to zero) the number of car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay must be accompanied by a Car Parking Demand Assessment.

The Car Parking Demand Assessment must assess the car parking demand likely to be generated by the proposed:

- new use; or
- increase in the floor areas or site area of the existing use; or
- increase to the existing use by the measure specified in Column C of Table 1 in Clause 52.06-5 for that use.

The Car Parking Demand Assessment must address the following matters, to the satisfaction of the responsible authority:

- The likelihood of multi-purpose trips within the locality which are likely to be combined with a trip to the land in connection with the proposed use.
- The variation of car parking demand likely to be generated by the proposed use over time.
- The short-stay and long-stay car parking demand likely to be generated by the proposed use.
- The availability of public transport in the locality of the land.
- The convenience of pedestrian and cyclist access to the land.
- The provision of bicycle parking and end of trip facilities for cyclists in the locality of the land.
- The anticipated car ownership rates of likely or proposed visitors to or occupants (residents or employees) of the land.
- Any empirical assessment or case study.

Before granting a permit to reduce the number of spaces, the responsible authority must consider the following, as appropriate:

- The Car Parking Demand Assessment.
- Any relevant local planning policy or incorporated plan.
- The availability of alternative car parking in the locality of the land, including:
 - Efficiencies gained from the consolidation of shared car parking spaces.
 - Public car parks intended to serve the land.
 - On street parking in non residential zones.
 - Streets in residential zones specifically managed for non-residential parking.
- On street parking in residential zones in the locality of the land that is intended to be for residential use.
- The practicality of providing car parking on the site, particularly for lots of less than 300 square metres.
- Any adverse economic impact a shortfall of parking may have on the economic viability of any nearby activity centre.
- The future growth and development of any nearby activity centre.

- Any car parking deficiency associated with the existing use of the land.
- Any credit that should be allowed for car parking spaces provided on common land or by a Special Charge Scheme or cash-in-lieu payment.
- Local traffic management in the locality of the land.
- The impact of fewer car parking spaces on local amenity, including pedestrian amenity and the amenity of nearby residential areas.
- The need to create safe, functional and attractive parking areas.
- Access to or provision of alternative transport modes to and from the land.
- The equity of reducing the car parking requirement having regard to any historic contributions by existing businesses.
- The character of the surrounding area and whether reducing the car parking provision would result in a quality/positive urban design outcome.
- Any other matter specified in a schedule to the Parking Overlay.
- Any other relevant consideration.

For applications to allow some or all of the required car parking spaces to be provided on another site

Before granting a permit to allow some or all of the car parking spaces required under Clause 52.06-5 or in a schedule to the Parking Overlay to be provided on another site, the responsible authority must consider the following, as appropriate:

- The proximity of the car parking on the alternate site to the subject site.
- The likelihood of the long term provision and availability of the car parking spaces.
- Whether the location of the car parking spaces is consistent with any relevant local policy or incorporated plan.
- Any other matter specified in a schedule to the Parking Overlay.

For applications to provide more than the maximum parking provision specified in a schedule to the Parking Overlay

An application to provide more than the maximum parking provision specified in a schedule to the Parking Overlay must be accompanied by a Car Parking Demand Assessment.

The Car Parking Demand Assessment must assess the car parking demand likely to be generated by the proposed use or increase to the existing use.

The Car Parking Demand Assessment must address the following matters, to the satisfaction of the responsible authority:

- The likelihood of multi-purpose trips within the locality which are likely to be combined with a trip to the land in connection with the proposed use.
- The variation of car parking demand likely to be generated by the proposed use over time.
- The short-stay and long-stay car parking demand likely to be generated by the proposed use.

- The availability of public transport in the locality of the land.
- The convenience of pedestrian and cyclist access to the land.
- The provision of bicycle parking and end of trip facilities for cyclists in the locality of the land.
- The anticipated car ownership rates of likely or proposed visitors to or occupants (residents or employees) of the land.
- Any empirical assessment or case study.

52.06-7 Requirement for a car parking plan

19/04/2013
VC95

Plans must be prepared to the satisfaction of the responsible authority before any of the following occurs:

- a new use commences; or
- the floor area or site area of an existing use is increased; or
- an existing use is increased by the measure specified in Column C of Table 1 in Clause 52.06-5 for that use.

The plans must show, as appropriate:

- All car parking spaces that are proposed to be provided (whether on the land or on other land).
- Access lanes, driveways and associated works.
- Allocation of car parking spaces to different uses or tenancies, if applicable.
- Any landscaping and water sensitive urban design treatments.
- Finished levels, if required by the responsible authority.
- Any other matter specified in a schedule to the Parking Overlay.

Plans must be provided to the responsible authority under Clause 52.06-7 wherever Clause 52.06 applies, whether or not a permit application is being made under Clause 52.06-3 or any other provision of the planning scheme.

Where an application is being made for a permit under Clause 52.06-3 or another provision of the planning scheme, the information required under Clause 52.06-7 may be included in other plans submitted with the application.

Clause 52.06-7 does not apply where no car parking spaces are proposed to be provided.

52.06-8 Design standards for car parking19/04/2013
VC95

Plans prepared in accordance with Clause 52.06-7 must meet the design standards of Clause 52.06-8, unless the responsible authority agrees otherwise.

Design standards 1, 3, 6 and 7 do not apply to an application to construct one dwelling on a lot.

Design standard 1 – Accessways

Accessways must:

- Be at least 3 metres wide.
- Have an internal radius of at least 4 metres at changes of direction or intersection or be at least 4.2 metres wide.
- Allow vehicles parked in the last space of a dead-end accessway in public car parks to exit in a forward direction with one manoeuvre.
- Provide at least 2.1 metres headroom beneath overhead obstructions, calculated for a vehicle with a wheel base of 2.8 metres.
- If the accessway serves four or more car spaces or connects to a road in a Road Zone, the accessway must be designed so that cars can exit the site in a forward direction.
- Provide a passing area at the entrance at least 5 metres wide and 7 metres long if the accessway serves ten or more car parking spaces and is either more than 50 metres long or connects to a road in a Road Zone.
- Have a corner splay or area at least 50 per cent clear of visual obstructions extending at least 2 metres along the frontage road from the edge of an exit lane and 2.5 metres along the exit lane from the frontage, to provide a clear view of pedestrians on the footpath of the frontage road. The area clear of visual obstructions may include an adjacent entry or exit lane where more than one lane is provided, or adjacent landscaped areas, provided the landscaping in those areas is less than 900mm in height.

If an accessway to four or more car parking spaces is from land in a Road Zone, the access to the car spaces must be at least 6 metres from the road carriageway.

If entry to the car space is from a road, the width of the accessway may include the road.

Design standard 2 – Car parking spaces

Car parking spaces and accessways must have the minimum dimensions as outlined in Table 2.

Table 2: Minimum dimensions of car parking spaces and accessways

Angle of car parking spaces to access way	Accessway width	Car space width	Car space length
Parallel	3.6 m	2.3 m	6.7 m

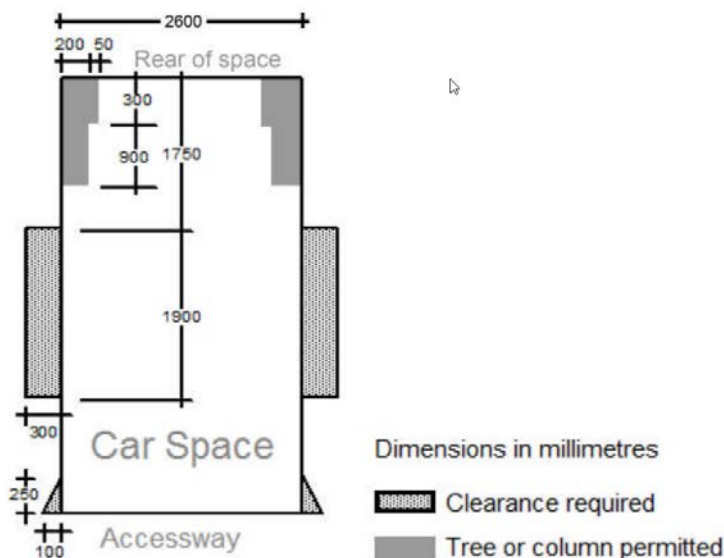
45°	3.5 m	2.6 m	4.9 m
60°	4.9 m	2.6 m	4.9 m
90°	6.4 m	2.6 m	4.9 m
	5.8 m	2.8 m	4.9 m
	5.2 m	3.0 m	4.9 m
	4.8 m	3.2 m	4.9 m

Note to Table 2: Some dimensions in Table 2 vary from those shown in the Australian Standard AS2890.1-2004 (off street). The dimensions shown in Table 2 allocate more space to aisle widths and less to marked spaces to provide improved operation and access. The dimensions in Table 2 are to be used in preference to the Australian Standard AS2890.1-2004 (off street) except for disabled spaces which must achieve Australian Standard AS2890.6-2009 (disabled).

A wall, fence, column, tree, tree guard or any other structure that abuts a car space must not encroach into the area marked 'clearance required' on Diagram 1, other than:

- A column, tree or tree guard, which may project into a space if it is within the area marked 'tree or column permitted' on Diagram 1.
- A structure, which may project into the space if it is at least 2.1 metres above the space.

Diagram 1 Clearance to car parking spaces



Car spaces in garages or carports must be at least 6 metres long and 3.5 metres wide for a single space and 5.5 metres wide for a double space measured inside the garage or carport.

Where parking spaces are provided in tandem (one space behind the other) an additional 500 mm in length must be provided between each space.

Where two or more car parking spaces are provided for a dwelling, at least one space must be under cover.

Disabled car parking spaces must be designed in accordance with Australian Standard AS2890.6-2009 (disabled) and the Building Code of Australia. Disabled car parking spaces may encroach into an accessway width specified in Table 2 by 500mm.

Design standard 3: Gradients

Accessway grades must not be steeper than 1:10 (10 per cent) within 5 metres of the frontage to ensure safety for pedestrians and vehicles. The design must have regard to the wheelbase of the vehicle being designed for; pedestrian and vehicular traffic volumes; the nature of the car park; and the slope and configuration of the vehicle crossover at the site frontage. This does not apply to accessways serving three dwellings or less.

Ramps (except within 5 metres of the frontage) must have the maximum grades as outlined in Table 3 and be designed for vehicles travelling in a forward direction.

Table 3: Ramp gradients

Type of car park	Length of ramp	Maximum grade
Public car parks	20 metres or less	1:5 (20%)
	longer than 20 metres	1:6 (16.7%)
Private or residential car parks	20 metres or less	1:4 (25%)
	longer than 20 metres	1:5 (20%)

Where the difference in grade between two sections of ramp or floor is greater than 1:8 (12.5 per cent) for a summit grade change, or greater than 1:6.7 (15 per cent) for a sag grade change, the ramp must include a transition section of at least 2 metres to prevent vehicles scraping or bottoming.

Plans must include an assessment of grade changes of greater than 1:5.6 (18 per cent) or less than 3 metres apart for clearances, to the satisfaction of the responsible authority.

Design standard 4: Mechanical parking

Mechanical parking may be used to meet the car parking requirement provided:

- At least 25 per cent of the mechanical car parking spaces can accommodate a vehicle clearance height of at least 1.8 metres.
- Car parking spaces that require the operation of the system are not allocated to visitors unless used in a valet parking situation.
- The design and operation is to the satisfaction of the responsible authority.

Design standard 5: Urban design

Ground level car parking, garage doors and accessways must not visually dominate public space.

Car parking within buildings (including visible portions of partly submerged basements) must be screened or obscured where possible, including through the use of occupied tenancies, landscaping, architectural treatments and artworks.

Design of car parks must take into account their use as entry points to the site.

Design of new internal streets in developments must maximise on street parking opportunities.

Design standard 6: Safety

Car parking must be well lit and clearly signed.

The design of car parks must maximise natural surveillance and pedestrian visibility from adjacent buildings.

Pedestrian access to car parking areas from the street must be convenient.

Pedestrian routes through car parking areas and building entries and other destination points must be clearly marked and separated from traffic in high activity parking areas.

Design standard 7: Landscaping

The layout of car parking areas must provide for water sensitive urban design treatment and landscaping.

Landscaping and trees must be planted to provide shade and shelter, soften the appearance of ground level car parking and aid in the clear identification of pedestrian paths.

Ground level car parking spaces must include trees planted with flush grilles. Spacing of trees must be determined having regard to the expected size of the selected species at maturity.

52.06-9

19/04/2013
VC95

Decision guidelines

Before deciding that a plan prepared under Clause 52.06-7 is satisfactory the responsible authority must consider, as appropriate:

- The role and function of nearby roads and the ease and safety with which vehicles gain access to the site.
- The ease and safety with which vehicles access and circulate within the parking area.
- The provision for pedestrian movement within and around the parking area.
- The provision of parking facilities for cyclists and disabled people.
- The protection and enhancement of the streetscape.
- The provisions of landscaping for screening and shade.
- The measures proposed to enhance the security of people using the parking area particularly at night.
- The amenity of the locality and any increased noise or disturbance to dwellings and the amenity of pedestrians.
- The workability and allocation of spaces of any mechanical parking arrangement.
- The design and construction standards proposed for paving, drainage, line marking, signage, lighting and other relevant matters.
- The type and size of vehicle likely to use the parking area.
- Whether the layout of car parking spaces and access lanes is consistent with the specific standards or an appropriate variation.
- The need for the required car parking spaces to adjoin the premises used by the occupier/s, if the land is used by more than one occupier.

- Whether the layout of car spaces and accessways are consistent with Australian Standards AS2890.1-2004 (off street) and AS2890.6-2009 (disabled).
- The relevant standards of Clauses 56.06-2, 56.06-4, 56.06-5, 56.06-7 and 56.06-8 for residential developments with accessways longer than 60 metres or serving 16 or more dwellings.
- Any other matter specified in a schedule to the Parking Overlay.

52.06-10 Construction of car parking

19/04/2013
VC95

Where a plan is required under Clause 52.06-7, the car parking spaces, access lanes, driveways and associated works and landscaping shown on the plan must be:

- constructed and available for use in accordance with the plan approved by the responsible authority; and
- formed to such levels and drained so that they can be used in accordance with the plan; and
- treated with an all-weather seal or some other durable surface; and
- line-marked or provided with some other adequate means of showing the car parking spaces,

before any of the following occurs:

- the new use commences; or
- the floor area or site area of the existing use is increased; or
- the existing use is increased by the measure specified in Column C of Table 1 in Clause 52.06-5 for that use.

52.06-11 Transitional arrangements

19/04/2013
VC95

The requirements of Clause 52.06 do not apply to any use or development of land that is undertaken in accordance with:

- a permit under the Building Act 1993 that was issued before 5 June 2012; or
- a planning permit that was issued before 5 June 2012.

To avoid doubt, this transitional provision does not apply where the permit issued before 5 June 2012 is amended after 5 June 2012, irrespective of how the permit is amended.

Refer to Section 4.2.2 for more information on parking provision standards.

C2.3 Bicycle Parking Provision Rates

Table C2 6: Bicycle parking provisions

Land use	Employee/resident parking spaces	Class	Visitor/shopper parking spaces	Class
Amusement parlour		1 or 2	2 plus 1 per 50 m ² gfa	3
Apartment house	1 per 4 habitable rooms	1	1 per 16 habitable rooms	3
Art gallery	1 per 1500 m ² gfa	2	2 plus 1 per 1500 m ² gfa	3
Bank	1 per 200 m ² gfa	2	2	3
Café	1 per 25 m ² gfa	2	2	3
Community centre	1 per 1500 m ² gfa	2	2 plus 1 per 1500 m ² gfa	3
Consulting rooms	1 per 8 practitioners	2	1 per 4 practitioners	3
Drive-in shopping centre	1 per 300 m ² sales floor	1	1 per 500 m ² sales floor	3
Flat	1 per 3 flats	1	1 per 12 flats	3
General hospital	1 per 15 beds	1	1 per 30 beds	3
General industry	1 per 150 m ² gfa	1 or 2	–	3
Health centre	1 per 400 m ² gfa	1 or 2	1 per 200 m ² gfa	3
Hotel	1 per 25 m ² bar floor area	1	1 per 25 m ² bar floor area	3
	1 per 100 m ² lounge beer garden	1	1 per 100 m ² lounge beer garden	
Indoor recreation facility	1 per 4 employees	1 or 2	1 per 200 m ² gfa	3
Library	1 per 500 m ² gfa	1 or 2	4 plus 2 per 200 m ² gfa	3
Light industry	1 per 1000 m ² gfa	1 or 2	–	3
Major sports ground	1 per 1500 spectator places	1	1 per 250 spectator places	3
Market	–	2	1 per 10 stalls	3
Motel	1 per 40 rooms	1	–	3
Museum	1 per 1500 m ² gfa	1	2 plus 1 per 1500 m ² gfa	3
Nursing home	1 per 7 beds	1	1 per 60 beds	3
Office	1 per 200 m ² gfa	1 or 2	1 per 750 m ² over 1000 m ²	3
Place of assembly	–	2	–	3
Public hall	–	1 or 2	–	3
Residential building	1 per 4 lodging rooms	2	1 per 16 lodging rooms	3
Restaurant	1 per 100 m ² public area	1 or 2	2	3
Retail show room	1 per 750 m ² sales floor	1	1 per 1000 m ² sales floor	3
School	1 per 5 pupils over year 4	2	–	3
Service industry	1 per 800 m ² gfa	1	–	3
Service premises	1 per 200 m ² gfa	1	–	3
Shop	1 per 300 m ² gfa	1	1 per 500 m ² over 1000 m ²	3
Swimming pool	–	1 or 2	2 per 20 m ² of pool area	3
Take-away	1 per 100 m ² gfa	1	1 per 50 m ² gfa	3
University/Inst. of Tech	1 per 100p/t students	1 or 2	–	3
	2 per 100f/t students	2	–	

Notes:

- 1 Refer to 0 for Class definitions.
- 2 '–' indicates that No Parking demand information is available and therefore planners should make their own assessment of the required bicycle parking provisions on an individual project basis
- 3 GFA – Gross Floor Area
- 4 It is sometimes appropriate to make available 50% of the level of provision recommended in the table at the initial installation stage, however, space should be set aside to allow 100% provision in the event that the full demand for bicycle parking is installed.

Refer to Section 4.2.2 for more information on parking provision standards.

C2.4 Land Costs

The cost of land per parking space will vary with geographic location, the amount of overall land required and other market factors. Accordingly, the cost will be higher in more expensive suburbs and city centres than in other locations.

Refer to Section 4.4 for more information on the cost of providing parking.

C2.5 Design and Development Costs

Design and development costs are those costs incurred prior to construction including those related to site and financial feasibility analysis, obtaining planning approvals, structural and civil engineering design, operational design heritage preservation, geotechnical and environmental assessment, general legal advice and expenses relating to real estate taxes, utilities insurance, government fees marketing and interim financing. These costs can range from 10% to 20% of the total project cost.

C2.6 Construction Costs

Cost estimates for constructing a parking facility in Australia are given in 2007 dollar terms in Table C2 7.

Table C2 7: Estimated 2012 cost of providing one public parking bay in Town of Cambridge commercial centres

Type of parking	Land per bay	Land cost /m ² \$2 000–\$3 500	Floor area per bay	Construction cost per bay	Estimated total cost per bay
Off-street surface (at-grade)	35 m ²	\$70 000–\$122 500	35 m ²	\$3 500	\$73 500–\$126 000
Deck – 2 level	16 m ²	\$32 000–\$56 000	32 m ²	\$31 000	\$63 000–\$87 000
Deck – 4 level	8 m ²	\$16 000–\$28 000	32 m ²	\$34 000	\$50 000–\$62 000
Basement – 2 level	8 m ²	\$16 000–\$28 000	32 m ²	\$39 000	\$55 000–\$67 000

Source: Adapted from Rawlinsons Quantity Surveyors and Construction Cost Consultants (2016).

C2.7 Maintenance and Operational Costs

Operating and maintaining car parking is an ongoing cost that extends throughout the life of the project. Costs can include:

- financing/debt servicing
- repairs, refurbishment and general maintenance
- cyclic replacement of fittings and fixtures
- upgrading facilities to satisfy new rules and regulations or operational needs
- wages, salaries and payroll taxes
- personnel management
- utilities and telecommunications
- security and safety measures
- ongoing professional fees
- licences and permits
- rates and taxes
- management fees and/or rent
- cash handling and revenue control
- insurance and corporate overheads.

It is crucial that these costs are considered during the planning process as they can have a significant impact on the whole-of-life cost of a facility.

C2.8 Decommissioning Costs

Decommissioning costs cover building demolition, removal and disposal once the car park ceases to be used for that purpose and returning the land to its original state. The costs will depend on the method of construction. Costs may be higher if any ground or groundwater pollution has occurred.

C2.9 Costs of Environmental and Aesthetic Impacts

Paving land for use in parking facilities has a number of environmental costs including increased stormwater management and loss of green space (Transportation Research Board 1997). This topic is discussed further in Section 6 .

Refer to Section 4.4 for more information on the cost of providing parking.

[\[Back to body text\]](#)

Commentary 3

The goals of a parking policy include:

- economic vibrancy and success of an area representing a diverse community of commercial enterprises, retailers, residents and visitors accessing a wide range of economic social and cultural activities; this includes the use of restricted use zones to create an efficient parking regime (refer to Section 8.10.1 for further information)
- social ambience and pleasantness of an area as a place for large numbers of people to visit without creating the adverse effects of mass access
- environmental quality and sustainability of an area including the contribution of parking policy to ensuring clean air limitations on traffic noise and congestion and the maintenance of a high standard of urban amenity for people
- safety and security of an area including the contribution of parking policy to efficient and safe movement of pedestrians, cyclists, public transport users and general traffic
- accessibility of the area using a balanced and sustainable transport system and specifically the enhancement of public transport, walking, cycling and car-sharing alternatives to single-occupant vehicle travel
- efficiency and effectiveness of town and city centres as social economic cultural and political hubs
- efficiency in the use of an adequate range of parking facilities in a manner that meets the reasonable needs for car access and encourages opportunities for reciprocal or shared use of parking by complementary land uses at different times of the day and week
- integration of parking activities with other land uses, the street network, built form, landscaping and heritage elements within the city
- improvement of information and choice for motorists
- efficient use of existing parking capacity and reduction of excessive automobile use and demand for and supply of car parking.

[\[Back to body text\]](#)

Commentary 4

There are many potential parking system management policy options in the toolbox from which practitioners may select to develop policies appropriate to their town or region. The commentary describes 20 of those options.

C4.1 Making Allowance for Shared Parking Effects

The simple multiplication of a land use area factor and a land use parking generation factor can be an over-simplistic and inappropriate method for determining optimal area-wide parking needs especially where the original derivation of the parking generation factor is itself questionable.

Each land use may reach its peak parking demand for only a short time during the day. Parking demands may also vary significantly over the course of the week and on a seasonal basis leading to frequent occurrences when the area-wide peak parking demand is considerably less than the sum of the peak parking demands calculated for each land use type.

The use of 'shared parking analysis' concepts (also see Section 2) can improve the process of estimating the optimal parking requirements for an area by including consideration of:

- time and proximity in the development of efficient parking solutions
- alternative modes of transport that can affect the actual demand for parking
- use of parking spaces by complementary road user types at different times e.g. taxi and bus
- mixed use urban environments that promote balanced access and extended activity over the day.

Reductions in the amount of parking required by a town planning scheme or a district plan can be achieved where parking supply allowances take into consideration opportunities for adjacent land uses or road user types to share parking facilities.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.2 Regulating Short-stay and Long-stay Parking

The other principal means of segregating short-stay and long-stay parking is to impose hours-of-opening restrictions on short-stay (shopper/visitor) parking facilities such that these parking spaces are kept 'off the market' until say 9:30 a.m. by which time the great majority of commuter employees will have already parked their vehicles and will not significantly infiltrate parking facilities intended for shoppers and visitors.

However, this approach may be opposed by commercial car park operators as a 'restraint of trade' and from the car-parkers' perspective imposes restrictions on those shoppers and visitors who have a genuine need to visit the area prior to the designated opening time for short-stay parking facilities.

Nevertheless, in specific cases where all-day parkers significantly impact on shopper/visitor car parks the restriction of the opening hour for a car park may be the best operational response to ensure that parking capacity remains available for the intended shorter-stay users.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.3 Unbundle Parking

Unpriced parking is often 'bundled' with building costs which means that a certain number of spaces are automatically included with building purchases or leases and cannot be avoided even if demand would otherwise allow this to occur. Unbundling parking means that parking is sold or rented separately. For example, rather than renting an apartment for \$1000 per month with two parking spaces at no extra cost, each apartment can be rented for \$850 per month plus \$75 per month for each parking space. Occupants only pay for the parking spaces they actually need. This approach is generally more efficient and fair since occupants save money when they reduce parking demand, are not forced to pay for parking they do not need and can adjust their parking supply as their needs change. For this to function efficiently building owners must be able to lease or sell excess parking spaces and local officials should regulate nearby on-street parking to avoid spill-over problems that could result if residents use on-street parking to avoid paying rents for parking spaces.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.4 Parking Allowance Maximums

For major city centres best practice has moved towards the imposition of 'maximum permitted parking capacities' and away from 'minimum mandated parking supply allowances'. This has occurred because parking is an important parameter in determining travel behaviour and thus potentially is a powerful tool in travel demand management.

The limit on the maximum amount of parking capacity allowed may be applied to various land uses or within a particular city precinct as part of a city accessibility strategy or travel demand management program. It is also likely to be more efficient and equitable to determine the shared parking needs of a multiple-use urban centre in aggregate rather than to estimate parking requirements for individual land uses.

This approach is usually applied in commercial centres with high quality public transport and other features that constrain car travel. Imposing a parking limit encourages better utilisation of existing parking facilities, encourages businesses to offer their employees and customers alternative (non-car) travel options, encourages greater use of public transport and allows more parking to be priced.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.5 Parking Supply 'Ceilings' and Parking Supply 'Freezes'

Based on the estimated capacity for a central area to accommodate the traffic generated by a given level of parking provision, some cities impose an upper limit or cap on the supply of parking in a defined urban area. Sometimes this approach may involve the imposition of a parking supply 'freeze' if the upper limit of parking supply has already been reached.

With respect to area-wide parking caps the objective is to limit the total supply of parking in an area through the application of combined policies targeted to an overall parking supply ceiling. A parking management plan and policy for example might set maximum parking provision rates, prohibit construction of new parking facilities, encourage construction of new sustainable developments without parking and revise pricing structures in public parking facilities to limit the demand for and supply of parking. This approach is especially relevant to long-term (commuter) parking that contributes most of the peak-period traffic congestion experienced by major city centres.

Parking supply ceilings may be most desirable where:

- unrestrained market forces produce more parking than is desirable to support strategic development and transport system objectives
- parking facilities are under-utilised thus limiting the initial impacts of the introduction of a parking supply ceiling and allowing time to adjust to new parking supply circumstances
- public transport alternatives are readily available
- control of on-street parking space is prevalent throughout the parking limitation area.

Where the existing supply of parking falls below the specified supply ceiling the remainder may be treated as a 'reserve' from which spaces for new developments can be allocated. A parking supply cap may also move over time to address changed circumstances, therefore a supply ceiling does not have to be viewed as an immutable constraint.

A policy to impose a parking supply ceiling should be combined with policies to improve alternatives to car travel, e.g. public transport and associated walk facility improvement programs, cycling enhancements, commute trip reduction programs, higher car occupancy schemes and so forth. When applying this type of policy, consideration needs to be given to boundary impacts including the method to manage any potential parking spill-over.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.6 Cash-in-lieu of Parking Provision

Within town centres the urban fabric often makes it difficult for individual land uses to provide all the parking spaces required by planning schemes or district plans. A policy to permit or require cash-in-lieu of parking can provide the flexibility to locate and consolidate reasonable quantities of parking to serve an activity centre without imposing pressures to under-supply or over-supply parking.

This approach is complementary to the concept of shared parking provision as it creates a planning mechanism such that public (shared) parking is established to serve many potential parkers, land uses and trip destinations.

A key aspect of cash-in-lieu parking policies is to ensure that the cash-in-lieu contribution or trust fund is used effectively to provide the originally intended shared parking facilities. In this respect it is important that the cash-in-lieu requirement is determined on the basis of integrated accessibility plans that can reduce initial parking needs to a minimum. Only after multi-modal accessibility programs have been taken into account should the required cash-in-lieu contribution be determined thereby reflecting a mechanism for the establishment of the minimum quantity of parking necessary to satisfy the reasonable parking demands of the maximum number and variety of users.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.7 Transport Management Associations and Parking Brokerage Services

In an environment where restraints are applied to the growth in supply of parking capacity in major activity centres and where a market in parking facilities is developed to optimise the allocation of available parking space, parking brokerage services can be very effective in providing a parking system management role that assists a range of business, commercial, retail and other users of parking infrastructure to locate suitable parking facilities to satisfy their basic parking needs. There are several organisations in Australia that currently provide parking brokerage services.

Private collective non-profit member-controlled organisations that are dedicated to reduce traffic congestion and improve mobility air quality etc. often referred to as transportation management associations have become widespread in places like the United States. Parking brokerage services have been provided by these types of organisations in particular areas (e.g. business parks) so that facilities with excess parking capacity can be sold, leased or traded to promote an efficient balance of supply and demand for parking. This allows all building owners to benefit from flexible parking requirements not just developers of new facilities. It also encourages more efficient use of transportation and parking resources and allows small employers to provide commute trip reduction services comparable to those offered by large companies which are usually more cost effective than programs managed by individual businesses. This approach can help businesses deal with changing parking demands and may allow businesses that implement successful trip reduction programs to save money if they end up with unused parking spaces.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.8 Encourage Higher Vehicle Occupancy

Parking facilities especially public parking facilities can be priced and operated in a manner that will encourage increased vehicle occupancy levels. Travel demand management outcomes can be achieved where opportunities are explored to reduce reliance on single-occupant vehicle (SOV) travel.

Whilst public transport, walking and cycling can substantially increase their share of trip making, many people will continue to travel to/from activity centres by car. To the extent that more people travel in each car, people-access can be enhanced without increasing the number of vehicles that the road network and parking system need to accommodate.

Parking policy should stipulate the types of preferential treatment being provided for multi-occupant vehicles (MOVs) to encourage greater people-access to urban centres. These incentives may involve:

- reduced parking fees
- preferred parking locations within car parks
- reserved parking spaces in car parks
- eligibility for a variety of cost-free or subsidised services which may be provided regularly or periodically such as car washing or servicing
- other incentives and benefits that may be appropriate to encourage higher vehicle occupancy including regular or occasional prizes.

A range of promotional measures may be offered to vehicles carrying two occupants whilst additional preferential treatment or incentives may be offered to vehicles with three or more occupants.

Whilst initially incentives to encourage increased car occupancy may focus on peak-period commuter travel there would also be benefit in offering incentives to promote higher vehicle occupancy in short-stay (shopper/visitor) car parks.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.9 Enhance the Attractiveness of Alternative Modes of Transport

The introduction and coordinated application of parking policies aimed at achieving travel demand management objectives may cause adverse commercial, economic, social and operational results unless judiciously planned as part of a systematic approach to accessibility planning. In particular, parking policies that impose constraints on the supply of parking and/or impose significant price increases should be undertaken in conjunction with plans to enhance alternative modes of transport such as public transport.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.10 Encourage the Development of Company Travel Plans

For developments likely to have specified impacts on an area (e.g. measured by the number of trips likely to be generated) consideration should be given to imposing a requirement that the development provide a *company (or site) travel plan* in which developers may be required to commit to the production and implementation of travel plans designed to constrain the magnitude and time pattern of car travel generated.

In circumstances where planning requirements impose a minimum mandatory level of parking provision, the development and application of a company or site-based travel demand management program could entitle the developer to provide less than the otherwise required number of parking spaces. Caution must be applied with this approach as it may be difficult for the approving authority to enforce ongoing application of these principles after the parking concession is granted.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.11 Modifying Parking Requirements Relative to the Proximity of Public Transport

Parking policy can dictate a reduction in the amount of parking required in town planning schemes or district plans relative to the proximity of a site to high levels of public transport. Several issues are relevant to the application of such a policy:

- Different people have differing potential to use public transport as a viable alternative to the car.
- The level of service – service frequency, service capacity, quality of service and hours of operation – is a crucial factor in determining the viability of public transport as an alternative transport mode.
- Car ownership should be distinguished from car travel. Some people, e.g. residents in and near city centres may have a need to park a car despite having excellent access to public transport.
- In determining the capacity for multi-modal accessibility to reduce parking demand consideration should address all alternative modes not only public transport.

C4.11.1 Case Study Example: Town of Vincent, Western Australia

The Town of Vincent, Western Australia has a parking policy that specifically and quantitatively provides a range of concessions to its minimum parking requirement standards based on proximity to public transport and proximity to other preferred modes of transport, e.g. bicycle facilities Table 4.1.

Table C4 1: Parking adjustment factors for proximity to public transport

Percentage reduction	Adjustment factor	Factors to be successfully justified by the applicant to the City of Vincent
20%	0.80	The proposed development is within 800 metres of a rail station.
15%	0.85	The proposed development is within 400 metres of a bus stop/station.
20%	0.80	The proposed development contains a mix of uses where at least 45% of the gross floor area is residential.
15%	0.85	The proposed development is within 400 metres of one or more existing public car parking place(s) with in excess of a total of 75 car parking spaces; or
10%	0.90	The proposed development is within 400 metres of one or more existing public car parking place(s) with in excess of a total of 50 car parking spaces; or
5%	0.95	The proposed development is within 400 metres of one or more existing public car parking place(s) with in excess of a total of 25 car parking spaces.
10%	0.90	The proposed development provides 'end-of-trip' facilities for bicycle users; or
5%	0.95	Secure on-site and/or adjacent street bicycle parking complying with the standards identified in Bikewest guidelines.
10%	0.90	The proposed development is within a District Centre zone.

Note: The calculated adjustment factor is applied to the car parking requirement provisions outlined in the town planning scheme requirements. The maximum adjustment factor where all factors are justified to the maximum extent is 0.37 ($0.80 \times 0.85 \times 0.80 \times 0.85 \times 0.90 \times 0.90 = 0.374544$).

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.12 Introduce (or Adjust) the Pricing of Parking Facilities

Whilst most central-area parking facilities are offered at a price to car parkers, there remain many parking facilities in urban and suburban areas that are offered free-of-charge to the motorist. In addition, in a context where the supply of parking is generally plentiful and geared to address peak demands, the tendency exists for parking prices to be relatively low. Indeed, parking prices throughout metropolitan regions generally apply at such modest levels that they have limited scope to significantly influence the demand for parking.

Nevertheless, there are numerous examples of the pricing mechanism – including both the magnitude of price and its variable application – being used to achieve parking management and travel demand management outcomes. Best practices for the pricing of parking facilities include:

- Variable parking fees should be applied such that they are highest for on-street short-stay parking and should be higher for parking at premium locations.
- Parking price incentives may be offered to promote an increase in vehicle occupancy levels, e.g. to promote ride sharing. In this way car parks can encourage higher 'people turnover' rather than 'vehicle turnover'.
- Parking rebate schemes may be offered to some parkers, e.g. customers who have spent at least a specified amount on the same day at qualifying premises within the specified shopping centre.
- Parking prices should be well publicised and predictable.
- Payment systems should be convenient. They should accept coins, notes and credit cards and allow motorists to pay for just the amount of parking they use (rather than requiring pre-payment based on expected parking duration) or make use of some of the more recent technologies that directly debit an account using credit card or SMS/text message via a mobile phone (see Section 11).
- Parking fees should be applied in a coordinated manner throughout a district or region rather than in just a few areas (e.g. a central business district) although the magnitude of parking fees may vary.
- Potential spill-over problems resulting from the introduction (or increase) of parking fees should be anticipated and appropriate regulations and enforcement should be introduced by way of response.
- Ideally, parking prices should be higher during peak periods and lower during off-peak periods. Parking should be rented by the hour or day with no discounts for long-term pay-in-advance lease arrangements. The benefits of this form of variable pricing scheme needs to be balanced against the desire to avoid excessive complexity and greater misunderstanding by users.

Setting market prices for parking allows motorists to make many small adjustments to optimise their parking choices according to many individual circumstances. Compared with minimum mandated parking provision requirements, demand-responsive parking prices have major advantages. Increasing the price of parking to market levels will give everyone an incentive to consider the alternatives to solo driving for every trip they make. Motorists will save money if they car pool, park for a shorter time or park in a less central car park and walk further to their final destination.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.13 'Cash-out Free Parking' Programs

Cashing-out parking means that commuters who are offered subsidised (often free) parking are also offered the cash equivalent if they use alternative travel modes. This tends to reduce car commuting and is more equitable than providing 'free' parking to some drivers with no comparable benefit for non-drivers provided that the cash-out plan includes the corollary: that the assistance is provided for commute trips using preferred non-single-user vehicle ('non-SOV') modes of transport.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.14 Tax Parking Facilities

A number of cities in various parts of the world impose a special tax on parking facilities. This can be an effective travel demand strategy and can promote other non-SOV modes of transport. However, the travel demand management impacts of a parking tax may be more effective where the tax is borne directly by car parkers rather than by parking owners or operators.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.15 Parking Levies

Parking levies that impose a financial impost on owners/providers of parking facilities in defined city areas have been introduced in several Australian cities including Sydney and Perth. The objectives are two-fold:

- an indirect price-based travel demand management measure to achieve a degree of constraint in the growth of demand for parking by increasing the price of parking
- a revenue source to fund and promote a multi-modal city accessibility strategy including requirements to enhance the role of public transport walking, cycling and increased car occupancy as viable alternatives to single-occupant vehicle (SOV) car trips.

It should be noted that even where the parking levy imposed is substantial, its capacity to **significantly** constrain the demand for parking in car-oriented city centres is limited. For example, it would require a hypothetical parking levy of say \$260 per bay per year to increase the price of parking by only \$1.00 per day in a long-stay CBD commuter car park.

C4.15.1 Case Study Example: The Sydney Parking Levy

- The Sydney Parking Space Levy (PSL) was the first parking levy introduced in Australia (July 1992). It initially applied to the Sydney CBD and to the North Sydney CBD.
- The PSL sought to discourage car use in the CBDs by imposing a levy on off-street parking spaces. The levy applies only to tenant parking facilities and not to off-street public car parks.
- Revenue from the PSL is used to fund the development of infrastructure to encourage the use of public transport to and from the target CBDs (*Parking Space Levy Act 1992*).
- The levy was initially set at \$200 per bay per year for the first five years of implementation.
- Subsequently the levy was increased to \$400 per bay per year in July 1997 and in May 2000 a *Parking Space Levy Amendment Bill* increased the rate further to \$800 per bay per annum.
- In the year 2000, legislative amendments extended the activity centres to which the levy applies to Bondi Junction, Chatswood, Parramatta, and St Leonards. These urban centres are at considerable distance from the Sydney/North Sydney CBDs and indicate that the PSL now encompasses regional travel demand management and parking strategy objectives. A different levy fee applies to these secondary centres (i.e. 50% of the central Sydney levy or \$400 per bay per year).
- The application of the parking levy in Sydney includes provision for parking space exemptions for spaces for people with disabilities, city residents, community charity organisations and city servicing activities e.g. loading/unloading bays.
- Parking levy revenues can only to be used to fund transport infrastructure and maintenance requirements: they cannot be used to subsidise services. The approach taken in Perth is less restrictive and allows levy revenues to be used to fund any initiative that enhances accessibility to, from and within central Perth. However, proponents of the Sydney approach may argue that the restrictions on the purposes for which the Sydney levy can be used prevent it being used as a funding substitute for existing public transport subsidy streams.

It can be argued that the objective of establishing a revenue source to promote and fund non-SOV transport alternatives is more significant than the indirect price-based travel demand management objective. The disadvantage of this approach is that the non-SOV transport funding can become reliant on the very thing it was introduced to constrain. A point of balance may be reached where further expansion of the non-SOV transport alternatives is not possible without separate funding. However, even where the total parking levy fund does not exceed several million dollars per year, these funds can be vital as seed investment for providing non-SOV transport initiatives including:

- line-haul public transport vehicles
- specialised city shuttle public transport vehicles
- new public transport services and/or increased levels of existing service

- bicycle facilities on-road, off-road and at end-of-journey
- pedestrian facility enhancements
- parking system improvements e.g. parking information guidance and fee payment systems
- promotion of higher car occupancy levels through support of ride-share initiatives
- park-and-ride facilities outside the city environment
- other forms of support for preferred transport infrastructure and services.

Beyond what is directly funded as a consequence of the accrual of parking levy revenues the message to the community is also vital i.e. that non-SOV alternatives for access to urban centres are supported and are viable as replacements for at least some single-occupant car trips.

C4.15.2 Case Study Example: The Perth Parking Levy

- Perth introduced its central Perth Parking Management Area (PMA) levy in 1999.
- All on-street and off-street non-residential parking bays within the defined PMA were required to be licensed.
- The annual parking licence fee was initially set at \$70 per bay per year.
- Annual renewal of the parking licence relied only on the satisfaction of any parking licence conditions that might apply (e.g. that the car park must operate as a short-stay visitor car park only) and on the payment of any licence fee applicable to the parking facility.
- All parking licence revenues were to be reinvested in the enhancement of any facility or service that improves access to, from or within the PMA.
- A range of parking licence fee exemptions was introduced to address social equity and economic issues though all parking bays in use still had to be licensed (i.e. 'registered').
- About 56 000 bays were licensed in the first year of operation of the scheme (1999–2000) raising about \$3.35 million at the rate of \$70 per bay per year. This total allows for a number of parking bays that were exempt from the payment of a licence fee under the terms and conditions of the scheme.
- An increase in the licence fee to \$150 per bay per year was introduced in 2001 raising total annual revenue beyond initial levels to about \$7.5 million.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.16 Parking Benefit Districts

The concept of the parking benefit district (PBD) can be developed and applied to strategies that increase parking fees and revenues and/or impose parking levies on various categories of parking.

A major purpose of this policy tool is to promote acceptance of increases in the price of parking by establishing a transparent mechanism through which the revenues resulting from increased prices can be directly re-invested in improved multi-modal accessibility to/within a district. Revenues are returned to the districts where they are raised and in proportion to the fees paid by operators and users of parking facilities.

A PBD may also be an effective strategy in residential districts as residents who benefit from parking charges paid by non-resident parkers in their area would begin to think like commercial car park operators.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.17 Price Relativities for Short-stay and Long-stay Parking

To ensure that long-stay (commuter) parkers do not significantly infiltrate parking facilities intended for city or town shoppers and visitors, parking fees for short-stay visits can be and usually are set considerably higher than the level for long-stay parking. A variation on this approach is to structure fees for short-stay parking so that they are comparable with long-stay fees for one or more hours with the fees increasing substantially after that time.

A similar price relativity issue can arise between on-street and off-street parking facilities. Where off-street parking fees are increased to promote parking turnover and to ensure that long-stay commuters do not inundate short-stay visitor parking facilities a car parker may be able to purchase only about half as much off-street parking as can be purchased for the same fee at a kerb-side location. This situation is the opposite of that pursued by most parking systems that seek to encourage shoppers and visitors to park off-street with on-street parking being managed for the shortest-stay parkers.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.18 Parking Policy Zones

Some international and Australian cities (e.g. Adelaide, Newcastle) have sought to segregate short-stay and long-stay parking facilities through the introduction of spatial zones for parking provision. Because regular car commuters are usually prepared to trade-off longer walk distances for lower all-day parking prices the typical zonal approach has been to establish a short-stay parking zone surrounding the pedestrian-oriented core of the town and a mixed-use parking zone at further distance from the town centre. This may sometimes be referred to as a long-stay parking zone or a commuter-parking zone but there is also the scope to locate short-stay parking facilities to serve localised demands within this outer zone. Because it is not the intention to exclude any possibility of short-stay parking in the outer zone it may more accurately be described as a general parking zone than as a commuter (only) parking zone.

The fundamental objective for the strategic zoning of city parking is to ensure that long-stay (commuter) parkers who typically arrive relatively early in the morning do not occupy those parking facilities that are intended for use by shoppers and visitors as these retail business and service industries depend on these shoppers/visitors to operate successfully.

The simple strategy is that in the short-stay parking zone only short-stay parkers would be permitted whilst in the mixed-use parking zone commuter parkers would use parking facilities as would those short-stay parkers who may have need to park in the neighbourhood.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.19 Location-specific Standards

Many analysts suggest that there is a need for more accurate and flexible parking standards to be determined and applied. They argue that current parking requirements tend to be arbitrary and excessive (Litman 2014, Shoup 1999). It might therefore be argued that parking allowances should be used only as a guide with developers and practitioners being required to investigate and justify the demand for and supply of parking for specific developments or urban areas.

Using standards that reflect each site's actual needs based on specific demand studies that take into account local geographic and demographic factors can reduce road and parking requirements. For example, land uses with good access to services and public transport could have lower parking requirements than are often mandated by parking standards that 'average' parking needs.

Refer to Table 5.1 for more information on the parking policy toolbox.

C4.20 Parking Permit Schemes

A typical strategy to address parking spill-over impacts is the implementation of a parking permit scheme. The permit scheme may be implemented due to commuter parking spill-over from adjacent employment areas and/or because residential parking allowances are intentionally low to prevent suburban car parking and car usage levels in inner-city areas.

Refer to Section 1.1 for more information on the scope and purpose of the Guide.

Refer to Table 5.1 for more information on the parking policy toolbox.

Refer to Section 5.3 for more information on parking policy tools.

Refer to Section 8.10.4 for more information about parking permit schemes.

[\[Back to body text\]](#)

Commentary 5

An example checklist may include the following steps:

- Undertake a comprehensive parking assessment that identifies parking inventory resources, problems, objectives and management strategies. Monitor and periodically review parking plans and policies and modify as appropriate.
- Implement a program to collect information on parking supply demand, costs, prices and utilisation.
- Understand the nature of the parking issues being addressed and consider a wide range of possible options. Give consideration to strategies that encourage more efficient use of existing parking and other transport facilities before turning to prospects for increasing the supply of parking.
- Develop a broadly-based framework for evaluating prospective parking options so that economic, environmental, social and cultural values and objectives are included in the evaluation.
- Develop packages of options including emphasis on non-infrastructure solutions that shape travel behaviour and mode choice whilst retaining high levels of accessibility.
- Develop integrated variable pricing strategies to manage parking demand such that the magnitude and relativities between the prices of different categories of parking facility in different locations supports broader policy objectives.
- Integrate parking policy with travel demand management goals.
- Develop spill-over parking solutions and contingency plans to respond to the potential 'boundary effects' that may arise when new parking policies (or policy components) are introduced in specific areas.

Further information regarding parking policy development may be found in Johnstone (2002), Valleley (1997), Victoria Transport Policy Institute (2014), Weant and Levenson (1990) and Austroads (1998a and 1998b).

Refer to Section 5.8 for more information regarding a parking policy checklist.

[\[Back to body text\]](#)

Commentary 6

C6.1 Small Car Bays

Up to 2006 the trend towards ownership of larger recreational vehicles and family sedans resulted in a decline in the number of small vehicles as a proportion of the total vehicle fleet. Post-2006 this trend appears to have reversed in light of fuel pricing and environmental factors. However, there is still a high proportion of larger vehicles in the fleet and the fleet characteristics are constantly changing. For this reason, it is preferable to adopt universally sized car bays unless there is strong justification to do otherwise.

It can be unclear to users of a car park as to what qualifies as a small vehicle and as a result care must be exercised if incorporating small car bays in the design of a car park. The misuse of small car bays by car park users with larger vehicles can impact on the ability of other vehicles to manoeuvre within a car park (as can small vehicles that are misparked). Therefore, small car bays should be used only in remnants of space and should not exceed 15% of total capacity.

Small car bays could also be linked to less convenient parking bays (e.g. end bays) whereby staff with smaller, more manoeuvrable vehicles can be allocated these 'substandard' spaces.

Refer to Section 7.3 for more information on parking facility layout and the provision of small car bays.

[\[Back to body text\]](#)

Commentary 7

C7.1 Education and Information

The majority of drivers do not understand the long-term impacts of the increasing demand for the limited supply of parking. Not only are there cost implications but also social, environmental and economic impacts that confirm that current parking trends are unsustainable. The majority of drivers want more parking and do not understand that demand satisfaction is unsustainable or that there are many strategic benefits to charging for parking than simply raising revenue.

Extensive and continuous education of the city's stakeholders on the benefits of alternative transport other than private motor vehicles will have long-term positive benefits for a city and the health of people. Parking demand and supply issues and options should be regularly published by the city in its website, brochures, advertisements and other publications. The following rationale should be reinforced in all education and responses to parking issues:

- drivers cannot expect long-term free parking close to their destination
- there are environmental, aesthetic and financial costs associated with unlimited supply of parking
- improved compliance has benefits for all stakeholders
- the user-pay principle is fair and applies to most services and products as well as to every other cost associated with owning and using a motor vehicle
- better parking control and management will benefit all stakeholders.

Future parking information should therefore include not only the underlying rationale but also parking user information about the different options available, simpler and easy to understand signage, easy to use equipment, and incentives for parkers to investigate and use off-street parking in preference to on-street parking.

C7.2 Benefits and Drawbacks

Table C7 1 highlights the relative benefits and drawbacks for each type of technology described in Section 7.8. The level of customer service and the efficiency of each system is then considered.

C7.2.1 Parking Control Systems (PCS) – Ticket Machines Pay by Space or Virtual Phone-Based Systems

Table C7 1: PCS benefits and drawbacks

	Benefits (+)	Drawbacks (-)
Pay and display	+ Paid time overlap (> 10% revenue) parking spaces are paid for a greater period than they are occupied + Unlimited layout of spaces + Spaces do not need to be marked + Automatic issue of ticket and receipt (credit card) + Easily relocated /expanded to additional spaces + Alternatives available if a machine is not working + Can be used on and off-street + Easily understood by the public + Less queries on infringements + More detailed transaction data available from every ticket issued + A two-part ticket can be used for discounts/ validation by businesses + Already easily understood by most drivers + Does not require personal technology such as smart phones	- Extra walking distance - Uses more paper - Additional maintenance costs due to more moving parts - Awkward for some parkers such as parents with small children - Unless designed to accommodate credit cards, requires parkers to potentially have significant amount of cash available depending on fee and length of stay - 'Meter feeding' can occur where parking is time limited
Pay by space	+ Shorter walking distance for drivers + Paperless – more environmentally friendly + Less moving parts therefore less maintenance + More efficient for enforcement as rangers only visit the machine not each space + Receipt can be generated on demand	- Restricted number of spaces per machine - Spaces must be marked and numbered. - Overlap is used unless machine resets to zero - No alternative if a machine is not working - Not used off-street - Inconvenient to relocate - Numbering requires maintenance - Fixed fee structure encourages overlap - Confusing for some parkers especially elderly
Pay by plate	+ Paid time overlap (> 10% revenue) + More efficient for enforcement and can target repeated offenders + Spaces do not need to be marked + Less queries on infringements + Unlimited layout of spaces + Paperless – more environmentally friendly + Can be used on and off-street + Discourages free parking period over multiple visits (i.e. Drivers moving vehicles for free parking)	- Extra time consumed to enter licence plate numbers may result in queues - Possible error when typing in the number plate - Higher maintenance on key pad - Confusing for some parkers especially elderly
Mobile phone	+ No maintenance costs + Paperless – more environmentally friendly + Can be used on and off-street	- Assumes all drivers have a mobile phone and that these are fully charged and usable at the time parking is required - Detailed signage required - Administration for debt collection - Requires sophisticated enforcement software - No receipt available

C7.2.2 Customer Service

Pay and display is easy to understand and use and therefore the level of compliance is high. A major drawback in a city centre is that in on-street situations it requires drivers to walk to the machine and then back to their car to display the ticket. This can be awkward for parents with small children. A disability permit holder in some councils is not required to purchase or display a parking ticket for parking in any permissive bay.

Pay by space and pay by plate both require the parker to remember and enter their bay number or their registration number. They are not popular with drivers who want a receipt or ticket showing proof of payment.

Pay and display is the most popular form of on-street metering device in Australia and Europe with more than 80% market share. It is therefore already easily recognised and understood by most drivers particularly in capital cities.

C7.2.3 Efficiency

Pay and display allows optimal distribution of the machines because they are not linked to specific numbered bays. If one machine is not working another machine can be used by the driver to issue a ticket. This option is not available with pay by space.

Pay by space and pay by plate only require the parking and information officer to visit the machine to determine the paid status of each vehicle rather than each individual space as with pay and display. The officer need only attend a space if the vehicle has overstayed.

C7.3 Parking Payment Systems – Cash and Credit Card

C7.3.1 Customer Service

The major customer service drawback of most meters in Adelaide is they require a driver to have coins. It is acknowledged that legislation currently mandates that parking machines must accept coins.

It is expected that for the next 10 years at least there will be continuing requirement for coin payment although as the public grows to expect alternative means of payment coin only technology will diminish. At this time not everyone carries a credit card or a mobile phone.

Cash and chip and pin payments will remain for some time yet as slow adoption of contactless readers by parking operators is coupled with a general lack of understanding of contactless payments among consumers.

Credit card usage (by insertion or wave and pay) is a growing market share at on-street parking machines. While some of the systems are cumbersome data from a number of Australian city councils shows payment by credit card at > 33% and increasing (Stonnington Council). Machines that issue a ticket serve the dual purpose of providing a form of receipt for the credit card payment.

An additional benefit will be the ability to top-up Metro-cards or permits using credit card or cash as the parking machines. The systems can permit and record another category of payment which is not for parking.

It must be emphasised that drivers should be offered a range of methods to pay for parking. This will maintain revenue streams and customers will not be inconvenienced should there be technical failure of one system.

C7.3.2 Efficiency

The reduced quantity and frequency of cash collection is a major benefit to a parking provider installing a credit card option. Less cash provides less opportunity for shrinkage or theft.

Additionally, drivers paying by credit card are less likely to overstay their paid time allowance because they are not limited by a shortage of coins.

The first contactless credit card payment technology for on-street parking was installed in 2009. Its major advantage is the speed of the transaction and reduced queues at machines. Wave and pay is now accepted in over 120 000 machines in the United Kingdom but the take-up by consumers to date has been slow.

Table C7 2: Cashless and contactless benefits and drawbacks

	Benefits (+)	Drawbacks (-)
Cashless and contactless	+ Improves compliance (accommodates for drivers not having coins or cash) + Reduces the frequency of coin and note collection costs + Minimises opportunity for cash mischarge + Minimises the possibility of downtime due to coins or notes jammed in machine + The use of 'pay wave' or contactless cards (chip and pin) also minimises time required for signature or pin number key in	- Lag in payment due to authorisation and transaction of credit cards - Potential fraud activity with credit cards - Compliance with PCCI and EMV regulations is essential - Public understanding and perceptions regarding wave and pay technology

C7.4 Parking Payment Systems – Mobile Phone

C7.4.1 Customer Service

Payment by mobile phone is to be distinguished from a variety of other parking-related information available in smart phones. Payment by mobile phone is convenient for drivers who do not wish to walk to a machine. It also offers the opportunity to top-up the time paid from a remote location by adding a further payment. This however may be contrary to council policy to ensure a high churn of parking spaces in the city centre.

Payment by mobile phone essentially links back to a credit card, details of which must be supplied at the time of registration of the phone number. Payment by mobile phone is easier than by cash but it does not always ensure the provision of a receipt as proof of payment.

Table C7 3: Mobile phone and virtual permits – benefits and drawbacks

	Benefits (+)	Drawbacks (-)
Pay by phone	+ Reduces and may eventually eliminate the need for coin collection thereby improving audit control and efficiency of collecting parking income + Parking payments made in the privacy and comfort of the customer's vehicle + Paperless – more environmentally friendly + Extension of parking time payment can be made from any phone and anywhere subject to appropriate time restrictions + With more convenient ways to pay, a higher percentage of people comply with parking rules and regulations	- No alternative if user does not own a mobile phone / credit card or have access to the internet - Possible human error when entering bay identification or zone number - Payments are usually exact and will not have a high amount of collection variance - No alternative if the server or website is down - Confusing for some parkers especially the elderly - Top-up may be contrary to council policy if time restrictions are exceeded
	+ Allows for the introduction of variable fee structures depending on demand for spaces at certain times + Considerably easier for disabled drivers and parents with small children + More efficient for enforcement – allows officers to view by zones and individual bays from a mapping system highlighting paid spaces and for how long some spaces have been expired + Offers text message expiry reminders to improve compliance and customer service	- Officers will still need to attend a vehicle that has overstayed to document and attach the expiation

	Benefits (+)	Drawbacks (-)
Virtual permits	+ Savings in face to face and physical operations + Reduced administrative pressure at council offices + Cost effective 24/7 service + Applications processed, managed and approved online	- Requires administration of authorised passwords

C7.4.2 Efficiency

Parking and information officers require sophisticated hand-held devices at a cost of approximately \$4000 each with back-to-house wireless connectivity to obtain relevant data and interrogate mobile phone payment by drivers for their vehicle. Despite many recent announcements by European, British, American and Australian cities offering mobile phone payment options the take-up has been very slow. In Australia less than 5% of transactions at on-street parking are paid by mobile phone despite some systems having been installed for several years (North Sydney, Bunbury, Fremantle, Melbourne). While this method of payment offers convenience to drivers the cost/benefit of establishment and maintenance of the supporting infrastructure may be negative.

C7.5 Parking Guidance Systems – In-ground Sensors Wayfinding Space Indicator Signs

Table C7 4: PGS benefits and drawbacks

	Benefits (+)	Drawbacks (-)
In-ground sensors (PODS)	+ Accurately records vehicle arrival and departure time - including overstays + Can be integrated with mobile hand-held device and produce notification of overstaying vehicles + Improves efficiency and accurately records the infringement- type location details, offence details and signage regulation + Can be integrated with dynamic signage to advise drivers of spaces available prior to arriving at car park + Buried beneath the pavement hence reduces the chance of vandalism	- Need to transmit back-to-house to a central server for efficiency - High cost of maintaining/repairing if sensors become faulty – requires small amount of pavement removal - Battery life over extended term has not yet been proven - Annual repair and maintenance cost of ±\$27.50 per unit
Wayfinding (dynamic signage) PGS	+ Provides real-time parking information to drivers + Reduces vehicle congestion caused by vehicle idling and circulating for parking space + Reduces carbon dioxide released due to vehicle idling + Reduces driver frustration + More attractive for drivers and hence increases the chance of revisiting the area + Improves the perception of availability of spaces + Improves the efficiency of spaces + Data can be integrated to include information for public off-street parking	- Needs to be integrated with in-ground parking sensors for each on-street bay at significant cost - May be a safety issue as it may confuse/distract drivers when driving - Additional set-up and maintenance costs

C7.6 Compliance – Enforcement Technologies

Table C7 5: Compliance benefits and drawbacks

	Benefits (+)	Drawbacks (–)
New handheld enforcement units	+ Improved productivity (no manual chalking or input) + Officers only need to carry one device to detect overstaying vehicles and issue infringements. + Accurately records activity and management reports for data analysis and assessment + Improves compliance + Provides real-time back-to-base communication and data input	- Needs to be integrated with in-ground parking sensors - Weight of the machines - Need to carry printers
Licence plate recognition	+ Camera captures each vehicle number plate + Plate information can be used for different enforcement purposes such as reporting on abandoned vehicles and raising alerts on vehicles of interest (e.g. stolen vehicles and repeat offenders) + Plate information can also assist in reporting on parking duration and specific customer trends + Identifies fraudulent parking ticket activity + Discourages free parking period over multiple visits (i.e. drivers moving vehicles for free parking) + Works with parking permit system to immediately highlight a permit authorised vehicle + Improved officer safety and comfort + Drive-by provides additional element of security	- Camera may also capture random numbers other than number plates (such as advertising phone number on vehicles) - Additional set-up and maintenance cost for camera equipment - Camera polling can be affected by traffic and congestion - Disputes may occur because a second picture is not always taken from the exact same angle as the first picture

C7.7 Information Systems

Table C7 6: Technology integration benefits and drawbacks

	Benefits (+)	Drawbacks (–)
Technology integration	+ Maximises the potential of all invested equipment + More efficiency and accuracy and greater flexibility with data + Easy to monitor and less labour intensive	- Increase in maintenance costs - May affect terms of warranty - All systems become dependent on the integration program. If integration program fails all other systems may not be able to function as standalone. Need to ensure independent systems still operate

[\[Back to body text\]](#)

Commentary 8

C8.1 Trials in Other Cities

C8.1.1 Westminster, UK

Westminster City Council became the first British local authority to use parking bay sensors to give real-time updates to motorists on the availability of parking spaces via a phone app. The pilot scheme claimed as a European first began on 15 August 2012. The sensors provide the latest real-time information about parking space availability which people can view on their phones, iPad or tablet to find a vacant space.

The council believes this could reduce congestion and minimise the need for motorists to cruise the streets searching for somewhere to park.

The council is linking the information to the Parkopedia website which already provides information on parking in Westminster and will make the data available in real-time to other app developers.

The pilot will be monitored for success on the following criteria: real-time parking availability on a smartphone application; linkage to the pay-by-phone system and its smartphone application; real-time data available to traffic marshals to help direct motorists; and utilisation in trial locations.

Other possible benefits of the pilot include the ability to pre-book loading or coach bays, the application of variable tariffs during peak and off-peak periods and the prospect of changing restrictions based on parking data in key areas. Data on traffic volumes could also be shared with businesses for their own use such as loading bay availability and parking spaces for West End theatres. The sensors could also be used to tackle disabled parking fraud, the unauthorised use of taxi ranks and coach bays, and to manage electric charging bays and pedestrianised zones.

C8.1.2 Nottingham, UK

Nottingham City Council installed pay and display parking machines to offer motorists a wider choice of payment options. The machines can accept cash and credit/debit cards. In addition to the new machines, the council has offered phone payment across the entire city since January 2012.

Nottingham has maintained detailed records. The council's analysis covers three months prior to the installation (October–December 2011) and three months afterwards (April–June 2012).

Post-installation the figures showed an immediate interest by the public in paying by credit/debit card with 4.5% of transactions using the card method.

Pre-installation 97% of all pay-and-display transactions were by cash and 3% by phone. After installation of the new machine with credit/debit card options, cash transactions had dropped from 97% to 94% with a shift towards the credit/debit card option. A similar shift has also been seen in phone-based payments which dropped from 3% to 2% over the same period. The ratio for the three months' post-installation is 94% cash, 4% credit/debit card, 2% phone.

C8.1.3 San Francisco, USA

San Francisco in California is exploring an on-street bay monitoring system (www.sfpark.org). The city began installing sensors in March 2012 across 8000 parking bays.

The system tracks usage and offers customers the option of paying by coin, credit card or phone. Those who choose to pay by phone can receive text messages alerting them when the meter is about to expire. They can add time remotely as long as it does not exceed the posted time limit. A 'max time exceeded' message will flash on the meter when time has expired. When the space is vacated the meter automatically resets giving council a significant additional understay revenue. Officials believe the system will help free up on-street parking spaces but warn that it will take some getting used to.

C8.1.4 Milan, Italy

In Milan, new integrated card reader terminals are equipped with a PIN pad and radio frequency identification (RFID) antenna to meet the Europay MasterCard and VISA (EMV) global standard for processing credit and debit card payment chip-based cards. The machines accept PayPass and Pay Wave contactless cards. The terminals also accept the local transport authority's contactless ATM card which can be reloaded at the terminals.

Milan's terminals feature an on-screen electronic keyboard on which users can identify themselves with their vehicle registration plate details. This enables them to pay the city's active congestion charge which includes a free 2-hour parking ticket. The service is accessed daily by over 10 000 users who may also pay parking fines at the machines.

C8.1.5 Australian Cities

The implementation of parking controls and payment in Australian cities in the past three years has been focussed mainly on solar-powered pay-and-display meters which offer cash and credit card options for payment (Perth, Melbourne, Hobart, Darwin and Sydney). Mobile phone payment has been offered in a few cities (Bunbury, Fremantle, and Brisbane) and some have introduced in-ground sensors as stand-alone in timed parking areas (Claremont, Brisbane, Holdfast Bay) or in conjunction with meters (North Sydney). The slight variance in demographic and other cultural patterns within cities has not affected the introduction of sophisticated new parking technologies. All parking installations exhibit an increasing use of credit card as drivers carry less cash. Compliance has generally improved wherever there are consistent, easy-to-understand on-street parking regulations and processes for payment.

Machineless parking has recently commenced for students-only at Curtin University. First reports are that this is operating well but it has been confusing for the public using student parking areas outside of campus time.

[\[Back to body text\]](#)

Commentary 9

C9.1 Location of Bicycle Parking Facilities

Bicycle parking facilities should be provided in small clusters within 100 m of common commuting and recreational destinations of bicycle trips such as schools, shopping centres, railway stations, bus terminals/interchanges, work places sports grounds etc.

It should be noted that if parking facilities are not conveniently located, cyclists will ignore them and continue the disorderly practice of securing bicycles to nearby railings, posts, seats, parking meters, trees etc. In particular, short-term bicycle parking needs to be convenient if it is to be effective.

C9.2 Types of Bicycle Parking Facilities

Bicycle parking facilities are classified by security level as shown Table C9 1.

Table C9 1: Classification of bicycle parking facilities

Class	Security level	Description	Duration of parking	Main user type
1	High	Fully enclosed individual locker	All day and night	Bike-and-ride commuters at railway and bus stations
2	Medium	Lockable enclosure, shelter or compound fitted with class 3 facilities where cyclist is responsible for locking their bicycle within the communal enclosure	All day	Regular employees, students regular bike-and-ride commuters
3	Low	Bicycle rails or racks to which both the bicycle frame and wheels can be locked	Short to medium term	Shoppers, visitors, employees of workplaces where security supervision of the facility is provided

C9.2.1 Bicycle Lockers

Bicycle lockers offer the highest level of security currently available. They also have the added advantage that helmets and other gear can be securely stored along with the bicycle. Bicycle lockers restrict access to one user and are most effective in public places where there is a high risk of theft or vandalism. They are most commonly located at railway stations and bus terminals to encourage the use of multi-modal travel as well as at apartments, residential complexes and university residences. They should be situated in a well-lit area and fabricated from corrosion, resistant materials if close to the sea.

It is important that the use of lockers is managed by an appropriate authority such as the managers of a shopping centre, major building or railway station. They can either be rented to a single user for a period of time or casual users can obtain a lock and key from the facility manager. It is also possible to manage lockers automatically with electronic access control similar to that used by some airport luggage lockers.

Figure C9 1: Example of bicycle lockers located at a bus terminal in Canberra



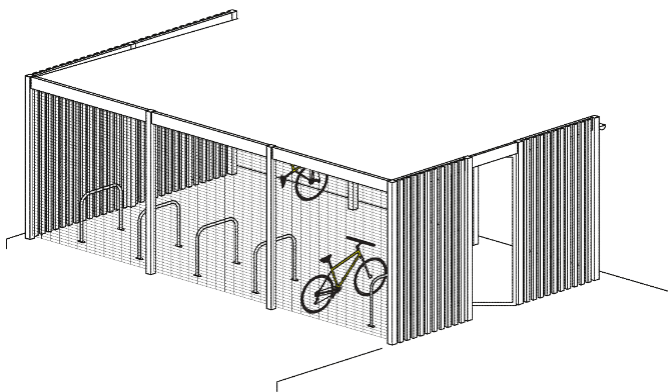
Source: ARRB Group

C9.2.2 Bicycle Enclosures

Bicycle enclosures offer a medium level of security in that while the owner can lock the bicycle within the enclosure, other users also have access to the enclosure. These are usually located at railway stations, public transport terminals, workplaces, universities/TAFE colleges, schools, apartments/residential complexes and university residences. Enclosures can be a room a compound or a purpose-built area containing groups of bicycle parking rails and fitted with a roof for increased security and weather protection. Public lighting is desirable where they are located in a public place and used after dark.

Enclosures should be lockable to prevent unauthorised access. If restricted keys are used, unauthorised copying will be prevented. Electronic access control may also be suitable particularly if the building already has such a system. It is important to ensure that a nominated person is responsible for managing access issues and distributing keys or access cards to the enclosure. If a higher level of security is required, it may be possible to install a surveillance camera to monitor the door to the enclosure.

Table C9 2: Examples of cage facilities



Source: ARRB Group

Where space is limited an enclosure designed for vertical bicycle storage may be provided.

C9.2.3 Bicycle Parking Rails

The parking rail is the most versatile methods of bicycle parking currently available in that it is:

- inexpensive to install and maintain
- easily fabricated
- able to be located close to cyclist destinations
- suited to short and medium-term parking.

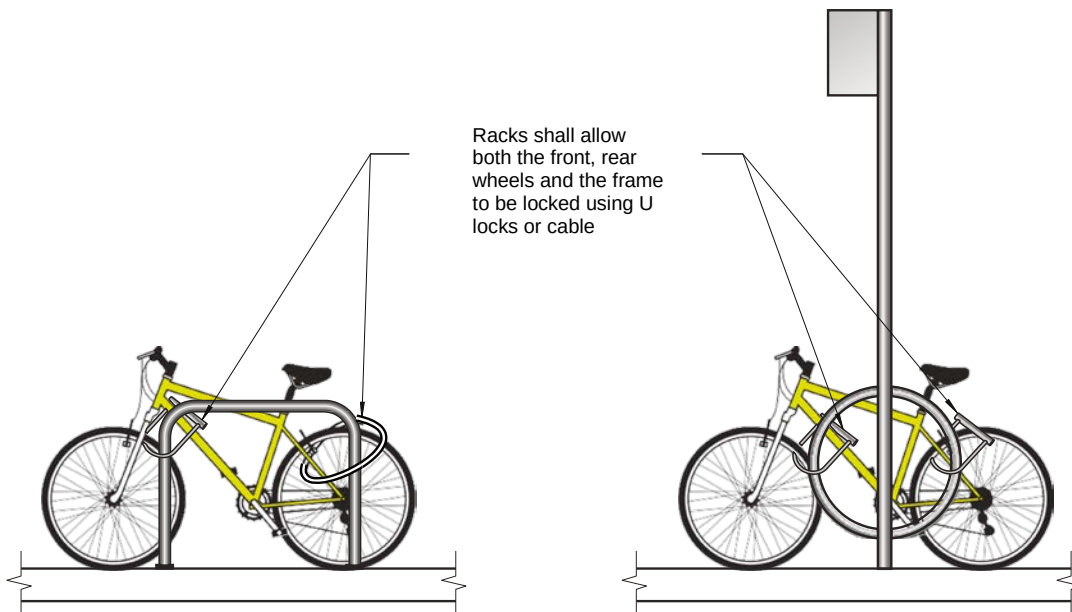
Parking rails are usually located at shopping centres/markets, business districts, recreational centres/swimming pools, libraries and universities/TAFE colleges. They should be located in well-lit areas in public view where they will not impede the opening of doors on parked cars and where they can also be easily seen by motorists. Where possible, they should be situated near buildings that have on-site security or if a high level of security is required it may be possible to install a surveillance camera to monitor the rails.

Parking rails may come in a number of shapes and sizes and can be as ornate as the site requires as long as the rail:

- supports the entire bicycle
- is of a shape that allows the cyclist to lock the front wheel and frame top bar and back wheel and frame to the rail

- is manufactured from smooth steel tubing of a diameter that a u-lock can easily fit around (usually 50 mm) and is vandal resistant
- has base plates welded to the bottom of each leg so that they can be bolted to a concrete surface or long enough so they can be set in concrete footings.

Figure C9 2: Examples of bicycle parking rails



Note: Signposting or physical devices may be required to discourage or prevent access to the area by motorcycles.

Source: AS 2890.3:1993.

Parking rails can be arranged to best fit the available space. Each parking rail can accommodate two bicycles with one on each side of the rail. They can also be installed in clusters or groups to meet the parking demand. Bicycle racks may also incorporate plastic-coated chains which can be secured by padlock.

The traditional 'toaster rack' style bicycle stands (Figure C9 3) holding only one wheel have been around for a long time. However, they do not meet the requirements of AS 2890.3:1993 as they do not allow the frame and wheels to be locked to the rack and can therefore damage the wheels. They should be replaced progressively giving priority to those where the security risk is greatest.

Figure C9 3: An example of toaster rack style bicycle stand



Source: ARRB Group

C9.3 Signs and Pavement Markings

Information signs and pavement markings should be provided to direct cyclists to parking facilities and indicate the purpose of the facility in order to encourage their use. Lockers and other facilities must also display instructions for use.

Figure C9 4: Examples of way-finding and position signage



Source: ARRB Group

Signs should be provided in accordance with AS 2890.3:1993 consisting of a standard bicycle pavement symbol with an additional panel below. The message on the lower panel should normally read 'Bicycle Lockers Parking Enclosure Parking Rails or Parking'. Another message may be required in special circumstances.

It is also recommended that bicycle rails have a small bicycle pavement symbol painted on the pavement beneath to clarify the purpose of the rails or have the words 'Bicycle Parking' stencilled on the rail. This is usually applicable to ornate rails that may be mistaken for street art.

Refer to Section 7.15 for more information on off-street parking provision for other road users.

Refer to Section 8.9.5 for information on bicycle parking provision for on-street parking.

C9.4 End-of-trip Facilities

Increasing numbers of office tower tenants are using the bike as their preferred mode of transport. Bike parking and end-of-trip facilities are one of the key drivers of demand in Australia's CBD property markets and are key to attracting employees. Some end-of-trip facilities include:

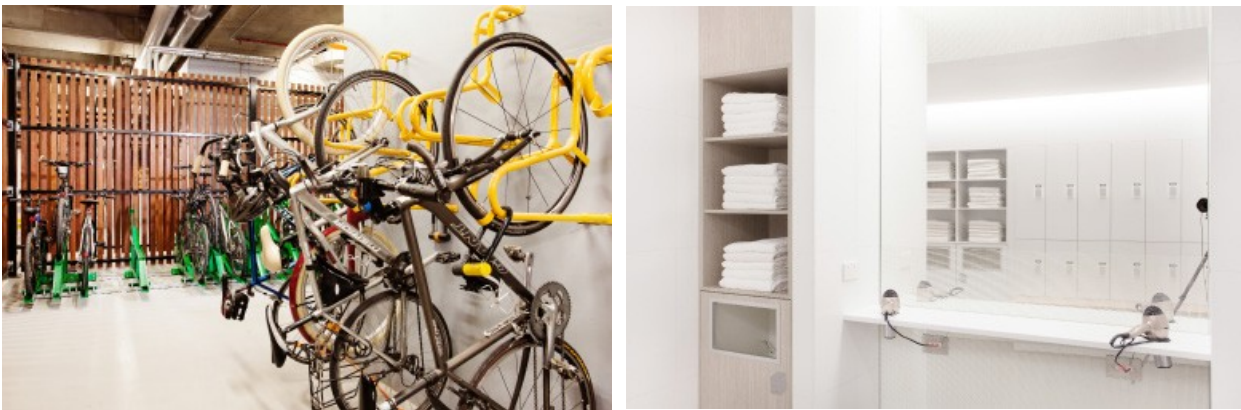
- secure access with free Wi-Fi access
- showers with male and female amenities
- accessible W/C amenity and shower
- complimentary towel service
- hair dryers and straighteners with refresh stations
- ironing stations, garment air drying units and airing cupboards, and free shoe shine
- change rooms with ironing facilities hair dryers and a hair straightener, a fresh towel service and a same day dry cleaning service
- swipe-card lockers offered on both a casual and permanent basis
- communal bike tools including a repair stand and electric air compression bike pump with quarterly bike tune ups and repairs.

Figure C9 5: Bike storage and secure clothes lockers, shoe shine and air pump



Source: ARRB Group

Figure C9 6: Secure bike parking and shower amenities



Source: ARRB Group

[\[Back to body text\]](#)

Commentary 10

C10.1 Meter/Multi-bay Parking

This is the most common form of pay parking. The main features of a meter/multi-bay parking scheme are as follows:

- It requires a motorist to 'buy' the time to park in a designated meter space. Generally, the motorist is required to insert coins into a parking meter although recently more sophisticated electronic and computerised meters accepting stored value cards (smart cards), credit cards or payment by mobile phone have become available. On payment, the meter must show the time 'bought'/available for parking and on expiry of this time the meter must also clearly indicate that the time has expired.
- Instead of the customer paying for a ticket the customer need only select the designated parking space and then pay for the desired parking time.
- It is designated by permissive parking signs on which the word 'meter' is added. Signs require a normal approval process before installation. The motorist is not allowed to exceed the time limit indicated on the parking sign.

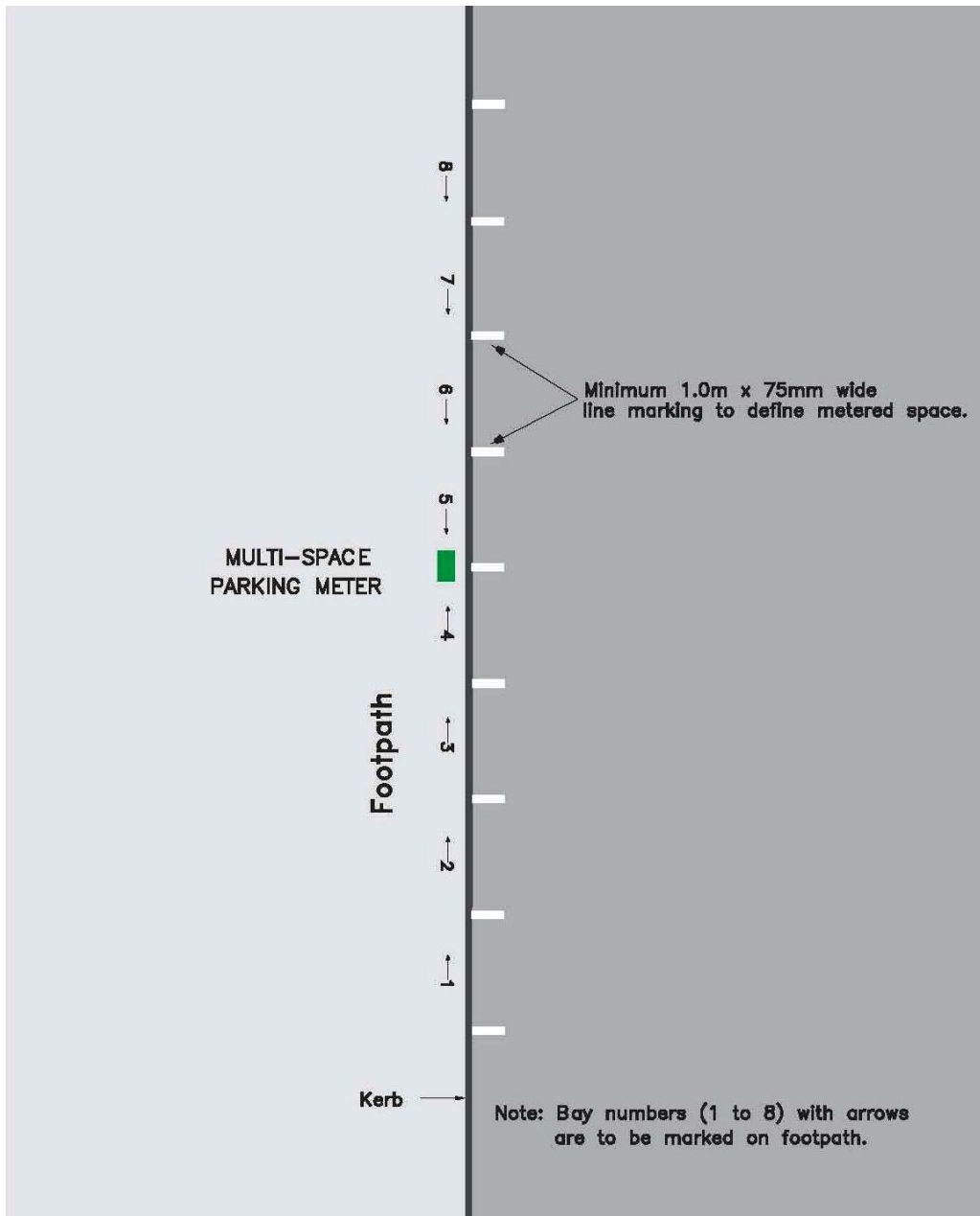
- Individual meters and multi-bay meters should be placed adjacent to the kerb to ensure a clear zone along the building line.
- Where multi-space meters are used, the parking meter and the spaces it controls should be located close to each other (within 50 m) and on the same side of the road so that users do not have to cross the road to access the parking meter and are not unduly inconvenienced. Usually up to 10 spaces and sometimes as many as 20 spaces can be served by the same multi-space meter depending on the parking layout and still satisfy this requirement. Each multi-space meter should also be capable of providing a printout reporting the status of each space it serves for the motorists as well as enforcement officers.
- Parking spaces for both single and multi-space parking meters should be designated by means of paint studs, pads plates or strips (rising no more than 3 mm high) and individually numbered together with arrows to indicate the direction of the meter (ideally a standard line. Marking layout should be developed). See Figure C10 1 for an example of a layout.
- Parking authorities may introduce a concurrent permit parking scheme and issue a permit authorising the parking of vehicles without charge or time restrictions but it must comply with relevant legislation.

Figure C10 1: Example of a multi-bay meter



Source: ARRB Group

Figure C10 2: An example of multi-bay meter markings



Source: Roads and Maritime Services (2012).

The advantages of meter/multi-bay parking are:

- Modern electronic parking meters are easy to use and as a result public acceptance and compliance is good.
- Access to a parking meter is instant and time can be 'bought' simply by making the appropriate payment by cash card or mobile phone.
- The time available for parking is displayed continuously on the machine.
- Enforcement is easy as expiry time is displayed.
- The customer need not return to the vehicle after payment.
- No tickets are required reducing consumable and litter costs.

The disadvantages are:

- Correct denomination of coins is required if another payment method is not available.
- The machines do not give change or receipts.
- Equipment failure can lead to unfair breaching, economic loss and enforcement difficulties. In the case of multi-bay meters all bays served by the machine can be affected.
- Vandalism of parking meters may render the meters inoperative and lead to economic loss however the new generation parking meters provide many safeguards against vandalism.
- An increase in the number of parking meters or a high pricing structure may lead to community concerns.
- The system needs to be enforced.
- More machines are needed per space than for pay-and-display.
- Bays must be clearly numbered with clear arrows indicating the machine they serve.
- Motorists must select in advance their required parking time.

It is difficult to configure and use this system in an off-street parking situation.

Figure C10 3: Example of a parking meter



Source: ARRB Group

C10.2 Coupon Parking

Coupon parking schemes operate in several cities such as Singapore. The main features of a coupon parking scheme are as follows:

- It involves the pre-purchase of coupons from sale outlets either close to the parking area or at remote locations and their display in the parked vehicle. Coupons can be either money-based (e.g. 50 cents coupons) or time-based (e.g. 1-hour coupons). The most common method of validation is by scratching the information to record the time of arrival. In some jurisdictions parking up to a certain time in the coupon area may be free, e.g. Wellington where parking in the coupon area is free for up to 2 hours.

- It is designated by permissive parking signs on which the word 'coupon' is added. Signs require a normal approval process before installation. The motorist is not allowed to exceed the time limit indicated on the parking sign.
- Parking space markings are optional for coupon parking spaces.
- Coupon parking schemes should be approved by a parking authority but they must comply with relevant legislation. In addition, parking authorities may introduce a concurrent permit parking scheme and issue a permit authorising the parking of certain vehicles without charge or time restrictions.

The advantages of coupon parking are as follows:

- It is flexible as there is no need to mark each parking space.
- Motorists do not have to carry the right amount of change or have to use stored value cards and they do not have to search for meters or ticket machines.
- There is less visual intrusion and no vandalism as there are no meters or ticket machines.
- There is better enforcement than meter parking as there is evidence of the unique serial number.
- Coupons can be given as incentives by employers.

The disadvantages of coupon parking are as follows:

- Motorists who do not know the correct time may be penalised for not marking the coupons correctly plus they may find them awkward to use.
- The hours of operation of a coupon parking area may have to be limited to the hours during which the coupon sales outlets are open; outside of those hours the parking spaces may be used illegally if people have not pre-purchased the coupons.
- It is inconvenient for tourists or other visitors to the area who are not familiar with this type of parking scheme.
- It is not suited to motorcycles.
- It may not be practicable if introduced by a number of adjoining council areas unless a common money-based scheme is adopted.

Refer to Section 8.10 for more information on parking control measures.

[\[Back to body text\]](#)

Commentary 11

The following listing provides a selection of strategies dealing with parking on arterial roads (Morgan 2002).

Funding strategies

- establish municipal parking funds
- spend parking revenue on parking infrastructure
- lane rental.

Legislative and enforcement strategies

- changes to local government powers and responsibilities
- no-stopping on state highways
- ban parking at night-time on arterial roads.

Town planning strategies

- provide enough on-site parking
- encourage developments which face off-street parking
- no-stopping signs as a requirement of new development.

Simple strategies

- park on your own property
- park in a side street
- put letter boxes and phone boxes in side streets.

Signs and lines strategies

- full-time clearway or No Stopping
- No Parking at all times
- No Stopping on the main carriageway where there is a service road.

Engineering strategies

- indented parking bays
- marked areas on wide footpaths
- conversion of angle parking to parallel parking.

Complementary strategies

- pedestrian refuges
- right-turn lanes into parking areas
- pedestrian fences.

Route management strategies

- strip shopping centres
- one-way streets
- manage parking in side streets.

Refer to Section 8.1 for more information on the priorities for use of kerbside space.

[\[Back to body text\]](#)

Commentary 12

C12.1 Spacing Requirements for Rest Areas

The spacing interval between rest areas should give the road user the opportunity to stop and rest at least once every hour. It should be noted that in remote areas this constraint may be impracticable or inappropriate and hence larger spacings may be justified.

Research indicates that the spacing interval between rest areas should depend on the category of rest area selected, the mix and volume of traffic, and the demand for parking and rest opportunities. Attention should be given to any demonstrated pattern of fatigue-related road crashes. In known fatigue areas the frequency of rest areas should be increased and better signposting provided. Research into driver fatigue also indicates that a significant number of fatigue-related crashes occur shortly after the commencement of a journey. This fact supports the need for rest areas to be provided within a half-hour journey from the outskirts of significant population centres where lengthy periods of driving are required to clear the urban/built-up area.

The spacing requirements of major and minor rest areas and truck parking bays are given below:

- major rest areas should be located at maximum spacing intervals of 100 km (the current range applied in Australia is between 80 km and 110 km)
- minor rest areas should be located at maximum intervals of 50 km (the current range applied in Australia is between 30 km and 60 km)
- truck parking bays should be located at maximum intervals of 30 km.

Refer to Section 9.1.1 for more information on categories of rest areas.

C12.2 Rest Area Site Location

Apart from the distance to the next rest area, the following factors should be taken into consideration when planning the location of new rest areas:

- **Sight distance and safety requirements:** rest areas should not be located below the crest of a hill or on bends. Straight sections on crests of hills prior to downgrades or on flat grades with good sight distance are preferred in order for vehicles to safely leave and re-enter traffic flow.
- **Scenic viewpoints:** opportunities to co-locate with existing points of interest or scenic lookouts and trees for shade should be maximised.
- **Environmental quality:** impact on the environment in site location, clearing operations, drainage construction, and operation should be minimised. It should also be established if the site contains any resources protected by law.
- **Topography:** the topography such as deep gullies adjacent to the road and watercourses that cross the road and high cuttings will influence the location of rest areas.
- **Existing infrastructure:** existing interchanges, overpasses and the availability of required utilities will also influence the location. Where a potential site is located near a freeway, interchange traffic analysis including an assessment of weaving may be necessary. As a guide there should be a minimum of 500 m from the end of the interchange ramp taper to the start of rest area taper.
- **Need for additional land:** consideration should also be given to reserving or acquiring necessary land to allow an existing or new rest area or truck parking bay to be expanded or upgraded in the future should demand for the facility or traffic volume increase.
- **Year-round accessibility:** rest areas should be accessible all-year-round and hence should not be placed in areas susceptible to flooding.

Refer to Section 9.1.1 for more information on categories of rest areas.

Refer to Section 9.2 for more information on roadside amenities.

C12.3 Rest Area Access Requirements

In order to maximise the safety and ease of entry to and exit from rest areas, the following principles should be observed:

- **Freeways and major divided highways:**

Rest areas should be located directly opposite each other on each side of the freeway/divided highway. If this is not possible they should be offset such that the first service centre encountered is on the left side of the road. This approach will reduce the risk of drivers parking on the opposite carriageway and crossing the median by vehicles or pedestrians to gain access to the rest area on the right side of the road.

Access to rest areas should be designed in accordance with relevant road agency design guidelines.

- **Dual carriageway highways:**

Where traffic volumes are high it is also desirable that rest areas be provided on each side of the road. Access should be designed with appropriate tapers, auxiliary lanes, profiles and curvatures as per the *Guide to Traffic Management Part 5: Road Management* (Austroads 2014).

- **Single-carriageway roads:**

The need to provide rest areas on both sides of the road depends on the volume of traffic, the type of traffic using the area and the type of traffic turning. For example, it may be undesirable for trucks to be encouraged to turn right at some locations. Where a facility is located on one side of the road only it will often be necessary to at least seal wide shoulders on both sides of the road to provide for deceleration and passing.

Where the above principles cannot be met no-right-turn signs for busier highways and/or where the sight visibility is less than desirable should be provided.

Refer to Section 9.1.1 for more information on categories of rest areas.

C12.4 Rest Area Design Requirements

Rest area design is dealt in the *Guide to Road Design Part 6: Roadside Design, Safety and Barriers* (Austroads 2010). The principles should be addressed when designing the layout of a rest area and its access roads/aisles to ensure safe operation and freedom of movement of through traffic.

In general, marked parking bay sizes in rest areas should be larger than those specified in the standard for cars due to the greater use of rest areas by large 4WD vehicles, campervans and vehicles towing trailers (including caravans and boats).

Design of parking spaces should meet the minimum standards specified in AS/NZS 2890.1:2004 *Parking facilities Part 1: Off-street Car Parking*, and AS 2890.2:2002 *Parking Facilities Part 2: Off-street Commercial Vehicle Facilities*.

Refer to Section 9.1.1 for more information on categories of rest areas.

C12.5 Rest Area Signs

Sign requirements for rest areas are as follows:

- Rural freeways: As a minimum signs should be provided in accordance with AS 1742.15:2007 *Manual of Uniform Traffic Control Devices Part 15: Directional Signs, Information Signs and Route Numbering* in Australia and *MOTSAM 1* (NZ Transport Agency 2010a) in New Zealand.
- Major non-freeway arterial roads: As a minimum signs should be provided in accordance with AS 1742.6:2014 *Manual of Uniform Traffic Control Devices Part 6: Tourist and Services Signs* and *MOTSAM 1* (NZ Transport Agency 2010a) in New Zealand.
- Key facilities provided at a rest area should be depicted on signs placed on all approach roads.

- All parking and other regulatory signs within rest areas should comply with the relevant part of AS 1742. It should be noted that when separate parking is provided for heavy vehicles and passenger vehicles, they generally should be signed accordingly. Additional signs can also be employed to indicate a restriction e.g. 'no trucks'.
- 'Next service' signs relating to upcoming rest areas should be provided including information on the facilities offered and the distance to the next service area (in kilometres only rather than hours to avoid motorists adjusting their speed in difficult road conditions).

Refer to Section 9.1.1 for more information on categories of rest areas.

C12.6 Provision for People with Disabilities in Rest Areas

All new rest areas and rest area upgrades should be planned in accordance with the *Disability Discrimination Act 1992* in Australia and the *Human Rights Act 1993* in New Zealand. The requirements include provision of suitable toilets, parking spaces and appropriately graded footways and ramps.

Refer to Section 9.1.1 for more information on categories of rest areas.

C12.7 Camping and Length of Stay

Rest areas are not normally intended to be camping grounds. This is because campers will take up space and a crowded area may discourage the entry of fatigued drivers or those looking for a quiet, peaceful area to rest. Longer-term camping can also reduce the visual amenity of an area and lead to littering.

Where rest areas permitting overnight use are provided they should not be located within 25 km of other establishments providing overnight accommodation and less than 200 m away from any residence.

Conspicuous signs (e.g. 'camping permitted') should be erected outlining the length of stay permitted and the penalty for non-compliance. It is important that the duration of camping be enforced to minimise misuse of the facilities.

Refer to Section 9.1.1 for more information on categories of rest areas.

C12.8 Proximity of Rest Areas to Towns

Facilities provided at rest areas are often available in towns. Therefore, in determining the need for rest areas the ability of towns to serve as rest areas should be considered.

It should be remembered that the primary purpose of a rest area is to provide the driver with an opportunity to rest. If a town is to be considered as a rest area, it should have a quiet area adjacent to the through route. Ideally such an area should also have natural shade and be sufficiently removed from the through traffic to minimise noise and light spill.

Where the demand warrants it consideration should be given to providing a truck-parking bay within 20 to 30 km of a town to allow drivers the opportunity to rest/sleep and check vehicle loads.

The adverse impacts of nominating a town as a rest area should also be considered. These can include:

- congestion of urban streets caused by parking of heavy vehicles, campervans or a large number of vehicles using the rest area
- noise and air pollution resulting from vehicle movements
- extended stays by motorists wanting to use the rest area as a camping area.

Refer to Section 9.1.1 for more information on categories of rest areas.

[\[Back to body text\]](#)

Commentary 13

C13.1 Scenic Lookouts

Scenic lookouts are stopping places provided to allow travellers to view and photograph scenic areas. Scenic lookouts should provide sufficient parking facilities for passenger cars, cars towing caravans and coaches.

Care is required for access to scenic lookouts, e.g. many scenic lookouts in New Zealand occur at locations on bends where the 'right turn in' movement can be dangerous.

Refer to Section 9.2 for more information on roadside amenities.

C13.2 Information Bays

Information bays are stopping places which provide travellers with information on tourist attractions and any local services and facilities.

As a minimum information bays should provide sufficient parking facilities for passenger cars, cars towing, caravans and coaches. Within the bay a suitable structure should be provided to display information on tourist attractions within the district cultural centres, local service organisations, emergency services, tourist facilities etc. as well as commercial advertising. The information sign should also include a map of the area and should preferably be lit or at least positioned so that car headlights can illuminate the sign.

Refer to Section 9.2 for more information on roadside amenities.

C13.3 Heavy Vehicle Assembly Areas

Heavy vehicle assembly areas are provided for assembling and disassembling road trains and other combination vehicles.

The following requirements apply to heavy vehicle assembly areas:

- Parking bays should accommodate the turning movements and storage requirements of the largest vehicle likely to use the facility e.g. triple road train. Livestock parking bays, if required, should be separated from general freight bays and a separate parking area should also be provided for truck dollies.
- The number of parking bays should be sufficient to meet the requirements for present and forecast future needs with a provision for extension if and when required.
- Assembly area lighting is to be in accordance with Table 1.3 of AS/NZS 1158.3.1:2005, *Lighting for Roads and Public Spaces: Pedestrian Area (Category P) Lighting: Performance and Design Requirements* due to vehicle assembly and disassembly operations and reasons of personal safety.
- Consideration should also be given to providing truck compliance inspection facilities within a heavy vehicle assembly area.

Refer to Section 9.2 for more information on roadside amenities.

C13.4 Interception Sites

Interception sites are safe areas outside the carriageway provided for:

- official weighing and inspecting of heavy and commercial vehicles
- self-inspection of vehicles
- other enforcement (e.g. random breath testing) and emergency vehicles.

Reference should be made to national, state and territory policies addressing the design of interception sites for further information.

Refer to Section 9.2 for more information on roadside amenities.

C13.5 Rural School Bus Stops

A rural school bus stop is any pick-up and set-down area, designated for buses that are used exclusively for carriage of school children to and from a school in a rural environment.

Although bus stops are not classified as parking areas, where parents use a vehicle to drop off and collect children at rural school bus stops, safe parking facilities should be provided with an adequate area to permit drivers to park their vehicle, drop off children and collect them in a safe manner with a minimum disruption to children and traffic. If a separate parking area is to be provided it should be designed in accordance with AS/NZS 2890.1:2004 *Parking Facilities Part 1: Off-street Car Parking* and AS 2890.2:2002 *Parking Facilities Part 2: Off-street Commercial Vehicle Facilities*.

For further information on bus stop design, practitioners are encouraged to refer to their applicable national state or territory standards, guidelines and policies.

Refer to Section 9.2 for more information on roadside amenities.

C13.6 Roadside Vending Sites

Roadside vending involves the selling of articles either from a vehicle parked within the road reserve or directly from a stall with the vendor's car parked in the vicinity. This is potentially dangerous as vehicles may suddenly swerve or stop creating an unsafe situation. Roadside vending sites should generally be designed in a similar manner to truck parking bays, however, only one heavy vehicle will generally need to be accommodated depending on the forecast usage of the site.

Reference should be made to any national, state or territory policies addressing roadside vending as in some jurisdictions it is not permitted. In New Zealand reference should be made to *Guidelines for Establishing Rural Selling Places* (Transit New Zealand 1992).

Refer to Section 9.2 for more information on roadside amenities.

[\[Back to body text\]](#)

Commentary 14

C14.1 Success Factors for Park-and-ride

Successful park-and-ride schemes are usually developed as part of a balanced transport strategy which seeks to balance the accessibility requirements of both public and private transport users.

It is stressed that park-and-riders are choice travellers whereas most other public transport travellers are captive. Choice travellers must be wooed and it is for this reason that the park-and-ride system must be made attractive if it is to be successful.

Low availability and the relatively high cost of city centre car parking is a crucial element in ensuring the success of a park-and-ride system. Cheap and readily available city-centre parking will discourage the use of park-and-ride. Park-and-ride has been successful in those towns and cities around the world where there has usually been an active policy of increasing the cost of long-stay city centre parking and strictly limiting or banning additional off-street parking in central areas.

In determining what a suitable location is for a park-and-ride facility, the following factors need to be considered:

- The facility should be located in major traffic corridors upstream of the traffic congestion points.
- The facility should be located within a short walking distance of a bus stop/train station in travel corridors serviced by fast, reliable and frequent public transport services.
- The facility should not be located within 5–8 km of major destinations such as a town centre or central business district. Locating the facilities further away from the core regional centres also saves money due to lower land values.
- As motorists do not like backtracking, the facilities should be located on the destination side of the catchment area providing the majority of users with a direct route to the facility and then onto their destinations.
- The facility should be accessible and highly visible from major travel corridors to increase their attractiveness and awareness.
- The facilities should be separated from one another to avoid duplication for a particular catchment area.
- To increase its success, the facility should be located in areas with a high level of demand for at least one major destination.
- It is usually best to have several smaller park-and-ride facilities in different locations rather than one large one.
- The facility should be located within view of businesses or homes to improve security.

It should be noted that the effectiveness of bus-based park-and-ride systems can be reduced if the bus service is not protected from the effects of traffic congestion. This can be minimised by the use of bus priority measures such as segregated busways bus lanes, bus priority at signal-controlled junctions etc. Capacity can also be a problem for park-and-ride systems particularly in the case of an existing bus or rail service. Purchasing higher capacity vehicles or increased service frequency will address this issue but it will also increase the costs.

Example: National Bus Company's Doncaster Park-and-ride, Melbourne

Melbourne's purpose-built park-and-ride facility – National Bus Company's Doncaster Park-and-ride opened in January 2003 offering Victoria's highest frequency bus service. It resulted in the following:

- dramatically reduced travel times to the city for eastern suburbs residents using the facility
- hassle-free travel to the central business district
- less congestion on the Eastern Freeway
- higher service frequency
- environmental and traffic-management benefits for inner-city municipalities.

Buses travel between the park-and-ride facility and city centre approximately every five minutes during the morning and afternoon/evening peak period. A 15-minute off-peak and 30-minute night service also operates from the park-and-ride facility.

There is space for 400 cars at a time and there is also a 'kiss-and-ride' area or drop-off point for people to catch frequent buses to the city centre.

A security officer is also available throughout the entire bus operation period and all areas are under CCTV coverage.

Refer to Section 10 for more information on park-and-ride.

C14.2 Demand for Park-and-ride

Demand for park-and-ride capacity can be determined in a variety of ways. Often sophisticated transport models are employed to forecast the relative attractiveness and competitiveness of the system relative to all other travel choices (Young 1991, Young et al.1989 and Yue & Young 1998). However, in the absence of such a model empirical formulae can be used.

Research work conducted in the United States (Turnbull 1995) has revealed demand rates of between 0.5 and 2.0% of the market area population for bus-based park-and-ride. The differences were attributed to factors such as the level of congestion intensity of development in the activity centre and the parking costs at the destination. It should be noted that a demand rate (or attractiveness factor) of 0.7% was determined for the Western Australian bus-based park-and-ride system (Arup 1998) and can be used in Australia in the absence of more relevant data.

Taking this approach, a population catchment containing 10 000 people serviced by a bus-based park-and-ride facility with an attractiveness factor of 0.7% would indicate the need for around 70 car parking bays to be provided at the facility.

In these formulae, population is generally estimated using a theoretical catchment area of parabolic, elliptical conical or circular shape based on accessibility time by road i.e. time contours.

A number of other numerical models including regression, heuristic and deterministic models are discussed by Young (1991).

Refer to Section 3.2.3 for more information on the availability and attractiveness of public transport and other car use alternatives.

Refer to Section 10 for more information on park-and-ride.

C14.3 The Optimum Size of Park-and-ride Facilities

The optimum size of a park-and-ride facility in a particular location will be up to a point driven by demand. Controlling factors will be:

- the catchment size
- household size, population growth/age
- zoning (and hence density) of the residential land
- serviceability of future planned residential land
- design and quality of the park-and-ride interchange
- service frequency and fare charges
- security issues
- the relative competitiveness of park-and-ride in terms of travel to the city centre taking account of parking time, walk time, wait time, in-vehicle time, park-and-ride fare, perceived fuel cost and parking charges
- influence on the catchment of adjacent park-and-ride facilities
- nature of the local employment market (poor employment trends would appear to encourage households to maintain only one car with greater emphasis on kiss-and-ride)
- the cost
- whether a new or proposed road will improve access from a catchment previously outside the sphere of influence.

Figure C14 1: Example of typical bus stopping area at a metropolitan park-and-ride facility

Source: ARRB Group

There are physical limits on the size of a facility. In general, park-and-ride facilities larger than 1000 bays are not favoured because of the unwillingness of users to walk a long way to reach the station or bus stop, and user and car security issues. The provision of larger facilities through the construction of parking structures is an option but this obviously changes the cost equation. Very large facilities can also have an adverse impact on the local highway network particularly during peak periods.

Refer to Section 10 for more information on park-and-ride.

C14.4 Design of Park-and-ride Facilities

There are a range of design features that should be considered for any new park-and-ride facility including:

- ease of access/egress and good layout design for manoeuvring/parking
- parking spaces close to the bus/rail interchange
- allowance for vehicle arrival rates in the morning and evening peak periods
- security/lighting/panic buttons, security cameras, key-pin entrance/exit system to a secure area
- short-term (two minutes) and longer-term (15 minutes) waiting spaces for set-down and pick-up close to the entrance
- attractive landscaping
- bus/taxi set-down/pick up areas with approach slip roads separate from the park-and-ride facility
- walkers and cyclists own access to the interchange to avoid conflict with vehicles

- park-and-ride/kiss-and-ride areas given priority access during peak times
- provision of bike lockers
- parking bays for people with disabilities adjacent to the entrances
- provision of motorcycle bays
- vehicular and pedestrian circulation arrangements
- installation of clearly visible information signs at the facility and appropriate guide signs on the road network
- good urban design and clean nature of interchange
- safe and attractive areas to wait/shelter at the interchange
- provision of services like newspapers/drinks at the interchange.

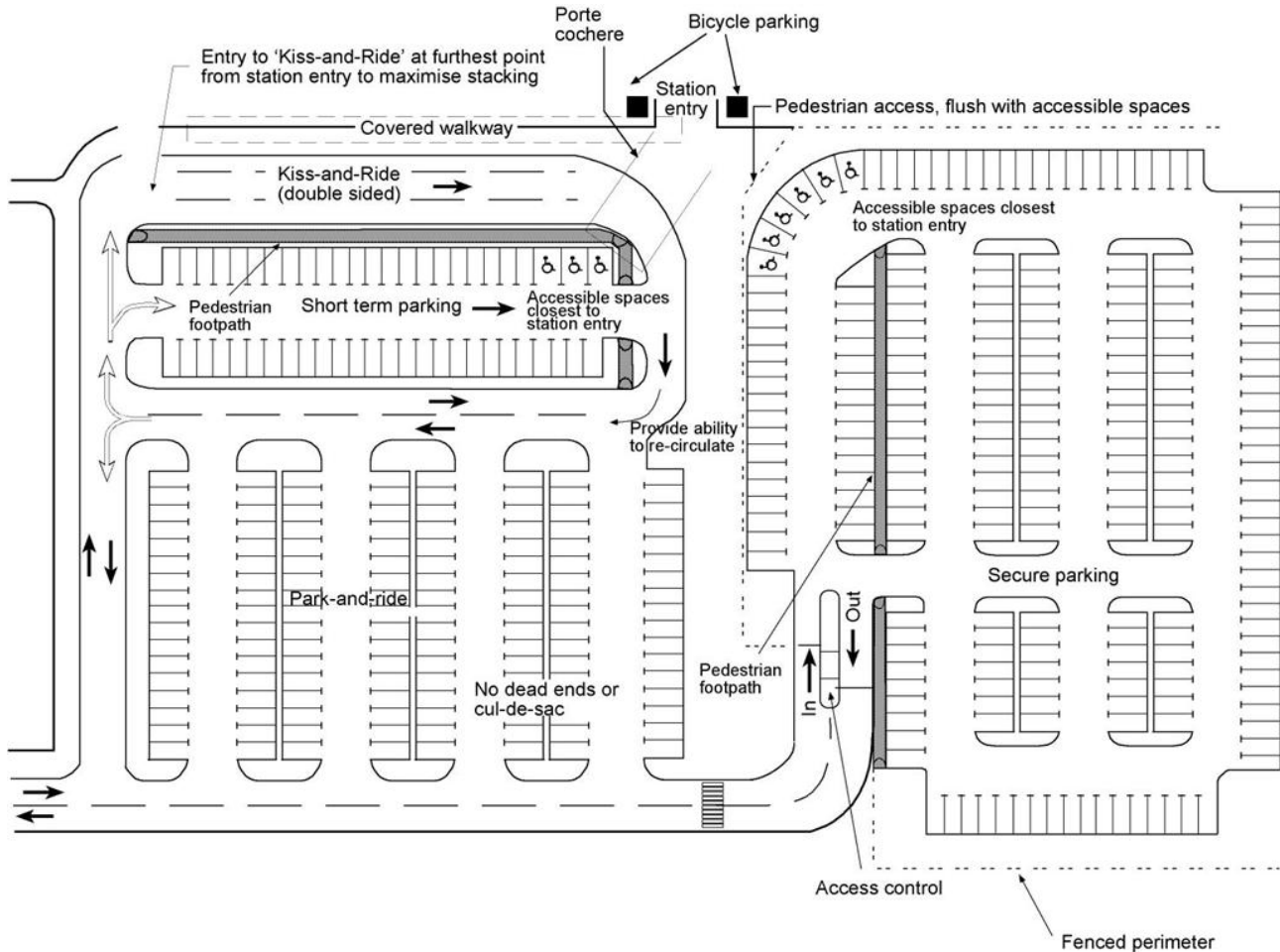
Figure C14 2: Example of layout and features (e.g. bicycle lockers) at a bus park-and-ride facility



Source: ARRB Group

Figure C14 3 provides an example of the layout and design details of a typical park-and-ride facility incorporating kiss-and-ride short-stay parking and other features.

Figure C14 3: Example of a typical park-and-ride facility layout



Refer to Section 10 for more information on park-and-ride.

C14.5 Other Park-and-ride Factors

There is a range of other important factors relating to park-and-ride, several of which are addressed in the following sections.

Kiss-and-ride

Sufficient dedicated space for kiss-and-ride (passenger drop-off areas) is essential. The provision of kiss-and-ride facilities is often largely underestimated in planning for park-and-ride facilities.

Kiss-and-ride facilities need to allow for set-down and pick-up close to the main entrances, be secure and well lit, and should incorporate waiting facilities such as shelters and seating. They should be designed sufficiently wide to safely allow for good traffic circulation and high parking space turnover.

In Figure C14 3 the double-sided kiss-and-ride allows the passengers to exit on both sides of the lane which increases efficiency.

As a general rule, park-and-ride facilities should be designed to allow for up to 15% of the total spaces (depending on catchment size/type) to be configured to cater for kiss-and-ride demand.

Figure C14 4: Example of part of a high capacity kiss-and-ride facility



Safety and security of park-and-ride facilities

Security should be considered in terms of both vehicle and personal safety. Vehicle security can be improved by:

- electronic surveillance systems e.g. security cameras
- staffed security areas
- electronic entry/exit systems with access via a barrier to a fenced area
- avoiding poor design (e.g. hidden areas).

Figure C14 5: Example of park-and-ride passenger information



Personal security can be improved by:

- rail/bus/ferry staff on site at interchanges
- electronic surveillance systems e.g. security cameras
- good lighting
- emergency systems such as a panic button linked to a security camera/central control
- easy access to public telephones (coin and card) which are well maintained
- a design which has a single bus or rail boarding/waiting facility surrounded on three sides by parking spaces (in a horse-shoe shape) has been found to be effective in several European cities in terms of reducing walk distances to cars and making the majority of the parking area visible from the central facility.

Electronic surveillance and an on-site security presence can provide reassurance for users and discourage car thieves

A barrier (such as a rising step barrier) at the exit to the parking area which can only be activated by a user with a park-and-ride ticket will discourage car theft but can extend departure times from the site.

Passenger information

High quality, reliable and easily understood passenger information is essential particularly as car drivers and passengers may not be regular users of public transport. Clear signs directing car drivers to the park-and-ride site are required along with information on the expected time of departure of the next park-and-ride service.

Multi-occupancy vehicles

Consideration should be given to providing preferential treatment to multi-occupancy vehicles particularly at park-and-ride facilities where parking utilisation is either close to or over capacity. There are a number of ways that this can be facilitated including:

- setting a certain amount of parking spaces aside (preferably close to the entrances)
- waiving any paid parking charges that may be applicable to single-occupancy vehicles.

Refer to Section 10 for more information on park-and-ride.

C14.6 Costs of Provision of Park-and-ride

Costs of park-and-ride systems are primarily associated with facility construction and operation but there may be additional costs if dedicated public transport services are used. Typical construction costs of facilities are usually lower than the costs of providing parking at city centres due to the availability of cheaper land.

Refer to Section 10 for more information on park-and-ride.

[\[Back to body text\]](#)

Commentary 15

C15.1 Objectives of Electronic Parking Guidance Systems

PGS essentially have to fulfil the following objectives:

- distributing the demand for parking by placing an even burden on existing parking facilities
- providing an aid to orientation for persons unfamiliar with a location
- reducing inner-city traffic through early guidance to park-and-ride locations
- improving parking search behaviour and reducing traffic circulation by informing the driver about the location and availability of a parking space and guiding drivers to the required parking location of their choice
- improving the public perception of the availability of parking
- improving the environmental quality of a city by reducing traffic circulation, reducing vehicle emissions and fuel consumption, and improving road safety
- reducing legal and illegal on-street parking.

Refer to Section 11.2 for more information on electronic guidance systems.

C15.2 Types of Parking Guidance Systems

Parking guidance systems can operate both 'on-route' and 'on-site' at specific parking stations.

On-route parking guidance systems

On-route parking guidance systems are one of the best established advanced driver information systems. They seek to reduce parking search behaviour and congestion by informing drivers of direction, location and availability of parking spaces.

Such systems function by cyclically acquiring data from all parking facilities connected to a network, e.g. by polling for data relating to the number of unoccupied parking bays and the number of entering/exiting vehicles.

An on-route parking guidance system must offer meaningful information to drivers with sufficient time for them to alter their access route to a car park where spare parking capacity is available. This may not be their 'usual' car park choice.

The system may also need to distinguish between different types of parking facility and/or types of parking bay within a single car park. This distinction may be a requirement where information and guidance is being offered to commuter parkers searching for all-day parking and to shopper/visitor parkers seeking short-stay (often more expensive) parking.

Other functions and components of a parking information and guidance system address supplementary driver information requirements. It is important to clearly define the objectives, specific functions and appropriate technologies for different levels within a parking information hierarchy. For example, early interception of motorists is necessary where information is being provided that will alter the selection of a car park and the approach route to car park.

The car park network should be as comprehensive as possible including information relating to:

- location of car parks
- occupancy rate of car parks
- direction signs to/from car parks
- opening hours for parking facilities
- number of parking bays available for disabled persons
- parking fees, restrictions and conditions for short-stay and long-stay parkers
- payment methods available.

The most comprehensive and notable Australian example of an on-route parking information and guidance system is the system that has been operating for a number of years in Melbourne.

Examples of on-route variable message signs are shown below (Axent Global Systems 2014).

Figure C15 1: Examples of on-route parking information and guidance signs



On-site parking guidance systems

Other parking information and guidance systems operate within a car park and seek optimum utilisation of available parking capacity. Such systems provide information on the occupancy status of all parking bays within a facility: as a car enters a car park, green overhead arrows guide each driver to the nearest parking bay.

In this system a detector equipped with pilot lights is installed above each parking bay. The control centre polls the detectors several times a second for vehicle presence and instantly updates the signs which are installed at each level. The control centre processes the data immediately a vehicle leaves or enters a parking bay. The central computer also continuously monitors whether the detectors are properly functioning and signals any loss of information from a device possibly due to an incident such as damage by a vehicle.

Figure C15 2: Example of an on-site parking guidance indicator



By providing real-time guidance towards vacant parking bays both drivers and car park operators receive benefits. Increased car park occupancy and enhanced utilisation of existing parking capacity can be achieved without the need for construction of underutilised and costly parking.

Examples of on-site variable message signs are shown below in Figure C15 3 and Figure C15 4

Figure C15 3: Examples of on-site variable message signs



Figure C15 4: Examples of on-site variable message signs



Variable message signs provide guidance to drivers seeking vacant parking bays or information on price and restrictions

Variable direction signs direct drivers to the nearest available parking bay or towards the entrance and exits

Refer to Section 11.2 for more information on electronic guidance systems.

[\[Back to body text\]](#)

Commentary 16

This commentary outlines ITS applications to parking, other than parking guidance systems.

C16.1 Automatic Vehicle Identification

Automatic vehicle identification (AVI) is a fundamental element of many proposed ITS. This term is used to describe a variety of alternative technologies which enable the unique identification of a stationary or moving vehicle without the need for intervention from the driver or system manager (Giummarra 1999).

AVI systems essentially consist of three functional components:

- a vehicle-mounted transponder often referred to as a tag
- a roadside detector and reader unit
- a central computer system for the processing and storage of information.

In its simplest form, information identifying the vehicle is encoded onto the transponder and as the vehicle passes the reader site it transmits the coded data to the reader unit from where it is forwarded to the central computer. The key feature of AVI systems is that they enable the spatial and temporal location of a vehicle to be determined either on a one-off basis (i.e. on entering a car park) or on several occasions throughout a journey (i.e. on entering and leaving a car park). This means that they can provide the information necessary for the application of a range of parking charging principles based, e.g. on a single entry tariff, spatially varying tariffs, time-of-day dependent tariffs or tariffs that vary according to the duration of stay (or any combination of the above).

The AVI systems do not themselves provide a mechanism for charging or accounting and therefore must be used in conjunction with either 'off-vehicle' accounting mechanisms implemented through a central computer or additional 'on-vehicle' accounting technology based on stored value cards to allow for the fee transaction to occur. The latter mode of operation requires two-way communication between a roadside detector and the vehicle.

A possible extension of this technology could be the issue of an electronic tag that acts as a means of allowing access to given parking areas with charging mechanisms included and with possible preference given to particular residents, retailers, shoppers or others as determined.

Benefits of AVI

The benefits of AVI are as follows:

- reduced queues at entry and exit lanes and potential for reservation of specific parking bays and lanes for AVI users
- enhanced revenue control and security
- reduced equipment and labour cost
- increased customer convenience – there is no contact with the driver.

Potential problems with AVI

The owner of the parking facility must be careful in the application of the AVI to maximise the usefulness of the system in the parking facility. The number of transactions processed using this technology should be compared with the total number of transactions in order to evaluate if one lane should be dedicated to AVI only, without slowing down non-AVI drivers.

C16.2 Licence Plate Recognition

Licence Plate Recognition (LPR) uses computer and video technology to automatically capture, identify and read licence plates on vehicles at entry and exit points to parking facilities. The system then automatically calculates the length of stay of the vehicle and automatically charges the correct parking fee. The process used to capture and process images essentially includes the following steps (Stehman 2005):

1. image capture
2. finding licence plate on the image
3. licence plate character segmentation
4. optical licence plate character recognition
5. association of optical licence plate character recognition and image with ticket data.

Benefits of LPR

The benefits of LPR include improved audit function of parking ticket transaction, reduced user fraud and reduced queues at entry lanes.

Potential problems with LPR

There are numerous issues that have to be overcome to ensure that the image is accurate and reflects the necessary information. These include the following:

- distance between vehicles – tailgating vehicles block off the licence plate of the first entering vehicle
- physical visibility of licence plate – potential for tow bars and bicycle-rack fittings to block plate
- location and type of plate on vehicle – the LPR camera may be set to capturing the central location of the plate only, the plate could have various background images/logos and it could be reflective
- environmental conditions – rain, glare/shadows and fog would all contribute to a deteriorated image quality
- condition of the licence plate – build-up of dirt etc.
- angle of vision – the camera must be positioned at an optimal location to allow visual access to the rear of the vehicle
- cost effectiveness – currently the systems are extremely expensive and require sophisticated software in order to capture and process the information.

C16.3 A Cashless Society

It is becoming increasingly easy to buy products and services including petrol, telephone calls, cinema tickets, airline seats and other services without using cash. Parking is no exception.

Stored-value payment cards (smart cards) are machine-readable devices generally similar in size and shape to existing credit cards with a stored value that decreases by an appropriate amount each time the card is used (Giummarra 1999). A standard smart card usually contains an embedded microprocessor which is positioned under a gold contact pad on one side of the card. Another form of smart card is the contactless smart card that contains a microprocessor and aerial inside the plastic card. It eliminates the need for swipe or slot facilities and hence reduces the chance of vandalism.

Smart cards can be issued in various denominations on a disposable basis. Alternatively, smart cards can be rechargeable via credit card online or at a recharge machine.

Various on-street meters now accept smart cards and credit cards for payment in addition to or instead of coins so that the motorist does not need to have exact change. The elimination of cash transactions reduces the administrative costs of fee collection.

Contactless smart cards have been trialled in Singapore to reduce delay in payment by bus passengers. This card can also be adapted for parking especially for park-and-ride.

There are two main approaches to the introduction of cashless parking payment:

- *Closed systems*: This option is for an authority to create its own kind of 'stored money': an example is the Telstra phone card. These systems operate under the authority of one organisation in a geographical area or they apply to one function.
- Several local authorities in Australia have introduced their own parking cards based on a magnetic card technology. These cards are loaded with a pre-set monetary value and are then used instead of cash for payment of parking fees but only at the council's own car parking facilities where card readers have been installed. Local authorities could also use the same card for payment for other municipal services e.g. library fees or use of leisure-centre facilities. It could also become a retail loyalty card to encourage use of local shops by awarding bonus/discount points.
- *Open systems*: This approach involves a multi-function card that has national acceptance rather than a system where each parking authority has its own card. An example of an open cashless payment system that is being used at some car parking stations is the credit card.

Refer to Section 7.7 for more information on parking payment methods.

C16.4 Mobile Telephony

Mobile telephony is another option to collect payment for parking. Here the motorist enters the code of the parking bay via SMS/text message and payment can take place by adding the fee to the telephone bill or via pre-paying parking by credit card or direct debit from the bank account. Traffic wardens can request the status of parking bays using mobile terminals. This approach to transaction processing could be profitable for both service providers and car park administration.

Refer to Section 7.7 for more information on parking payment methods.

C16.5 In-vehicle Route Guidance Systems

These systems utilise in-vehicle displays which offer advice to drivers in the form of descriptive information or recommendations concerning the best route to follow to the desired parking destination.

The simpler (autonomous) system depends solely on road network information carried in the vehicle frequently in the form of maps stored on a CD ROM and thus cannot take into account prevailing traffic conditions or parking availability.

More sophisticated (externally linked) systems are based on two-way communications between in-vehicle transponders and roadside beacons where the required route information is transferred to the vehicle from a central computer.

Figure C16 1: Example of an in-vehicle route guidance system



C16.6 Trip Planning Systems

All the systems discussed so far operate principally during a traveller's journey. By contrast, trip planning systems aim to provide travellers with relevant information before they set out on their journey. This enables them to modify not only their choice of route and parking but their choice of mode and time of travel as well.

There is considerable variation in the nature of the different systems which can range from simple route planning services based on PC-software to sophisticated interactive teletext/videotext based in-home services such as the French TELETEL system providing its subscribers with travel information including parking availability, weather conditions and traffic delays.

Figure C16 2: Example of an on-site VMS



C16.7 Enforcement Technologies

Even where increasingly sophisticated technologies for parking systems, management emerge, the need for enforcement will continue as a major priority.

A range of new technologies have been introduced into enforcement practice. These include:

- hand-held data capture terminals that can significantly reduce the time taken to issue a penalty notice and thus improve the efficiency and effectiveness of parking inspectors
- hand-held scanners to validate in-vehicle smart card payment systems
- in-ground parking overstay detection system (POD).

The challenge for many government authorities is to disentangle their sometimes conflicting roles as promoters of urban centres, parking business providers, parking policy formulators and parking enforcement agencies.

This requires that the (usually) local government authority develops a balanced position on travel demand management goals for its area of jurisdiction including goals aimed at supporting business and retail activity (and access to central areas) but in a manner that is sustainable and also supportive of broader social, environmental and heritage goals. Refer to Section 5 for more information on this topic.

C16.8 Technical Compatibility

Technical compatibility is a key issue for ITS equipment and sub-systems including the need for unified functional or technical standards. Until the market develops further, technical difficulties are possible particularly where neighbouring authorities select different and incompatible systems, e.g. in cashless parking payment technology.

Other forms of technical incompatibility relating to competing functional requirements rather than competing standards may be complex in nature and take a significant time to resolve. An example might include the difficulties that may arise for specific automatic vehicle-identification-based road pricing schemes when attempts are made to further extend their scope to include duration-based parking charges.

Refer to Section 1.1 for information on the scope of this Guide.

Refer to Section 5.6 for more information on linking technology such as this one to policy.

Refer to C15.2 for information on the types of parking guidance systems.

[\[Back to body text\]](#)

Austroads' *Guide to Traffic Management Part 11: Parking* is concerned with the parking management process. It provides guidance for planners and engineers to ensure that parking is provided in a safe and efficient manner and with due regard to considerations of access to and the impact on the wider road and transport system.

Part 11 presents guidelines for determining the demand for and supply of parking and it provides a parking policy framework – how the demand should be addressed. The implementation of on-street and off-street parking for all road users including parking controls in urban centres is addressed as is parking on rural roads and at park-and-ride facilities. Electronic parking guidance systems and signs are also described.

Guide to Traffic Management Part 11



Austroads

Austroads is the association of Australasian road and transport agencies.

www.austroads.com.au